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Working Paper

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A Comparative Assessment of the North American and Japanese 2x4 Residential Construction Systems: Opportunities for US Building Materials

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CINTRAFOR
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Executive Summary

The purpose of this project was to perform a comparative assessment of the US and Japanese 2x4 construction technologies, evaluate Japanese builders perceptions of US value-added wood building materials and identify opportunities to increase the use of US wood building materials within the Japanese 2x4 construction sector.

In 2008, housing starts in the US and Japan totaled 906,200 and 1.05 million units, respectively. Two by four housing starts in Japan totaled 107,747 (up 9.3% from 2007) and reached a record market share of 21.3% of total wooden housing starts and 9.8% of total housing starts. Approximately half of the prefectures in Japan had a ratio of 2x4 housing starts above the national average of 20.8%. However, in many of these prefectures, the total number of 2x4 housing starts is relatively small. The prefectures where the adoption of the 2x4 construction technology is well established, as well as where the housing market is relatively large, include Saitama, Tokyo, Hyogo, Kanagawa, Chiba, Hokkaido, Fukuoka and Aichi. These 8 prefectures represented 51.7% of 2x4 housing starts in Japan in 2008.

While the global economy performed poorly in 2008, exports of wood products from the US to Japan increased substantially. Total wood exports from both the US and Washington to Japan, which had been declining since 2004, recorded increases in 2008, with US wood exports growing by 6.6% while Washington exports rose by 5.2%. Softwood logs and lumber remain the primary wood products exported to Japan, although exports of OSB and veneer sheets increased significantly in 2008. Exports of value-added wood products from Washington to Japan were dominated by prefabricated buildings (25.3% of total value-added wood exports), builder's joinery (44.8%), wooden windows (16.9%) and wooden doors (6.4%).

Despite the success of the 2x4 construction system in Japan, imports of US wooden building materials are constrained due to the fact that there is a Japanese version of the 2x4 construction technology that co-exists with the North American-style. The primary difference between the two systems relates to the size of the basic construction module used in the construction process. The Japanese-style 2x4 system utilizes a 3'x6' panel size which is based on the size of a traditional *tatami* mat, whereas the North American-style 2x4 system employs 4'x8' panels in the construction process. Another difference between the two construction systems is the spacing of studs and joists; 17.9 inches (455 mm) on center in the Japanese system versus 16 inches (405 mm) on center in the North American system. In addition, the Japanese system tends to use more wood in the construction process (particularly in the structural framing) and thus tends to have higher material and labor costs, making the Japanese system less cost effective. Finally there is less labor specialization and efficient scheduling of construction tasks with specialist crews; significantly slowing down the construction process, reducing housing quality and increasing labor costs.

Despite the fact that most builders interviewed in this project recognize the cost effectiveness of the North American-style 2x4 construction system, relatively few Japanese builders have adopted it. Discussions with Japanese 2x4 home builders point to a broad range of factors that influence this decision. Perhaps the most important factor is that home builders in Japan are not customer-oriented in the sense that they work closely with their customers to maximize customer satisfaction and reduce overall cost. Another factor which contributes to the widespread use of the 3x6 module relates to the strong relationship that exists between Japanese 2x4 builders and Japanese manufacturers of wooden building materials, particularly commodity wood products. Home builders interviewed during this study universally emphasized that reliability of supply and just-in-time delivery of building materials to the construction site are very important to them. Domestic manufacturers of structural panels and wood products are willing to provide this service for them whereas few foreign suppliers will.

This same bias is somewhat less evident in the use of value-added wood products such as wood windows,

door and cabinets. In this case, we found that 2x4 home builders were much more willing to use imported building materials. However, the biggest concern for them when specifying these products is that they should be readily available in Japan and they must be able to obtain spare parts and installation support in a timely manner. For example, some home builders indicated that they do not use US wood windows because they have difficulty obtaining spare parts and replacement windows in a timely manner and because technical support in Japan is generally not available (although some US wood window manufacturers do have representatives in Japan to handle product and installation issues quickly).

Another issue that affects the use of US wood building materials is Japanese home builders' perception that US manufacturers and exporters are not committed to the Japanese market for the long-term. The perception that US exporters are 'inners and outers' is problematic and must be overcome in order to make greater inroads in Japan.

This project included a survey of Japanese 2x4 builders, with survey respondents representing 62.1% of total 2x4 housing starts in 2007. Not surprisingly, given the design of the sample frame, almost 85% of the houses built by respondents were 2x4 houses with the remaining houses being post and beam. Virtually all of the P&B builders reported that they used the 3'x6' module. While over a third of the 2x4 builders reported that they have used the 4'x8' module, the number of houses that they build using the 4x8 module was less than 5% of the total houses they built in 2008.

With respect to the specification and sourcing of value-added wooden building materials, the survey found that home owners specified these products between 17% and 30% of the time, depending on the type of product. The survey also found that 2x4 homebuilders are quite willing to use imported value-added wood building materials, with their use of these products ranging from 20% in the case of kitchen and bathroom cabinets to almost 50% for hardwood flooring and wood windows. Japanese 2x4 builder's use of US value-added wood products was highest for hardwood flooring (18.4% of total use), interior doors (16%), wood windows (16%) and exterior doors (14%). It was lowest for kitchen cabinets (4%), bathroom cabinets (6%) and softwood flooring (7%).

Survey respondents reported that the most important product attributes for them were high quality (6.6 rating out of 7), reliability of supply (6.4) and low price (6.2). In terms of product quality, they reported that US value-added wood products were perceived as having only average quality. Interestingly, small builders rated the quality of US value-added building materials much higher than did large builders. Respondents also reported that US suppliers provide below average levels of products support, although small builders again reported substantially higher ratings than did large builders.

The survey results clearly show that the large, national 2x4 builders have a poor perception of US value-added wooden building materials, both in terms of quality and service, relative to small and medium-sized local builders. This suggests that US manufacturers and exporters should focus their marketing efforts on small and medium-sized 2x4 builders in the short-term. However, long-term success in Japan will require that US manufacturers and exporters understand and address those factors that adversely affect large builder's perceptions of US value-added wood building materials. This should provide the basis for additional research in the future.

One product for which there is strong market potential is dimension lumber. Many of the 2x4 home builders reported that they were having trouble sourcing 2x8 and 2x10 joist material, as well as most other sizes of dimension lumber. More 2x4 home builders are now willing to accept a "home center" grade of lumber rather than the traditional higher quality J grade. This suggests that now may be a good time for dimension sawmills in Washington to reenter the Japanese market.

In summary, the struggling domestic housing market in the US combined with the relatively weak US dollar and strong Japanese yen provide a unique for manufacturers and exporters of wood building materials increase their presence in Japan. However, they must demonstrate a long-term commitment to the Japanese market in order to be successful.

The Japanese 2x4 market continues to represent a good opportunity for US manufacturers and exporters of wood products who are confronted with the worst US housing market since 1945. However, re-establishing US wood products in the Japanese market will require substantial effort on the part of manufacturers and exporters, especially those who abandoned the market during the period 1996-2006. US manufacturers and exporters who are returning to the Japanese market or who are new to this market will need to demonstrate a long-term commitment to their Japanese customers if they are going to be successful. They also need to develop a strategy for providing after sales support for their products in a variety of areas, including: timely claims evaluations, assistance with installation questions and providing spare parts and replacement products.

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Background

In 2008, 2x4 housing starts in Japan totaled 107,747 (up 9.3% over 2007) and reached a record market share of 21.3% of total wooden housing starts and 9.85% of total housing starts. Much of the success of the North American 2x4 construction technology in Japan can be attributed to several factors. First, 2x4 construction costs (both labor and material) are substantially lower than for traditional post and beam homes. Second, total construction time is substantially shorter for the 2x4 construction system. Third, younger home buyers are attracted to the western-style designs and open floor plans that the 2x4 system provides. Finally, the standardized nature of the 2x4 construction system and the use of standard load-span tables simplifies the process of performing structural calculations for 2x4 houses relative to post and beam houses. This latter factor is particularly relevant given the current regulatory environment in Japan as the housing industry adjusts to a more stringent house permitting process.

Despite the success of the 2x4 construction system in Japan, imports of US wooden building +materials are constrained due to the fact that there is a Japanese version of the 2x4 construction technology that co-exists with the North American-style. The primary difference between the two systems relates to the size of the basic construction module used in the construction process. The Japanese 2x4 system utilizes a 3'x6' panel size which is based on the size of a traditional *tatami* mat, while the North American style 2x4 system employs 4'x8' panels in the construction process. Other differences between the two construction systems include the stud spacing: 17.8 inches in the Japanese system versus 16 inches on center in the North American and the greater integration of domestic building materials into the Japanese system. Construction drawings and house plans in the Japanese system are generally based on metric sizes (i.e. meter, millimeter) whereas the North American system relies on the foot-inch system of measurement. In addition, the Japanese system tends to use more wood in the construction process (particularly in framing applications) and thus tends to have higher material and labor costs, making the Japanese system less cost effective. Finally, because the structure of the Japanese 2x4 system is more oriented to replacement housing rather than sub-divisions and there is less specialization of labor, the overall construction costs for the Japanese system tend to be substantially higher than in the North American system.

Many sources have noted that 2x4 residential construction costs in Japan are much higher than in the US. In May 1994, the Ministry of Construction's (MOC) North America Housing Cost Study Group determined that a two-story 2x4 house built in Japan was between 1.82 to 1.98 times more expensive than a comparable house built in the US on an exchange rate basis of ¥111 to $1 (JETRO 1996a). The MOC Study Group also found that the cost of an average 164 square meter house in Seattle was about $139,000 compared to $255,000 (exclusive of land costs) for a comparable house in the Sendai region of Japan (Magnier 1994).

The MOC Study Group concluded that the reasons why 2x4 construction costs were higher in Japan include complex and hard to use distribution channels, non-standardized construction methods, reduced competition, higher overhead, more cumbersome regulations, higher material costs for domestic products, the high cost of certifying US wood products, and the fact that 2x4 houses are built using the same management system employed in the post-and-beam industry. The MOC Study Group acknowledged that extended distribution channels are typical in Japan and that the residential construction industry has a long history where material supply channels have become well established (JETRO 1996b). They conclude that it would be very difficult to modify this system without causing severe disruptions in the supply of residential building materials.

The MOC Study Group further found that labor comprised approximately two-thirds (65 percent) of the total construction cost in Japan compared to 35% in the US (EP 1992). The various factors that contribute to higher labor costs in Japan include: little specialization of labor in the residential

construction trades, high carpenter wages, and low labor productivity. Tokyu Home Corporation estimated that US carpenters can complete work on one tsubo (a common Japanese construction measurement equivalent to 3.3 square meters) in 6.72 hours while the most efficient Japanese carpenter requires 9.6 hours to complete the same amount of work (Nakamae 1994). Thus, the Tokyu researchers concluded that the labor productivity of carpenters in Japan is substantially lower than in the US. Similarly, the Ministry of International Trade and Industry estimated that the labor requirement for building a 2x4 house in the US was approximately 700 hours compared with 2,500 hours to build a traditional Japanese post and beam house of equivalent size (Briggs and Dickens 1984). Japanese researchers also estimated that the overall cost savings resulting from using the North American-style 2x4 construction technology would be in the range of 20 percent of total construction costs as compared to the traditional post and beam method of construction. In summary, the potential for growth within the Japanese 2x4 construction sector remains strong and can perhaps be best summarized in the quote below taken from a comparative study of the US and Japanese 2x4 homebuilding industries.

> *"…there is no structural or cultural reason why the 2x4 market segment cannot continue to experience positive growth over the long-term. The current restrictions on the growth of the 2x4 market are as much a result of a lack of imagination on the part of North American architects, builders, and exporters as it is on Japanese architects and contractors. Having established a strong position in the Japanese housing market, the 2x4 housing industry must evolve and develop to better meet the needs and expectations of Japanese home buyers in the future." (Eastin et al. 1998)*

US exports of wood products to Japan increased by 7.1% between 2007 and 2008. To a large degree, this can be attributed to the recent weakness of the US dollar, the strengthening of the Japanese yen, reduced supplies of Russian logs into Japan and extremely weak demand for wood products in the US. However, other factors including high transportation costs, regulatory reforms and increasing price sensitivity have also affected the competitiveness of US wood products in Japan. Overall, the extreme weakness of the US housing market will continue to provide further impetus for US wood products manufacturers and exporters to refocus their attention on the Japanese market. The strong performance of the Japanese 2x4 construction market makes this sector especially attractive to US exporters of wooden building materials.

This is particularly true of the Japanese 2x4 construction industry where the potential exists to reduce construction costs further by increasing the use of imported US value-added wooden building materials. The Japanese government continues to be interested in providing affordable housing for first time home buyers, particularly the younger generation that is currently living in condominiums and apartments but are interested in owning their own home. For these entry-level home buyers, price and affordability are major concerns. These younger home buyers are more international in their perspective and life style and surveys show that they are open to purchasing a western-style house. These social and economic factors also support an increased effort to expand the use of North American-style 2x4 construction technology and building materials.

Finally, the recent scandal involving a few renegade Japanese and architects who falsified structural calculations and used faulty construction materials in residential housing projects has resulted in several significant changes to the building codes and approval process. In general, it will be much easier for builders using the 2x4 construction technology to comply with these new codes and processes because of its standardized construction technology and simplified design and structural calculations. In contrast, the myriad different post and beam construction systems make it expensive and difficult for post and beam builders to meet these new requirements. This project seeks to compare and contrast the two different 2x4 construction techniques used in Japan (3'x6' versus 4'x8'), understand Japanese builders use and perceptions of imported building materials and identify market opportunities to increase US exports of wooden building materials to Japan.

Overview of the Japanese Economy

Japan's economy has been in a state of flux since the end of the bubble economy in the early 1990s and the 1997 Asian economic crisis. Widespread concern about the economy caused extensive industrial restructuring, increasing numbers of bankruptcies and record post-war unemployment levels. On the way out are the days of the lifetime employment guarantee between a company and its employees and many of the large iconic Japanese manufacturers, such as Sony, Honda and Toyota, are increasing their use of contractors. In its place is a Japan that is less sure of its role in the global economy. Of course, as with everything in Japan, a closer look reveals that the economic landscape (just as the political landscape) is divided into traditional, rural-based small agricultural producers and highly competitive urban industrial manufacturers. Examples of both of these types of producers can be easily found within the forest products industry where small labor intensive "mom and pop" sawmills can operate within a stone's throw of huge highly automated sawmills and precutting manufacturers. In this sense, Japan truly is a study in contrasts and contradictions.

The 1990s, perhaps aptly described as the post-bubble decade, was a decade of economic stagnation. During this period, GDP growth averaged a mere one percent per year (Figure 1). The unemployment rate jumped from 2.1% to a post war high of 5.5% (Figure 2) and bankruptcies rose from approximately 7,000 in 1989 and 1990 to almost 20,000 in 1999. Uncertainty over the future caused Japanese consumers to curtail their spending, resulting in a period of deflation as the consumer price index fell by 0.3% in 1999 and by almost 0.6% in 2000. Continued concern over the state of the economy caused consumers to reduce spending and resulted in a record 23 ***quarters*** of deflation in Japan that began in the first quarter of 1999 and did not end until the third quarter of 2004 (Figure 3). And even then the deflationary period hung on with the consumer price index falling into negative numbers in 7 of the next 12 quarters. It is only since the fourth quarter of 2007 that deflationary pressure has given way to increasing inflation. The pullback in consumer spending was reinforced by two periods of substantial declines in monthly earnings, 1998-1999 and the last half of 2001 through 2002, which further undermined consumer's confidence in the economy, Figure 4.

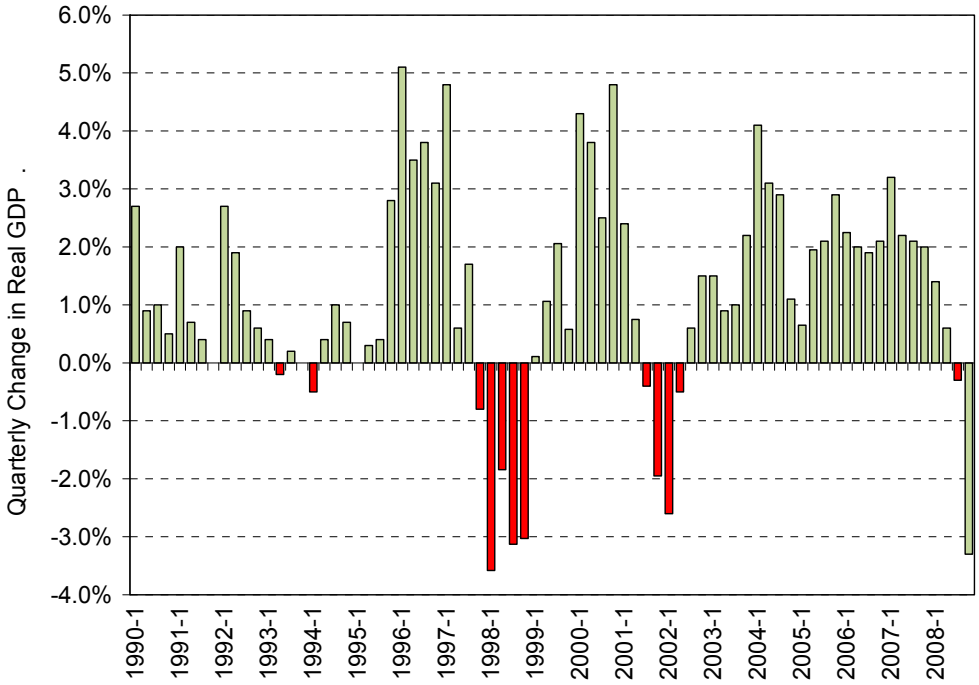


Figure 1. Quarterly changes in real GDP in Japan between 1990 and the third quarter of 2008.

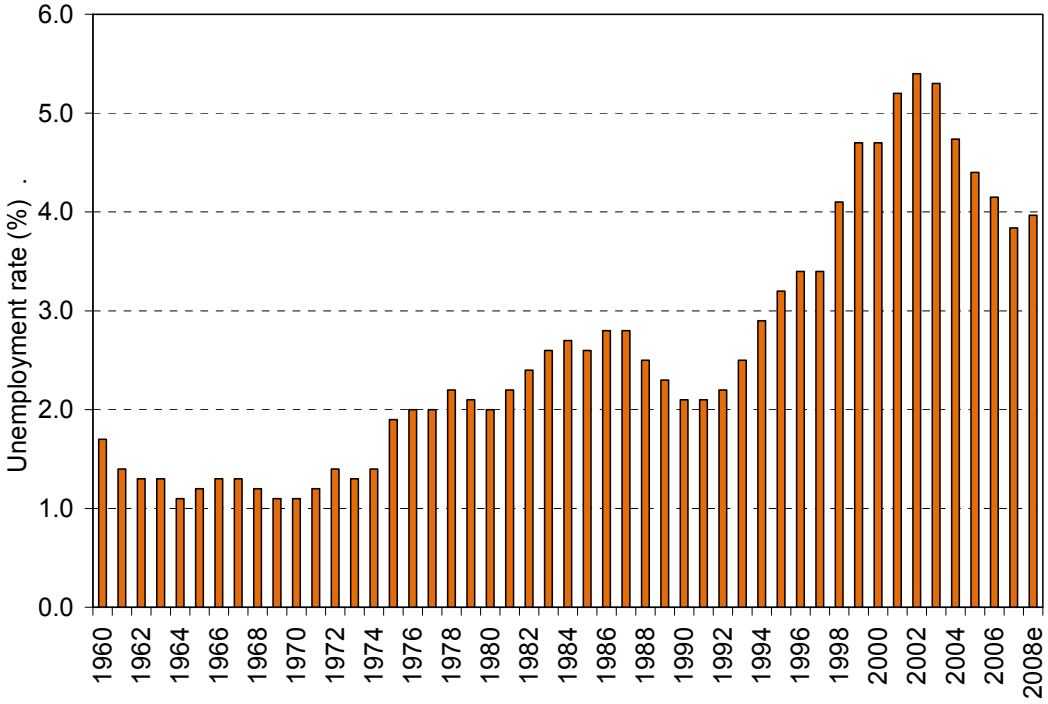


Figure 2. Annual change in the unemployment rate in Japan between 1960 and 2008.

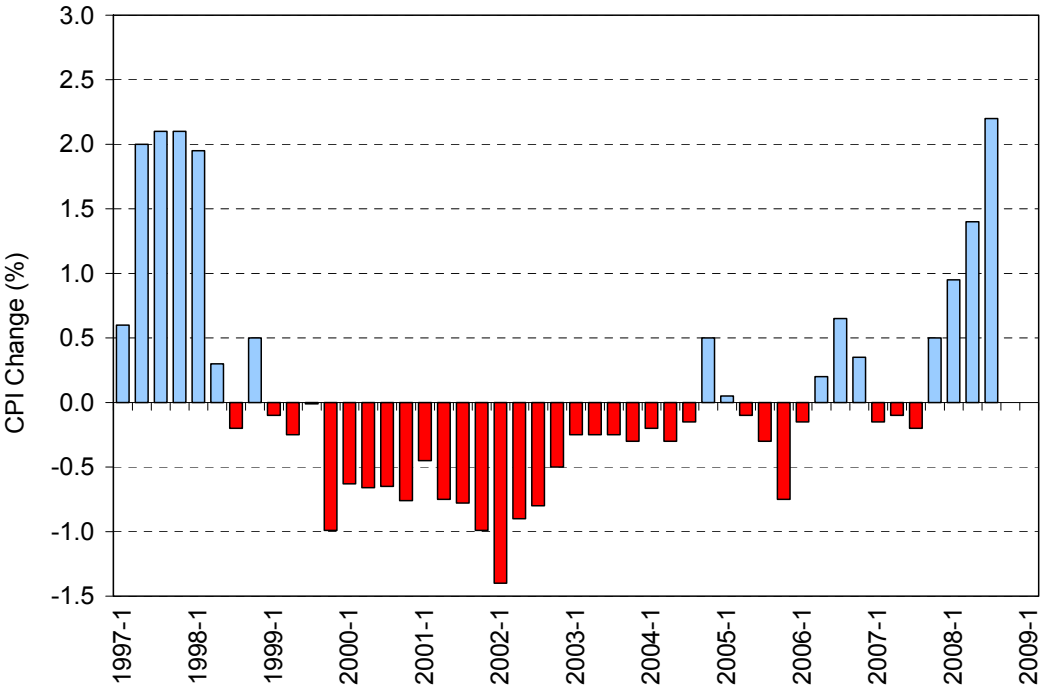


Figure 3. Changes in consumer price index in Japan between 1997 and 2008.

By the end of 2002, the Japanese economy had begun to respond to the fiscal stimulus and relaxed monetary policies introduced by Prime Minister Koizumi. Between 2003 and the middle of 2008, real quarterly GDP growth averaged almost 2% and unemployment dropped from a post-war high of 5.5% to 3.8%, although deflationary pressure continued to haunt the economy up until the end of 2007.

The recent global economic crisis has hit the Japanese economy hard with GDP declining by 3.3% in the fourth quarter of 2008, a post-war record. Perhaps a bigger concern for the Japanese is the relative strength of the yen, which combined with declining demand for automobiles and electronics, caused Japanese exports to plummet by 13.9% in the fourth quarter of 2008 while industrial production in December dropped by 9.8%.

Looking into the future, demographic statistics clearly indicate that Japan's trend of an aging and shrinking population will have serious implications in the future. Perhaps two statistics best summarize the demographic problem confronting Japan. First, the population of Japan peaked at 127,787,000 in 2007 and is expected to decline to less than 100 million by 2051. At the same time, the dependency ratio in Japan (defined as the ratio of people aged 65 and above to the number of people aged 15 to 64) jumped from 8.9% in 1960 to 25.3% in 2000 and is expected to increase to 49.4% by 2015.

Clearly the government must address two major challenges in the years ahead. In the short-term it must aggressively resolve the lingering structural problems in the financial sector that have undermined economic performance in the wake of the global economic crisis. In the longer-term, the government must realistically confront the social and financial challenges presented by a shrinking and aging population. Addressing this demographic trend will be particularly problematic in Japan where immigration has not been traditionally viewed as an acceptable option.

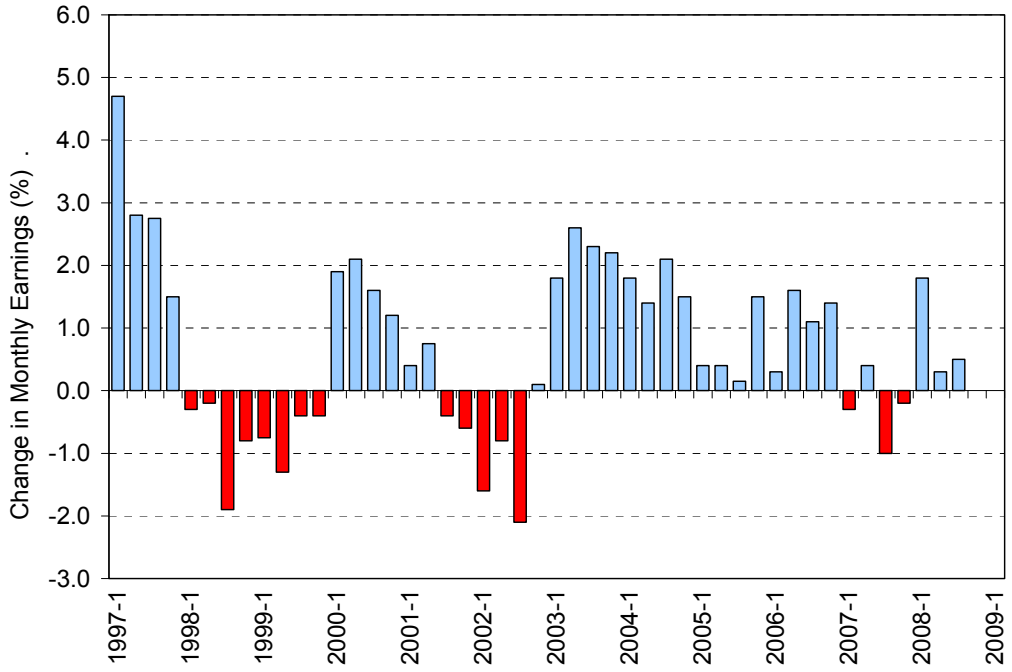


Figure 4. Changes in monthly earnings in Japan, reported on a quarterly basis.

Overview of Japanese Housing Sector and Regulatory Reform

Background

The greatest single end use for imported wood in Japan is within the residential construction industry (JAWIC undated). It is estimated that approximately 80% of the Japanese lumber supply is used within the housing construction sector. Japan's residential housing market has consistently been one of the largest and most dynamic in the world. Between 1987 and 1997, Japan's housing starts exceeded those in the US, despite the fact that Japan has only 46.9% of the population and 3.9% of the landmass of the US, Figure 5. To get a better perspective of Japan's population density, consider placing half of the US population into the state of California. Obviously, population density is very high in Japan and the migration of people from rural areas to the three main population centers (i.e., Tokyo, Osaka and Nagoya) has exacerbated this situation. Between 1950 and 2000, the population of the three major metropolitan areas in Japan has increased from 84.1 million (36% of total population) to 126.9 million (51% of total population). The rapid growth of the urban areas has had a substantial impact on the type of housing built, especially in the cities.

Wood has always been an important part of Japanese culture and trees were thought to be the places where the native gods first descended to earth. As a result, wood has traditionally had strong religious meaning in Japan, with most temples and shrines being built from wood. The Japanese people are deeply drawn to the aesthetic beauty, strength, and aroma of wood and this appreciation is demonstrated by the high value that the Japanese place on having wood in their homes. A recent survey conducted by the Japanese Prime Minister's Office showed that, if given a choice, nearly 80% of respondents would prefer to live in a wooden house.

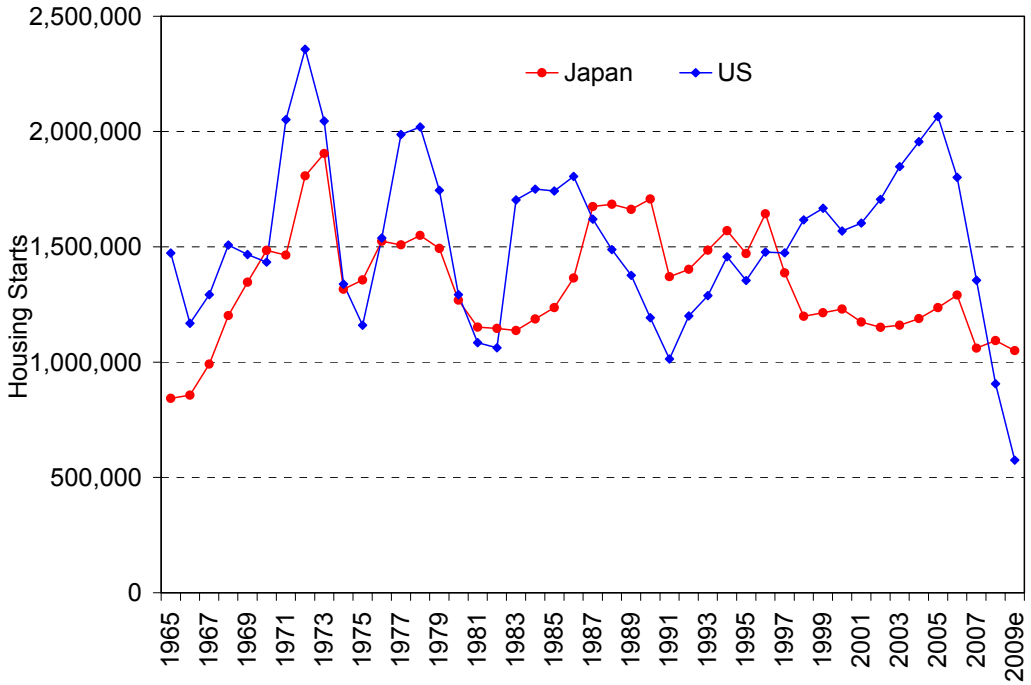


Figure 5. Comparison of US and Japanese housing starts, 1965-2009e.

In 2008, housing starts in the US and Japan totaled 906,200 and 1.05 million units, respectively, Figure 5. Housing starts in the US and Japanese have tended to follow world economic trends while exhibiting differences based on domestic trends as well. The economies of both countries grew rapidly in the early 1970s, as indicated by the high level of housing starts, until 1973 when the OPEC oil crisis slowed their economies and resulted in a decline in the number of new housing starts. Both countries also experienced housing slumps in the early 1980s and early 1990s in response to the second oil crisis and the Persian Gulf War, respectively.

In Japan, the number of housing starts was very high during the late 1980s (the so-called Bubble-Economy) and in 1996, the first time since the bubble economy that housing starts increased at a double-digit rate over the previous year. The high number of housing starts in 1996 has been attributed, in part, to the rebuilding effort following the 1995 Hanshin Earthquake in Kobe. The Kobe earthquake damaged approximately 147,600 houses (Japan Lumber Reports 1995) and displaced over 400,000 households (Pacific Rim Wood Market Report 1996). The high number of housing starts was influenced by homeowners rushing to purchase houses before the Ministry of Finance increased the national consumption tax from 3% to 5% on April 1, 1997. Since the increased consumption tax applied to new house purchases, consumers wanted to avoid paying hundreds of thousands of yen in extra taxes.

Residential construction in Japan was dominated by wooden housing well into the mid-1970s, accounting for more than two-thirds of all housing until 1976, Figure 6. However, continued growth in multi-family housing and prefabricated single-family housing has contributed to the declining share of wooden housing. In 2008, wooden housing represented 46% of all housing starts in Japan although the share of wooden housing starts has increased from a low of 43% in 2006. There are three main types of wooden housing built in Japan: traditional Japanese post-and-beam houses, 2x4 (both Japanese-style and North American-style), and prefabricated houses.

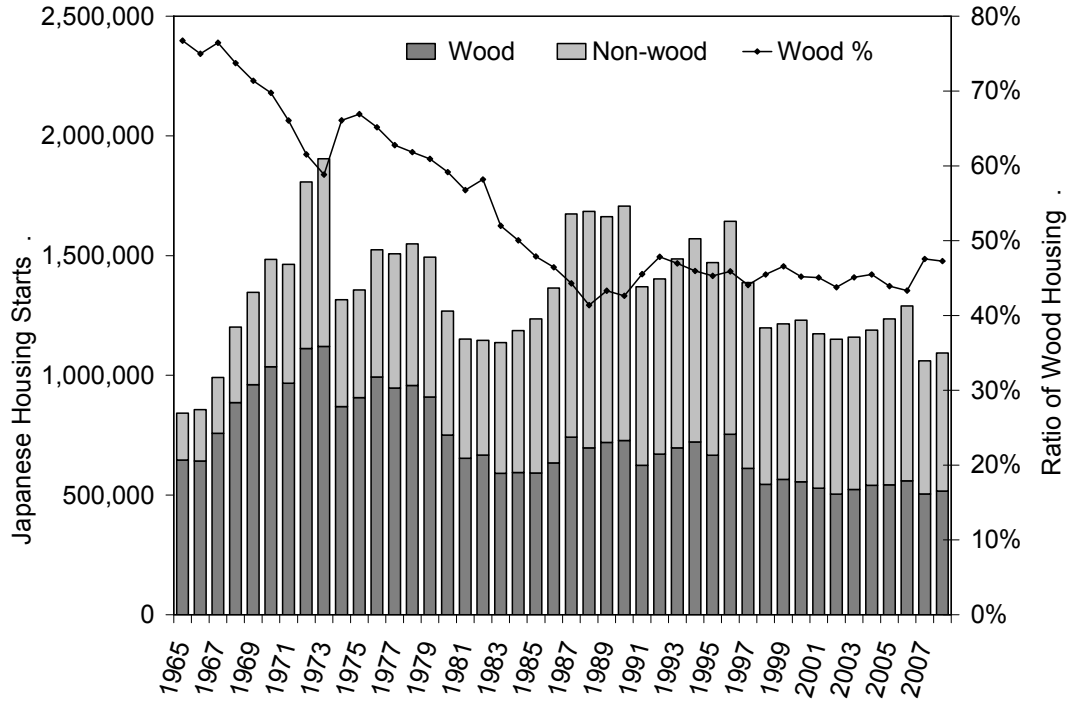


Figure 6. Wood and non-wood housing starts in Japan and the ratio of wood starts to total housing starts.

Historically, post-and-beam housing has dominated the residential housing market Figure 7. In 1963, 86.2% of all residential housing starts utilized the traditional post-and-beam construction method (Coaldrake 1990). However, by 2008, post and beam homes represented just 35.9% of all new residential housing starts. Great inroads have been made by the steel and ferro-concrete construction industry in the residential construction sector as the number of multi-family apartments and condominiums has increased. Multiple-family housing units are characterized by high and medium-rise, high-density condominium or "mansion" buildings where steel and concrete are used for the structural framework of the building. In the large metropolitan cities, they are an absolute requirement to house the enormous population. In addition, for many people, mansions are more affordable than a detached single-family house. The only drawback to mansions is that their floor space is usually smaller than the average detached single-family home. On average, the floor space for a single-family residence is 2.7 times greater than for a multiple-family residence (JETRO 1996a).

Inroads by prefabricated houses and 2x4 houses have further eroded the market share of post-and-beam houses. Total prefabricated housing starts comprised about 12.4% of residential housing starts in 2006. In addition, 2x4 housing units represented about 9.8% of all residential housing starts and 22% of wooden housing starts in 2008, Figure 7. The decline in post-and-beam construction can partly be attributed to an aging labor force. Many young people dislike working in the residential construction sector because of the strenuous and dirty work involved. In addition, it takes seven years of apprenticeship training to become a post-and-beam carpenter-another factor which discourages entrance into this profession (Cohen et al. 1996). As a result, the average age of carpenters in Japan is approaching 60 years old and it is estimated that the number of carpenters could decrease by as much as 45% by 2015.

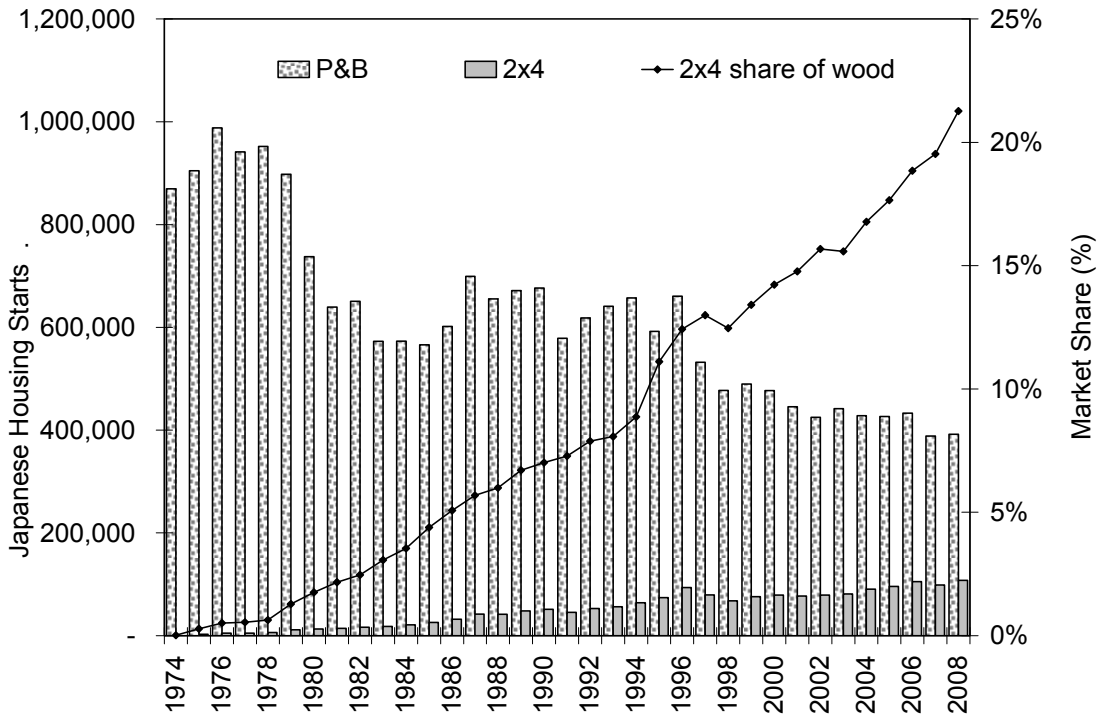


Figure 7. Comparison of post & beam housing starts relative to 2x4 housing starts in Japan.

The 2x4 residential construction sector has continued to expand annually since its introduction into Japan in 1974, Figure 7. In fact, since its introduction in 1974, the 2x4 sector has seen its market share grow every year with the dual exceptions of 1998 and 2003. This is an amazing record given that during this same 34 year period, the overall Japanese housing market experienced 15 years where housing starts recorded a yearly decline and the post and beam segment of the housing market experienced 18 years of declines in annual housing starts. While it might be an overstatement to say that the 2x4 segment is recession proof, it wouldn't be far from the truth. Much of the success in the 2x4 sector is driven by its adoption by a small number of large homebuilders, both in the single-family as well as the multi-family housing sectors The biggest home builders in each of the major segments of the wooden house sector are listed in Tables 1-3.

Table 1. Top Japanese post & beam home builders, FY2007.

Company Name	Houses/Units Built
Sumitomo Forestry Co.Ltd.	9,526 B
Ichijo Co.,Ltd.	5,550 B
Arnest One Corporation	4,353 B
Sekisui House, LTD.	3,588 U
Iida Home Max Co.,Ltd.	3,219 B
Touei Housing Corporation.	2,508 B
Polus Group	2,296 U
Tact Home Co.,Ltd.	2,164 B
Higashi Nihon House Cp., Ltd.	1,858 B
Fuji House Co.,Ltd.	1,610 B
Leohouse, Ltd.	1,458 B
Aqura Home Corporation	1,165 B
Daowa House Industry Co., Ltd.	916 B
Hosoda Co., Ltd.	865 U
Fuji Corporation Limited	758 U
Hinokiya Juutaku Co., Ltd.	750 B
Sala House Co.,Ltd.	588 B
Sanei Architecture Planning	524 B
Grandy House, Ltd.	434 B
Totate Housing Co., Ltd.	409 B

B - the number of buildings; U - the number of housing units

Table 2. Top Japanese wooden prefabricated home builders, FY2007.

Company Name	Houses/Units Built
Leopalace 21 Corporation	33,443 U
Misawa Homes Co., LTD	10,573 B
Sekisui Chemical Co., Ltd.	2,100 U
Sweden House Co., Ltd.	1,699 U
S X L Co. Ltd.	1,402 U
R.C.Core Co., Ltd.	793 U

Table 3. Top Japanese 2 X 4 home builders, FY2007.

Company Name	Houses/Units Built
Daito Trust Construction Co., Ltd.	38,869 U
Mistui Home Co., Ltd.	5,967U
Sekisui 2U	2,600
Sumitomo Realty & Development Co., Ltd.	1,630 B
Toshin Juken (Nagoya)	1,500 U
Sanyo Housing Nagoya Co., Ltd	970 U
Shin Showa Corporation	739 U
Toyota Wood You Home	700
Sumitomo Forestry	500
Elk Homes (Yamaguchi)	450
Hokusu Co., Ltd. (Sendai)	245 U

Source: (Nikkan Mokkuzai Shinbun. Sept.17.2008)

Housing Starts, by prefecture

Japan is divided into forty-seven prefectures (Map 1) and the number of wood housing starts and ratio of wood housing starts are summarized in Figure 8 with further details provided in Table 4. The national average for wood housing starts was 47.3% in 2008. The housing data shows that the vast majority of the prefectures in Japan build a much higher proportion of wood houses than is reflected in the national average. However, the housing data is heavily skewed by the large number of housing starts in the major metropolitan areas and the bias towards non-wood multi-family housing in these areas. This is particularly true for the two biggest metropolitan areas: Tokyo and Osaka. Individually these two areas represent a total of 157,169 and 76,328 housing starts, or 21.4% of total Japanese housing starts and the ratio of wood housing starts in these two areas is just 26.4% and 31.6%, well below the national average. Despite this fact, these two areas still generate a huge number of wooden housing starts (41,478 and 24,153, respectively), making them important market segments to be considered.

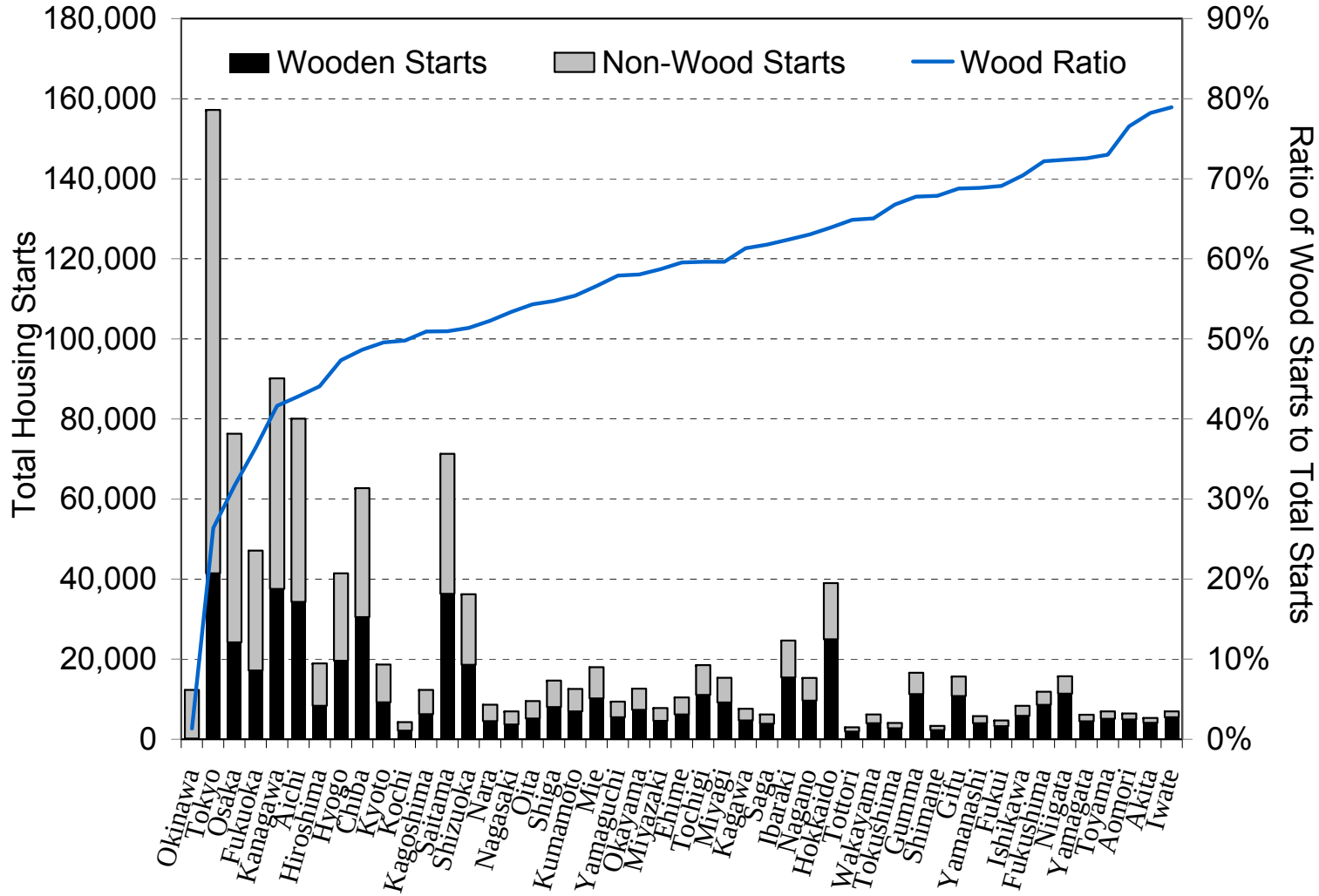
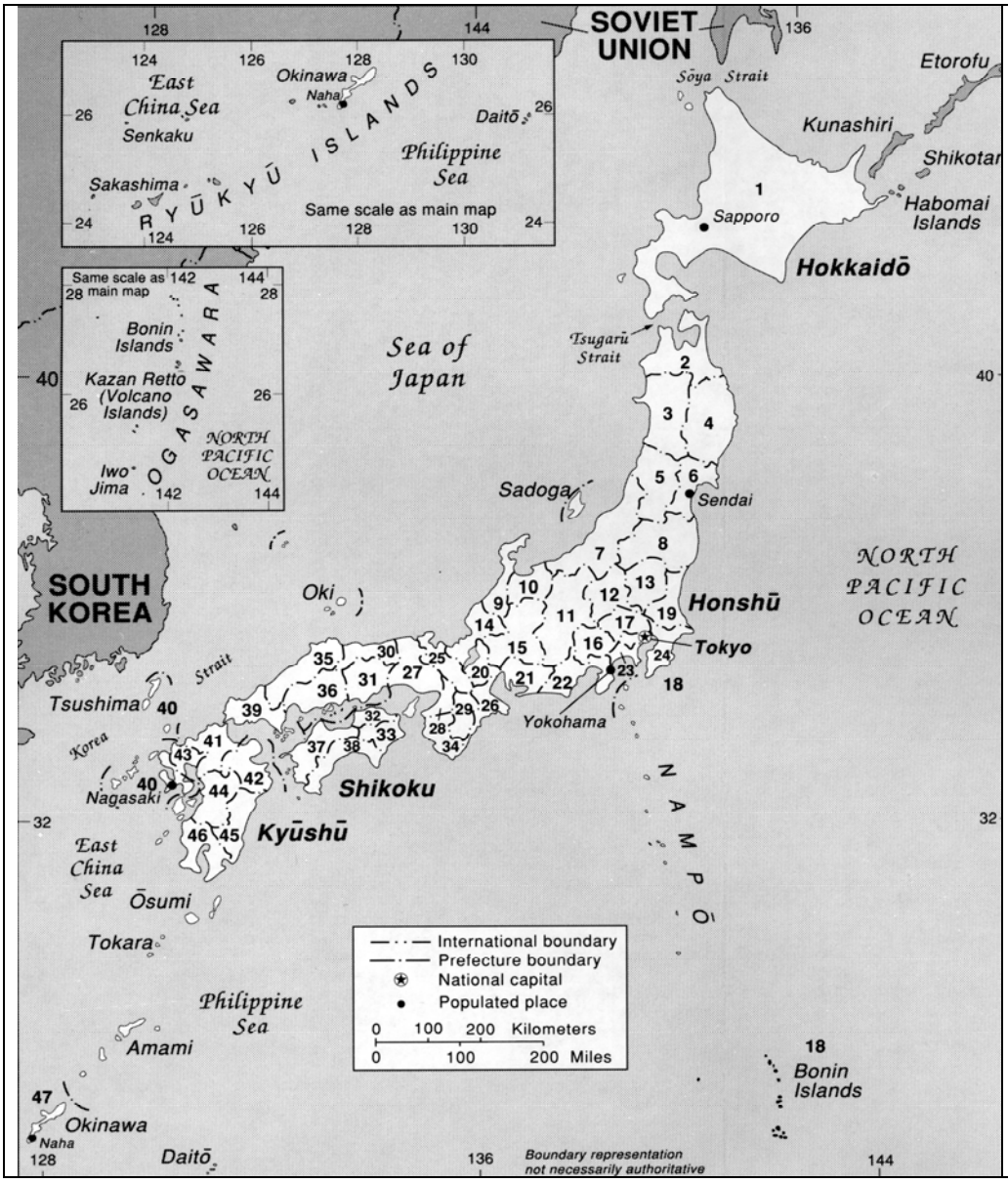


Figure 8. Number and ratio of wooden housing starts in Japan, by prefecture.



Japan Prefectures

1. Hokkaido
2. Aomori
3. Akita
4. Iwate
5. Yamagata
6. Miyagi
7. Niigata
8. Fukushima
9. Ishikawa
10. Toyama
11. Nagano
12. Gumma
13. Tochigi
14. Fukui
15. Gifu
16. Yamanashi
17. Saitama
18. Tokyo
19. Ibaraki
20. Shiga
21. Aichi
22. Shizuoka
23. Kanagawa
24. Chiba
25. Kyoto
26. Mie
27. Hyogo
28. Osaka
29. Nara
30. Tottori
31. Okayama
32. Kagawa
33. Tokushima
34. Wakayama
35. Shimane
36. Hiroshima
37. Ehime
38. Kochi
39. Yamaguchi
40. Nagasaki
41. Fukuoka
42. Oita
43. Saga
44. Kumamoto
45. Miyazaki
46. Kagoshima
47. Okinawa

Map 1. Prefectures of Japan.

Table 4. Summary housing and population statistics for Japan.

	Population Change (00--05) %	Total Population 2007*	Housing Starts	Change in Starts (07/08)	Wooden Starts	Non-Wood Starts	Wood Ratio	2x4 Starts	Change in 2x4 Starts	2x4 Ratio
Hokkaido	-1.0	5,570	39,014	-7.0%	24,937	14,077	63.9%	6,204	1.8%	15.9%
Aomori	-2.6	1,407	6,457	5.2%	4,942	1,515	76.5%	794	-11.5%	12.3%
Iwate	-2.2	1,364	6,980	-6.6%	5,508	1,472	78.9%	1,809	-3.6%	25.9%
Miyagi	-0.2	2,347	15,375	-21.0%	9,168	6,207	59.6%	2,545	-4.4%	16.6%
Akita	-3.7	1,121	5,275	-12.9%	4,125	1,150	78.2%	613	-32.9%	11.6%
Yamagata	-2.2	1,198	6,156	9.0%	4,466	1,690	72.5%	714	23.7%	11.6%
Fukushima	-1.7	2,067	11,853	1.1%	8,557	3,296	72.2%	1,589	17.1%	13.4%
Ibaraki	-0.4	2,969	24,684	-4.7%	15,402	9,282	62.4%	2,839	29.3%	11.5%
Tochigi	0.6	2,014	18,551	5.5%	11,060	7,491	59.6%	2,413	3.8%	13.0%
Gumma	-0.0	2,016	16,613	5.3%	11,257	5,356	67.8%	1,722	25.6%	10.4%
Saitama	1.7	7,090	71,325	10.3%	36,352	34,973	51.0%	5,269	5.3%	7.4%
Chiba	2.2	6,098	62,745	7.9%	30,512	32,233	48.6%	7,528	18.7%	12.0%
Tokyo	4.2	12,758	157,169	14.5%	41,478	115,691	26.4%	8,684	13.1%	5.5%
Kanagawa	3.6	8,880	90,123	10.8%	37,526	52,597	41.6%	8,718	1.2%	9.7%
Niigata	-1.8	2,405	15,714	-1.9%	11,370	4,344	72.4%	1,298	9.7%	8.3%
Toyama	-0.8	1,106	6,992	-7.9%	5,103	1,889	73.0%	1,147	-15.5%	16.4%
Ishikawa	-0.6	1,170	8,331	-5.9%	5,866	2,465	70.4%	898	0.3%	10.8%
Fukui	-0.9	816	4,714	-9.5%	3,257	1,457	69.1%	639	9.2%	13.6%
Yamanashi	-0.4	877	5,764	0.6%	3,968	1,796	68.8%	780	8.9%	13.5%
Nagano	-0.8	2,180	15,297	-3.7%	9,644	5,653	63.0%	2,074	14.2%	13.6%
Gifu	-0.1	2,104	15,637	-5.8%	10,753	4,884	68.8%	2,695	6.0%	17.2%
Shizuoka	0.7	3,801	36,210	-2.7%	18,601	17,609	51.4%	3,545	9.8%	9.8%
Aichi	3.0	7,360	80,030	8.3%	34,285	45,745	42.8%	10,799	13.2%	13.5%
Mie	0.5	1,876	18,016	5.2%	10,199	7,817	56.6%	2,211	1.0%	12.3%
Shiga	2.8	1,396	14,669	4.0%	8,031	6,638	54.7%	1,221	1.7%	8.3%
Kyoto	0.1	2,635	18,652	-9.1%	9,243	9,409	49.6%	859	24.0%	4.6%
Osaka	0.1	8,812	76,328	-2.5%	24,153	52,175	31.6%	3,841	-5.5%	5.0%
Hyogo	0.7	5,589	41,450	2.4%	19,614	21,836	47.3%	4,343	19.7%	10.5%
Nara	-1.5	1,410	8,654	-5.5%	4,524	4,130	52.3%	667	8.8%	7.7%

Table 4 (con't.). Summary housing and population statistics for Japan.

	Population Change (00--05) %	Total Population 2007*	Housing Starts	Change in Starts (07/08)	Wooden Starts	Non-Wood Starts	Wood Ratio	2x4 Starts	Change in 2x4 Starts	2x4 Ratio
Wakayama	-3.2	1,019	6,176	0.6%	4,017	2,159	65.0%	550	42.9%	8.9%
Tottori	-1.0	600	2,954	-7.8%	1,916	1,038	64.9%	407	41.3%	13.8%
Shimane	-2.5	731	3,345	-10.3%	2,270	1,075	67.9%	440	199.3%	13.2%
Okayama	0.3	1,953	12,612	-11.6%	7,321	5,291	58.0%	1,387	19.1%	11.0%
Hiroshima	-0.1	2,873	18,955	-16.4%	8,355	10,600	44.1%	1,816	-0.4%	9.6%
Yamaguchi	-2.3	1,474	9,416	-2.7%	5,452	3,964	57.9%	1,443	-15.6%	15.3%
Tokushima	-1.7	800	4,068	-8.5%	2,716	1,352	66.8%	454	-6.0%	11.2%
Kagawa	-1.0	1,006	7,647	13.1%	4,690	2,957	61.3%	1,089	-3.1%	14.2%
Ehime	-1.7	1,452	10,441	1.8%	6,217	4,224	59.5%	1,400	16.4%	13.4%
Kochi	-2.2	782	4,284	12.6%	2,133	2,151	49.8%	471	73.2%	11.0%
Fukuoka	0.7	5,056	47,139	4.6%	17,183	29,956	36.5%	4,096	17.3%	8.7%
Saga	-1.2	859	6,223	8.1%	3,844	2,379	61.8%	929	28.0%	14.9%
Nagasaki	-2.5	1,453	6,942	0.6%	3,704	3,238	53.4%	487	22.7%	7.0%
Kumamoto	-0.9	1,828	12,542	-5.6%	6,949	5,593	55.4%	1,479	60.8%	11.8%
Oita	-0.9	1,203	9,550	-0.1%	5,187	4,363	54.3%	1,148	0.0%	12.0%
Miyazaki	-1.4	1,143	7,811	7.2%	4,585	3,226	58.7%	817	91.8%	10.5%
Kagoshima	-1.8	1,730	12,302	9.5%	6,264	6,038	50.9%	805	25.2%	6.5%
Okinawa	3.3	1,373	12,300	13.1%	164	12,136	1.3%	31	-18.4%	0.3%
Japan	0.7	127,771	1,093,485	3.1%	516,868	576,617	47.3%	107,707	9.3%	9.8%

** Population in thousands*

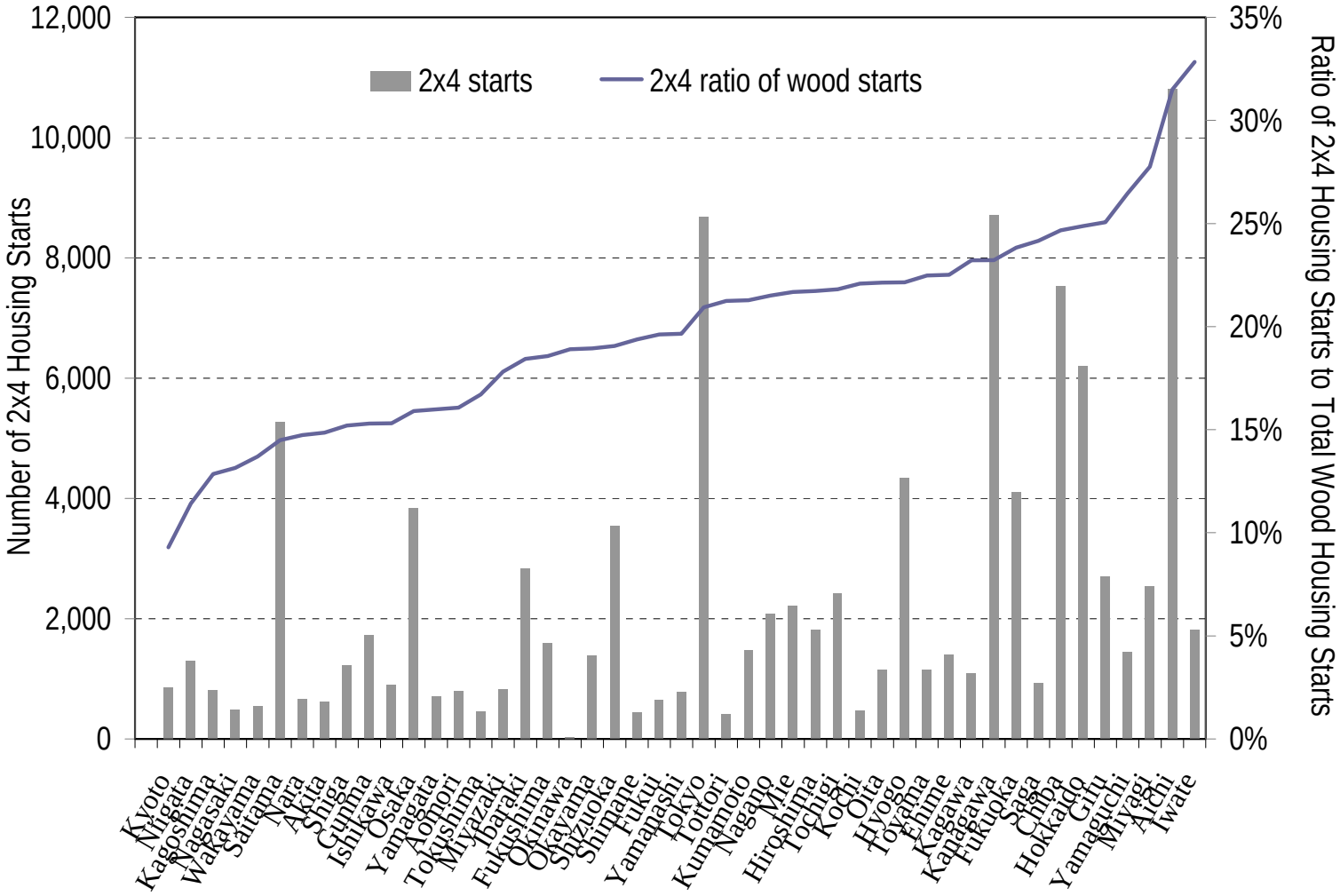


Figure 9. Number and ratio of 2x4 housing starts in Japan, by prefecture.

Approximately half of the prefectures in Japan had a ratio of 2x4 housing starts above the national average of 20.8%, Figure 9. However, in many of these prefectures, the total number of 2x4 housing starts is relatively small, suggesting that they may be less interesting from a marketing perspective. The penetration of the 2x4 housing technology varies greatly across prefectures from a low of 31 housing units (.3% of total starts) in Okinawa prefecture to a high of 10,799 housing units (13.5% of total housing starts) in Aichi prefecture. Perhaps a more meaningful way to look at the successful adoption of the 2x4 construction technology is to see where the highest ratio of 2x4 starts to total wooden starts occurs. Using this measure, it can be seen that in both Iwate prefecture (Tohoku region) and Aichi prefecture (Tokai region), 2x4 housing starts represented 32.8% and 31.5% of total wooden housing starts, respectively.

Identifying prefectures where the adoption of 2x4 construction is well established as well as where the housing market is relatively large would provide a useful metric to help exporters of 2x4 wooden building materials more effectively focus their marketing efforts. Considering Figure 9 and the shaded rows of Table 4, it appears that the most promising prefectures (based on a combination of the number of 2x4 housing starts or the market share of 2x4 starts relative to total wooden starts) are: Saitama, Tokyo, Hyogo, Kanagawa, Chiba, Hokkaido, Fukuoka and Aichi. These 8 prefectures represented 51.7% of 2x4 housing starts in Japan in 2008. Four of these prefectures (Saitama, Tokyo, Chiba and Kanagawa) are located in the Kanto Region while the remaining four are spread across the country, including Hyogo prefecture (Kinki Region), Hokkaido prefecture (Hokkaido Region), Fukuoka prefecture (Kyushu Region) and Aichi prefecture (Tokai Region).

Interestingly, while the prefectures noted above represent the best market opportunities for 2x4 wooden building materials, growth in the 2x4 housing sector occurred across almost half of the regions of Japan between 2007 and 2008, Figure 10. More importantly, the post and beam sector of the housing market shrank within every region of Japan and, with the singular exception of the Chugoku region; the 2x4 sector outperformed the post and beam sector of the housing market across every region of the country.

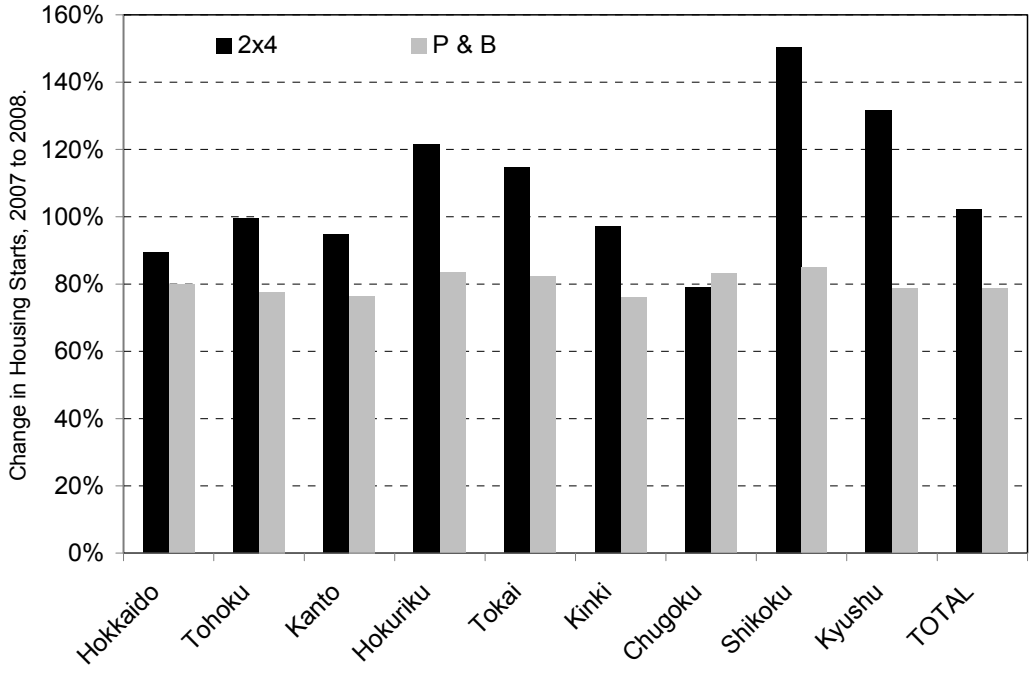


Figure 10. Comparison of the change in traditional housing starts and 2x4 housing starts between 2007 and 2008, by region.

Trends in floor area are heavily influenced by the fact that a greater proportion of the 2x4 units built in Japan are multi-family whereas the post and beam sector is more heavily skewed towards single gamily construction, Figure 11. In fact, only in Hokkaido is the average floor area of 2x4 houses greater than that for post and beam houses. Similarly, the average volume of wood used per house is substantially lower in the 2x4 sector. Despite this, we find that the average volume of wood used per square meter of floor area is about 11% lower for 2x4 construction (.17 cubic meters of wood used per square meter of floor area built) compared to post and beam construction (.191 cubic meters of wood used per square meter of floor area built).

Demographics and Housing Start Outlook.

Demographic trends suggest that the housing industry in Japan has entered an unfavourable period of declining population and household formation that is not expected to change, Figure 12. Japan's population peaked at 127,790,000 in 2004 and has been declining since even as the birth rate has dropped to a record low of 1.25 births per woman, far below the population replacement rate of 2.33 births per woman. At the current rates, it is estimated that Japan's population will drop to 120 million around 2025 and will fall below 100 million by 2051.

A look at the population pyramids for Japan for 1970, 2010 and 2050 clearly illustrate the challenge confronting the Japanese, Figures 13a-13c. The population pyramid for 1970 shows the classic upright triangular shape where the population is skewed towards a higher proportion of younger people. By 2010 the population pyramid has already shifted and is displaying an inverted triangular shape which only becomes more pronounced by 2050. Similarly, the number of household formations in Japan is also slowing and it is expected to peak at approximately 50.6 million in 2015, Figure 14.

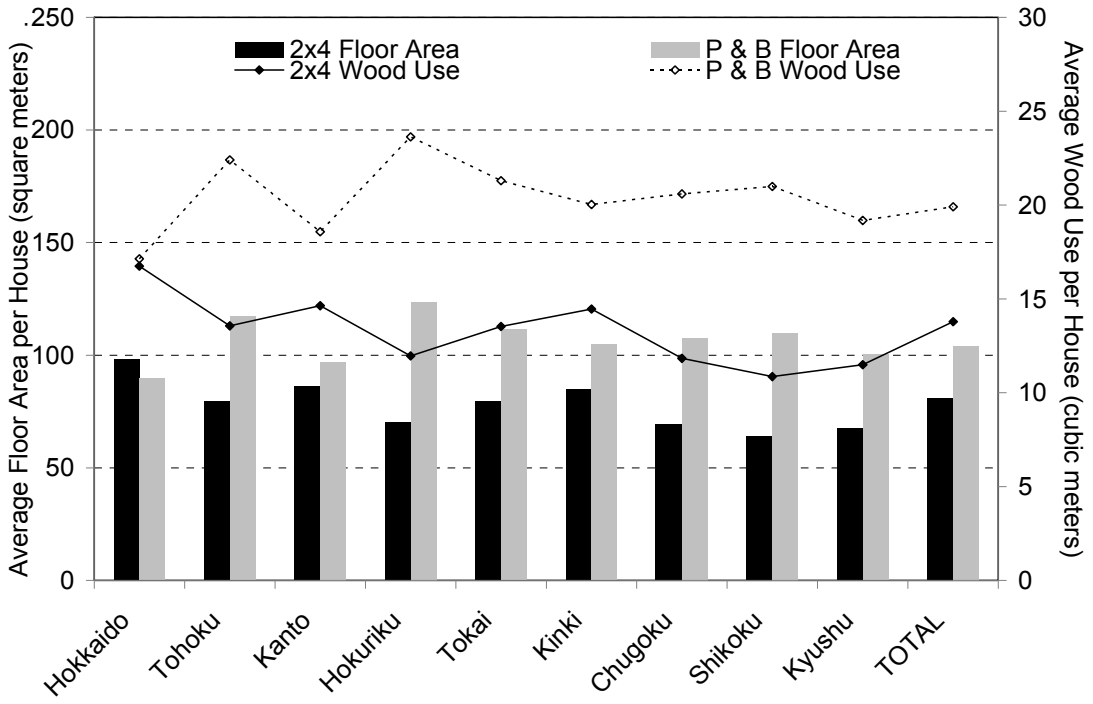


Figure 11. Floor area and amount of wood used in post and beam houses and 2x4 houses, by prefecture.

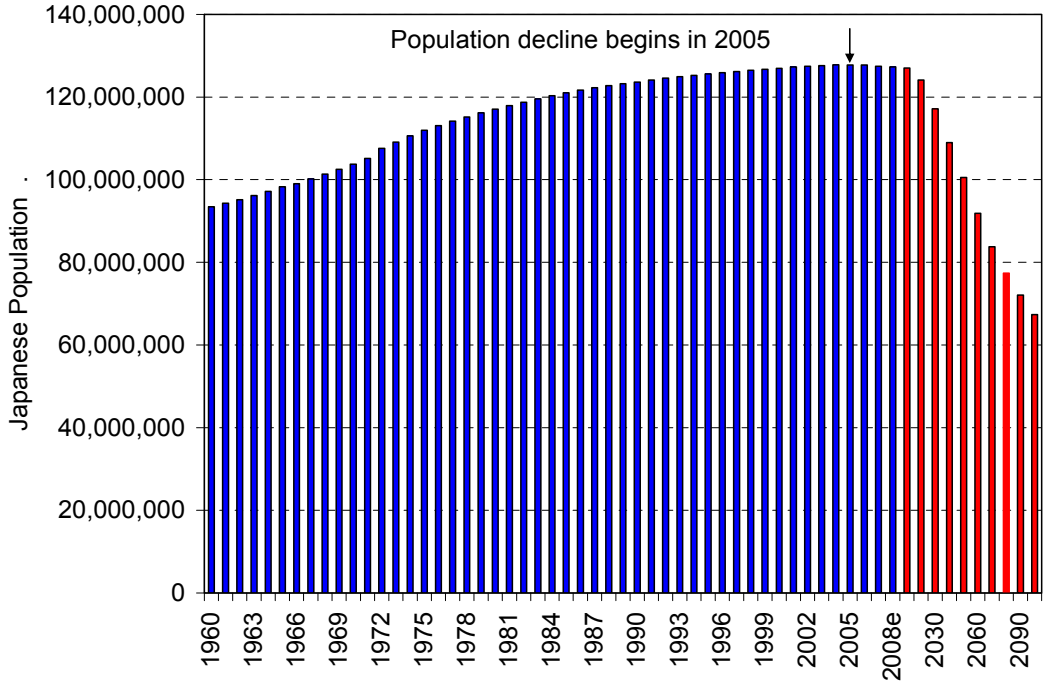


Figure 12. Japanese population trend with estimates to 2090.

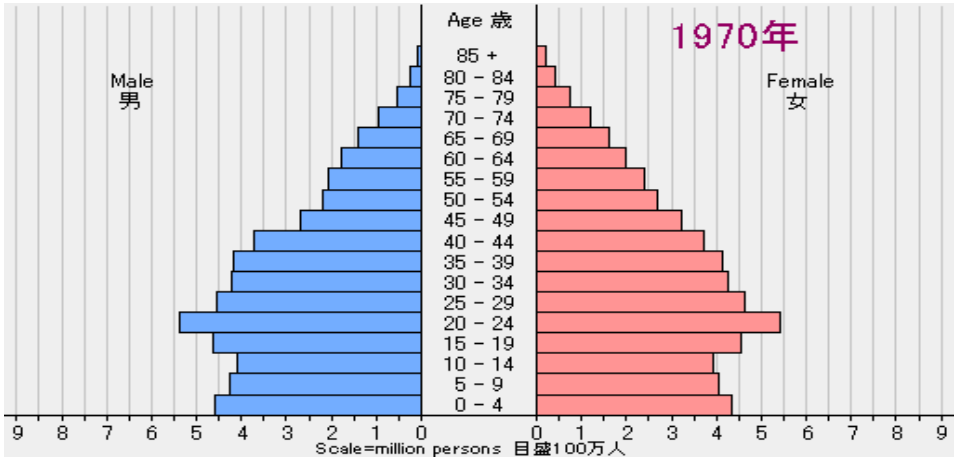


Figure 13a. Population pyramid for Japan in 1970.

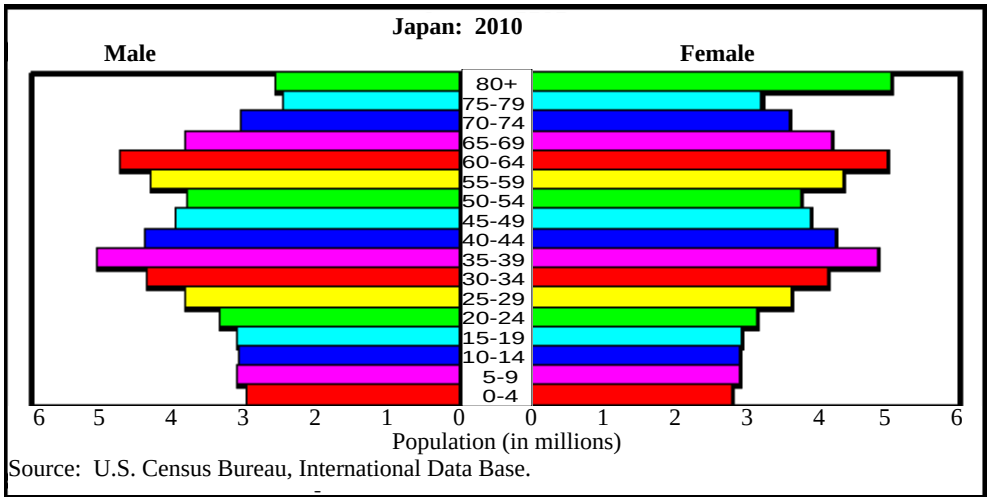


Figure 13b. Population pyramid for Japan in 2010.

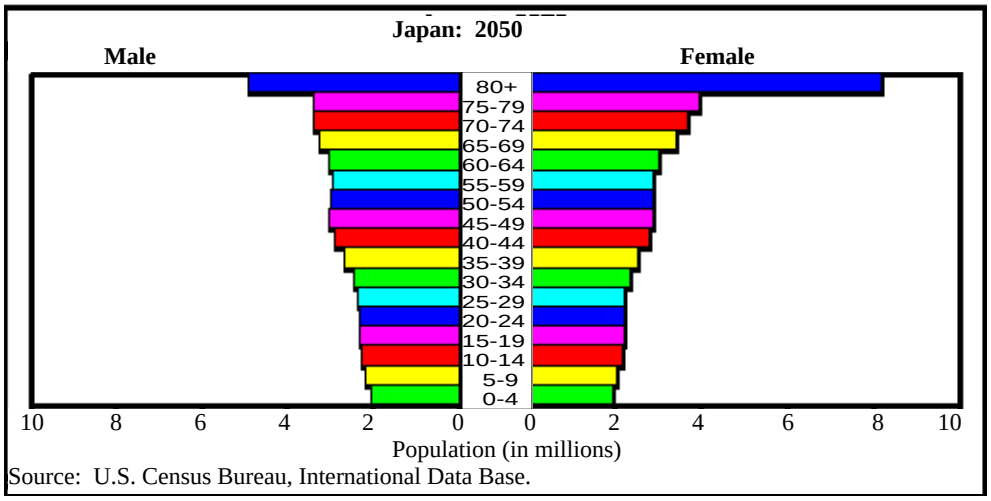


Figure 13c. Population pyramid for Japan in 2050.

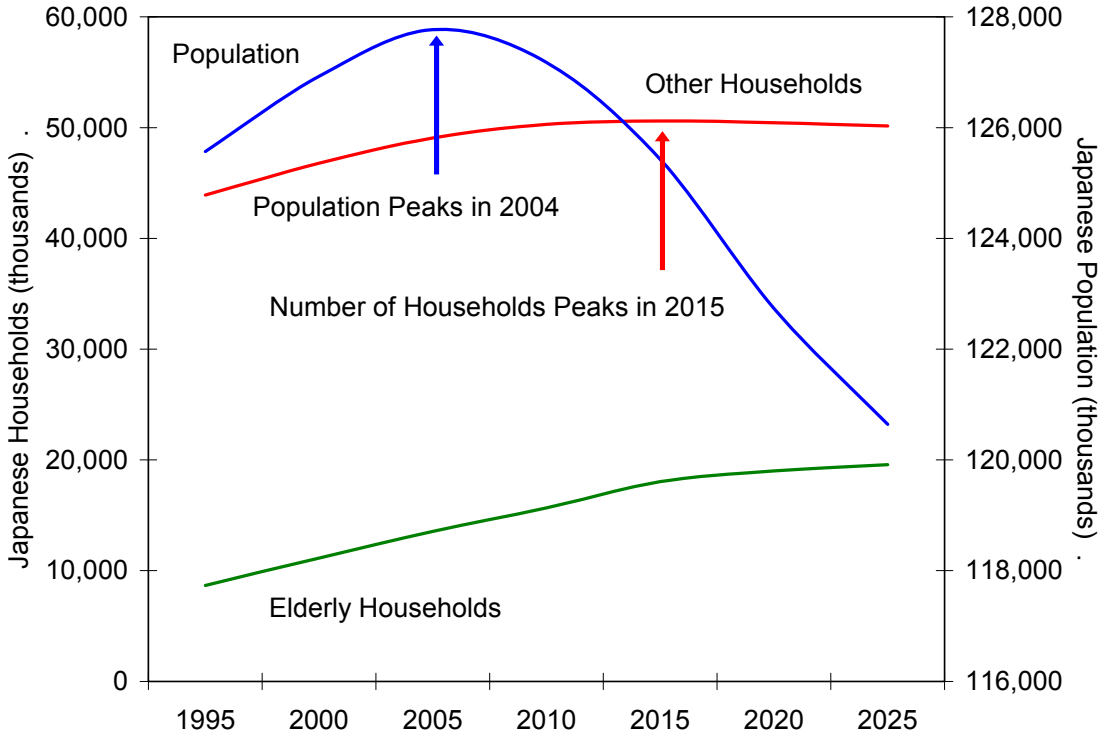


Figure 14. Trends and projections for Japanese population, households and elderly households.
Source: Japan Federation of Housing Organizations 2008

The implications of this transition in the population are significant. Currently, Japan has the highest proportion of elderly people (21%) among the industrialized countries and the world, surpassing Italy's ratio of 20.1% in 2005, Figure 15. At the same time, Japan's ratio of young people (aged 15 years and below) is the lowest in the world at 13.8%. It is estimated that the proportion of people aged 65 and over will reach 40.5% by 2050. This combination of trends is bad news for Japan's economy and social services programs, and by 2050 there will be just 1.3 working persons for every person aged 65 and above compared to 3.3 working age people today.

These demographic trends have serious implications for the housing industry, both in terms of the number of housing starts that will be required in the future as well as the type of houses built and the housing designs adopted. Most industry analysts expect that the number of housing starts will remain in the 1 million to 1.1 million range for the next several years before dropping down to a more sustainable range of 800,000 to 900,000 starts after 2013. Regarding housing design, the rapid aging of the Japanese society argues for a dramatic increase in barrier-free house designs and products that increase the mobility of the elderly.

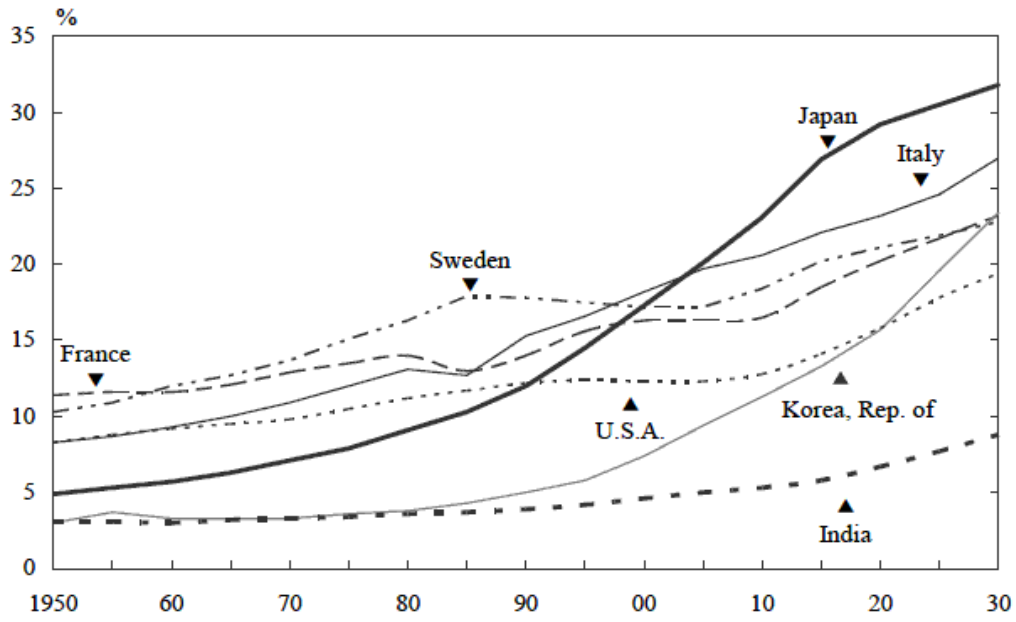


Figure 15. Proportion of elderly population, by country.

Source: Statistics Bureau, MIC; United Nations; Ministry of Health, Labour and Welfare.

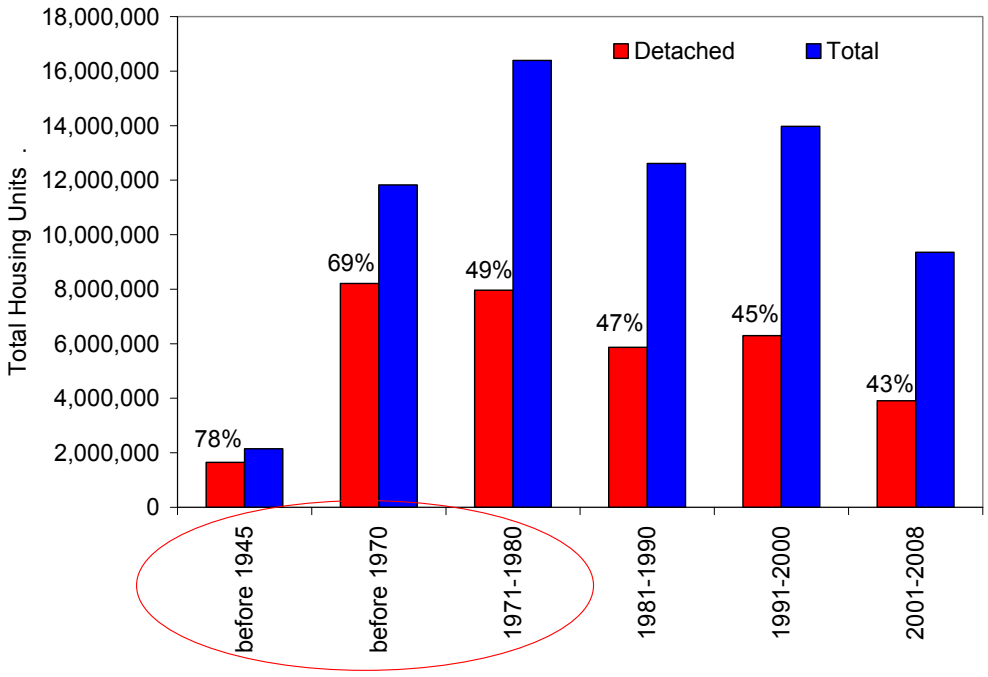


Figure 16. Age distribution of Japanese residential housing.

Offsetting the population demographic trends are the housing demographics, Figure 16. The housing stock in Japan remains heavily weighted towards older, poor quality houses that were built prior to 1980. The most recent estimate is that there are over 30 million homes built before 1980 that will need to be replaced rather than repaired; with 14 million of these houses being built prior to 1970. This older housing stock represents 45.8% of the total housing stock in Japan and as a result, this inventory of older homes will continue to inflate annual housing starts into the future. Considering these older homes, almost 18 million (58.7%) are single family dwellings. Traditionally, Japanese houses are replaced every 20-25 years and most new homes are built on sites where the previous home has been demolished. Given the poor quality of most of the older post-war housing (1945-1979), it has generally been considered to be more cost-effective and efficient to demolish older homes rather than repair or remodel them. For this reason, a resale market for used housing has never developed in Japan as has been the case in most developed countries. This observation on the lack of a resale market for used housing is perhaps best illustrated by the sales data for new and used houses in Japan, the US, the UK and France, displayed in Figure 17. Whereas only about 13.1% of the total annual home sales in Japan were for used homes, in the US, the UK and France this ratio is significantly higher at 77.6%, 88.8% and 66.4%, respectively. The Japanese policy to promote longer lived homes (the so-called 200 Year House program) and replace older homes with more energy efficient and environmentally friendly homes should continue to inflate annual housing starts and keep them in the 1 to 1.1 million units range.

Recent Regulatory Changes

The recent scandal involving a small number of home builders and architects who falsified structural calculations and used faulty construction materials in residential housing projects has resulted in several significant changes to the building codes and approval process. The housing industry seems to have adjusted to these changes over the past two and the current impact on housing appears to be minimal.

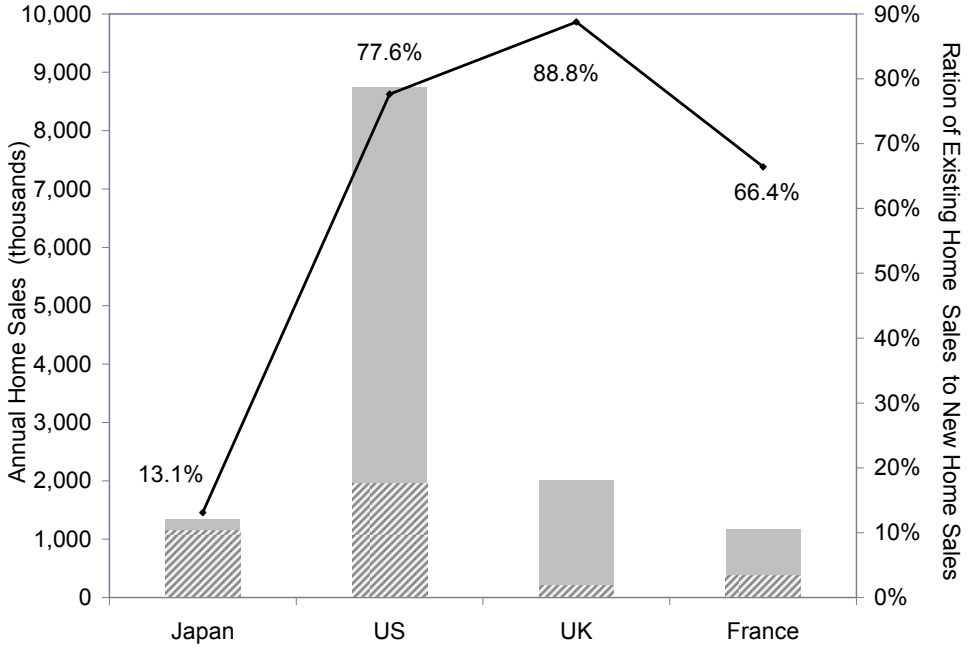


Figure 17. The ratio of new home sales to existing home sales is extremely low in Japan relative to other developed economies.

Source: Japan Federation of Housing Organizations 2008

Another new program that has been initiated within the housing sector is called the Long-life Housing System also referred to as the 200 Year House. The purpose of this program, which was promoted by former Prime Minister Yasuo Fukuda, is to provide high quality durable housing for Japanese homebuyers. This program, which went into effect on June 4 2007, provides a variety of incentives and tax breaks to encourage both homebuyers and homebuilders to favor durable housing. For example, home buyers who purchase a durable house will be able to increase the amount of their home loan that they can deduct from their taxes (the increase will be approximately ¥1,000,000), homebuyers will be able to obtain longer mortgages (possibly up to 50 years vs. the usual 35 years), and homeowners could see their property taxes reduced by between 25% to 75% for up to seven years. This program is only just beginning and the success of the program will hinge upon a variety of things, not the least of which is the development of a resale market for used homes. This is an idea which Japanese homebuyers have resisted in the past; preferring to regard housing as a depreciating asset rather than as an appreciating investment. Given the poor quality of older housing in Japan, and the resistance of homebuyers towards purchasing used homes, the establishment of a growing and healthy resale housing market is uncertain at best, particularly at a time of a declining population and a reduced demand for housing in the near future.

US and WA Exports of Wood Products

Both US and Washington state exports of wood products have been increasing since 2004, largely due to the relative weakness of the US dollar, Figure 18. In 2008, US total wood exports increased by 5.15% whereas wood exports from Washington state increased by 11.5%. Exports from Washington state have been increasing faster than US exports in recent years, and as a result, Washington's share of US exports has increased from 16.2% in 2006 to 17.5% in 2008.

US exports of primary wood products declined 3.6% but this decline was more than offset by increases in secondary wood products (up 22.4%) and wooden furniture (up 20.8%). Total secondary wood product and wooden furniture exports reached record levels in 2008. The ratio of secondary and furniture exports to total exports was 60.1%, down from 65.6% in 2007, continuing a trend that has been going on for several years. In the case of Washington state, exports of all three product categories were up substantially, with primary products up 8.2%, secondary products up 19% and wooden furniture up 42.6% in 2008. While primary products make up a larger component of Washington exports (74.3% in 2008), this is down slightly from 76.9% in 2006.

Exports of wood products from Washington State have been increasing since 2004, jumping by 11.5% in 2008. More importantly, total exports of value-added wood products have been increasing even faster and their ratio to total wood products exports almost doubled from 19% in 2000 to 34.6% 2008. While the vast majority of value-added wood exports from Washington are comprised of secondary products (84% in 2008), exports of furniture from Washington have been growing faster than secondary wood products (42.6% vs 19.1% in 2008). The largest product categories for primary wood products were softwood logs (up 12.3% in 2008) and softwood lumber (up 23.8%). These two categories accounted for 70.7% of all primary wood product exports from Washington. The largest product categories for secondary wood products were prefabricated buildings (up 52.5% in 2008), builder's joinery (up 1.7%) and wooden doors (up 7.8%). These three products made up 65.4% of secondary exports in 2008.

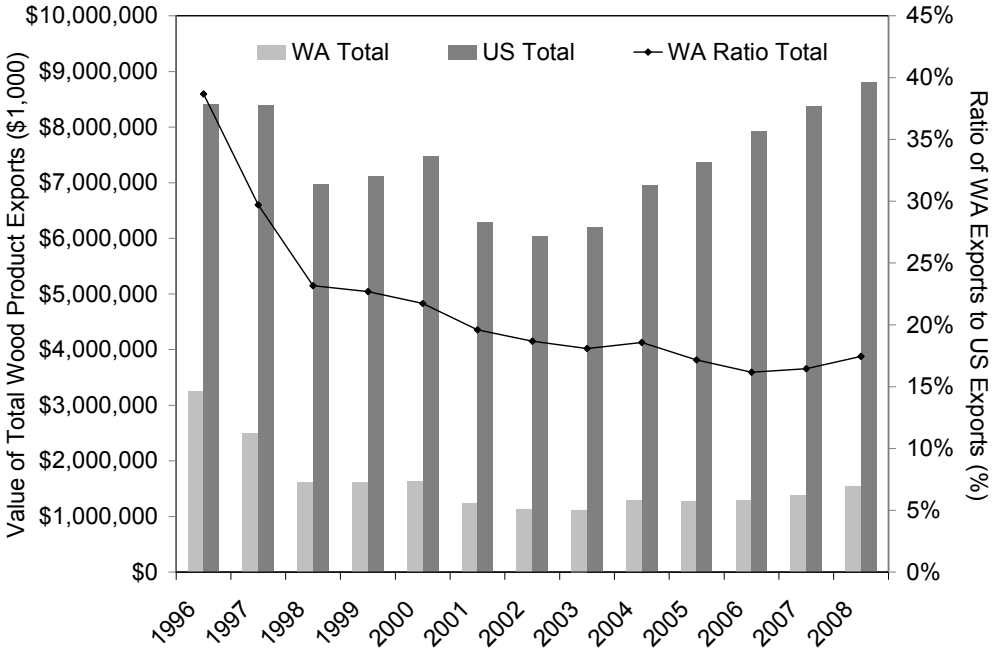


Figure 18. Comparison of wood exports from Washington State and the US.

Source: US International Trade Commission Trade Database, 2008.

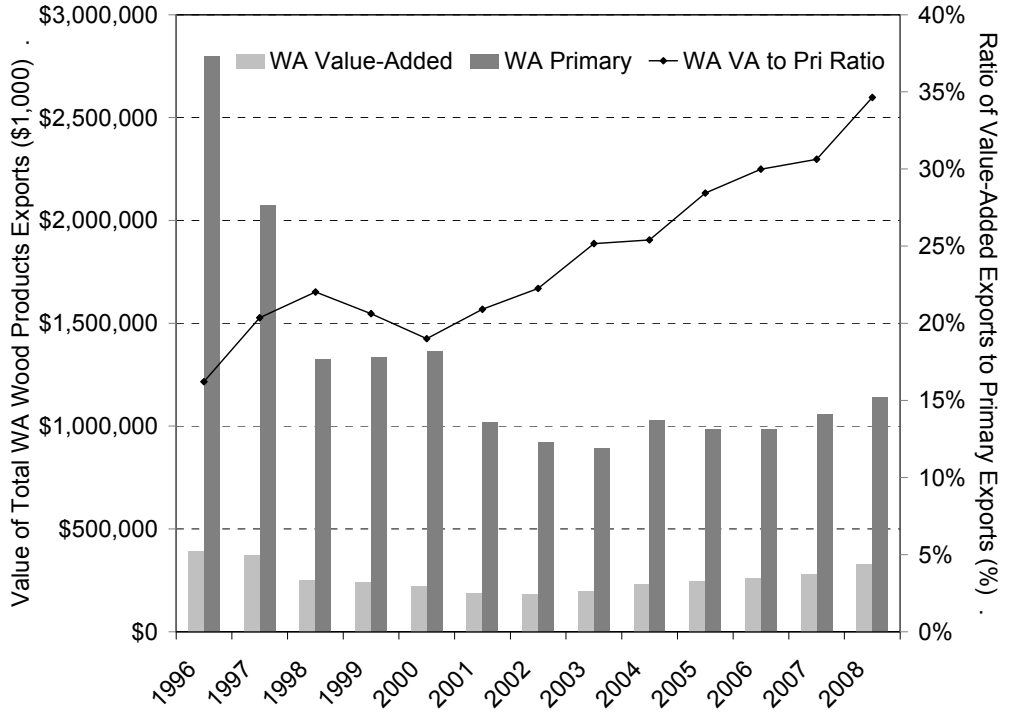


Figure 19. Exports of primary and value-added wood products from Washington

Source: US International Trade Commission Trade Database, 2008.

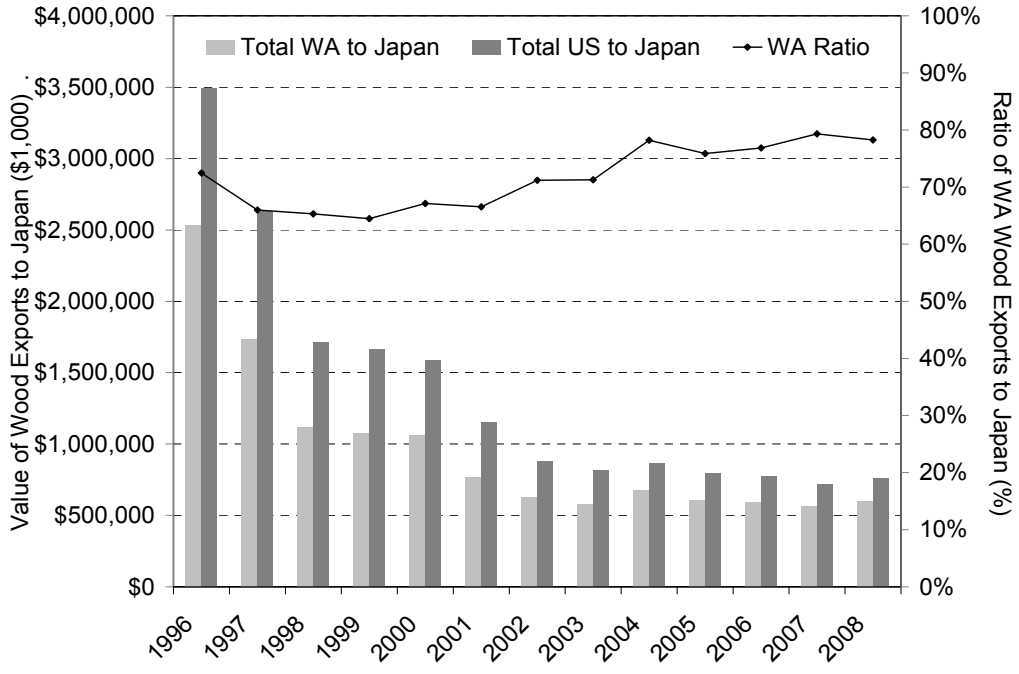


Figure 20. Value of wood products exports to Japan from US and Washington State.

Wood exports from both the US and Washington to Japan, which had been declining since 2004, recorded increases in 2008, with US exports growing by 6.6% while Washington exports rose by 5.2%. The main exports from the US were primary products (market share of 89.2%) with softwood logs (up 3% in 2008) and softwood lumber (up 46.7%) representing 72.8% of total primary wood exports to Japan. A similar trend was found in Washington state, where primary products were again the major type of wood product export (market share of 94.6%) with the major products being softwood logs (up 1.8% in 2008), softwood chips (up 7.9%) and softwood lumber (up 57.4%). Logs comprised 64.6% of primary product exports to Japan while softwood chips represented 19.2% and softwood lumber accounted for 13.9%. Exports of value-added wood products from Washington to Japan were dominated by prefabricated buildings (25.3%), builders joinery (44.8%), wooden windows (16.9%) and wooden doors (6.4%).

Comparison of the North American-style 2x4 and Japanese-style 2x4 systems

Overview

Much of the success of North American 2x4 construction technology can be attributed to several factors. First, 2x4 construction costs are substantially lower than for traditional post and beam homes. Second, total construction time is substantially shorter for the 2x4 construction system. Third, younger home buyers are attracted to the western-style designs and open floor plans that the 2x4 system provides. Finally, the standardized nature of the 2x4 construction system and the use of standard load-span tables simplify the process of performing structural calculations for 2x4 houses relative to post and beam houses. This latter factor could be increasingly important in the current regulatory environment in Japan as the housing industry adjusts to a more stringent house permitting process.

Cost comparison between the North American-style 2x4 and Japanese-style 2x4 systems

It is important to recognize that there is a Japanese version of the 2x4 construction technology that co-exists with the North American-style. In fact, more than 90% of 2x4 houses built in Japan utilize the Japanese-style system rather than the North American-style system. The primary difference between the two systems relates to the size of the basic construction module used in the construction process. The Japanese 2x4 system utilizes a 3'x6' module size, which is based on the size of a traditional *tatami* mat, while the North American style 2x4 system employs a 4'x8' module size. Other differences between the two construction systems include the stud spacing (17.8 inches [455 mm] on center in the Japanese system versus 16 inches on center in the North American) and the greater integration of domestic building materials into the Japanese system. In addition, the Japanese system tends to use more wood in the construction process (particularly in the framing applications) and thus is less cost effective. Finally the construction costs for the Japanese system tend to be substantially higher than in the North American system. A summary of the major differences in material use are presented in Table 5.

Many sources have noted that residential construction costs in Japan are much higher than in the US. In May 1994, the MOC's North America Housing Cost Study Group determined that a two-story 2x4 house built in Japan was between 1.82 to 1.98 times more expensive than a comparable house built in the US on an exchange rate basis of ¥111 to $1 (JETRO 1996a). The MOC Study Group also found that the cost of an average 164 square meter house in Seattle was about $139,000 compared to $255,000 (exclusive of land costs) for a comparable house in the Sendai region (Magnier 1994), Table 6.

Table 5. Major differences between the North American-style 2x4 system and the Japanese 2x4 system.

Component	USA	Japan
Sill	2x4 or 2x6 ACQ	4x4 or 4x6 Japanese ACQ
Floor Joist	2x10 16"O.C.	2x6 18"O.C. (455mm O.C.)
Subfloor	3/4"-4'x8' T&G	5/8"-3'x6' T&G
Stud	2x4 or 2x6 16"O.C.	2x4 or 2x6 18"O.C.
Ceiling Joist	2x4 or 2x6 16"O.C.	2x4 or 2x6 18"O.C.
Rafter	2x6-2x12 16"O.C.	2x618"O.C.
Wall Plywood	1/2"-4'x8' CDX 4-5Ply	3/8"-3'x8'
Roof Plywood	1/2"-4'x8' CDX 4-5Ply	1/2"-3'x8'
Sheetrock (Wall)	1/2"-4'x8' (Horizontally)	1/2"-3'x8' (Vertically)
Sheetrock (Ceiling)	1/2"-4'x8'	3/8"-3'x6'
Drywall	Typical Style	Just Putty

Table 6. Comparison of construction costs for similar 2x4 houses built in Japan and the US (based on 1996 data).

	US Carpenters/US Materials			J. Carpenters/J. Materials		
	Material	**Labor**	**Total**	**Material**	**Labor**	**Total**
General Requirements	-	190,200	190,200	-	626,519	626,519
Foundation	216,700	433,300	650,000	341,830	529,526	871,355
Framing	760,100	727,917	1,488,017	2,863,239	1,100,077	3,963,316
Tile	26,870	98,100	124,970	58,902	97,279	156,181
Finish Carpentry	794,313	612,576	1,406,889	1,764,437	557,536	2,321,973
Gutter	39,943	38,271	78,214	56,040	77,450	133,490
Masonry/Foundation	-	-	-	55,947	98,707	154,654
Exterior Doors/Windows	802,571	112,424	914,995	1,764,675	210,300	1,974,975
Interior Doors	96,947	26,263	123,210	1,214,660	159,480	1,374,140
Paint/Finish	60,371	196,377	256,748	244,393	379,295	623,688
Floor/Wall Covering	236,772	306,810	543,582	702,884	277,120	980,004
Roofing	324,316	198,888	523,204	458,740	278,860	737,600
Siding	249,135	242,456	491,591	682,600	487,574	1,170,174
Fixtures/Appliances	1,136,421	259,359	1,395,780	4,180,075	655,650	4,835,725
Electrical	266,875	228,900	495,775	331,075	385,575	716,650
Gas	-	-	-	26,892	59,656	86,548
Plumbing	123,790	260,673	384,463	91,527	201,895	293,422
HVAC	238,000	79,400	317,400	1,099,000	369,000	1,468,000
Total	**5,373,124**	**4,011,913**	**9,385,037**	**15,936,916**	**6,551,498**	**22,488,414**

The Study Group concluded that the reasons why 2x4 construction costs were higher in Japan include complex and hard to use distribution channels, non-standardized construction methods, reduced competition, higher overhead, more cumbersome regulations, higher material costs for domestic products, the high cost of certifying US wood products, and the fact that 2x4 houses are built using the same management system employed in the post-and-beam industry. The MOC Study Group acknowledged that extended distribution channels are typical in Japan and that the residential construction industry has a long history where material supply channels have become well established (JETRO 1996b). They conclude that it would be very difficult to modify this system without causing severe disruptions in the supply of residential building materials.

Despite the fact that most builders recognize the cost effectiveness of the North American-style 2x4 construction system, relatively few use the North American system in Japan. Discussions with Japanese 2x4 home builders, both this past fall and in the past, point to a broad range of factors that influence this decision. Perhaps the most important factor is that home builders in Japan are not customer-oriented in the sense that they work closely with their customers to maximize customer satisfaction and reduce overall cost. This is a large difference with the US where the construction costs are plainly laid out for customers before, during and after the home is built. Customers have input into the construction budgeting process and must approve all costs and change orders for the builder. The construction budgeting process is anything but transparent in Japan and construction companies are rarely focused on controlling costs for their customers.

Interestingly, the quality of home design was not perceived as being a significant factor in Japan, simply because most homes built in Japan are custom homes designed to customer specifications. Home design could be a factor with tract houses built for sale, where most of the home buyers are young couples purchasing their first home. However, most of the builders interviewed felt that this was not an issue in the sense that cost, not design, was the driving factor in this segment of the market.

Another factor that contributes to the widespread use of the 3x6 module relates to the strong relationship that exists between Japanese 2x4 builders and Japanese manufacturers of wooden building materials, particularly commodity wood products. Home builders interviewed for this study universally emphasize that reliability of supply and just-in-time delivery of building materials to the construction site are very important to them. Domestic manufacturers of structural panels and wood products are willing to provide this service for them whereas few foreign suppliers will. Thus, builders who buy direct from the manufacturer use domestic products to a large extent. This same bias is somewhat less evident in the use of value-added wood products such as wood windows, door and cabinets. In this case, 2x4 home builders are much more willing to use imported building materials. However, the big concern for them when specifying these products is that they must be able to obtain spare parts and installation support in a timely manner. Many home builders have indicated that they do not use US wood windows because they have difficulty obtaining spare parts and replacement windows in a timely manner and because technical support in Japan is generally not available (although some manufacturers like Marvin Windows and Weathershield do have representatives in Japan to handle product and installation issues quickly).

Another issue that affects the use of US wood building materials is Japanese home builders' perception that US manufacturers and exporters are not committed to the Japanese market for the long-term. The perception that US exporters are 'inners and outers' is problematic and must be overcome in order to make greater inroads in Japan.

Finally, US suppliers must deal with the introduction of new building systems in Japan that require specialized components that are generally not available from foreign suppliers. One example of this is the 'neda-less' (or joist-less) floor system. While this subfloor system, which was originally developed for the post and beam industry, is beginning to be used by a small number of 2x4 builders, its use could grow

in the future as 2x4 builders become more familiar with the system. This subfloor system supports the subflooring plywood with joists only located under the edges of the panel and eliminates the need for interior floor joists by using a much thicker and stiffer (24mm and 28mm thick) plywood panel than the typical subflooring panels used in the US. The panel size being used varies but is either 1m x 2m x 24mm or 28mm or 3'x6'x24mm or 28mm. The floor joists are often 89mm x 89mm although some builders occasionally use 2'x8' or 2'x10' dimension lumber. The spacing for the floor joists is generally 910mm in case of 3'x6' subfloor panels and 1,000mm in case of 1m x 2m panels. The subfloor panels are generally made with Russian larch veneers on the face of the panel and domestic sugi veneers used in the core of the panel. The neda-less system can be used for both the first and second floors of a 2x4 house. The advantages to using the neda-less floor system include reduced wood use, better noise insulation, increased floor stiffness and increased labor savings.

Formaldehyde Emission Requirements for Value-Added Wood Products

This section specifically looks at the recently implemented formaldehyde requirements for wooden building materials used in the interior of the house. The Ministry of Construction amended the Building Standards Law (BSL) by implementing the Sick House Regulations effective on July 1, 2003. The Sick House Regulations were designed to ban the use of chloropyrifos and regulate acceptable levels of formaldehyde emissions in a house. This change had significant impacts on many North American manufacturers and exporters of value-added wood products. The goal of this section of the report is to explain the impact of the changes in the BSL and describe how North American manufacturers and exporters can comply with these changes to gain or maintain access to the Japanese market.

The BSL Sick House regulations were specifically designed to address health problems caused by chlorpyrifos and formaldehyde emissions in residential construction. The Sick House regulations limit the amount of formaldehyde emissions from building materials, including wooden building materials. The Sick House regulations address formaldehyde emissions in residential housing by specifying three Countermeasures: 1) F**** rating of materials, 2) Mechanical Ventilation and 3) Attic, etc.

Countermeasure 1: F* Rating of Materials***

The first Countermeasure imposes restrictions on interior finishing materials that emit formaldehyde and imposes surface area restrictions on building materials that receive a rating below F****. (Note that there are no restrictions on the use of wooden building materials that have received an F**** rating). This Countermeasure generally applies to wooden building materials that are considered to be built-in (permanent), visible, and are used in a habitable room in a house. This group of products includes:

- kitchen cabinets,
- bathroom cabinets,
- finished wood flooring,
- engineered wood flooring,
- wooden doors,
- wall and ceiling paneling,
- fixed shelving in cabinets,
- wooden stair treads and risers,
- wooden countertops and
- edge-glued panels.

As a general rule, structural glulam and LVL do not fall under the sick house regulations. There has been a recent inclusion, however, that is referred to as the "1/10 Calculation". Linear glulam and linear LVL are subject to the Sick House regulations if the exposed area of the glulam or LVL member exceeds 1/10 of the surface area of the room (surface area is the sum of the wall area, floor area and ceiling area).

Embedded glulam or LVL (ie. Members hidden within a wall and not visible within the room) are included in the Attic, etc. section of the regulations and are exempted from the 1/10 Calculation.

There is also a group of wooden building materials that are exempted from the Sick House regulations and whose use in a house is unrestricted. These products are either considered to be movable or of a small enough surface area that formaldehyde emissions would be low enough as not to pose a significant health risk to the buildings inhabitants. These unrestricted products include:

- lineal wood moulding and millwork,
- door and window casings,
- wooden windows,
- wooden furniture,
- removable wood shelving,
- wooden stair railings, banisters and stringers,
- unfinished solid wood flooring and
- finger-jointed lumber.

In addition, any product that is movable within a room is exempted from the formaldehyde emission restrictions (for example, furniture and removable cabinet shelves). If a product is listed as an exempted product, then it is unaffected by the formaldehyde amendment to the BSL.

It is important to note that while the Sick House regulations allow the use of F*** and F** building materials, home buyers are reluctant to accept these products in their homes. Responding to these concerns, most home builders prefer to use F**** rated building materials whenever possible (and many are demanding that only F**** be used in their homes, even in areas where they are not specifically required). As a result, building material importers and wholesalers in Japan may specify that building materials achieve an F**** rating to coincide with market preference.

Wherever possible value added manufacturers should use F**** rated raw material for all components in their product to avoid the possibility of being shut out of the Japanese market. For those building materials that emit formaldehyde and are subject to the Sick House regulations, a formaldehyde emission rating system was developed. ***Any building material that receives an F**** rating can be used without restriction anywhere within a residential house.*** Building materials that receive a lower F star rating (either F*** or F**) can be used in habitable rooms in residential homes subject to specific area restrictions. Building materials that receive an F* rating cannot be used in a residential house at all.

Countermeasure 2: Mechanical Ventilation

The second Countermeasure requires that ventilation equipment must be installed in new homes (with very few exceptions) to remove formaldehyde emissions from the indoor environment before they can build up to noxious levels. The efficiency of the ventilation system is generally measured in the number of times it can replace the air in a room per hour. Ventilation systems are required since there are many point sources of formaldehyde in a house and even small amounts of formaldehyde off-gassing from a large number of materials can have substantial health impacts. Significant point sources of formaldehyde in Japanese rooms include vinyl wall coverings and adhesive, carpeting, upholstered furniture, and vinyl floor coverings. The ventilation efficiency is important since it determines the value used in the area restriction equation and therefore influences the amount of F*** and F** wooden building materials that may be used in a house.

Countermeasure 3: Attic, etc

The third Countermeasure applies restrictions on building materials used in attic spaces, etc. This Countermeasure is designed to prevent the infiltration of formaldehyde from the attic into living spaces in

the house. If an air barrier is installed in the attic (for example an impermeable plastic or vinyl sheet), then the building materials used in the attic and roof system are not subject to the Sick House regulations. This also applies if a ventilation system is installed in the attic area. However, if an air barrier or ventilation system are not installed in the attic area, then only F*** or F**** materials can be used in the attic area.

The specification of the etc. in the Attic spaces, etc, refers to the inclusion of non-visible surfaces in habitable rooms which are included in the Sick House regulations but are not included in the third Countermeasure. This portion of the Countermeasure applies to materials that are installed or used in habitable rooms but which are not visible (and thus are not covered by the first Countermeasure). An example of this would be the back and top of a wall mounted kitchen cabinet. Since these surfaces are not visible and they are not separated from the room by a vapor barrier, only F*** or F**** materials may be used.

Formaldehyde Approval Process

When considering how the BSL amendment might affect a specific building material and the procedure for gaining approval for its use in Japan, exporters need to determine which of three scenarios apply to their product:

1) the product being exported is listed as an exempted product,
2) the product being exported is manufactured entirely from exempted products and/or JAS or JIS certified materials, or
3) the product being exported is manufactured at least partially using wood products that are not exempted and that are not JAS or JIS approved and therefore must be submitted through the Ministerial Approval process.

Product Manufactured Entirely from JAS or JIS approved Material

In this case, we are looking at products that are made entirely from components manufactured from exempted materials or JAS or JIS approved materials (for example, JAS approved OSB or plywood or JIS approved particleboard or MDF). These materials are manufactured in mills that have received a JAS or JIS certification that specifies the F star rating of the material. If a product is manufactured exclusively from JAS or JIS rated materials (or includes materials identified as an exempted product), then it can be exported to Japan without further approvals. However, the value-added manufacturer will need to obtain a copy of the JAS or JIS mill certification (including the relevant F star rating for the material used). A copy of the mill certification indicating the F star rating of the materials used in the product will need to be included with each product being exported to verify that it is in compliance with the formaldehyde emission requirements. It is important to note that if a product is manufactured using materials with different F star ratings, then the finished product has a formaldehyde rating equivalent to the lowest F star rated material used. For example, if a cabinet is manufactured using F**** plywood for the cabinet box and F*** MDF for the cabinet door, the entire cabinet is rated at the F*** level. The exception to this would be to apply for a Ministerial Approval in order to potentially increase the formaldehyde emission rating for the cabinet from F*** to F**** based on a formaldehyde emission test.

Ministerial Approval Process

The third case applies to value-added wood products that are manufactured from a combination of different wood materials. For example, if the cabinet described above was manufactured from plywood and MDF that was not manufactured in a JAS or JIS certified mill, the finished cabinet could be approved for use in residential homes in Japan using the Ministerial Approval process. In this case the materials used in the products are submitted to a testing agency to evaluate the level of formaldehyde emission. The test results are then sent to the Ministry of Land, Infrastructure and Transportation in Japan and a Ministerial Approval is issued for the product.

Survey of Japanese 2x4 home builders

Survey Methodology

In order to develop a better understanding of Japanese 2x4 homebuilders perceptions and use of wooden building materials and determine the importance of a range of material attributes on their material purchase decisions, a survey was conducted (the survey instrument is located in Appendix A). The survey population was comprised of two sub-groups of 2x4 home builders; a census of the top 13 2x4 home builders and a random sampling of 21 2x4 home builders at the Japan Home Show in Tokyo. Survey data was collected in October and November 2008. The survey was pretested by several building material exporters in the US and by the Japanese office managers for AF&PA and SEC in Tokyo. The survey was then translated into Japanese to facilitate its implementation in Japan. Data collection for the top 13 2x4 home builders was conducted by Mr. Hidehiko Okada, a consultant who has extensive knowledge and experience working in the Japanese housing industry. Mr. Okada conducted interviews with the senior managers of the top 11 2x4 house builders in Japan as well as senior managers at 2 of the biggest pre-cut manufacturers who use the 2x4 construction module. In addition, a CINTRAFOR researcher attending the 2008 Japan Home Show collected 18 completed surveys from a random sampling of small 2x4 home builders attending the trade show. This sampling method was influenced by budget and time constraints but still provided the ability to compare responses between small 2x4 home builders (n=18) and large 2x4 home builders (n=13).

Survey Results

The survey results show the survey participants built a total of 79,425 housing units in 2007, Table 7. The type of house built by survey respondents were almost evenly split between single family (45.1%) and multi-family housing (54.9%). Not surprisingly, given the design of the sample frame, almost two-thirds of the houses built were 2x4 with the remaining houses being post and beam (15.9%) and prefabricated (19.7%), Table 8. Since virtually all of the prefabricated housing was based on the 2x4 construction technology, the total ratio of 2x4 housing built by survey respondents was 84.1% of the total response and represented 62.1% of total 2x4 housing starts. Most builders reported that they build both post and beam homes as well as 2x4 homes, underlining the reason why the most builders use the less efficient post and beam construction management system to build 2x4 houses.

Table 7. Number of homes built by survey respondents, by type.

	Single Family	Multi Family	Total Units Built by Respondents
Survey Responses	35,784 *(45.1%)*	43,641 *(54.9%)*	79,425

Table 8. Number of homes built by survey respondents, by construction type.

Post and Beam	2x4	Prefabricated
12,572 *(15.9%)*	51,179 *(64.4%)*	15,674 *(19.7%)*

The vast majority of the survey respondents (97.1%) reported that they utilized the 3'x6' (*tatami* mat) Japanese-style module when building 2x4 houses as opposed to just 2.9% who used the North American-style 4'x8' construction module, Table 9. A total of 6 companies (4 small companies and 2 large companies) reported using the 4'x8' module while an additional 3 companies (1 small and 2 large) reported using both construction modules. While there was no significant difference between small and large builders in their use of the two construction modules, there was a significant difference between 2x4 builders and P&B builders, Table 10. Virtually all P&B builders used the 3'x6' module while over a third of 2x4 builders used the 4'x8' module.

Table 9. Number of homes built using different construction modules.

3x6 Module	4x8 Module
77,158 (97.1%)	2,264 (2.9%)

Table 10. Comparison of respondents use of 3x6 module, by construction type.

	Construction Type	Mean	Significance
Use the 3'x6' module	2x4 Builders	65.50	0.0038
	Post & Beam Builders	99.60	

Table 11. Percentage of building materials that are specified by builder and homeowner.

PRODUCT TYPE	Material Specifier	
	Your Company	Home Owner
Hardwood Flooring	79.43%	20.57%
Softwood Flooring	82.29%	17.71%
Wooden Interior Doors	78.10%	21.90%
Wooden Exterior Doors	75.23%	24.77%
Wooden Windows	75.00%	25.00%
Kitchen Cabinets	76.07%	23.93%
Bathroom Cabinets	70.40%	29.60%
Wood Mouldings	78.13%	21.88%

Q4. Who specifies the following building materials that are used in your homes?

Survey respondents were asked to indicate who specified a broad range of wooden building materials used in the homes that they build, Table 11. The survey results show that approximately 20% of these materials are specified by the home owner while the majority are specified by the home builders. Home owner specification of building materials ranged from a low of 17.7% for softwood flooring to a high of 29.6% for bathroom cabinets. There were no significant differences observed in the data based on firm size or type of construction.

Home builders were asked to specify the percentage of their wooden building materials that were manufactured domestically as opposed to those that were imported, Table 12. For the wooden building materials that were imported, the respondents were asked to specify the percentage that were sourced from the US, the EU, China, Canada or another country. The survey results show that the majority of building materials used were manufactured domestically, with the use of domestic materials ranging from about 50% (hardwood flooring and wood windows) to about 80% (bathroom cabinets and kitchen cabinets). The survey results clearly show that 2x4 homebuilders purchase a substantial percentage of their wooden building materials from foreign sources. No significant differences were observed based on firm size or type of construction.

Respondent's were also asked to rank the quality of a variety of wooden building materials across several countries, Table 13 and Figure 21. In most cases, Japanese products were perceived as having the highest quality followed closely by the EU. US wooden building materials were generally ranked third and were perceived as having only average quality, although the quality rankings were somewhat higher for wood windows, wood mouldings and wood kitchen cabinets. In most case, US materials were ranked ahead of Canada and China but behind the EU.

Table 12. Breakdown of country of manufacture for value-added building materials used by respondents.

	Country of Manufacture					
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**	**Other**
Hardwood Flooring	6.38%	18.45%	10.69%	10.34%	50.69%	3.45%
Softwood Flooring	17.22%	6.67%	13.33%	0.00%	61.67%	1.11%
Wood Interior Doors	8.77%	16.04%	6.72%	2.61%	63.62%	2.24%
Wood Exterior Doors	14.22%	13.76%	9.63%	0.46%	57.80%	4.13%
Wooden Windows	23.18%	15.91%	9.55%	0.00%	51.36%	0.00%
Kitchen Cabinets	4.34%	4.30%	10.39%	0.00%	80.97%	0.00%
Bathroom Cabinets	7.06%	5.58%	5.20%	0.00%	78.44%	3.72%
Wood Mouldings	10.78%	8.84%	17.46%	2.59%	60.34%	0.00%

Q5. What percentage of the following building materials does your company purchase from the following countries.

Table 13. Japanese homebuilder's perception of quality based on country of manufacture.

	Country of Manufacture				
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**
Hardwood Flooring	2.3	3.1	3.5	3.4	1.6
Softwood Flooring	2.3	3.3	3.4	3.6	1.9
Wood Interior Doors	2.0	3.2	3.4	4.1	1.5
Wood Exterior Doors	1.8	3.0	3.7	4.3	1.9
Wooden Windows	2.3	2.4	3.4	4.4	1.9
Kitchen Cabinets	2.8	2.8	3.5	4.3	1.4
Bathroom Cabinets	2.9	3.1	3.9	4.1	1.0
Wood Mouldings	2.9	2.6	3.3	3.9	1.7

Q6. In your opinion, how do the following countries compare in terms of product quality for the listed products (Please rank from 1 to 5 where 1 indicates the highest quality and 5 represents the lowest quality)

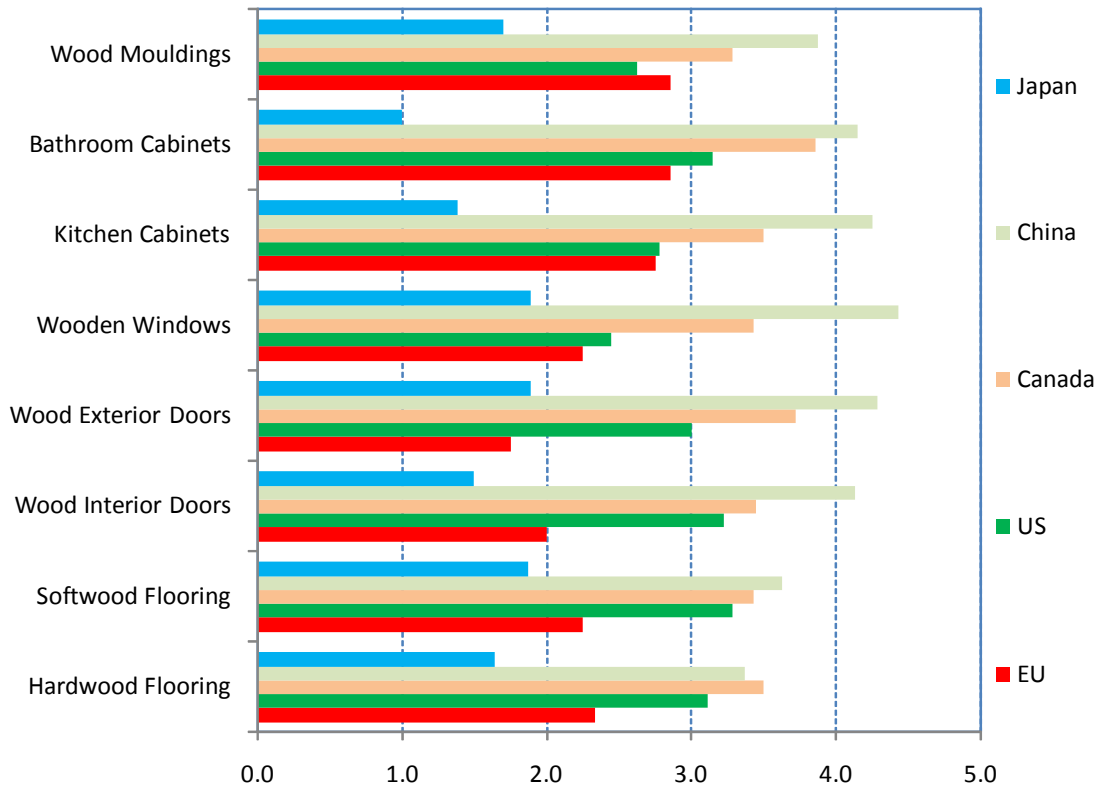


Figure 21. Japanese homebuilder's perception of quality based on country of manufacture.

It is interesting to note that there were significant differences in the perception of product quality between builders based on firm size, Table 14. This was particularly true for all of the building materials sourced from the US. For all eight of the product categories included in the survey, small firms were more likely to perceive that US building were high quality than were large firms. Across all products, small firms gave US wood building materials an average quality rating of 1.46 compared to the average quality rating of 3.69 provided by the large firms (note that a rating of 1 represents high product quality whereas a rating of 5 indicated low quality). While care should be taken because of the small sample size, it appears that large firms perceive that the quality of US wood building materials is poor. US exporters of wood building materials would do well to try to understand the basis for these perceptions and how they impact the use of US wooden building materials in Japan. This is particularly important since the 10 largest 2x4 home builders accounted for 66.9% of total 2x4 housing starts in Japan in 2007.

Table 14. Comparison of respondent's perception of product quality based on country of manufacture, by firm size.

	Construction Type	Mean	Significance
HW Floor US	Small Firm	1.00	0.0005
	Large Firm	4.17	
HW Floor Canada	Small Firm	2.00	0.0006
	Large Firm	4.00	
HW Floor Japan	Small Firm	3.33	0.0140
	Large Firm	1.18	
SW Floor US	Small Firm	1.00	0.0010
	Large Firm	4.20	
SW Floor Canada	Small Firm	2.00	0.0032
	Large Firm	4.00	
Interior Doors US	Small Firm	1.67	0.0031
	Large Firm	4.00	
Exterior Doors US	Small Firm	1.67	0.0060
	Large Firm	3.80	
Wood Windows US	Small Firm	1.33	0.0301
	Large Firm	3.00	
Kitchen Cabinets Europe	Small Firm	4.00	0.0108
	Large Firm	2.33	
Kitchen Cabinets US	Small Firm	1.67	0.0133
	Large Firm	3.33	
Bath Cabinets US	Small Firm	2.00	0.0161
	Large Firm	3.60	
Moldings Europe	Small Firm	4.00	0.0349
	Large Firm	2.40	
Moldings US	Small Firm	1.33	0.0078
	Large Firm	3.40	

Similar to the trend observed with product quality, Japanese suppliers were perceived to provide the highest level of service for their products, Table 15 and Figure 22. None of the other supply countries were perceived to provide even an average level of service, although European suppliers did receive average service ratings for wood interior doors, exterior doors and windows. The average service rating (average across all eight products) was even lower (average rating equal to 3.23) than the average quality rating (average rating equal to 2.94).

Table 15. Japanese homebuilder's perception of product service, based on country of manufacture.

	Country of Manufacture				
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**
Hardwood Flooring	3.10	3.33	3.44	3.27	1.27
Softwood Flooring	3.00	3.00	3.25	3.63	1.78
Wood Interior Doors	2.50	3.56	3.60	3.67	1.23
Wood Exterior Doors	2.44	3.38	4.00	3.75	1.30
Wooden Windows	2.33	2.89	3.50	4.38	1.50
Kitchen Cabinets	3.00	3.25	3.50	4.13	1.07
Bathroom Cabinets	3.29	3.29	3.86	3.57	1.00
Wood Moldings	3.29	3.14	3.86	3.25	1.20

Q7. In your opinion, how do the following countries compare in terms of product service for the listed products (Please rank from 1 to 5 where 1 indicates the highest level of service and 5 represents the lowest level of service)

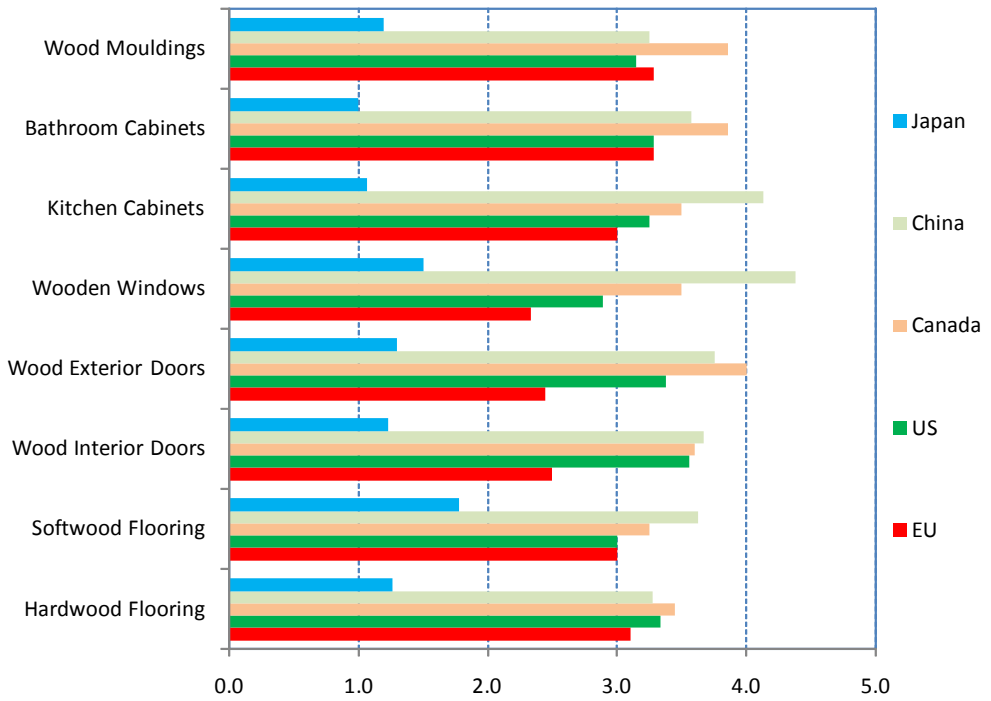


Figure 22. Japanese homebuilders' perception of product service based on country of manufacture.

Table 16. Comparison of respondent's perception of product service based on country of manufacture, by firm size.

	Construction Type	Mean	Significance
HW Floor Europe	Small Firm	4.67	0.0072
	Large Firm	2.43	
HW Floor US	Small Firm	2.00	0.0028
	Large Firm	4.00	
HW Floor China	Small Firm	4.33	0.0355
	Large Firm	2.88	
SW Floor Europe	Small Firm	4.67	0.0119
	Large Firm	2.17	
SW Floor US	Small Firm	1.67	0.0060
	Large Firm	3.80	
Interior Doors US	Small Firm	2.33	0.0087
	Large Firm	4.17	
Exterior Doors US	Small Firm	2.00	0.0367
	Large Firm	4.20	
Wood Windows Canada	Small Firm	2.67	0.0326
	Large Firm	4.00	
Bath Cabinets Europe	Small Firm	5.00	0.0039
	Large Firm	2.60	
Moldings Europe	Small Firm	5.00	0.0093
	Large Firm	2.60	
Moldings US	Small Firm	1.50	0.0551
	Large Firm	3.80	
Moldings Canada	Small Firm	3.00	0.0327
	Large Firm	4.20	

Similar to the trend seen with product quality, small Japanese home builders tended to provide higher service ratings for US products than did the larger home builders, Table 16. The average service rating across all product lines for small home builders was 2.1 versus an average service rating of 3.8 obtained from the large firms. As with product quality, there is a large disparity in the perceptions of US products between small home builders and large home builders, with the latter having a much lower opinion of product service. Interestingly, wood windows (which are generally harder to service in Japan because of the number of spare parts involved and the importance of proper installation to product performance), had the best service rating of all US products.

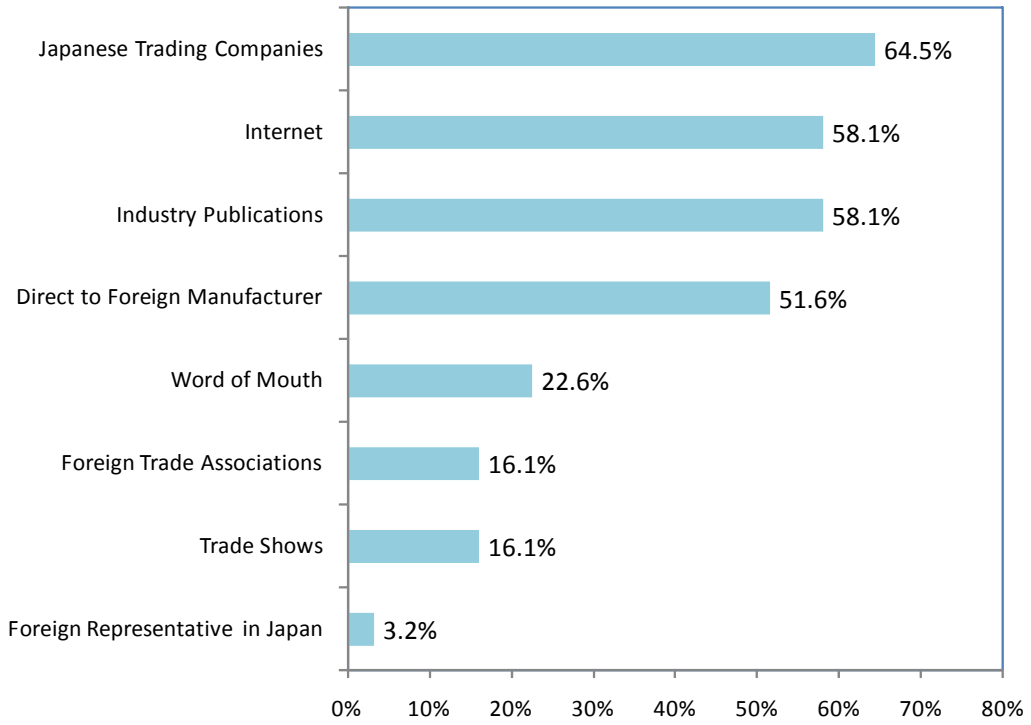


Figure 23. Sources of information used by Japanese builders to learn about imported building materials.

Q8. Where do you go to find information about imported building materials?

Survey respondents indicated that the most important sources of information on imported building materials were trading companies (64.5% of respondents) followed by the internet and industry publications (58.1%) and direct from foreign manufacturers (51.6%), Figure 23. The lowest rated sources of information were foreign representatives in Japan, trade shows and foreign trade associations. Table 17 shows there were few significant difference based on firm size or type of construction.

Table 17. Comparison of respondent's use of different sources of information to learn about imported building materials.

	Variable	Mean	Significance
Industry Publications	Small Firm	1.59	0.0336
	Large Firm	1.21	
Foreign Trade Association	2x4	1.76	0.0212
	Post & Beam	2.00	

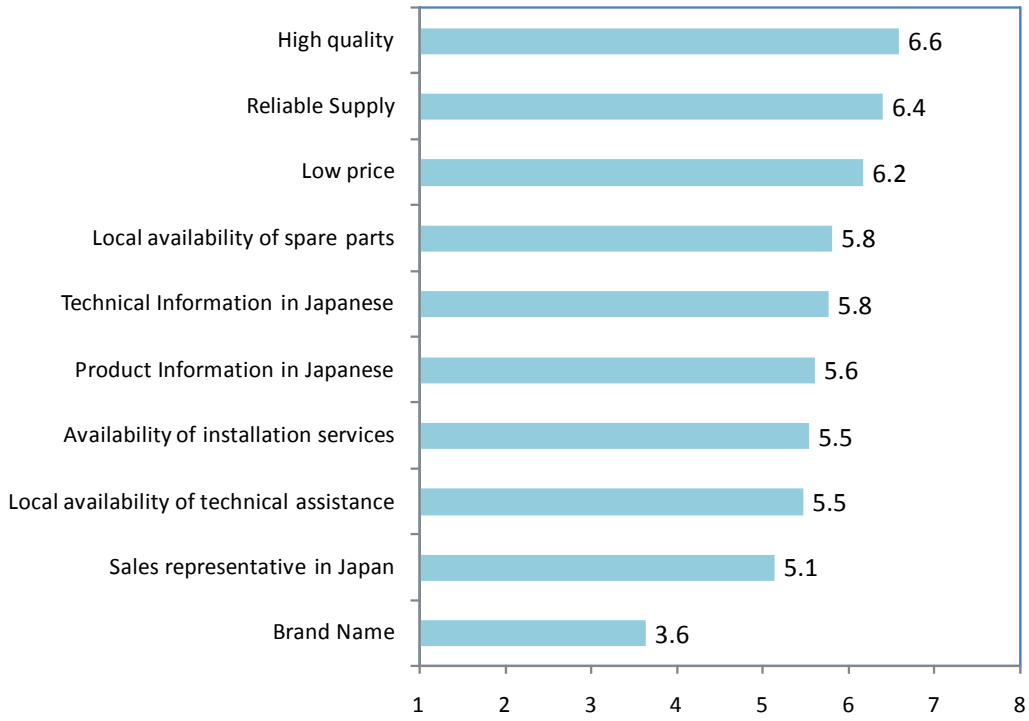


Figure 24. Japanese homebuilder's importance ratings of factors that influence their purchase decision for imported building materials.

Q9 How important are each of the following factors to your company when you are considering purchasing imported wooden building materials?

The importance rating for product attributes are summarized in Figure 24. Respondents reported that the most important product attributes were high quality (6.6), reliability of supply (6.4) and low price (6.2). The next five highest rated product attributes (importance ratings ranging from 5.8 to 5.5) were all related to product service issues. There were few significant differences observed based on firm size or type of construction, although large builders did place a significantly higher importance on reliability of supply and low price compared to small firms, Table 18. The most important attributes for each industry segment (with a rating above 6.0) were:

Large Firms: Reliability of supply, Low Price and Product Quality

Small Firms: Product Quality

2x4 Builders: Product Quality, Reliability of Supply, Low Price

P&B Builders: Low Price, Reliability of Supply, Product Quality and Availability of Spare Parts

Table 18. Comparison of Japanese homebuilder's importance ratings for factors influencing their purchase decision for imported building materials.

	Average Importance	Large Firms	Small Firms	2x4	P&B
High quality	6.6	6.5	6.6	6.7	6.4
Reliable Supply	6.4	7.0*	5.9*	6.4	6.4
Low price	6.2	6.6*	5.8*	6.0	6.7
Local availability of spare parts	5.8	5.6	5.9	5.7	6.0
Technical Information in Japanese	5.8	5.8	5.8	5.8	5.6
Product Information in Japanese	5.6	5.2	5.9	5.7	5.3
Availability of installation services	5.5	5.8	5.3	5.5	5.7
Local availability of technical assistance	5.5	5.2	5.6	5.5	5.4
Sales representative in Japan	5.1	4.9	5.3	5.0	5.6
Brand Name	3.6	3.2	3.9	3.7	3.6

It appears that product quality, reliability of supply and low price are important considerations across all industry segments. Comparing the survey results presented in Tables 13, 15 and 18, there appears to be a mismatch between the high importance placed on product quality and product service by Japanese home builders when specifying wood building materials and their perceptions of US wood building materials. Any marketing effort to increase US exports of value-added wood building materials into Japan need to address these issues and improve Japanese home builders perceptions of the quality and reliability of supply of US products.

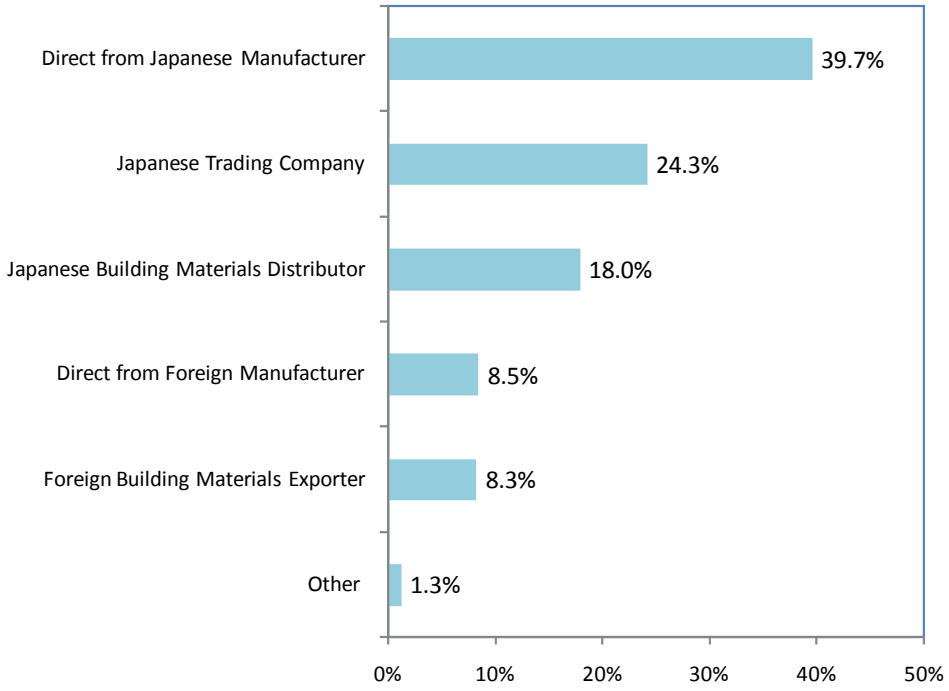


Figure 25. Breakdown of Japanese homebuilders sources for wooden building materials.

Most respondents obtain their wooden building materials through domestic distribution channels, with the main sources of supply being Japanese manufacturers, trading companies and Japanese building materials distributors, Figure 25. These three sources of supply provided 82% of building materials while foreign suppliers represented an additional 16.8%. Foreign suppliers were almost evenly distributed between foreign manufacturers and foreign exporters.

Large firms were significantly more likely to purchase from Japanese manufacturers then were small firms (69.3% vs. 15.3%). In contrast, small firms were much more likely to purchase from trading companies and foreign exporters than were large firms. Regarding buying from foreign suppliers (manufacturers and exporters), large firms used these two supply channels for 7.5% of their building material purchases whereas small firms used them for 24.4% of their building material purchases. In contrast 2x4 home builders purchased 22.5% of the building materials from foreign suppliers whereas post and beam builders only used these channels for 4.7% of their building materials, Table 19.

Table 19. Comparison of Japanese homebuilders sources for value-added wood building materials.

	Variable	Mean	Significance
Japanese Manufacturer	Small Firm	15.29	0.0000
	Large Firm	69.29	
Japanese Trading Company	Small Firm	36.47	0.0125
	Large Firm	9.43	
Foreign Distributor	Small Firm	15.00	0.0183
	Large Firm	0.14	
Japanese Manufacturer	2x4	27.62	0.0093
	Post & Beam	65.00	
Foreign Manufacturer	2x4	12.48	0.0226
	Post & Beam	0.10	

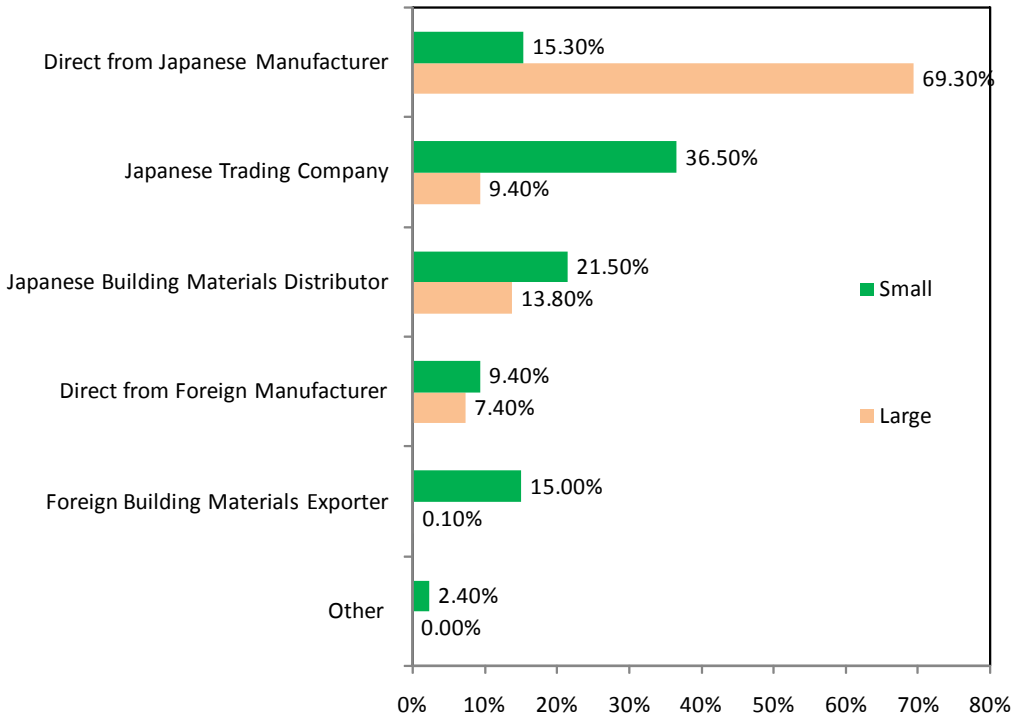


Figure 26. Comparison of supply sources for value-added building materials between small home builders and large home builders.

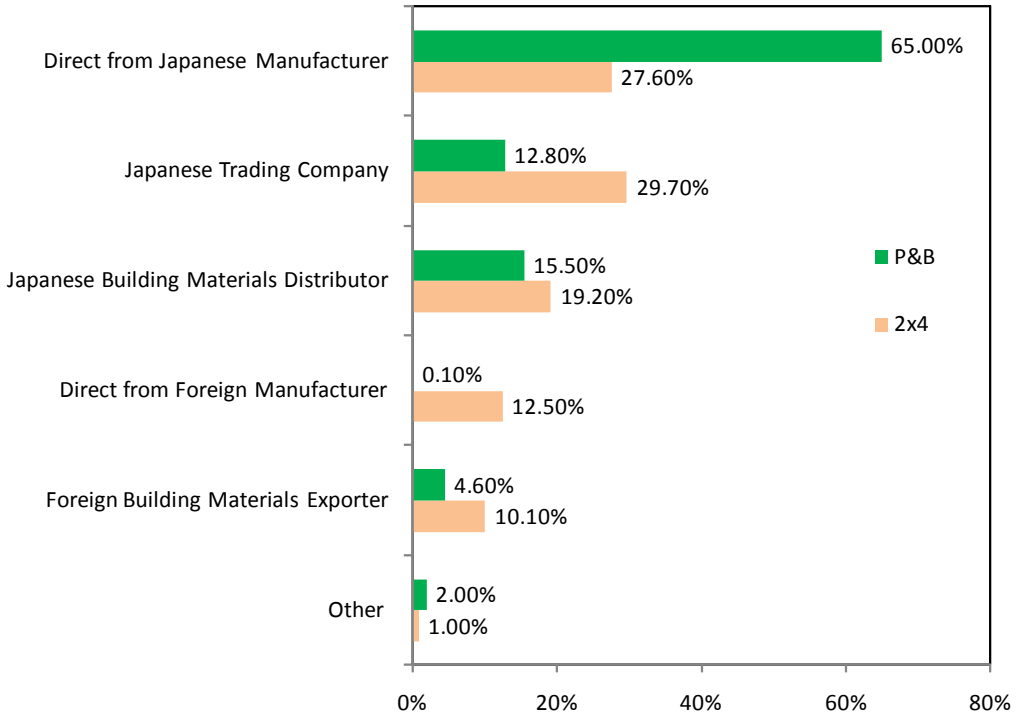


Figure 27. Comparison of supply sources for value-added building materials between 2x4 home builders and post & beam home builders.

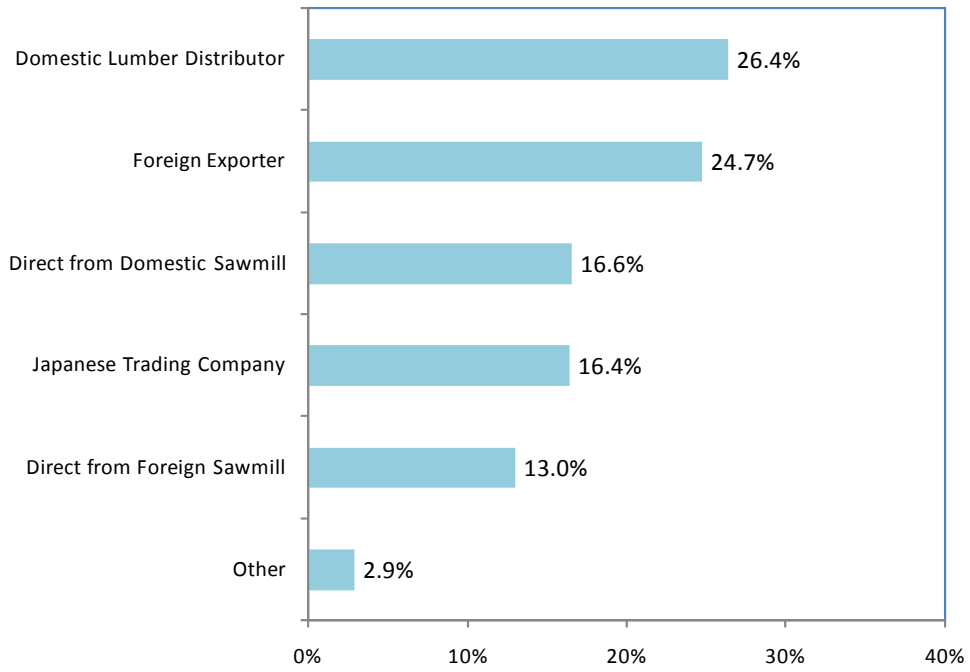


Figure 28. Breakdown of Japanese homebuilders sources for structural lumber.

The data displayed in Figures 26 and 27 compare the survey results based on firm size and type of construction. These figures show that each type of firm utilizes a unique supply chain for obtaining their value-added wood building materials. From the perspective of a foreign supplier, these results clearly show that small firms are more likely to buy direct as well as firms specializing in 2x4 construction.

The results for the supply channels for structural lumber differ from those for value-added wood products in that foreign suppliers play a much bigger role in supplying structural lumber to Japanese home builders, Figure 28 Almost 40% of structural lumber is obtained directly from foreign sources; either foreign exporters (24.7%) or direct from a foreign sawmill (13%). Interestingly, almost half of small home builders (44.1%) purchased their lumber from domestic sawmills whereas just 4.9% of large firms bought direct from domestic sawmills, Table 20. In contrast, almost a quarter (24.5%) of large home builders purchased their structural lumber direct from foreign sawmills relative compared to just 3.5% of small home builders.

The data displayed in Figures 29 and 30 compare the survey results based on firm size and type of construction. These figures show that each type of firm utilizes a unique supply chain for obtaining their structural softwood lumber. From the perspective of a foreign supplier, these results clearly show that large firms are more likely to buy direct as well as firms specializing in 2x4 construction. Ppost and beam firms purchased slightly more structural lumber direct from foreign sawmills than did 2x4 firms.

Table 20. Comparison of Japanese homebuilders sources for structural lumber.

	Variable	Mean	Significance
Japanese Distributor	Small Firm	44.12	
	Large Firm	4.86	0.0026
Foreign Sawmill	Small Firm	3.53	
	Large Firm	24.50	0.0695

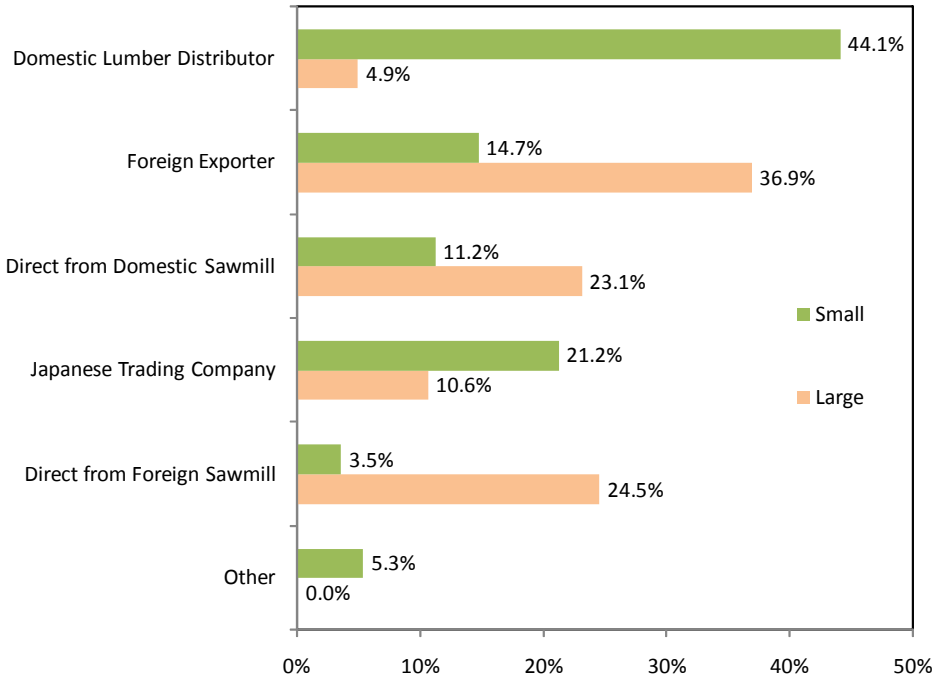


Figure 29. Comparison of supply sources for structural lumber between small home builders and large home builders.

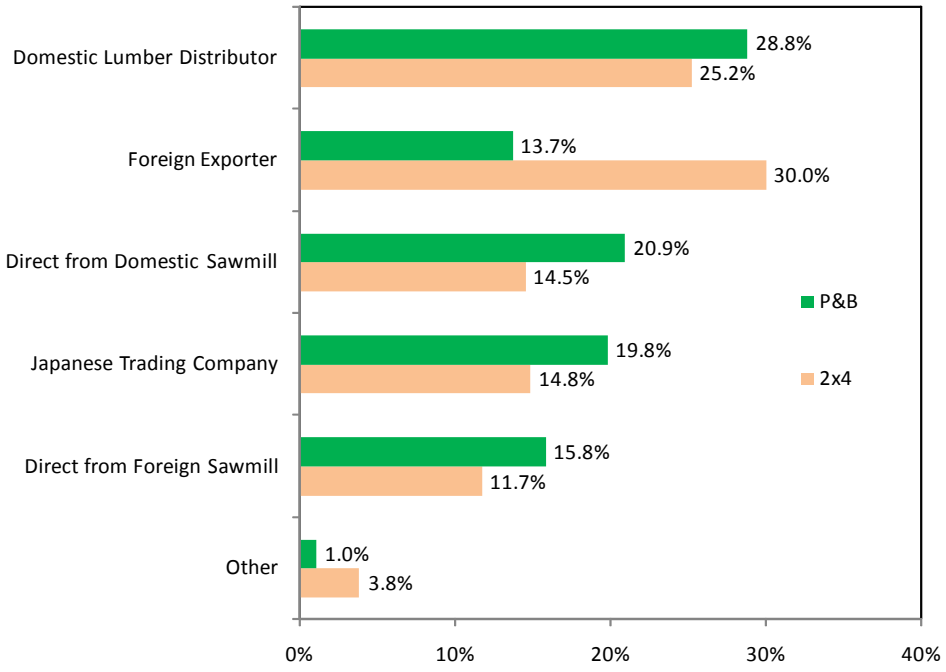


Figure 30. Comparison of supply sources for structural lumber between 2x4 home builders and post & beam home builders.

Conclusions and Opportunities

The Japanese 2x4 market represents a good opportunity for US manufacturers and exporters of wood products who are confronted with the worst US housing market since 1945. This is particularly true given the recent strength of the yen, Figure 31. In addition, the relative weakness of the US dollar, particularly with respect to the Canadian dollar and the Euro, provides US wood products with a competitive advantage in Japan.

However, re-establishing US value-added wood products in the Japanese market will require some effort on the part of manufacturers and exporters, especially those who abandoned the market during the period 1996-2006 when strong housing starts in the US averaged 1.71 million annually. The resultant strong demand for value-added wood building materials in the US caused many exporters and manufacturers to withdraw from the Japanese market. This withdrawal, partly caused by the strong US dollar which undermined the competitiveness of US wood products in Japan has reinforced the perception of US manufacturers and exporters as 'inners-and-outers' with no long-term commitment to the Japanese market. US manufacturers and exporters who are returning to the Japanese market or who are new to this market will need to demonstrate a long-term commitment to their Japanese customers if they are going to be successful. They also need to develop a strategy for providing after sales support for their products in a variety of areas, including providing: timely claims evaluations, spare parts, assistance with installation questions and replacement products.

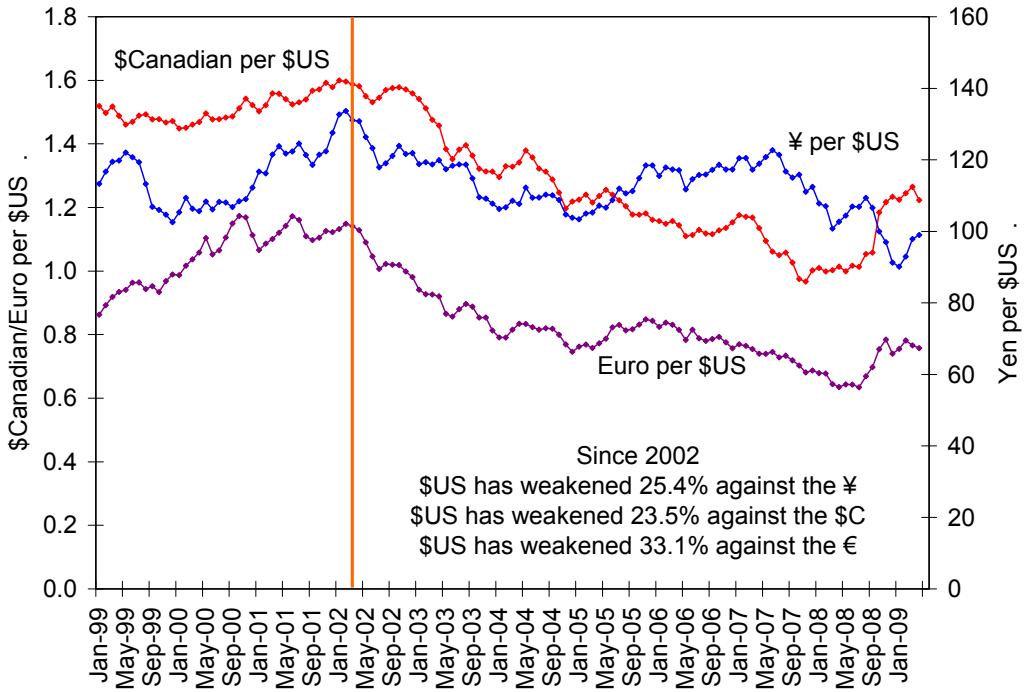


Figure 31. Comparative exchange rates for Europe, Canada, Japan and the US.

This research was specifically designed to determine the likelihood of increasing the use of the North American-style 4x8 construction module by Japanese 2x4 home builders and panelizers. The survey data shows that less than 5% of 2x4 houses built in Japan in 2007 utilized this construction system despite the labor and material cost savings enjoyed by the North American system, Table 6. Discussions with a number of 2x4 home builders identified several reasons for this reluctance. First, many home builders indicated that most architects use the metric module for their architectural drawings. Converting these metric drawings to the foot-inch measurement system used for the North American-style system is time consuming and expensive but necessary given the differences in stud spacing and the size of the structural panels used in the two systems. The second reason for this reluctance is the fact there are virtually no plywood manufacturers who produce a 4 foot wide structural panel (the same is true for gypsum board). This means that builders using the 4x8 system generally rely on imported panels and gypsum board. Many of the builders indicated that they do not want to be reliant on imported supplies of structural panels and gypsum board. Additionally, many foreign suppliers are not willing or able to provide the JIT delivery to job sites that Japanese suppliers are capable of providing. The third factor that is often mentioned but less important is that aging Japanese carpenters resist the use of the larger, heavier panels sizes required in the 4x8 system While this may occasionally be the case, most builders we talked with tended to downplay this factor. All in all, the results of these interviews suggest that there is little likelihood that there will be a widespread acceptance of the 4x8 construction module in Japan. However, given the fact that the 2x4 market segment is the fastest growing segment of the housing sector, it would be worthwhile to conduct an on-going series of technical seminars with Japanese architects and home builders promoting the advantages in utilizing the 4'x8' module.

Table 21. Total wood products exports from the US and Washington State.

	Washington State		United States		WA/US Ratio
	2008	Change 07/08	2008	Change 07/08	
Softwood Lumber	$216,013	23.8%	$687,563	2.5%	31.4%
Hardwood Lumber	$101,410	52.5%	$1,155,916	46.2%	8.8%
Prefab Buildings	$83,675	52.5%	$832,653	46.2%	10.0%
Builders Joinery	$75,076	1.7%	$190,309	6.9%	39.4%
Doors	$49,887	7.8%	$174,499	17.6%	28.6%
Windows	$16,038	28.6%	$91,953	19.3%	17.4%
Articles of Wood NESOI*	$10,229	36.6%	$224,027	24.6%	4.6%
Posts and Beams	$4,254	99.2%	$7,148	-0.4%	59.4%
Laminated floors	$1,389	98.1%	$13,112	58.4%	10.6%
Wooden Furniture	$65,079	42.6%	$1,214,312	20.8%	5.4%
Total Solid Wood Products	**$1,536,717**	**11.50%**	**$8,804,052**	**5.15%**	**17.4%**

*Note: **Articles of Wood NESOI (HS 442190)** includes edge glued lumber, pencil slates and wood fencing, etc.)*

Table 22. Wood products exports from the US and Washington State to Japan.

	Washington State		United States		WA/US Ratio
	2008	Change 07/08	2008	Change 07/08	
Softwood Lumber	78,654	57.4%	82,435	46.7%	95.4%
Total Lumber	85,817	45.3%	113,351	19.5%	75.7%
Builders Joinery NESOI*	13,682	-5.9%	16,208	-9.9%	84.4%
Veneer Sheets	864	4.2%	1,249	-27.7%	69.2%
OSB Panels	657	3,395.7%	731	1,993.4%	89.9%
Molding	538	51.5%	1,917	42.7%	28.1%
Doors	1,962	-18.2%	3,905	-24.0%	50.1%
Windows	5,161	3.0%	7,758	-6.6%	66.5%
Articles of Wood NESOI*	558	54.0%	2,340	12.3%	23.8%
Posts and Beams	711	48.8%	711	48.8%	100%
Total Solid Wood Products	**589,390**	**6.1%**	**739,141**	**7.1%**	**79.7%**

Note: ***Builders joinery (HS 441890)*** *includes edge glued lumber, trusses, fabricated structural members and glued-laminated lumber, etc.)*

Articles of Wood NESOI (HS 442190) *includes edge glued lumber, pencil slates and wood fencing, etc.)*

US exports of wood products both globally and to Japan have been growing despite the grim global economic situation, Tables 21 and 22. Interestingly, when considering the export of US wood products, the state of Washington is a dominant player in the export market. The most promising product categories in 2008 are summarized in Table 21 and the ratio of exports from Washington to total US exports ranges from about 5% to almost 60%. Overall, Washington represents 17.5% of total US exports of wood products, and almost 35% of value-added wood products, making it the largest wood exporting state in the US.

While the entire range of wood products, from logs to wooden doors and windows, is exported from the US to Japan, there are some products that have enjoyed more success in Japan. These wood products include softwood lumber, wood windows, wood doors, builders joinery, wood mouldings and laminated wooden beams (Table 22). In virtually all of these product categories, Washington state exporters dominate total US exports to Japan. Clearly the unique relationship between Washington state and Japan can provide exporters in Washington with an advantage in Japan. However, the survey results clearly show that the large, national 2x4 builders have a poor perception of US value-added wooden building materials, both in terms of quality and service, relative to small and medium-sized local builders. This suggests that US manufacturers and exporters should focus their marketing efforts on the small and medium-sized 2x4 builders in the short-term. However, long-term success in Japan will require that US manufacturers and exporters understand and address those factors that adversely affect large builder's perceptions of US value-added wood building materials. This should provide the basis for additional research in the future.

One product for which there is strong market potential is dimension lumber. Many of the 2x4 home builders we talked with indicated that they were having trouble sourcing 2x8 and 2x10 joist material, as well as most other sizes of dimension lumber. They also indicated that dimension SPF lumber from Canada was becoming problematic because of the increasing presence of blue stain. While blue stain does not impact the structural strength of the lumber, it has an adverse impact on the aesthetics of the

lumber. This is a particularly important consideration for 2x4 home builders who specialize in replacement single family homes where the home owners are frequently on the job site and can easily see the quality of the lumber being used in the project. Many builders we talked with noted that their customers do not like blue stained lumber and many perceive that the blue stain is a defect that weakens the lumber. At the same time, more 2x4 home builders are willing to accept a "home center" grade of lumber (along the lines of a No.2 and better grade) rather than the traditional higher quality J grade that they demanded in the past. Both of these trends, taken in conjunction with the weaker US dollar and strong Japanese yen, suggest that this may be a good time for dimension sawmills in Washington to get back into the Japanese market.

Part of the success of Washington exporters of wood building materials in the Japanese market can be attributed to the active role of Washington state trade associations such as the Washington State Department of Community, Trade and Economic Development (CTED), the Evergreen Building Products Association (EBPA) and the Center for International Trade in Forest Products (CINTRAFOR). The trade missions and trade show activities of these associations in Japan over the past five years have made a substantial contribution to the success of Washington companies in Japan. For example, Washington companies have reported $19,055,162 in sales as a direct result of Japan trade events since May of 2002, including Spring and Fall Sales Missions, Trade Shows (Japan Home Show, Architecture & Construction Materials Show, Total Living Show, Osaka Home Builders Show) and the Gateway Program. In total, 131 different companies have participated in these Japan trade events since May of 2002. It is important to note that these sales results are only recorded up to one year after the event and therefore substantially underestimate the actual impact of these trade events on the value of Washington wood products exports.

Attending trade shows and trade missions are excellent ways for small and medium-sized companies to learn more about the Japanese market, showcase their products to a large group of qualified Japanese companies and meet potential customers face to face. These events are geared to help small and medium-sized firms and are designed to reduce the costs for participating companies. They provide a low risk strategy for helping managers of small and medium-sized companies assess the Japanese market first hand. These trade events also provide a valuable opportunity to gain insights from other participating companies who have experience doing business in Japan as well as participating association and government trade representatives.

In summary, the struggling domestic housing market in the US combined with the relatively weak US dollar and strong Japanese yen provide a unique opportunity for US manufacturers and exporters of wood building materials increase their presence in Japan. However, they will need to demonstrate a long-term commitment to the Japanese market in order to be successful.

Appendix A

SCOPE OF WORK

A. Background

The North American 2x4 construction technology was introduced into Japan in 1973 and, following an extended introduction period, has gained broad acceptance within the building community in Japan. As a result, there exists a good opportunity to provide these post and beam builders with information on the North American construction system as a way to simplify the construction process, provide their customers with lower cost houses, improve the structural performance their houses. This project seeks to compare and contrast the Japanese-style and North American-style 2x4 construction technologies, evaluate Japanese builders perceptions of US value-added wood building materials and identify opportunities to increase the use of US wood building materials within the Japanese 2x4 construction sector.

B. Objectives

The objectives of this comparative assessment of Japanese and North American 2x4 construction technologies, as defined within the EBPA Request for Proposals, are summarized below. Based on interviews with Japanese builders and developers:

- Identify user perceptions about U.S. building materials used in Japanese- and North American-style 2x4 home construction and make recommendations for increasing the use of imported building materials.
- Describe Japanese developer and builder perceptions about U.S. building materials and identify why Japanese construction professionals are adopting or rejecting the use of U.S. building materials.
- Identify areas where the Japanese 2x4 construction technology differs from that used in North America, determine the reasons for this difference, and provide suggestions for increasing the use of U.S. building materials in both North American and Japanese 2x4 homes.
- Identify obstacles and opportunities for imported building materials in Japanese- and North American-style 2x4 housing.
- Evaluate the quality of home designs available to consumers and identify if there is a financial benefit to Japanese developers by providing more aesthetically pleasing designs.
- Evaluate competition from lower cost producers and user perceptions of the quality of these products compared to American supplied building materials. Provide recommendations for U.S. suppliers to improve their competitiveness with these lower cost substitutes.
- Include information about the F Four Star formaldehyde regulation and how it affects the import and use of value-added wood building materials, including panel based products from China.
- Identify to what extent "American Made" is a selling point for Japanese builders and consumers and make recommendations for positively distinguishing American imported building materials from lower quality imported building materials from lower cost suppliers.

Appendix B

Japan 2x4 Homebuilder Survey

Center for International Trade in Forest Products
University of Washington
Japan 2x4 Housing Survey

1. Approximately how many wooden housing units did your company build in 2007?
_____ wooden houses

2. What percentage of the wooden housing units you built in 2007 were:

a) Multi-family _____% Single Family _____%

b). Post & Beam _____% 2x4 _____ Prefabricated _____%

3. Approximately what percentage of the 2x4 houses you built in 2007 were based on the 3x6 construction module? _____%

4. Who specifies the following building materials that are used in your homes?

PRODUCT TYPE	Material Specifier			Percentage Imported
	Your Company	Home Owner	Total	
Hardwood Flooring	_____%	_____%	**100%**	_____%
Softwood Flooring	_____%	_____%	**100%**	_____%
Wooden Interior Doors	_____%	_____%	**100%**	_____%
Wooden Exterior Doors	_____%	_____%	**100%**	_____%
Wooden Windows	_____%	_____%	**100%**	_____%
Kitchen Cabinets	_____%	_____%	**100%**	_____%
Bathroom Cabinets	_____%	_____%	**100%**	_____%
Wood Mouldings	_____	_____%	**100%**	_____%

5. What percentage of the following building materials does your company currently purchase from the following countries.

	Country of Manufacture						
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**	**Other**	**Total**
Hardwood Flooring	____	____	____	____	____	____	100%
Softwood Flooring	____	____	____	____	____	____	100%
Wood Interior Doors	____	____	____	____	____	____	100%
Wood Exterior Doors	____	____	____	____	____	____	100%
Wooden Windows	____	____	____	____	____	____	100%
Kitchen Cabinets	____	____	____	____	____	____	100%
Bathroom Cabinets	____	____	____	____	____	____	100%
Wood Mouldings	____	____	____	____	____	____	100%

6. In your opinion, how do the following countries compare in terms of product quality for the listed products *(Please rank from 1 to 5 where 1 indicates the highest quality and 5 represents the lowest quality)*

	Country of Manufacture				
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**
Hardwood Flooring	____	____	____	____	____
Softwood Flooring	____	____	____	____	____
Wood Interior Doors	____	____	____	____	____
Wood Exterior Doors	____	____	____	____	____
Wooden Windows	____	____	____	____	____
Kitchen Cabinets	____	____	____	____	____
Bathroom Cabinets	____	____	____	____	____
Wood Mouldings	____	____	____	____	____

7. In your opinion, how do the following countries compare in terms of product service for the listed products *(Please rank from 1 to 5 where 1 indicates the highest level of service and 5 represents the lowest level of service)*

	Country of Manufacture				
PRODUCT TYPE	**EU**	**US**	**Canada**	**China**	**Japan**
Hardwood Flooring	____	____	____	____	____
Softwood Flooring	____	____	____	____	____
Wood Interior Doors	____	____	____	____	____
Wood Exterior Doors	____	____	____	____	____
Wooden Windows	____	____	____	____	____
Kitchen Cabinets	____	____	____	____	____
Bathroom Cabinets	____	____	____	____	____
Wood Mouldings	____	____	____	____	____

8. Where do you go to find information about imported building materials?

☐ Industry Publications ☐ Trade Shows

☐ Japanese Trading Companies ☐ Internet

☐ Word of Mouth ☐ Foreign Trade Associations

☐ Foreign Representative in Japan ☐ Direct to Foreign Manufacturer

☐ Other (Please Specify) _____

Of the above, which are the two most important:

1. _____ 2. _____

9 How important are each of the following factors to your company when you are considering purchasing imported wooden building materials?

FACTOR	NOT IMPORTANT						VERY IMPORTANT
Reliable Supply	1	2	3	4	5	6	7
Brand Name	1	2	3	4	5	6	7
Local availability of spare parts	1	2	3	4	5	6	7
Local availability of technical assistance	1	2	3	4	5	6	7
Availability of installation services	1	2	3	4	5	6	7
Sales representative in Japan	1	2	3	4	5	6	7
Low price	1	2	3	4	5	6	7
High quality	1	2	3	4	5	6	7
Product Information in Japanese	1	2	3	4	5	6	7
Technical Information in Japanese	1	2	3	4	5	6	7

10 What percentage of your building materials do you purchase from the following sources?

Direct from Japanese Manufacturer _____ %

Japanese Building Materials Distributor _____ %

Japanese Trading Company _____ %

Foreign Building Materials Exporter _____ %

Direct from Foreign Manufacturer _____ %

Other _____ _____ %

100%

11. What percentage of your structural lumber do you purchase from the following sources:

Direct from Domestic Sawmill _____ %

Domestic Lumber Distributor _____ %

Japanese Trading Company _____ %

Foreign Exporter _____ %

Direct from Foreign Sawmill _____ %

Other: _____ _____ %

100%