



Factory-Built Construction:

Domestic and Export Developments

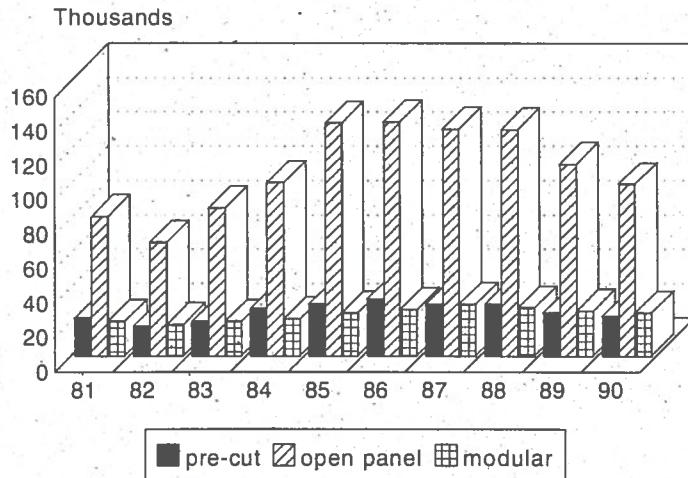
Over the past two decades, the U.S. housing industry has undergone a rapid shift from nearly exclusive on-site construction toward more building completion in a controlled factory environment. In 1990, factory-built homes accounted for 25% of the single-family homes completed in the U.S. compared to nearly 90% of the single-family homes built in Sweden. Exporting factory-built homes could be the ultimate value-added export strategy, hence the importance in understanding factory-built or "componentized" construction. A recent CINTRAFOR study assessed marketing strategies, export activity, and technological developments among building systems prefabricators in those two countries.

Factory-Built Construction Methods

Factory building systems in Sweden, the U.S. East, and the U.S. Northwest can be characterized in three groups:

- ▲ open panel systems, including pre-cut homes with interlocking timbers and open panel homes with exterior siding attached to wooden frames.
- ▲ closed panel systems, which are stressed-skin panels with interior and exterior wall coverings attached and which often include factory-installed doors and windows. The "Swedish" system is a closed panel system that conforms to strict construction standards.
- ▲ three-dimensional systems, which include modular and manufactured homes nearly completed in the factory.

U.S. Pre-Cut and Factory-Built Homes Produced to Site-Built (UBC) Standards



Marketing and Consumer Preferences

The factory-built housing industry regards high quality and product differentiation as top promotional factors, according to industry survey results. While these homes are hard to distinguish from traditional site-built homes, the average factory-built home is higher in quality than the average site-built home due to quality control achieved in the factory. Considering historic consumer perceptions that factory-built homes in the U.S. are of lower quality, stemming from the "trailer"-type homes produced until the early 1970's, acceptance in the U.S. has been slow.

Product differentiation between the factory-built and traditional building sectors is pronounced. Major differences occur in levels of custom design, time efficiencies, and transportation advantages. Affordability is another factor that differentiates factory-built from site-built homes. Economies of scale in production and reducing the number of subcontractors needed to complete a home contribute to a lower sales price.



International Trade and the Export of Factory-Built Housing

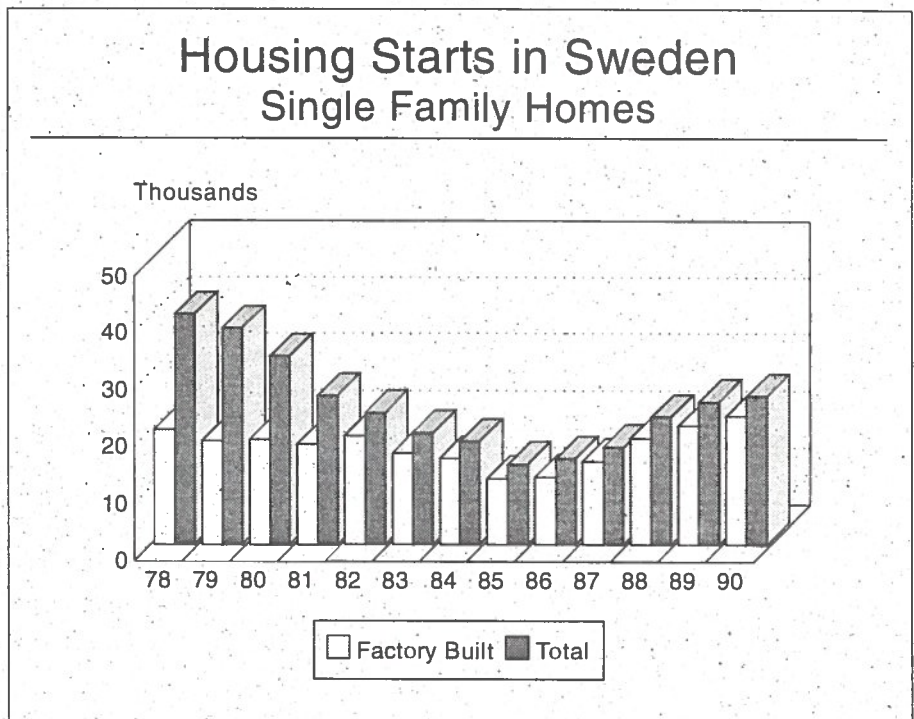
Factory-built housing is growing in the U.S. housing market, and its potential for international trade could be considerable. There are many motivations for factory-built housing firms entering export markets, but the two primary motivations are to:

- ▲ satisfy increasing foreign demand where wood is in short supply, and
- ▲ diversify markets beyond domestic sales, which are heavily dependent on building cycles.

Japan led the list of export nations for the U.S. in 1990, followed by Canada, Israel, and South Korea. The major barriers for exporting houses are high transportation costs and the difficulty of obtaining foreign on-site assembly labor.

Technological Developments

The Swedish factory housing industry differs from the U.S. industry in its degree of automation. Automation in Sweden is generally based on two-dimensional construction because it is easiest for automated machines to construct components in two, rather than three, dimensions. In Swedish computerized wall framing assembly lines, the computer feeds structural components, moves the assembled frame forward via conveyors, determines wall lengths, provides information on the size and locations of windows and doors, cuts and installs insulation, squares the wall frame, and turns the wall 180 degrees for drywall application. Control of these major steps in the home component building process is more developed in Sweden than in the U.S. Once components arrive at a building site, a crew can normally finish enclosing the shell of an average sized (1400



square foot) house in one day.

Swedish producers are interested in investing abroad. Swedish technology in the U.S. is estimated to reduce construction costs by 27% over traditional U.S. residential construction methods. An average site-built home in the U.S. is estimated to use about 1,074 labor hours, compared to 533 hours for the typical Swedish closed wall panel house. The panel system also makes good use of export shipping container space, by shipping solid walls with a minimum of wasted space.

Industry Issues

Building codes are extremely important to factory home builders, especially in the modular and closed wall panel sectors. Closed wall and modular producers face a series of building code requirements that are regarded by the industry as major constraints to increasing market share because they add time and additional inspection costs to factory home building. U.S. federal legislation has been proposed that would

promote national uniformity in the regulation of modular and closed wall building systems. This would increase the availability of affordable housing by lowering inspection costs. Similar breakthroughs in export markets such as Japan could actually reduce the barriers for processed wood products entering that market.

Customization is a major issue, referring to anything that makes a home unique and distinguishable. This can include custom architecture and floor plans, interior trim, carpeting, and appliances. Two-dimensional factory building systems have more potential for custom architecture and varied floor plans. Modular homes are more flexible in arrangement, and modules can be stacked over one story. The ability to customize using computer-aided design has revolutionized the industry both in the U.S. and Sweden. Integration of computer technology in factory home manufacturing has been limited by the low degree of flexibility existing in the factory assembly process used in the U.S.

For more information about factory-built housing, contact CINTRAFOR.