



# Is there a price premium for certified wood? Empirical evidence from log auction data in Japan



Yuki Yamamoto <sup>a</sup>, Kenji Takeuchi <sup>a,\*</sup>, Takayoshi Shinkuma <sup>b</sup>

<sup>a</sup> Graduate School of Economics, Kobe University, Kobe 657-8501, Japan

<sup>b</sup> Faculty of Economics, Kansai University, Japan

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## ABSTRACT

We investigate the price premium on certified wood from sustainable forests, using data from more than 38,000 log transactions in Shizuoka Prefecture, Japan. We found a positive and statistically significant effect of certification. The premium added by certification was 1.4% more than the price of conventional logs. This was well in the lower range of additional willingness to pay found in previous studies that used stated preference techniques. The effect of certification varies by wood species. The premium for cedar is 4.0%, while that for cypress is statistically insignificant.

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## 1. Introduction

The certification of sustainable forest management has been increasingly promoted throughout the world over the last two decades. According to UNECE/FAO (2011), as of May 2011, the total area of forests certified worldwide was approximately 375 million hectares, about 9.3% of the world's forests. The certification has been endorsed by one or both of the two dominant international organizations: the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC), which evaluate both forest management activities (forest certification) and the tracking of forest products (chain of custody certification). There is a considerable variety of certified forest products on the market, from paper to furniture items. Certified products often bear labels indicating that they come from forests that meet the standard of sustainable forest management. Through such labeling, forest certification acts as a tool by which producers can transfer information on sustainability to consumers.

Haener and Luckert (1998) identify the existence of a green price premium as a contentious issue concerning the impact of forest certification. Many studies have estimated additional willingness to pay for certified wood products using stated preference surveys (Ozanne and Vlosky, 1997, 2003; Ozanne and Smith, 1998; Forsyth et al., 1999; Grönroos and Bowyer, 1999; Pajari et al., 1999; Veisten, 2002, 2007; Kozak et al., 2004; O'Brien and Teisl, 2004; Aguilar and Vlosky, 2007; Aguilar and Cai, 2010). Table 1 shows a brief summary of the findings of these studies. Most found there is a positive willingness to pay

among consumers in North America and Europe, and estimates of a willingness to pay more than the price of conventional forest products have ranged from 1.4% to 18.7%. Other studies (Vlosky et al., 1999; Bigsby and Ozanne, 2002; Teisl et al., 2002a; Anderson and Hansen, 2004a; Thompson et al., 2010) also attempted to investigate the preference structure and motivation for willingness to pay using similar techniques such as conjoint analysis and cluster analysis.

While willingness to pay on the part of environmentally conscious consumers plays a key role in the existence of a price premium, the price premium also depends on the supply side since the price is determined by the interaction of supply and demand. Using a qualitative survey for suppliers in Finland, Owari et al. (2006) confirmed that it was not possible for most of the surveyed Finnish companies to charge a price premium. Certification has not helped them improve their financial performance, but it was positively evaluated by customers, and, as such, was a tool to enhance reputation. For suppliers in countries such as Finland and Austria, where all forests are certified and therefore all forest products could bear a label, there is little incentive to use this tool to indicate a difference from competitors' products (UNECE/FAO, 2005).

This study investigates the existence of a price premium by using market data on log auctions in Shizuoka Prefecture in Japan. While many studies have estimated willingness to pay for certified wood products using a stated preference survey, as far as we know there have been no attempts to use actual price data to investigate the size of a price premium. Two exceptions to the stated preference survey method are the experimental studies by Anderson and Hansen (2004b) and Anderson et al. (2005), in which consumer behavior was studied at two home improvement retailers and two university bookstores in the US. The findings of these studies, however, rely on the

\* Corresponding author. Tel.: +81 788036809; fax: +81 788037293.

E-mail addresses: [yuuki00007@hotmail.com](mailto:yuuki00007@hotmail.com) (Y. Yamamoto), [takeuchi@econ.kobe-u.ac.jp](mailto:takeuchi@econ.kobe-u.ac.jp) (K. Takeuchi), [shinkuma@ipcku.kansai-u.ac.jp](mailto:shinkuma@ipcku.kansai-u.ac.jp) (T. Shinkuma).

**Table 1**  
Estimated willingness to pay in stated preference studies.

Authors	Area	Results
Ozanne and Vlosky (1997)	US	18.7% for a \$1 stud 4.4% for a \$100,000 housing start
Ozanne and Smith (1998)	US	18% of homeowners prefer certified wood products
Forsyth et al. (1999)	Canada	5% (67.3% of sample) 10% (28.3% of sample) More than 10% (13% of sample)
Grönroos and Bowyer (1999)	US	\$2500 per home built
Pajari et al. (1999)	EU	1.4%–4.9%
Veisten (2002)	UK, Norway	5% or less (32%–39% of sample)
Ozanne and Vlosky (2003)	US	11.7%
Kozak et al. (2004)	Canada	5.6%–14%
O'Brien and Teisl (2004)	US	Positive
Aguilar and Vlosky (2007)	UK	At least 10%
Veisten (2007)	UK, Norway	2%–16% (median)
Aguilar and Cai (2010)	US, UK	5% higher price can capture 34 to 50% of the market

Note: Additional willingness to pay is indicated by the ratio to the price for conventional products.

observation of behavior in an artificial situation, and the number of observations and period of experiment was relatively limited. Since there is a difference between stated intention to pay and actual behavior (List and Gallet, 2001; Murphy et al., 2005) and possibly between behavior in an artificial situation and that in a real situation, using data from a real market would be valuable for ascertaining the price premium for forest certification.

This study relates to a body of empirical analyses that have investigated the existence of a price premium for eco-labeled goods (Henion, 1972; Nimon and Beghin, 1999; Teisl et al., 1999, 2002b; Blamey and Bennett, 2001; Bennett et al., 2001; Roe et al., 2001; Bjørner et al., 2004). For example, Teisl et al. (1999) investigated the effect of the dolphin-safe label on the overall market share of canned tuna by using aggregated sales data. Bjørner et al. (2004) used a large body of Danish consumer panel data to estimate the impact of the Nordic Swan eco-label on consumers' shopping behavior. While these studies focus mainly on final consumer goods sold in retail shops, we focus on the premium for certified logs, which are used as primary inputs or intermediate goods. The existence of a price premium at the earlier stage of the supply chain has an important implication for the economic viability of sustainable resource management since it is more directly relevant to the decision making of resource managers.

The rest of this paper is structured as follows. Section 2 presents the statistical details of our data. Section 3 discusses the results of an econometric analysis. Section 4 presents our brief concluding remarks.

## 2. Data

There are two prominent forest certification schemes in Japan: the Sustainable Green Ecosystem Council (SGEC) and the Forest Stewardship Council (FSC). The SGEC is a certification scheme of Japanese origin that has certified more than 0.86 million hectares in Japan, 3.5% of its total forest area. The FSC has certified more than 0.35 million hectares, 1.5% of Japan's forests. With regard to chain of custody (CoC) certification, Japan has the third-largest number of companies in the world (UNECE/FAO, 2005). As of 2011, more than 1500 Japanese companies had acquired CoC certification: 402 under the SGEC and 1107 under the FSC.

Our empirical study uses more than 38,000 log auction transactions in 2011 in Shizuoka Prefecture. The Shizuoka Forest Owners Association has been actively involved in sustainable forest management and forest certification. Of the 899,000 ha of forest area in Shizuoka Prefecture, the SGEC and the FSC have certified 8169 ha (0.9%) and 37,966 ha (4.2%),

respectively, as sustainable forest. Furthermore, 32 companies have acquired CoC certification from the SGEC and 63 from the FSC.

Log auction markets emerged in the first half of the 1960s throughout Japan; these markets played the role of distribution centers since forest stands and log suppliers are small-scale and scattered (Ito, 2002). Logs produced by suppliers are trucked to the auction market and sorted into selling units (*hai*) by species, diameter, length, quality, and shipper. Buyers create a price for each *hai* by auction or bidding and then purchase their logs. Auction markets are generally financed by sales commissions imposed on buyers and sorting charges imposed on shippers. The number of log auction markets in Japan was 516 as of 2006 and the log volume they handled was 7.11 million cubic meters, approximately 51.4% of the total domestic log supply for sawn timber (Ministry of Agriculture, Forestry and Fisheries of Japan, 2007).

Our data on the timber trade in Shizuoka Prefecture include the clearing price per cubic meter, diameter, length, information on defects (such as crooks, knots, and scars), and forest certification. The Shizuoka Forest Owners Association consists of three offices: the Shizuoka Office, the Fuji Timber Center and the Tenryu Office. We obtained data from the Shizuoka Forest Owners Association. On the website, only recent auction data is available. Therefore, we requested each association office to provide as much data as possible. We thus collected complete auction data for 2011 from each office. In 2011, the total number of auction markets held in these offices was 118. The first market was held on 11 January and the last market was held on 23 December, both at the Fuji Timber Center. Auction data before 2011 have not been kept except by the Tenryu Office.

Each office typically holds log auction markets twice a month using a first-price sealed-bid auction. On the day of the auction, logs sorted into *hai* are set out in the yard of the market. Each *hai* has information provided on diameter, length, defects, and forest certification so that buyers can differentiate their bids according to product attributes. Buyers put cards with their written bids into a box in front of each *hai* in the morning. Bidding closes at noon, and each *hai* goes to the highest bidder. Sellers can tell the auctioneer the reserve price, but it is not announced to bidders. Since reserve prices data are unavailable, they are not included in our analysis. Timber is sold to industrial sectors such as paper and pulp manufacturers, construction companies, and furniture manufacturing companies. However, our database does not include information on the type of buyer or on the product market where the logs were used.

Table 2 presents a summary of descriptive statistics. The timber in our data are mostly Japanese cedar (*Cryptomeria japonica*) and Japanese cypress (*Chamaecyparis obtusa*). We found that 30.0% of the timber is certified, but were unable to identify which institution (the SGEC or the FSC) issued each certification.

## 3. Empirical results

This section estimates the impact of forest certification on log price. We regress the sale prices of logs on various factors such as product qualities (length, diameter, certification, defects and species), markets' fixed effects (Fuji, Tenryu and Shizuoka), and other important covariates. Since our data contains prices of zero when logs have not sold, we use a Tobit model for estimation (Huang and Buongiorno, 1986; Boltz et al., 2002).

$$\begin{aligned}
 MV_i^* &= \beta' X_i + \epsilon_i \\
 y_i &= MV_i^* \text{ if } MV_i^* > RP_i \\
 y_i &= 0 \text{ if } MV_i^* < RP_i
 \end{aligned} \tag{1}$$

where  $MV_i$  is the latent market value per cubic meter of log  $i$ ,  $y_i$  is the sale price per cubic meter of log  $i$ ,  $X_i$  is a vector of exogenous variables for log sales  $i$ ,  $\beta$  is a vector of coefficients corresponding to the variables  $X_i$ ,  $\epsilon_i$  is the error term, and  $RP_i$  is the reserve price for log  $i$ . In our analysis,

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