

Secondary wood manufacturers' willingness-to-pay for certified and local wood materials in Italy

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ABSTRACT

In recent decades forest certification systems have emerged to address the management of forest ecosystems according to the principles of sustainability and environmental protection. This study analyzes the secondary wood manufacturers' attitudes, awareness and willingness-to-pay for certified and local wood materials in Italy. A structured questionnaire was submitted by email to a sample of 1,520 secondary wood manufacturers, having a response rate of 8% (121 manufacturers). The results show that the main factors that influence the consumption/choice of secondary wood manufacturers are the durability of wood products and the personal knowledge of the seller. In addition, the results show that 29.7% of respondents would be willing to pay a mean premium price of 2.40% for certified wooden planks, while 19.0% of them are willing to pay a premium of 2.68% for certified wooden panels. With regard to local wood materials, the results show that 23.1% of respondents would be willing to pay a mean premium price of 2.95% to buy local wooden planks, and 20.7% of them a premium of 4.13% for local wooden panels. The results of this study can contribute to the forest certification knowledge base in order to support decision makers (owners and wood manufacturers) in their strategic business decisions.

Keywords: environmentally friendly products, questionnaire survey, carpentry, attitudes, awareness, Contingent Valuation.

1. Introduction

In the early 1990s forest certification emerged as a response to the deforestation and degradation of natural resources occurring in many developing countries (Vogt et al., 1999; Rametsteiner and Simula 2003).

Forest certification systems - such as the Forest Stewardship Council (FSC), the Program for the Endorsement of Forest Certification (PEFC), the Sustainable Forestry Initiative (SFI), and the Indonesian Ecolabelling Institute (LEI) - have emerged to address the management of forest ecosystems according to the principles of sustainability as defined by the Brundtland Report "Our Common Future" in 1987 (Cha et al., 2009; Paletto et al., 2014).

The penetration rate of certified wood materials into consumer markets was initially slow (Vlosky et al., 2003), but its diffusion has been constant and continuous. In order to satisfy increasing consumer demand for environmentally friendly products, different labels have been developed to inform consumers about the environmental concerns and ethical behavior of companies (Aguilar and Vlosky, 2007). In this context, wood product certification has been introduced to indicate certified origin in sustainably managed forests in order to satisfy an increasing demand for "eco-friendly" products as society's response to global environmental issues (Perera and Vlosky, 2006). The certification of wood products is more complicated than the certification of forests because sometimes wood products are composed of timber or wood pulp from many different forests (Teisl et al., 2001). Therefore, an independent third party must ensure that

current forest management practices follow some environment management standards, e.g. Criteria and Indicators of Sustainable Forest Management (Secco and Pettenella, 2006). In recent decades the certification of both forests and wood materials has spread to many parts of the world. The global diffusion of wood product certification is due to the fact that many manufacturers believe that offering certified wood products will allow them to gain competitive advantages over their non-certified peers (Anderson, 2003). The potential economic advantages for manufacturers that offer certified wood materials can be analyzed considering the environmentally-friendly behavior of consumers (Anderson and Cunningham, 1972; Berkowitz and Lutterman, 1968) and consumers' willingness-to-pay for "eco-friendly" or "green" products (Reizenstein et al., 1974; Vlosky et al., 1999; Aguilar and Vlosky, 2007).

From a methodological point of view, the value of sustainable origin of wood materials can be estimated using Contingent Valuation (CV), analyzing consumers' willingness to pay (WTP) a premium price for a wood product with such certification (Ozanne and Vlosky, 1997; Veisten, 2007). A price premium refers to the additional amount of money an individual is willing to pay to buy a product that guarantees a minimum standard for environmental stewardship (Aguilar and Vlosky, 2007). Consumers' willingness-to-pay premiums for certified forest products are important for compensating additional costs incurred in the implementation of a certification program, such as preparation for certification, auditing, compliance and the establishment of a Chain-of Custody (CoC). In literature, many studies on consumer demand and WTP for different environment-friendly wood products have been published since the mid-1990s. Conversely, few studies have investigated the WTP a premium price for a certified wood product from primary and secondary wood manufacturers (Ozanne and Vlosky, 1997; Veisten, 2002; Ozanne and Vlosky, 2003; Veisten, 2007; Lee et al., 2007; Cha et al., 2009).

The knowledge of attitudes, awareness and preferences of all actors of the forest-wood chain - primary wood manufacturers (sawmills), secondary wood manufacturers (carpentry), and consumers - is a fundamental prerequisite for developing a forest certification system at national and local level. In the context of certification of wood products, the geographic origin of wood is also a key factor in defining local supply chain (LSC) strategies and creating added value along the supply chain (Paletto et al., 2017). This research field is little investigated; a limited number of studies have analyzed consumers' attitudes about purchasing local or national wood products over foreign wood products (Winterhalter and Cassens, 1993; Donovan and Nicholls 2003; Estep et al., 2013; Wright 2013), and no studies have analyzed secondary wood manufacturers' attitudes and awareness. Consumers and manufactures' attitudes towards the origin of wood materials is related to the country-of-origin (COO) effects on product evaluations (Verlegh et al., 2005; Liu and Johnson, 2005; Sharma, 2011). In literature, many authors highlighted that product's COO potentially could have direct and indirect effects on product evaluations: first, COO may activate knowledge that affect the interpretation of other product attribute information; second, COO may provide a heuristic basis for inferring the quality of the product without considering other attribute information (Hong and Wyer, 1989). In particular, Han (1989) and Johansson (1989) show that COO influences evaluations by signaling product quality, while Maheswaran (1994) shows that consumers use COO as stereotypical information in making evaluations and the impact of COO is influenced by consumers' level of expertise. Therefore, the COO effect is rooted in consumers' images of the quality of specific products marketed by enterprises of their territory. Consequently, it would possible to find a COO effects at different scales: from local to national.

Starting from these considerations, this study focuses on the secondary wood manufacturers' attitudes towards certified and local wood materials in Italy. Secondary wood manufacturers are those that use primary wood products (e.g., lumber, veneer, plywood) as inputs for remanufacturing semi-finished and finished products. We have focused on secondary wood manufacturers because they are a key actor of the Italian forest-wood chain in order to implement the principles of the National Bioeconomy Strategy. The aims of the study are: (1) to investigate the attitudes and opinions of secondary wood manufacturers about forest certification and local wood materials; (2) to identify the WTP of buyers (secondary wood manufacturers) for purchasing certified wood materials; (3) to identify the WTP of buyers (secondary wood manufacturers) for purchasing local wood materials rather than non-local wood materials.

2. Literature review

Since the mid-1990s, many studies have investigated consumers' WTP for several certified wood products in North America (Ozanne and Vlosky, 1997; Jensen, 2004; Andersen and Hansen, 2004; Kruger, 2010; Elliott, 2014), in Europe (Pajari et al., 1999; Veisten, 2002; Ladenburg and Martinsen, 2004; Veisten, 2007), and in Asia (Shukri and Muhamad, 2007; Lee et al., 2007; Cha et al., 2009; Yamamoto et al., 2014). The main objective of these studies was to analyze whether consumers' WTP could cover the additional costs associated with the wood product certification process. These studies highlighted a wide range of values - from 1% to over 45% - due to the type and price of wood products, and geographic setting (Giacovelli et al., 2015). In a literature review, Veisten (2009) pointed out that only a segment of the market - approximately one-third of consumers in countries in North America and Europe - will pay premiums for eco-labelled wood products. Besides, Veisten (2009) highlighted that demographic characteristics of respondents do not have a clear relationship with ecological values, while psychographic characteristics (e.g., personality, knowledge, attitudes) of respondents are a better predictor of eco-oriented consumer behaviors. Conversely, few studies have investigated wood manufacturers' WTP for certified wood products (Table 1). A first study was conducted in 1990; Milland Fine Timber Ltd. investigated the willingness of 160 UK forest companies to pay an environmental premium in order to buy timber from tropical forests managed in a sustainable way. This study estimated an average WTP premium of 5.3% (Milland Fine Timber Ltd, 1990). Vlosky et al. (2003) analyzed the WTP of primary solid wood manufacturers ($n=270$) for four different wood products (KD FAS red oak, KD no.1 common red oak, red oak furniture grade veneer unclipped), obtaining a price ranging between 92 US\$ and 1,600 US\$ in all regions of the United States. These authors estimated a mean WTP for the four wood products of between 3.05% and 3.44%. Another study in the United States showed that 77% of the sample of wooden home builders were willing to pay an average premium price of 4.6% for the purchase of certified wood products (Estep et al., 2013). Recently some studies investigating the WTP of wood manufacturers have been conducted in Asia. Lee et al. (2007) showed that 69% of the sample of 67 forest companies involved in the study were willing to pay a premium price to buy wood certified products (timber and semi-finished products). These authors highlighted an average WTP of 13.6% for primary wood manufacturers (sawmills), 10.4% for furniture companies, and 3.0% for panel manufacturers. Another study conducted in Malaysia showed that 56% of the sample of carpentry firms involved in the survey were willing to pay a premium price (average WTP of 3.2%) in order to buy certified wood products (Shukri and Ainol Mardhiah, 2014). In Italy, a study quantified the WTP of customers of a sawmill in a valley in Northern Italy for semi-finished certified wood products (Notaro et al., 2008). The results of this survey showed that 55% of customers were willing to pay a premium price, with a mean value of 2.5%. In addition, few studies have focused on consumers' or manufacturers' WTP for local (or national) wood products rather than foreign wood products. Winterhalter and Cassens (1993) showed that US consumers were willing to pay an average premium price of 9.6% to buy furniture made of wood from North American forests rather than furniture of foreign origin. Donovan and Nicholls (2003) used a dichotomous choice contingent valuation survey to estimate a price premium for made-in-Alaska secondary wood products. In that study US consumers compared two superficially identical tables, one made in China and the other in Alaska. The results showed that consumers were willing to pay a premium price of 62% for the Alaska-made table. Estep et al. (2013) evaluated in 2011 the demand for certified wood products, green-labeled wood products and local products in the central Appalachian affordable housing sector. These authors showed that more than 70% of affordable housing respondents expressed a willingness to pay an additional percentage for certified wood products and local wood products. Finally, Wright (2013) estimated consumers' WTP ($n=496$) for three local wood products (bundled wood, cordwood and hardwood flooring) in the state of Connecticut (United States), achieving results ranging between 12.5% and 22.9%.

3. Materials and methods

3.1. Forest-wood sector in Italy

The forest-wood sector in Italy plays a secondary role in national economic growth, because forestry and forest industries contribute less than 1% to Gross National Product (Eurostat, 2015). Currently, more than

70,000 manufacturers are active nationally in the wood transformation industry, employing about 400,000 professionals (annual turnover of €40 billion). In addition, the cellulose-based industry has more than 200 companies and over 20,000 employees (annual turnover of €8 billion). Despite this high annual turnover, there is a lack of integration between primary production (forestry activities) and the wood processing industry.

The main structural weaknesses of the Italian forest-wood sector are summarized as follows (Cesaro et al., 2010; Paletto et al., 2015): highly fragmented private ownership (individual and family property), the declining value of the timber market, the high costs of harvesting, with the consequent abandonment of active management of mountain forests. In addition, according to the Italian Bioeconomy Strategy (2017), the low competitiveness of the national forest-wood sector at an international level is due to the lack of integration between primary production and the wood processing industry.

In order to overcome these weaknesses, in 2008 the Forestry Sector Framework Program (PQSF) identified four main Priority Objectives for the national forest sector (Carbone and Savelli, 2009): (1) to improve the sector's competitiveness in the long term, taking the sustainable management of the forest sector as the basis for economic development; (2) to safeguard the environment and the territory, maintaining the protective function, the landscape and biological diversity, carbon stocking and others ecosystem services supplied by forests; (3) to maintain and enhance the social and cultural dimensions of forests, considering forests as a tool for increasing social and territorial cohesion; (4) to improve cooperation and coordination among institutions. In addition, the PQSF established a set of strategies to achieve the Priority Objectives that includes the promotion of forest certification and marketing of wood-based raw materials.

In this context, the certification of forest products and the Chain of Custody (CoC) should become increasingly important, and the market of certified wood materials might grow further. Therefore, studies focusing on techniques aimed at analyzing consumer demand and secondary wood manufacturer demand for certified and local wood products and to promote forest certification will have a strategic importance in coming years.

3.2. Research framework

The study was broken down into three main phases: (1) identification of secondary wood manufacturers in Italy; (2) preparation and administration of a structured questionnaire to identified secondary wood manufacturers; and (3) analysis of data and interpretation of results.

3.2.1. Identification of secondary wood manufacturers

A preliminary list of secondary wood manufacturers was prepared using the database of enterprises in Italy (iCRIBIS database - <http://www.informazione-aziende.it/>) in September and October 2015. Then 6.8% of total secondary wood manufactures in the iCRIBIS database were randomly selected and involved in the survey (1,520 secondary wood manufacturers).

3.2.2. Questionnaire survey

Our analysis is a Contingent Valuation (CV) study (Riera et al., 2012) integrated with a set of specific questions related to attitudes and buying behaviors of secondary wood manufacturers. Data were collected through an internet-based online survey over six months (November 2015-April 2016). We chose this survey method for the following advantages mentioned in literature (Tse, 1998; Bachmann et al., 1999; Woong Yun and Trumbo, 2000): the relatively low cost, the possibility of reaching a large number of respondents and the possibility of covering a wide geographic area.

A preliminary version of the questionnaire was prepared in early November 2015. This version of the questionnaire was pre-tested with two secondary wood manufacturers in order to highlight words or questions that were difficult to answer, and to estimate the time needed to complete the survey. After the pre-test stage, the final version of the questionnaire included 22 closed-ended questions structured in four thematic sections called: "Consumption behavior", "Certification of wood products", "Origin of wood products", and "Personal information of respondents". The structuring of the questionnaire into thematic sections is considered an important aspect in order to prevent the respondent from getting tired/bored (Nielsen et al., 2007; Adamowicz et al., 1998).

The first thematic section ("Consumption behavior") consists of three questions about the factors that influence the purchasing of primary wood products, the quantity and prices of wood products (wooden planks, wooden slats, wooden beams, wooden panels) purchased in 2014, and the geographic origin of products purchased (local, national, intra-EU, extra-EU). On the first question, the following factors were proposed to respondents: (i) personal knowledge of the seller; (ii) price of the product; (iii) geographic distance between seller and buyer; (iv) differentiation of products offered by a seller; (v) design of products; (vi) durability and quality of products; (vii) origin of products.

The second thematic section ("Certification of wood products") focuses on the knowledge, opinions and buying behavior of respondents regarding forest certification. Respondents were asked to say if they are used to purchasing certified products and the related reasons, distinguishing between positive reasons (1-economic benefits due to the use of certified forest products; 2-sharing the principles of Sustainable Forest Management; 3-greater guarantees of quality of certified forest products; and 4-customer demand for certified forest products) and negative reasons (1-high price of certified products; 2-doubts about the environmental benefits of certified wood products; 3-negative past experience about certified wood products; and 4-sellers do not sell certified products). In the second part of this thematic section, respondents were asked if they were willing to pay (WTP) a premium price for the purchase of certified wood products. In order to collect this information an open-ended (OE) response format was adopted. Specifically, respondents were asked if they were willing to pay a percentage above pre-certification prices for the two wood products considered in this study (wooden planks and wooden panels).

In the third thematic section ("Origin of wood products") the respondents' opinions and buying behavior regarding local wood materials were considered. Wood materials are considered to be local when purchased at a distance of less than 70 km (Sacchelli et al., 2013). Respondents were asked to say if they were used to purchasing local wood products and the related reasons, distinguishing between positive reasons (1-promoting the local wood market; 2-local wood products have a higher quality; 3-supporting the protection of local forests; and 4-local wood products have a lower price) and negative reasons (1-local wood products have a higher price; 2-buying local wood products does not support the protection of local forests; 3-difficulty in finding local wood products on the market; 4-buying local wood products does not promote the local forest tradition). In the second part of this thematic section, respondents were asked if they were willing to pay (WTP) a price premium for the purchase of local wood products (wooden planks and wooden panels), with a question similar to that of certification. Respondents stated their willingness to pay a premium price (in percentage) to buy wooden planks and wooden panels from the same region where the manufacturer is located.

The last thematic section ("Personal information of respondent") focuses on the personal details of respondents: gender; level of education (distinguishing between primary school and high school certificates, university and post-university degrees); age (distinguishing between four age classes: 18-34 years old, 35-49 years old, 50-64 years old, and over 64 years old); and registration with an environmental Non-Governmental Organization (NGO). This latter question was included in the questionnaire in order to understand the respondents' environmental attitude.

The final version of the questionnaire was sent by email to 1,520 carpentry firms in November 2015. The questionnaire was accompanied by a cover letter containing the objectives of the survey and a brief definition of certification and CoC. In accordance with Vlosky et al. (2003) these definitions help to minimize respondent error due to disparate perspectives regarding the level of understanding of certification and CoC. Subsequently, in January 2016 a reminder email was sent to all those that did not respond to the initial mail. Data collection was completed in April 2016.

3.2.3. Data analysis

The main descriptive statistics were developed for the data collected, using the Likert scale format (mean, median, minimum, maximum, and standard deviation), while the frequency distribution percentage was calculated for all other questions. The data were processed using the statistical software XLStat 2012. Secondary wood manufacturers' WTP for certified and local wooden planks and wooden panels was estimated using a Tobit model (Tobin, 1958).

The Tobit model is a censored (or truncated) regression model in which the range of the dependent variable (WTP values) is constrained in one way: above or below. In this particular case censoring was effected from below, with the threshold set to zero, meaning that values below zero were constrained. In cases of a continuous variable but with a relatively large number of zero values, Tobit regression models using maximum likelihood estimation are preferred to ordinary least squares (OLS), as they predict only positive rational WTP values (Tobin, 1958). When the variable is censored, OLS provides inconsistent and biased estimates of the parameters (Maddala, 1983).

The Tobit model can be written as:

$$Y_i = \begin{cases} X_i\beta + e_i & \text{if } Y_i > 0 \\ 0 & \text{otherwise} \end{cases}$$

Where:

Y_i = is the Willingness-To-Pay of the respondent i ;

X = is the vector of explanatory variables;

β = is the regression coefficient;

e_i = is a random disturbance term.

The Tobit model has been widely employed in CV surveys using open-ended WTP questions and having a relatively high percentage of zero values (Halstead et al., 1991; Martín-López et al., 2007; Adams et al., 2008; Nikodinoska et al., 2014). The Tobit model has been estimated using Limdep Nlogit (version 5.0) (Greene 2009). In this field of studies, Veisten (2007) has used the Tobit model to estimate customers' WTP for eco-labeled wooden furniture in two IKEA stores, one in the UK, the other in Norway. Yamamoto et al. (2014) have used the Tobit model for estimating a price premium for eco-labeled wood products (Japanese cedar and Japanese cypress logs) in Shizuoka Prefecture (Japan).

4. Results

4.1. Characteristics of the sample

The survey was completed by 121 secondary wood manufacturers (8% response rate) located in almost all Italian regions: 47.9% are located in northern Italy, 14.9% in central Italy and the remaining 37.2% in southern Italy and the main islands (Sardinia and Sicily). As already mentioned a low response rate is common for surveys distributed electronically by email (Couper et al. 1999). In addition, in the electronic mail survey the percentage of incomplete or inaccurate questionnaires is rather high than mail survey and face-to-face survey (Schuldt and Totten, 1994).

Among respondents, men made up 92.3% of the sample, while women accounted for the remaining 7.7%. The distribution of respondents by age class was as follows: 17.9% of respondents aged between 18 and 34; 52.1% between 35 and 49; 27.4% between 50 and 64; the remaining 2.6% over the age of 64.

As regards education, the majority of respondents had primary school certification only (54.7% of total respondents), high school certification was possessed by 32.5% of respondents, while only 12.8% had a Bachelor's or Master's degree or - in very few cases - a post-University degree.

Finally, most of the respondents are not registered with an environmental NGO (97.4% of total respondents), while 2.6% of respondents are registered with an environmental-NGO, such as World Wildlife Fund or Greenpeace.

4.2. Consumption behavior

Results show that the main factors that influence the consumption choices of managers of secondary wood manufacturers are the durability of wood products (mean=4.22) followed by personal knowledge of the seller (mean=4.21) and the price of products (mean=3.72). Conversely, in accordance with respondents' opinions, the least important factors are the geographic distance between seller and buyer (mean=3.07) and the local origin of the products (mean=3.12). The latter result is of great importance for this study aimed at evaluating the importance of the origin of wood products for buyers (Table 2).

In 2014 the manufacturers of the investigated sample processed several primary wood products - i.e. wooden planks, wooden slats, wooden beams and wooden panels - but the two most important products were wooden planks and wooden panels. On average, each manufacturer processed 56 m³ of wooden planks per year (75.2% of total secondary wood manufacturers), with a range between 1 m³ and more than 1,000 m³. In addition, 66.1% of total secondary wood manufacturers processes 1,875 m² of wooden panels per year, with a range between 10 m² and 100,000 m². The average price for 1 m³ of wooden planks is €650, while the average price for 1 m² of wooden panels is €75, but with a very high variability among manufacturers. The most important factors that influence the price of products are the quantity and geographic origin of the product.

Primary wood products are mainly purchased from European Union (EU) member countries other than Italy (44.2% of total primary wood products purchased), followed by other regions of Italy (24.0%) and from the same region/local area (19.4%). The remaining 12.4% are wood products from non-EU countries (i.e. United States, Africa, Indonesia, Brazil, and Russia). In fact, as stated by the sample of manufacturers, more than 50% of primary wood products are of foreign origin, and the use of local materials is very limited.

4.3. Manufacturers' WTP for certified wood products

The results show that 30% of respondents (27 of 91 respondents who buy wooden planks) indicated that they would be willing to pay a premium price to buy certified wooden planks, while the remaining 70% (64 on 91) are not willing to pay a premium price. In addition, 19% of respondents (23 on 121) would be willing to pay a premium price to buy certified wooden panels, while 81% (98 on 121) would not be willing to pay a premium price. Considering those who are willing to pay a premium price, 44% of respondents would be willing to pay a premium price of between 5% and 9% for certified wooden planks, while for certified wooden panels 49% of respondents would be willing to pay a premium price of between 10% and 19% (Figure 1).

In accordance with respondents' opinions, the main reasons for paying a premium price for certified forest products are: sharing the principles of Sustainable Forest Management (42% of respondents who are willing to pay a premium price), followed by economic benefits for the manufacturer due to the use of certified forest products (23%), higher quality guarantee of certified forest products (22%) and customer demand for certified forest products (20%). It is interesting to highlight that 39% of respondents indicated one reason, 60% indicated two reasons, no one indicated three reasons, and about 1% indicated all four reasons.

Conversely, the main reasons stated by respondents who are not willing to pay a premium price for certified forest products are that sellers do not sell certified wood products (100% of respondents who are not willing to pay a premium price for certified wood products), followed by doubts about the environmental benefits of certified wood products (35%) and the high price of certified wood products (10%). Interestingly, nobody indicated negative past experiences with certified wood products.

The mean premium price for certified wooden planks estimated using the Tobit model is 2.40% (st.dev.=1.68, min=0.27, max=10.36), while the mean premium price for certified wooden panels is 2.68% (st.dev.=1.62, min=0.59, max=10.63).

With regard to the variables that influence manufacturers' WTP for certified wood products (Table 3), the results show that three variables are statistically significant for both products: quantity of products purchased (Q), the age of respondents (AGE), and registration with an environmental NGO (ENVIR).

As expected, younger secondary wood manufacturers and those that are registered with an environmental NGO are more willing to pay for both certified wood products. This result might be expected, considering the fact that forest certification was a innovative idea of environmental NGOs to counter deforestation and forest degradation. Interestingly, WTP increases with the rise in quantity of purchased products, presumably indicating that medium-large size carpentry firms are more willing to pay than small-sized ones. Prior knowledge of the principles of sustainable forest certification (KNOWCERT) will positively influence WTP only for certified wooden planks (Table 3), while economic benefits from certified wood products (BE) explains WTP only for certified wooden panels.

Conversely, the other three variables used in the Tobit model are not statistically significant: sharing the principles of Sustainable Forest Management (GS), higher quality assurance of certified forest products

(GAR), customers' demand for certified forest products (CLIENT). What stands out is that secondary wood manufacturer buyers are not interested in these features related to certified products.

4.4. Manufacturers' WTP for local wood materials

The results show that 23% of respondents (23 out of 121) would be willing to pay a premium price to buy local wooden planks, while the remaining 77% (98 out of 121) would not be willing to pay a premium price. In addition, 21% of respondents (25 out of 121) would be willing to pay a premium price to buy local wooden panels rather than non-local wooden panels, while 79% of respondents (96 out of 121) would not be willing to pay a premium price for the local origin of product. Considering those who are willing to pay a premium price, for both wood products (wooden planks and wooden panels), the majority of respondents would be willing to pay a premium price for local products of between 10% and 19%, respectively 48% of respondents who are willing to pay a premium price for local wooden panels and 46% of respondents who are willing to pay a premium price for local wooden planks (Figure 2). Only 14% of respondents are willing to pay a premium price of more than 19% for local wooden panels and more than 8% for local wooden planks.

The results show that the main reason for paying a premium price for local wood materials is to promote the local wood market (73% of respondents who are willing to pay a premium price for local wood materials), followed by support for the environmental protection of local forests (29%) and the high quality of local wood materials (27%). Conversely, only a minority of respondents think that local wood materials should have a lower price than non-local wood materials (13%).

The main reason stated by respondents who are not willing to pay a premium price for local forest materials are the difficulty in finding local wood materials on the market (89%). The other three reasons are considered less important by respondents: the higher price of local wood materials (16%), buying local wood materials does not support the protection of local forests (1%), and buying local wood materials does not promote local forest traditions (1%).

With regard to secondary wood manufacturers' WTP for local materials, results from the Tobit model show that the mean premium price for local wooden planks is 2.95% (st.dev.=1.14, min=1.06, max=6.46), while the mean premium price for local wooden panels is 4.13% (st.dev.=1.99, min=0.93, max=10.22).

The same three variables, statistically significant for certified wood products, are also statistically significant for the origin of wood products (Table 4): the quantity of products purchased (Q), the age of respondents (AGE), and registration with an environmental NGO (ENVIR). Conversely, the other four variables used in the Tobit model are not statistically significant: promoting the local wood market (LOCMERC), higher quality of local wood (LOCQUAL), supporting the protection of local forests (LOCTUT), and local wood products have a lower price (LOCPL). Similarly to certified products, only age, the quantity purchased and environmental involvement have a role in explaining the WTP for local wood products, while other variables that could represent significant reasons for paying an additional amount of money to buy local products are not considered important by secondary wood manufacturer buyers.

5. Conclusion

The results of this study show that secondary wood manufacturers' WTP for local wood materials is higher than WTP for certified products: respectively 2.95% for local wooden planks and 4.13% for local wooden panels, compared with 2.40% for certified wooden planks and 2.68% for certified wooden panels. The results of this study are comparable with those reported in other studies (Table 1); in particular the results of our study for certified wood products are similar to those estimated by Notaro et al. (2008) in a case study in Italy. Even if our WTP values for local products are lower than those found in literature, the result that WTP for local products is larger than WTP for certified products is consistent with this literature. The highest manufacturers' WTP for local wood products is probably partially related to COO effects with special regard to people's belief that local products are synonymous with quality.

This study has provided results on secondary wood manufacturers' WTP for two semi-finished wood products in Italy. These results can be a starting point for future studies aimed at investigating in-depth attitudes, perceptions and WTP for several primary and secondary certified products for different actors of

the forest-wood sector (primary wood manufacturers, secondary wood manufacturers and consumers) in Europe. The major contribution of the present study is the investigation of variables that influence the secondary wood manufacturers' WTP for environmentally friendly wood products and local wood products. In addition, the present study provides an overview about secondary wood manufactures' perceptions, attitudes and behavior towards certified and local wood materials. The results of this study can provide indications to public policy makers in order to create added value through the valorization of certified local wood products. In this sense, public policy makers should invest in an information campaign aimed at raising awareness among consumers and actors in the forest-wood supply chain (forest owners, primary and secondary manufactures). The information campaign should focus on the benefits and potential impacts of forest certification system for sustainable forest management and local economy. In order to better target this information campaign, public policy makers should take into account the variables that influence manufactures' WTP for certified and local wood products. Availability of data on manufactures' WTP for local wood materials can be a starting point for defining political strategies aimed to increase the use of local wood products. In Italy, the low use of local wood in the production of finished wood products is one of the main weaknesses of the national forest-wood chain.

The main strength of this study is that it provides new results that contribute to the wood product certification knowledge base. Indeed, studies investigating secondary wood manufacturers' WTP for certified wood products are very few at an international level, and mainly set in the United States. In Europe these kinds of studies are limited to consumers' WTP for certified wood products in some local case studies.

The main weakness is due to the convenience sampling involved in the study: secondary wood manufacturers with a website and an official email. Random samples of industrial sectors should be taken for this kind of study, but in the present study it was not possible because many secondary wood manufacturers in Italy are family-run enterprises that are difficult to reach. In addition, the main disadvantage of the survey administration (email questionnaire) is the low response rate compared to other survey modes, such as face-to-face and telephone interviews.

Future studies can extend the survey to primary wood manufacturers and consumers in order to compare their WTP for certified wood products and local origin wood products.

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Tables

Table 1

Wood manufactures' WTP for certified wood products.

Authors and year	Country	Wood Product	Type of wood manufacture	WTP%
Milland Fine Timber Ltd. (1990)	United Kingdom	Tropical timber	Carpentry Cabinet-making Furniture factories	5.3%
Vlosky et al. (2003)	United States	KD FAS red oak KD n.1 common red oak Red oak furniture grade veneer unclipped Southern Pine 3/4" industrial grade particleboard	Wood manufacturers	3.1% 3.1% 3.4% 3.1%
Lee et al. (2007)	South Korea	Certified wood products	Sawmills Furniture factories Chipboard panels manufacturers	13.6% 10.4% 3.0%
Notaro et al. (2008)	Italy	Sawn	Sawmills	2.5%
Estep et al. (2013)	United States	Wooden building products	Wooden home builders	4.6%
Shukri & Ainol Mardhiah (2014)	Malaysia	Certified wood products	Carpentry	3.2%

Source: Paletto et al., (2017).

Table 2

Factors that influence the consumption choice of managers of secondary wood manufactures ($n=121$).

	Personal knowledge of seller	Price of product	Geographic distance	Diversification of offer products	Design of product	Durability of products	Origin of products
Mean	4.21	3.72	3.07	3.55	3.17	4.22	3.12
Median	4	4	3	4	3	5	3
St.dev.	0.91	1.02	1.28	1.12	1.38	1.11	1.35
Min	2	1	1	1	1	1	1
Max	5	5	5	5	5	5	5

Table 3

Variables that influence the secondary wood manufactures' WTP for certified wooden planks and panels.

Variable	Certified wooden planks			Certified wooden panels		
	β	t-test	sign.	β	t-test	sign.
Q	0.010	2.69	***	0.012	2.77	***
BE	2.036	0.63		6.188	1.71	*
GS	2.429	0.89		0.135	0.04	
GAR	-2.961	-0.91		1.862	0.51	
CLIENT	-1.110	-0.31		-0.928	-0.23	
AGE	-4.583	-3.55	***	-3.893	-2.42	**
ENVIR	4.614	3.55	***	4.054	1.78	*
KNOWCERT	4.093	2.24	**	-0.117	0.9639	
LL	-138.335			-124.207		
AIC	2.435			2.202		
BIC	2.643			2.410		

*, **, and *** indicate significance levels at 10%, 5%, 1% level respectively

Table 4

Variables that influence the secondary wood manufactures' WTP for local wooden planks and panels.

Variable	Local wooden planks			Local wooden panels		
	β	t-test	sign.	β	t-test	sign.
Q	0.009	2.09	**	0.013	2.22	**
LOCMERC	1.841	0.44		5.727	0.96	
LOCQUAL	1.586	0.26		4.780	0.54	
LOCTUT	2.761	0.48		2.675	0.32	
LOCPL	0.499	0.06		7.411	0.73	
AGE	-4.117	-3.07	***	-6.636	-3.34	***
ENVIR	4.169	3.05	***	6.707	3.33	***
LL	-152.658			-147.556		
AIC	2.656			2.571		
BIC	2.840			2.756		

*, **, and *** indicate significance levels at 10%, 5%, 1% level respectively

Figures

Figure 1 Respondents' willingness-to-pay a premium price for environmentally certified wood products, with an average base price of 75 € m⁻² for wooden panels and 650 € m⁻³ for wooden planks.

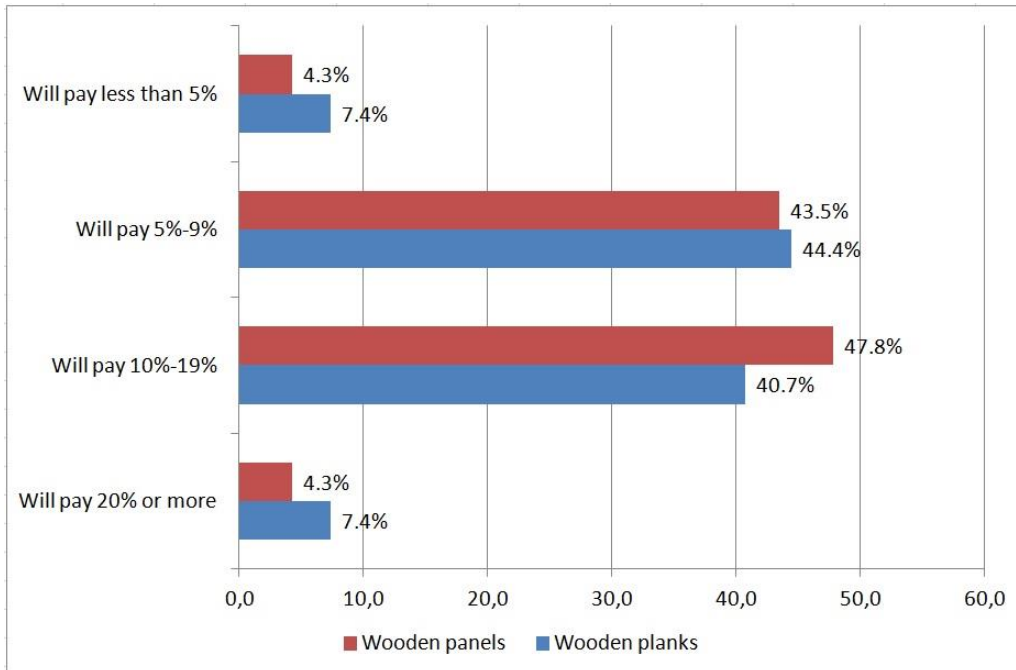


Figure 2 Respondents' willingness-to-pay a premium price for local wood materials, with an average base price of 75 € m⁻² for wooden panels and 650 € m⁻³ for wooden planks.

