

UNIVERSITY OF HELSINKI

**FACULTY OF AGRICULTURE AND FORESTRY
DEPARTMENT OF FOREST SCIENCES**

Developing Guidelines for an Ideal Eco-label for Wood and Paper Products in the U.S.

Master's Thesis
for the examination of Master of Science (Agr. & For.)
Forest Economics

Hanna-Lotta Heikkonen

November, 2012

Tiedekunta/Osasto Fakultet/Sektion – Faculty Maatalous-metsätieteellinen tiedekunta		Laitos/Institution– Department Metsätieteiden laitos	
Tekijä/Författare – Author Hanna-Lotta Heikkonen			
Työn nimi / Arbetets titel – Title Suositukset esimerkilliselle puu- ja paperituotteiden ympäristömerkintä järjestelmälle Yhdysvaltain markkinoille			
Oppiaine /Läroämne – Subject Metsäekonomia			
Työn laji/Arbetets art – Level Pro gradu -tutkielma		Aika/Datum – Month and year Marraskuu 2012	Sivumäärä/ Sidoantal – Number of pages 80 + liitteet 8
Tiivistelmä/Referat – Abstract Tämän tutkimuksen tavoitteena on kehittää suositukset puu- ja paperituotteiden ympäristömerkijärjestelmälle Yhdysvaltain markkinoille. Metaregressio-analyysillä selvitettiin mitkä tekijät vaikuttavat kuluttajien maksuhalukkuuteen ympäristömerkityistä puu- ja paperituotteista. Kuluttajien suosimia ympäristömerkin ominaisuuksia kartoitettiin systemaattisella kirjallisuuskatsauksella. Tulokset osoittavat että yhdysvaltalaiset kuluttajat ovat halukkaita maksamaan vähemmän ympäristömerkityistä puu- ja paperituotteista kuin eurooppalaiset kuluttajat. Ympäristömerkityistä puisista ja käytössä kestävästä tuotteista ollaan valmiita maksamaan suurempi hintapreemio kuin ympäristömerkityistä puu- ja paperituotteista, joilla on lyhyt käyttöaika. Mitä enemmän tietoa ympäristömerkit antavat kuluttajalle, sitä suurempi on niistä saatava hintapreemio. Kuluttajan ominaisuuksiin liittyvistä muuttujista iän huomattiin olevan positiivisesti korreloitunut maksuhalukkuuden kanssa. Kuluttajat kokevat ympäristömerkin myöntäjän yhteystiedot ja tiedon tuotteen ympäristövaikutuksista tärkeinä osina tuotteeseen liitettyä ympäristömerkkiä. Kuluttajat arvostavat myös ympäristömerkkiä, joka mahdollistaa eri tuotteiden ympäristövaikutusten vertailun. Kirjallisuuden perusteella kuluttajat luottavat ympäristöjärjestöjen myöntämiin ympäristömerkkeihin enemmän kuin muiden tahojen myöntämiin merkkeihin.			
Avainsanat – Nyckelord – Keywords ympäristömerkki, ympäristömerkin ominaisuudet, maksuhalukkuus, metaregressio			
Säilytyspaikka – Förvaringställe – Where deposited Metsätieteiden laitos, Viikin tiedekirjasto			
Muita tietoja – Övriga uppgifter – Additional information			

Tiedekunta/Osasto Fakultet/Sektion – Faculty Agriculture and Forestry		Laitos/Institution– Department Forest Sciences	
Tekijä/Författare – Author Hanna-Lotta Heikkonen			
Työn nimi / Arbetets titel – Title Developing Guidelines for an Ideal Eco-label for Wood and Paper Products in the U.S.			
Oppiaine /Läroämne – Subject Forest Economics			
Työn laji/Arbetets art – Level Master's thesis		Aika/Datum – Month and year November 2012	Sivumäärä/ Sidoantal – Number of pages 80 + appendices 8
Tiivistelmä/Referat – Abstract <p>The goal of this research was to produce guidelines for an eco-labeling program of wood and paper products in the U.S. market. The factors affecting consumers' willingness to pay for eco-labeled wood and paper products were examined using a metaregression analysis. A systematic literature review was conducted to examine what are the preferable on-product label characteristics. Results show that consumers in North America are willing to pay less for eco-labeled wood and paper products than European consumers. Wooden and durable goods are able to capture larger price premiums compared to less durable wood/paper products. Consumers are willing to pay more for eco-labeled products where the labels provide more information to the consumers. Among demographic variables, age is shown to positively influence the amount consumers are willing to pay for eco-labeled wood and paper products. Among desirable label characteristics contact information of the labeling agency and information about the environmental effects of the product were found important in addition to information enabling product comparison. Environmental non-governmental organizations are perceived as the most credible labeling providers as shown in past studies.</p>			
Avainsanat – Nyckelord – Keywords eco-labels, on-product eco-labels, willingness to pay, metaregression			
Säilytyspaikka – Förvaringställe – Where deposited Department of Forest Sciences, Viikki Science Library			
Muita tietoja – Övriga uppgifter – Additional information			

ACKNOWLEDGMENTS

I would like to acknowledge my thesis committee: Drs. Erin O. Sills, Sudipta Dasmohapatra and Susan E. Moore from North Carolina State University and Dr. Anne Toppinen from University of Helsinki. Thank you for your co-operation!

I am also very grateful for the opportunity to participate in the Transatlantic Master's Degree Program in Forest Resources. This program has enabled my studies at North Carolina State University, at University of Helsinki in Finland, and at Swedish University of Agricultural Sciences in Sweden.

Finally, I would like to thank Wiipurilaisen Osakunnan Stipendisäätiö for financial support for the thesis work.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
1 INTRODUCTION	1
1.1 Background	1
1.2 Eco-labels.....	2
1.3 Consumer confusion and demand for a uniform label	4
1.4 Existing eco-labels on wood and paper products	5
1.4.1 Forest management and chain-of-custody certification programs.....	6
1.4.2 General labeling programs that include wood and paper products.....	9
1.4.3 Goals for eco-labeling and forest certification programs	12
1.5 Willingness to pay and price premium	15
2 METHODS.....	22
2.1 Meta-analysis	22
2.2 Data collection.....	23
2.2.1 Search protocol for consumers' WTP for eco-labeled wood and paper products	27
2.2.2 Search protocol for consumer responses to eco-labels.....	29
2.3 Vote-counting.....	31
2.4 Meta-regression	32
3 RESULTS.....	33
3.1 Results of the systematic review for consumers' WTP for eco-labeled wood and paper products	33
3.2 Vote-counting for factors effecting consumers' WTP for eco-labeled wood and paper products	35
3.3 Meta-analysis regression results.....	38
3.3.1 Metaregression results for the restricted sample.....	42
3.3.2 Metaregression results for the full sample.....	45
3.3.3 Summary results of the metaregressions	47
3.4 Label characteristics preferred by consumers	48
3.4.1 Information content of the label.....	49
3.4.2 Label format.....	51
3.4.3 Labeling organization.....	52

4 DISCUSSION.....	53
4.1 Vote-counting results versus metaregression results.....	53
4.2 Comparison to the Cai & Aguilar meta-analysis	54
4.3 Time trend in research	57
4.4 Differences between North American and European consumers.....	58
4.5 Guidelines for an eco-labeling program in the U.S.....	60
5 CONCLUSIONS	62
5.1 Limitations of the work.....	62
5.2 Future research	63
REFERENCES	65
APPENDICES	

LIST OF TABLES

Table 1. The researchers' certifiers' and retailers' goals for eco-labeling and certification programs.....	14
Table 2. Criteria for including or excluding a study in the willingness to pay metaregression estimation.	28
Table 3. Criteria for including or excluding a study in the on-product label review.....	30
Table 4. Studies meeting the inclusion criteria for the meta-analysis.	34
Table 5. Studies meeting the inclusion criteria for the vote-counting analysis, the dependent variable in the study, number of vote-casting regressions and the sample size of the datasets.	36
Table 6. Variables used in the metaregression and summary statistics.	39
Table 7. Metaregression articles.	41
Table 8. Metaregression results for the smaller, restricted sample, N=44, 2-level durability.	43
Table 9. Metaregression results for the smaller, restricted sample, N=44, 3-level durability.	45
Table 10. Metaregression results for the large sample, N=64, 2-level durability.	46
Table 11. Metaregression results for the large sample, N=64, 3-level durability.	47
Table 12. Studies meeting the inclusion criteria for research question 2 – What are desirable characteristics of an on-product eco-label?	49

LIST OF FIGURES

Figure 1. Forest area certified by the four largest certification programs (UNECE/FAO 2011).	7
Figure 2. Examples of FSC labels (FSC 2004).	8
Figure 3. PEFC label. (PEFC 2010)	8
Figure 4. SFI label. (SFI 2012).....	9
Figure 5. Blue Angel label. (Blue Angel 2012d).....	10
Figure 6. Nordic Ecolabel. (Nordic Ecolabelling 2011)	11
Figure 7. EU Ecolabel. (EU Ecolabel 2012b)	12
Figure 8. Model of consumer's purchase decision and points of interest for the supplier.	21
Figure 9. Six steps of systematic review (adapted from Jesson 2011).	26
Figure 10. Number of studies per data collection year in each of the regions.	58

1 INTRODUCTION

1.1 Background

In July 2009, Walmart (2009) announced plans to develop a Sustainable Product Index to provide sustainability information about products in an easily comprehensible form. As a large retailer, Walmart realized its power to influence the market and provided start-up funding for a research organization called The Sustainability Consortium. The goal of the consortium is “to develop a global database of information on the life-cycle of the products” that is not only for the private use of Walmart but for other interested organizations. (Walmart 2009)

In Walmart’s Global Responsibility Report (2012), the Sustainable Product Index was indicated to still be “in progress”. So far Walmart has employed data from the Sustainability Consortium to grade suppliers based on their performance in the most important environmental aspects of their products’ life cycle. The suppliers have also been given suggestions on which areas of their performance could be enhanced and how. Current work at Walmart’s initiative includes development of “Live Better scorecards”, which provide the company’s buyers with information about the suppliers’ current stand in sustainability issues and the suppliers’ potential actions to tackle these issues. Only a few product categories are currently covered with pilot-scorecards (Walmart 2012).

This initiative by the world’s largest retailer inspired this study on eco-labels for wood and paper products. As the management of Walmart has recognized, there seems to be a need for a comprehensive and authoritative sustainability or “eco-label” for all product categories, including wood and paper products, which is yet lacking in the US.

The objective of this study is to suggest guidelines for such a standardized eco-label for wood and paper products in the U.S. Specifically, I seek insights from the literature, by conducting systematic reviews and analyzing the literature on eco-labeling in North America as well as in Europe. Eco-labeling has long been a prominent part of the European market with the world's oldest eco-label, "Blue Angel", in the markets since 1978 (Blue Angel 2012c), and thus lessons learned from European studies may provide important insights for the US market.

In the rest of this introduction, I describe the literature on eco-labeling, existing eco-labels for wood and paper products, different stakeholders' goals for eco-labeling programs, and the theoretical framework and methods used to assess demand (or "willingness-to-pay") for eco-labeled products. In the next three chapters, I present my methods and results and discuss my findings on the following two research questions:

1. What are the factors that influence consumer demand for eco-labeled wood and paper products in Europe and North America?
2. What are the desirable characteristics of an on-product eco-label?

Finally, I present a synthesis of the main results, conclusions, and consider limitations of this work and recommendations for future research.

1.2 Eco-labels

Eco-labels are granted for a variety of products and services, which have different kinds of environmental effects and consumption patterns across their life cycle. For example, organic labels for food consider environmental effects during the growing period, while energy-star labels for electronics are granted for products that consume less energy, while in use by the end-consumer.

The Corporate Sustainability Initiative Report (2010, p. 14) provides the following definition for an ecolabel: "An ecolabel identifies a product that meets a wide range of

environmental performance criteria or standards.” The report also points out that labeling is not compulsory for the producers and manufactures, but it will help the consumer to compare environmental effects of similar products.

Basically, an eco-labeling program ensures that a product is able to fulfill a set of standards controlling the product’s environmental effects. The eco-label itself, the stamp or seal seen by consumers, is a sign that the product has fulfilled these requirements. Eco-labels are also referred to as green or environmental labels or seals.

Market demand for the eco-labeled products and services drive producers to improve their environmental performance. (Brouhle and Khanna 2012). Thus, eco-labels can be viewed as informational and marketing tools for retailers. For consumers, eco-labels can be considered a way to redress a basic information asymmetry: producers are not required to inform the consumers about the potential environmental effects of their products although the producers might be aware that there are effects. Eco-labels can fill this information gap between the perception and knowledge of consumers and the producers. Producers can use eco-labels to differentiate their products as beneficial to the environment.

The International Organization for Standardization (ISO) has developed a standard for eco-labels in their ISO 14000-series. In this standard, eco-labels are divided into three types. Type I label can be awarded to a product based on third-party verification. The verifying party examines one or more of the product’s environmental features to see if the product fulfills the predetermined criteria. Type I labels give guidance to consumers wanting to choose the product that is more environmentally friendly. In the forest industry, forest certification labels such as FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification) are type I eco-labels. Type II labels are statements of a product’s environmental quality originating from the producer or manufacturer without an external evaluator. The recycle logo, Mobius loop, is an example of a type II label. Type III labels are the most informative. They are third-party

verified and show a set of environmental impacts based on life cycle assessment in a quantifiable form. Type III labels leave the decision on environmental superiority or environmental impact of a product to the consumer who can, for example, compare the different emissions caused by the products she is considering to purchase. Currently there is much focus on “environmental product declarations (EPD)” that are type III eco-labels and are typically used in business-to-business communication (Bergman and Taylor 2011, UNEP/IISD 2000).

1.3 Consumer confusion and demand for a uniform label

The global directory Ecolabel Index (Big Room 2012) reports that there are currently 432 legitimate, active eco-labels in the global markets. In addition, some companies make unverified claims of the environmental friendliness of their products, resulting in substantial confusion for the consumers about the green nature of products also called greenwashing (Oxford 2012). With all these environmental statements, whether true or false, it is no wonder that consumers may find themselves puzzled when making a choice. This is one reason for interest in developing a uniform eco-labeling format.

In addition to the multitude of eco-labels existing today, the consumers’ lack of awareness of the eco-labeling standards and their difficulty in understanding what is achieved by those standards can create confusion and uncertainty to the markets of eco-labeled goods (Harbaugh et al. 2011). Harbaugh et al. (2011) conclude that when consumers do not possess all the knowledge of different eco-labeling standards they can only assume that a labeled product has passed some level of criteria. Other research has also shown that the knowledge of forest certification differs in different countries (Cashore and Auld 2012). For example, ISEAL Alliance is a non-governmental organization promoting sustainability that has recognized the confusion and lack of awareness of ecolabels among the consumers. Therefore, ISEAL’s mission is to identify and help distinguish credible standards, partly by educating consumers about differences between the different labeling systems (ISEAL 2012).

Teisl et al. (2002) conducted focus group discussions on U.S. consumers with recent wood product purchase experiences to study their responses to eco-labels on wood products and what impact labels have on the consumers' purchase behavior. The respondents were asked to express their thoughts on different labels' formats. The research group found that there was a demand for uniform appearance of eco-labels for wood products. Another finding was that consumers would prefer more information about the environmental effects of the product on the label rather than just a logo or seal in the label.

Recently Rätty et al. (2012) noted that wood and forest product markets are lacking a regional or a worldwide labeling system that is recognized as a standard. In their study they recommended the enhancement of business-to-business communication regarding environmental information of wood products. They also suggested that EPDs might work in business-to-business environments, but consumers might adapt better to simpler forms of information on the labels.

Even though a standard system for ecolabels is proposed in the earlier study, when Overdevest (2010) compared situations with and without a competing forest certification program in a three country context (USA, Sweden, Finland) for 1995 and 2005, they found that in the situation without a competitor, the existing certification system has lower standards. The study showed that competition between certification programs induced all programs to adopt the higher goals.

1.4 Existing eco-labels on wood and paper products

In this study I consider two types of eco-labeling programs which can both include wood and paper products. The first type presented below is forest certification programs which focus on certifying forest management practices and can be expanded to labeling of the final product through a chain-of-custody process. The second type is general labeling

programs that consider a broader scope of product and service groups among which there are wood and paper products. Next, I describe the certification and eco-labeling programs discussed in the literature reviewed and analyzed in later chapters. I also describe the goals the stakeholders have for eco-labeling and forest certification programs.

1.4.1 Forest management and chain-of-custody certification programs

Forest certification labels indicate that the forests where the wood was extracted are managed in a sustainable manner (Rametsteiner and Simula 2003). Forest certification providers are non-governmental, non-profit organizations. Most of them were founded in the early 1990s. Their mission is to endorse sustainable use of forests with regard to the three pillars of sustainability – economic, ecological and social. Forest certification programs FSC, PEFC and the Sustainable Forestry Initiative (SFI) provide two types of labeling – labels for forest management certification and labels for chain-of-custody certification for value-added products (FSC 2012b, PEFC 2011, SFI 2011).

The initial aim of forest certification was to reduce tropical deforestation, but over the years it has become evident that the main areas certified can be found elsewhere and in 2011 nearly 90 % of forest area which had been granted forest certification labels were located in the northern hemisphere (Rametsteiner and Simula 2003, UNECE/FAO 2011).

PEFC (Programme for Endorsement of Forest Certification) currently has the most forest land under its certification of all the forest certification programs accounting for over 245 million hectares around the world (PEFC 2011). FSC (Forest Stewardship Council) reports having over 150 million hectares of certified forest land worldwide in 2012 (FSC 2012a). SFI operates only in North America where they have certified almost 80 million hectares of forests (SFI 2011). Figure 1 presents the growth of certified forest area over the past six years. After PEFC endorsed SFI in 2005, the areas certified by SFI

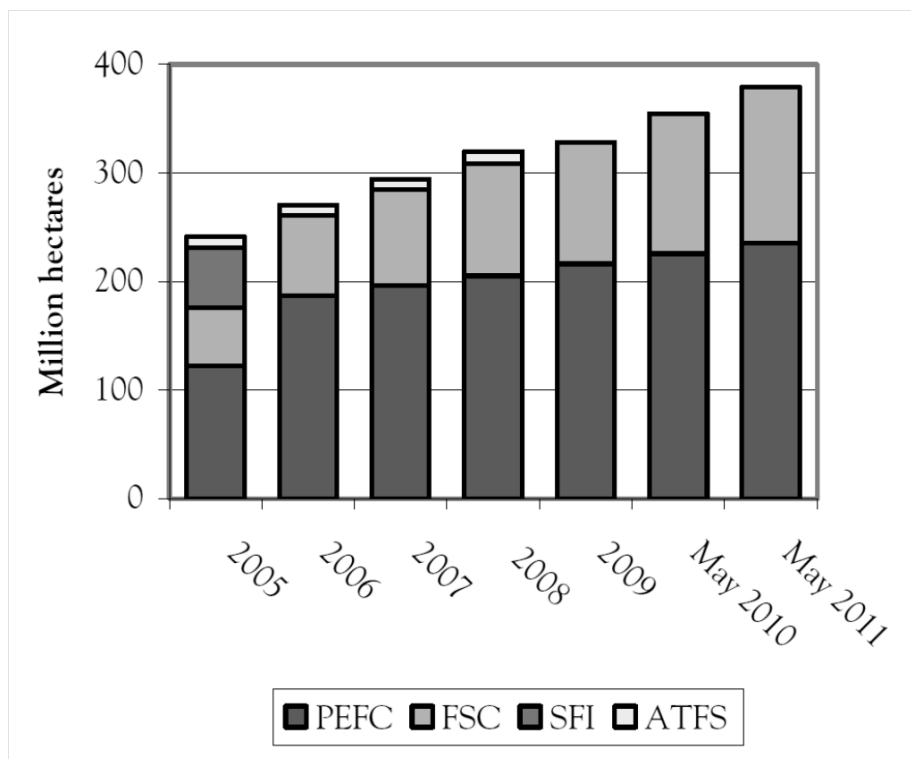


Figure 1. Forest area certified by the four largest certification programs (UNECE/FAO 2011).

and other PEFC endorsed programs are combined under PEFC certified area (UNECE/FAO 2011). My systematic review of the literature did not identify any studies about consumer demand or label preferences for ATFS, American Tree Farm System.

Figure 2 shows two examples of what the FSC labels look like. The one with the recycle logo indicates that the product contains recycled fibers. There are six mandatory elements to be included in the label. These are the FSC logo and copyright claim, label title explaining the content of the product (in Figure 2 it is “100%” and “Mixed Sources”), registration code, standard claim which depends on the label type (all certified or partly certified raw material), and FSC’s webpage address. (FSC 2004)



Figure 2. Examples of FSC labels (FSC 2004).

Figure 3 presents the model of an on-product PEFC label. There are three required elements on the label as well as three optional elements. The required elements are the PEFC logo, TM-symbol indicating registered trademark, and a unique license holder number. The optional elements include the percentage of certified wood in the product, label name and claims, and website address (PEFC 2010).

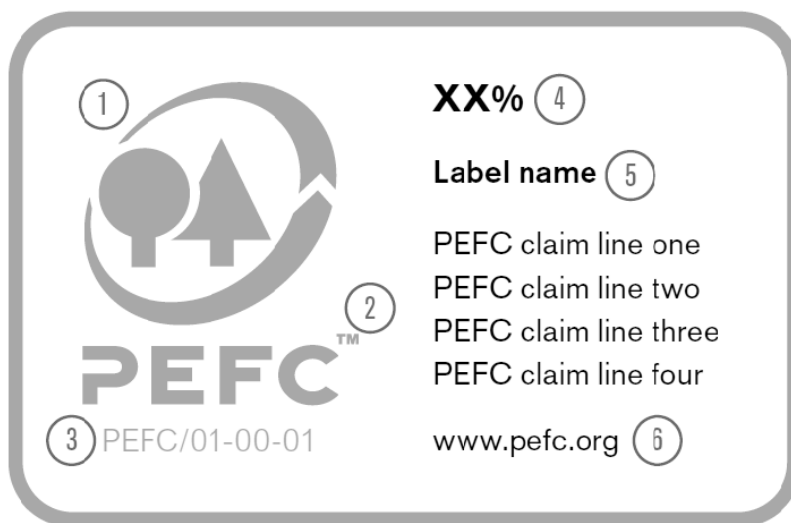


Figure 3. PEFC label. (PEFC 2010)

Figure 4 shows a SFI label. The logo with the name Sustainable Forestry Initiative, and the website address are included in every SFI label. The other parts vary depending on the content of the product. The recycle logo is used when post-consumer content is included in the product. The list following Certified Chain of Custody specifies the percentages of raw material from different sources used to manufacture the product (SFI 2012).



Figure 4. SFI label. (SFI 2012)

1.4.2 General labeling programs that include wood and paper products

The label Blue Angel (Der Blaue Engel), developed in the 1970s in Germany, applies to 120 product categories including 13,000 products (Blue Angel 2012a, 2012c). Ten product categories include wood and paper products. The groups are 1) sanitary paper products made of recycled paper, 2) recycled paper, 3) wallpapers and woodchip wall coverings primarily made of recycled paper, 4) low-emission wood products and wood-based products, 5) recycled cardboard, 6) unbleached filter papers for use with hot or boiling water, 7) printing and publication papers, 8) low-emission composite wood panels, 9) wooden toys, and 10) technically dried wood chips/ wood pellets. (Blue Angel 2012d)

Blue Angel label consists of three parts (Figure 5). First, there is the label with a character looking like a blue angel; second is the text which states the environmentally superior characteristics of the product (the example label indicates the raw material is 100% recycled paper (*Altpapier*)); third is the central “protection goal” of the product. There are four protection goals in the Blue Angel labeling program: environment and health, climate, water, and resources (Blue Angel 2012d).

Nordic Ecolabel is a general labeling program that is used in the Nordic countries of Denmark, Finland, Iceland, Norway, and Sweden. It is an ISO type 1 label and acts as a third-party certifier. The criteria are adjusted continuously to make sure that the environmental impacts remain low (Nordic Ecolabelling 2012b).

There are 63 product categories in the Nordic Ecolabelling program ranging from tissue papers and laundry detergents to small houses and hotel services. Twelve of the categories include wood or paper products. The categories are biofuel pellets; coffee filters; copy and printing paper; durable wood alternative to conventionally impregnated wood; floor coverings furniture and fitments; grease-proof paper; outdoor furniture and playground equipment; panels for the building, decorating and furniture industry, paper envelopes; small houses; apartment buildings and pre-school buildings; and tissue paper (Nordic Ecolabelling 2012a).



Figure 5. Blue Angel label. (Blue Angel 2012d)

Figure 6 presents the Nordic Ecolabel. The label is more commonly known as the Swan label among Scandinavian consumers due to the swan figure in the label. The number below the picture refers to the license number for identification of the product and it must be visible whenever the label is presented on the product. The requirement to present the product group name is optional to the label user. The text “Nordic Ecolabel” can be translated to the language of the country where the label is used (Nordic Ecolabelling 2011).

EU Ecolabel is a general eco-labeling program which provides ISO Type I voluntary third party verified labels just like Blue Angel and Nordic Ecolabel. EU Ecolabel operates in a broader geographical area than the other two, and labeled products can also be sold in countries other than European Union member countries. There are 23 product and service groups of which two include wood and paper products. These two are Paper products and Do-it-yourself groups (European Communities 2006).



Figure 6. Nordic Ecolabel. (Nordic Ecolabelling 2011)

Figure 7 presents the label format for the EU Ecolabel. The minimum requirements for this label are that it must display the logo with the name and the webpage address along with the product's registration number. The statements about the environmental effects are optional (EU Ecolabel 2012b).

EU Ecolabel and Nordic Ecolabelling both operate in the European markets, but Nordic Ecolabelling is constricted to the Nordic countries. The other major difference between these two labelling schemes is the number of product groups. Nordic Ecolabelling reports to have 64 product groups (Nordic Ecolabelling 2011) whereas EU Ecolabel, although operating in larger region, reports only 23 (European Communities 2006). With the large product base the Nordic ecolabelling has been able to collect enough license fees to fund its operations and be dynamic in its operation. The EU Ecolabel is under European commission strict budget and still unable to cover all the costs by license fees due to small number of certifiable products. (TemaNord 2008)



Figure 7. EU Ecolabel. (EU Ecolabel 2012b)

1.4.3 Goals for eco-labeling and forest certification programs

To develop guidelines for a standardized eco-label for wood and paper products, it is essential to first identify the goals of eco-labeling. To assess these goals or expectations of eco-labels, I extracted relevant statements from the literature reviewed in this thesis,

the webpages of the certifiers who set the standards for existing ecolabels (Blue Angel 2012b, CSA 2012, EU Ecolabel 2012a, FSC 2007, Nordic Ecolabelling 2012b, PEFC 2007, SFI 2008) and the sustainability reports of some of the most important retailers of wood and paper products in Europe and North America (Bauhaus 2012, Byggmax 2011, Home Depot 2012, IKEA 2011, K-rauta 2012, Lowe's 2012, Puukeskus 2012, S-ryhmä 2011, Starkki 2012, Walmart 2012).

Table 1 presents the different goals that researchers, certifiers and retailers have for eco-labeling and certification programs. The goals cover all three pillars of sustainability: environmental, social, and economic, as well as informational aspects such as education of consumers and producers. In fact, there is the greatest consensus on the goal of education and informing consumers, with some also explicitly stating a goal of helping or encouraging them to choose sustainable products. I address this goal with my second research question about what should be included on the label itself.

Turning to the environmental goals, the certifiers seem to no longer consider the reduction of tropical forestation as their goal, but instead they have expanded their focus to all the forests of the world. Environmental quality and sustainable forestry are word pairs that came up often as goals of the certifiers. Eco-labeling as an environmental policy was only considered by the researchers. In contrast, the literature that I reviewed did not state any social goals for eco-labeling, while goals in this dimension were clearly stated in retailers' sustainability reports and on certifiers' websites.

The third pillar of sustainability is economics. While retailers did not explicitly discuss the economic benefits of ecolabels in their sustainability reports, both researchers and certifiers emphasize the economic possibilities of eco-labeling – specifically, the possibility that certified products could gain market share or a price premium. In fact, much of the scientific literature on ecolabels has focused on this economic dimension, as does my first research question. The following section describes the conceptual

framework employed in most of this literature: consumer demand and willingness to pay.

Table 1. The researchers' certifiers' and retailers' goals for eco-labeling and certification programs.

Aspect	Keywords	Researchers	Certifiers	Retailers
Environmental aspects	<i>Tropical deforestation</i>	To reduce tropical deforestation		To make sure that tropical timber/ timber from endangered forests is harvested in sustainable manner
	<i>Healthy environment</i>	To improve environmental quality	To protect environment, health, climate, water and resources	
	<i>Sustainable forest management</i>	To promote sustainable forest management	To promote sustainable forest management	To promote sustainable forest management
	<i>Conservation</i>		Conservation	To protect high conservation value forests
Informational aspects	<i>Correcting market failure</i>	To correct information asymmetry		
	<i>Policy making</i>	To improve the environmental policy with a market mechanism		
	<i>Consumer education</i>	To inform consumers of the sustainability of the wood product	To provide consumers with reliable information about products' environmental impacts	To educate consumers about certification systems and their importance
	<i>Sustainable consumption</i>		To promote sustainable consumption	To help consumers choose more environmentally friendly products

Table 1. Continued.

Economic and marketing aspects	<i>Market penetration and share</i>	To gain market share and preference	To create market access for certified wood products
	<i>Product differentiation</i>	To differentiate certified products	To create value with differentiated products
	<i>Improving consumer and producer behavior</i>	To influence the behavior of producers and consumers	To develop sustainable production
	<i>Economic gains</i>		To create economical benefit
	<i>Legality of the procurement</i>		To make sure that timber comes from legal sources
Social aspects	<i>Equality of population groups</i>		To support rural development
	<i>Sustainable society</i>		To create sustainable society To increase the use of wood in the society

1.5 Willingness to pay and price premium

Consumers' demand for environmental improvements, or equivalently the monetary value of those improvements to consumers, is typically measured as willingness to pay. Kalish and Nelson (1991, p.328) define willingness to pay as "a maximum price [customers] are willing to pay for a given product which equals the product's value to the consumer". The value of the product to the consumer is not necessarily equal to the product's price set by the seller. When the consumer is deciding between a set of products, she will choose the one which has the largest positive difference between the product's value to her and the product's price. In other words, she is maximizing her utility. (Kalish and Nelson 1991)

Champ et al. (2003, p.12) define willingness to pay (WTP) with regard to environmental quality: “[willingness to pay] for an environmental improvement is the maximum sum of money the individual would be willing to pay rather than do without the improvement”. The willingness to pay for environmental improvement is dependent on an individual’s personal preferences and her knowledge of how the state of the environment is affecting her welfare. If an individual is unaware of how emissions from a nearby factory may worsen the air quality and her health, she cannot value the cleaner air after environmental improvements. An individual’s income also limits her willingness to pay. (Champ et al 2003)

In the case of eco-labeled wood and paper products, an individual’s willingness to pay reflects the desire for environmental improvement in forest management as well as in the production of the wooden or paper item. The extra price charged for the eco-labeled good is called a price premium.

Willingness to pay enables valuation of consumers’ demand for environmental improvements by producing monetary values for the environmental changes. Willingness to pay can be expressed in monetary units, such as dollars, or as percentages describing the monetary premium as a percentage of the base price of a good.

Methods of elicitation for willingness to pay can be divided into two approaches: stated preferences and revealed preferences. In the stated preferences approach, respondents are asked how they would respond to hypothetical situations, whereas in the revealed preferences approach researchers observe respondents in their actual behavior (Champ et al. 2003). Most studies estimating consumers’ willingness to pay for eco-labeled wood and paper products with multivariate regression analysis use the stated preference method.

Methods for stated preference include conjoint analysis and contingent valuation. In conjoint analysis the respondent is asked to choose between or rate a set of goods with

different attributes, for example on a scale from 1 to 10, depending on how important or attractive they find each good. Contingent valuation questions can be open-ended, asking the respondent to state their maximum willingness to pay, or they can ask the respondent whether they would purchase a good at a stated price, which is varied across respondents. The good can be a change in environmental quality generated by a change in policy or standards that is paid for through a “payment vehicle” such as donations, increased taxes, or higher prices (Champ et al. 2003).

Data for revealed preference studies are developed from actual markets. In the travel cost method, demand for a recreation site is estimated from data on distances traveled for recreation and the cost of that travel (Champ et al. 2003). In the empirical literature used for this study, preferences were revealed by respondents keeping a diary of their everyday purchases.

Champ et al. (2003) point out that some respondents state zero willingness to pay when they think that the environmental improvement should belong to all people without an extra cost. In that case, zero willingness to pay does not mean zero value to the respondent. On the other hand, some respondents might not care about the environmental effects that a certain product or service provides. In that case, willingness to pay is also zero, reflecting zero value. It is also possible that the most important – and effectively, the only important - attribute of a product is its price.

In their article about the Nordic Swan eco-label, Brouhle and Khanna (2012) discuss the nature of the benefits provided by eco-labeled wood and paper products. Unlike purchase of organic food for which the motivation can be health reasons, or energy efficient electronics that can save money, consumer preferences for eco-labeled wood and paper products must be based on their WTP for improvements in public goods. Forest certification labels indicate that the forests where the wood was extracted are managed in a sustainable manner. Sustainable forest management aims at protecting biodiversity and other ecosystem services while simultaneously extracting timber.

(Rametsteiner and Simula 2003) This means that when paying a premium for these products, the consumer is paying for the conservation of biodiversity that will benefit both herself as well as others.

Consumers' willingness to pay depends on various factors. In their conceptual model for consumers' willingness to pay, Aguilar and Vlosky (2007) propose the following four sets of factors: belief that consumer can make a difference by buying eco-labeled products; confidence in the certifying body; habit of purchasing eco-labeled products; and demographic characteristics. The type of good can also have an effect on willingness to pay (Teisl et al. 2002).

Eleven studies encountered in the literature review for this thesis had addressed the proportions of consumers willing to pay for eco-labeled wood and paper products (Aguilar and Vlosky 2007, Forsyth et al. 1999, Grönroos and Bowyer 1999, Jensen et al. 2002, Jensen et al. 2003, Jensen et al. 2004, Ozanne and Vlosky 1997, Ozanne and Vlosky 2003, Pajari et al. 1999, Spinazze and Kant 1999, Veisten 2007). The share of consumers willing to pay more for the eco-labeled wood and paper products reported in the publications ranged from 31% (Jensen et al. 2004) to 67.3% (Forsyth et al. 1999).

The share of consumers unwilling to pay for the eco-labeled wood and paper products reported in the publications ranged from 11.3% (Jensen et al. 2003) to 77% (Grönroos and Bowyer 1999). The figures presented here did not specify if the unwillingness to pay was because the respondents were not interested in participating in the markets for eco-labeled product or if they were unwilling to pay extra for the eco-label attribute of the product. Those consumers not willing to pay more for the eco-labeled products might not be aware that they can make a choice or may not understand the difference between an eco-labeled product and a non-eco-labeled product.

Seven out of the eleven studies asked the respondents whether they were willing to purchase eco-labeled wood and paper products if the price of the eco-labeled product

would have been equal to the price of non-labeled product. The answers ranged from 25% (Grönroos and Bowyer 1999) to 94.3% (Forsyth et al. 1999).

Even though consumers are aware of eco-labels, it seems that the decision to buy eco-labeled products is not always a conscious choice. Aguilar and Cai (2010) asked the respondents in their study, “Have you purchased certified wood products in the past year?” In the US, 6.4% and in the UK 23.6% replied yes, while a relatively large share of respondents were not sure if they had purchased certified wood products. There were 44.6% of “not sure” answers among US respondents and 35.1% among the UK respondents. These consumers may not have considered the eco-label relevant to their purchasing decision and therefore not have noticed whether any products they purchase carry an eco-label.

The unwillingness to pay extra for the eco-labeled products could be due to doubts about eco-labeled products having a lower/poorer quality. D’Souza et al. (2006) interviewed Australian consumers about food product eco-labels and found that 25.7 % of respondents suspected that labeled products are of worse quality than non-labeled ones.

Figure 8 presents a model of the consumer decision-making process for deciding whether to pay a premium for eco-labeled products. The model divides this decision into two steps. The first step is to decide whether or not to prefer eco-labeled products over non-eco-labeled products, without yet considering price or budget constraints. If a consumer prefers eco-labeled products, the second step is to decide if she is willing to pay for these eco-labeled products, i.e., whether the eco-label attribute create value for her. If it does, the third step is to consider how much is that value, or willingness to pay.

It is also possible that the consumers do not prefer eco-labeled products over non-eco-labeled ones. In that case they answer “no” to the question at the first step and their willingness to pay is zero. The eco-label attribute does not give them any value.

Those who answer “yes” to the first question and prefer the eco-labeled products might still answer “no” to the second question on willingness to pay more for the eco-labeled products. In that case, the eco-labeled attribute does offer some value, but not enough value (or not with enough certainty) to create a positive willingness to pay.

From the point of view of an eco-labeled product supplier, the two consumer groups who end up paying zero monetary units both affect market share, but in opposite directions. The group that is willing to pay extra not only increases their market share, but also awards them with the price premium.

This study conceptually reviews both consumer preferences and willingness to pay. Consumers’ demand for ecolabeled products can be viewed in two ways: 1) consumers’ preference for eco-labeled products or participation in the eco-labeled markets and 2) the amount that the consumers are willing to pay for. As shown in the following chart, if consumers prefer an ecolabeled product, they are likely to contribute to a higher market share and/or a price premium for suppliers’ ecolabeled products.

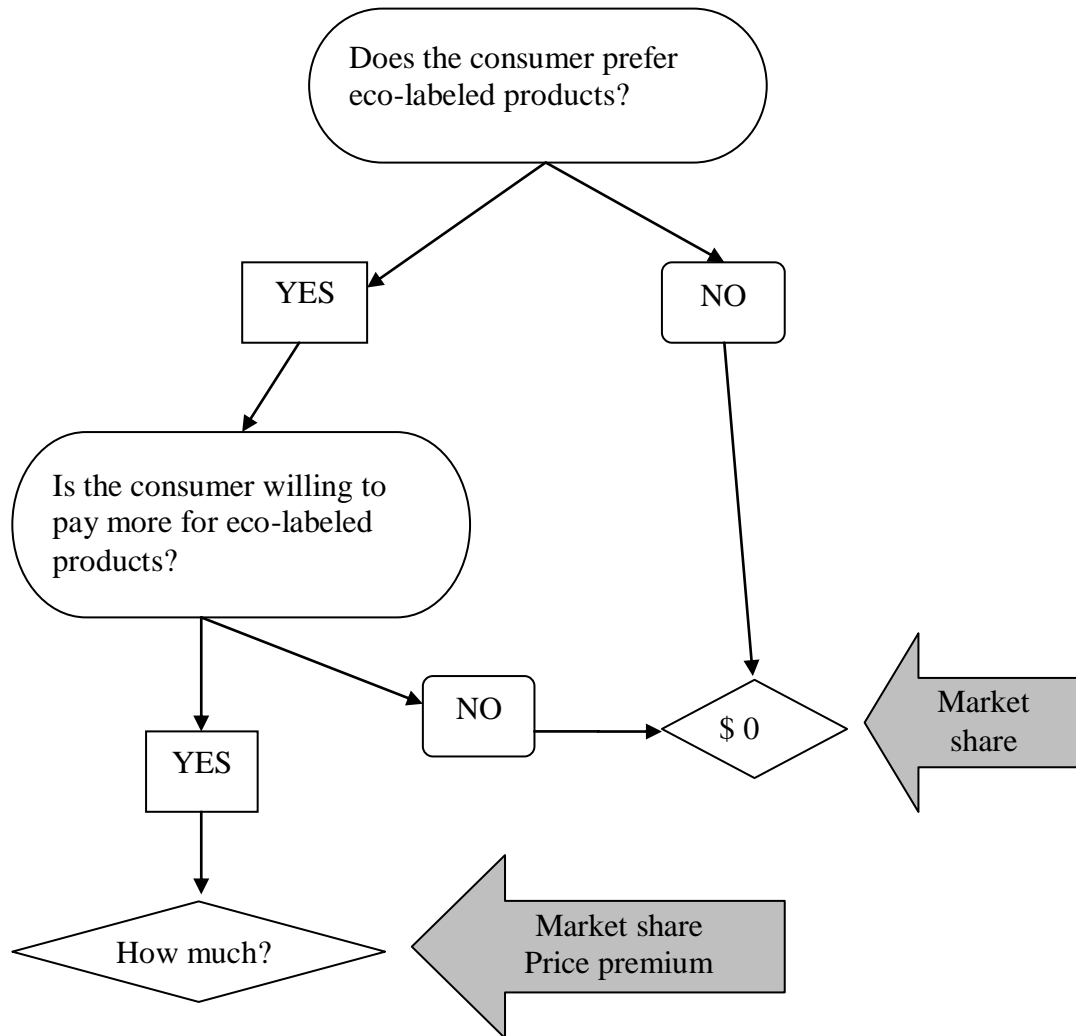


Figure 8. Model of consumer's purchase decision and points of interest for the supplier.

2 METHODS

To answer the first research question “*what are the factors influencing consumer demand for eco-labeled wood and paper products in Europe and North America?*”, I used a meta-analysis. In this study, the meta-analysis is done in three stages. First, I conducted a systematic review of the empirical literature on consumers’ willingness to pay for eco-labeled wood and paper products to identify studies to be used in the meta-analysis regression. Second, vote-counting was used to determine which factors were most commonly used and most commonly found significant in explaining consumers’ willingness to pay. Finally, meta-analysis regression or meta-regression was used to estimate the significance and direction of these factors.

To address the second research question, “*what are desirable characteristics of an on-product ecolabel?*” I conducted a systematic literature review to identify these characteristics of on-product eco-labels that are most appealing to consumers and synthesized the results in narrative form.

In this chapter, I present the methods mentioned above and how they are used in this study. I start with meta-analysis and continue with systematic literature review which is the main data collection method for an objective and unbiased meta-analysis.

2.1 Meta-analysis

Meta-analysis was first defined by Glass in his article entitled Primary, Secondary, and Meta-analysis of Research in 1976. Glass (1976, p. 3) defines meta-analysis as “the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the studies”. Originally, meta-analysis was used by Glass in the field of education, but the method has been widely used in many other fields since.

Beach et al. (2005) used meta-analysis in their work concerning non-industrial private forest (NIPF) management and NIPF owners' decision strategy. They define meta-analysis as a technique of condensing findings from research articles to a quantitative form. It allows a researcher to conduct regression analyses on data extracted from different types of research sources as if it were primary data (Beach et al 2005).

Regression based on meta-analysis, or metaregression, is used in this study. The primary data collection method for meta-analysis is a systematic review. A well-done systematic review provides an unbiased outcome for meta-analysis (Greenhalgh 2006). In the next section I will describe the systematic literature review data collection method and how it is applied in this study.

2.2 Data collection

According to Petticrew (2001, p. 99), the goal of systematic review is to “answer a specific question, to reduce bias in the selection and inclusion of studies, to appraise the quality of the included studies and to summarize them objectively”. It is a competent technique for testing research hypothesis, synthesizing results from previous studies, and looking for possible inconsistencies between them. Systematic review also provides scientists an easy to understand tool for evaluating current and future research directions (Petticrew 2001). Jesson (2011) emphasizes that systematic review can refer to the method of systematic review or to the type of output a study gives.

The difference between traditional review and systematic review of literature is that in systematic review, the researcher is looking for an answer to a question that has been defined before the search begins. The researcher is not trying to gain comprehensive knowledge of the topic, instead she is focusing on finding certain pieces of information (Jesson 2011). In addition, the inclusion criterion for the studies is stricter than in traditional reviews (Petticrew 2001).

Before the search for studies in the systematic review begins, the researcher sets up criteria for the information she is gathering. She develops a search protocol that she will follow. It should be made so clear that another researcher could repeat the search and come up with the same studies. Also, during the study the researcher should document the steps taken when looking for and choosing between studies (Jesson 2011).

Figure 9 presents the six steps to be followed to complete a systematic review. The steps have been adapted from Jesson (2011) to fit this study. First the researcher takes a look at the data available with first initial data searches. It is important that there are enough data available otherwise the results are not very reliable. After it seems that there is a feasible amount of research done on the topic, it is time to search the databases with predetermined search phrases. Another way to find more articles is to turn to reference lists of the publications, and to see who has cited the studies.

The assessment of inclusion for the studies is done in steps. First, the titles and abstracts of the search results are scanned to see which ones fit the inclusion criteria. After that the researcher takes the ones that seem most compatible based on the title and the abstract to closer examination and reads the full paper. While reading the full paper, the researcher decides whether the contents allow the paper to be included into the review and assesses the credibility of the methods and results of the study.

Jesson (2011) warns about the selection/publication bias. If the search limits only to certain databases, some studies may be misrepresented or some approaches may come up more often than others. Publication bias is sometimes caused also by publication of positive results, when simultaneously other studies without specific or unwanted outcomes are left unpublished (Jesson 2011).

The next step in the data collection is to put the extracted information from the included studies in a spreadsheet with columns for each desired variable. This allows missing values and other data gaps to be spotted quickly. Now it is time for the researcher to do

either a narrative review or a mathematical summary of the results. Some of the written variables might need to be coded in numbers if the researcher aims for statistical tests on data.

Greenhalgh (2006) emphasizes that clearly defined and reported method of data collection is likely to limit bias in choosing studies and gives more precise conclusions. When the researcher sticks to the data collection plan, the same articles can be found by another researcher later. Also adoption of data is faster and it can also be implemented sooner. Comparison of different studies shows the results that are most consistent and inconsistent can be studied to see consistencies between them.

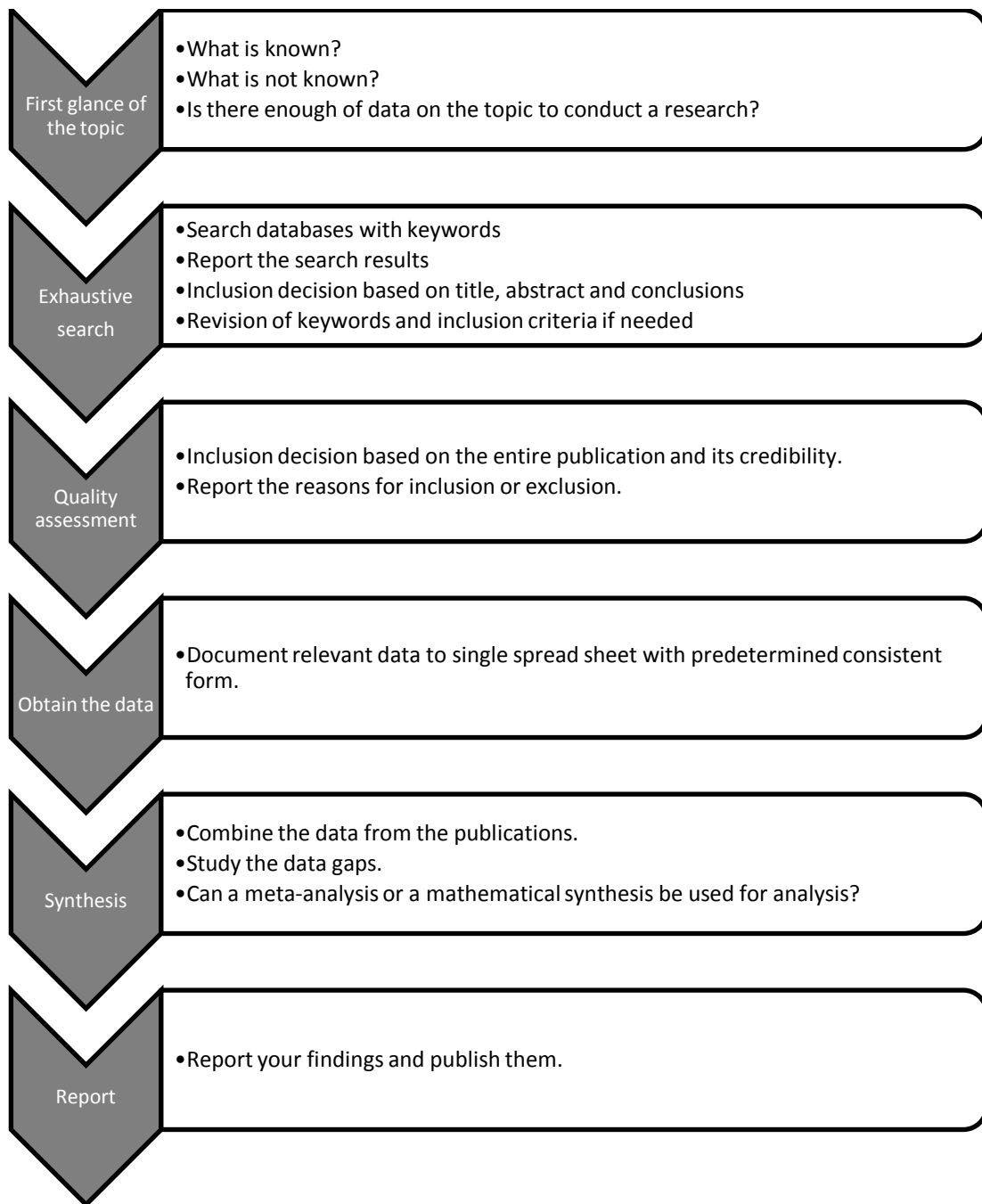


Figure 9. Six steps of systematic review (adapted from Jesson 2011).

2.2.1 Search protocol for consumers' WTP for eco-labeled wood and paper products

The dependent variable for the metaregression in this study is the average willingness to pay for eco-labeled wood and paper products. In this study, the willingness to pay in the regressions is the percentage of the product's price and it is input as a proportion into the regression data set. The independent variables are grouped into four categories: product related variables, label related variables, consumer variables, and study related variables.

Most of the data were directly collected from the articles. Some data, especially about the consumer characteristics, was not reported in all of the studies although there were indications of the data to have been collected. In these instances, the authors were contacted for more information. Most of them replied and were able to aid in completing the missing information.

Inclusion criteria for an article to fit this study are presented in the Table 2. The study was narrowed down to include articles and documents about eco-labels for wood and paper products, such as furniture, lumber, toilet paper and paper towels, etc. Non-industrial forest products as well as other products with natural resource raw materials were excluded. It should be noted that forest certification labels were considered as eco-labels and included in this study.

To be included for the meta-analysis, the outcome or one of the outcomes of the publication had to be an estimate of consumers' willingness to pay as a price premium in monetary value or as a percentage value for eco-labeled wood and paper products. Producers' and manufacturers' point of views were excluded in this research question, as well as studies that examine how consumers rank different product attributes and those studies that did not produce a willingness to pay estimate.

Table 2. Criteria for including or excluding a study in the willingness to pay metaregression estimation.

Type of criteria	Inclusion criteria	Exclusion criteria
Product type	+ focus on wood and paper products	– focus on other products such as non-industrial forest products or other natural resources
	+ eco-labeled or certified products	– products without eco-labels
Measure	+ consumer purchase behavior observed in the form of willingness to pay	– producers’ or manufacturers’ point of views – consumer purchase behavior in other forms, e.g., preference and importance rankings
Region	+ study in North America or Europe	– studies in other regions of the world
Document type	+ peer-reviewed: journal article, thesis or dissertation, proceedings	– non-peer-reviewed: report, working paper, annual review etc
Language	+ published in English	– published in other languages

This study was restricted to two geographical regions, North America and Europe. The majority of international level research has focused on data from these two regions. The main focus in this study is the wood and paper products markets in the U.S. In order to gain more perspective on the topic, the research on European markets was included as well. One reason was also the transatlantic co-operation in the Master’s candidate’s study program.

Finally, only peer-reviewed journal articles, and theses and dissertations were included to ensure high quality and credibility of the studies. There was no restriction regarding when the study was done or when the article was published. The language of the publications was restricted to English.

The following search phrases were used in data collection:

1. “eco-label” and “forest products” and “consumers” and “willingness to pay”

2. “certified” and “wood products” and “consumers” and “willingness to pay”
3. “eco-labeled wood products price premium”

The literature review and data collection was conducted over a period of 7 months (November 2011-May 2012).

Summon database at North Carolina State University (NCSU) was the main database used in the search. Summon is a metabase that searches for the publications among the NCSU’s Libraries’ catalog as well as other libraries’ catalogs which are available to NCSU students and staff via contracts. I also searched “backwards” and “forwards” from the publications identified, by reviewing their reference lists and by using Google Scholar to identify more recent publications citing the ones initially identified.

During the search period, Google Scholar Alerts were also set by the researcher to automatically be alerted about articles with the best match. These alerts send an email to the researcher when someone cites the article with alert attached.

2.2.2 Search protocol for consumer responses to eco-labels

A systematic review was conducted to answer the second research question “What are desirable characteristics of an on-product eco-label?” Inclusion criteria for the studies are presented in the Table 3. Similar to search protocol for WTP for eco-labeled wood and paper products, the articles included in the review were required to be peer-reviewed. Focus of the study had to be design of the on-product label and how consumers perceive different kinds of information on the label, which characteristics were preferred by consumers, and what are the reactions to different kinds of label designs.

Table 3. Criteria for including or excluding a study in the on-product label review.

Type of criteria	Inclusion criteria	Exclusion criteria
Study focus	+ focus on the on-product label design and information provided for the consumer	
Label type	+ environmental labels, eco-labels, green labels	– fair-trade label, energy-saving label
Labeled product	+ generally on labeling or on wood and paper products	– labeling of vehicles, organic food, electronic equipment
Document type	+ peer-reviewed: journal article, thesis, or dissertation	– non-peer-reviewed: report, working paper, annual review etc
Language	+ published in English	– published in other languages

Studies concerning eco-labels were included. This means that only labels that promote the environmental effects of products were included. Possible studies about labels with effects on workers' and producers' rights, and user safety were excluded because consumers' motivation to base their purchase on those labels is likely to be different from the motivation for purchasing goods with environmental effects.

Unlike the previously used search protocol in research question 1, there was no restriction on the geographical area under focus in the study. Only articles published in English language were included.

Search phrases used for the search are the following:

1. eco-label characteristics preferred by consumers
2. eco-label "consumer information"
3. "environmental product information" "consumer perspective"
4. "on product" and eco-label and design
5. "green label" "consumer information"
6. "on-product" "green label"

NCSU's database Summon was the main database for data searches. Literature review and data collection were conducted over a period of three months (July 2012 to September 2012). Google Alerts were set to the articles fitting the inclusion criteria best. Reference lists were scanned to find more studies and Google Scholar was used to find studies citing the included articles.

2.3 Vote-counting

The vote-counting method of meta-analysis was used in this study to assess patterns in variables that have been taken into account and that affect consumers' willingness to pay for wood and paper products.

Beach et al. (2005) describe vote-counting as the simplest form of meta-analysis. As Bushman and Wang (2009) explain, the relationships between the independent and dependent variable found in each study are categorized into significant positive results, significant negative results and non-significant results. Every variable that appears in a study is examined and moved to one of the categories mentioned. The same variables don't need to appear in all the studies (Beach et al. 2005). The number of times that the coefficient on a variable is found positive, negative, or not significant is summed up. The name for vote-counting comes from each study casting a vote for one of the relationships. The "winner" is the category that has most the most votes. This winner is assumed to provide the most accurate estimate for the relationship between independent and dependent variable (Bushman and Wang 2009).

In this thesis, I follow the protocol suggested by Beach et al. (2005) for coding the studies. I will denote a statistically significant positive relationship with (+) sign and a statistically significant negative relationship with a (-) sign. If variable was used in the study, but was found statistically insignificant, (0) was marked on the table. Since same variables don't appear in all of the studies, there is a blank space representing that.

Significance level of 10% used in this thesis is also suggested and used in the study by Beach et al. (2005).

When the regressions identified for the vote-counting were based on the same datasets, I included only one to make sure that this dataset was presented with equal emphasis compared to others. To choose the regression, I first examined which regression was emphasized by the authors. If the authors didn't prefer one regression over another, I examined number of independent variables in each study and goodness-of-fit indicators, such as R^2 , to decide which one to include. If the regressions were based on multiple datasets, I followed the vote-counting procedure by Beach et al. (2003) and included the regression if the sample size for its dataset was bigger than 49.

Vote-counting gives the researcher a view of what factors have been used in previous research and what are the factors that have not been studied or included in the regression analyses. Based on the vote-counting results, the researcher can also expect certain relationships between the dependent and independent variable. In meta-regression analysis, which is explained in the next section, the researcher can test whether these expectations fit with the regression results. Sometimes, like in this study, the metaregression can be done with a larger pool of research results.

2.4 Meta-regression

The final stage regarding the first research question was to conduct a meta-analysis regression, also called metaregression. As Greenhalg (2006) states the same data analysis methods can be used for meta-analytic data as for any other data. For the data I have collected it means that I will study the average willingness to pay extracted from the meta-analysis articles as a function of variables in three groups: product related variables, label related variables and socio-demographic variables. A linear regression model is used for the analysis (SPSS software is used).

3 RESULTS

3.1 Results of the systematic review for consumers' WTP for eco-labeled wood and paper products

The three search phrases produced altogether 334 search results. 25 of these studies seemed potential and interesting based on the title, conclusion and abstract. After reading the full text, 9 studies met the inclusion criteria. 5 studies were found with “backwards” and “forwards” searches from these 9 studies. 4 studies were found from the citations of other articles related to the topic. A total of 18 articles were identified in the systematic review for the metaregression analysis. These are presented in Table 4.

Most of the studies included for the meta-analysis are journal articles. There are also 3 theses (Freriks 2012, Kruger 2010, and Ladenburg and Martinsen 2004) and 1 proceedings report (Pajari et al 1999).

The 18 articles account for 64 observations of willingness to pay. Number of observations is defined as the amount of observed willingness to pay estimates per product, per country, per label, or per year. For example, one study may report data from two countries or have willingness to pay data for two or three different products.

Appendix A presents the descriptive statistics of the metaregression studies including the base price of the products in the focus of the study, the range of willingness to pay reported, survey method, sample size, the product on focus, and the elicitation format of willingness to pay. Appendix A also indicates which of the studies provided only one estimate for willingness to pay, and also the studies that provided two estimates of willingness to pay, high and low estimates.

Table 4. Studies meeting the inclusion criteria for the meta-analysis.

Authors (year)	Data collection year	Number of observations	Region
Aguilar and Cai (2010)	2008 and 2009	2	US and UK
Aguilar and Vlosky (2007)	1995 and 2005	8	US
Bjørner et al. (2004)	1997-2001	2	Denmark
Freriks (2012)	2011	1	The Netherlands
Grönroos and Bowyer (1999)	1997	1	US
Jensen et al. (2003)	2001	1	US
Jensen et al. (2004)	2001	3	US
Kozak et al. (2004)	2003	4	Canada
Kruger (2010)	2008	2	Canada
Ladenburg and Martinsen (2004)	2003	3	Denmark
Ozanne and Vlosky (1997)	1995	5	US
Ozanne and Vlosky (2003)	2000	5	US
Pajari et al. (1999)	1996-1997	5	Germany, France, Italy, UK and Austria
Spinazze and Kant (1999)	1997	13	Canada
Srinivasan and Blomquist (2009)	1997-1998	1	US
Thompson et al. (2010)	2002	2	US
Veisten (2002)	1997	2	UK and Norway
Veisten (2007)	1997 and 1998	4	UK and Norway
18 articles		64 observations	10 countries

3.2 Vote-counting for factors effecting consumers' WTP for eco-labeled wood and paper products

I identified 8 articles for the vote-counting. They are presented in the Table 5. All of these are journal articles. Some of the articles presented multiple regressions, ranging from 2 to 4 regressions in the articles.

Variables that were used in the articles can be divided into 4 groups: consumer characteristics, consumers' attitudes and habits, label characteristics and product characteristics. Tables B1 to B4 in the Appendix B present the vote-counting results of each variable group.

The most commonly used variables in these studies are gender, income, and age. Gender, mainly as female consumers (dummy variable), appears in the 19 observed regressions 16 times, income appears 13 times, and age appears 12 times.

The "winner" in terms of most appearances as significant independent variable is gender with 13 significant positive appearances (positively affecting the dependent variable). Following the gender is "on product ecolabel" that was found to appear 8 times with positive relationship with dependent variable. In the third place were two variables, income with 6 significant positive appearances, and price of product 6 significant negative appearances (negatively related to dependent variable, meaning as price goes up willingness to pay goes down).

Table 5. Studies meeting the inclusion criteria for the vote-counting analysis, the dependent variable in the study, number of vote-casting regressions and the sample size of the datasets.

Publication	Dependent variable	Number of included regressions	Sample size of datasets
Aguilar & Vlosky 2007	price premium on a scale from 0 to 4	4 (four different wood products on focus)	439
Aguilar & Cai 2010	binary variable 1 = eco-labeled alternative chosen, 0 = otherwise	2 (data from two countries)	US: 918 UK: 1017
Brouhle & Khanna 2012	probability of purchasing eco-labeled products	2 (two different paper products on focus)	toilet paper: 2933 paper towels: 2483
Jensen et al 2003	willingness to participate in the market for certified wood products	1	617
Jensen et al 2004	likelihood of having a nonzero WTP	3 (three different wood products on focus)	shelf: 973 chair: 969 table: 967
Srinivasan & Blomquist 2009	purchased eco-labeled product: yes/no	1	9883
Veisten 2002	probability of choosing the more expensive eco-labeled alternative	2 (data from two countries)	UK: 764 Norway: 768
Veisten 2007	probability of positive WTP for the eco-label	4 (two different elicitation methods in two countries)	CA in UK: 133 CA in Norway: 125 CV in UK: 152 CV in Norway: 181
Total 8 articles		19 observed regressions	Total 23,322 (North America 14,766 and Europe 8556)

The most common consumer background characteristics measured in the studies include gender, income, age and level of education (Table B1). Other variables in this group were related to the living situation of the consumers – location, household size and homeownership. Household size may be correlated with income, because big households are likely to have less disposable income than small ones, and because two-parent families are likely to have higher earnings than one-parent families.

Females were found to be significantly positively correlated with willingness to pay in majority of significant cases (meaning females were likely to pay more for ecolabel wood and paper products). Additionally, income was also found to be positively correlated to willingness to pay. Age and education turned out to be insignificant although they were often included as predictor variables in regressions.

Positive orientation to environmental issues, forest recreation habits and eco-label seeking purchase behavior were the most common attributes or variables among the variable group measuring consumers' attitudes and habits (Table B2). All three of these were observed to have a positive influence on willingness to pay for eco-labeled products.

Table B3 presents the results for the label characteristics. The most often tested label provider was environmental non-governmental organization (ENGO) which was reported to have a significant positive impact on willingness to pay in half of the cases where it was included. Other certifiers, such as third party, industry and government, were tested as well. None of them had a negative impact when found to be significant variables affecting willingness to pay. In these studies it appears that the amount of information the consumer gets from an eco-label doesn't seem to significantly impact their willingness to pay for the eco-labeled product.

Finally, the results for the product characteristics group show that product's own price is the most common variable included in the studies (Table B4). It is reported to be

significant and negatively related to the willingness to pay in over two thirds of the cases.

3.3 Meta-analysis regression results

The dependent and independent variables are presented in Table 6. For continuous variables, the mean of observations is reported and for the categorical variables the share of observations of each category is reported. This study considers two dependent variables, low and high estimate for willingness to pay. On some of the included articles, the authors report two estimates of willingness to pay without emphasizing one over the other. In that case I extracted both of those estimates. When one estimate for willingness to pay was reported, it was used as both for high and low estimate.

The dependent variable, estimate of willingness to pay, was extracted straight from the studies when it was reported as a percentage and entered in to the regression data as a proportion. For example, when the willingness to pay was reported to be 22%, it was inserted into the regression as 0.22. When the willingness to pay was reported as a monetary value, the percentage estimate was calculated according to equation 1 below and again, reported as a proportion in the dataset.

$$\text{Equation (1): } WTP = \frac{WTP \text{ for the ecolabeled product} - \text{base price of the product}}{\text{base price of the product}}$$

In the studies where either the willingness to pay percentage nor the monetary value was reported, I searched for possible regression parameter estimate for the eco-labeled product and the parameter estimate for the price. If these two were reported, the willingness to pay portion was calculated according to the equations 2 and 3, as has been suggested by Ladenburg and Martinsen (2004) and by Cai and Aguilar (2012). These estimations were in the proportion form and were input in the data as such.

Table 6. Variables used in the metaregression and summary statistics.

Variable categories	Variables	Description	Mean / share of observations
DEPENDENT VARIABLES			
	average WTP low	The lower estimate for average willingness to pay for eco-labeled wood and paper products.	14.8%
	average WTP high	The higher estimate for average willingness to pay for eco-labeled wood and paper products.	15.9%
INDEPENDENT VARIABLES			
Product variables	Durability	Durability is measured in three levels: Consumable Durable Building	18.8% 67.2% 14.1%
	Material	There are two types of material in the observations: Wood Paper	18.8% 81.3%
Label variables	Level of information	Indicates the amount of information provided for the respondents at the moment of data collection. Three levels: No information Low level High level	37.5% 46.9% 15.6%
Consumer variables	Age	Average age of respondents in the study in years.	45.9
	Gender	Share of female respondents	46.6%
	Education	Share of respondents with a completed college degree or higher education	61.6%
	Region	Binary variable Value 1 for North America Value 0 for Europe.	71.9% 28.1%
	Income	Average annual household income of respondents in the study in thousand US\$	49.8
Study related variables	Data collection year	Year of data collection. If data was collected during multiple years, the midpoint was used.	1999

In the studies where either the willingness to pay percentage nor the monetary value was reported, I searched for possible regression parameter estimate for the eco-labeled product and the parameter estimate for the price. If these two were reported, the willingness to pay portion was calculated according to the equations 2 and 3, as has been suggested by Ladenburg and Martinsen (2004) and by Cai and Aguilar (2012). These estimations were in the proportion form and were input in the data as such.

Equation (2):

$$WTP \text{ for ecolabeling} = - \left(\frac{\text{parameter estimate for ecolabeled wood product}}{\text{parameter estimate for price}} \right)$$

$$\text{Equation (3): } WTP \text{ percentage premium} = \frac{WTP \text{ for ecolabeling}}{\text{base price}}$$

As shown in Table 6, for the regression model, durability and material are variables that reflect the purchase frequency of the product. Consumable products are defined as the most frequently purchased items, such as toilet papers or printer papers. Durable products include furniture and building materials, such as flooring and a piece of plywood from a Do-It-Yourself retailer. Buildings are the least frequently bought items. Building group is defined to include new homes as well as remodeling of rooms.

Label variable in this study is the amount of information about eco-labeling program that was presented to the respondent at the time of data collection. No information means that the respondents acted based on their previous knowledge of eco-labeling when responding. Low level of information means that the respondents were provided with an eco-label logo or a brief definition of eco-labeling program. High level of information means that the respondents were given long and detailed description of the eco-labeling program and its effects.

When only median age was reported, that was used instead of average age. In some articles, age and income were reported as percentages per age or income group. In those

cases, I calculated the weighted average age or income by multiplying the midpoint of the group with the percentage of respondents in that group. In one case the last income group was “Refuse/Do not know” (Veisten 2007), I counted the weighted average income and multiplied that with one minus the share of the group “Refuse/Do not know”, to level off the impact of this group in the weighted average income.

When income was not collected or reported at all, I followed the suggestions by Cai and Aguilar (2012) and used the gross domestic product (GDP) per capita for that country for year of the data collection. The GDP data was retrieved from World Bank’s Data Service (World Bank 2012) and the possible currency conversions from Oanda’s historical exchange rate service (Oanda 2012).

Since I was only able to extract certain variables from meta-analysis articles, I have divided the samples into two sets. The first set is a restricted sample of 9 articles that report age, gender and education variables. Number of observations in the restricted sample is 44. In the second set I have excluded age, gender and education variables from the regression and I am able to include all of the 18 meta-analysis articles which provide 64 observations. Table 7 presents the articles in the small, restricted sample on the left. The full sample comprises of all of the articles listed in Table 7.

Table 7. Metaregression articles.

Publications that report all of the variables = small, restricted sample	Publications that do not report age, gender and/or education
Aguilar & Cai (2010)	Bjørner et al. (2004)
Aguilar & Vlosky (2007)	Freriks (2012)
Kruger (2010)	Grönroos & Bowyer (1999)
Ladenburg & Martinsen (2004)	Jensen et al. (2003)
Ozanne & Vlosky (1997)	Jensen et al. (2004)
Ozanne & Vlosky (2003)	Kozak et al. (2004)
Spinazze & Kant (1999)	Pajari et al. (1999)
Thompson et al. (2010)	Srinivasan & Blomquist (2009)
Veisten (2007)	Veisten (2002)
9 studies	9 studies

The data analysis was done with IBM SPSS Statistics 20.0 program. A linear multivariate regression model was used for the analysis. For each set of variables I estimated the regressions with the higher and the lower estimate of willingness to pay.

Table 8 presents the regression results for the restricted sample with the product material variable. I did not use product material and product durability in the same regressions because they were correlated with each other (multicollinearity of variables is a problem in regression model solutions). The results for the regression model where product characteristic is represented by durability are presented in Table 9.

Table 10 and 11 present the regression results for the larger sample where age, gender and education variables had to be excluded due to lack of observations. In Table 10, the product variable is product material and in Table 11 the product variable is product durability.

Next I will go through the results for each of the metaregression and finally I will summarize the main differences and similarities between the metaregressions.

3.3.1 Metaregression results for the restricted sample

In Table 8 the variable “North America” is found to be statistically significant with p-value less than 0.000 and negatively related with dependent variable implying that the consumers in North America are willing to pay less for the eco-labeled products compared to European consumers. For the lower WTP estimation, they are willing to pay 24.8 percentage points less and in the higher WTP scenario 22.2 percentage points less than that of Europeans.

When different product materials wood and paper are compared to each other, the regression result implies that consumers are willing to pay 5.5 percentage points more

for the wood products vs. other products. This result is significant with p-value less than 0.10 for both estimations (90% significance level).

When the consumers are given some information about the eco-labeling program compared to no information at all about the ecolabels at the purchase decision moment, the significant ($p < 0.000$) regression results imply that they are willing to pay 37.9 percentage points less, but when they are given more information about the ecolabel they are willing to pay 33.7 percentage points more for the eco-labeled products.

Table 8. Metaregression results for the smaller, restricted sample, N=44, 2-level durability.

Dependent variable	Lower estimate for WTP			Higher estimate for WTP		
	Parameter estimate	Standard error	Significance	Parameter estimate	Standard error	Significance
	R ² = 0.907 adjusted R ² = 0.883			R ² = 0.911 adjusted R ² = 0.887		
Intercept	45.311	10.464	.000	37.730	10.454	.001
North America	-.248	.051	.000	-.222	.051	.000
Paper	Base level	-	-	Base level	-	-
Wood	.055	.032	.096	.055	.032	.096
No information	Base level	-	-	Base level	-	-
Low information	-.379	.072	.000	-.341	.072	.000
High information	.337	.059	.000	.368	.059	.000
Data year	-.023	.005	.000	-.019	.005	.001
Income	.003	.002	.098	.002	.002	.148
Age	.025	.006	.000	.023	.006	.001
Female	.412	.290	.165	.434	.290	.144
Education	-.094	.058	.115	-.063	.058	.283

The significant negative coefficient for the data collection year implies that the willingness to pay for eco-labeled products has declined with 2.3 percentage points over the study years. The earliest data collection year in this sample was 1995 (Aguilar and Vlosky 1007, Ozanne and Vlosky 1997) and the latest, 2009 (Aguilar and Cai 2010).

The parameter estimate for income is positive on both regressions, but the significance level is below 0.10 only when dependent variable is the lower estimate for WTP. This gives a weak indication that the people with higher incomes are willing to pay more for eco-labeled products (i.e., income is weakly contributing to willingness to pay for ecolabeled products).

The parameter estimate for age is positive and significant. It implies that older people are willing to pay 2.5 percentage points more for the model with the lower WTP estimate and 2.3 percentage points more when estimating with the higher WTP estimate. Female consumers might have a higher willingness to pay for eco-labeled products, but the significance of this parameter estimate is quite small. The parameter estimate for education is negative, but not very significant.

Table 9 presents the regression results with the smaller, restricted sample (N=44) for both lower and higher estimate for willingness to pay. The difference between Table 8 and Table 9 is that the product variable here (in table 9) is the durability of the product measured in three different levels.

The direction and the significance for the parameter estimates for North America, levels of information, data collection year, income, age, female, and education is approximately the same as the model shown in Table 8. The variable of interest in Table 9 is the durability variable. The parameter estimate for durability is positive and significant with p-value of 0.10. This implies that consumers are willing to pay 5.5 percentage points more for eco-labeled products such as furniture and other durable goods compared to consumable products such as toilet paper and printer paper

(measured at 90% level of significance). Results for the most durable variable, building, are not statistically significant.

Table 9. Metaregression results for the smaller, restricted sample, N=44, 3-level durability.

Dependent variable	Lower estimate for WTP			Higher estimate for WTP		
	Parameter estimate	Standard error	Significance	Parameter estimate	Standard error	Significance
	$R^2 = 0.910$	adjusted $R^2 = 0.883$		$R^2 = 0.913$	adjusted $R^2 = 0.886$	
Intercept	46.195	10.500	.000	38.498	10.529	.001
North America	-.246	.051	.000	-.219	.051	.000
Consumable	Base level	-	-	Base level	-	-
Durable	.055	.032	.096	.055	.032	.098
Building	.025	.044	.567	.029	.044	.512
No information	Base level	-	-	Base level	-	-
Low information	-.378	.072	.000	-.341	.073	.000
High information	.335	.059	.000	.366	.059	.000
Data year	-.024	.005	.000	-.020	.005	.001
Income	.003	.002	.080	.002	.002	.127
Age	.025	.006	.000	.023	.006	.001
Female	.434	.291	.145	.453	.292	.130
Education	-.096	.058	.109	-.065	.058	.276

3.3.2 Metaregression results for the full sample

The following two tables, Table 10 and Table 11, present the results for the regressions that include all of the meta-analysis articles. These articles do not report observations for age, gender, and/or education, which is why these variables are excluded from the regression. Table 10 presents the regression results with the product variable as the product material and Table 11 presents the results for product durability as the product variable.

As in the previous set of regressions the parameter estimate for North America is significant and negative, implying that the European consumers (vis a vis North Americans) are willing to pay more for the eco-labeled products. In Table 10, the difference to European consumers is 9.6 percentage units for the lower WTP estimate regression and 10.1 percentage units for the higher one as compared to North American consumers.

Table 10. Metaregression results for the large sample, N=64, 2-level durability.

Dependent variable	Lower estimate for WTP			Higher estimate for WTP		
	$R^2 = 0.441$	adjusted $R^2 = 0.382$		$R^2 = 0.492$	adjusted $R^2 = 0.438$	
Variable	Parameter estimate	Standard error	Significance	Parameter estimate	Standard error	Significance
Intercept	-9.055	9.448	.342	-9.800	9.125	.287
North America	-.096	.041	.022	-.101	.040	.013
Paper	Base level	-	-	Base level	-	-
Wood	-.050	.045	.274	-.052	.044	.238
No information	Base level	-	-	Base level	-	-
Low information	-.024	.043	.576	-.028	.041	.499
High information	.202	.056	.001	.226	.055	.000
Data year	.005	.005	.342	.005	.005	.287
Income	.005	.001	.000	.005	.001	.000

The parameter estimate for wood as a product material is in these regressions insignificant and negative unlike in the regressions based on the stricter, smaller sample. Of the information level parameter estimates only the one for high information level is significant. The parameter estimate is positive which implies that the more information

about the eco-labeling program the consumers receive at the moment of purchase decision the more they are willing to pay compared to receiving no information at all.

The parameter estimate for data collection year is insignificant in both regression sets presented in Tables 10 and 11. The parameter estimate for income is significant and positive in both sets of regressions. This implies that the people with higher income are willing to pay more for the eco-labeled products.

Table 11. Metaregression results for the large sample, N=64, 3-level durability.

Dependent variable	Lower estimate for WTP			Higher estimate for WTP		
	Parameter estimate	Standard error	Significance	Parameter estimate	Standard error	Significance
	R ² = 0.467 adjusted R ² = 0.400			R ² = 0.516 adjusted R ² = 0.455		
Intercept	-7.253	9.371	.442	-8.044	9.046	.378
North America	-.086	.041	.040	-.091	.039	.025
Consumable	Base level	-	-	Base level	-	-
Durable	-.038	.045	.405	-.041	.044	.359
Building	-.131	.066	.053	-.132	.064	.045
No information	Base level	-	-	Base level	-	-
Low information	-.007	.044	.866	-.012	.042	.778
High information	.213	.056	.000	.236	.054	.000
Data year	.004	.005	.445	.004	.005	.379
Income	.005	.001	.000	.005	.001	.000

3.3.3 Summary results of the metaregressions

The parameter estimates for North America were consistently significant and negative. It appears that Europeans are willing to pay more for the eco-labeled wood and paper products compared to North Americans.

The parameter estimates for high information were consistently significant and positive. This means that the more information about the labeling program the consumers are provided at the time of purchase decision the more they are willing to pay for the eco-labeled wood and paper products.

3.4 Label characteristics preferred by consumers

The search phrases (eco-label characteristics preferred by consumers; eco-label “consumer information”; “environmental product information” “consumer perspective”; “on product” and eco-label and design; “green label” “consumer information”; “on-product” “green label”) gave a total of 405 search results. 19 of these studies seemed potential and interesting based on the title and abstract and conclusions. After reading the full text, 10 studies met the inclusion criteria. Backward and forward search in the literature citations for these ten studies resulted in 3 articles that met the inclusion criteria. After removing duplicates 9 articles had met the inclusion criteria. These 9 articles are presented in Table 12.

The findings from these articles can be divided into 3 groups: first, there are studies on the information content provided for the consumers in the label; second, there are studies that examine the preferred formats for eco-labels; and third, there are studies that provide information on which certifying agencies are considered the most reliable.

Table 12. Studies meeting the inclusion criteria for research question 2 – What are desirable characteristics of an on-product eco-label?

Publication	Method of elicitation	Possible products on focus
Borin et al 2011	Web survey – purchase simulation	Multiple product categories
Dendler 2012	Case studies of eco-labelling organizations	No specific
Grankqvist et al. 2004	Computer-based choice experiment	Multiple products including paper products
Nissinen et al. 2007	Development process which included a multidisciplinary research group, consumer groups and stakeholders	Multiple products including an apartment
O'Brien and Teisl 2004	Mail survey with choice experiments	Forest products
Tang et al. 2004	Simulation of web-based shopping	Multiple products including paper products
Teisl 2003	Mail survey	Forest products
Teisl and Roe 2000	Literature review	Forest products
Teisl et al. 2002	Focus group studies	Forest products

3.4.1 Information content of the label

Contact information of the producer/supplier of products or the labeling agency was found to be desired by consumers. Teisl et al. (2002) present results of consumer focus group studies where the respondents were asked to express their response to different label formats. Phone number or a webpage address attached to the label got support from the groups. After the focus group studies, Teisl (2003) conducted a mail survey which was based on the findings from these discussions. This survey confirmed that an eco-label with contact information was considered more credible than an eco-label on its own.

Yet, in these same focus group discussions respondents indicated that too much information on the label made them lose their interest in the label and concentrate on other product features (Teisl et al. 2002).

Tang et al. (2004) found that when a written message of the product's environmental impact was added to an eco-label picture, its effect increased. However, this requires that the consumers should understand the meaning of different kind of environmental impacts or forest management practices. When O'Brien and Teisl (2004) studied the effect of different environmental attributes on WTP, they found that defining the terms was crucial. The definition of clear-cutting for example was found to be unknown to the respondents. Once it was explained to the respondents, they ranked it differently compared to other attributes.

Grankvist et al. (2004) note that consumers develop strong routines when purchasing food and other frequently used everyday items. When this happens, the eco-labels don't affect their choice after the first purchase. Grankvist et al. (2004) point out that in this kind of situation, a negative label might be able to raise awareness for a different choice in consumers' minds. A negative label on a product states that the production has had negative impacts on the nature compared to a product with average or no impacts on the environment.

Grankvist et al. (2004) tested the effect of a negative message with a "traffic-light" simulation where the products were grouped into three categories based on their environmental effects: worse for environment, average impact to environment, and better for the environment. They found that environmentally interested consumers would strongly prefer the product with the label indicating better environmental impacts. It must be noted that if the eco-labeling program is based on voluntary participation, approach with stating the negative impact would not be desirable for the suppliers. (Grankvist et al. 2004)

The results by Grankvist et al. (2004) are supported by Borin et al. (2011) who found that when positive impacts of one product were presented together with the negative impacts of another product, consumers would prefer the product that is more environmentally friendly. When the product with positive information was compared to a product with information on its neutral impacts, they found no significant difference on preference.

3.4.2 Label format

Teisl and Roe (2000) suggest that type III labels from ISO 14000 series be used as a model for forest product eco-labeling because those labels present more detailed information on forest management in standardized structure for better consumer understanding. Type III labels are third party verified and they provide data on the life cycle analysis of the product in a form similar to the nutrition labels in the food sector (Bergman & Taylor 2011).

Dendler (2012) is on the same track when she discusses the ways to communicate the product's sustainability aspects for consumers. She suggests dividing the information on product's sustainability into smaller categories, rather than one category which includes all the aspects.

Among the focus group studies, Teisl et al. (2002) found that a standardized label format provides consumers a simple way of comparing products and is therefore favored by them.

There was demand for the details of the rating criteria for labeling. Especially, a rating provided as a number or a description that could be compared to another rating, for example rating of another product or industry average, was seen as practical. (Teisl et al. 2002) Rating scores with an explanation improved the credibility, but average rating without an explanation had a negative effect on the label's credibility. Based on the

findings by Teisl (2003) the respondents preferred more information than just a label. This result is backed up by Leire and Thidell (2005) but is in contradiction with findings by Jensen et al. (2003, 2004).

Nissinen et al. (2007) suggest an eco-benchmark design in a ruler form. The ruler sets marks for different products and goes from 0 to 100. The maximum of 100 stands for the daily environmental impact of a citizen and a consumer can compare the product or service to that. The figure also provides a comparison, another often used product or service, on which the consumer can base the purchase decision. The eco-benchmark model has been tested and improved based on focus group discussions.

3.4.3 Labeling organization

Teisl et al. (2002) also asked the respondents about their views on the agency endorsing the label. ENGOs, and especially those ENGOs that were previously known to the consumers, were seen as credible labelers. Labeling standards of government issued labels were questioned, but as established institutions, governments can also assure that the label is not a fake.

Sønderskov and Daugbjerg's (2011) in their study on organic labeling found that governmental labels were not always deemed credible. Their result was that high involvement by government increased consumers' perceived credibility of eco-labels for organic food, but only in the countries where the citizens already have confidence in their government.

O'Brien and Teisl (2004) point out the effect of source location on consumers' willingness to pay for certified forest products. They found that when the wood was labeled originating from US forests, the US respondents considered the origin to tell them more about the management circumstances. They suggest that location could be revealed in the label.

4 DISCUSSION

4.1 Vote-counting results versus metaregression results

The vote-counting and metaregression analyses showed some similarities and differences which are discussed in this chapter. The winner of the vote-counting was the variable for female which was found to have a positive relationship to willingness to pay. The metaregression resulted in positive parameter estimates for female attribute, with p-values around 0.15. These results seem to be in accordance with vote counting results. Another socio-demographic variable that had many significant positive appearances in the vote-counting analysis was income. Income was found to have a positive relationship to willingness to pay in the metaregressions as well, with p-values from 0.080 to 0.148.

Other socio-demographic variables included in the metaregression were age and education. The vote-counting analysis found that age had a positive impact on willingness to pay, which is in accordance with the significant positive parameter estimates produced by the metaregression analysis. Education was included in 8 of the vote-counting studies in which it was significant only once and was found to have a positive effect on willingness to pay. The metaregression results are in contradiction with this vote-counting result because there the education variable is found to be negative, although non-significant. There is a possibility that the education variable is correlated with regional variable. The Pearson correlation coefficient for region and education is 0.526 with $p < 0.000$. Other vote-counting “winner” variables - eco-labels seeking purchase behavior and product’s own price - were not included in the metaregression analysis.

The metaregression showed a significant positive impact on consumers’ willingness to pay by high level of information on eco-labeling. The vote-counting on the other hand

indicated that high amount information provided for the consumers didn't have a significant impact on consumers' willingness to pay. In the vote-counting sample, the high information attribute had been included for only four observed regressions from two studies (Jensen et al. 2003 and Jensen et al. 2004) where as in the metaregression data set the level of information was extracted for all of the observations. The vote-counting is based on a smaller sample of meta-analysis studies and does not give a broad perspective on the matter.

It must be noted that the number of studies included in the vote-counting was less than half of the studies included in the metaregression analysis. Vote-counting gives a narrower view of the topic by including only the studies that use regression as an analysis method. Metaregression pooled in results from the studies that did or did not use regression as the analysis method, and thus gives a broader data set for the analysis. By nature, vote-counting is more of a descriptive method. Here it was used to list the variables that have been considered important in the previous studies.

4.2 Comparison to the Cai & Aguilar meta-analysis

Recently Cai and Aguilar (2012) published an article "Meta-analysis of consumer's willingness-to-pay premiums for certified wood products". Since there are a few differences and similarities in the variables used and the results between their study and this study, these will be discussed next.

Unlike this study, Cai and Aguilar (2012) expanded their literature review to other continents than just Europe and North America. Their systematic literature review resulted in studies also from South Korea, China, Malaysia, and New Zealand. Another difference in the methods is that they use a Bayesian model for their statistical analysis, where as in this study the analysis method is a linear regression analysis.

Cai and Aguilar (2012) used the same dependent variable as in this study, i.e. consumers' willingness to pay. They inserted it to the data as a percentage (eg. 22 %) where as in this study it has been inserted into the data as a proportion (0.22) but in essence they mean the same.

The product variables in the Cai and Aguilar (2012) study are product's own base price and product's purchase frequency on three levels: least frequently purchased, less frequently purchased, and frequently purchased. The price and purchase frequency were not used at the same time in the regressions. The product variables in this study were product material (paper or wood) and product durability on three levels (consumable, durable and building) which as well were not used at the same time due to correlation among these variables.

It is not possible to directly compare results for the product's base price between the two studies since that variable was not included in this study, but the purchase frequency results could be compared if one would think that the consumable products are equivalent to the frequently purchased products, the durables to be equivalent to the less frequently purchased products, and the buildings to be equivalent to the least frequently purchased products. The results for buildings in this study were significant and insignificant as well as positive and negative, which does not give as any reliable subject of comparison. In the Cai and Aguilar study the purchase frequency was found to significantly influence consumers' willingness to pay and consumers' were willing to pay more for the frequently purchased goods compared to the less and least frequently purchased goods. This study found a higher willingness to pay for wooden and durable goods, which would be equivalent to less frequently purchased goods and thus in contradiction with the result of Cai and Aguilar (2012).

Cai and Aguilar (2012) included the data collection year as well, but they had divided it to three groups (1995-1999, 2000-2004, and 2005-2009) and included that as a categorical variable in the model. In this study the data collection year was a continuous

variable. Cai and Aguilar found that the studies in 2000-2004 and 2005-2009 resulted in bigger premiums than the studies with data collected in 1995-1999. The significant data collection year parameter estimates in this study was negative indicating decreased WTP over study period, thus in conflict with Cai's and Aguilar's results.

Other study related predictor variables in Cai and Aguilar study included elicitation method as a binary variable (contingent valuation or conjoint analysis), and survey method as a binary variable (face-to-face/telephone survey or online/mail survey). They found that contingent valuation method yields on average lower willingness to pay values, and that online and mail surveys yielded higher willingness to pay values. In this study I had extracted the elicitation method based on if the data was collected as a stated preference or revealed preference from consumers. Stated preference means that the respondents were asked hypothetical questions about their willingness to pay for eco-labeled products in different kinds of surveys. Revealed preference was studied by extracting information from consumers' actual purchase behavior. Such a large majority of the studies were based on respondent's stated preference, that is wasn't possible to conduct a comparison between these two methods.

The two consumer related variables included in the Cai and Aguilar study are income and region. The income was divided into three groups: lower income, medium income, and higher income included as a categorical variable in the model. The income limits were defined based on the observations: the lowest third was the lower income group, the middle third the medium income group and the final and highest third of the observations was the higher income group. They found that income had no impact on consumers' willingness to pay. In this study, the parameter estimate for income was significant only at 90% significance level for the estimations with lower willingness to pay as the dependent variable. This result is thus in contradiction with Cai and Aguilar meta-analysis. The parameter estimate for the regional variable was found to be in contradiction as well. Cai and Aguilar found it to be non-significant for all the regions

they had included, where as this study found a strong positive relationship towards Europeans willingness to pay for ecolabeled products.

4.3 Time trend in research

Figure 10 presents how the data collection of meta-analysis studies is divided on the time scale. Total number for studies in North America is 11.5 and total in Europe is 6.5 (one study included both North America and European focus). Most of the data seem to be collected in the late 1990s and early 2000s. If one seeks to gain knowledge on current or even future consumer purchase behavior, it is clear that the data used in this meta-analysis is out-dated and might not reflect the behavior of today's consumers.

Two of the latest studies by Kruger (2010) and Freriks (2012) produce willingness to pay estimates in similar way as the earlier studies. Kruger (2010) examined whether there is a difference between willingness to pay for two different forest certification schemes. Aguilar and Cai (2010) produced an outcome different from the common willingness to pay estimate produced by the most of the other studies. They examined how the market share of an eco-labeled wood product is affected by different price premiums.

The reason for so much research on consumers' willingness to purchase eco-labeled wood and paper products in the late 1990s, could be the emergence of forest certification schemes in the early 1990s. Perhaps it is considered that the eco-labeled markets have now stabilized and no more research on that area is required, or because of the disappointment in low market interest in certified products.

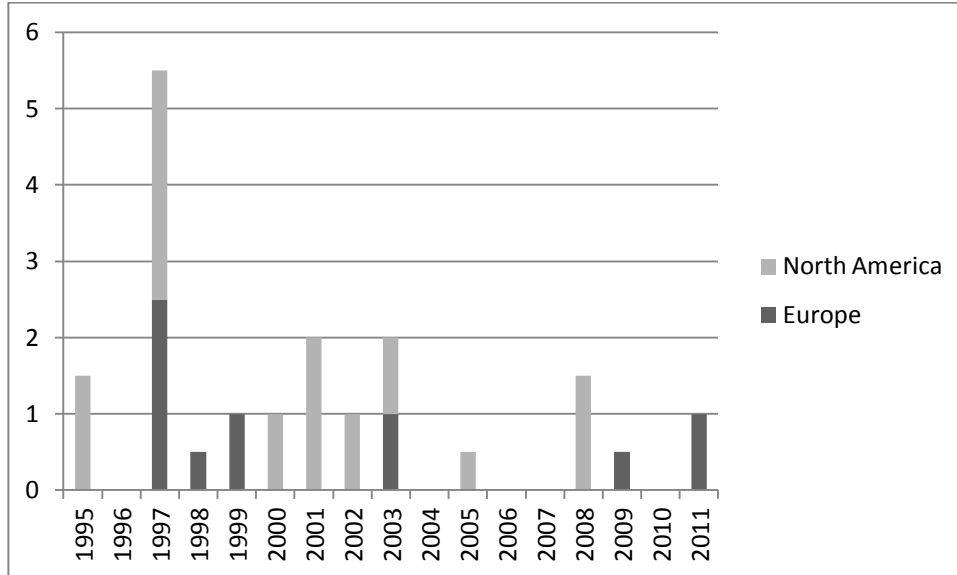


Figure 10. Number of studies per data collection year in each of the regions.

Another interesting trend to be noted from the meta-analysis studies is the lack of studies beyond Scandinavia and Northern Europe (none in Eastern Europe and only one Mediterranean country, Italy). The European countries featured in the meta-analysis are Austria, Denmark, France, Germany, Italy, the Netherlands, Norway, and United Kingdom. The lack of coverage could be due the fact that meta-analysis studies included here were restricted to be published in English. It is also possible that there are no consumer markets yet in the countries not studied for eco-labeled wood and paper products.

4.4 Differences between North American and European consumers

The metaregression results show that there is a difference in the willingness to pay for eco-labeled wood and paper products between the European and North American consumers. One possible explanation is that the general eco-labels presence in European markets has been longer term than in the North American markets. The oldest eco-label in the European markets is the Blue Angel that has been available since 1978. (Blue Angel 2012c) Green Seal, the first eco-certification program in the U.S., was founded

over ten years later in 1989. (Green Seal 2012) The Canadian Environmental Choice Program's Eco-logo has also been in the markets since the late 1980s. (EcoLogo 2012) But even though all of these programs have been available for consumers already for over twenty years in the US, the consumers seem not to be aware of their existence.

Another explanation could be that the level of people's concern for environmental issues differs in the two continents. Lorenzoni and Pidgeon (2006) studied the climate change perception results from various surveys of U.S. and European public done in the last 20 years. They found that the survey results of citizens' views on environmental issues in both continents are alike. For example, the awareness of environmental issues is common for both Americans and Europeans, although other issues are experienced as more critical and there is lack of knowledge on climate change drivers and solutions.

Two more recent studies on the other hand show a difference between the citizens' environmental attitudes. Brulle et al. (2012) base their result on Gallup polls in U.S. and found that when asking the citizens about the biggest concerns over the last 40 years, environmental issues rank consistently among the lowest. The Special Eurobarometer 300 survey done in 2008 concludes that climate change is seen as one of the biggest concern by European citizens (Special Eurobarometer 300 2008). The findings of these three studies suggest that the difference in people's concern for environmental issues is debatable and whether it affects consumers' willingness to pay for eco-labeled products should be studied more.

It is also possible that the legal restrictions for the environmental claims are stricter in Europe than in North America, thus consumers can rely on the information better. For example the claims for recyclability in Europe must be used only for products which are not only made of recyclable material but also in practice be recycled, meaning that there should be facilities that must be able to utilize the recycled material (European Commission 2000). The U.S. Federal Trade Commission has produced similar guidelines called Green Guides, however the use of that is unknown in the US markets.

4.5 Guidelines for an eco-labeling program in the U.S.

As socio-demographic factors such as age, income and gender are found to be significant when adding them to the models, the metaregressions with the restricted sample provide more reliable results. Based on the results of this study, the U.S. consumers might not be willing to pay price premiums for eco-labeled wood and paper products. Thus the primary focus of companies engaging in eco-labeling should be in gaining market share, instead of aiming for price premiums.

There's an indication that market segment including older people with higher income may be willing to pay more for eco-labeled products. This market niche should be taken into consideration. It is worth noting that concentrating on a market segment might not be the solution for gaining market share. These people are the ones that possibly adopt the eco-labeled products first among the entire population group. In order to gain more customers and market share, Rex and Baumann (2007) suggest that the marketing tools of eco-labeled products should be expanded to include other methods than the established eco-labeling.

Rex and Baumann (2007) conducted a literature review of the green and conventional marketing publications and notice two major differences. First, the green marketing has focused on only a segment of consumers identified as environmentally conscious. Rex and Baumann (2007) suggest considering all consumers and examining the needs and wants of all those current and potential consumers. This way the marketing of environmentally friendly products could be aimed for a bigger market. Second, they found that green marketing is not utilizing the whole marketing mix (product, place, price and promotion), but is focusing solely on the product aspect which is the eco-label attribute. They suggest that green companies could benefit from altering pricing strategies, adjusting the distribution channels and product selection, and advancing the promotion of the environmentally friendly goods.

The results of this study indicate that the high level of information on the on-product eco-label is positively correlated with consumers' willingness to pay for the eco-labeled products. When developing an eco-labeling program for wood and paper products, it seems that the label design and information content should be carefully developed to be shown on the label.

One way of developing an eco-labeling program for wood and paper products in the U.S. markets is what Walmart is doing currently for all of their product lines. As one of the biggest retailers, they are forcing their suppliers to look into the processes and giving the suppliers suggestions for improvements in their environmental output. The suppliers are given a chance to stay in the game, but those suppliers with no improvements face a risk of being substituted by better environmental performers. The Sustainability Consortium, partly founded by Walmart, consists of companies, governmental organizations, environmental non-governmental organizations, and universities. The aim of this multistakeholder co-operation is to develop an index which enables comparison of products' environmental impacts which is available for all operators in the markets, including consumers.

5 CONCLUSIONS

The metaregressions in this study had 4 consistent significant results that appeared in the simulations with the socio-demographic variables. First, North Americans are willing to pay less for the eco-labeled wood and paper products compared to European consumers. Second, wooden and durable goods capture larger price premiums than other forestry products. Third, the more information the consumers are provided in the ecolabel, the more they are willing to pay (however, too much information is not good either). Fourth, older people are willing to pay more for eco-labeled wood and paper products compared to younger population

Desirable label characteristics include contact information of the labeling agency and information about the environmental effects of the product. The consumers would appreciate given more information for comparing substitute products and rating them according to their environmental impacts. Environmental non-governmental organizations are perceived as the most credible labeling providers compared to other organizations.

5.1 Limitations of the work

Not being able to produce primary data, I had to rely on the data provided by the publications. Some of the demographic variables were not collected, reported in past literature, and I wasn't able to receive more information from the authors. Access to this missing information would have provided a more reliable model in the regression.

It is also possible that the primary researchers have included some variables in their regressions and then later decided to leave them out of the question due to non-significant estimates, for example. This might have affected the vote-counting results in this study.

There has also been discussion in the literature about which elicitation methods provide the most accurate willingness to pay estimates. On a study by Veisten (2007) conjoint analysis and contingent valuation method results were compared and he couldn't find a trend for support of either method. Voelckener (2006) found that the difference between revealed and stated willingness to pay was significant. The difference between elicitation methods wasn't tested in this study. The inclusion of the elicitation methods in this study might have brought more insight to the results.

Estimates for high and low willingness to pay were close to each other. The average of low estimates for willingness to pay was 14.8% and the average of high estimates was 15.9%. Thus, by inserting the average of these two estimates as the observation of dependent variable in the regression model it is likely that the results would have been similar.

Statistics for multiple observations per study have not been corrected for clustered robust standard errors since an attempt to do that in SPSS with Generalized Estimating Equations procedure failed. It is therefore possible that the regression errors are correlated and the statistical significance of the covariates might be over-stated.

5.2 Future research

The past literature included studies that didn't report their results in an uniform way which made it harder to extract the facts that was needed was this study. The comparison of the studies would become easier with the uniformity of reporting. On the other hand, new ways of producing and reporting information are welcome too when they ease the adoption of the gained knowledge in the markets.

Regarding the eco-label characteristics it would be interesting to study what kind of market analysis the certifiers have done when developing the eco-labels. Do they study

articles on which label characteristics are preferred by consumers or do other type of research that has not been reported?

Successful market diffusion of an eco-label proved to be a complex question. Therefore, it would be interesting to ask the wider set of stakeholders what they consider as the indicators of success of an eco-labeling program. For a company the most important things are probably increasing and maintaining market share, customer loyalty and positive price premiums. Displaying actual improvements in the environment in a quantitative form could be an effective marketing tool, such as the environmental product declarations, EDPs, currently used in business-to-business marketing mainly. That might also lead the companies to the areas within production that need the most improvement. Adding this information would probably require more consumer education.

In their Forestry Review for the Toward Sustainability report, Cashore and Auld (2012) found that the focus of the research and marketing has gradually over the last 20 years shifted from the individual end-use customers to the procurement processes of government and industry who hold more purchasing power which could be an area of focus in future studies on ecolabels.

REFERENCES

Aguilar, F.X. & Cai, Z. 2010. Conjoint effect of environmental labeling, disclosure of forest of origin and price on consumer preferences for wood products in the US and UK. *Ecological economics* 70(2): 308-316.

Aguilar, F.X. & Vlosky, R.P. 2007. Consumer willingness to pay price premiums for environmentally certified wood products in the U.S. *Forest Policy and Economics* 9(8): 1100-1112.

Bauhaus. 2012. Nachhaltigkeit – Produkte. *Product sustainability*. Accessed on Nov 3 2012 at <http://www.bauhaus.info/unternehmen/nachhaltigkeit/produkte/index.html>.

Beach, R.H., Pattanayak, S.K., Yang, J-C, Murray, B.C. & Abt, R.C. 2005. Econometric studies of non-industrial private forest management: a review and synthesis. *Forest Policy and Economics* 7(3): 261-281.

Bergman, R. & Taylor, A. 2011. EDP - Environmental Product Declarations for Wood Products - an application of life cycle information about forest products. *Forest Products Journal* 61(3): 192-201.

Big Room Inc. 2012. Ecolabel Index – Who’s deciding what’s green? Accessed August 20 2012 at www.elolabelindex.com.

Bjørner, T.B., Hansen, L.G. & Russell, C.S. 2004. Environmental labeling and consumers’ choice – an empirical analysis of the effect of the Nordic Swan. *Journal of Environmental Economics and Management* 47(3): 411-434.

Blue Angel 2012a. Der Blaue Engel auf einen Blick. *The Blue Angel at a first glance*. Blue Angel, Dessau-Rossblau, Germany.

Blue Angel. 2012b. Objectives. Accessed on Sep 30 2012 at http://www.blauer-engel.de/en/blauer_engel/whats_behind_it/protection-goals.php.

Blue Angel 2012c. The Blue Angel – Eco-label with brand character. Accessed October 23 2012 at http://www.blauer-engel.de/en/blauer_engel/index.php.

Blue Angel 2012d. The Blue Angel – What’s behind it? Accessed August 24 2012 at http://www.blauer-engel.de/en/blauer_engel/whats_behind_it/index.php

Borin, N. & Cerf, D.C. 2011. Consumer effects of environmental impact in product labeling. *Journal of Consumer Marketing* 28(1): 76-86.

Brouhle, K. and Khanna, M. 2012. Determinants of participation versus consumption in the Nordic Swan eco-labeled market. *Ecological Economics* 73: 142-151.

Brulle, R.J., Carmichael, J. & Jenkins, J.C. 2012. Shifting public opinion on climate change; and empirical assessment of factors influencing concern over climate change in the U.S., 2002-2010. *Climatic Change* 114: 169-188.

Bushman, B.J. and Wang, M.C. 2009. Vote-counting procedures in meta-analysis. In *The Handbook of Research synthesis and meta-analysis*, Edited by Cooper H, Hedges LV and Valentine JC. New York: Russell Sage Foundation.

Byggmax. 2011. Årsredovisning 2011. *Annual report 2011*. Byggmax, Solna, Sweden.

Cai, Z. and Aguilar, F.X. 2012 (In press). Meta-analysis of consumer’s willingness-to-pay premiums for certified wood products. *Journal of Forest Economics*.

Cashore, B. & Auld, G. 2012. Forestry review. Appendix F in report by Steering Committee of State-of-Knowledge Assessment of Standards and Certification. 2012.

Toward Sustainability: The roles and limitations of certification. Washington, DC: Resolve Inc.

Champ, P.A., Boyle, K.J. and Brown, T.C. 2003. A primer on nonmarket valuation. Kluwer Academic Publishers, Dordrecht.

Corporate Sustainability Initiative. 2010. An overview of ecolabels and sustainability certifications in the global marketplace. Duke University Interim report document No. 2010-10-1.

CSA. 2012. Fact sheet. Accessed on Sep 30 2012 at http://www.csasfmforests.ca/docs/fact_sheet_oct_2011_eng.pdf.

Dendler, L. 2012. Sustainable meta-labeling: an effective measure to facilitate more sustainable consumption and production? Proceedings: Global Research Forum on Sustainable Consumption and Production Workshop, June 13-15, 2012, Rio de Janeiro, Brazil.

D'Souza, C., Taghian, M. & Lamb, P. 2006. An empirical study on the influence of environmental labels on consumers. *Corporate Communications: An International Journal* 11(2): 162-173.

EcoLogo. 2012. Ecologo program. Accessed on October 29 2012 at <http://www.ecologo.org/en/>.

EU Ecolabel. 2012a. Information and contacts. Accessed on Sep 30 2012 at <http://ec.europa.eu/environment/ecolabel/information-and-contacts.html>.

EU Ecolabel. 2012b. Guidelines for the use of the EU Ecolabel logo. Accessed on Oct 1 2012 at http://ec.europa.eu/environment/ecolabel/documents/logo_guidelines.pdf.

European Commission. 2000. Report No. 67/94/22/1/00281: Guidelines for Making and Assessing Environmental Claims. Directorate of General Health & Consumer Protection, Brussels, Belgium.

European Communities. 2006. The European ecolabel – Better by nature. European Commission, Luxembourg.

FSC. 2004. FSC on-product labeling requirements.

FSC. 2007. The global strategy of the Forest Stewardship Council. FSC International Center GmbH, Bonn, Germany.

FSC. 2012a. Forest Stewardship Council Factsheet. FSC, Bonn, Germany.

FSC. 2012b. Types of FSC certificates. Accessed on Oct 2 2012 at <http://www.fsc.org/types-of-certification.35.htm>.

Forsyth, K., Haley, D. & Kozak, R. 1999. Will consumers pay more for certified wood products? *Journal of Forestry* 97(2): 18-22.

Freriks, P. 2012. Relative willingness to pay for environmentally friendly products and its relation with eco-certification. Master's thesis in University of Twente, the Netherlands.

Glass, G.V. 1976. Primary, secondary and meta-analysis of research. *Educational Researcher* 10: 3-8.

Grankvist, G., Dahlstrand, U. & Biel, A. 2004. The impact of environmental labelling on consumer preference: Negative vs. positive labels. *Journal of Consumer Policy* 27: 213-230.

Greenhalg, T. 2006. How to read a paper: The basis of evidence-based medicine. BMJ Books/Blackwell Publishing, Malden, Massachusetts.

Green Seal. 2012. About Green Seal. Accessed on October 29 2012 at <http://www.greenseal.org/AboutGreenSeal.aspx>.

Grönroos, J.C.M. and Bowyer, J.L. 1999. Assessment of the market potential for environmentally certified wood products in new homes in Minneapolis/St. Paul and Chicago. Forest Products Journal 49(6): 28-34.

Harbaugh, R., Maxwell, J.W. & Roussillon, B. 2011. Label confusion: The Groucho effect of uncertain standards. Management Science 57(9): 1512-1527.

Home Depot. 2012. Wood purchasing. Accessed on Nov 3 2012 at <https://corporate.homedepot.com/CorporateResponsibility/Environment/WoodPurchasing/Pages/default.aspx>.

IKEA. 2011. Sustainability report 2011. Accessed on Nov 3 2012 at http://www.ikea.com/ms/en_US/about_ikea/pdf/sustainability_report_fy11.pdf.

ISEAL. 2012. Our mission, vision and values. Accessed October 23 2012 at <http://www.isealalliance.org/about-us/our-vision>.

Jensen K., Jakus P.M., English B. and Menard J. 2002. Willingness to pay for environmentally certified hardwood products by Tennessee consumers. Department of Agricultural Economics Study series No. 01-02.

Jensen, K., Jakus, P.M., English, B. and Menard, J. 2003. Market participation and willingness to pay for environmentally certified products. Forest Science 49(4):632-641.

Jensen, K., Jakus, P.M., English, B. and Menard, J. 2004. Consumers' willingness to pay for eco-certified wood products. *Journal of Agricultural and Applied Economics* 36(3):617-626.

Jesson, J. 2011. *Doing your literature review: traditional and systematic techniques*. SAGE, Los Angeles, California.

K-rauta. 2012. K-ympäristökauppa – Vastuullisuus. *K-environmental store – Responsibility*. Accessed on Nov 3 2012 at <http://www.k-rauta.fi/yritystieto/vastuullisuus/Pages/K-ymparistokauppa.aspx>.

Kalish, S. & Nelson, P. 1991. A comparison of ranking, rating and reservation price measurement in conjoint analysis. *Marketing Letters* 2(4): 327-335.

Kozak, R.A., Cohen, D.H., Lerner, J. & Bull, G.Q. 2004. Western Canadian consumer attitudes towards certified value-added wood products: An exploratory assessment. *Forest Products Journal* 54(9): 21-24.

Kruger, C.R. 2010. *Public preferences for SFM: Case studies in tenure policy and forest certification*. Master's thesis in University of Alberta, Canada.

Ladenburg, J. & Martinsen, L. 2004. Danish consumers' willingness to pay for certified wood products – a contingent ranking study. Social science series No. 14. Unit of Economics, Danish Research Institute of Food Economics, Royal Veterinary and Agricultural University, Denmark.

Leire, C. & Thidell, Å. 2005. Product-related environmental information to guide consumer purchases – a review and analysis of research perceptions, understanding and use among Nordic consumers. *Journal of Cleaner Production* 13; 1061-1070.

Lorenzoni, I. & Pidgeon, N.F. 2006. Public views on climate change: European and USA perspectives. *Climatic Change* 77: 73-95.

Lowe's. 2012. Lowe's Wood Policy. Accessed on Nov 3 2012 at http://www.lowes.com/cd_Lowes+Wood+Policy_545633779.

Nissinen, A., Grönroos, J., Heiskanen, E., Honkanen, A., Katajajuuri, J-M., Kurppa, S., Mäkinen, T., Mäenpää, I., Seppälä, J., Timonen, P., Usva, K., Virtanen, Y. & Voutilainen, P. 2007. Developing benchmarks for consumer-oriented life cycle assessment-based environmental information on products, services and consumption patterns. *Journal of Cleaner Production* 15(6): 538-549.

Nordic Ecolabelling. 2011. Regulations for the Nordic ecolabelling of products. Ecolabelling Denmark, Charlottenlund, Denmark.

Nordic Ecolabelling. 2012a. Product groups. Accessed on Aug 24 2012 at <http://www.nordic-ecolabel.org/criteria/product-groups/?p=2>.

Nordic Eco-label. 2012b. The mission. Accessed on Sep 30 2012 at <http://www.nordic-ecolabel.org/about/the-mission/>.

Oanda. 2012. Historical exchange rates. Accessible at <http://www.oanda.com/currency/historical-rates/>.

O'Brien, K.A. & Teisl, M.F. 2004. Eco-information and its effect on consumer values for environmentally certified forest products. *Journal of Forest Economics* 10(2): 75-96.

Overdevest, C. 2010. Comparing forest certification schemes: the case of ratcheting standards in the forest sector. *Socio-Economic Review* 8: 47-76.

Oxford Dictionaries. 2012. Definition of greenwash. Accessed on Aug 20 2012 at http://oxforddictionaries.com/definition/american_english/greenwash.

Ozanne, L.K. & Vlosky, R.P. 1997. Willingness to pay for environmentally certified wood products: A consumer perspective. *Forest Products Journal* 47(6): 39-48.

Ozanne, L.K. & Vlosky, R.P. 2003. Certification from the U.S. consumer perspective: A comparison from 1995 and 2000. *Forest Products Journal* 53(3): 13-21.

Pajari, B., Peck, T. & Rametsteiner, E. 1999. Potential markets for certified forest products in Europe. *EFI Proceedings No. 25*. Brussels, Belgium.

PEFC. 2007. Strategic plan for the PEFC Council. PEFC Council, Luxembourg.

PEFC. 2010. Logo usage tool kit, second edition. PEFC, Geneva, Switzerland.

PEFC. 2011. Annual Review 2011. PEFC, Geneva, Switzerland.

Petticrew M. 2001. Systematic reviews from astronomy to zoology: myths and misconceptions. *British Medical Journal* 322:98-101.

Puukeskus. 2012. Ympäristöpolitiikka. *Environmental policy*. Accessed on Nov 3 2012 at <http://www.puukeskus.fi/yrityksesta/ymparistopolitiikka>.

Rametsteiner, E. & Simula, M. 2003. Forest certification – an instrument to promote sustainable forest management? *Journal of Environmental Management* 67: 87-98.

Rex, E. & Baumann, H. 2007. Beyond ecolabels: what green marketing can learn from conventional marketing. *Journal of Cleaner Production* 15:567-576.

Räty, T., Lindqvist, D., Nuutinen, T., Nyrud, A.Q., Perttula, S., Riala, M., Roos, A., Tellnes, L.G.F., Toppinen, A. & Wang, L. 2012. Communicating the environmental performance of wood products. Working papers of the Finnish Forest Research Institute 230.

S-ryhmä. 2011. Vastuullisuuskatsaus 2011. *Responsibility review 2011*. Suomen Osuuskauppojen Keskuskunta, S-ryhmä.

SFI. 2008. SFI Inc. 2009 Strategic Plan. Sustainable Forestry Initiative Inc., Washington, District of Columbia.

SFI. 2011. Supporting responsible forestry with SFI. Sustainable Forestry Initiative Inc., Washington, District of Columbia.

SFI. 2012. Labels and claims. Accessed on Aug 24 2012 at <http://www.sfiprogram.org/SFILabels/>.

Special Eurobarometer 300. 2008. Europeans' attitudes towards climate change. European Commission, Brussels, Belgium.

Spinazze, M.C. & Kant, S. 1999. Market potential for certified forest (wood) products in Ontario, Canada. *The Forestry Chronicle* 75(1): 39-47.

Srinivasan, A.K., & Blomquist, G.C. 2009. Eco-labeled paper towels: Consumer valuation and expenditure analysis. *Journal of Environmental Management* 90(1): 314-320.

Sønderskov, K.M. & Daugbjerg, C. 2011. The state and consumer confidence in eco-labeling: organic labeling in Denmark, Sweden, the United Kingdom, and the United States. *Agriculture and Human Values* 28(4): 507-517.

Starkki. 2012. Vastuullisuus. *Responsibility*. Accessed on Nov 3 2012 at <http://www.starkki.fi/fi/Starkin-perussivut/Vastuullisuus/>.

Tang, E., Fryxell, G.E. & Chow, C.S.F. 2004. Visual and verbal communication in the design of eco-label for green consumer products. *Journal of International Consumer Marketing* 16(4): 85-105.

Teisl, M.F. 2003. What we may have is a failure to communicate: labeling environmentally certified forest products. *Forest Science* 49(5): 668-680.

Teisl M.F., Peavey S., Newman F., Buono J. & Hermann M. 2002. Consumer reactions to environmental labels for forest products: a preliminary look. *Forest Products Journal* 52(1): 44-50.

Teisl, M.F. & Roe, B. 2000. Environmental certification: informing consumers about forest products. *Journal of Forestry* 98(2): 36-42.

TemaNord. 2008. The Nordic Swan – from past experiences to future possibilities. The third evaluation of the Nordic ecolabelling scheme. Nordic Council of Ministers, Copenhagen.

Thompson, D.W., Anderson, R.C., Hansen, E.N. & Kahle, L.R. 2010. Green segmentation and environmental certification: Insights from forest products. *Business Strategy and the Environment* 19: 319-334.

UNECE/FAO. 2011. Forest products annual market review 2010-2011. Geneva Timber and Forest Study paper 27.

UNEP/IISD. 2000. Environment and trade: A handbook. UNEP, Hartforshire, England & IISD, Winnipeg, Manitoba, Canada.

Veisten, K. Potential demand for certified wood products in the United Kingdom and Norway. *Forest Science* 48(4):767-778.

Veisten K. 2007. Willingness to pay for eco-labelled wood furniture: choice-based conjoint analysis versus open-ended contingent valuation. *Journal of Forest Economics* 13(1): 9-48.

Voelckener, F. An empirical comparison of methods for measuring consumers' willingness to pay. *Marketing Letters* 17:137-149.

Walmart. 2009. Walmart announces Sustainable Product Index. Press release on Jul 16, 2009.

Walmart. 2012. 2012 Global responsibility report. Wal-Mart Stores Inc., Bentonville, Arkansas.

World Bank. 2012. GDP per capita data. Accessible at <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>.

APPENDICES

Appendix A

Table A1. The descriptive statistics of the metaregression studies.

Article	Base price as it is in the publication	low WTP premium %	high WTP premium %	WTP premium % when only one	Survey method	Sample size	Certified item(s)	Elicitation format
Aguilar and Cai (2010)	\$100; £100			20.02%; 29.28%	online survey	1142; 1160	bedside night table	choice-based conjoint analysis
Aguilar and Vlosky (2007)	\$100; \$1000; \$5000; \$100,000	1995: 9.9 - 19.9% 2005: 13.2 - 23.4%	1995: 11.1 - 19.2% 2005: 13.7 - 22.1%		self-administered survey	274; 165	ready-to-assemble chair, dining-room set, kitchen remodeling job, and new home	contingent valuation
Bjørner et al (2004)	DKK 2.1; DKK 3.75	13.3%; 1.9%	18.1%; 2.9%		purchase diary data	45796; 28198	toilet paper, paper towels	revealed preference
Freriks (2012)	€ 10			1.70 %	questionnaire survey	230	white printer paper	open-ended contingent valuation
Grönroos and Bowyer (1999)	unavailable	1 %	2 %		mail survey	646	home	contingent valuation
Jensen et al (2003)	\$28.80	15.90 %	35.30 %		2-step telephone survey	376	oak shelving board	contingent valuation
Jensen et al (2004)	\$28.80; \$199; \$799			13%; 8%; 5.6%	2-step telephone survey	516	shelf, chair, table	contingent valuation
Kozak et al (2004)	not mentioned			5.6 - 14%	questionnaire after focus group discussion	40	certified value added wood products in general	contingent valuation
Kruger (2010)	CAN\$5	33%; 34%	41%; 39.8%		online survey, recruitment via telephone	206	printer paper	conjoint analysis

Table A1. Continued.

Ladenburg and Martinson (2004)	DKK 9; DKK 100; DKK 1.4/m ²			56%; 94%; 83%	mail survey	376	toilet paper, cutting board, table top	conjoint analysis
Ozanne and Vlosky (1997)	\$1; \$100; \$1000; \$5000; \$100,000			18.7%; 14.4%; 14.2%; 11%; 4.4%	mail survey	803	stud, chair, dining room set, kitchen remodeling job, new home	contingent valuation
Ozanne and Vlosky (2003)	\$1; \$100; \$1000; \$5000; \$100,000			17.3%; 11.7%; 14.2%; 11%; 4.4%	mail survey	308	stud, chair, dining room set, kitchen remodeling job, new home	contingent valuation
Pajari et al (1999)	ECU 780 and 1870	3.7%; 1.4%; 2.4%; 1.6%; 4.9%	6.6%; 5.7%; 6.7%; 7%; 9.6%		face-to-face interviews at respondents home	2426; 1063; 967; 1004; 937	piece of wooden furniture	open-ended contingent valuation
Spinazze and Kant (1999)	\$100; \$200; \$500; \$1000; \$4; \$6; \$1.5; \$3; \$2; \$6; \$10; \$1; \$20			8.7 - 11.4%	mail survey	73	wooden table, flooring, lumber, photocopy paper, laser paper, letterhead paper, newspaper, paperback book	contingent valuation
Srinivasan and Blomquist (2009)	\$2.25			69.90 %	internet stores purchase data	34100	paper towels	revealed preference
Thompson et al (2010)	\$22.10; \$300			5.3%; 8.65%	questionnaire handed by the researchers; mail survey	287; 487	a piece of sanded plywood and a wooden dining table	contingent valuation
Veisten (2002)	US\$ 331.90; US\$ 275.46			1.6%; 1%	telephone survey	764; 768	wooden table	contingent valuation
Veisten (2007)	US\$330; US£233			16.4%; 1.8%; 7.5%; 5.9%	face-to-face interview	133; 125; 152; 181	wooden dining table	contingent valuation and conjoint analysis

Appendix B

Table B1. Vote-counting results for the consumer characteristics

Publication	Female	Income	Age	Education	Living in urban area	Household size	Homeowner
Aguilar & Vlosky 2007	+	+	0	0			
	+	+	0	0			
	+	+	0	0			
	+	+	0	0			
Aguilar & Cai 2010							
Brouhle & Khanna 2012	0	+	0	0		-	
	0	+	0	0		-	
Jensen et al 2003	+			+	0		-
Jensen et al 2004	+		+		+		
	+		+		+		
	+		+		+		
Srinivasan & Blomquist 2009		-	-	0		0	
Veisten 2002	+	0	0				
	-	0	0				
Veisten 2007	+	0					
	+	-					
	+	0					
	+	0					
Included	16	13	12	8	4	3	1
Significant	14	8	4	1	3	2	1
Positive significant	13	6	3	1	3	0	0
Negative significant	1	2	1	0	0	2	1
Insignificant	2	5	8	7	1	1	0
Percent included	84.2	68.4	63.2	42.1	21.1	15.8	5.3
Percent significant (included studies)	87.5	61.5	33.3	12.5	75.0	66.7	100
Percent significant (all studies)	73.7	42.1	21.1	5.3	15.8	10.5	5.3

Table B2. Vote-counting results for the consumers' environmental attitudes and habits

Publica tion	Positive orientati on to environ mental issues	Forest recreat ion habit	Seeks eco- label ed produ cts	Believes that certificat ion reduces tropical deforesta tion	Enga ged in hunti ng and/o r fishin g	Kno ws wha t eco- label s mea ns	Negat ive attitu de towar ds Nordi c forest ry	Thinks that Nordic forestry not conside ring biodiver sity enough	Negative impressio n of environm ental control of forest managem ent in the Nordic countries	Rec ycle s
Aguilar & Vlosky 2007			+	+						
			+	+						
			+	+						
Aguilar & Cai 2010										
Brouhle & Khanna 2012										
Jensen et al 2003	0	0	+		0					+
Jensen et al 2004	+	+	+		-					
	+	+	+		-					
	+	+	+		-					
Srinivas an & Blomqu ist 2009										
Veisten 2002	+	0					0	0	-	
	+	0					0	+	0	
Veisten 2007	0	+				+				
	0	0				0				
	0	0				-				
	0	0				+				
Include d	10	10	8	4	4	4	2	2	2	1
Signific ant	5	4	8	4	3	3	0	1	1	1
Positive significa nt	5	4	8	4	0	2	0	1	0	1
Negative significa nt	0	0	0	0	3	1	0	0	1	0

Table B2. Continued.

Insignificance	5	6	0	0	1	1	2	1	1	0
Percent included	52.6	52.6	42.1	21.1	21.1	21.1	10.5	10.5	10.5	5.3
Percent significant (included studies)	50.0	40.0	100.0	100.0	75.0	75.0	0.0	50.0	50.0	100.0
Percent significant (all studies)	26.3	21.1	42.1	21.1	15.8	15.8	0.0	5.3	5.3	5.3

Table B3. Vote-counting results for the label characteristics

Publication	Label provider: ENGO	Label provider: third party	Label provider: industry	Eco-label is forestry related	High amount of information provided for the respondent	Label provider: government
Aguilar & Vlosky 2007	0	0	0			
	+	+	0			
	+	+	0			
	0	0	+			
Aguilar & Cai 2010	+					+
	+					+
Brouhle & Khanna 2012						
Jensen et al 2003					0	
Jensen et al 2004					0	
					0	
					0	
Srinivasan & Blomquist 2009						
Veisten 2002	0	0				
	0	0				
Veisten 2007				+		
				0		
				+		
				+		
Included	8	6	4	4	4	2
Significant	4	2	1	3	0	2
Positive	4	2	1	3	0	2
significant						
Negative	0	0	0	0	0	0
significant						
Insignificant	4	4	3	1	4	0
nt						

Table B3. Continued.

Percent included	42.1	21.1	21.1	21.1	21.1	10.5
Percent significant (included studies)	50.0	75.0	25.0	75.0	0.0	100.0
Percent significant (all studies)	21.1	10.5	5.3	15.8	0.0	10.5

Table B4. Vote-counting results for the product characteristics

Publication	Products' own price	Environmental friendliness of the product	Premium's size	Origin: tropical forests	Origin: temperate forests	Wood material (species: birch=1, pine=0)
Aguilar & Vlosky 2007						
Aguilar & Cai 2010	-			-	+	
Brouhle & Khanna 2012	0			-	+	
Jensen et al 2003	0					
Jensen et al 2004			-			
			-			
			-			
Srinivasan & Blomquist 2009	-					
Veisten 2002	0	+				
Veisten 2007	-	+				+
	-	0				+
Included	9	4	3	2	2	2
Significant	6	2	3	2	2	2
Positive significant	0	2	0	0	2	2
Negative significant	6	0	3	2	0	0
Insignificant	3	2	0	0	0	0
Percent included	47.4	21.1	15.8	10.5	10.5	10.5
Percent significant (included studies)	66.7	50.0	100.0	100.0	100.0	100.0
Percent significant (all studies)	31.6	10.5	15.8	10.5	15.8	10.5