# The Effects of the 2008 Lacey Act Amendment on Chinese Companies in the Forest Products Industry

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A thesis

Submitted in partial fulfillment of the

Requirements for the degree of

Master of Science

University of Washington

2015

Committee:

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Program Authorized to Offer Degree:

School of Environmental and Forest Sciences

## Abstract

Illegal logging is a prevalent problem that threatens forest conservation around the world, and thus has come into the spotlight of global forest policy. The 2008 US Lacey Act Amendment is one of the most important consumer country timber legality regulation initiatives to tackle illegal logging in global forest product trade. It requires that timber imports be sourced from legally harvested wood, and could have profound impacts on China's re-exports of manufactured wood products to the US. This study aims to assess the effect of the Lacey Act Amendment on Chinese companies and illuminate how it exerts the effect empirically. The first phase of this study examines how Chinese wood manufacturer's sales to the US have changed in response to the Lacey Act Amendment with a standard ordered probit model. The second phase of this study examines the effect of the US Lacey Act Amendment 2008 amendment on Chinese companies' export cost to US with a zero-inflated ordered probit model, including in the analysis the Chinese companies' characteristics and sourcing behaviors. A sample of 225 Chinese wood manufacturers was drawn from two trade shows in Shanghai, China, in 2013.

Chinese companies' familiarity with the Lacey Act Amendment may affect their ability to control their cost to export to the US, and the results reveal that Chinese companies' awareness of the Lacey Act Amendment has played an important role in their decision to export to the US over the last 5 years. The smaller Chinese companies were more likely to withdraw from the US market in the aftermath of the Lacey Act Amendment as compared to their larger counterparts. The Chinese companies who have increased their imports of raw materials from the US were found to have increased their sales to the US market over the last 5 years. The more the company is familiar with the Lacey Act Amendment, the more likely that they will increase their exports to

the US market. The US Lacey Act Amendment has also had an impact on Chinese companies' export costs by changing their sourcing behaviors. Chinese companies have been encouraged by the Lacey Act Amendment to adopt more COC certified raw materials, as well as more reliable temperate softwood raw materials instead of risky tropical hardwood raw materials.

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# Chapter 1- Introduction to the Study

## 1.1 Illegal logging and related trade

### 1.1.1 Definition of illegal logging

Due to the multifarious nature of illegal logging, there is no single definition of illegal logging. According to World Wildlife Fund (WWF)[1], Illegal logging includes harvesting, transporting, processing, buying or selling of timber in violation of national laws. This definition also applies to harvesting wood from protected areas, exporting threatened plant/tree species, and falsifying official documents. It further includes breaking license agreements, tax evasion, corrupting government officials and interfering with access and rights to forest areas.

According to the Four Corners[2] , Illegal logging can be described as forestry practices or activities connected with wood harvesting, processing and trade that do not conform to law. Illegalities occur throughout the chain from source to consumer; the harvesting procedure itself may be illegal, including corrupt means to gain access to forests, extraction without permission or from a protected area, cutting of protected species, or extraction of timber in excess of agreed limits. Illegalities may also occur during transport, including illegal processing and export as well as inaccurate declarations of goods to customs, before the timber enters the legal market.

According to Food and Agriculture Organization (FAO)[3], in a general sense, "illegal logging takes place when timber is harvested, transported, bought or sold in violation of national laws (Brack & Hayman, 2001)[4]. This broad definition includes almost any illegal act that may occur between the actual growing of the tree to the arrival of the forest-based product in the hands of the consumer.

According to International Tropical Timber Organization (ITTO), the term illegal logging is used to refer to timber harvesting-related activities that are inconsistent with national (or regional) laws, in the context of forest management or sustainable forest management. Illegal activities in the forest sector can span the entire industry from wood harvesting and transport to industrial processing and trade. Illegal cutting includes logging inside protected areas or outside concession areas. Logging within allocated concessions can be illegal if it does not conform to the law. Other types of illegal activities include under-reporting the amount cut, false reporting of the species harvested to avoid higher taxes, the illegal transport of timber, and the poaching of wildlife in areas opened up by timber-cutting.

### 1.1.2 Extent of illegal logging

Illegal logging is currently one of the most prominent global forest policy issues. It appears to occur in many countries throughout the world, especially high-risk countries such as China, Russia and all countries in tropical regions (Contreras-Hermosilla, et.al., 2008)[5]. It is estimated that approximately 70 countries are affected by illegal logging problems (WWF, 2002). Credible evidence suggests that illegal forest activity (of the type that rises to a level of international concern) represents between 5% and 10% of global industrial round wood production – approximately 4% for softwood, but 15% for hardwood (Seneca Creek 2004)[6]. In high-risk countries, it is estimated that the extent of illegal logging ranges between 20% - 90% of total production, with the median being around 40%. More recently, research by Chatham House (Lawson and MacFaul 2010)[7] concluded that illegal harvesting represented 35-72% of logging in the Brazilian Amazon, 22-35% in Cameroon, 59-65% in Ghana, 40-61% in Indonesia and 14-25% in Malaysia.

Illegal logging and the international trade in illegally-logged timber are major problems for many timber-producing countries, particularly in the developing world (Brack and Buckrell 2010)[8]. However, it is important to note that illegal logging is not confined to developing countries. In Canada, research on compliance in British Columbia estimated that between 1998 and 2001 forest companies logging on the West Coast avoided paying US$149 million to the provincial government by 'grade setting' – including an inaccurately high proportion of low-value wood in the samples used by the government to set the stumpage fee (Contreras-Hermosilla 2002)[9]. An analysis of mahogany imports into the US in 1997– 1998 estimated that at least 25% of sawnwood imports (worth more than US$17 million a year) were illegal (Blundell 2000)[10]; the figure did not include trade unreported to US Customs and so the true magnitude is therefore likely to be much higher.

### 1.1.3 Causes of illegal logging from the perspective of producing countries

The high-risk countries defined above are, in broad terms, responsible for 30% of total production and 20% of end use consumption in the world. The high-risk countries are all timber-providing countries except for China, which is the world's largest wood processing country that imports massive amounts of raw materials primarily from the high-risk timber-providing countries (Contreras-Hermosilla, et.al., 2008). In these high-risk timber-producing countries, poor logging practices, i.e. illegal logging, can be mainly accounted for by government and market failures (Palmer 2001)[11], and further encouraged by institutional failures.

The most important underlying causes of illegal logging issues are market and government failures in timber-providing countries (Pearce and Brown 1994)[12]. Government failure occurs both when the state fails to take action to correct market failures, and when policies are

implemented which further distort prices and cause disincentives for sustainable management (Palmer 2001). Examples of market and government failures include: near-monopolistic effect due to political patronage (Brown 1999) [13] ; short-term timber concessions and uncertainty/insecurity of property rights that lead to overly rapid and irresponsible expansion of timber harvesting; logging and export bans that lead to overcapacity in wood-processing industry and distorted price; very low taxation and fee charges (perverse subsidy) that bring in "superprofits" to the private sector, thus encouraging rapid and inefficient logging, wasteful consumption, and irresponsible road-construction that contributes to forest loss and degradation.

Institutional failure is constituted by a failure to implement effective interventions against illegal logging. Examples of institutional failure include flawed and inconsistent logging laws that result in violations of logging regulations(Smith et al, 2006) [14], limited monitoring and law enforcement capacity to oversee and scrutinize the sector, null penalty systems for forest crimes (McGrath and Grandalski 2000), abuse of permits and authorizations, and confusing taxation regimes (Callister 1999)[15].

The symbiotic relationship between illegal logging and corruption within the context of governance has been widely discussed and highlighted in academia (Callister 1999, Palmer 2001, Contreras-Hermosilla 2001). Corruption, or the abuse of public office for private gain (World Bank 1997), exacerbates illegal logging primarily by allowing it to occur unchecked and unpunished (Callister 1999). In some cases, grand corruption may be present at the top of government, affecting the formation and the objectives of forest policy and leading to government and market failures. In other cases, petty corruption is present amongst low-level officials, leading to the formation of local-level networks of illegal logging (Obidzinski and Suramenggala 2000)[16], that

brings about institutional failure (Palmer 2001). Corruption can be collusive and more persistent within weak and fragmented governments (Smith, Joyotee, et al. 2003)[17] who have a precarious hold on power and are characterized by political instability, anarchy and local fiefdoms (Frye and Shleifer 1997). Corruption also poses a corrosive challenge to improved governance.

### 1.1.4 The responsibility of the consuming countries in the context of forest product trade

Recent years have seen a growing awareness of the issues of illegal logging and the associated responsibility of consumer countries (Lawson and MacFaul 2010). The consumer countries play an important role in driving the demand for timber and timber products, hence increasing the incentives for illegal logging in providing countries (Brack 2005)[18].

Global consumer countries are primarily USA, EU and Japan. They are responsible for around 70% of the world's end-use consumption, and their consumption is much higher than domestic production. In this way, these consumer countries are the biggest net importers of wood products and overwhelmingly dominate forest trade (Contreras-Hermosilla, et.al., 2008).

Global forest-product trade has been established for centuries and can be regarded as a traditional part of international trade. The forest products sector is estimated to contribute to about 1% of world GDP and accounts for approximately 3% of international merchandise trade (Contreras-Hermosilla, et.al., 2008). In 2002, the global value of wood products trade (HTS Chapter 44)[1] can be estimated at approximately $69 billion, based on data available through the Global Trade Information Service (GTIS)[19]. Pulp, paper and paperboard trade would add another $117 billion, bringing the total value of forest-products trade to $186 billion (Seneca Creek 2004).

[1] Note: Harmonized Tariff Schedule of United States (2012) (rev.2) Chapter 44 includes: wood and articles of wood, wood charcoal.

Beneficial results of the global forest trade are comprised of the positive social and economic contributions and potentials that these commodity chains exert on stakeholders in participating countries. First, timber-producing countries can attract capital and catalyze local employment and economic development. Second, processors can make huge volume of the benefits through trade. Third, for consumer countries—in volume terms, mostly developed countries—this global commodity chain has brought large quantities of inexpensive yet quality products to their consumers (Sun, et.al., 2008)[20].

However, the amount of forest product trade related with illegal logging is alarming. Thus, consumer countries contribute to the illegal logging problems in the context of forest product global trade, by importing timber and wood products without ensuring that they are legally sourced (Brackand Buckrell 2010)[21]. In the mid-1990s, illegal forest product trade irregularities were estimated to be 15% of the total trade (Brack and Hayman 2001). Between 5 and 10% of the value of the global wood products trade is likely to have been illegally sourced. Illegal logging that warrants international concern roughly represents 8%-10% of the share of global wood products trade in logs, lumber and wood panels (Seneca Creek 2004). High-risk exports amount to approximately 15% of total world-wide industrial wood removals per year (Contreras-Hermosilla, et.al., 2008).

### 1.1.5 The impacts of illegal logging

Illegal logging presents many benefits for some stakeholders, such as the alternative land users and those who are involved; national or local governments; military and police forces; the poor and unemployed who derive an income from illegal logging; national industries who gain

the competition due to lower timber prices; and the consumers who can access cheaper products (Tacconi 2007)[22].

Much of the academic discussion on this topic focuses on the negative impacts of illegal logging. The negative environmental and social impacts of illegal logging are similar to those of poor forest management, including increased erosion, increased sedimentation of watercourses, flash floods and landslides, and the loss of biodiversity (Lawson and MacFaul 2010). The negative social impacts include lack of access to forest resources for forest-dependent communities, potential loss of earnings from forest-related activities (Amariei 2005)[23], and a degraded environment that will not be able to sustain the livelihoods of forest-dependent people in the near future (Casson and Obidzinski 2002)[24].

The negative economic impacts of illegal logging are manifold and a pressing topic of academic discussion. Illegal logging causes losses in excess of US$15 billion per year (Contreras-Hermosilla, et.al., 2008) in the countries in which it occurs. In Indonesia, the government is thought to lose a minimum of US$600 million a year in revenue as a result of non-payment of taxes due to illegal logging (World Bank, 2006)[25]. The Cameroon government is estimated to lose between 5 and 10 million USD/year in revenue from the felling tax alone due to illegal activities (World Bank/WWF Alliance, 2002)[26].

The consumer countries are not exempted from the negative economic impacts of illegal logging. Illegal timber is presumably obtained at a lower cost (Seneca Creek 2004) and is therefore sold at a lower price (domestic and international) than legally produced products. This hinders the competitiveness of legal products (Lawson and MacFaul 2010), mainly of products legally produced in the consumer countries defined above. Additionally, the forest products

global markets are distorted. Estimated show that the world price may have been depressed by the illegal material by 7% -16% on average, and US prices are depressed by 2% - 4% (Seneca Creek 2004). The ability of US producers to export has been significantly affected by foreign illegal materials.

Some studies simulated the trade situation without illegal logging and thus the opportunity cost for the affected countries. The simulation in 2004 showed that without illegal volume in the global market, US exports of sawnwood and wood panels could have increased by a cumulative total of more than $2.8 billion through 2012, or an average of $275 million annually. The average annual increase in the value of US roundwood exports could have also increased by an estimated $186 million, bringing the projected total annual increase in value of wood product exports to just over $460 million, in real dollar terms (Seneca Creek 2004). Another study in 2007 on the long-term effects of eliminating illegal logging shows that without illegal logging the world prices would rise by 1.5 to 3.5% for industrial round wood and by 0.5 to 2% for processed products. Changes in producer revenues would be almost twice the changes in consumer expenditures in countries with little illegal logging and efficient industries, such as Canada, Germany and the United States. The value in forest industries would decrease most in countries with heavy illegal logging (12% in Indonesia and up to 9% in Brazil), and it would increase most in Germany, Canada (4%), and the United States (2%) (Li et al. 2008)[27].

## 1.2 International strategies to combat illegal logging

As stated above, illegal logging and the international trade in illegally-logged timber are major problems for timber-producing countries. The supply side measures in these timber-producing countries to prevent illegal logging aims to increase the risk of punishment of illegal behaviors

and increase the benefits of sustainable forest management. It mainly includes improvement of sector governance and law enforcement, such as improving land tenure and land ownership rights, streamlining the legal framework, achieving a reasonable balance between demand and supply of industrial forest raw materials, attacking the financing of illegal operations, improving the profitability of legal forest management and logging by promoting payments for environmental services, and combating corruption (Contreras-Hermosilla, et.al., 2008).

In addition, there are several initiatives directly involving private sector corporations that require measures in both producer and consumer countries. The most important—and the prerequisite to controlling international trade—is an effective certification system (Contreras-Hermosilla, et.al., 2008). Certification is the process whereby an independent third-party (called a certifier or certification body) assesses the quality of forest management in relation to a set of predetermined standard requirements. The certifier gives written assurance that a product or process conforms to the requirements specified in the standard (Rametsteiner and Markku Simula., 2003)[28]. Many certification schemes are national in scope; the two with the greatest global coverage are the Forest Stewardship Council (FSC), set up in 1993 mainly by environmental NGOs, which accounts for 28% of certified forests; and the Program for the Endorsement of Forest Certification Schemes (PEFC), founded in 1999 as the European forest owners' and forest industry's answer to FSC. PEFC now acts as a recognition mechanism for national schemes worldwide and accounts for 65% of certified forests (Brack 2008)[29].

Until recently, importing countries had no legal mechanisms to reject illegal timber even if they could detect it. However, over the last few years, consumer countries have taken a series of measures to try to ensure that they exclude illegal timber products from their markets (Brack and

Buckrell 2010). Their demand side measures attempt to reduce rewards for illegal logging by discriminating between legally and illegally-sourced wood products and closing markets in consumer countries (Contreras-Hermosilla et.al. 2008).

There are several complementary international schemes launched by developed countries from the demand side to combat illegal logging:

### 1.2.1 Procurement policy

Public-sector and private-sector timber procurement policies (TPPs) are demand-side tools designed to strengthen forest governance and promote sustainable forest management (Simula et al. 2010)[30]. The objective of the timber procurement policies (both public-sector and private-sector) are to promote legally and sustainably-produced products, and to exclude illegal and unsustainable products from the market altogether through regulatory measures.

In all developed countries, government – central, regional and local – is a major consumer of products and services. The impacts of procurement policies suggest that government procurement can achieve market leverage of up to 25% of the market (compared with about 10% for direct purchases) when the wider indirect knock-on impacts are included (Simula, 2006)[31]. Several EU member states, and a number of other countries, now possess government procurement policies aimed at ensuring that public purchasers source only legal and/or sustainable timber and wood products (Brack 2008), and nine countries currently possess some form of timber procurement policy at the central government level. In addition, in the last fifteen years, progressive private-sector companies have implemented their own TPPs as tools to mitigate their reputational risks and to make use of environmentally-sensitive market segments for timber and timber products (Simula et al. 2010).

Among various other approaches, the private certification schemes are the main mechanism for government procurement policies to ensure that the products purchased meet their criteria for legality and sustainability. In addition, all these countries must also possess some system for assessing claims by suppliers that their products meet the sustainability or legality criteria even if they are not certified by any recognized schemes. This is partly because the volume of certified material available is so low, and partly (for EU member states) because EU procurement rules require that procurement policies must rest on criteria, not on membership of any particular scheme (Brack 2008).

Procurement policies are effective because they can be developed and implemented more rapidly than most other policy options (Brack and Buckrell. 2010). Market research shows that the market share of legally certified and sustainable timber products has grown steadily since the introduction of public procurement policies (Simula et al. 2010). However, price premiums are observed for legally produced timber – in some cases as high as 30%, but more commonly 3-5%. As a result of this general price increase and the cross-price elasticities between tropical timber and competing materials, there would be substitution effects between tropical and other types of timber, particularly temperate hardwoods. Tropical timber is likely to fail on the market due to the higher relative costs of achieving sustainability and its certification (Simula et al. 2010).

TPPs constitute only one of the demand-side options, and they have close linkages with other regulatory and voluntary measures. An optimal mix of available demand-side instruments, such as international agreements and timber legality regulations, is needed to achieve the identified policy goals (Simula et al. 2010).

### 1.2.2 International agreements

The EU as a whole is a major global importer of timber and wood products. Several countries from which EU Member States import these products suffer from extensive illegal activities. In 2003, the EU's Action Plan for Forest Law Enforcement, Governance and Trade (FLEGT) was published by the European commission and approved by the EU Council (Brack 2005). EU attempts to exclude illegal products from its imports and to build markets for verifiably legal products through its FLGT initiatives, and the FLEGT Action Plan remain the most ambitious set of measures adopted by any consumer country or bloc to date (Brack and Buckrell 2010).

The FLEGT Action Plan set out a range of measures available to the European Union and its Member States to tackle illegal logging in the world's forests. Among those measures, the FLEGT Voluntary Partnership Agreements (VPAs) are the core approaches (Brack and Buckrell 2010). The VPAs are bilateral agreements between the European Union and the tropical wood-exporting countries, which aim to improve forest governance and guarantee that the wood imported into the EU is from legal sources (EU FLEGT Faculty)[32]. The negotiations of FLEGT VPAs with timber-producing countries mainly include the establishment of a licensing system under the terms of VPAs. The licensing system is designed to identify legal products and license them for import to the EU, and to prevent the export of timber products that have not been licensed as legally produced from the partner country. In many ways this licensing approach resembles the voluntary forest certification schemes (such as FSC and PEFC), with the important difference that the FLEGT systems will apply to all of a country's timber production (Brack and Buckrell 2010). Although there will be costs associated with the establishment of the licensing system, they are not likely to be very high (Brack 2005).

By ensuring that timber imports from FLEGT Partner countries are legal, the EU can create economic incentives for improving forest governance. The aim is not simply to reduce illegal deforestation, but to attempt to tackle poverty and encourage economic development (EU FLEGT Faculty). Thus far the EU's FLEGT VPAs are the only international arrangements which include direct measures to curb illegal logging. On the contrary, other international agreements such as the Memoranda of Understanding (MoUs) between producer and consumer countries do not include formal measures to prevent illegal trade (Lawson and MacFaul 2010). By the end of 2010, the bilateral VPA negotiations had been concluded with Ghana, the Republic of Congo, Cameroon, and the Central African Republic, and were under way with Indonesia, Liberia and Malaysia. Gabon, the Democratic Republic of Congo and Vietnam started negotiations in 2010, and many other countries, particularly in Africa and Southeast Asia, have expressed an interest in entering negotiations (Brack and Buckrell 2010).

However, the obvious weakness of the proposed licensing system is that some producer countries may choose not to enter into partnership agreements, in which case no controls will be applied to their exports to the EU. This, in turn, may provide a relatively straightforward means of trans-shipping illegal products from partner countries through non-partner countries, effectively "laundering" them into the legitimate market. Once products that have been illegally produced overseas enter the EU it seems unlikely that any action can be taken against them. It is hoped that this problem will be minimized by the main producer countries all signing partnership agreements. In addition, the domestic legislations are supposed to be used to target products produced illegally overseas, but it seems unlikely that much of this domestic legislation will be useful: it may not be applicable where the original crime takes place in a foreign country, or, if it

is, it may require evidence and witnesses, and sometimes even the existence of a court case or conviction, from the country of origin – none of which are easy to obtain – before it can be applied (Brack 2005).

### 1.2.3 Timber legality regulations (legality verifications)

Pressure on illegal logging is expected to become stronger in the future, when the forest sector at large shifts emphasis from resistance to proactive measures, from "soft" policy voluntary tools to the "hard" regulatory instruments (Simula et al. 2010). In light of all these concerns, the timber legality regulations, the US Lacey Act Amendment and the EU Timber Regulations come into force.

The Lacey Act Amendment is a 100-year-old law that combats trafficking in illegal plants and wildlife. The Lacey Act Amendment marked the world's first-ever law prohibiting trade of illegally logged wood products (EIA 2009)[33]. It is designed to stem the flow of goods from illegally harvested wood and to document the foreign sources of wood-based products (Wang et al. 2010)[34]. Under this law, all trade in plant or plant products that are illegally sourced from any US state or foreign country is prohibited (EIA 2009).

The Lacey Act Amendment includes a definition of "illegal timber" in response to industry concerns about what exactly should be prohibited (Brack and Buckrell 2010). There are two components to a violation of the Lacey Act Amendment. First, a plant must be taken, harvested, possessed, transported, sold or exported in violation of an underlying law in any foreign country or the US Second, a person or company must trade this illegally-sourced plant in US interstate or foreign commerce. The range of relevant laws includes theft, logging in protected areas or without authorization, payment of taxes and fees, and transport regulations (EIA 2009). Another

additional feature included in the amendment was a requirement for an import declaration (Brack and Buckrell 2010), which requires the importers to declare the country of origin of harvest and species name of all plants contained in their products (EIA 2009).

The companies are required to practice "due care" under the Lacey Act Amendment in order to guard against liability (EIA, 2010)[35]. "Due care" means "that degree of care at which a reasonably prudent person would exercise under the same or similar circumstances" (EIA 2009). In practice, "Due care" is a flexible concept that remains to be determined through case law (Brack and Buckrell 2010). The Lacey Act Amendment provides a powerful combination of penalties, including forfeiture of goods and vessels, fines and jail time (EIA 2009), mainly on the level of intent and the "due care" that can be shown on the part of the violator.

The Lacey Act Amendment is a fact-based rather than a document-based statute. Documents contribute toward demonstrating due care and assessing legality, but are not proof of legality. It is important to look behind the documents to determine whether the company truly eliminates illegal wood from their supply chain or not. The burden of ensuring this proof is on the US Government. Specifically, the legality verification and the certification under third-party schemes constitute and demonstrate "due care" but are not required by law, nor are they a get-out-of-jail free card (EIA 2009,2010).

The Lacey Act Amendment is in many ways very strong and very thorough (Lawson and MacFaul 2010). It provided the US with an effective means of encouraging the timber industry to exercise 'due care' and preventing imports of illegal timber. It belongs to the broader measures that can be implemented more quickly and with greater coverage compared with FLEGT VPAs (Brack and Buckrell 2010). To some extent, it makes procurement policies unnecessary in US since

illegal wood should not be able to enter US at all (Lawson and MacFaul 2010). It is likely to encourage the spread of private certification and legality verification systems, and promote the uptake of FLEGT-licensed products when these become available (Brack and Buckrell 2010). Chatham House's indicators have already identified positive effects of the Lacey Act Amendment in terms of the response of producer and processing-country governments and the private sector (Lawson and MacFaul 2010).

However, some have argued that the Lacey Act Amendment's effectiveness may be weakened by the potentially high level of expense and resources required to identify crimes and carry out prosecutions (Lawson and MacFaul 2010). A long and complex supply chain is often a distinctive factor for timber products, as they often go through many intermediaries, making it increasingly difficult to recognize a particular product or to keep track of its origin (Saltzman 2010)[36]. Timber companies complain that they are left in a state of uncertainty and ambiguities about the declaration requirements and the extent to which the provision would be enforced (Saltzman 2010; Tanczos 2011) [37] . Forestry codes in some countries are so vague and contradictory that they are hard to follow even for loggers with good intentions, and even more difficult for American judges to interpret. Additional documentation requirements are burdensome (Cashore and Stone 2010), imposing substantial costs in terms of reducing international trade flows (Tanczos 2011).

The EU FLEGT action plan highlights the need to review the feasibility of a legislation to control imports of illegal logging (Buckrell and Hoare 2013)[38] given the concerns regarding its effectiveness. Inspired by the US Lacey Act Amendment and its ability to cover all countries simultaneously, the EU Council and Parliament adopted the "EU Timber Regulation" in 2010,

which requires that importers not covered by VPAs also avoid importing illegal timber (Cashore and Stone 2010)[39]. It was applied in 2013, three years after its adoption, to allow time for the development of secondary legislation (Brack and Buckrell 2010).

The EU's 2010 Timber Regulation is expected to have a similar impact as the Lacey Act Amendment (Brack and Buckrell 2010). The Regulation prohibits the placing of illegally harvested timber and timber products on the European market, and requires that those placing timber on the market (referred to as 'operators') exercise due diligence to minimize the risk that it is illegally harvested (Buckrell and Hoare 2013). The use of certification or other third-party-verified schemes can help to demonstrate due diligence, but it does not amount to proof of legality (Buckrell and Hoare 2013).

The differences between the Lacey Act Amendment and the EU timber regulation lie primarily in their coverage of actors in the supply chain and specifications of requirements for compliance. The Lacey Act Amendment's offence of handling illegal timber applies to all actors in the supply chain and allows them to establish a system to avoid committing such an offence. The prohibition offence in the EU regulation applies only to operators but provides some operational details to avoid handling illegal products (Brack and Buckrell 2010).

## 1.3 Strategic Response to Legality Legislation – a Similar Case

The timber legality regulations are not the only case of import restrictions for environmental protection. In the 1960s, high dolphin mortality caused by yellowfin tuna fisheries reached public awareness (Nafziger and Armstrong 1976)[40]. During this time the US fleet dominated the fishery; In 1960, US vessels accounted for about 85% percent of the international tuna fleet in the Eastern Pacific Ocean (Pella and Psaropulos 1975)[41]. However, in the 1970s, the levels of dolphin

mortality caused by the non-US fleets began to rise, and the problem of dolphin mortality rose to international concern. Despite the international scale, the United States consumed about 85 percent of the yellowfin tuna from the Eastern Pacific, and thus was the most important market for tuna in the world.

Given the great responsibility of the US the for tuna fishing in association with dolphins, the Marine Mammal Protection Act (MMPA) of 1972 was enforced (Eberhardt 1977)[42].This Act issued a general permit to the US tuna fleet that allowed the vessels to continue fishing for tunas associated with dolphins with a limit of permissible mortality. Also, the MMPA provides a ban on "the importation of commercial fish or products from fish which have been caught with commercial fishing technology which results in the incidental kill or incidental serious injury of ocean mammals in excess of United States standards". Further, in the MMPA 1984 Amendment, the application of import restrictions was allowed against foreign vessels, and the nation under whose flags such vessels operated, fishing for tuna associated with dolphins "in excess of United States standards" (USDC 1985)[43]. Again, the MMPA 1988 Amendment requires all tuna-fishing nations to: (1) furnish documentary proof that it has a regulatory program governing the taking of marine mammals in the fishery that is comparable to the US program; (2) the average rate of incidental mortality of marine mammals in the fishery caused by that nation's fleet has to be comparable to that of the US fleet. Any nation failing to meet these requirements is subjected to a primary embargo which prohibits the importation of that nation's yellow-fin tuna and subsequent products (16 US Code § 1361).

In 1990, several of the largest US tuna-canning companies announced that they would no longer purchase tuna from purse-seine vessels fishing in the Eastern Pacific unless such tuna was

accompanied by a certification that it was not taken in associated with dolphins (Write 2000)[44]. The Dolphin Protection Consumer Information Act was passed by Congress, and the use of a "dolphin safe" label was provided on cans of tuna not caught in association with dolphins (D'Souza 2000)[45].

Dolphin mortality in the fishery declined in response to pressure from environmental groups and the US Congress. From 1976 through the early 1980s it once again declined to about one-third of the 1972-1976 levels. Between 1986 and 1991, dolphin mortality due to the fishery fell by 80% (Joseph 1994)[46].

At the same time, the US embargo and canners' "dolphin-safe" policy changed the world trade in tuna dramatically. Domestically, the US vessels departed the Eastern Pacific because fishing for tuna unassociated with dolphins is not economically feasible (Joseph 1994). Internationally, the US embargo and "dolphin-safe" policy greatly impacted the previous exporters who were not able to comply and thus embargoed by the US. Firstly, these exporters, mainly Latin American states managed to develop alternative markets for their catch. After the US closed to the imports of tuna from the Eastern Pacific, the catch from the Eastern Pacific diverted to Europe, the second largest market. The resulting abundance of supply and the lack of competition from the US canners led to a precipitous fall in the price of fish in Europe[47]. Secondly, the Latin American states involved in the fishery increased their internal consumption of tuna. From 1975 to 1992 the amount of yellowfin tuna from the Eastern Pacific consumed by the US fell from 85% to 10%. During the same period, Mexico's internal consumption rose from about 20000 to about 100000 tons; the same effect can be seen in other fishing nations (Joseph 1994).

## 1.4 Thesis structure

The thesis encompasses 5 chapters. Chapter 2 illustrates the framework of this research. It composes of the problem statement, the research objectives and questions, survey methods, overview of survey results and the modeling approach. Chapter 3 contains the results and the discussions for the first phase of this research, which cast light on the factors that influence Chinese companies' export decisions to the US market. Chapter 4 contains the results and the discussions for the second phase of this research, which explains the factors that influence the Chinese companies export cost increase to the US market due to the Lacey Act Amendment. Chapter 5 illustrates the final conclusions and limits of this research.

# Chapter 2 - Research framework

## 2.1 Problem statement / introduction and motivation

About 15% of the earth's forests and woodlands have disappeared as a result of human activities over the past century. It is estimated that the net deforestation at the global level occurred at the rate of 0.14% per year between 2005 and 2010, 0.12% between 2000 and 2005, and 0.2% between 1990 and 2000 (FAO 2010)[48]. While deforestation is not necessarily wasteful or destructive, wasteful deforestation that replaces highly valued forest resource with lower-value alternative uses is widespread. Extensive deforestation is associated with a loss of biodiversity, climate change, threat to the cultural survival of indigenous population, degradation of watersheds, and desertification in the dry tropics (Rowe 1992)[49].

Despite the fact that the temperate and boreal zones are the regions where most of the forest gains are located (FAO 2010), the rate of deforestation is still alarming in many countries, and the tropical area accounts for the most deforestation: the FAO report in 2000 included estimated annual losses of natural forest area of 15.2 million hectares in the tropics and 16.1 million hectares worldwide; and net deforestation (taking into account expansion of natural and planted forests) of 12.3 million hectares in the tropics and 9.4 million hectares worldwide (FAO 2001)[50].

Much of the deforestation that takes place in the tropics is wasteful and induced by illegal logging (Contreras-Hermosilla et.al., 2008). A research by Chatham House (Lawson and MacFaul 2010) concluded that illegal harvesting represented 35-72% of logging in the Brazilian Amazon, 22-35% in Cameroon, 59-65% in Ghana, 40-61% in Indonesia and 14-25% in Malaysia.

Among the causes of the illegal logging, besides the governance problems in these raw-material-providing tropical countries, the consumer countries play an important role in driving

the demand for timber and timber products (Brack 2005), by importing timber and wood products without ensuring that they are legally sourced (Brack and Buckrell 2010). It's worth noting that between 5 and 10% of the value of the global wood products trade is likely to have been illegally sourced. Illegal logging that warrants international concern constitutes approximately 8%-10% of the share of global wood products' trade in logs, lumber and wood panels (Seneca Creek 2004). High-risk exports amount to approximately 15% of total world-wide industrial wood removals per year (Contreras-Hermosilla, et.al., 2008). This portion of illegal logging-related trade flow increases the incentives for illegal logging in providing countries. The objective of the consumer side initiatives to combat the illegal logging is to eliminate the amount of the illegal logging-related trade, by refusing to buy any illegal or suspicious forest product from providing countries.

In the world, the consumer countries are mainly USA, EU and Japan. They are responsible for around 70% of the world's end use consumption, and their consumption is much higher than domestic production. In this way, these consumer countries are the biggest net importers of wood products and overwhelmingly dominate forest trade (Contreras-Hermosilla, et.al., 2008).

Fig.1 and Fig. 2 display the top six importers of wooden products in the world, which are wooden furniture and wooden flooring in this study. The United States is the world's largest importer of wooden furniture, following by Germany, France, United Kingdom, Japan and Switzerland. In the year 2013, the import value of the United States for wooden furniture was 9334 million dollars, which takes up 26.5% of the world total. The United States is also the world's largest importer of wooden flooring, followed by Canada, Japan, France, Germany, and United Kingdom. In the year 2013, the import value of the United States for wooden flooring was 1073

million dollars, which takes up 23.6% of the world total. The import value of the United States for wooden furniture and flooring far exceeds that of any single countries.

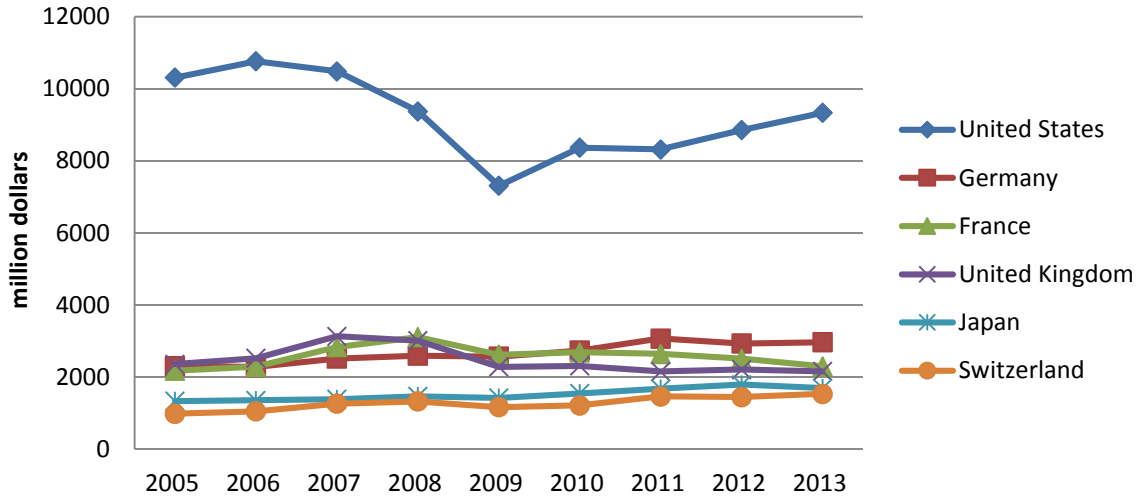


**Figure 1 Top 6 Importers of Wooden Furniture**

Source: Global Trade Atlas 2012. Wooden furniture represent HS 940330, 940340, 940350 & 940360.

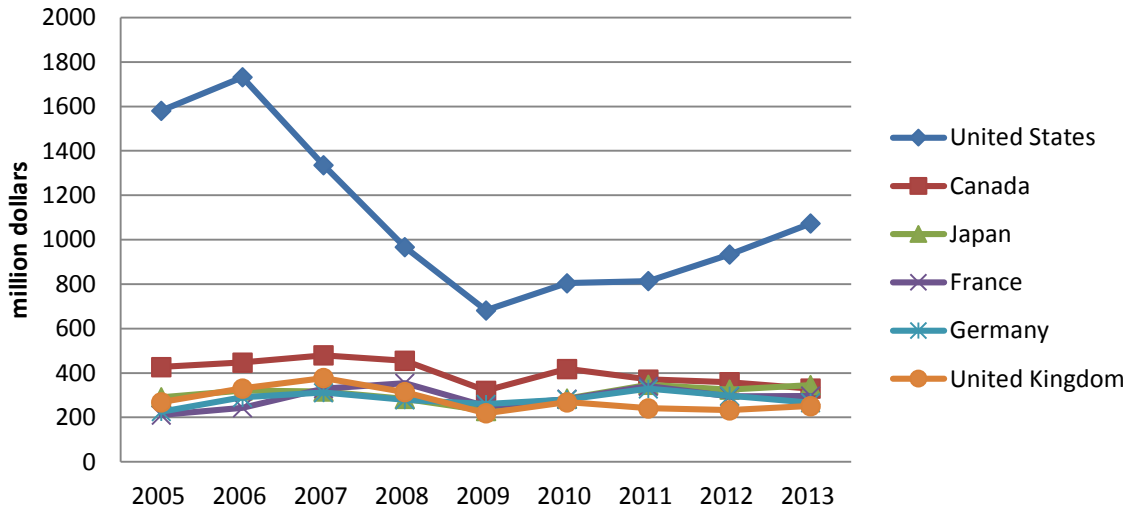


**Figure 2 Top 6 Importers for Wooden Flooring**

Source: Global Trade Atlas 2012. Continuously shaped wood (HS 4409) used as Proxy for solid wood flooring.

China is now in the world's spotlight regarding its global impacts on forests and forest industries (White et al. 2006)[51], especially on its implications for illegal logging issues. Since the

21st century, China has rapidly become the wood workshop of the world, capturing almost a third of the global trade in furniture.

Figure 3 displays China's raw timer (log) sourcing regions. According to Figure 3, many supplier countries of China are countries where illegal harvesting and other legal violations are well documented (Gregg and Porges. 2008)[52], particularly those with weak governance records. They have increasing trade flows into China that associated with illegal logging (Sun et.al. 2008). The largest supplier of timber to China is Russia, where half of the logging is illegal and losses to the state run as high as US$1 billion. China is the number one buyer of timber from many of the countries most affected by the scourge of illegal logging, such as Liberia (47% of exports destined for China), Burma (42%) and Cambodia (78%) – all countries where the sale of stolen timber has fuelled armed conflict. China's imports also include illegally-logged timber from Gabon, Papua New Guinea and Thailand. With as much as 44% of imports estimated to have been felled illegally at the source, China is actually the largest buyer of stolen timber in the world (EIA 2005)[53].

On the other hand, China is also a significant exporter of processed wood products and is thus designated as a processing rather than a consumer country (Lawson and MacFaul 2010). A global commodity chain of forest products has been formed with China at the center as the manufacturing base, importing primary raw materials from developing countries and exporting finished products to major consumers in developed Western countries (Sun et.al. 2008). In 2013, China's export value in wood furniture awss 8811 million dollars, which constitutes for 30% of the world total. In 2013, China's export value in wood flooring was 647 million dollars, which takes up 14.11% of the world total. Potentially a large amount of illegal or suspicious processed wood products are exported to the final consumer countries from China.

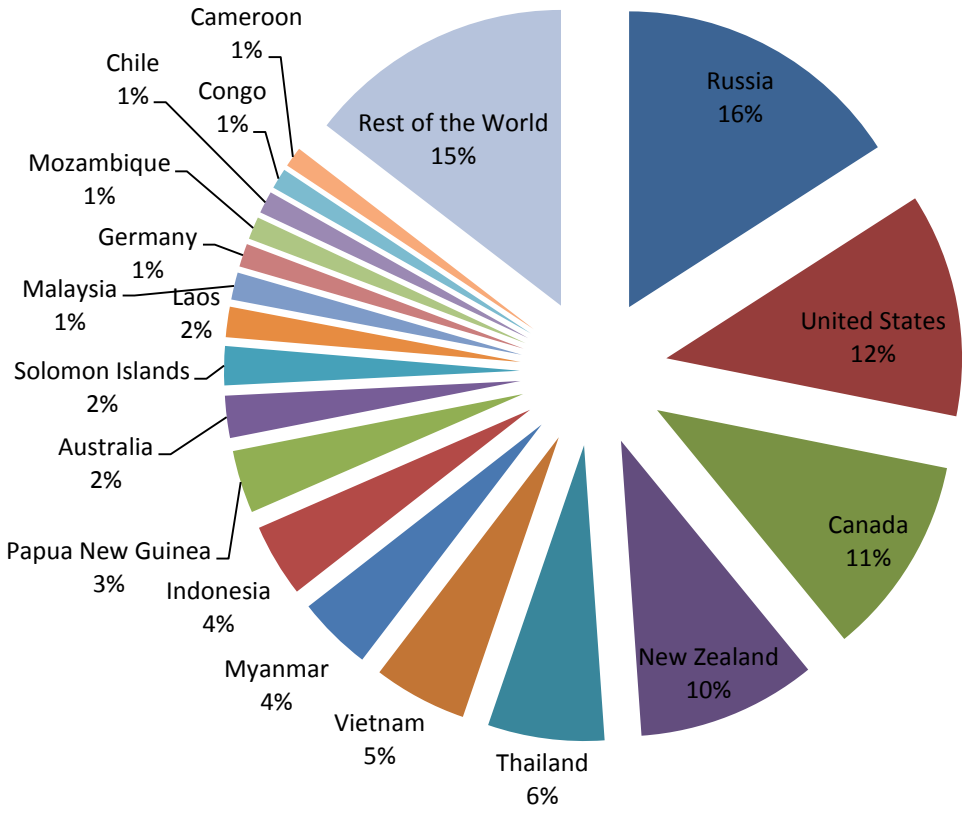


**Figure 3 China's Log Sourcing Regions in 2012**

Chinese wood products have been mainly exported to the US, the EU and Japan. China and the US are the top two largest wood products trading countries, with China's total value of wood products trade (imports and exports combined) surpassing that of the US in 2010. Figure 4 and 5 display the value of export wooden furniture and flooring from China to the US. The U .S. has been the largest buyer for wooden furniture and flooring from China. China is also the US's largest supplier of wooden furniture and third largest supplier of wood flooring. Actually China is the second largest wood products trading partner, following Canada, for the US.

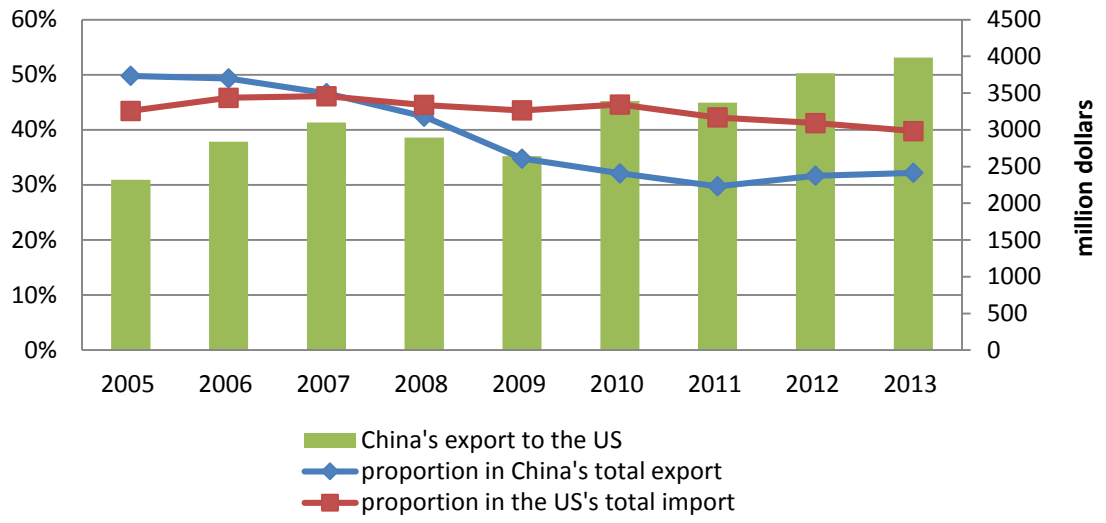


**Figure 4 Wood Furniture Value and Proportion of China's Export to the US**

*Source: global trade atlas 2012. Wooden furniture represent HS 940330, 940340, 940350 & 940360.*

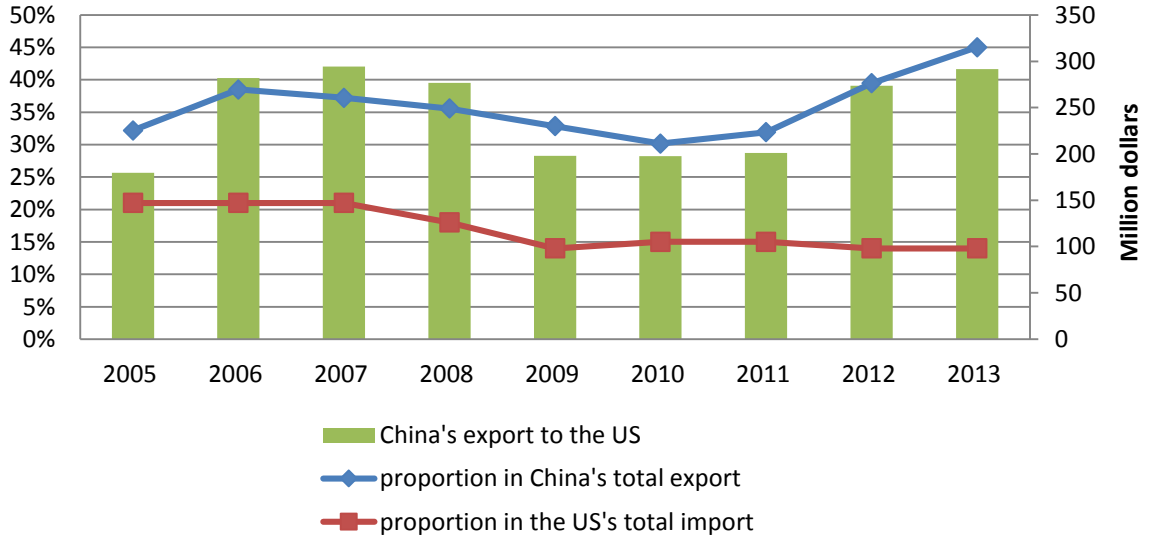


**Figure 5 Wood Flooring Value and Proportion of China's Export to the US**

*Source: global trade atlas 2012. Continuously shaped wood (HS 4409) used as Proxy for solid wood flooring.*

The smaller furniture makers in the US are shocked by the US importing from China, as their manufacturing business is being shifted overseas to China (Sun et.al. 2008). In response to competition from Chinese exports, and also given the general environmental concerns, the US

introduced the legislation, the 2008 Lacey Act Amendment, to prohibit illegally-sourced timber entering the US market (Saltzman 2010; Tanczos 2011). This creates a risk that manufacturers, exporters and retailers of goods made in China with suspect timber could face forfeiture, penalties and even imprisonment under the 2008 US Lacey Act Amendment (Gregg and Porges 2008).

Given the large volume of wood products trade between the two countries, the Lacey Act Amendment plays an important role in the flow of forest products traded between the United States and China. The Lacey Act Amendment has already impacted the forest product trade between China and the US by generating higher production and export costs for Chinese companies, thus making it more difficult for Chinese forest products companies to export to the US market (Tao et al. 2009). Conversely, some experts suggest that new opportunities might be created for legally harvested US hardwood products in China.

## 2.2 Research objectives and questions

This research aims at capturing the established effects of the 2008 Lacey Act Amendment on Chinese wooden industry manufacturers and exporters, four years after the 2008 Lacey Act Amendment was implemented. The main interests focus on the Chinese companies' awareness of the Lacey Act Amendment, the change of their sourcing and sales amount in the US market as well as their export cost, their strategies to deal with the 2008 Lacey Act Amendment, and the demographic characteristics that influence all these aspects. Fundamentally, this research attempts to identify how Chinese wood- manufacturing companies have adopted changes to accommodate the Lacey Act Amendment and to evaluate export opportunities in both the

domestic market and the new market segments of China, as well as to help to enhance the competitiveness of the US companies in the global market.

The first phase of this research is relatively straightforward. The objective of the first phase of this research is to understand what factors might influence a change in Chinese firms' exports behavior with respect to the US as a result of the Lacey Act Amendment. The following research questions are addressed in the first phase:

- How has Chinese companies' awareness of the Lacey Act Amendment influenced their exports to the US market
- What role do company size (based on annual sales revenue) and industry type (furniture vs flooring) play in Chinese companies' decision to export to the US market?
- How has the Lacey Act Amendment affected Chinese companies' raw material sourcing behavior (e.g., sourcing region, use of tropical hardwood, and acquisition of chain-of-custody certification) and how has this influenced their decision to export to the US market?
- How has the Lacey Act Amendment influenced the relationship between export markets and the domestic market in Chinese companies' sales orientation?

The second phase of this research aims to verify whether or not the Chinese companies' export cost to US has increased, and discovering the characteristics of the Chinese companies that may cause an export cost increase due to the Lacey Act Amendment. The increase in international competition indicates a heightened sensitivity of cost for exports, and relative costs have important effects on export market shares (Wendy et.al. 2001)[54]. Chinese companies are concerned that their international competitiveness might be reduced as a result of higher export costs (Tao et al. 2009). This is possible in two aspects: firstly, the Lacey Act Amendment is

designed to stem the flow of goods from illegal harvested wood and document the foreign sources of wood-based products (Wang et al. 2010). Failure to comply with the Act will cause civil administrative penalties, forfeiture of the trafficked goods, criminal fines, or imprisonment. The Lacey Act Amendment makes it necessary for Chinese companies to do more work to keep track of and declare the species, quantity, value, and origin of wood used in their products, and the extra work may cause an export cost increase. Secondly, the Lacey Act Amendment creates a stronger incentive for Chinese companies to import raw materials (e.g., logs and lumber) from legal and sustainable sources such as the United States or other reliable regions in order to sell their final products back to US (Wang et al. 2010), which is probably more expensive than their previous insecure sourcing. The following research questions are addressed in the second phase:

- What are the characteristics of the companies who are prone to export cost increases? This study takes into account the Chinese companies' familiarity with the Lacey Act Amendment and industry differences (flooring vs furniture).
- What kind of Chinese sourcing activities are associated with their companies' export cost increase? This study attempts to cast light on the Chinese companies' Chain-of-Custody certified raw material proportion, and their sourcing regions all over the world.

## 2.3 Survey method

### 2.3.1 Survey design

A structured questionnaire was designed to fulfill the research objectives of this research. The questionnaire mainly acquires three kinds of data from the companies that are relevant to this research.

Firstly the questionnaire asks the companies about their demographic characteristics, including their industry type and the size of the company.

**Industry type** is a frequently discussed factor when analyzing companies' activities and strategies. Consider the illegal logging issue as an environmental ethics problem: previous general business research reveals that type of industry had no significant effect on the frequency or importance of ethical problems in the international market environment (Armstrong and Sweeney 1994)[55]. Inducing firms to adopt corporate environmentalism requires the use of different agents of influence, and that choice depends on industry type; Industry type moderates the influences of public concern, regulations, and competitive advantages on top managements (Banerjee et.al. 2003)[56]. In this research, the significance of the Chinese forestry industries' types and their effect on the companies' market strategies remains to be seen.

This research takes into consideration the different industry types of flooring and furniture; the surveys are conducted in the focused flooring trade show and the furniture trade show. There are discussions about the different impacts of the flooring and furniture industries on US hardwood production, distribution or the supply chain as a whole. Several research studies immediately prior to the 2008 economic crisis show that hardwood lumber production in the south central region was correlated with hardwood flooring production and had been increasing (Luppold and Bumgardner 2008)[57]. By contrast, imports have gained an increasing share of the hardwood furniture market, and lumber consumption by this industry has declined dramatically (Grushecky et al., 2006)[58]. Primary hardwood lumber and component producers were shifting their sales from domestic furniture manufacturers to flooring, kitchen cabinet and export market

to reduce loss. The question will be answered in later chapters whether the Chinese flooring and furniture industries have had different impacts on their sales to the US market in the first phase of the research, and on their export cost to the US in the second phase of the research.

For this study, regardless of the multiple business types that belong to the same company, the respondents who participated in the DOMOTEX Asia/CHINAFLOOR Show in March 2013 are placed into the flooring industry group unless they have no business in flooring; similarly, the respondents who participated in the Furniture Manufacturing & Supply China Show in September 2013 are put into the furniture industry group unless they have no business in furniture. In this way, 65 of the respondents (47%) fall into the flooring industry category, and 73 of the respondents (53%) fall into the furniture industry category.

**The company's size** is another factor that is frequently analyzed in the business field as well as in the forest product marketing research. It is believed that the small and mid-sized enterprises (SME) tend to make business, survive and grow on the local domestic market rather than moving toward international markets, given their limited resources (Holmlund and Kock., 1998)[59]. Under market pressure, manufacturing SMEs are not motivated to undertake voluntary actions for the benefit of wider stakeholders and society. Regulations have a vital part to play in improving the environmental and social practices of SMEs. SMEs will generally try to comply with, but will not go beyond, environmental regulations (Williamson et.al. 2006)[60]. A higher proportion of large homebuilders are more likely to adopt innovative insulation material than smaller homebuilders. However, the smaller homebuilders replace the existing product from their material usage portfolio at a faster rate (Indroneil et.al. 2010)[61].

Research results verify the above conclusions for forest product companies. Firm size does impact the innovation type pursued by companies in the wood products industry. Large companies outrun smaller companies in process innovation. However, small companies level the field with larger companies when considering all three innovation types of process, product and business systems (Wagner and Hansen., 2005)[62]. Medium-sized sawmills are more likely to target international markets than smaller sawmills, and medium-sized sawmills are more flexible than smaller sawmills based on the number of operational changes a firm made after the housing crisis (Sasatani 2013)[63].

In this survey, the companies are categorized into 6 size-levels based on their annual sales revenue and analyzed directly in the first phase of the study. For the second phase of the study, the 6-level size variable is regrouped into 3 levels: the small companies stand for the two smallest size groups in the survey, the medium companies stand for the two size groups in the middle, and the large companies stand for the two largest size groups.

Inquiries about **the Chinese companies' sales to the US and their sourcing behaviors** are the core of the survey. The surveys directly asked the Chinese companies' best estimated percentage of tropical hardwood raw material they use for exports, the percentage of chain-of-custody certified raw material, and the percentage of their sales in the domestic market in 2012, the year previous to when the survey was conducted. In addition, a thorough inquiry was performed about the companies' sourcing changes from the regions all over the world and their sales change to the US market from 2008 to 2012, the 5 years following the implementation of the Lacey Act Amendment.

The illegal logging issues and associated trade are highly suspicious in tropical areas (Glastra 1998)[64], and tropical hardwood receives the most attention with respect to illegal activity (Seneca Creek 2004). The Lacey Act Amendment could provide a significant disincentive to the import of illegally logged wood products, especially from the highly suspicious tropical area for hardwood. At the same time, there is a very low risk of US hardwoods being derived from illegal or controversial sources (Goetzl et al. 2008). The Lacey Act Amendment is supposed to promote imports of raw materials from certain regions to Chinese companies, such as raw materials from US (Wang et.al. 2010). In addition, the implementation of the amended Lacey Act Amendment is likely to encourage the spread of private certification and legality verification systems (Brack and Buckrell 2010). Within China, certification favored by legislation such as the Lacey Act Amendment is increasingly seen as a means to protect the timber processing industry's position within the global market (Putzel 2009)[65]. This research seeks to discover the impacts of sourcing from different regions and the certification system on Chinese companies' export amounts and cost to the US.

The role and implications of both the domestic market and the international US market for Chinese companies are highlighted by the research. In China, domestic consumption of forest products has been burgeoning in addition to overseas demand (White et al. 2006)[66].

The following sourcing regions are covered in this survey: Russia, United States (US), Canada, Southeast Asia, Africa, European Union (EU), Latin America and China. According to Fig.3, the 8 regions above are the top 8 sourcing regions for Chinese companies in 2012, and cover all the important regions around the globe. The answers to the sourcing/sales change questions have

the following four levels: no sourcing/sales, decreased sourcing/sales, stable sourcing/sales, and increased sourcing/sales.

Finally, the questionnaire asked **specific questions about the Lacey Act Amendment**: the companies' awareness or familiarity with the Lacey Act Amendment, and the companies' export cost increase because of the Lacey Act Amendment.

The companies' adequate knowledge of legislation is the first step toward conforming to the legislation. In the survey, the companies' familiarity with the Lacey Act Amendment was evaluated at three levels, ranging from an absolute lack of any information to a high degree of familiarity with the Lacey Act Amendment. In the survey, the Chinese companies were asked if they have ever heard about the Lacey Act Amendment (variable value equal to 1), if they have heard about the Lacey Act Amendment but are not familiar with it (variable value equal to 2), or if they are familiar with the Lacey Act Amendment (variable value equal to 3). This variable has 3 levels in the survey and for the first phase of the study. In the second phase of the study, the Chinese companies' basic knowledge of the Lacey Act Amendment is required in order to study their export cost increase. Therefore, the respondents who have never heard about the Lacey Act Amendment are deleted from this research. Only two levels, not familiar with the Lacey Act Amendment (indicated by 97 or 70% of the respondents) and familiar with the Lacey Act Amendment (indicated by 41 or 30% of the respondents) are left for the final variable.

Chinese companies' export cost increase is the key issue in the second phase of the study. The questionnaire asked the company about their export cost increase because of the Lacey Act Amendment. The respondents of the survey were asked about their perceptions about the Lacey

Act Amendment first. If the respondents were aware of the Lacey Act Amendment, they were then asked how their export cost had increased due to the Lacey Act Amendment. The respondents gave their best estimations of the companies' export cost increase.

The companies who gave a nonzero reply to this question were then asked to estimate what was the percentage of their export cost increase as a result of the Lacey Act Amendment. The ordinal variable for levels of export cost increase of the Chinese companies in this study is a monotonic transformation of the percentage-usage variable of the export cost increase percentage into an ordinal variable (Winship and Mare 1984)[67]. The four categories, or levels of the export cost increases are: 1) No increase with a variable value equal to 0, indicated by 47 (34%) respondents; 2) small cost increase between 0 (>0) to 5% (≤5%) with a variable value equal to 1, indicated by 25 (18%) respondents; 3) moderate cost increase between 5% (>5%) to 10% (≤10%) with a variable value equal to 2, indicated by 36 (26%) respondents; and 4) notable cost increase greater than 10% (>10%) with a variable value equal to 3, indicated by 30 (22%) respondents.

### 2.3.2 Survey Implementation

Data for this study was collected using a structured questionnaire administered at two trade shows in Shanghai, China. The first trade show was the DOMOTEX Asia/CHINAFLOOR Show in March of 2013, and the second one was the FMC China (Furniture Manufacturing & Supply China) trade show in September of 2013. There were 40,000 visitors and 1,100 exhibitors in the DOMOTEX Asia/CHINAFLOOR 2013 Show, and 33,834 visitors and 790 exhibitors in the FMC China 2013 Show. These shows were selected for the survey because they are the largest flooring and furniture trade shows in China. The DOMOTEX Asia/CHINAFLOOR is the largest international

flooring trade exhibition in the Asia-Pacific region (China Exhibition 2013)[68]. FMC China is the 3rd largest furniture show in the world and the leading furniture trade show in China (10Times 2013)[69]. A total of 226 valid questionnaires were collected from both trade shows, and the number achieved by both trade shows are displayed in Table 1.

**Table 1 Data Collections from Each Trade Shows**

| | Valid | Total | Valid rate |
|---|---|---|---|
| DOMOTEX Asia/ China Floor | 106 | 113 | 93.81% |
| FMC China (Furniture Manufacturing & Supply) | 120 | 135 | 88.89% |
| Sum | 226 | 248 | 91.13% |

The Chinese manufacturers and exporters who attended these trade shows were the target population for the survey. Visitors and exhibitors attending the trade shows who also matched the target population criterion were surveyed. A convenient sampling method was used for conducting the surveys. All the exhibitors matching the target population criterion were requested to take the survey. Visitors at the trade show floor were randomly stopped and screened for the survey.

## 2.4 Modeling Approach

A categorical variable has a measurement scale consisting of a set of categories (Agresti 2002)[70]. In this study, the dependent variables for the two phases, say, the strategies of the Chinese companies to the US market and the Chinese companies' export cost increase, are both levels that falls into different categories. Moreover, these dependent variables in this study have more than two categories (actually four categories) and are measured using rank-ordered discrete characteristics; hence, they can be defined as discrete ordinal variables (Ishii-Kuntz

1994)[71]. Such ordinal responses cannot be modeled using a classical regression approach because the spacing among the rank ordered categories cannot be assumed to be uniform (Liao and Futing 1994)[72]. Since the coding used in the ordinal-level dependent variable is arbitrary (0, 1, 2 and 3 in this case), the estimated coefficient of the regression model will depend on the coding used (McKelvey et al. 1975)[73].

Ordinal response models recognize the indexed nature of various response variables. The family of generalized linear models is the most important models for categorical responses, and one of those generalized linear models, the ordered probit is theoretically superior to most other models for the data analyzed in this work. The probit model is defined by (Fahrmeir and Tutz 1994)[74]:

$$\pi = \Phi(\eta) = \Phi(z'\beta)$$

where $\Phi$ is the standard normal distribution function. It imposes no restrictions on $\eta$.

In contrast to ordinal response models, multinomial logit and probit models neglect the data's ordinality, require estimation of more parameters (in the case of three or more alternatives, thus reducing the degrees of freedom available for estimation), and are associated with undesirable properties, such as the independence of irrelevant alternatives (IIA, in the case of a multinomial logit (Ben-Akiva and Lerman 1985)[75]) or lack of a closed-form likelihood (in the case of a multinomial probit (Greene 2000)[76]). Ordinal response models are more appropriate for this study compared with multinomial models.

Regression analysis with generalized linear models is based on likelihoods. Given the sample $y_1, \ldots, y_i, \ldots$, together with the covariates $x_1, \ldots, x_i, \ldots$,or design vectors $z_1, \ldots, z_i, \ldots$, a maximum likelihood estimator (MLE) of the unknown parameter vector $\beta$ in the model $\mathrm{E}(y_i \mid x_i) = u_i = h(z_i'\beta)$ is obtained by maximizing the likelihood (Fahrmeir and Tutz 1994).

For the purpose of interpretation, the open-source statistical software R is used for estimating the likelihood model. The estimated model coefficients are translated into probability values. The effect of each of the significant explanatory variables on the dependent variable are calculated by fixing the values of all other explanatory variables in the model at their respective means, and varying the value of the explanatory variable under consideration. To obtain the bootstrapped estimates, 10,000 simulations were run using the variance–covariance matrix and the parameter estimates for the models. The simulation codes were written in R (Adolph C. 2013)[77]. To understand the precision of the estimated probability values, 95% confidence interval zones for research phase one, and single standard-deviation zones for research phase two are used around the estimated probability curves.

# Chapter 3 – Overview of Survey Results

## 3.1 Descriptive analysis

A total of 226 valid surveys were collected from the two trade shows (Table 1). All 226 responses are used in the first phase of the study. The purpose of the second phase of the study is to cast light on the companies' export cost increase because of the Lacey Act Amendment, therefore, the responses that are either not aware of the Lacey Act Amendment or have no exports to the US are deleted from the sample. Finally, 138 responses were obtained for the second phase of the study.

Fig. 6 displays the province distribution of respondents. The 226 respondents are from 20 provinces and main cities out of a total of 34 administrative regions in China. They cover the five forest-product manufacture centers in China: (1) the Pearl River region forest-product manufacture center based in Guangzhou province, (2) the Yangtze River region forest-product manufacture center based in Jiangsu Province, Zheliang Province and Shanghai City, (3) the Bohai Sea region forest-product manufacture center based in Tianjin and Beijing City, (4) the Northeastern forest-product manufacture center based in Liaoning Province, and (5) Western forest-product manufacture center based in Sichuan Province (China Forestry Information 2014)[78]. The data were collected in two large and influential trade shows in Shanghai City. It is particularly convenient for local companies to present in the trade shows, thus 50% of the respondents are from the local Yangtze River region.

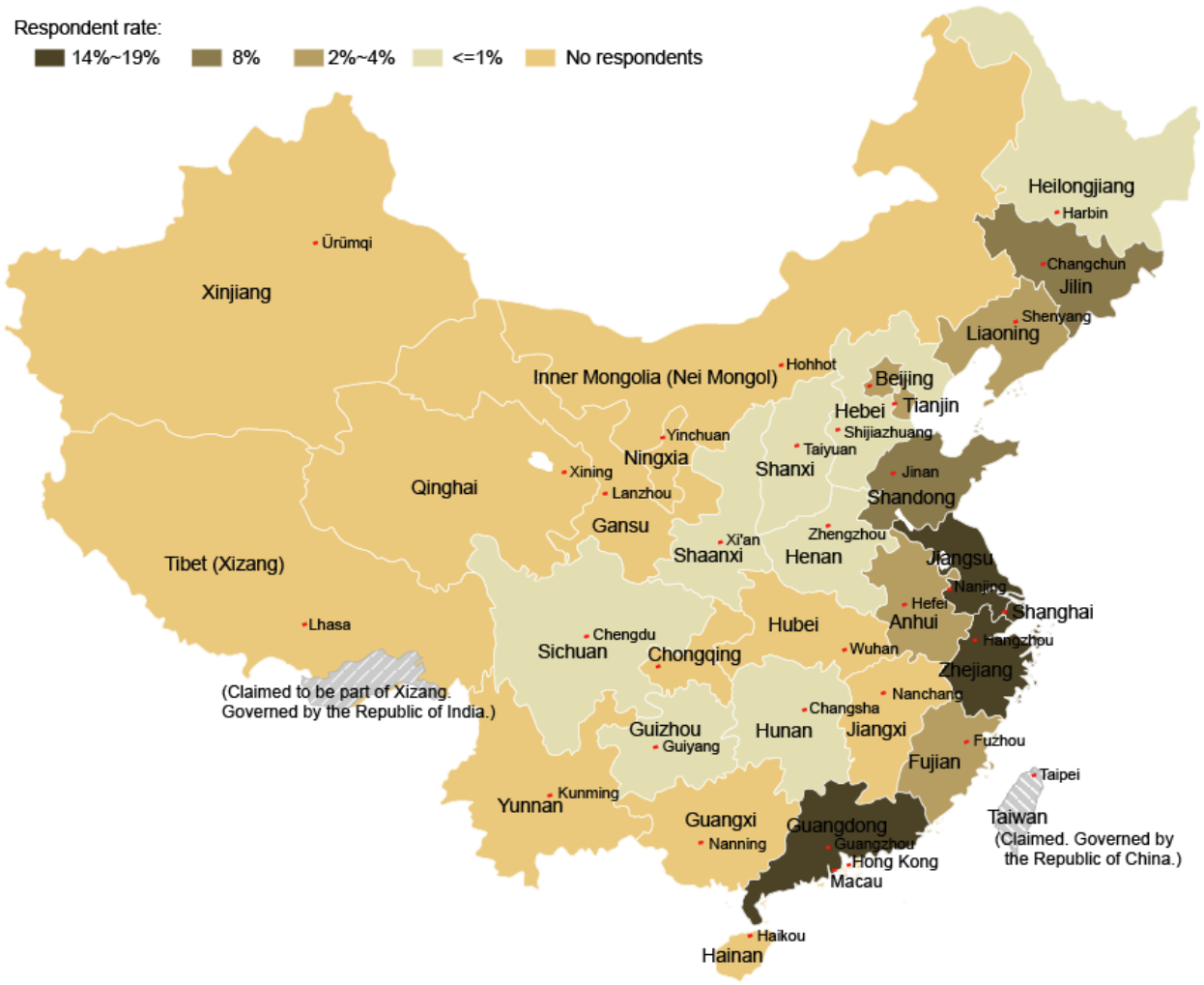


**Figure 6 Province Distribution of the Respondents**

Fig. 7 displays the frequency of the business types indicated by the respondents. Out of 226 respondents, 82 respondents indicate dual business types, and 20 respondents indicate triple or more business types. Wood furniture manufacture and wood flooring manufacture dominates the business types from the survey sample: 163 respondents out of 226 are either wood flooring or furniture manufacturers or a combination of the two. The manufacture businesses are frequently combined with exporting businesses: 59 of the wood flooring or furniture manufacturers are combined with exporting business.

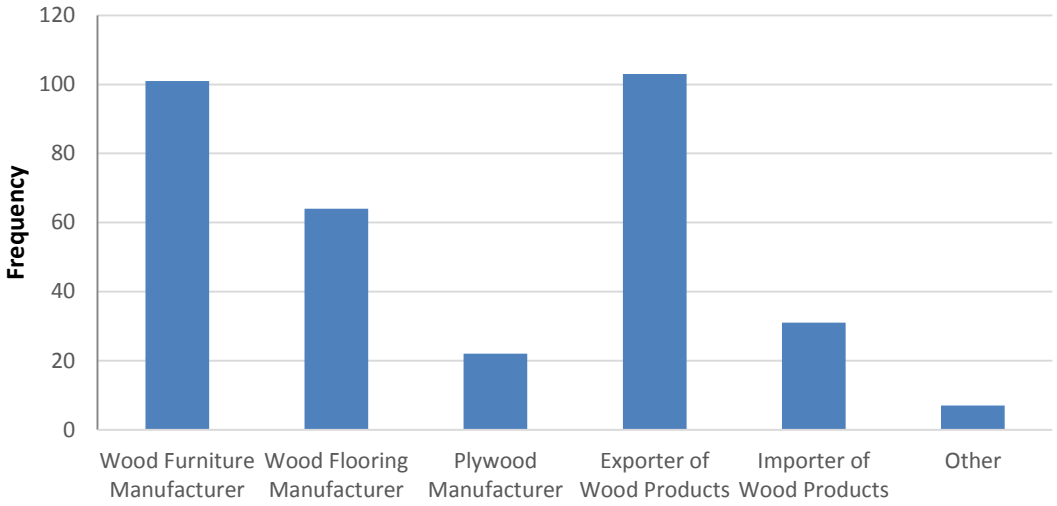


**Figure 7 Frequency of the Business Types Indicated by the Respondents**

Figure 8 displays the percentage of companies who have COC certificates. PEFC is the COC certificate owned by the most respondents. FSC and CFCC are both owned by more than 60% of the respondents. Only 21 (9.29%) of the respondents have no COC certificates of any kind.

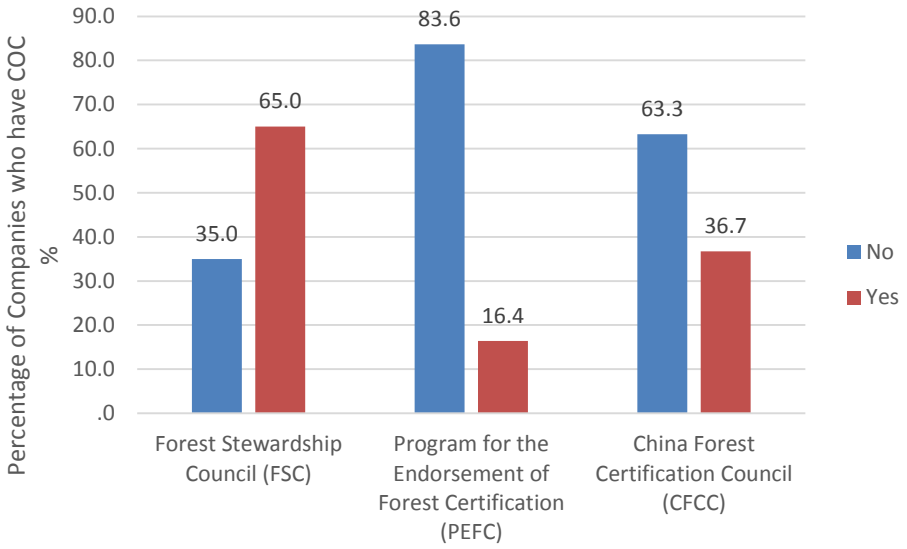


**Figure 8 Percentage of Companies Who Have COC Certificates**

Fig.9 displays the structure of the respondents' annual revenues. Their annual revenues range from less than 10,000,000 Chinese yuan up to 200,000,000 Chinese yuan. Given the exchange rate of 6.15 Chinese Yuan to 1 US dollar today, the US Dollar equivalences of the companies' annual revenues in Chinese Yuan are approximated in Table 2:

**Table 2 US Dollar Equivalences of the Companies' Annual Revenues**

| **Chinese Yuan ¥** | 10,000,000 | 40,000,000 | 70,000,000 | 100,000,000 | 200,000,000 |
|---|---|---|---|---|---|
| **US Dollars $** | 1,626,016 | 6,504,065 | 11,382,114 | 16,260,163 | 32,520,325 |

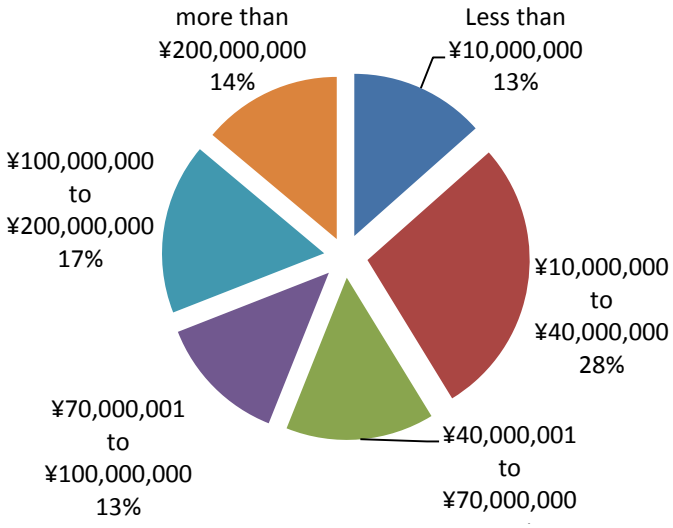


**Figure 9 Annual Revenue of the Respondents**

Fig. 10 illustrates the size of the companies in the flooring and furniture industries. Of 223 Chinese companies who replied to both of the questions about their size and industry type, there are 97 flooring companies and 126 furniture companies. The furniture industry in the sample is dominated mainly by small companies, especially those whose annual revenue ranges between 10 million Chinese Yuan and 40 million Chinese Yuan. Meanwhile, large companies dominate the

flooring industry in the sample; the largest size group consists of the flooring companies that have an annual revenue larger than 200 million Chinese yuan (the largest size group).

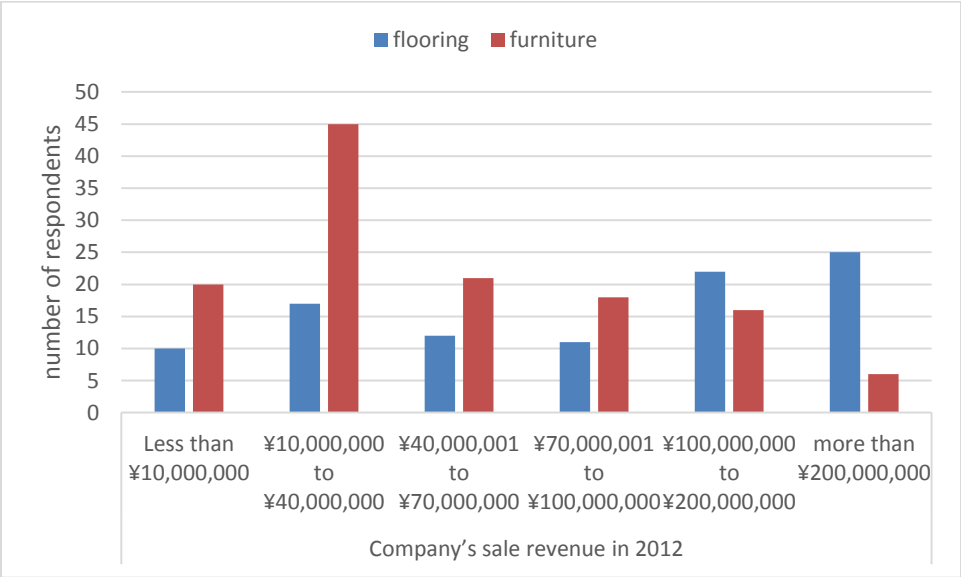


**Figure 10 Annual Revenue of Respondents from Different Industries**

Fig. 11 displays the percentage of tropical hardwood raw material used for exported finished products in 2012 according to the respondents' sales revenues. It demonstrates that bigger companies had greater amounts of tropical hardwood in their raw material used for exported finished products in 2012. The mean percentage of tropical hardwood raw material ranges from 20% to 45% from the smallest companies to the biggest companies.

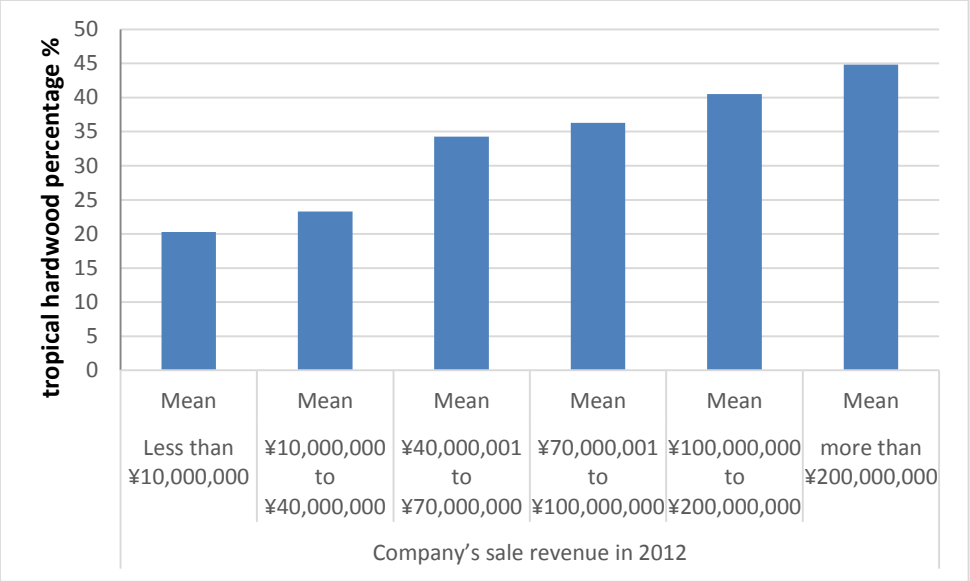


**Figure 11 Percentage of tropical hardwood raw material 2012**

Fig. 12 displays the percentage of COC certified raw material for exported finished products in 2012 according to the respondents' sales revenues. Although there is a trend that larger companies utilize more COC certified raw material for exported finished products, the difference between big companies and small companies is marginal The mean percentage of tropical hardwood raw material ranges from 50% to 56% among companies of different sizes. The mean COC certified raw material for all the respondents is 53.13%.


**Figure 12 Percentage of COC Certified raw material 2012**

Fig. 13 displays the percentage of sales revenue derived from different markets. The sales structure is similar for companies of different sizes: around half of their sales go to direct export, and a smaller proportion goes to domestic markets. The mean percentage of direct sales ranges from 49% to 60% among companies of different sizes, and the mean percentage of domestic markets ranges from 35% to 40%. This demonstrates that export markets are the most important markets for Chinese companies, unrespecting to their size.


**Figure 13 The Percentage of Sales Revenue Derived from Different Markets**

Figure 14 displays the change in the respondents' sales destinations for 5 years after the implementation of the Lacey Act Amendment. Over the past 5 years Chinese companies have expanded their overall trade volume in the world. This is clear evidence of the Chinese companies' strong momentum to grow in the international market. The number of companies who indicate an increase to their sales destinations far exceeds the number of the companies who indicate a decrease. The greatest sales increase occurs in China's domestic market, which implies a strong domestic demand for forest products in China. Meanwhile, it is worth noting that the other remarkable sales increases all occur in sales countries that possess timber legality regulations. Particularly, 92 Chinese companies out of 226 indicate a sales increase to the US market, where the Lacey Act Amendment is implemented. It is worth noting that another 93 Chinese companies indicate a sales increase to the EU market, where the EU Timber Regulation (the European

counterpart of the Lacey Act Amendment) would be implemented soon in 2013 (the survey was conducted in 2012).

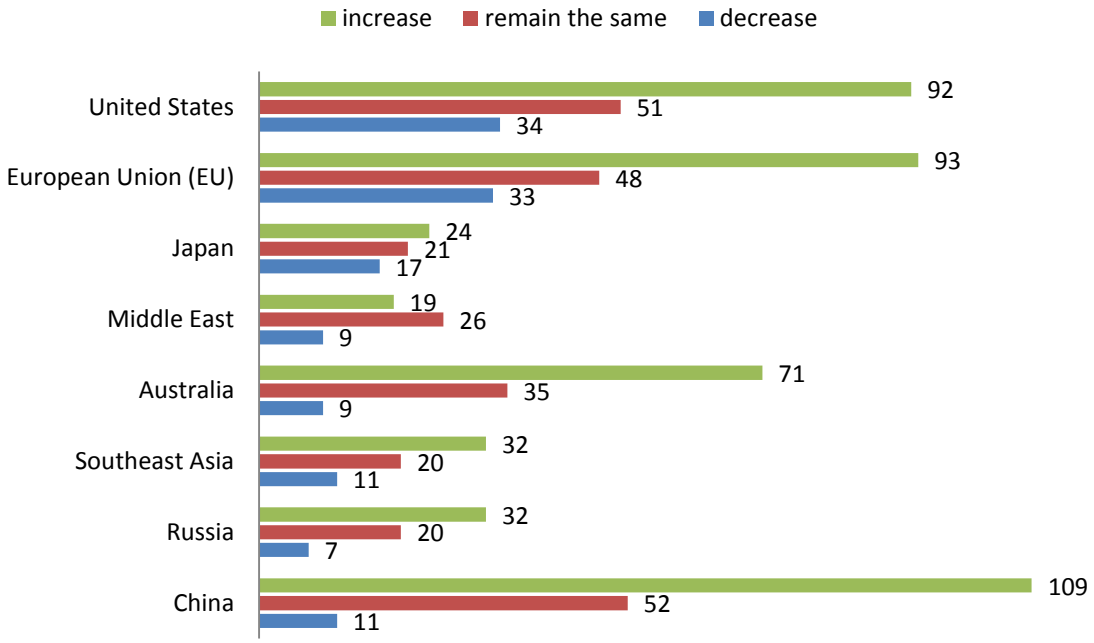


**Figure 14 Sales Destination Change in the last 5 years**

Figure 15 displays the respondents' raw material source changes for the 5 years following the implementation of the Lacey Act Amendment. Chinese companies have increased raw material sourcing from around the globe, particularly from Russia, the US, Southeast Asia and the EU. The largest sourcing increase occurs within China domestically.

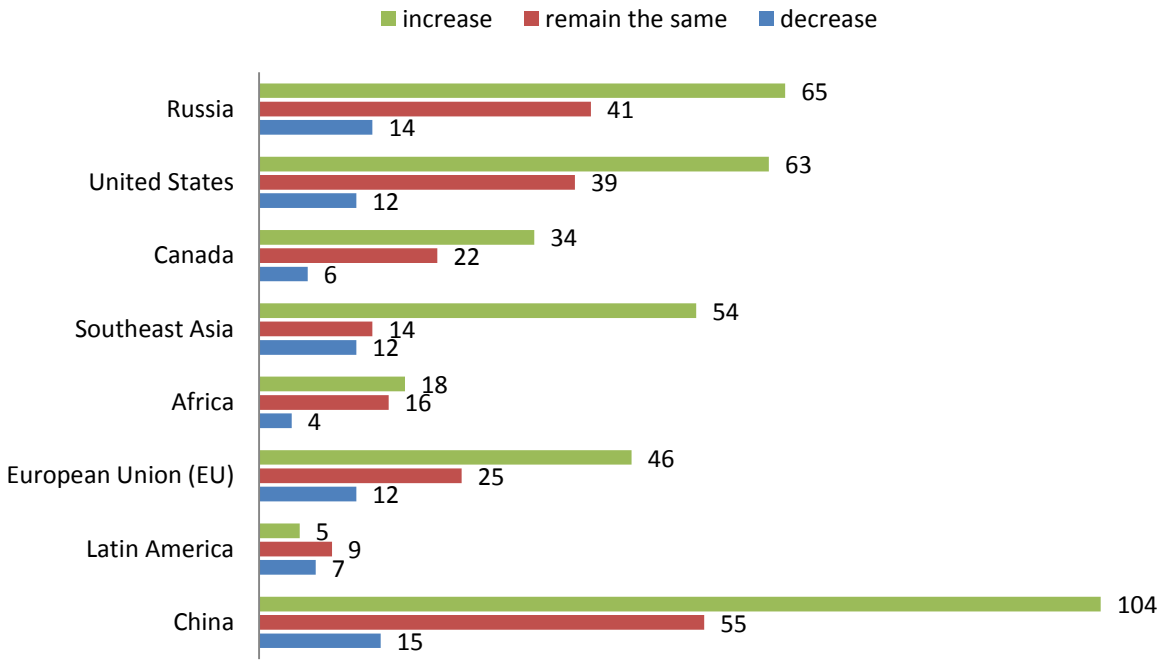


**Figure 15 Raw Material Source Changes in the last 5 years**

Table 3 displays the respondents' general perceptions toward timber legality regulations. Respondents agreed on many subjects: 96% of the respondents believe that legality regulations are an effective way to reduce illegal timber; 93% of the respondents believe that Illegal logging is a major environmental problem; 82% of the respondents believe that timber legality regulations increase the cost of exporting; 79% of the respondents have plans to increase their use of certified wood to help them comply with legality legislation; and 73% of the respondents believe that timber legality regulations cause timber prices to increase.

The respondents give controversial responses to other questions, and display diverse perceptions toward timber legality regulations. For example, only 42% of the respondents intend to increase their exports to countries that do not have timber legality regulations; 57% of the

respondents believe that timber legality regulations are a trade barrier designed to protect foreign manufacturers; and 65% of the respondents intend to sell more products within China because of timber legality regulations.

**Table 3 General Perceptions towards Timber Legality Regulations**

| | | Frequency | Percent % |
|---|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | Disagree | 7 | 3 |
| | Agree | 218 | 96 |
| I intend to increase my exports to countries that do not have timber legality regulations | Disagree | 130 | 58 |
| | Agree | 94 | 42 |
| Timber legality regulations cause timber prices to increase | Disagree | 58 | 26 |
| | Agree | 166 | 73 |
| Timber legality regulations increase the cost of exporting | Disagree | 17 | 17 |
| | Agree | 82 | 82 |
| I intend to decrease my exports to countries that have timber legality regulations | Disagree | 125 | 55 |
| | Agree | 98 | 43 |
| I plan to increase my use of certified wood to help me comply with legality legislation | Disagree | 45 | 20 |
| | Agree | 178 | 79 |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | Disagree | 97 | 43 |
| | Agree | 128 | 57 |
| I intend to sell more products within China because of timber legality regulations | Disagree | 76 | 34 |
| | Agree | 147 | 65 |
| Illegal logging is a major environmental problem | Disagree | 14 | 6 |
| | Agree | 210 | 93 |

Fig. 16 displays the respondents' different levels of awareness of the four current timber legality regulations: the US Lacey Act Amendment, EU timber regulations, Japanese Procurement Policies, and the Australian Illegal Logging Prohibition Act. Generally speaking, awareness of the US Lacey Act Amendment and EU Timber Regulation is higher than the awareness of the Australian Illegal Logging Prohibition Act and Japanese Procurement Policies. To focus specifically on the US Lacey Act Amendment, 54 respondents (24%) indicate that they have never heard of

it, 127 respondents (56%) are aware of the Lacey Act Amendment but not familiar with it, which takes up the majority of the sample, and 45 (?%) respondents are very familiar with the Lacey Act Amendment.

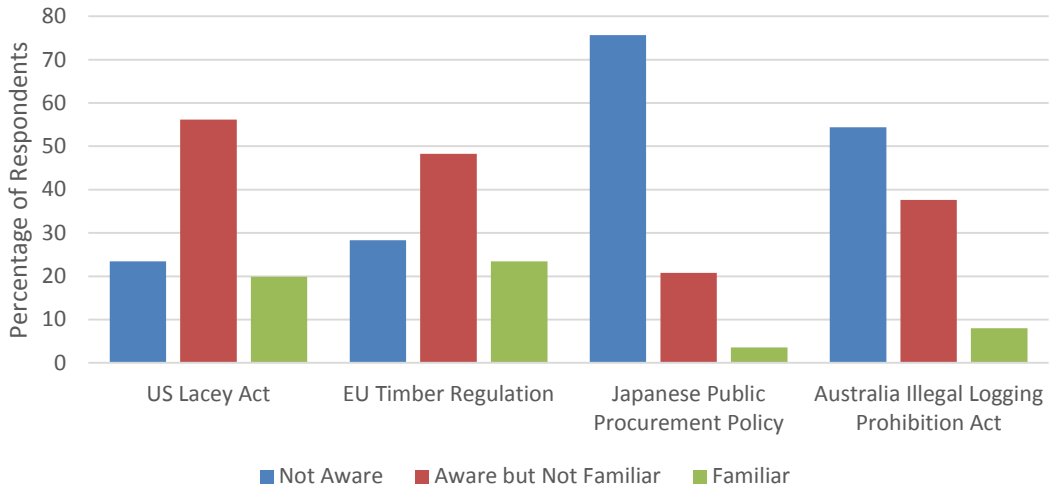


**Figure 16 The Respondents' Awareness of the Timber Legality Regulations**

Table 4 displays Chinese companies' perceptions of the Lacey Act Amendment (for the respondents who are aware of the Act). The majority of the respondents indicated that they acquired chain-of-custody certification to comply with the Lacey Act Amendment (70% agree vs 6% disagree), and that the Act has made them more careful about sourcing logs/lumber (64% agree vs 11% disagree). There are apparently more respondents who believe it is easy to comply with the Lacey Act Amendment (53% agree vs 21% disagree), and who believe their export cost has increased because of the Lacey Act Amendment (46% agree vs 26% disagree). However, it is controversial whether the Chinese companies as a whole will increase their use of wood from the US to comply with the Lacey Act Amendment (38% agree vs 37% disagree) or reduce their exports to the US as a result of the Lacey Act Amendment (43% agree vs 31% disagree).

**Table 4 Perceptions towards the Lacey Act Amendment**

| | | Frequency | Percent |
|---|---|---|---|
| I acquired chain-of-custody certification to help me comply with the Lacey Act | Disagree | 13 | 6 |
| | Agree | 158 | 70 |
| I will increase my use of wood from the US to help my company comply with the Lacey Act | Disagree | 83 | 37 |
| | Agree | 85 | 38 |
| The Lacey Act will cause me to reduce my exports of wood products to the US | Disagree | 69 | 31 |
| | Agree | 97 | 43 |
| The Lacey Act has made me more careful about sourcing logs/lumber | Disagree | 24 | 11 |
| | Agree | 145 | 64 |
| It is easy to comply with the Lacey Act | Disagree | 48 | 21 |
| | Agree | 120 | 53 |
| Compliance with the Lacey Act has increased the cost of exporting to the US | Disagree | 59 | 26 |
| | Agree | 104 | 46 |

Fig. 17 displays the respondents' different levels of export cost increases. Out of 172 respondents who are aware of the Lacey Act Amendment, 154 responded to the question of whether they have had an export cost increase because of the Lacey Act Amendment: 59 of them replied 0 export cost increase. We deleted another 16 respondents who have no sales to the US market, as the second phase of the study aims at examining the direct impacts of the Lacey Act Amendment on the companies who have sales to the US. 138 responses were obtained, of which 47 (34%) respondents indicate zero export cost increase.

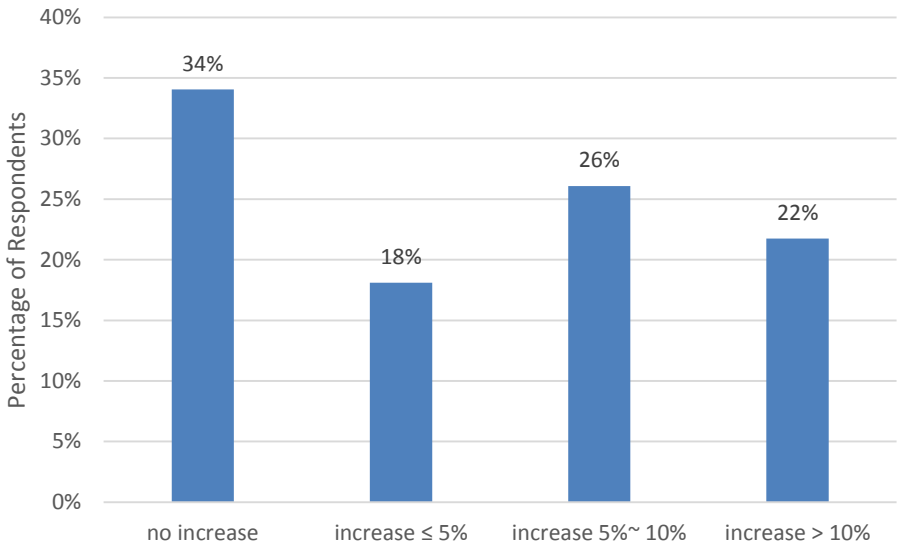


**Figure 17 Cost Increases of the Respondents**

Figure 18 displays the number of full time workers according to company size. Then mean of full time workers ranges from 200 people to 1100 people from the smallest companies to the largest companies.

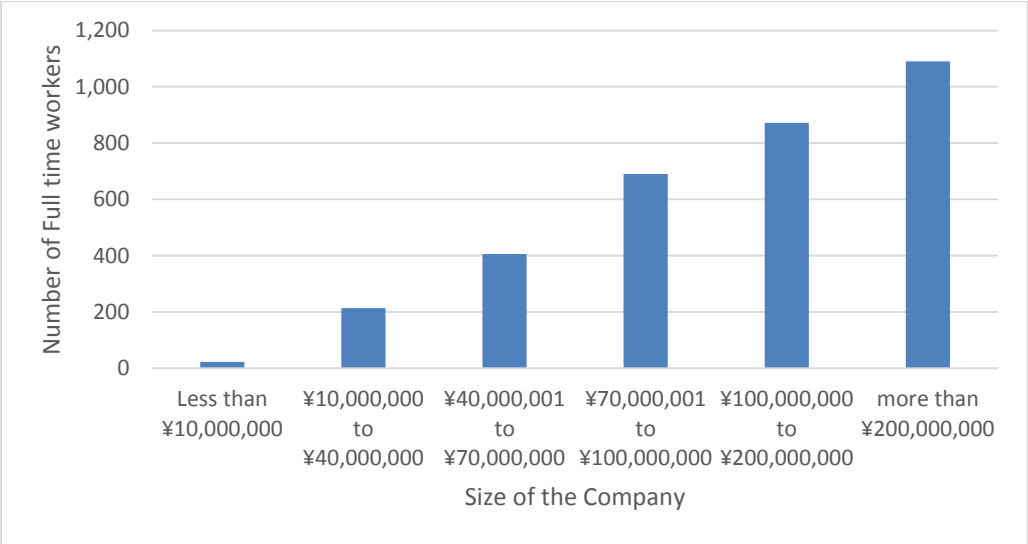


**Figure 18 Number of Full Time Workers according to Company Size**

## 3.2 Data Explorations

This section examines factors that interact with Chinese companies' sales to the US or their perceptions based on contingency tables. The Chi-square tests are conducted to check the independence of counts, and Z-tests are conducted to compare column proportions. Results with significance level 0.05 for both tests are further analyzed and displayed by graphs.

### 3.2.1 Sales to the US vs Sources from different regions

The survey inquires about the Chinese companies' sales circumstances to the US in the past 5 years, as well as sourcing circumstances from the following regions: Russia, the US, Canada, Southeast Asia, Africa, EU, Latin America and China. 216 of 225 respondents responded to both of the inquiries concerning sales and sourcing (only manufacturers are required to report their sourcing circumstances). The sales/sourcing circumstances include: increase, remain the same, decrease and no sales/sourcing. The contingency tables demonstrate significant results between sales to US and sourcing from Russia, the US, Southeast Asia, the EU and China.

Table 5 is the correlation table between the Chinese companies' sales to the US and sourcing from all the regions, and demonstrates similar patterns with column proportion comparison results. In addition, all the Pearson Correlation coefficients are positive, which means that the changing directions are the same for sales to the US and sourcing from all the regions.

Overall, most of the companies increased sales to the US in the past 5 years. Accordingly, the Chinese companies' sourcing from all the regions is mainly expanding as well.

**Table 5 Correlation between sales to the US and sourcing from all the regions**

| | Sources of wood raw materials changed over the past five years from: | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Russia** | **US** | **Canada** | **Southeast Asia** | **Africa** | **EU** | **Latin America** | **China** |
| **Pearson Correlation** | 0.26 | 0.30 | 0.10 | 0.13 | 0.08 | 0.23 | 0.10 | 0.16 |
| **Sig. (2-tailed)** | 0.00*** | 0.00*** | 0.15 | 0.07* | 0.25 | 0.00*** | 0.14 | 0.02** |
| **Number of Responses** | 216 | 216 | 216 | 216 | 216 | 216 | 216 | 216 |

Figure 19 demonstrates the relationship between the Chinese companies' sales to the US and the sourcing from Russia. 108 of 216 companies (50%) have both sourcing from Russia and sales to the US, and 56 (26%) of all the respondents have increased their sourcing from Russia in the past 5 years. This indicates that Russia is an important raw material provider for the Chinese processors that eventually export to the US market. The significant results in the contingency table show that of the companies who have decreased their sales to the US in the past 5 years, the proportion of companies who decreased their sourcing from Russia is significantly higher than those who have increased or continued sales to the US.

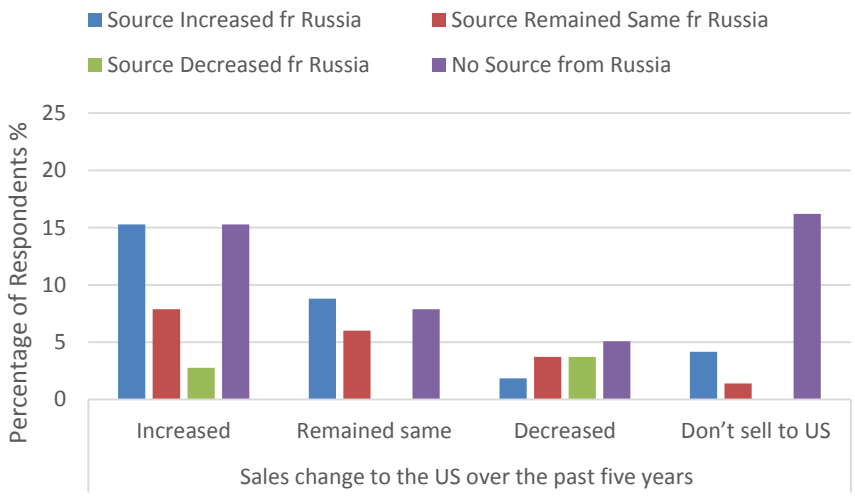


**Figure 19 Relationship between Sales to the US and Sourcing from Russia**

Figure 20 demonstrates the relationship between the Chinese companies' sales to the US and sourcing from the US. 100 of 216 companies (46%) have both sourcing from the US and sales back to the US, and 54 (25%) of all the respondents have increased their sourcing from the US in the past 5 years. This indicates that the US is an important raw material provider for the Chinese processors to eventually export back to the US market. According to the significant results in the contingency table regarding companies who have increased their sales to the US, the proportion of companies who have increased sourcing from the US is significantly higher compared to those who have decreased or maintained the same sales to the US.

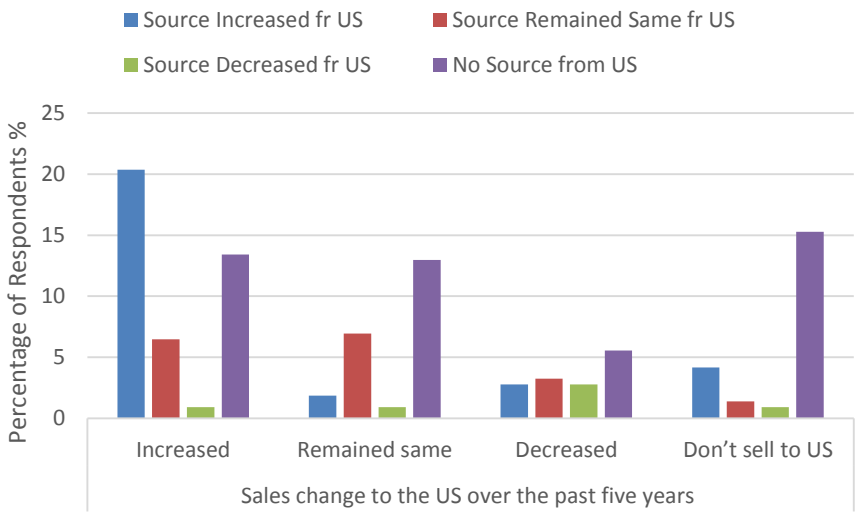


**Figure 20 Relationship between Sales to the US and Sourcing from the US**

Figure 21 demonstrates the relationship between the Chinese companies' sales to the US and the sourcing from Canada. 54 of 216 companies (25%) have both sourcing from Canada and sales to the US, and 29 (13.43%) of all respondents have increased their sourcing from Canada in the past 5 years.

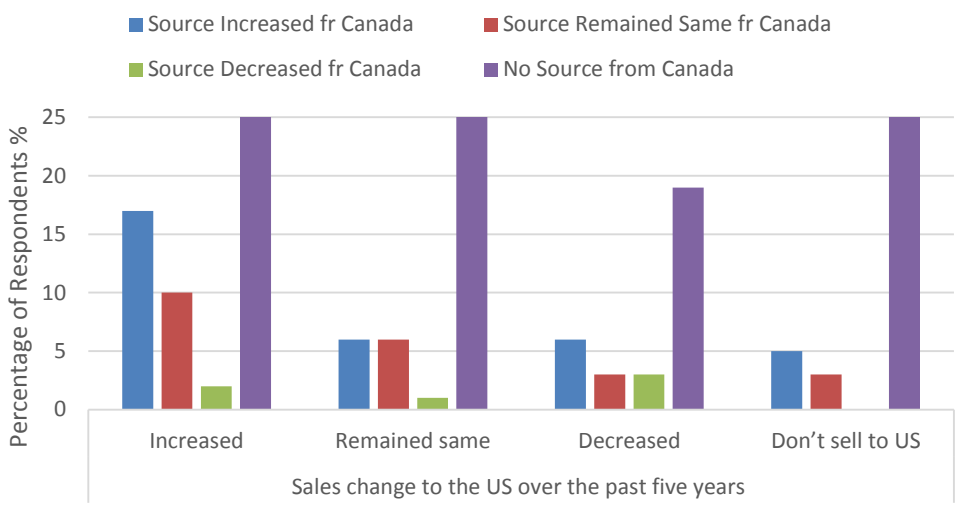


**Figure 21 Relationship between Sales to the US and sourcing from Canada**

Figure 22 demonstrates the relationship between the Chinese companies' sales to the US and sourcing from Southeast Asia. 73 of 216 companies (34%) have both sourcing from Southeast Asia and sales to the US, and 50 (23%) of all the respondents have increased their sourcing from Southeast Asia in the past 5 years. This indicates that Southeast Asia is a fast-growing raw material provider for Chinese processors to eventually export to the US market. According to the significant results in the contingency table regarding companies who have no sales to the US, the proportion of companies who have no source from Southeast Asia is higher compared with companies who have sales to the US.

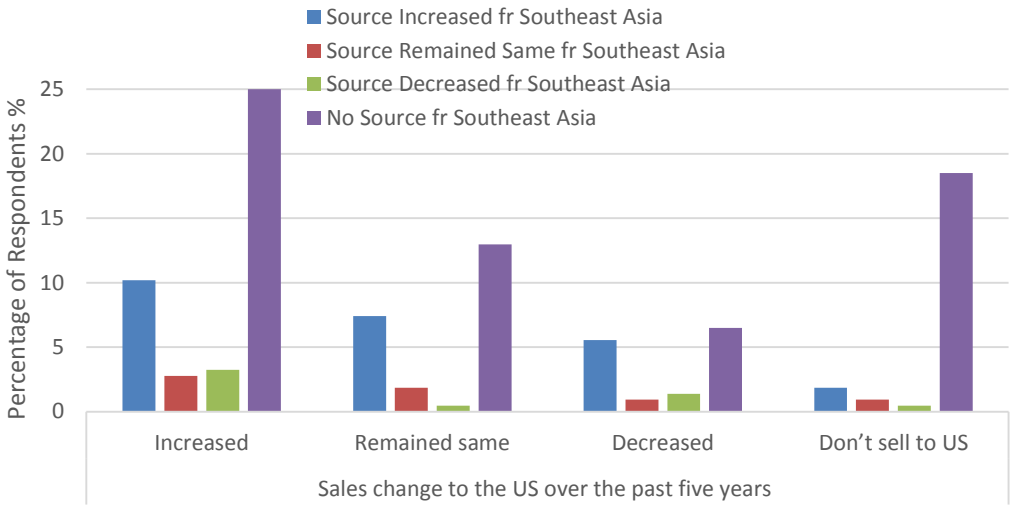


**Figure 22 Relationship between Sales to the US and Sourcing from Southeast Asia**

Figure 23 demonstrates the relationship between the Chinese companies' sales to the US and sourcing from Africa. 32 of 216 companies (14.8%) have both sourcing from Africa and sales to the US, and 15 (6.94%) of all the respondents have increased their sourcing from Africa in the past 5 years.

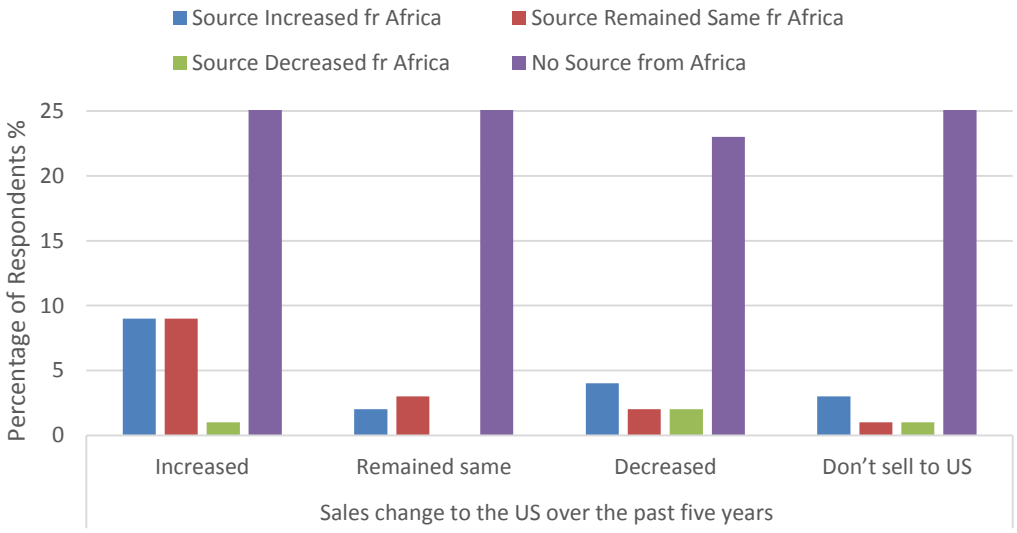


**Figure 23 Relationship between Sales to the US and Sourcing from Africa**

Figure 24 demonstrates the relationship between the Chinese companies' sales to the US and the sourcing from the EU. 76 of 216 companies (35%) have both sourcing from Southeast Asia and sales to the US, and 42 (19.4%) of all respondents have increased their sourcing from Southeast Asia in the past 5 years. According to the significant results in the contingency table regarding companies who have decreased sales to the US market, the relative proportions of the companies that decreased sourcing from the EU is higher, compared with companies that have increased sales, maintained sales or have no sales to the US. For companies that have no sales to the US market, the relative proportions of the companies that have no sourcing from the EU is higher, compared with companies that do have sales.

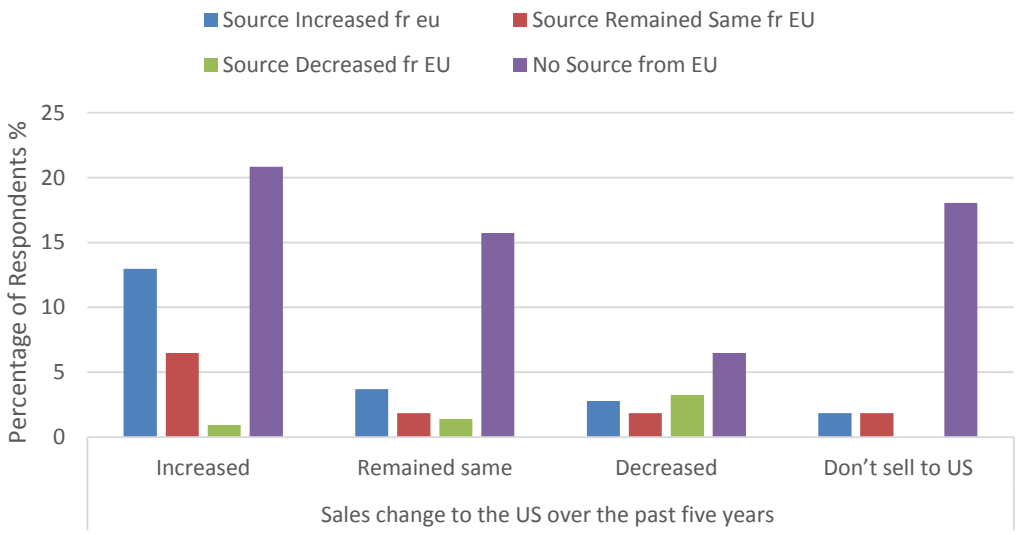


**Figure 24 Relationship between Sales to the US and Sourcing from EU**

Figure 25 demonstrates the relationship between the Chinese companies' sales to the US and sourcing from Latin America. 32 of 216 companies (14.8%) have both sourcing from Latin America and sales to the US, and 15 (6.94%) of all respondents have increased their sourcing from Latin America in the past 5 years.

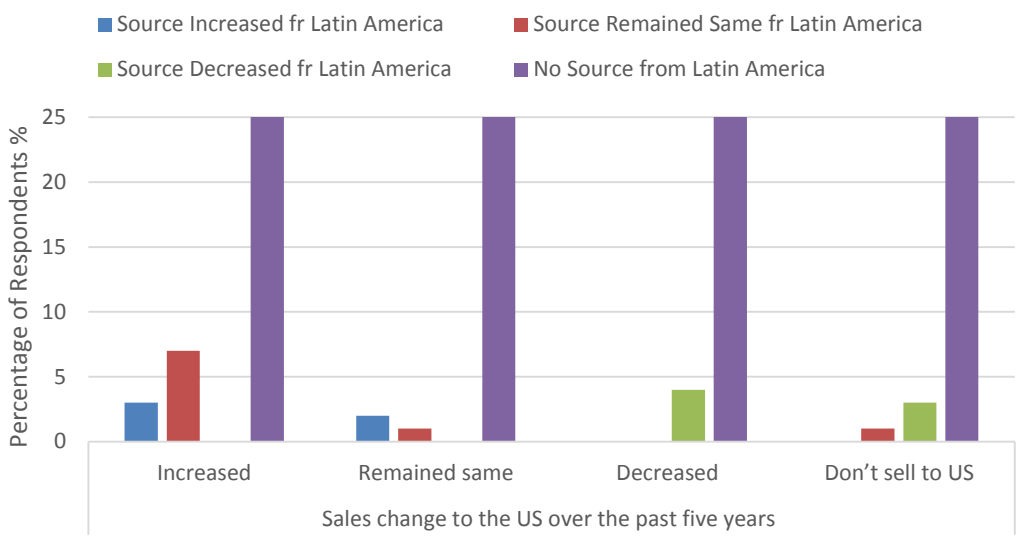


**Figure 25 Relationship between Sales to the US and Sourcing from Latin America**

Figure 26 demonstrates the relationship between the Chinese companies' sales to the US and sourcing domestically from China. 142 of 216 companies (66%) have both sourcing from China and sales to the US, and 87 (40%) of all respondents have increased their sourcing from China in the past 5 years. The survey data demonstrate that China has been the most important and fastest growing raw material provider for Chinese companies who eventually export to the US. According to the significant results in the contingency table regarding companies who have decreased sales to the US market, the relative proportions of the companies who decreased sourcing from China is higher, compared with companies who have increased sales, maintained sales or have no sales to the US.

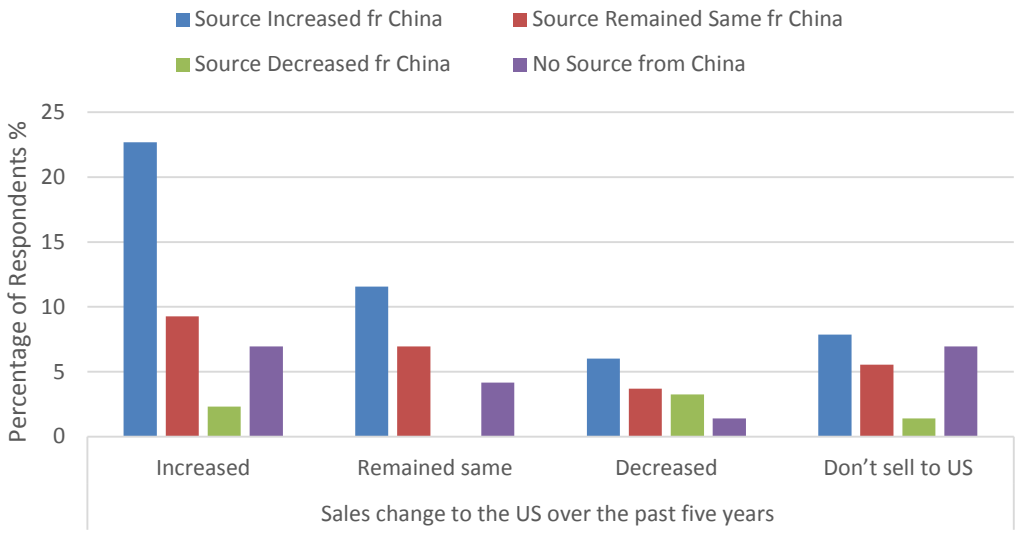


**Figure 26 Relationship between Sales to the US and Sourcing from China**

### 3.2.2 Sales to the US vs Perceptions towards the Lacey Act Amendment

The survey queries the Chinese companies' perceptions toward the Lacey Act Amendment. Table 6 is the contingency table displaying frequency distribution of the respondents' perceptions toward the Lacey Act Amendment according to their sales to the US. Significant results are interpreted in detail with graphs as follows.

**Table 6 Relationship between Companies' Perceptions towards the Lacey Act Amendment and Sales to the US (number of companies)**

| | | Increased | Remained same | Decreased | Don't sell to this region |
|---|---|---|---|---|---|
| I acquired chain-of-custody certification to help me comply with the Lacey Act | Disagree | 3 | 2 | 5 | 3 |
| | Agree | 78 | 42 | 19 | 19 |
| I will increase my use of wood from the US to help my company comply with the Lacey Act | Disagree | 30 | 29 | 13 | 11 |
| | Agree | 51 | 13 | 12 | 9 |
| The Lacey Act will cause me to reduce my exports of wood products to the US | Disagree | 43 | 16 | 4 | 6 |
| | Agree | 38 | 27 | 20 | 12 |
| The Lacey Act has made me more careful about sourcing logs/lumber | Disagree | 10 | 5 | 4 | 5 |
| | Agree | 71 | 38 | 21 | 15 |
| It is easy to comply with the Lacey Act | Disagree | 18 | 14 | 10 | 6 |
| | Agree | 63 | 30 | 14 | 13 |
| Compliance with the Lacey Act has increased the cost of exporting to the US | No | 26 | 12 | 9 | 12 |
| | Yes | 50 | 31 | 16 | 7 |

Figure 27 demonstrates the relationship between the Chinese companies' sales to the US and their familiarity with the Lacey Act Amendment. The results of the contingency table demonstrate that the higher proportions of companies that have heard about and are familiar with the Lacey Act Amendment have increased their sales to the US. For companies who have no sales to the US, the proportions of companies that have never heard of the Lacey Act Amendment are significantly higher than for companies that do have sales to the US.

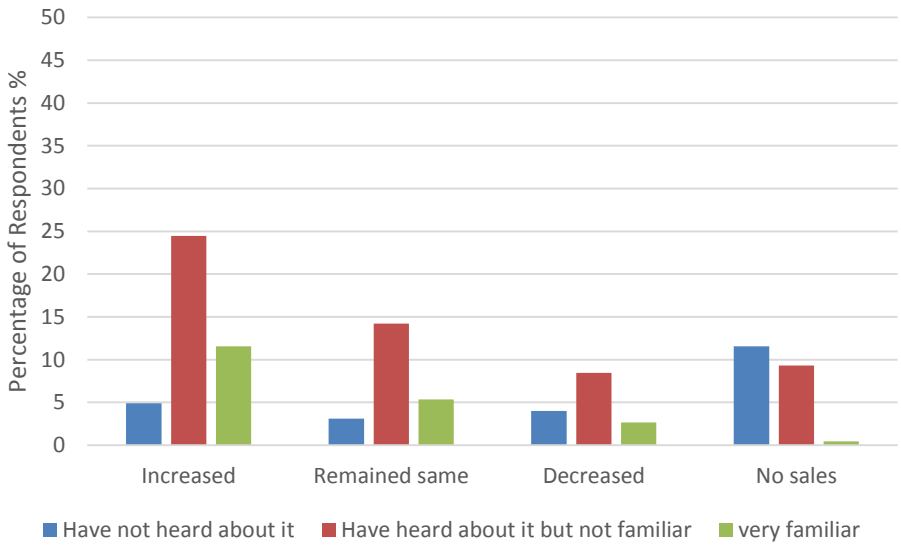


**Figure 27 Relations between Sales to the US and Familiarity about the Lacey Act Amendment**

Figure 28 demonstrates the relationship between Chinese companies' sales to the US and their established actions to adopt COC certifications in order to comply with the Lacey Act Amendment. The results show that, regarding companies who have decreased sales to the US, the proportion of companies who have adopted COC certifications are higher.

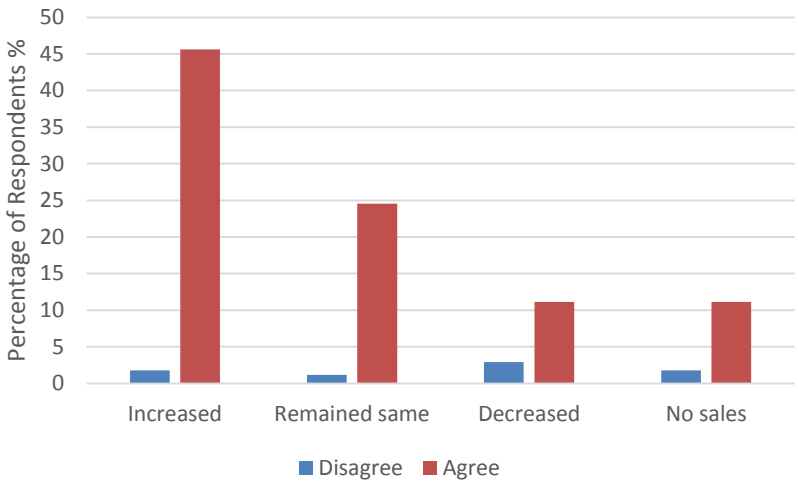


**Figure 28 Relations between Sales to the US and Having Adopted COC Certifications**

Figure 29 demonstrates the relationship between Chinese companies' sales to the US and their willingness to source more material from the US. Regarding companies that have increased their sales to the US, the proportion of companies who are willing to source more from the US are higher than for companies who have remained, decreased and have no sales to the US market.

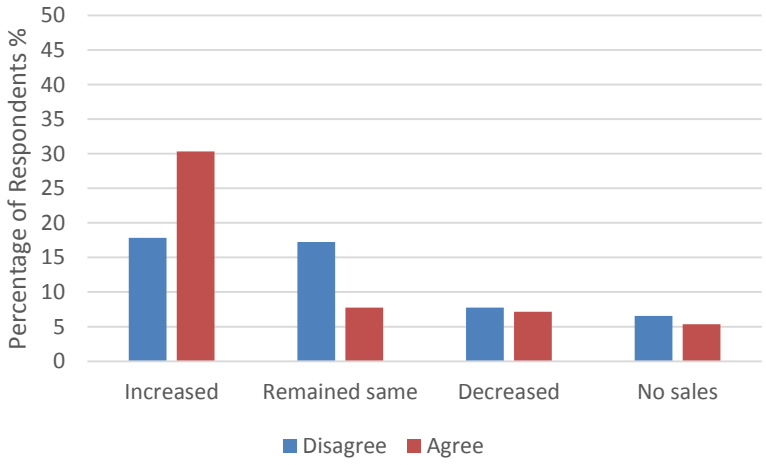


**Figure 29 Relations between Sales to the US and Willingness to Source More from the US**

Figure 30 demonstrates the relationship between the Chinese companies' sales to the US and their attention to sourcing more carefully. Although the test results are not significant for the contingency table, Figure 31 displays that most of the companies agreed that the Lacey Act Amendment has made them more careful about sourcing logs/lumber. Regarding companies that have increased their sales to the US market, the majority of the companies agreed that the Lacey Act Amendment has made them more careful about sourcing logs/lumber.

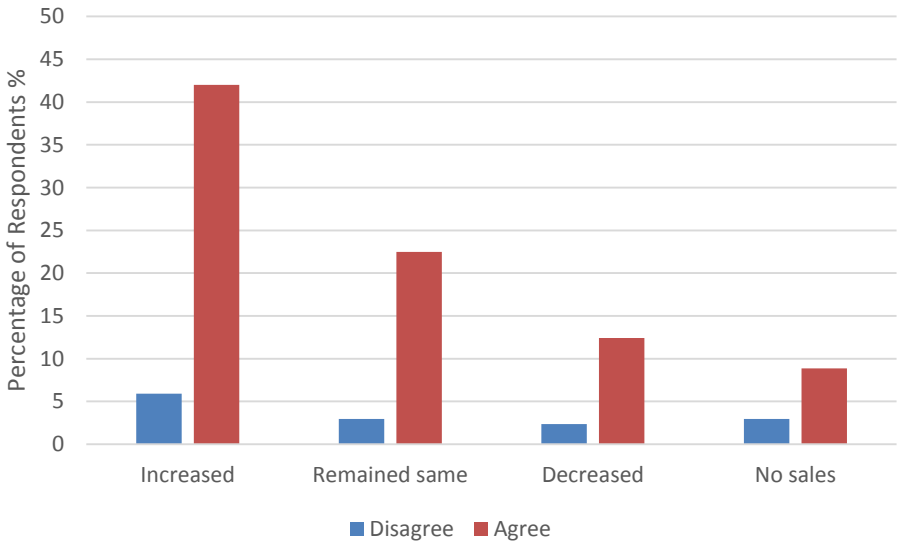


**Figure 30 Relations between Sales to the US and More Carefulness About Sourcing**

Figure 31 demonstrates the relationship between Chinese companies' sales to the US and the ease with which they can comply with the Lacey Act Amendment. Although the tests for contingency tables are not significant, Figure 32 displays that the companies who think it is easy to comply with the Lacey Act Amendment constitute the majority of the companies that have increased sales to the US. Further, only over half the companies who think it is easy to comply have decreased their sales to the US.

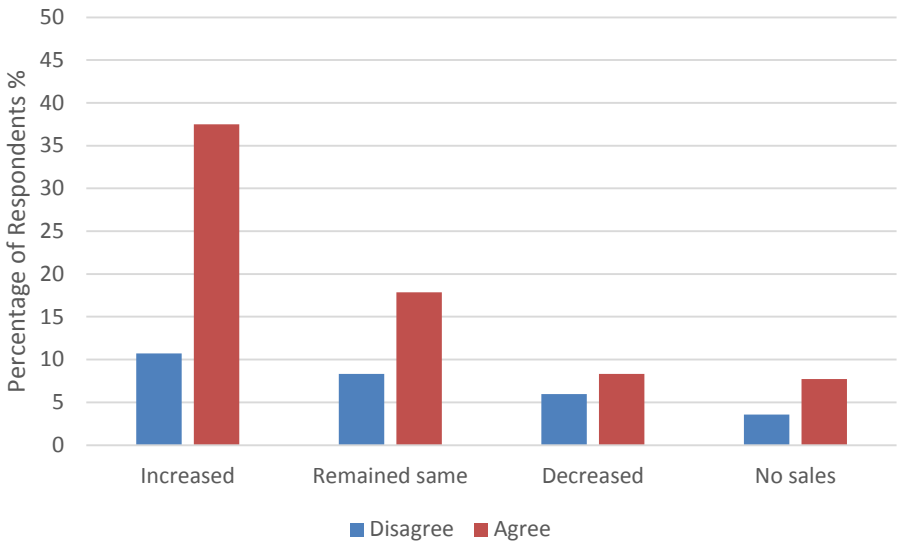


**Figure 31 Relations between Sales to the US and Ease to Comply with the Lacey Act Amendment**

### 3.2.3 Companies' characters vs Perceptions towards timber legality regulations

The survey queries the Chinese companies' general perceptions of the timber legality regulations. This section examines the relationship between companies' characteristics and their perceptions of the timber legality regulations. Specifically, the companies' sizes (big vs small), industry type (flooring vs furniture), exports (yes vs no), COC adoption (yes vs no), and tropical hardwood raw material usage (yes or no) are taken into account. Table 7 to Table 10 are contingency tables displaying the frequency distributions of the respondents' general perceptions of timber legality regulations according to their size, industry type, exports and COC adoption:

**Table 7 Different Perceptions toward Timber Legality Regulation btw Flooring and Furniture Industries**

| | | flooring | furniture |
|---|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | Disagree | 4 | 3 |
| | Agree | 96 | 122 |
| I intend to increase my exports to countries that do not have timber legality regulations | Disagree | 59 | 71 |
| | Agree | 40 | 54 |
| Timber legality regulations cause timber prices to increase | Disagree | 28 | 30 |
| | Agree | 72 | 94 |
| Timber legality regulations increase the cost of exporting | Disagree | 14 | 25 |
| | Agree | 86 | 100 |
| I intend to decrease my exports to countries that have timber legality regulations | Disagree | 56 | 69 |
| | Agree | 43 | 55 |
| I plan to increase my use of certified wood to help me comply with legality legislation | Disagree | 10 | 35 |
| | Agree | 88 | 90 |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | Disagree | 48 | 49 |
| | Agree | 52 | 76 |
| I intend to sell more products within China because of timber legality regulations | Disagree | 35 | 41 |
| | Agree | 64 | 83 |
| Illegal logging is a major environmental problem | Disagree | 4 | 10 |
| | Agree | 96 | 114 |

**Table 8 Different Perceptions toward Timber Legality Regulation btw Domestically Oriented Companies and Internationally Oriented Companies**

| | | domestic >90% | mainly export |
|---|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | Disagree | 0 | 7 |
| | Agree | 31 | 185 |
| I intend to increase my exports to countries that do not have timber legality regulations | Disagree | 21 | 107 |
| | Agree | 10 | 84 |
| Timber legality regulations cause timber prices to increase | Disagree | 9 | 48 |
| | Agree | 22 | 144 |
| Timber legality regulations increase the cost of exporting | Disagree | 9 | 29 |
| | Agree | 22 | 163 |
| I intend to decrease my exports to countries that have timber legality regulations | Disagree | 16 | 108 |
| | Agree | 15 | 82 |
| I plan to increase my use of certified wood to help me comply with legality legislation | Disagree | 6 | 39 |
| | Agree | 25 | 151 |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | Disagree | 11 | 86 |
| | Agree | 20 | 106 |
| I intend to sell more products within China because of timber legality regulations | Disagree | 5 | 71 |
| | Agree | 26 | 119 |
| Illegal logging is a major environmental problem | Disagree | 1 | 13 |
| | Agree | 30 | 178 |

**Table 9 Different Perceptions toward Timber Legality Regulation btw Companies With and Without COC Certificates**

| | | W/o COC | With COC |
|---|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | Disagree | 2 | 5 |
| | Agree | 19 | 199 |
| I intend to increase my exports to countries that do not have timber legality regulations | Disagree | 10 | 120 |
| | Agree | 11 | 83 |
| Timber legality regulations cause timber prices to increase | Disagree | 10 | 48 |
| | Agree | 11 | 155 |
| Timber legality regulations increase the cost of exporting | Disagree | 7 | 32 |
| | Agree | 14 | 172 |
| I intend to decrease my exports to countries that have timber legality regulations | Disagree | 10 | 115 |
| | Agree | 11 | 87 |
| I plan to increase my use of certified wood to help me comply with legality legislation | Disagree | 4 | 41 |
| | Agree | 17 | 161 |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | Disagree | 6 | 91 |
| | Agree | 15 | 113 |
| I intend to sell more products within China because of timber legality regulations | Disagree | 7 | 69 |
| | Agree | 14 | 133 |
| Illegal logging is a major environmental problem | Disagree | 0 | 14 |
| | Agree | 21 | 189 |

**Table 10 Different Perceptions toward Timber Legality Regulation btw the Smallest Companies and the Largest Companies**

| | | **Less than ¥10,000,000** | **more than ¥200,000,000** |
|---|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | Disagree | 1 | 0 |
| | Agree | 28 | 31 |
| I intend to increase my exports to countries that do not have timber legality regulations | Disagree | 13 | 21 |
| | Agree | 16 | 10 |
| Timber legality regulations cause timber prices to increase | Disagree | 11 | 5 |
| | Agree | 17 | 26 |
| Timber legality regulations increase the cost of exporting | Disagree | 6 | 5 |
| | Agree | 23 | 26 |
| I intend to decrease my exports to countries that have timber legality regulations | Disagree | 11 | 15 |
| | Agree | 18 | 15 |
| I plan to increase my use of certified wood to help me comply with legality legislation | Disagree | 7 | 3 |
| | Agree | 22 | 28 |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | Disagree | 10 | 18 |
| | Agree | 19 | 13 |
| I intend to sell more products within China because of timber legality regulations | Disagree | 7 | 12 |
| | Agree | 22 | 19 |
| Illegal logging is a major environmental problem | Disagree | 5 | 2 |
| | Agree | 24 | 29 |

Statistical tests demonstrate that the companies' perceptions of timber legality regulations differ significantly according to the size and the industry type of the company. The significant results are analyzed in detail with graphs as follows:

For the relationship between companies' perceptions and their sizes, only the largest companies (annual revenue greater than 200,000,000 Chinese Yuan) and the smallest companies (annual revenue smaller than 10,000,000 Chinese Yuan) are analyzed. The sample is composed of 60 respondents for the two groups combined. The significant result is displayed in Fig. 32. Companies are asked whether they agree or disagree with the statement that timber legality regulations cause timber prices to increase. The proportion of companies who don't agree with the statement is significantly higher within small companies than in big companies. Accordingly, the proportion of companies who agree with the statement is significantly higher in big companies than in small companies. In other words, big companies tend to believe that timber legality regulations result in a timber price increase.


**Figure 32 Company Size and Perceptions toward Timber Price Increase**

The Chinese companies' industry type falls into either flooring manufacture or furniture manufacture. The significant result of the relationship between companies' perceptions and their industry type is displayed in Fig. 33. Companies are asked whether they plan to increase their use of certified wood to help comply with legality legislation. A larger amount of flooring manufacture companies agree with the statement than furniture manufacture. Accordingly, the proportion of furniture manufacture companies who disagree with the statement is significantly higher than the proportion of flooring manufacture companies. In other words, flooring companies are more willing to use certified wood to help comply with the timber legality regulations.

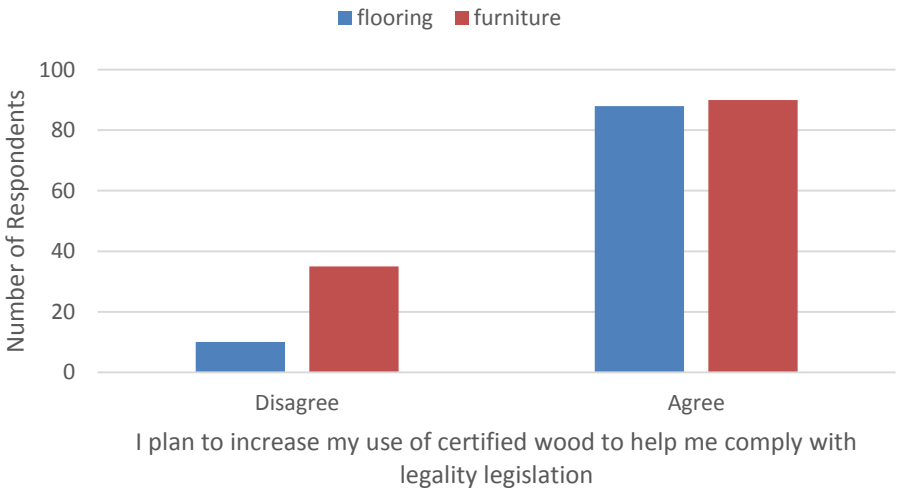


**Figure 33 Companies' Industry type and Perceptions toward the Use of Certified Wood**

## 3.3 Factor Analysis about companies' sourcing regions

The survey respondents were asked to indicate whether they have sourced from the following regions over the past 5 years (following the implementation of the Lacey Act Amendment): Russia, United States (US), Canada, Southeast Asia, Africa, European Union (EU), Latin America and China. These regions cover sourcing from almost the entire globe. In order to further analyze the Chinese companies' sourcing behaviors from different regions, to reduce the

dimensions of the data for Phase 2 of this study, and to eliminate the severe multi-colinearities among the regional procurement variables, a factor analysis is conducted for the companies' sourcing changes from different regions.

Factor analysis is one type of method used to achieve dimension reduction of multivariate data (Lattin et.al., 2003)[79]. Factor analysis is concerned with identifying underlying sources of variance common to two or more variables (called common factors). An assumption explicit in this common factor model is that the observed variation in each variable is attributable to the underlying common factors and to a specific factor (often interpretable as measurement error).

Factor analysis can be either exploratory or confirmatory in nature. The objective of exploratory factor analysis is to identify these common factors (separate from the specific factors) and explain their relationship to the observed data. The goal is to infer factor structure from the patterns of correlation in the data (Lattin et.al., 2003). This study employs the exploratory factor method.

Varimax rotation is adopted tofacilitate the interpretation of a factor analytic solution. After extracting a set of factors from a data set a rotation of the factors is generally followed in order to make the interpretation of the factors that are considered relevant (Abdi 2003)[80]. Varimax is the most popular rotation method. It simplifies the interpretation by maximizing the sum of the variances of the squared loadings (squared correlations between variables and factors).

The factor analysis results in three new standardized variables. The results of the factor analysis with component values are displayed in table 11. The 8 regions above were reduced to three groups: The first group is composed of the US, Canada, EU, and Russia. These countries are

in temperate regions dominated by temperate softwood, and thus form the "sourcing from softwood dominated regions" group. The second group is composed of Southeast Asia, Latin America and Africa. These countries are in the tropical regions dominated by tropical hardwood, and thus form the "sourcing from hardwood dominated regions" group. The third group is composed of only one country of China, ehnce is called the "sourcing from local" group.

**Table 11 Grouping Results of the Factor Analysis**

Component values:

| | **Softwood Dominant Regions** | **Hardwood Dominant Regions** | **China Local** |
|---|---|---|---|
| Russia | 0.683 | | |
| US | 0.809 | | |
| Canada | 0.77 | | |
| EU | 0.794 | | |
| Southeast Asia | | 0.817 | |
| Africa | | 0.775 | |
| South America | | 0.555 | |
| China | | | 0.932 |

Note: Extraction Method: Principal Component Analysis
Rotation Method: Varimax with Kaiser Normalization

# Chapter 4 – sales strategy changes (phase 1)

## 4.1 Model specification and evaluation

The dependent variable is measured using rank-ordered discrete characteristics, hence, it can be defined as a discrete ordinal variable (Ishii-Kuntz 1994)[81]. Such ordinal responses cannot be modeled using a classical regression approach because the spacing among the rank ordered categories cannot be assumed to be uniform (Liao 1994). Moreover, since the coding used in the ordinal-level dependent variable is arbitrary (0, 1, 2 and 3 in this case), the estimated coefficient of the regression model will depend on the coding used (McKelvey et al. 1975). This study employs an ordinal probit modeling approach for estimating the relationship between the ordinal and discrete dependent variable and the independent variables previously described.

The following model specification is used for the study (Long 1997)[82]:

$$T_n^* = \beta z_n + \varepsilon_n \qquad \ldots\ldots \text{(eq. 1)}$$

Where

$T_n^* = latent\ measure\ of\ the\ nth\ firm's\ sales\ change\ in\ the\ US, over\ the\ last\ 5\ years$

$z_n = a\ vector\ of\ explanatory\ variables\ as\ has\ been\ identified\ in\ the\ model$

$\beta = a\ vector\ of\ parameters\ to\ be\ estimated, and$

$\varepsilon_n = a\ vector\ of\ the\ error\ term\ (assumed\ to\ follow\ a\ standard\ normal\ distribution)$

The observed and coded discrete sales choice variable, $T_n$, is determined from the model as follows:

$$T_n = \begin{cases} 0\ if -\infty \le T_n^* \le u_1 & (no\ sales\ to\ US) \\ 1\ if\ u_1 < T_n^* \le u_2 & (have\ sales\ to\ US\ but\ have\ been\ decreasing) \\ 2\ if\ u_2 < T_n^* \le u_3 & (have\ sales\ to\ US\ and\ remain\ the\ same) \\ 3\ if\ u_3 < T_n^* \le \infty & (have\ sales\ to\ US\ and\ have\ been\ increasing) \end{cases} \quad \text{..... (eq. 2)}$$

Where the $u_i$'s in Equation 2 represent thresholds to be estimated (along with the $\beta s$).

In this case of a 4 category ordered probit model, $u_1$is set to be 0 and $u_2$ and $u_3$ need to be estimated.

The probabilities associated with the coded responses of the 4-level ordered probit model in this study are as follows:

$$P(0) = P(T_n = 0) = P(T_n^* \le u_1) = \Phi(u_1 - \beta' z_n)$$

$$P(1) = P(T_n = 1) = P(u_1 < T_n^* \le u_2) = \Phi(u_2 - \beta' z_n) - \Phi(u_1 - \beta' z_n)$$

$$P(2) = P(T_n = 2) = P(u_2 < T_n^* \le u_3) = \Phi(u_3 - \beta' z_n) - \Phi(u_2 - \beta' z_n)$$

$$P(3) = P(T_n = 3) = P(u_3 < T_n^*) = 1 - \Phi(u_3 - \beta' z_n)$$

Where n is an individual, k is a response alternative, $\mathrm{P}(T_n = k)$ is the probability that individual n responds in manner k, and $\Phi()$ is the standard normal cumulative distribution function.

After specifying the full set of probabilities and assuming that the sample is identically and independently distributed (iid) on the variables, the parameters of the full model can be estimated consistently and efficiently using the conditional maximum likelihood estimation (MLE) technique, yielding asymptotically normally distributed maximum-likelihood estimates for the stated parameters. Given an iid sample (i=1,2, …, N) and the number of categories (j=0, 1, 2, 3), the log-likelihood function for the stated problem can be written as:

$$\iota(\Phi) = \sum_{j=1}^{J} \sum_{i=1}^{n} h_{ij} ln[Pr(y_i = j \mid z_i, \beta, u_i)] \quad \text{…… (eq. 3)}$$

The open-source statistical software R has been used for estimating the likelihood model stated in Equation 3. Model selection and evaluation was undertaken using the two most popular information criteria, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) (Buckland **et al.** 1997)[83]. In this study, the estimated AICc (AIC corrected for sample size) and BIC values for the proposed models are used to select the best approximating model, and inferences are drawn using the chosen model.

For the purpose of interpretation, the estimated model coefficients are translated into probability values. The effect of each of the significant explanatory variables on the dependent variable are calculated by fixing the values of all other explanatory variables in the model at their respective means, and varying the value of the explanatory variable under consideration. To obtain the bootstrapped estimates, 10,000 simulations were run using the variance–covariance matrix and the parameter estimates for the models. The simulation codes were written in R (**Adolph C., 2013**). To understand the precision of the estimated probability values, 95% confidence interval zones are used around the estimated probability curves.

## 4.2 Model results

The variables relevant for this survey with their corresponding coding details are described in Table 5. Table 6 shows the model estimates of the ordered probit regression exploring the role of the modeled factors that are likely to influence a change in the Chinese firms' exports behavior to the US, in the aftermath of the 2008 Lacey Act Amendment. The full model is estimated including all the variables of interest. A modeling exercise was undertaken to find the most parsimonious model with the best AICc and BIC values. The independent variables "industry" and

the “sourcing regions” of Russia, Canada and Southeast Asia emerged to be statistically insignificant, and were not included in the final model. The three models presented in the table are quite robust with the consistent parameter estimates across the models (Table 13).

**Table 12 Data Descriptions for the Model Regression**

| | code | item | descriptions |
|---|---|---|---|
| **dependent variable** | **Sales_Change_US** | in the past 5 years<br>0: no sales;<br>1: decrease;<br>2: remain the same;<br>3: increase | Chinese Companies' sales change to US market in the past 5 years |
| **independent variables** | **Per_Exp_Hardwood** | continuous variable % | percentage of tropical hardwood raw material |
| | **Per_Exp_CoC** | continuous variable % | percentage of chain-of-custody certified raw material |
| | **Per_Sales_Dom** | continuous variable % | percentage of domestic sales |
| | **Industry** | 1: flooring industry<br>2: furniture industry | Different forest product industries |
| | **Lacey_Act** | 0: not aware of;<br>1: aware but not familiar;<br>2: familiar | level of familiarity with the Lacey Act Amendment |
| | **Sales.Rev** | 1: Less than ¥10,000,000<br>2: ¥10,000,000 to ¥40,000,000<br>3: ¥40,000,001 to ¥70,000,000<br>4: ¥70,000,001 to ¥100,000,000<br>5: ¥100,000,000 to ¥200,000,000<br>6: more than ¥200,000,000 | company sales revenue in 2012 (indicator of the company's size) |
| | **Source_Change_RUS** | in the past 5 years<br>0: no source;<br>1: decrease;<br>2: remain the same;<br>3: increase | raw material sourcing change from Russia |
| | **Source_Change_US** | | raw material sourcing change from US |
| | **Source_Change_CAN** | | raw material sourcing change from Canada |
| | **Source_Change_Sea** | | raw material sourcing change from Southeast Asia |

**Table 13 Descriptions of variables and model results**

| | full model | | Parsim. M1 w/o interaction | | Parsim. M2 with interactions (best fit) | |
|---|---|---|---|---|---|---|
| | estimates | p values | estimates | p values | estimates | p values |
| (intercept) | 0.694 | 0.289 | 0.778 ** | 0.025 | 1.013 * | 0.070 |
| Per_Exp_Hardwood | -0.002 | 0.539 | -0.001 | 0.635 | -0.001 | 0.702 |
| Per_Exp_CoC | -0.001 | 0.710 | -0.000 | 0.923 | -0.001 | 0.798 |
| Per_Sales_Dom | -0.038 *** | 0.000 | -0.009 *** | 0.000 | -0.036 *** | 0.000 |
| Lacey_Act | 0.661 ** | 0.023 | 0.525 *** | 0.000 | 0.613 ** | 0.025 |
| Sales.Rev | 0.112 * | 0.053 | 0.093 * | 0.079 | 0.123 ** | 0.025 |
| Industry | -0.203 | 0.308 | | | | |
| Source_Change_rus | 0.081 | 0.266 | | | | |
| Source_Change_us | 0.925 *** | 0.000 | 0.335 *** | 0.000 | 0.871 *** | 0.000 |
| Source_Change_can | -0.092 | 0.272 | | | | |
| Source_Change_sea | -0.03 | 0.729 | | | | |
| Lacey_Act *Source_Change_US | -0.286 ** | 0.020 | | | -0.264 ** | 0.020 |
| Lacey_Act *Per_Sales_Dom | 0.014 *** | 0.003 | | | 0.014 ** | 0.002 |
| $u_2$ | 1.293 * | 0.051 | 1.317 *** | 0.000 | 1.591 *** | 0.005 |
| $u_3$ | 1.983 *** | 0.003 | 1.982 *** | 0.000 | 2.283 *** | 0.000 |
| **log likelihood** | **-222.645** | | **-231.7796** | | **-224.3419** | |
| **AIC.c** | **475.8923** | | **481.7837** | | **471.0138** | |
| **BIC** | **526.5974** | | **512.344** | | **508.31** | |

*: Values are significant at $p < 0.1$.

**: Values are significant at $p < 0.05$.

***: Values are significant at $p < 0.01$.

## 4.3 Model Understandings

Just as discussed before, the discrete dependent variable for Phase 1 study, the Chinese companies' export change to the US market in the past 5 years, has 4 levels: no sales, decreased sales, remained the same, increased sales. The assumption about the four levels is that: the fact

of a Chinese company having sales to the US, even it is decreased sales, demonstrates more positive actions and attitudes of the Chinese company towards the US market. In this way, level 2 has a bigger effect than level 1. Similarly, level 3 has a bigger effect than level 2, and level 4 has a bigger effect than level 3. In this way, according to the assumption, the dependent variable has ordered levels, and the distance between two levels cannot be assumed to be uniform. Thus the dependent variable is a categorical variable.

When I say a set of discrete, ordered choices are not "equally spaced", I'm implicitly appealing to their values on a continuous latent variable. The relationship between y, the ordered discrete variable and y*, the latent continuous variable, is interpreted in Figure 36:

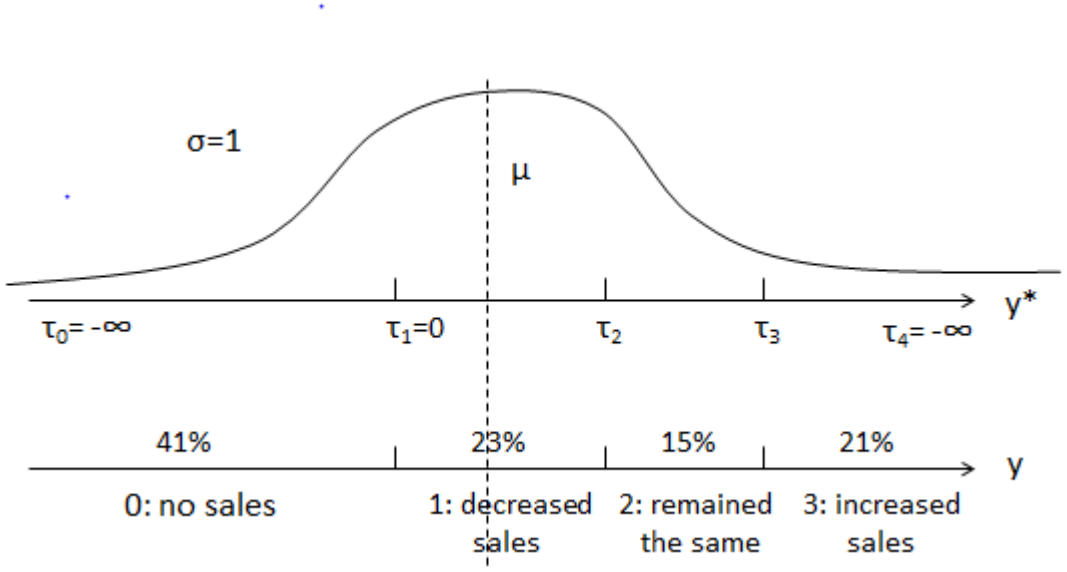


**Figure 34 Relationship between Observed Variable y and Latent Variable y* (1)**

The $\tau_i$is the threshold. By assumption, $\tau_1$ is negative infinity, $\tau_4$ is positive infinity and $\tau_1$ is 0. So $\tau_2$ and $\tau_3$ are parameters to estimate.

$$y_n = \begin{cases} 0\ if\ -\infty \le y_n^* \le \tau_1 & (no\ sales\ to\ US) \\ 1\ if\ \tau_1 < y_n^* \le \tau_2 & (have\ sales\ to\ US\ but\ have\ been\ decreasing) \\ 2\ if\ \tau_2 < y_n^* \le \tau_3 & (have\ sales\ to\ US\ and\ remain\ the\ same) \\ 3\ if\ \tau_3 < y_n^* \le \infty & (have\ sales\ to\ US\ and\ have\ been\ increasing) \end{cases}$$

The outcome is assumed to conform to a standard normal distribution with σ=1. $u_i = x_i\beta$ is a parameter in terms of observed exogenous variables that capture individual difference across observations. The value of $u_i$ determines the location of the standard normal curve (Figure 37). The value of $u_i$ shifts the distribution around while the thresholds remain constant.

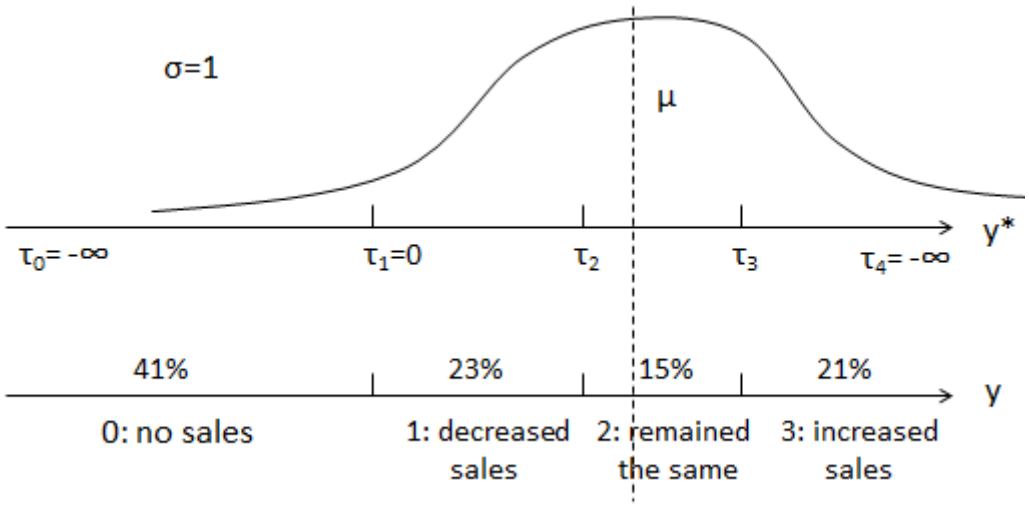


**Figure 35 Relationship between Observed Variable y and Latent Variable y* (2)**

Taken one particular company as an example (Table 12), in the most parsimonious model without interactions (for simplicity), the value of μ for this particular case is 50*(-0.001)+0+50*(-0.009)+2*0.525+3*0.093+3*0.335+0.778=2.612. In this case, μ is greater than $\tau_3$, so the center of the standard normal distribution is at the right side of $\tau_3$. In phase 1 study, the dependent variable y has 4 categories. The location of this μ means that for this particular company represented in Table 12, the fourth category (increased sales to the US) is expected.

**Table 14 Observed Values and Parameters for an Example**

| | example | parameters estimated |
|---|---|---|
| **(intercept)** | | 0.778 ** |
| **Hardwood material %** | **50 (%)** | -0.001 |
| **COC certified material %** | **50 (%)** | 0 |
| **Domestic sales %** | **50 (%)** | -0.009 *** |
| **Lacey Act familiarity** | **2** | 0.525 *** |
| **company size** | **3** | 0.093 * |
| **Source from US** | **3** | 0.335 *** |
| $\tau_2$ | | 1.317 |
| $\tau_3$ | | 1.982 |

For the example indicated in Table 14, we can also get one expected probability for each category of y. These 4 probabilities sum to one. According to the assumed standard normal distribution for the outcomes, the 4 probabilities associated with the 4 categories are the cumulative distribution function of the standard normal distribution divided into 4 parts by the thresholds:

$$P(0) = P(y_n = 0) = P(y_n^* \leq \tau_1) = \Phi(\tau_1 - \beta' x_n)$$

$$P(1) = P(y_n = 1) = P(\tau_1 < y_n^* \leq \tau_2) = \Phi(\tau_2 - \beta' z_n) - \Phi(\tau_1 - \beta' x_n)$$

$$P(2) = P(y_n = 2) = P(\tau_2 < y_n^* \leq \tau_3) = \Phi(\tau_3 - \beta' z_n) - \Phi(\tau_2 - \beta' x_n)$$

$$P(3) = P(y_n = 3) = P(\tau_3 < y_n^*) = 1 - \Phi(\tau_3 - \beta' x_n)$$

To acquire likelihood, let's recode $y_i$ into a vector, such that $y_{ij}$=1 if the latent variable $y_i^*$ falls into category j, and $y_{ij}$=0 otherwise:

$$y_{ij} = \begin{cases} 1 & if\ \tau_{j-1} < y_{ij} \leq \tau_j \\ 0 & \text{otherwise} \end{cases}$$

If the observed variable $y_i$ falls into category j, then the likelihood of $y_i$ is proportional to Pr($y_{ij}$=1). All other categories $\neq$ j are irrelevant. The log-likelihood function for the whole set of sample can be written as:

$$\iota(\Phi) = \sum_{j=1}^{J} \sum_{i=1}^{n} h_{ij} ln[Pr(y_i = j \mid x_i, \beta, u_i)] \quad \text{…… (eq. 3)}$$

All the β coefficients and threshold parameters are estimated by maximizing this log likelihood function.

After obtaining the β coefficients and threshold parameters, it is still very difficult and tedious to come up with the expected category for each case, or the probabilities for all 4 categories in each case. In the following chapter, simulation and graphs rather than coefficients are used to illustrate model results.

## 4.4 Discussions

Further analysis is based on the final best fit model, which is the most Parsimonious Model 2 with interactions. To enhance the ease of model interpretability, the model coefficients are translated into probability values and displayed in Figures 36 and 37. The results presented in these figures are based on the bootstrapped model. In Figure 36, the variables included in the final model are displayed along the y-axis. The x-axis displays the probability of the response for each of the categories corresponding to the respective variables on the y-axis. Figure 37 focuses on the interaction between the Lacey Act Amendment awareness variable and the respondents' sales in the domestic market.

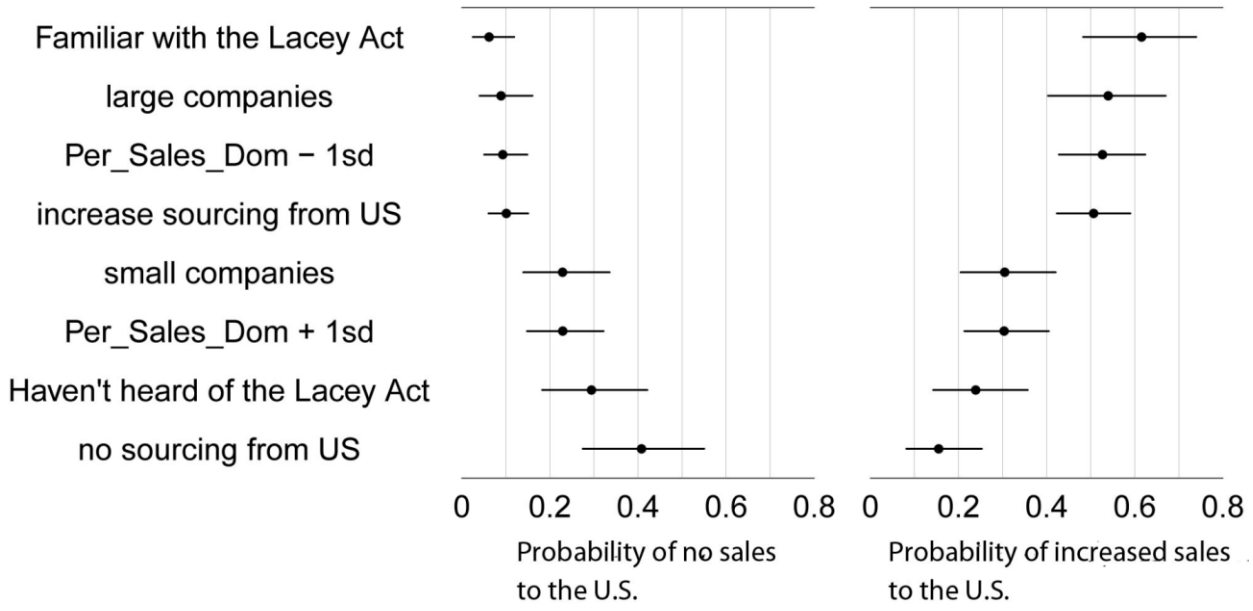


**Figure 36 Rope Ladder Representation of the Significant Model Results**

The modeling results reveal that the Chinese companies' awareness of the Lacey Act Amendment plays a significant role in their export behavior to the US following the implementation of the Lacey Act Amendment (Figure 36). Thus, companies with a higher awareness of the Lacey Act Amendment were significantly more likely to have increased their sales to the US over the past 5 years. The first row of Figure 36 shows that the respondents who are very familiar with Lacey Act Amendment had a 60% chance of increasing their sales to the US over the last five years, and less than a 10% chance of reporting that either they do not sell to the US or their sales to the US market have decreased.

The Chinese companies' domestic sales have a negative relationship with their sales to the US market. As can be observed by comparing the third and the sixth rows of Figure 36, those Chinese companies whose domestic sales percentages are one standard deviation above the mean are 20% less likely to have increased their sales to US than were those companies who were one standard deviation below the mean. Moreover, these companies who had a higher

percentage of sales to the domestic were 10% more likely to have no sales to US market than the group with a lower percentage of sales to the domestic market.

The modeling results reveal that the interaction between "the awareness of the Lacey Act Amendment" and the domestic sales percentage is also a significant predictor for the respondents' sales change in the US over the last five years. This aspect of the model is explained in Figure 37, which represents the probability that the Chinese firms' would decrease their sales to the US, given their awareness level of Lacey Act Amendment. The black line in the figure represents the corresponding probability of the group that is completely unaware of Lacey Act Amendment, whereas, the red line in the figure represents the corresponding probability of the group that has a high level of awareness of the Lacey Act Amendment. It can be observed from the steep positive slope of the black line, in Figure 37, that for the group that is unfamiliar with Lacey Act Amendment is significantly more likely to have no sales (for the past 5 years) in the US following the implementation of the Lacey Act Amendment. In contrast, the red line shows that there is no statistically significant relationship between these two variables as the firms become more familiar with Lacey Act Amendment. From the figure it can also be observed that for all levels of domestic sales, the companies that are highly aware of the Lacey Act Amendment are significantly less likely to have decreased their sales to the US as compared to the companies that were unaware of the Lacey Act Amendment.

The impact of the Chinese companies' demographic characteristics on their sales to the US was also tested in this paper. It can be observed from Table 13 that the 'industry' variable, which explores the difference in sales response by the furniture and flooring manufactures, proved to be insignificant in the regression model. However, company size proved to have a significant

positive relationship, which indicates that the larger companies were more likely to increase their exports to the US over the last 5 years. According to Figure 36, the large companies were approximately 20% more likely to increase their sales to the US during the last 5 years relative to the small companies.

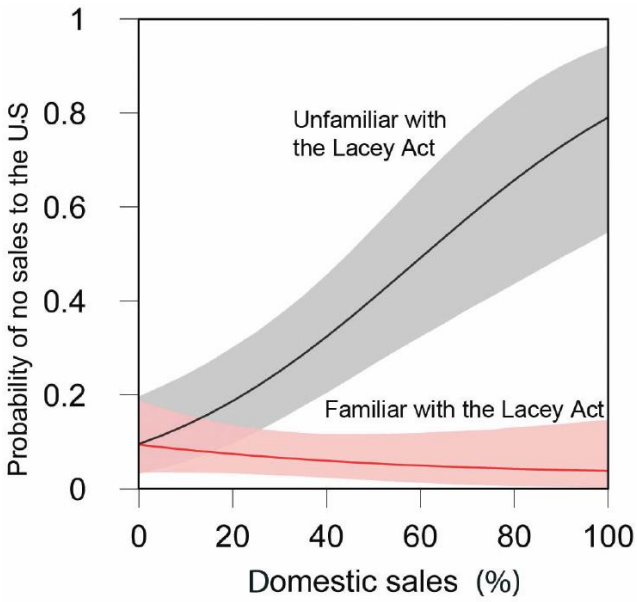


**Figure 37 Role of Lacey Act Amendment familiarity on probability of decreasing exports to the U.S. in the last five years**

With respect to the third research question, whether the Lacey Act Amendment has impacted the Chinese companies' material sourcing decisions, the model indicates that: (1) there is no evidence of any statistically significant relationship between the percentage of the companies' hardwood raw materials, or the chain-of-custody certified raw materials, in their supply chain and the companies' sales change behavior in the US market over the last 5 years. However, (2) a significant positive relationship between a companies' sourcing of raw materials from the US and their increased sales to the US was observed. Over the past 5 years, those Chinese companies who increased their raw material sourcing from the US were also significantly more likely to have increased their sales to the US, and vice-versa. From Figure 36 it can be observed that the Chinese

companies were approximately 40% more likely to increase their sales to US if they have increased their sourcing of raw materials from US relative to those companies who did not source raw materials from the US.

## 4.5 Conclusions

This research shows that there is a significant positive relationship between a firm's awareness of the Lacey Act Amendment and their change in sales to the US market over the past 5 years. Based on the nature of the study, a causal relationship between a firm's awareness of the Lacey Act Amendment and their sales to the US market cannot be drawn, although, it is clear that as a firm's awareness of the Lacey Act Amendment increases, their withdrawal from the US market decreases. Moreover, the study indicates that a lack of awareness of the Lacey Act Amendment may contribute to Chinese companies' decision to withdraw from the US market and focus on the less environmentally sensitive domestic market.

The study also suggests that the Lacey Act Amendment may influence the Chinese companies' sales strategies in US market in the same way within both industries (i.e., flooring and furniture). Moreover, over the last 5 years, the larger companies were able to maintain, and in some cases, even increase, their sales to the US. It is evident from the study that the lack of awareness of the Lacey Act has had a greater impact on the smaller companies and may have resulted in their reducing their sales into the US market. It can also be inferred from the study that the Lacey Act Amendment has encouraged the Chinese companies to increase their import of wood raw materials from the US in order to maintain their exports to the US and more easily demonstrate the legality of the wood used to manufacture their products exported to the US, which could enhance the competitiveness of the US forest products industry.

# Chapter 5 – Export cost increases (phase 2)

## 5.1 Modeling rationale

In the second phase of the study, the dependent variable—Chinese companies' export cost increase due to the Lacey Act Amendment—is grouped into four levels indicating the extent of the export cost increase to US. They survey's question of whether the Chinese companies' export cost to the US has increased or not frequently encountered a negative answer, indicating a zero export cost increase. This is not surprising, as the Lacey Act Amendment is not a trade barrier aimed at increasing all the companies' export cost as long as they have exports to US. The company may be subjected to an export cost increase to the US if they previously utilized "illegal sources" defined by the US Lacey Act Amendment, and are pushed by the Act to switch to "legal sources," which are generally more expensive.

However, some companies that are not sourcing completely legally may not be impacted by the Lacey Act Amendment or suffer from an export cost increase. Since it was implemented in 2007, the Lacey Act Amendment has only been enforced twice: two individual cases against the Gibson Guitar Corporation concerning the import of ebony wood stocks from India and Madagascar (Pryce 2012)[84], and the seizure of Peruvian hardwood from the Amazon (Noguerón et.al. 2010)[85]. The Lacey Act Amendment mainly impacts the wood industry by expressing severe warnings to all companies, but it doesn't necessarily detect or eradicate all the illegal sourcing activities performed.

In this way, the discrete ordered dependent variable of export cost is characterized by ''excessive'' zero observations which may relate to two distinct data generating processes. Thus, it is likely that these two types of zeros indicating the Chinese companies' zero export cost

increase are driven by different systems of consumer behavior: the first type of zero is reported by companies who have always had legal sourcing in history, and are thus unaffected by the Lacey Act Amendment. The second type of zero is reported by companies who are still half-way toward legal sourcing transmission.

A zero-inflated model is used to address various econometric issues in which the dependent variable is characterized by excessive zeros. The zero-inflated model can help to accommodate cases in which the number of zeros in the data exceeds what would typically be predicted by standard models (Greene 1994)[86]. In this study, the zero-inflated ordered probit model is used (Harris and Zhao, 2007)[87] as an extension of the standard ordered probit model, to take into account of the probability that the zeros can arise from two different aspects of individual behavior.

The zero-inflated model deals with excessive zeros in two processes: the first process is the zero part, or the "binary part" of the model. The zero part differentiates real zeros and non-zeros. In my model, the zero part attempts to answer whether the companies have an export cost increase (non-zeros) or not (zeros). It's worth noting that companies who indicate a zero export cost increase may be profiled into the non-zero group (for companies who have an export cost increase) if their characteristics are more aligned with companies who have an export cost increase.

The second process is the positive part, or the "ordered part" of the model. In this model, the positive part attempts to illuminate the levels/degrees of the export cost increase for companies who already have an export cost increase. The companies who have real zero cost

increases are excluded from the positive part. The companies who indicate zero cost increase but are regarded as more aligned with companies who have cost increase are included in the positive part of the model.

## 5.2 Modeling and estimation

In this study, the dependent variable y, the Chinese companies' export cost increase to US, has four discrete ordered values of 0, 1, 2, 3. A latent variable, y*, ranging from $-\infty$ to $\infty$ is mapped to an observed variable y (Long 1997). For a standard ordered probit model, the variable y is thought of as providing incomplete information about one latent variable, an underlying y* according to the measurement equation:

$$y_i = m \;\; if \;\; \mu_{m-1} \leq y_i^* < \mu_m \;\; \text{for m=1 to J}$$

$$y_i^* = \beta' x_i + \varepsilon_i, i = 1,2, \dots, n$$

The $\mu's$ are called thresholds or cutpoints. For observation i, $y_i^*$ is the latent-response variable of interest, $x_i$ is a vector of the independent variables, $\beta'$ is a vector of parameters, $\varepsilon_i$ is a random disturbance term, and $y_i^*$ is unobserved and is considered as the underlying tendency of the observed phenomenon $y_i$ . We assume that $\varepsilon_i$ follows a normal distribution with zero mean in the probit modeling approach.

However, for ZIOP, the ultimate data generating process here can be seen as coming from two separate underlying latent variables. Two latent equations are involved: a probit selection equation r and an OP equation$\hat{y}$. This splits the observations into two regimes that relate to potentially two different sets of explanatory variables. In this study, a Chinese export company to US is modeled as having to overcome two hurdles: whether the export cost to US has increased,

and then, how much has increased given the cost increase levels. The two types of zero-export-cost-increase observations relate to those sheer legal sourcing companies who are unaffected no matter how strict the Lacey Act Amendment is executed, and those companies who involves in some activities that are not allowed by the Lacey Act Amendment, but they haven't neither adjusted their own behaviors nor detected by the Lacey Act Amendment by far. The latter group of companies hasn't endured an export cost increase by far, but eventually need to get rid of their illegal sourcing in the long term. We refer to the former group the unaffected companies, and the latter group the potentially cost-increased group who have zero-export-increase by far. The potentially cost-increased group may exhibit behaviors similar to the unaffected companies as well as some illegal suspicious character such as some particular sourcing areas or some other characters.

The split among the "zero" response is indicated by r, where r=0 indicates zero export cost increase (regime 0), and r=1 indicated an actual export cost increase (regime 1). Within regime 1 (where r=1) adoption levels are represented by $\hat{y}$ (in this case $\hat{y} = 0, 1, 2\ and\ 3$). Though variables r and $\hat{y}$ are not individually observable, they can be observed through the variable y via the criterion

$$y=r\times\hat{y}$$

The underlying function r is generated by a binary-probit model through the underlying latent function r*, and $\hat{y}$ is generated by an ordinal-probit model through the underlying function $\hat{y}^*$as follows:

$$r_i^* = \alpha' v_i + \varepsilon_{1i}$$

And

$$\hat{y}_i^* = \gamma z_i + \varepsilon_{2i}$$

Where,

$v_i$ is a vector of predictor variables that determines the choice of zero-category regime,

$z_i$ is a vector of explanatory variables for determining the levels of export cost increase

$\alpha'$ is a vector of unknown coefficients for vector v

$\gamma$ is a vector of unknown coefficients for vector z.

Hence, for ZIOP, the relation between the observed variable $y_i$ and the latent variable $\hat{y}_i^*$ and $r_i^*$ can be stated as follows:

$$y_i = r_i \times \hat{y}_i^* = \begin{cases} 0 \ \ if \ \ r_i^* \leq 0 \ \text{ or } \ r_i^* > 0, \ \hat{y}_i^* \leq 0 \\ 1 \ \ if \ \ r_i^* > 0 \ \text{ and } \ 0 < \hat{y}_i^* \leq \hat{\mu}_1 \\ 2 \ \ if \ \ r_i^* > 0 \text{ and } \hat{\mu}_1 < \hat{y}_i^* \leq \hat{\mu}_2 \\ 3 \ \ if \ \ r_i^* > 0 \text{ and } \hat{\mu}_2 < \hat{y}_i^* \end{cases}$$

That is, to observe a y = 0 outcome we require either that r = 0 (the unaffected companies) or jointly that r = 1 and y = 0 (the potentially cost-increased group who have zero-export-increase by far). To observe a positive y, we require jointly r=1 that the company is not sheer legal in the past and y>0 that it has taken measures to convert to legal practices. Under the assumption that $\varepsilon$ and u are identically and independently follow standard Gaussian distributions, the equations above can be translated to the full probability function for y in the following form:

$$Pr_j = \begin{cases} \Pr(\hat{y} = 0 \mid \mathrm{z}, \mathrm{v}) = \Pr(\mathrm{r} = 0 \mid \mathrm{v}) + \Pr(\mathrm{r} = 1)\Pr(\hat{y} = 0 \mid \mathrm{z}, \mathrm{r} = 1) \\ \Pr(\hat{y} = 1 \mid \mathrm{z}, \mathrm{v}) = \Pr(r = 1 \mid v)\, Pr(\hat{y} = 1 \mid z, r = 1) \\ \Pr(\hat{y} = 2 \mid \mathrm{z}, \mathrm{v}) = \Pr(\mathrm{r} = 1 \mid \mathrm{v})\Pr(\hat{y} = 2 \mid \mathrm{z}, \mathrm{r} = 1) \\ \Pr(\hat{y} = 3 \mid \mathrm{z}, \mathrm{v}) = \Pr(r = 1 \mid v)\, Pr(\hat{y} = 3 \mid z, r = 1) \end{cases}$$

$$= \begin{cases} \Pr(\hat{y} = 0 \mid \mathrm{z}, \mathrm{v}) = [1 - \phi(-\mathrm{v}'\alpha)] + \phi(\mathrm{v}'\alpha)\phi(-\mathrm{z}'\gamma)] \\ \Pr(\hat{y} = 1 \mid \mathrm{z}, \mathrm{v}) = \phi(-\mathrm{v}'\alpha)[\phi(\hat{\mu}_1 - \mathrm{z}'\gamma) - \phi(-\mathrm{z}'\gamma)] \\ \Pr(\hat{y} = 2 \mid \mathrm{z}, \mathrm{v}) = \phi(-\mathrm{v}'\alpha)[\phi(\hat{\mu}_2 - \mathrm{z}'\gamma) - \phi(\hat{\mu}_1 - \mathrm{z}'\gamma)] \\ \Pr(\hat{y} = 3 \mid \mathrm{z}, \mathrm{v}) = \phi(-\mathrm{v}'\alpha)[1 - \phi(\hat{\mu}_2 - \mathrm{z}'\gamma)] \end{cases}$$

In this way, the probability of a zero observation has been ‘‘inflated’’ as it is a combination of the probability of ‘‘zero export-cost-increased’’ companies from the OP process plus the probability of ‘‘unaffected’’ companies from the split probit model.

Once the full set of probabilities has been specified and given an identically and independently distributed (i.i.d) sample of size N from the population on ($y_i, v_i, z_i$), $i$=1, ……, N, the parameters of the full model (β’, ϒ’, μ’)’ can be consistently and efficiently estimated using maximum likelihood (ML) criteria, yielding asymptotically normally distributed maximum likelihood estimates (MLEs). The log likelihood function is

$$\iota(\theta) = \sum_{i=1}^{N}\sum_{j=0}^{J} h_{ij} \ln[\Pr(y_i = j \,|\, v_i, z_i, \theta)]$$

Where the indicator function $h_{ij}$ is

$$h_{ij} = \begin{cases} 1 & \text{if the company has export an cost increase, and the increase level is category j} \\ 0 & \text{if the company is unaffected} \qquad (i = 1, 2, \ldots, \mathrm{N};\ j = 1, 2, \ldots \mathrm{J}) \end{cases}$$

## 5.3 Model selection and evaluation

The log-likelihood function above is maximized to provide model estimates with discrete dependent variables. The maximized value of the log-likelihood function of the full model is the direct and primary indicator of the model's fit (Greene, 2000). However, the zero-inflated probit model used in this study incorporates complexity in terms of the number of covariates in the modeling process, which is also an important criterion when comparing the maximized log-likelihood values of the competing models. Various information criteria are used in this study for comparing and selecting the best approximating model among the competing models. Akaike's entropic information criterion, which is known as AIC, has had a fundamental impact in statistical model evaluation problems (Bozdogan 1987)[88]. The corrected AIC (AICc) method provides greater penalty for extra parameters, thus provides substantially better selection than AIC (Burnham and Anderson 2002)[89]. The Bayesian information criterion (BIC) has become a popular method of model selection in sociological research (Weakliem 1999)[90]. While AIC represents the approach of information-theoretic selection based on Kullback-Leibler (K-L) information loss, the BIC represents the other well-known approach of Bayesian model selection based on Bayes factors (Burnham and Anderson 2004)[91]. The AIC, AICc and BIC are used in this study for selecting the best approximating model, and inferences are drawn using the chosen model.

The Vuong test is a hypothesis testing approach for the selection between nested and non-nested models (Vuong 1989)[92]. In this study, the Vuong test is used to test the zero-inflated model against its non-zero-inflated counterpart, the standard ordered probit model. Vuong's test can be termed as a suitably normalized version of the log-likelihood ratio test. Hence, if Vuong's test-statistic is greater than 1.96, the ZIOP is considered a better approximating model than the

ordinal probit; whereas, if Vuong's test-statistic is less than − 1.96, then the ordinal probit is a better approximating model than ZIOP, at the 95% confidence level. If the test-statistic lies between − 1.96 and 1.96, then the models are not statistically distinguishable from each other (Indroneil et.al. 2010).

For the purpose of interpretation, the estimated model coefficients are translated into probability values. The effect of each of the significant explanatory variables on the dependent variable are calculated by fixing the values of all other explanatory variables in the model at their respective means, and varying the value of the explanatory variable under consideration. To obtain the bootstrapped estimates, 10,000 simulations were run using the variance–covariance matrix and the parameter estimates for the models. The simulation codes were written in R. To understand the precision of the estimated probability values, single standard-deviation zones are used around the estimated probability curves.

## 5.4 Results and discussions

The export cost increase of the Chinese companies is estimated using standard ordered-probit and zero-inflated ordered-probit models, and the modeling results are presented in table 15 and 16 along with the coefficient estimated for each of the covariates, model selection, and evaluation criteria.

The zero-inflated ordinal-probit (ZIOP) model estimates more parameters than the ordinal-probit (OP) model. Thus, the log-likelihood ratio test will be biased towards the ZIOP model. However, the corrected Akaike information criteria and the Bayesian information criteria (BIC) judge the models by comparing the proximity of the fitted parameter values to those of the true

values while adjusting for the number of parameters estimated in the models. In this study, both the AIC and BIC tests favor the ZIOP model as an efficient estimator of the data as compared to the OP model, that the BIC and AIC values of the ZIOP model were estimated to be lower than those of the OP model. Hence, the ZIOP model is favored over the OP model as a closer approximation of the 'true' model. It is worth noting that the BIC values of the ZIOP models are lower than that of the OP model by a difference of almost 30, indicating strong evidence that the zero-inflated model has done a superior job of predicting the companies' export cost increase patterns (Weakliem 1999)[93]. Further, Vuong's test also favored ZIOP as a better approximating model than OP with p-values less than 0.01, indicating that ZIOP is a better approximating model at the 99% confidence level. Accordingly, the following section focuses on the parameter estimates of the ZIOP model because it has superior predictive power.

The full model (Table 15) is estimated including all the variables of interest. The backward stepwise selection was conducted to find the most parsimonious model with the best AICc and BIC values for the ZIOP models. The independent variables "industry," "Lacey Act: Easy to Comply," "Hardwood Raw Materials (%)" and "Domestic Sales (%)" emerged to be statistically insignificant, and were not included in the final model (Table 16). The independent variables "Size of the Company," "Lacey Act: Familiarity," "COC Certified Raw Materials (%)" and "Sourcing from SD/HD/Local Regions (5 years)" are significant in either the binary or the ordered part of the final ZIOP model. The full model and the final model are robust with the consistent parameter estimates across the models (Table 15 & 16).

Further discussions are based on the final ZIOP model presented in Table 16.

**Table 15 Full Model: Estimated Coefficients for Ordered Probit and ZIOP Models for the Impacts of the Lacey Act Amendment on the Chinese Companies' Export Cost Increase**

| | Ordered Probit (OP) | | Zero-Inflated Order Probit (ZIOP) | | Model Selection |
|---|---|---|---|---|---|
| | Estimates | *p*-value | Estimates | *p*-value | |
| **Binary parameters** | | | | | |
| Constant | - - | - - | 0.276 | 0.859 | - - |
| Industry | - - | - - | -0.014 | 0.982 | - - |
| Size of the Company | - - | - - | 0.689** | 0.045 | - - |
| Lacey Act: Familiarity | - - | - - | -1.719** | 0.033 | - - |
| Lacey Act: Easy to Comply | - - | - - | 0.131 | 0.568 | - - |
| COC Certified Raw Materials (%) | - - | - - | 0.024* | 0.051 | - - |
| Hardwood Raw Materials (%) | - - | - - | -0.003 | 0.783 | - - |
| Domestic Sales (%) | - - | - - | -0.011 | 0.179 | - - |
| Sourcing from SD Regions (5 years) | - - | - - | -0.803*** | 0.007 | - - |
| Sourcing from HD Regions (5 years) | - - | - - | 1.643* | 0.059 | - - |
| Sourcing from Local (5 years) | - - | - - | 0.310 | 0.333 | - - |
| **Ordered parameters** | | | | | |
| Constant | -0.120 | 0.831 | 1.216 | 0.104 | - - |
| Industry | 0.139 | 0.540 | 0.224 | 0.398 | - - |
| Size of the Company | 0.093 | 0.483 | -0.081 | 0.632 | - - |
| Lacey Act: familiarity | -0.247 | 0.282 | 0.451 | 0.114 | - - |
| Lacey Act: Easy to Comply | 0.072 | 0.591 | 0.005 | 0.974 | - - |
| COC certified materials (%) | 0.003 | 0.409 | -0.005 | 0.173 | - - |
| Hardwood Raw Materials (%) | 0.001 | 0.798 | -0.004 | 0.372 | - - |
| Domestic Sales (%) | 0.000 | 0.949 | 0.005 | 0.216 | - - |
| Sourcing from SD Regions (5 years) | -0.004 | 0.970 | 0.418*** | 0.002 | - - |
| Sourcing from HD Regions (5 years) | 0.186 | 0.117 | -0.097 | 0.477 | - - |
| Sourcing from Local (5 years) | -0.108 | 0.300 | -0.252** | 0.047 | - - |
| Tau 1 | 0.505 | 0.000 | 0.828 | 0.000 | - - |
| Tau 2 | 1.220 | 0.000 | 1.761 | 0.000 | - - |
| **Diagnostics - model evaluation** | | | | | |
| Log Likelihood at maximum | -175.858 | | -155.967 | | ZIOP favored |
| Akaike information criteria (AIC) | 377.715 | | 337.934 | | ZIOP favored |
| Bayesian information criteria (BIC) | 478.668 | | 438.887 | | ZIOP favored |
| Akaike information criteria - Corrected for Sample size (AICC) | 380.315 | | 340.534 | | ZIOP favored |
| Vuong's test (OP v/s ZIOP) | Non-nested hypothesis test-statistic: 3.541 | | | | ZIOP favored (p-val: 0.000) |

- - : not applicable

*: Values are significant at p<0.1.

**: Values are significant at p<0.05.

***: Values are significant at p<0.01.

**Table 16 Final Model: Estimated Coefficients for Ordered Probit and ZIOP Models for the Impacts of the Lacey Act Amendment on the Chinese Companies' Export Cost Increase**

| | Ordered Probit (OP) | | Zero-Inflated Order Probit (ZIOP) | | Model Selection |
|---|---|---|---|---|---|
| | Estimates | *p*-value | Estimates | *p*-value | |
| **Binary parameters** | | | | | |
| Constant | - - | - - | -0.174 | 0.793 | - - |
| Size of the Company | | | 0.717** | 0.023 | |
| Lacey Act: Familiarity | - - | - - | -1.500*** | 0.009 | - - |
| COC Certified Raw Materials (%) | - - | - - | 0.016** | 0.040 | - - |
| Sourcing from SD Regions (5 years) | - - | - - | -0.762*** | 0.002 | - - |
| Sourcing from HD Regions (5 years) | - - | - - | 1.291*** | 0.008 | - - |
| Sourcing from Local (5 years) | - - | - - | 0.102 | 0.643 | - - |
| **Ordered parameters** | | | | | |
| Constant | 0.163 | 0.322 | 1.750 | 0.000 | - - |
| Size of the Company | 0.085 | 0.504 | -0.160 | 0.313 | |
| Lacey Act: familiarity | -0.227 | 0.312 | 0.423 | 0.133 | - - |
| COC certified materials (%) | 0.003 | 0.338 | -0.005 | 0.191 | - - |
| Sourcing from SD Regions (5 years) | -0.017 | 0.861 | 0.416*** | 0.002 | - - |
| Sourcing from HD Regions (5 years) | 0.172 | 0.094 | -0.177 | 0.151 | - - |
| Sourcing from Local (5 years) | -0.116 | 0.238 | -0.237** | 0.050 | - - |
| Tau 1 | 0.504 | 0.000 | 0.849 | 0.000 | - - |
| Tau 2 | 1.217 | 0.000 | 1.775 | 0.000 | - - |
| **Diagnostics - model evaluation** | | | | | |
| Log Likelihood at maximum | -176.157 | | -158.761 | | |
| Akaike information criteria (AIC) | 370.315 | | 335.523 | | ZIOP favored |
| Bayesian information criteria (BIC) | 440.205 | | 405.413 | | ZIOP favored |
| Akaike information criteria - Corrected for Sample size (AICC) | 371.476 | | 336.684 | | ZIOP favored |
| Vuong's test (OP v/s ZIOP) | Non-nested hypothesis test-statistic: 3.435662 | | | | ZIOP favored (p-val: 0.000 ) |

- - : not applicable

*: Values are significant at p<0.1

**: Values are significant at p<0.05

***: Values are significant at p<0.01

There are three ways to interpret the model results: (1) As the first step, the binary part of the model explores whether the Chinese companies' export cost to US has increased or not due to the Lacey Act Amendment; (2) As the second step, the ordered part of the model explores the increase level of the Chinese companies' export cost to US due to the Lacey Act Amendment; (3) the combined part of the two binary and the ordered steps examines how much the Chinese companies' export cost to US has increased as one process due to the Lacey Act Amendment. The following discussion will illustrate the variables in the three possible ways based on the final ZIOP model presented in Table 16.

The companies' familiarity with the Lacey Act Amendment may have some slight impact on whether the companies would have an export cost increase to US. The estimated parameter is negatively significant in the binary part of the model at 0.1 significance level ($p<0.1$), which means that the companies who are more familiar with the Lacey Act Amendment are less likely to have an export cost increase. It makes sense that the companies that are more familiar with the Lacey Act Amendment are more likely to respond to the Act without hurting the companies' business, and were able to take precautions before the Lacey Act Amendment came into effect. In this way they are more likely to avoid an export cost increase to US. However, there is no clear evidence that the companies' familiarity with the Lacey Act Amendment has an impact on their export cost increase levels.

The size of the company is negatively significant in the binary part, which means that smaller companies are more likely to have no export cost increase. This is probably because small companies are more flexible about their sourcing, and adapt more easily to the new requirements of the Lacey Act Amendment.

Meanwhile, the variables indicating the sourcing activities of the companies demonstrate complicated patterns of significant impact on the companies' export cost increase, which is the main finding and the emphasis of this study. To enhance the ease of model interpretability, the model coefficients are translated into probability values and displayed in Figures 38 to 41. The results presented in these figures are based on the bootstrapped model. The continuous variables indicating the companies' sourcing behaviors are displayed along the x-axis. The y-axis displays the probability of export cost increase (the binded probabilities for three levels of export cost increase which are 1,2 and 3).

The variable of the percentage of the COC certified raw materials is significant at 0.05 significance level ($p<0.5$) in the binary part of the model, which indicates a positive relationship between the companies' adoption of COC certified raw materials and their export cost increase to the US. When companies have more COC certified raw material, they are more likely to have an export cost increase. This result demonstrates that companies are associating the COC expenditures with the cost of the Lacey Act Amendment, and the enforcement of the Lacey Act Amendment encourages the companies to adopt more COC certified materials.

There is no significant relationship between the percentage of COC certified raw materials and the companies' export cost increase levels indicated by the ordered part. From Figure 38, the predicted values of the companies' export cost increase do not depict much variance along the percentage of the COC certified level. The plot is almost flat throughout the binary part, the ordered part, and finally the combined part of the model, which implies that the percentage of COC certified raw material is probably not the key factor in determining the companies' export cost increase despite its weak significance.

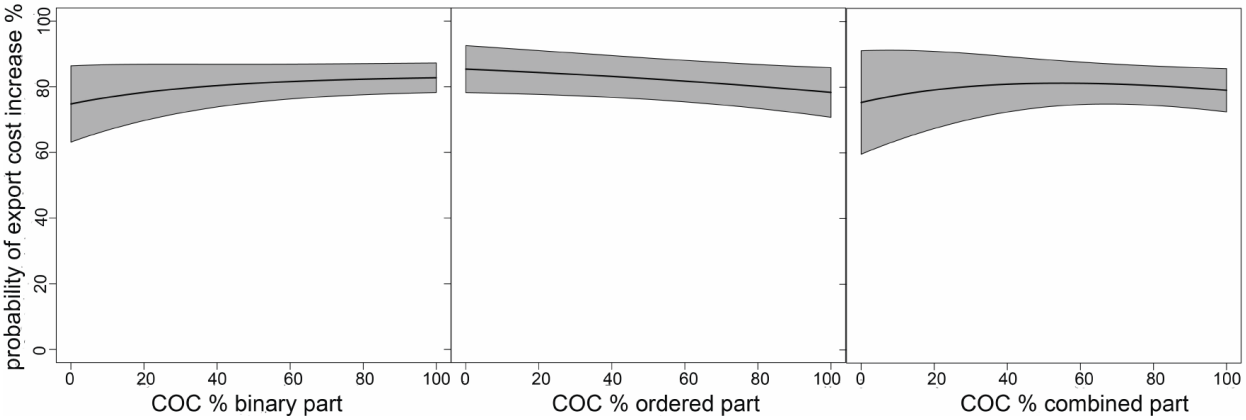


**Figure 38 The impact of COC certified materials (%) on export cost**

The variable of the softwood[2] sourcing in the past 5 years displays significant but paradoxical patterns in both the binary part and the ordered part of the model: in the binary part, the variable of the probability for the companies to have an export cost increase is negatively significant at 0.1 significance level; in the ordered part, the variable of the probability for the companies to have an export cost increase is positively significant at 0.01 significance level. Accordingly, in the binary part of Figure 39, the estimated probability for the companies to have an export cost increase remains stably high until their softwood sourcing reaches a certain quantity, when the probability to have an export cost increase declines rapidly; in the ordered part of Figure 14, the probability to have an export cost increase rises along with the increase of softwood sourcing.

These findings become clear if we interpret the results from a different perspective. Companies are more likely to have no export cost increase due to the Lacey Act Amendment (binary part) if they are sourcing from softwood dominant countries. This implies that the

[2] Note: The variables of "softwood sourcing", "hardwood sourcing" and "local sourcing" are the new variable generated by factor analysis established in chapter 5.2. They are the standardized results ranging across 3 standard deviations.

companies who rely on softwood sourcing would most probably avoid an export cost increase, for the reason that the softwood is trusted and not hindered by the Lacey Act Amendment. Alternatively, if we look closer at the levels of export cost increase (ordered part) of companies who already have export cost increases, it can be seen that if they also have sourcing from softwood dominant countries they are more likely to have higher level of export cost increase.

There are two possible reasons to explain the seemingly contradictory results about sourcing from softwood dominant regions of the ordered part:

The first possible reason is that Russian data is causing problems within the softwood dominant group. The explorative factor analysis is not able to separate Russia from softwood dominant countries. Companies who used to rely heavily on Russian raw material may face the pressure from the Lacey Act Amendment to change their sourcing to other safer softwood countries, such as the US, Canada and the EU. These companies should indicate a high level of export cost increase. Data from respondents who have sourcing from Russia cannot be deleted because there will not be enough data left to analyze.

The second possible reason is that the companies that previously maintained small amounts sourcing from softwood dominant countries are increasing their sourcing from those countries, which is more expensive than their previous less-safe source. When companies indicate that they have sourcing from one particular region, some companies have a large proportion while others' are relatively small.

However, the sourcing base of the companies is not known from the survey, so further analysis cannot be conducted. The reasons why the companies have a higher export cost increase when they source from softwood dominant regions cannot be inferred directly from this study.

The combined plotting from Figure 39 synthesizes all the information. Overall, the companies who have inadequate softwood (approximately below the average) have a higher probability of encountering an export cost increase when they switch to more softwood sourcing. For companies whose softwood sourcing is below the average, the estimation in the combined model is dominated by the ordered part. The ordered part of the model mainly incorporates companies that have inadequate softwood and therefore declare an export cost increase, and thus are further analyzed in the ordered part of the model for export cost increase levels. Meanwhile, the companies who have adequate softwood sourcing (approximately above the average) have lower probability to encounter an export cost increase. For these companies the estimation in the combined model is dominated by the binary part. This is because the companies who have adequate softwood sourcing generally declare no cost increase, and thus are retained in the binary part of the model and do not proceed into the ordered part for analysis of export cost increase levels.


**Figure 39 The impact of softwood sourcing on export cost**

The tropical hardwood-sourcing patterns correspond with those of softwood sourcing. The binary part of the model for hardwood sourcing demonstrates a significant positive relationship with whether the companies have an export cost increase at 0.01 significance level. When companies have sourcing from hardwood dominant countries they are more likely to have an export cost increase, which demonstrates that sourcing from hardwood dominant countries may bring risks of increasing the companies' export cost.

Comparatively to the softwood sourcing, the plotting in Fig 40 indicates that the companies who have tropical hardwood sourcing (approximately above the average) are those who are strongly affected by the Lacey Act Amendment and therefore have a high probability of an export cost increase to the US. It is evident that the Lacey Act Amendment impedes the high-risk hardwood from entering the US market. To conform to the Lacey Act Amendment, Chinese companies who relied on hardwood sourcing paid a higher cost to export to the US, possibly for performing "due care" and switching to more reliable sourcing. There is no significant relationship shown between the companies' hardwood sourcing and their export cost increase levels in the ordered part of the model. Finally, the combined plotting mainly follows the patterns of both the binary and ordered parts where the significant statistical result appears, to increase the possibility first and decrease later.

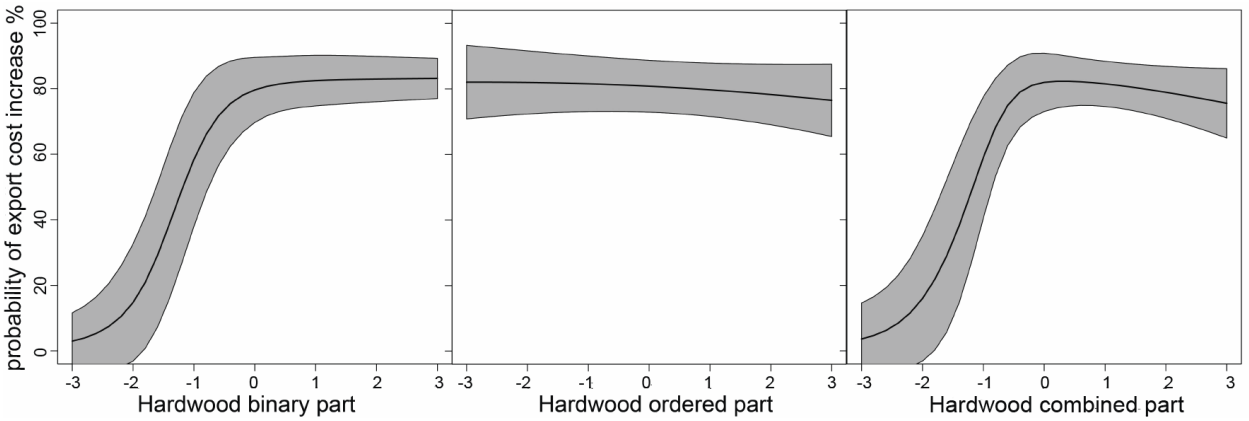


**Figure 40 The impact of hardwood sourcing on export cost**

There is no evidence of a significant relationship between the Chinese companies' local sourcing and whether their export cost increases in the binary part of the model. However, there is a border-line negative significant relationship between the companies' local sourcing and the levels of their export cost increase. This means that companies who have already had an export cost increase will be more likely to have a lower level of export cost increase if they have local source, which is illustrated by Figure 41. Unlike sourcing from the hardwood dominant regions, the local source doesn't encounter inhibition by the Lacey Act Amendment to enter the US market. The final combined plotting presents the patterns of the ordered part for local sourcing modeling.

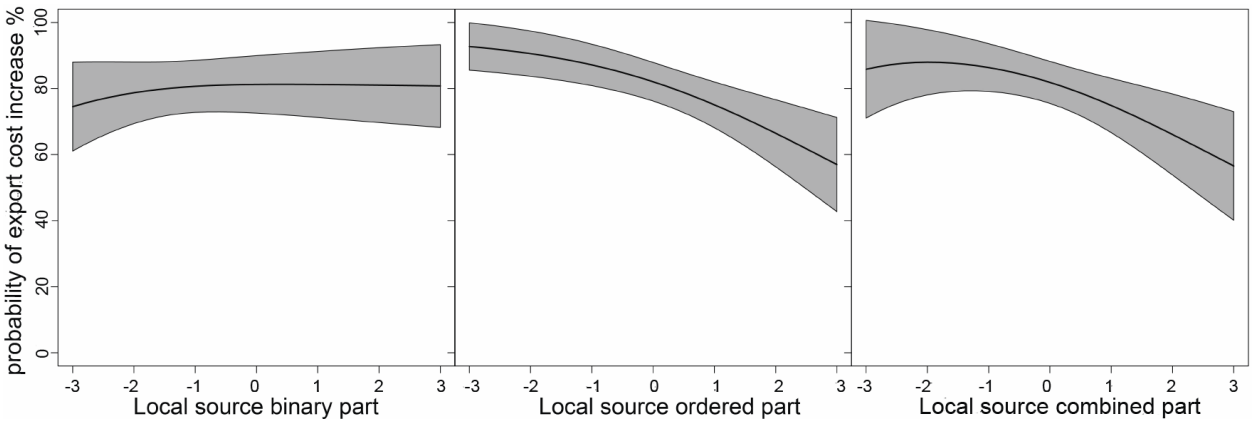


**Figure 41 The impact of local sourcing on export cost**

## 5.5 Conclusions

This research shows that the Lacey Act Amendment has affected the Chinese companies' sourcing behaviors by increasing their export cost increase to the US market. Large Chinese companies are more likely to have an export cost increase to the US because of the Lacey Act Amendment compared with small companies. The Chinese companies' sourcing behaviors, particularly their sourcing regions, prove to have a significant impact on their export cost increase to the US. Evidence illustrates that the Lacey Act Amendment encourages Chinese companies to adopt more COC certified wood and avoid high-risk tropical hardwood in order to better accustom to the US market. This study confirms the Lacey Act Amendment's positive effect on the tropical hardwood conservation since the 2008 amendment. There is also evidence that the Lacey Act Amendment encourages Chinese companies to use temperate softwood raw materials in substitution of its former cheaper competitors (probably tropical hardwood). However, the Lacey Act Amendment does not hinder the Chinese local raw materials to the US market.

The Chinese companies' usage percentage of COC certified raw material accounts for their export cost increase to the US to a moderate extent. The more COC certified raw material they have, the more likely that they would have an export cost increase to the US.

The Chinese companies' sourcing regions are a significant factor in explaining their export cost increase to the US. The more temperate softwood raw material they have, the less likely that their export cost to the US would increase. Meanwhile, when those companies that have an export cost to the US source more softwood from temperate regions, their export cost increases. On the contrary, the more hardwood they have from tropical regions, the more likely the increase in export cost to the US. Companies that already have an export cost increase are less likely to see further export cost increases if they use more local raw materials.

In addition to sourcing behaviors, the companies' familiarity with the Lacey Act Amendment has an obscure impact on the companies' export cost increase to the US market. When Chinese companies become more familiar with the Lacey Act Amendment they adapt more adeptly to the Act and are thus more likely to avoid the export cost increase to the US. Smaller companies are more likely to have no export cost increase probably because small companies are more flexible about their sourcing, and adapt more easily to the new requirements of the Lacey Act Amendment.

# Chapter 6 – conclusions, policy implications and limitations

## 6.1 Overall conclusions

In conclusion, this study examined the effects of the Lacey Act Amendment from two aspects: the Chinese companies' sales decisions to the US market, and their export cost increase to the US market because of the Lacey Act Amendment. Similar sets of factors provide data about each of the two aspects, and some factors prove to play important roles in both:

The size of the company has a positive relationship with the Chinese companies' export decisions to the US, which means that bigger companies are more likely to make positive decisions to increase sales to the Chinese market. However, smaller companies are more likely to have no export cost increase compared with large companies. This is probably because small companies are more flexible about their sourcing, and adapt more easily to the new requirements of the Lacey Act Amendment. The size of the company is an important factor to affect the Chinese companies' abilities to cope with the Lacey Act Amendment.

Chinese domestic sales and sourcing markets greatly affect the companies' sales decisions to the US market and their export cost increase because of the Lacey Act Amendment. When the Chinese companies have more domestic sales, they are less likely to take positive decisions (such as decrease sales or even have no sales) in the US market. When the Chinese companies have more domestic sourcing, their export cost increase level decreases. This may imply that both the Chinese sales and sourcing markets are taking negative actions against the Lacey Act Amendment by harboring illegal or suspicious forest products.

The international regions from where the Chinese companies' raw material is sourced are important factors that influence the Lacey Act Amendment's effects on these Chinese companies.

Raw materials from the US market are promoted among the Chinese companies who are increasing their sales to the US market. The Chinese companies who source raw material from suspicious hardwood regions such as Southeast Asia, Africa and Latin America are more likely to have an export cost increase to US market which means a degradation of their international competitiveness. Instead, the Chinese companies who source the raw material from relatively safer regions such as the US, Canada and EU experienced no change in the export cost. This evidence demonstrates that raw materials from high-risk regions are suppressed by the Lacey Act Amendment, while raw materials from relatively safer regions are promoted.

The Chinese companies' awareness of the Lacey Act Amendment is the key aspect affecting their ability to cope and comply with the Lacey Act Amendment, and thus to survive and thrive in the US market. The companies who are more aware and familiar with the Lacey Act Amendment are more likely to increase their sales to the US market, and have less export cost increase to the US because of the Lacey Act Amendment. This proves there is a difference between those companies who are aware of the Lacey Act Amendment legislation and those who are not.

The study reveals that the Chinese companies' COC certified raw material use increases their export cost to the US, and the exporters attribute the increase to the Lacey Act Amendment. However, the use of COC certified raw material is not significant for the companies' sales decisions in the US. In addition, the implementation of the Lacey Act Amendment does not make a difference between flooring or furniture industry types.

## 6.2 Policy implications

The Lacey Act Amendment marked the world's first-ever law prohibiting trade of illegally logged wood products (EIA 2009). In the context of the Chinese exporting market, the Lacey Act Amendment has proven to be beneficial and has provided effective message to Chinese companies to reduce/stop their procurement of raw materials from countries with high risk of illegal harvest activities. However, it has only been enforced twice since its implementation in 2008: : two individual cases against the Gibson Guitar Corporation concerning the import of ebony wood stocks from India and Madagascar (Pryce 2012) , and the seizure of Peruvian hardwood from the Amazon (Noguerón et.al. 2010). The Lacey Act Amendment 2008 Amendment may gradually loose its effectiveness without further enforcements. More enforcements of the Lacey Act is necessary to maintain the effectiveness of the Lacey Act Amendment.

The Chinese government and companies in the forest product industry should raise their environmental awareness and shoulder the global responsibility in the battle to combat illegal logging. This study shows that the manufacturers who do not want to comply with the Lacey Act direct their sales to the Chinese domestic market. Hence, to effectively address the issue of illegal wood being used in Chinese wood based manufacturing sector, Chinese government should take similar initiatives to reduce use of illegally harvested wood in the Chinese furniture and flooring manufacturing sector. Moreover, in order to help the Chinese wood based export industry comply with these newly enforced timber legality regulations, the Chinese government should take the initiative to provide necessary orientation and training programs for the Chinese companies to comply with timber legality regulations such as the Lacey Act Amendment.

Tropical hardwood dominant regions, especially Southeast Asia (the largest tropical hardwood provider to China) may be at a competitive disadvantage due to the Lacey Act Amendment. The tropical hardwood dominant regions are typically high-risk and provide illegal logging-related commodities. Both enforcements of the Lacey Act Amendment target illegal logging practices originating in tropical hardwood dominant regions, resulting in many companies' decisions to reduce or halt sourcing from tropical hardwood dominant regions in order to better comply with the Lacey Act Amendment. In order to repair the damaged regional image for illegal logging and retain competitive advantage in the US market as well as other major markets with timber legality regulations, tropical hardwood dominant regions should take measures to reduce domestic illegal logging practice and promote forest governance for sustainable development.

## 6.3 Limitations

The convenience sampling method was used for conducting the surveys. This sampling method was adopted as it is a cost effective way to survey a readily available target population (Greene 1981). Since most convenience sampling is collected with the target population on hand, the selection of the survey venue is critical for this kind of sampling method. Hence, the furniture and flooring trade shows in China were selected as the preferred venue for the surveys. Convenience sampling does have distant advantages and disadvantages over probability sampling methods. For this research the positives associated with convenience sampling far outweighed the negatives associated with the sampling method. However, the research team is cognizant of the selection biases associated with the convenience sampling method (Greene 1981) and regional coverage biases and homebuilder demographic characteristic biases are tested prior to making any conclusions.

For the phase 1 study in Chapter 4, the dependent variable, the Chinese companies' export change to the US market for the past 5 years (no sales, decreased, remain the same, increased) is not a typical categorical variable, because "decreased sales" is generally not regarded as a higher level of "no sales." However, the phase 1 study treats the Chinese companies' export change, as categorical variable, from a different view of interpretation: from no sales to the US at all to increased sales to the US in the past 5 years, the Chinese companies' attitudes and actions in the US market are increasingly positive. In this way, the Chinese companies' sales change can be regarded as a categorical variable for the companies' 4 levels of positivity in the US market.

For the phase 2 study in Chapter 5, due to the feasibility of the surveys in trade shows, the respondents were not queried about their sourcing percentage from each region. However, having 90% of the sourcing from one region is quite different from having only 5% of the sourcing from that region when analyzing regional effects on export cost increases, which cannot be clarified by this study.

## Acknowledgement

I am truly grateful to all my academic committee members for their valuable guidance, patience and support throughout my graduate study. I cannot thank my academic advisor, Dr. Indroneil Ganguly more for his immense help though the whole process of my thesis research, from survey design, data collection to modeling building and writing up. I would like to thank all the other members of my committee: they are Dr. Ivan Eastin, Dr. John Perez-Garcia, and Dr Sergey Rabotyagov. Dr Ivan Eastin kindly funded me for half of my education. Dr. John Perez-Garcia and Dr Sergey Rabotyagov are well-respected economists and it was an honor to have them on my committee.

In addition, I want to thank all co-students in the CINTRAFOR office. I had some best memories with them. They encouraged and helped me much in academic and in life.

Last but not least, I gratefully acknowledge the support of the USDA Federal State Marketing Improvement Program (FSMIP), award no. 12-25-G-1519 and the McIntire-Stennis Formula Fund for providing financial support to this study. I also thank the Softwood Export Council for funding the international travel, and the American Hardwood Export Council for their help with the data collection.

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# Appendix A. Survey in English

## Survey on the Impact of Timber Legality Regulations

1. **Please specify your main business type**: (check all that apply) :
   - ❑ Wood Furniture Manufacturer
   - ❑ Wood Flooring Manufacturer
   - ❑ Plywood Manufacturer
   - ❑ Exporter of Wood Products
   - ❑ Importer of Wood Products
   - ❑ Other (Please Specify): _____

2. **Please indicate which of the following chain-of-custody programs your company has obtained:**
   - ❑ Forest Stewardship Council (***FSC***)
   - ❑ Program for the Endorsement of Forest Certification (***PEFC***)
   - ❑ China Forest Certification Council (***CFCC***)
   - ❑ We do not have chain-of-custody certification

3. **What percentage of your wood raw materials/wood products exports were tropical hardwoods in 2012? _____%**
4. **What percentage of your wood raw materials/wood products exports had chain-of-custody certification in 2012? _____%**

5. **Approximately what percentage of your sales revenue was derived from the following markets.**

| | **China** | **Direct Export** | **Indirect Export** | **TOTAL** |
|---|---|---|---|---|
| **2012** | % | % | % | **100%** |

6. **How have your *SALES* of wood products changed over the past five years? (select one option for each choice)**

| | ***Increased*** | ***Remained same*** | ***Decreased*** | ***Don't sell to this region*** |
|---|---|---|---|---|
| United States | ❑ | ❑ | ❑ | ❑ |
| European Union (EU) | ❑ | ❑ | ❑ | ❑ |
| Japan | ❑ | ❑ | ❑ | ❑ |
| Middle East | ❑ | ❑ | ❑ | ❑ |
| Australia | ❑ | ❑ | ❑ | ❑ |
| Southeast Asia | ❑ | ❑ | ❑ | ❑ |
| Russia | ❑ | ❑ | ❑ | ❑ |
| China | ❑ | ❑ | ❑ | ❑ |

7. *Only manufacturers*: **How have your sources of wood raw materials changed over the past five years? (select one option for each choice)**

| | ***Increased*** | ***Remained same*** | ***Decreased*** | ***Don't import from this region*** |
|---|---|---|---|---|
| Russia | ❑ | ❑ | ❑ | ❑ |
| United States | ❑ | ❑ | ❑ | ❑ |
| Canada | ❑ | ❑ | ❑ | ❑ |
| Southeast Asia | ❑ | ❑ | ❑ | ❑ |
| Africa | ❑ | ❑ | ❑ | ❑ |
| European Union (EU) | ❑ | ❑ | ❑ | ❑ |
| Latin America | ❑ | ❑ | ❑ | ❑ |
| China | ❑ | ❑ | ❑ | ❑ |

**Continue to back side.↺**

**8. Do you agree or disagree with the following statements.**

| *Statement* | *Agree* | *Disagree* |
|---|---|---|
| Legality regulations are an effective way to reduce illegal timber | ❑ | ❑ |
| I intend to increase my exports to countries that do not have timber legality regulations | ❑ | ❑ |
| Timber legality regulations cause timber prices to increase | ❑ | ❑ |
| Timber legality regulations increase the cost of exporting | ❑ | ❑ |
| I intend to decrease my exports to countries that have timber legality regulations | ❑ | ❑ |
| I plan to increase my use of certified wood to help me comply with legality legislation | ❑ | ❑ |
| Timber legality regulations are a trade barrier designed to protect foreign manufacturers | ❑ | ❑ |
| I intend to sell more products within China because of timber legality regulations | ❑ | ❑ |
| Illegal logging is a major environmental problem | ❑ | ❑ |

**9. Please indicate your level of familiarity with the following timber legality regulations.**

| | *Have not heard about it* | *Have heard about it but am not sure of the details of this regulation* | *Am very familiar with this regulation* |
|---|---|---|---|
| **US Lacey Act Amendment** | ❑ | ❑ | ❑ |
| **EU Timber Regulation** | ❑ | ❑ | ❑ |
| **Japanese Public Procurement Policy** | ❑ | ❑ | ❑ |
| **Australia Illegal Logging Prohibition Act** | ❑ | ❑ | ❑ |

**10. Based on your perception/experience of the Lacey Act Amendment please respond to the following questions. <u>(Skip to question 11 if you are not aware of Lacey Act Amendment)</u>**

**a. Do you agree or disagree with the following statements**

| *Statement* | *Agree* | *Disagree* |
|---|---|---|
| I acquired chain-of-custody certification to help me comply with the Lacey Act Amendment | ❑ | ❑ |
| I will increase my use of wood from the US to help my company comply with the Lacey Act Amendment | ❑ | ❑ |
| The Lacey Act Amendment will cause me to reduce my exports of wood products to the US | ❑ | ❑ |
| The Lacey Act Amendment has made me more careful about sourcing logs/lumber | ❑ | ❑ |
| It is easy to comply with the Lacey Act Amendment | ❑ | ❑ |

**b. Has compliance with the Lacey Act Amendment has increased the cost of exporting to the US? ❑ YES ❑ NO**

(if yes specify ____%)

**11. Please select the category that best describes your company's sale revenue in 2012**

❑ Less than ¥10,000,000 ❑ ¥10,000,000 to ¥40,000,000 ❑ ¥40,000,001 to ¥70,000,000

❑ ¥70,000,001 to ¥100,000,000 ❑ ¥100,000,000 to ¥200,000,000 ❑ more than ¥200,000,000

**12. How many full time workers does your company employ: _____**

**13. Within which province is your company located? _____**

**14. Please indicate where you would be most likely to go to get information about timber legality regulations**

❑ Government Agencies ❑ Industry Associations ❑ Other Exporters ❑ My foreign customers ❑ Trade Publications ❑ Internet websites ❑ Other: Please specify:

_____

**Thank you for your cooperation!**

## Appendix B. Survey in Chinese

1. **贵公司的业务类型**（多选）：

❑ 木质家具制造　　❑ 木质地板制造

❑ 胶合板制造　　❑ 木质产品出口

❑ 木质产品进口　　❑ 其他 _____

2. **贵公司已获得的林产品产销监管链认证有哪些：**

❑FSC（森林管理委员会）认证　　❑ PEFC(森林认证认可计划)认证

❑CFCC(中国森林认证管理委员会)认证　　❑ 无

3. **2012 年，贵公司生产/周转的木质产品所用的原材料中，热带硬材所占比重：** _____%

4. **2012 年，贵公司产品所使用的原材料中，具备林产品产销监管链认证的原材料比重** _____%

5. **2012 年，贵公司的销售收入市场结构：**

| | 中国 | 直接出口 | 间接出口 | 总共 |
|---|---|---|---|---|
| 2012 | % | % | % | 100% |

6. **过去的五年内，贵公司木质产品的销售额市场变化情况：**

| | 增加 | 不变 | 减少 | 无销售额 |
|---|---|---|---|---|
| 美国 | ❑ | ❑ | ❑ | ❑ |
| 欧盟 | ❑ | ❑ | ❑ | ❑ |
| 日本 | ❑ | ❑ | ❑ | ❑ |
| 中东 | ❑ | ❑ | ❑ | ❑ |
| 澳大利亚 | ❑ | ❑ | ❑ | ❑ |
| 东南亚 | ❑ | ❑ | ❑ | ❑ |
| 俄罗斯 | ❑ | ❑ | ❑ | ❑ |
| 中国 | ❑ | ❑ | ❑ | ❑ |

7. **（此问仅对生产厂商）过去的五年内，贵公司木制产品的原材料来源变化情况：**

| | 增加 | 不变 | 减少 | 无来源 |
|---|---|---|---|---|
| 俄罗斯 | ❑ | ❑ | ❑ | ❑ |
| 美国 | ❑ | ❑ | ❑ | ❑ |
| 加拿大 | ❑ | ❑ | ❑ | ❑ |
| 东南亚 | ❑ | ❑ | ❑ | ❑ |
| 非洲 | ❑ | ❑ | ❑ | ❑ |
| 欧盟 | ❑ | ❑ | ❑ | ❑ |
| 拉丁美洲 | ❑ | ❑ | ❑ | ❑ |
| 中国 | ❑ | ❑ | ❑ | ❑ |

8. **请根据贵公司的情况评价下列陈述（同意或者不同意）：**

| | 同意 | 不同意 |
|---|---|---|
| 木材合法性法规是遏制非法采伐的有效途径 | ❑ | ❑ |
| 我倾向于对不执行木材合法性法规的国家增加出口 | ❑ | ❑ |
| 木材合法性法规导致世界木材价格升高 | ❑ | ❑ |
| 木材合法性法规导致出口成本升高 | ❑ | ❑ |
| 我倾向于对执行木材合法性法规的国家减少出口 | ❑ | ❑ |
| 我计划更多地使用通过认证的木材原料，以遵守木材合法性法规 | ❑ | ❑ |
| 木材合法性法规是一个贸易壁垒，目的是保护本国的生产厂商 | ❑ | ❑ |
| 由于原出口地的木材合法性法规，我倾向于在中国国内市场扩大销售 | ❑ | ❑ |
| 非法采伐是一个严重的全球性环境问题 | ❑ | ❑ |

9. **您对以下木材合法性法规的熟悉程度：**

| | 未听说过 | 听说过，但是不熟悉 | 非常熟悉 |
|---|---|---|---|
| 美国·雷斯法案（修正案） | ❑ | ❑ | ❑ |
| 欧盟·新木材法案 | ❑ | ❑ | ❑ |
| 日本·政府木材绿色采购政策 | ❑ | ❑ | ❑ |
| 澳大利亚· 非法采伐禁令 | ❑ | ❑ | ❑ |

10. **如果贵公司听说过雷斯法案（修正案）**

a. 请根据贵公司的情况评价下列陈述（同意或者不同意）：

| | 同意 | 不同意 |
|---|---|---|
| 我公司已取得绿色标签（林产品产销监管链认证），以遵守雷斯法案 | ❑ | ❑ |
| 我公司将增加对产自美国的木材原材料的使用，以遵守雷斯法案 | ❑ | ❑ |
| 雷斯法案将导致我公司木质产品向美国的出口减少 | ❑ | ❑ |
| 雷斯法案已使我公司更加注重木材原料的甄选环节 | ❑ | ❑ |
| 我公司遵守雷斯法案的难度不大 | ❑ | ❑ |

b. 为遵守雷斯法案，贵公司向美国的出口成本是否上升 ❑上升 上升幅度 ____% ❑未上升

11. **2012 年，贵公司的销售收入（人民币）：**

❑ 1000 万元以下 ❑ 1000 万元 ~ 4000 万元（含 4000 万元） ❑ 4000 万元~ 7000 万元（含 7000 万元）❑ 7000 万元 ~ 1 亿元 ❑ 1 亿元~2 亿元 ❑ 2 亿元以上

12. **贵公司的全职员工数量** _____

13. **贵公司所在地（省份）** _____

14. **您最有可能从哪些渠道获悉木材合法性法规的相关信息：**

❑ 政府机构 ❑ 行业协会 ❑ 同行

❑ 海外客户 ❑ 贸易相关出版物 ❑ 网站

❑ 其他 （请说明） _____