

THE EFFECT OF EXPORT PROMOTION PROGRAMS ON ESTABLISHING  
EXPORT MARKETS

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**Title**

THE EFFECT OF EXPORT PROMOTION ASSISTANCE

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USAGE ON ESTABLISHING EXPORT MARKETS

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**By**

NATHAN R. OCH

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**MASTER OF SCIENCE**

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## ABSTRACT

Och, Nathan Ronald, M.S. in Agribusiness and Applied Economics, Department of Agribusiness and Applied Economics, College of Agriculture, Food Systems, and Natural Resources, North Dakota State University, April 2010. The Effect of Export Promotion Programs in Establishing Export Markets. Major Professor: Dr. Gregory McKee.

There is a pattern of growth throughout agribusiness in North Dakota in which agricultural products ranging from commodities to machinery have all seen growth since 2000. Exports have contributed to most of this production increase. Agribusinesses across North Dakota are exporting to many areas of the world. With the help of the North Dakota Trade Organization (NDTO) many companies have developed trading relationships with clients in other nations. The purpose of this research is to measure the value of NDTO export promotion on North Dakota agribusiness [through the use of marketing, export programs, and counseling]. If the data supports the use of the NDTO, firms may be encouraged to use the services provided by the NDTO when export issues arise. This thesis uses a Tobit left censored model to bring the data together to produce empirical results which can be associated with the NDTO and its impact on a firm's total exports. Firm-level export promotion was found to be insignificant. However, small and medium firms were shown to benefit from the use of the NDTO through an average increase in 2008 export revenue of about \$16,095 and \$269,317, respectively. Furthermore, this is a \$6.44 and a \$107.73 return on dollar investment for small and medium firms investing in the services of the NDTO, respectively.

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## CHAPTER 1. INTRODUCTION

### 1.1. Rationale and Significance

The North Dakota economy includes production of agricultural goods and agricultural machinery. Growing conditions and land availability make it ideal for growing corn, soybeans, sugar beets, and other crops. Because of the relatively small population of the state, much of the output from these crops is exported (Local Census 2006). Beginning in 1999, North Dakota started to become a major manufacturer of agricultural equipment, mainly machinery that assisted in producing similar types of crops grown in North Dakota. Today, many countries purchase machinery from North Dakota such as Canada, Russia, Germany, Australia, and most recently, Kazakhstan and Ukraine.

North Dakota's gross domestic product (GDP) has risen between 2% and 3% annually between 1999 to the present day (Local Census 2006). A part of this growth has come from steady growth in the machinery exports and increased agricultural exports. Since 1999, machinery exports have increased from \$282 million to \$1,183 million in 2008, a 319% increase (NDTO 2008). The machinery sector was 78% of total durable exports from North Dakota in 2007. North Dakota agricultural exports, such as crops and food products increased from \$140 million in 2004 to \$507 million in September 2008 (NDTO 2008). Table 1.1 below shows the figures from 1999 through 2008 for machinery and agricultural exports from North Dakota (NDTO 2008). Figure 1 below illustrates the growth in overall production in each sector using a production index where the year 2000 is equal to 100. It compares production in the two sectors to North Dakota population.

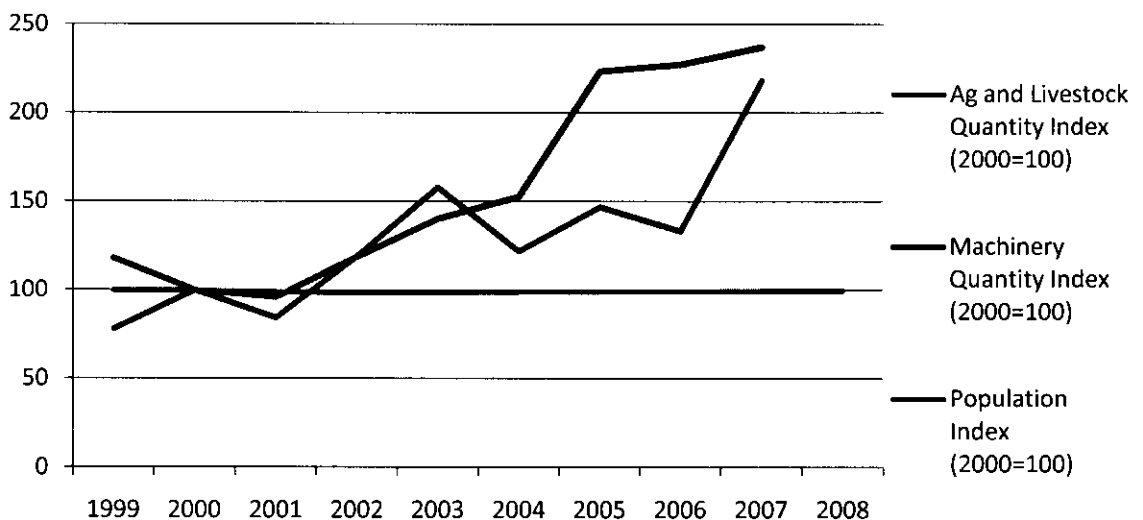
The purpose of Figure 1.1 is to illustrate that although prices may have increased during the time period, production has increased as well.

**Table 1.1 Total Machinery and Crop and Livestock Exports: 1999-2008.**

<b>North Dakota Exports</b>		
<i>Year</i>	<i>Machinery Exports (thousands of \$)</i>	<i>Agricultural and Livestock (thousands of \$)</i>
1999	282,228	250,974
2000	242,664	259,992
2001	401,308	393,886
2002	425,276	392,402
2003	403,631	458,747
2004	500,967	335,513
2005	647,627	342,045
2006	818,513	591,248
2007	931,837	628,469
2008	1,183,048	624,410

Comparing Table 1.1 and Figure 1.1 will show the increase in exports for the two sectors in addition to the increase in overall state production in the two sectors, relative to the North Dakota population. According to the index, state production of machinery and agriculture and livestock doubled between 1999 and 2007.

**Figure 1.1 Indices showing production and population (2000=100)**



Many firms focus on developing their domestic market long before attempting to sell abroad because there are many difficulties associated with entering a foreign market. Information costs such as equilibrium price, how much to export to any given market, and consumer preferences abroad are only a few of the challenges that accompany participation in foreign markets. Marketing costs not known to the firm makes advertising to foreign consumer preferences difficult. Also, labor costs deter many firms from exporting because the extra labor costs associated with increased production and possible foreign offices abroad make it costly to make the transition to foreign markets. Foreign offices are offices abroad that have continuous contact with the customer. It is usually located within the importing country, and can have high costs due to capital expenses to build and labor expenses to maintain. Finally, educational expenses for firms to increase their knowledge about foreign market participation can deter firms from beginning to export. These costs can be substantial based on the level of knowledge the firm has, and the level of knowledge the firm needs.

The North Dakota Trade Organization (NDTO) was formed in 2004 for “Trade expansion through advocacy, education, and expertise” (NDTO 2010). The NDTO offers several services, making it a “one-stop shop” for most export promotion services. NDTO personnel set up trade missions and meetings with possible nations who are interested in building a trade relationship with North Dakota manufacturers. They also educate manufacturers on the subject of exporting and its components so when the company decides to export, the firm can efficiently run operations. NDTO personnel discuss what the company is looking for when exporting begins such as partners, amount of exports, and how the company wants to expand. A key role that the NDTO, and other export

promotion offices, play is identifying promising markets for its clients to export to. Other services include:

- Market-entry research and planning
- Export education and certification
- A network of 45 reliable export service providers – international shippers, law firms, bankers and other professionals who are dedicated to North Dakota and its business community
- Product research and export project assistance to meet trade requirements
- Access to market research that is specific to countries and industries
- Promotional services on a statewide and industry wide basis
- Assistance in finding qualified, well-suited international distribution partners
- Management of trade missions that connect North Dakota businesses with high-level trade officials and the “world’s most reliable and committed importers”
- Quarterly meetings with trade experts who share their insight about export opportunities, export tax credits, grant opportunities, trade issues and other valuable information

These promotional activities are funded by a fee paid by the client company to the NDTO, as well as through export expenditures incurred by the firm in developing its own resources for marketing to other countries. It is common for companies to invest their own manpower and funds into certain export promotion activities (Adams et al. 1997).

Accounting for both sources of export promotion expenses, firms and state governments, will allow us to determine whether both sources effect total trade volumes.

Using a Tobit censored model, this thesis will detect the effect of the NDTO on North Dakota machinery and agribusinesses exports. Measuring the effect of export promotion programs, whether by the company or the use of the NDTO, on export volume it will be clear how important the assistance is to agribusiness and machinery manufacturers across the state.

## **1.2. Export Promotion Programs**

The effect of the NDTO is to reduce transactions costs associated with entering foreign markets. This thesis will focus primarily on whether the NDTO has a significant effect on the increase in international exports.

Export promotion programs aid the ability of firms to initiate increased trade to foreign markets. Since “the cost of entering a familiar market is lower than entering an unfamiliar one” (Andersson 2007), firms use these services to develop a relationship with foreign customers and meetings with possible clients. As a result, transactions costs, fixed costs, and other expenditures dealing with the creation of international relations are reduced. Costs associated with starting to export to a foreign market include, for example, developing an export division within a company, creating foreign infrastructure, and restructuring a product to fit foreign regulations.

Approximately 100 North Dakota-based companies export machinery and agribusiness goods. Some of these may have used export promotion services to begin trade relations with customers in other nations. A typical relationship between the NDTO and a client corporation works as follows. When a company decides to enter the global

marketplace it can be an area never traveled by many of the company's executives. Firm managers must first decide to enter the selected foreign market alone or receive help from an organization like the NDTO. After paying a nominal fee for the NDTO's services, an analyst from the NDTO is assigned to determine whether exporting is viable. If it is, then the analyst develops a plan of action. Example countries the NDTO helps firms establish relationships with include Russia, Kazakhstan, Ukraine, and other nations sharing North Dakota's soil type. The NDTO analyst will then arrange missions to these countries. This allows client company executives to travel to prospective nations and build a relationship before doing business. This is contrary to the American way of business where we develop a relationship while doing business. Instead of letting the product do all the talking, North Dakota company representatives meet with prospective clients even before one product is sold.

The NDTO might then assist the client firm start an export division within the company. The expertise of NDTO employees to assist the company in handling export affairs can reduce the frustrations that accompany expansion into foreign markets. This expertise benefits the company they are assisting since it prevents the company from hastily learning and completing the steps necessary to have successful export sales. For instance, instead of hiring an export manager before operations have begun, the NDTO establishes export promotion for the company which allows the company to take their time in the export expansion process and solidify the transition into the global market. The company can make sure the best person is chosen for the job and can establish international relationships before a piece of machinery, fertilizer, or other agribusiness good leaves the factory.

Empirical measurement of the effect of NDTO services on export sales can provide a statement about the return on export promotion dollar invested by the firm. These results may encourage other companies to take advantage of this program, which may spur more export growth. This is good for the North Dakota economy in many ways. The growth in GDP due to increased export manufacturing, job creation in North Dakota specific sectors, and a budget surplus which could be used for state-wide funding of many programs are all benefits that have already resulted from increased exports, but could continue to grow even more because of the role of the NDTO in export promotion.

Entering a foreign market can be costly for a firm, not only with sunk costs in capital and infrastructure, but with the increase in costs that are associated with foreign market participation. Assuming a firm enters a foreign market to increase firm revenue, they will have increased costs due to labor, capital, market research, market education, increased foreign advertisement, and shipping costs. These costs can make it difficult for some firms to overcome, and enter foreign markets, keeping them as a domestic seller only. The NDTO export promotion services allow the firms to reduce many costs such as, market research costs, market education costs, and foreign advertisement costs. The elimination of such costs allow firm managers to focus on production and international relations with foreign customers.

In order to conduct this measurement, I will gather data from North Dakota-based firms in the machinery and agricultural products sectors which have exported products during 2008. I will use the data to show empirically what export promotion can contribute to a company by helping it prepare and better understand the needs for them to successfully export.



The rest of the paper is constructed as such. Chapter two will discuss past literature that is relevant to the topic being researched. In it are areas pertaining to patterns in agribusiness exports and export promotion and uncertainty that is created from entering a foreign market. Next, chapter three explains the methodology, including the theoretical and statistical framework behind testing the hypotheses, along with the type of data that will be used. The results from the empirical model, and their implication on the dependent variable, will be explained in chapter four followed by concluding remarks, suggestions for future research, and research limitations in chapter five.

## CHAPTER 2. LITERATURE REVIEW

Export promotion services have been primarily a tool for expansion through education and expertise of foreign markets. These programs are usually funded by the government and are principally designed to reduce the transactions costs of entering a foreign market. Initially, many of the programs were to increase exports within a firm. However, recently, many economists have studied and measured the impact export promotion programs have on an industry, state, region, or even a country (Coughlin and Cartwright 1987, Onunkwo and Epperson 2000, Kotabe and Czinkota 1992). This chapter reviews studies that analyze the effect of export promotion programs on firm export revenues. Important aspects related to the proposed research are reviewed and presented.

### **2.1. Agribusiness and Trade**

Krugman (1980) developed a simple model of international trade. This model includes specific assumptions about economies of scale, product differentiation possibilities, imperfect competition, and transportation costs. He derives the equilibrium trade conditions for each country, as a function of each country's demand for a given good. Krugman concludes that based on his analysis there is justification to why countries export what they demand domestically. The main justification that Krugman finds is the symmetric demand between domestic and foreign markets. A large domestic market leads to trade, instead of trade leading to a larger domestic market.

Marc Melitz (2003) uses the Paul Krugman (1980) model but incorporates different productivity levels among the two-firm model to analyze the effects of international trade on inter-firm reallocations within an industry. The results from the model show that exposure to trade is only successful among the firms who are more

productive and choose to export while simultaneously driving out firms that are less productive giving these firms more market control. Work from Bernard and Jensen (1999) in the United States shows these results empirically, and concludes exposure to exporting results in the growth of some firms while other firms in the same industry will downsize. Melitz' model shows that new entrants will have, on average, lower productivity and a higher probability of exit than incumbents. He concludes the impact of trade decreases the number of firms after open trade is established, but product differentiation increases within the industry, the "Darwinian" result from trade. The most apparent result from the article is that increases in a country's exposure to trade will lead to welfare gains from trade within the country. However, export costs can differentiate from firm to firm and alter the distribution of gains from trade across the firms in the industry. Only the most efficient firms usually reap the benefits from trade resulting in a gain in market share and profit.

Chaney (2008) also modifies Krugman's (1980) model to consider the effect of product heterogeneity on international trade. He creates two aspects of trade for differentiation purposes; the intensive margin, or economic size of exports, and the extensive margin, or quantity of exporters. The cornerstone finding Chaney (2008) discovers is that the elasticity of substitution has opposite effects on the intensive and extensive margins.

The main determinant of the extensive margin (number of exporters) is based on how successfully these firms export. Rational firms will only enter the foreign market if they stand to gain profits, which are a function of fixed costs of entry, variable costs after entry, and subsequent fixed costs. Export promotion programs are used to try and

decrease the costs associated with foreign market participation, making it possible for a firm to export successfully. As a result, the decrease in costs associated with exporting will possibly increase the number of exporters and the amount exported. Adjustments to the extensive margin have a large impact on aggregate export volume (Andersson 2007). Andersson primarily looks at the extensive margin, but states that the adjustments made by using export promotion services increases export volume as a whole, whether it be the intensive or extensive margin.

## **2.2. Export Promotion**

Czinkota (1996) theorized how export promotion expenditures benefit firms. In today's markets, specialization is preferred over mass production, so economies of scale can rarely be achieved through producing more than one product type. Not only must a firm specialize before thinking of exporting, but they also need to have a significant market base for successful export expansion. Czinkota (1996) observes that smaller firms usually do not have the capacity to export. Export promotion projects aspects of the firm to foreign buyers which created successful domestic sales.

State export promotion programs increased in popularity in the 1980s and became a large part of increasing exports for many states by the late 1990s. Patterson (2006) explains how many states use parallel programs that have already been used in other states. North Dakota was one of the first states to create an export promotion program in 1985. Even though Patterson (2006) focused strictly on state exports consumed in different regions in the United States, his ideas can also be applied to global exporting. Patterson states that most of the time consumers find domestic products to be fresher or constructed with better quality, and they choose to purchase these products based on

knowledge of local suppliers. The problem exporters have, and this can be applied globally, is getting consumers to trust and believe in the quality of products exported into their region or country, a major form of consumer preference (Patterson 2006). Some analysts feel this entry cost may be too overwhelming for many firms to begin exporting their product.

### **2.3. Case Studies of Export Promotion Effects**

Another important aspect of valuating export promotion programs is developing an understanding to the logic behind the use of such programs at a local, state, or federal level. Diamantopoulos, Schlegelmilch, and Tse (1992) discuss the level of use, and growing popularity, of export marketing assistance (EMA). According to the article there are three kinds of export promotion assistance: (1) government departments and offices to assist in the promotion of a good overseas, (2) programs which assist firms in the entry of export markets, and (3) programs which assist in covering a firm's costs of opening international trade through insurance coverage and financial contributions. They observe that the level a nation is involved with exporting will ultimately decide the level at which EMAs are funded and implemented.

The authors' explain their three phase approach in export promotion. First, is the idea of creating awareness about the problems and obstacles that accompany export growth. This includes education about becoming exporters, awareness of export barriers, benefits from exporting, etc. This lack of knowledge could restrict trade and hinder a company from opening a foreign market. The next phase is to meet the company's needs through supplying the right information at the right time. Also, there is a necessity to start to get the firm involved. This means the firm starts to use services aimed at improving

expertise through experience before actually beginning to export. Finally, the company will participate in proactive programs such as trade missions, trade shows, and advertising to promote their product globally. The task that accompanies this three-phase approach is determining the correct amount of each phase that will minimize time before exporting, allowing for a solid transition to the global market.

The authors conclude that inexperienced firms tend to perceive export information assistance as more beneficial than seasoned exporters, and that smaller firms have been known to use less of government export assistance while larger firms tend to use EMA assistance. Smaller firms may be using other sources of advertisement, or simply lack the knowledge of such an existing program.

Gençtürk and Kotabe (2001) develop a model to calculate the effect of export assistance programs (EAPs) on export performance. They classify exporting firms into five categories: passive involvement, exploratory involvement, experimental involvement, active involvement, and committed involvement. From this, two categories of characteristics determine whether exporting is feasible or not. First, *organizational characteristics*, includes international experience, export coverage, and technological intensity. Second, *managerial characteristics*, includes education level, export expertise, and international orientation. The most important aspects for export success are efficiency, effectiveness, and competitive position. Efficiency deals with the tie between organization resources and outputs achieved. Effectiveness includes market share and export sales growth. Competitive position includes management style and the pattern of resource deployment. These three aspects of export performance are tested empirically with their model. The only variable that was deemed significant through the usage of

export assistance was competitive position. This is interesting because it shows export assistance is only used to gain a global competitive edge. Gençtürk and Kotabe (2001) conclude from this that the results undeniably support the importance of firms' export involvement behavior for export success in terms of all three measures of performance.

Francis and Collins-Dodd (2004) obtain the same conclusions about the need for export promotion confirming it as a strategy for enhancing performance. An obstacle for companies when it comes to export promotion is lack of experience and limited resources. Export promotion programs bolster competencies and strategies within the export market for a firm. These programs aid small- and medium-sized firms because these often have little, if any, export experience. There are difference stages of exporting starting from just beginning to using export assistance as a way to sell their product, not just promote it. The authors used traditional performance measures to show gains from export programs. These include export diversification, achievement of export objectives, export competencies, and export expansion strategies. The authors conclude that active exporters use the largest number of export assistance programs; companies with well established export markets keep using these programs to either keep the customer well-informed or to find new and potential export markets. This means that active exporters take advantage of export promotion services more than other categories of exporters. Pre-exporters used the least amount while majority exporters used the most programs. Also, firms that use more export programs are more likely to place a high priority on market diversification.

Coughlin and Cartwright (1987) studied export promotion on manufacturing exports at a state level. A cross-section dataset was used to quantify the relationship

between state export promotion and exports. The model they present is the basis for the statistical model used in this research analysis. The authors' used a basic Heckscher-Ohlin trade model of individual states. The conceptual model took the form:

$$EX = f(K, H, L, PROM, u)$$

Where K is the amount of capital depreciation in a given year, the amount of human capital is measured by H, L is the number of manufacturing employees in a given state, and PROM is the amount of promotion expenditures for a given state in a year. The model used by Coughlin and Cartwright (1987) includes variables in this research making it an interesting aspect of study. The authors' found promotion to be positive and significant on the amount of export revenue.

The model used by Andersson (2007) shows how export promotion expenditures can affect the level of export revenue that a firm receives. The interesting aspect of this model is that it shows export promotion expenditures as a cost incurred to the firm to increase export revenue. It introduces the use of export promotion as a potential cost in the function that theoretically determines export revenue. Up until this point, export promotion was mainly theoretical. However, Andersson (2007) is showing how, not only spending on capital and labor, but also on export promotion, can significantly affect the amount of export revenue the firm has.

The effect of export promotion has also been studied for sales of agricultural products. Adams et al. (1997) used firm-level data in their analysis to conclude that firms targeted by export assistance services, which are usually firms that do not have an established export sector, are more likely not to use services and do not have strong knowledge about exporting compared to those not being pursued by these federal



programs. In other words, these export assistance programs are targeting firms that do not, and may not wish to, export. Instead, they should be targeting firms that may want to expand their export sector. They also conclude there is an association between firm size and agribusiness export experience. However, this may be somewhat biased because larger firms may actually have specialized personnel to deal with exporting issues. Their results also showed that firms with more exporting experience actually use, and are more familiar with, these specific export assistance services. In the end, they conclude that larger firms that export regularly and have a sufficient amount of exporting experience use export assistance services more often and are more knowledgeable about the services offered than those of smaller and less experienced firms.

Onunkwo and Epperson (2000) studied the effect of federal export promotion on pecan farming and exports for United States producers. The important aspect of this case study is not the pecan industry itself, but how export promotion increased the amount of exports in the pecan industry.

The empirical framework from Onunkwo and Epperson (2000) indicates that single-equation models can be affected by simultaneity. Thus, the regression becomes biased. However, single-equation models are best when the supply of the good associated with the model is exogenous to the importing nation. Pecan price, income, and promotion expenditures are the variables in the model that are vital in showing how export demand is affected. Based on this model, they conclude export promotion programs significantly increase pecan exports. Onunkwo and Epperson (2000) conclude that the U.S. pecan industry should benefit greatly from the large increase in export promotion to Asia and European Union.

Richards et al. (1997) used a two-stage Linear Expenditure System/Almost Ideal Demand System (LES/AIDS) analysis to look at the effectiveness of promotion programs on U.S. apples exports to Singapore and the United Kingdom (U.K.). They concluded that export promotion increases consumption of apples in both the UK and Singapore. The authors show, however, that export promotion is an “international public good,” affecting aggregate consumption, not just in specific countries. Free-ridership on promotional expenditures occurs when other countries gain market share from the U.S. through the promotion of U.S. apples. Their evidence suggests that promotion is less effective the more price-inelastic demand is in that particular country. This could have the effect of forcing companies to reconsider exports if a free rider problem affects their international sales.

Finally, Le et al. (1998) analyzed non-price promotion programs (demand promotion) in four industrialized Pacific Rim nations (Hong Kong, South Korea, Singapore, and Taiwan). They used an estimated import demand equation and found that export promotion of red meat was only effective in South Korea while the others showed little or no significance in import increases of U.S. red meat. The overall conclusion is that reallocating funds to the South Korean market would have likely increased the total value of U.S. exports of meats to this country.

The studies focused on a certain export or commodity that could be used as an example for this paper. Table 2.1 summarizes the studies analyzed and provides some details from each project. Although some studies used for this research were not identical in location or data type they provided great insight into the methodology of export promotion.

**Table 2.1 Export promotion examined in other industries.**

	<u>Featured Studies</u>		
	<b>Gençtürk and Kotabe (2001)</b>	<b>Francis and Collins- Dodd (2004)</b>	<b>Coughlin and Cartwright (1987)</b>
Observations:	162	175	50
Data type/level:	Cross-Section	Cross-Section	Cross-Section
Period:	2000	2003	1980 – 50 states
Location:	Midwest U.S.	Canada	U.S.
Method:	Ordinary Least Squares	Correlation Tests	Generalized Least Squares
	<b>Onunkwo and Epperson (2000)</b>	<b>Le, Kaiser, and Tomek (1998)</b>	<b>Richards, Van Ispelen, and Kagan (1997)</b>
Observations:	21	44	31 per equation
Data type/level:	Panel	Panel	Time Series
Period:	1986 - 1996	1984 – 1994	1960 – 1993
Location:	U.S.	U.S.	U.S.
Method:	Ordinary Least Squares	---	Two-Stage LES/AIDS

The basis for reviewing previous research in the topic of export promotion programs is to facilitate development of a theoretical model that best represents the purpose and objective of this paper. Export promotion has been studied by many fields including marketing, business, and economics in the hopes of making exporting more efficient and at a lower cost to the producer/consumer relationship. Past research is extended in the current paper to focus primarily on North Dakota agribusiness and the effect of export promotion on establishing export markets.

#### **2.4. Export Uncertainty**

Uncertainty can negatively affect any decision making people change behaviors. Overall, this uncertainty can change the end result of any behavior because decisions are

altered to adjust for the uncertainty that is present. Uncertainty usually accompanies lack of education and expertise on a certain subject. It also increases the risk of possible failure making the decision to follow through with something harder and maybe even impossible. The role of the NDTO and other export promotion services is to decrease the uncertainty that accompanies exporting, decreasing the chance of failure, to allow firms to successfully enter foreign markets.

### 2.4.1. Exchange Rates

Exchange rates are one of the main areas of uncertainty incorporated with exports. Holly (1995) states that exchange rate volatility, which increases the risk of international trade, has a direct and negative effect on exports. Volatility also plays a role in the supply of exports, but not in the demand when risk is absorbed through prices from the consumer viewpoint (Holly 1995).

For risk-averse companies, exchange rate volatility can affect production decisions. Holly (1995) also shows how expected utility is negatively correlated to the level of the exchange rate volatility, shown by the following expected utility function:

$$E(U(\pi)) = - e^{-\lambda(\mu_{\pi} - 0.5\lambda\sigma_{\pi}^2)}$$

where  $\mu_{\pi}$  is the expected profits, and  $\sigma_{\pi}^2$  is the expected variance of export profits. The variable  $\lambda$  is the coefficient of absolute risk aversion. This is analyzed under the major assumption that all exports are paid for in foreign currency so that all the uncertainty is concentrated on the supply side. Two aspects are used to test Holly's hypothesis that exchange rates have a significant effect on the supply of exports. First, an explicit demand and supply framework is constructed using a restricted cost function approach. Second, a GARCH model is used to generate a conditional variance time series for the

exchange rate. Holly (1995) finds the more volatile the exchange rate, the larger effect it has on the supply amount, but does not affect demand in a significant way. Finally, Holly (1995) concludes that even though the effects are significant, the impact of exchange rate volatility on supply is very small.

An important aspect of exchange rates are entry and exit decisions a firm makes based on current and expected future exchange rates. Dixit (1989) shows the significance of these decisions on firm operations and performance. Once a firm enters a foreign market, it begins creating a distribution network and developing a brand-recognition among its consumers. The firm constantly has a choice of either staying in the market, or exiting. If they exit, however, they must pay a lump sum  $l$  to exit and the sunk cost of entry  $k$  again, if they choose to reenter. The sunk cost may not be the same the next time a firm enters due to the durability of some inputs such as capital that may still be available. A firm invests a lump sum  $k$  of sunk costs to become exporters. Then, the firm produces an output  $y$ , at a variable cost  $w$ . A vital economic cost is the discount rate (cost of capital) that is needed to increase output to cover the new foreign demand associated with exporting. The variables for entry and exit,  $k$  and  $l$ , respectively, are the upper and lower bound that determine a rational firm's decision. Two trigger prices affect entry and exit. The market entry trigger must be greater than the sum of the variable cost plus the entry cost interest, which is the interest from investment foregone by the firm to purchase production inputs for increasing production. Also, the market exit trigger must be less than the variable cost minus the exit cost interest.

Exchange rate volatility can also determine how much product a company produces. Goldberg and Kolstad (1995) use a two-period model to conclude that a

company will produce more abroad when exchange rate volatility increases. Their analysis is focused on flows of foreign direct investment (FDI) to and from the United States to the Canada, Japan, and the United Kingdom. However, the authors' confirm Holly's conclusion (1995) that expected profits are negatively correlated with exchange rate variability.

Several empirical studies show a negative correlation between real exchange rate volatility and exports. Cabellero and Corbo (1989) were concerned with the effects of changes in the level of firm uncertainty given the expected real exchange rate assuming perfect competition. They wanted to show how the expected real exchange rate can determine the level of uncertainty, and how this uncertainty can affect exports. Exports among Chile, Colombia, Peru, the Philippines, Thailand, and Turkey all displayed a negative relationship between real exchange rate uncertainty and export sales.

Campa (2000) looks at the effect of exchange rate changes on a country's export supply within the intensive (export output levels) and the extensive (number of exporters in that particular country). Hysteresis is "the failure of an effect to reverse itself as its underlying cause is reversed" Dixit (1989). Campa (2000) explained how hysteresis from exchange rate change can alter export supply for a longer period than the exchange rate change itself. His basic assumption for exporters, along with many other papers, is that there exists a cost to enter export markets and this cost is sunk. A firm will enter when the expected gross profits outweigh that of the sunk cost of entering. The paper examines the effects of changes in exchange rates on a country's aggregate export supply based on the export participation decision (discrete choice variable) and the firm's export supply.

The important model representation from Campa (2000) maximizes the present discounted value of its profits from exporting and takes the following form:

$$V_{it}(\Omega_{it}) = \max_{I_{it}, Q_{it}} E_t \left[ \sum \delta^{j-t} R_{ij} \mid \Omega_{it} \right]$$

Where  $\Omega_{it}$  is the data set of exports available at time t,  $\delta_{it}$  the discount factor of one period, and  $R_{it}$  are the expected net revenues from exporting by firm i in period t.  $I_{it}$  is the discrete choice variable for exporting (1 = chooses to export, 0 = otherwise).  $Q_{it}$  measures the optimal export level, but if it is not optimal, the value equals zero. The author assumes, like Dixit (1989), that there exists fixed costs of entry or exit in the export market.

He finds that sunk cost hysteresis to be an important factor in determining export market participation. However, the degree of hysteresis was not found to be an important factor in determining export market participation from a firm. Hysteresis, although small, had a significant effect on the responsiveness on the volume of trade to the degree of exchange rate uncertainty. Overall, he found trade adjustments due to exchange rate changes mainly occurred through the adjustment of the amount exported by existing firms (intensive margin) rather than through changes in quantity of actual firms (extensive margin).

Cho, Sheldon, and McCorriston (2002) analyzed exchange rate uncertainty on agricultural trade through a fixed effects model using panel data. They showed that trade in agriculture is most affected by this type of uncertainty. Furthermore, they found that every sector studied; machinery, chemicals, agriculture, and other manufacturing all had negative coefficients from the effect of exchange rate uncertainty. The chemicals sector

was the only sector with a non-significant coefficient. However, the machinery sector had a positive and significant coefficient saying that an increase in exchange rate uncertainty yielded an increase in agricultural trade growth. As a result, Cho, Sheldon, and McCorriston (2002) found that total overall agricultural trade had a significant negative coefficient in terms of growth.

#### **2.4.2. Foreign Demand Shocks**

A study conducted by Moner-Colonques et al. (2008) analyzes how price is affected by asymmetric information and demand uncertainty. They measure a firm's actions in the second period after observing the host firm in the first period. There is an assumption that each firm is trying to maximize their expected profit. However, the host firm is doing so while competing against an exporter. The exporter has the disadvantage of asymmetric information and a certain level of demand uncertainty for the product being exported. If, the unknown factor is less (more) than the average unknown factor then, the foreign firm will export (invest) (Moner-Colonques et al. 2008). This will happen after the first period production, and the decision to invest (FDI) or export will be conducted before the second period of production. The output decision of the host firm in the first period affects the probability of foreign entry in period two.

Moner-Colonques et al. (2008) discovered that a host firm may send out a "noisy signal" from their output decision in the first period resulting in statistical information being captured about market size to the foreign firm. To counter act this, the host firm will deviate from its monopoly-like output for period two to try and throw off the incoming foreign firm's intuition about production output. However, a host firm prefers to compete against a fully informed and equally efficient entrant, rather than one that



assumes a better market than really exists, and overproduces. This would flood the market with their product and drive down prices. Demand uncertainty stems from the affect that the host firm's production decision in period one has on the probability of the foreign firm entering in period two.

### **2.4.3. Foreign Income Uncertainty**

An analysis by Grier and Smallwood (2007) concluded that foreign income uncertainty (FIU) had a larger influence on export performance than the real exchange rate (RER). The study consisted of nine developed and nine developing countries. Foreign income uncertainty, they found, can have a significant effect on developed countries exports (RER effects less developed countries more than developed). Foreign income uncertainty is also a determinant of export growth. Grier and Smallwood (2007) used the conditional variance of the RER to measure foreign income uncertainty. This says that as the RER changes, it shows how much a firm's national income may have changed, and thus changed the value of the host country's currency value a foreign firm's product may have in that country. As a result, it may deter foreign firms from entering such markets if the variation in RER is quite large and/or unsteady.

### **2.4.4. Trade Policy**

Firm's can also be deterred from entering a market if they do not have current market information. For instance, certain trade policies that may have restricted a firm to enter into an export market may have been eliminated, but the effect of those trade policies still exist. The firm does not enter for reasons such as they may still assume the trade policies are still in effect. This was discussed earlier from Dixit (1989) as "hysteresis." For the purpose of this research the focus of the problems with hysteresis

will only be on trade policy hysteresis. Entry decisions based on this type of hysteresis are the main focus, even though Dixit (1989) explains how it can affect a firm's entry and/or exit decision. This research focused on entry decisions only. Uncertainty can stem from trade policy hysteresis and restrict a firm from exporting simply due to asymmetric information about foreign market trade policies. An example would be if a firm did not entertain the idea of entering a certain foreign niche market due to restrictions that existed months or even years ago. They are simply uncertain about any trade policy barriers that exist.

#### **2.4.5. Foreign Price Uncertainty**

Satyanarayan (1999) researches how foreign price uncertainty can affect firm decision making. "Random exchange rates" create foreign price uncertainty which can affect how much a firm may decide to produce and for whom it is producing. Price uncertainty is shown here:

$$P_i = p_i + \sigma_i \varepsilon_i$$

The important aspect that may make price  $P_i$  different than the average price  $p_i$  is the shift parameter  $\sigma_i$  and random variables  $\varepsilon_i$ . When  $\varepsilon_i$  does not equal zero, there is an unknown change in prices. If the random variable gets farther and farther from zero, then there is more and more uncertainty in the foreign price of goods. As a result, a firm may object to entering this market based on its price volatility from the average. This can also be a form of entry uncertainty and may be an overall factor when a company is considering entering a foreign market.

#### 2.4.6. Foreign Demand Variations

The concept of foreign price variations (uncertainty) can also be applied to foreign demand variations. This concept was researched by Ensor (1991) and found to be significant. Demand uncertainty can affect the amount exported by a firm; that is, if they even decide to export in the first place. This form of uncertainty can restrict a firm's exports, or even deter exporting altogether. The theory suggests this:

$$F - F_0 = a_0 + a_1(\alpha - \alpha')$$

In other words, actual exports,  $F$ , less expected exports,  $F_0$ , equals a base number of exports  $a_0$ , plus the unanticipated demand (measured by the difference in the actual ( $\alpha$ ) and expected ( $\alpha'$ ) multiplied by  $a_1$ ). Ensor found that uncertainties in domestic demand for a product are actually carried over into uncertainties for demand in a foreign economy supply. This happens because firms tend to exploit foreign markets with their good(s) in times of low domestic demand. In a sense, they are flooding the foreign market with their good(s). As a result, part of the uncertainty then follows the good(s) overseas and affects industry profits in the supply of such good(s) in foreign markets (Ensor).

Previous literature was reviewed to develop knowledge about export promotion programs, and illustrate the problems that could arise, which restrict trade, when a company decides to export. Table 2.2, on the following page, is a review of the studies used in this research to build the methodology. The authors of the previous literature that were reviewed are categorized to illustrate the methodology behind desired research. It is also categorized to show the attention that has been paid to this subject prior to this research.

**Table 2.2 Review of Empirical Studies**

**Empirical Studies Reviewed**

Agricultural Trade

Krugman (1980) Chaney (2008)  
Melitz and Krugman (2003)

Export Uncertainties & Risk

Moner-Colonques (2008)  
Grier and Smallwood (2007)  
Satyanarayan (1999)

Ensor (1991)

Moser, Nestmann, and Wedow (2006)

Export Promotion Case Studies

Diamantopoul, Schlegelmilch,  
and Tse (1992)

Gençtürk and Kotabe (2001)

Francis and Collins-Dodd (2004)

Coughlin and Cartwright (1987)

Exchange Rates

Holly (1995) Dixit (1989)

Goldberg and Kolstad (1995)

Callebero and Corbo (1989)

Campa (2000)

Export Promotion Theory

Czikota (1996) Patterson (2006)

Hotchkiss, Moore, and Rockel (1994)

An example that restricts trade is consumer preference which could hinder the expansion or creation of foreign markets because consumers trust products made domestically in their nation. Furthermore, barriers that are associated with production are also quite common. A company experiencing increasing returns to scale may have an advantage in foreign markets over a different company trying to open exports at the same time. Increasing returns to scale makes the product more attractive than the competition making the firm more profitable, so the other company may be restricted when deciding to export. Other barriers to trade come from exporting in general. Lack of education and knowledge of export subjects can create quite a large barrier for many companies to export. This requires many steps before the company can begin which may deter the company from exporting altogether. Also, there may be no export marketing assistance (EMA) to assist the company in reaching customers overseas. This problem can be restrictive because a company will not export if they do not see a market in a foreign

country. Possible aspects of uncertainty that could deter a company from entering any foreign market were reviewed. Exchange rate uncertainty is the main cause of uncertainty as seen in the literature. However, there are other cases in which companies have postponed exporting because of other forms of uncertainty such as foreign price uncertainty, policy implications, foreign demand and supply uncertainty, and foreign income variations.

### **CHAPTER 3. METHODOLOGY AND DATA**

The main purpose of this research is to determine whether state-funded export promotion programs increase a company's expected profits by lowering variable and fixed costs associated with entry into foreign markets. The reason for this analysis focuses on the performance of export promotion and its impact on a firm's export revenues, thus increasing firm profitability. The purpose of the method is to gather data about a company and its use of export promotion, or its time with the North Dakota Trade Office (NDTO). Included are the views of the company about export promotion or what the NDTO provided and, their viewpoint about the transition into the export market. To justify the use of export promotion the effect will have a positive impact on company profits and investor utility. To do this, export promotion must have a positive and statistically significant impact on the level of sales to foreign customers, fixed or variable costs of trade, or both.

The objective of this chapter is to develop theoretical knowledge in which an empirical model can be formed and ran to prepare unbiased and significant results pertaining to the valuation of export promotion programs and how they can affect a firm's investor utility. A conceptual model will be developed which demonstrates why a firm might be interested in participating in a state-funded export promotion program. The conceptual model will be used to develop testable hypotheses. These hypotheses will be tested empirically based on a statistical model using sales and cost data gathered from agribusiness companies which make direct sales to foreign customers.

### 3.1. Theoretical Model

#### 3.1.1. CES Utility and Demand Shifters

The theoretical framework used to illustrate how a firm would act is taken from Helpman et al. (2004). The utility model considers an individual producer of a differentiated specialty product in country  $i$ . Product differentiation exists due to product characteristics. However, the elasticity of substitution with similar products, denoted  $\varepsilon$ , is assumed to be constant. The product will have a standard CES taking the form:

$$U(X_j, X_i) = \frac{X_j^\delta}{\delta} + \frac{X_i^\delta}{\delta} \quad \text{given, } \delta \neq 0 \quad (1)$$

Here, utility is gained by the buyers of product  $X$  either from their domestic market  $j$  or abroad in  $i$ , otherwise known here as North Dakota firms. The constant elasticity means that utility can be equally gained from either market based on the level of substitutability.

The total amount of the product produced by country  $i$  is represented by  $Y$ , so one unit of  $y$  is produced from an aggregated input,  $a$ . Each producer in the industry sector receives a certain amount from the distribution of  $a$ ,  $G(a)$ .  $G(a)$  being the total amount of this input used to produce  $y$ . The amount of  $y$  produced is dependent on the amount of  $a$  used, productivity of the producers is inversely proportional to their use of  $a$  in producing a unit of  $y$ . In other words, productivity for each firm equals  $1/a$ .

In every industry, it is assumed producers cover a fixed cost of entry to produce in their domestic markets. We will label this  $F_E$  in the model. Given the single aggregated input  $a$ , from above, this presumes a certain level of productivity is required to enter the domestic market. This is supported by the assumption that a firm would not enter the domestic market unless there was a demand for their product greater than or equal to one

unit. If the fixed costs of entry,  $F_E$ , are covered, there are additional fixed costs associated with operating in the domestic market labeled  $F_D$ . These are costs it takes to run production after the firm enters the market.

Total firm production can be attributed to two categories, production for domestic consumption and production for foreign consumption, or exports. This subset of the sector's output can be produced and exported at fixed and variable costs represented by  $f_X$  (Helpman et al. 2004). We assume, for simplicity purposes, exports are from one sector and all exports flow from country  $i$  to country  $j$ . As in Helpman et al. (2004), the fixed cost of exporting, denoted  $f_X$ , is associated with establishing a marketing network in country  $j$ , and includes such costs as border costs as well as costs of entering into transactions with individual buyers. Border costs can include insurance and transport costs, or tariffs that have been implemented by the importing nation. The fixed costs associated with exporting are not known *a priori*, and as a result, are drawn from a distribution  $F(f_X)$ . The model in this paper differs from Helpman et al. (2004) by ignoring the potential for foreign direct investment (FDI), but will concentrate on relatively small producers of specialized products as does Helpman et al. (2004).

### 3.1.2. Export Profits and Export Promotion

We apply a version of Andersson's (2007) theoretical model of entry costs for entering a foreign market. Andersson's (2007) theoretical model shows firm  $i$  located in market  $r$  maximizes profits by exporting to market  $s$  according to the following equation:

$$\pi_{i,s} = p_{i,s}z_{i,s} - \frac{\beta}{\gamma} t_{rs}z_{i,s} - F_{rs} \quad (2)$$

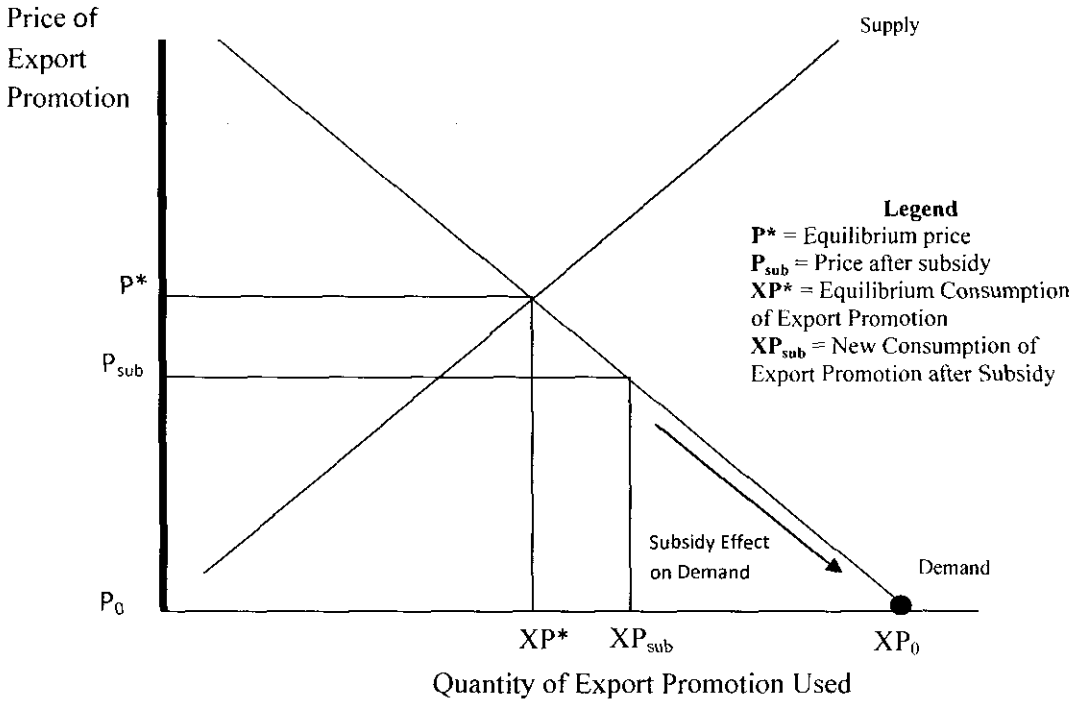


where  $p_{i,s}$  denotes firm  $i$ 's price in market  $j$ ,  $Z_{i,s}$  denotes the quantity demanded in market  $s$ , and  $\frac{\beta}{\gamma}$  denotes firm  $i$ 's marginal cost.  $F_{rs}$  is the entry costs associated with firm  $i$  entering and exporting to market  $s$ . Because we assume that the firm has already entered in their domestic market, the assumption can be made that  $F_{rs} > 0$  and  $F_{rr} = 0$ . This assumption is validated because a firm begins operation in the best market possible for their products to ensure successful business. Exporting happens after the firm has strengthened its domestic market and has found room to grow in others (Andersson 2007). It is usually irrational for a firm to open in an area containing no potential consumers because shipping, advertising, consumer travel expenses, etc. will cause the price of their goods to be relatively more expensive, causing a lack of competitiveness for the firm.

Previous research shows that companies use export promotion programs, but the distortion that exists in the export market with this method is that these programs are funded by state governments or the Foreign Agricultural Service; causing a move down the demand curve. If the benefits outweigh the costs, then companies have every reason to use export promotion services without much to lose if unsuccessful. However, the programs may have no effect whatsoever, which can lead to a misinterpretation that these programs are significant in increasing export revenues. Simply, firm's export revenue is increasing because of firm performance not export promotion (Diamantopoulos et al. 1992). The NDTO is also subsidized, but only through partial state grants. Moreover, it charges a nominal fee for their services which illustrates that companies choose to use such services because they believe it helps with the transition into foreign markets. A

simple supply and demand graph will show how subsidies can distort the equilibrium amount of export promotion demanded (Figure 3.1).

**Figure 3.1 A supply and demand model showing the possible impact of export promotion on firm export quantity.**



As shown in the graph, a subsidy will increase the amount of export promotion demanded from  $XP^*$  to  $XP_{sub}$ , maybe even  $XP_0$ , depending on the size of the subsidy. However, this subsidy creates an equilibrium distortion because the services are subsidized, causing an increase in the amount of these services used. As a result, the effect from these programs may be overstated. The NDTO charges a small fee, rather than providing free export promotion services, which may decrease the possible distortion represented by  $XP_0 - XP_{sub}$ . The market distortion may be reduced in this instance because the service is partially paid for by the firm, making it the firm's voluntary choice to use export promotion. It can be considered an expense the business incurs to try and spur foreign

market activity. This also applies to any firm level export promotion conducted by the firm itself. It is a business expense purchased solely on the idea of increasing export revenues.

### **3.1.3. Expected Utility Maximization from Exports**

Export promotion programs, such as that offered by the NDTTO, are used to reduce the fixed costs of entry into foreign markets. Revenue from exports within North Dakota agribusinesses is affected by demand from foreign consumers. Because data measuring the quantity demanded by each foreign customer was not available here, another determinant of demand that was available for this research is the buying power of the importing country. Rather than using the amount of a good purchased from a North Dakota firm we can use a measure of a foreign nation's agricultural income, represented by each respective country's gross domestic product (GDP) in agriculture (CIA 2009). This will show how much income is generated in any given nation and their ability to "afford" agribusiness products. The theory showed the higher the overall GDP from agriculture in a given nation the higher their ability to purchase agribusiness goods from firms, or the greater their buying power (Onunkwo and Epperson 2000). This measure of wealth is the revenue generating side of the profit function and is an indicator as to how successful a firm exports given the amount of available GDP in agriculture its importing partners hold.

Foreign markets, variable costs, and risks associated with production affect the manufacturer of the goods when exporting. As mentioned in Chapter 2, reducing costs and risks both attract new entrants into the export market and increases export activity of current exporters (Dixit 1989). The extensive margin measures the number of exporters

in a certain sector, industry, state, region, etc., and the intensive margin is the amount exported by the extensive margin in a certain sector, industry, state, region, etc. (Andersson 2007).

The null hypotheses being tested are stated as such:

- 1)  $H_0$ : *There is no significant effect from the use of export promotion by North Dakota agribusiness firms.*
- 2)  $H_0$ : *There is no significant effect from the use of the NDTO by North Dakota agribusiness firms.*

This is essentially saying that promotion has no effect on the share of export revenue showing that firms using export promotion have the same share of revenue coming from trade. These hypotheses will be tested using the data gathered from the North Dakota firms. To test these hypotheses, export promotion expenditures and NDTO use will be collected and regressed on the dependent variable to show any effects these may have on the level of export revenues at a firm. If the coefficients from these variables are significant and unbiased then the null hypothesis can be accepted.

The alternative hypotheses, or the hypotheses that will be accepted if the null is rejected, will show:

- 1)  $H_1$ : *Export promotion has a positive effect on export revenues in the agribusiness sector of North Dakota firms.*
- 2)  $H_1$ : *The NDTO has a positive effect on export revenues in the agribusiness sector of North Dakota firms.*

If the alternatives are accepted, it must be noted that this conclusion can only be valid for this particular set of data and research objectives; in other instances beyond this sample and in other sectors or industries this may be incorrect.

Again, Helpman et al.'s (2004) model carries with it an assumption of a CES utility function for buyers of the products. Characteristics of the CES utility function result in the demand function of product  $y$  being  $y = A^i p^{-\epsilon}$ .  $A^i$  is the demand shifter for country  $i$  and, from Helpman et al. (2004) is shown in equation (4) as:

$$A^i = \frac{\beta E^i}{\int_0^{n^i} p^i(v)^{1-\epsilon} dv} \quad (3)$$

In this model,  $E^i$  is the aggregate level of expenditures in country  $i$ ,  $n^i$  are the total number of close substitutes available in country  $i$ , and  $p^i(v)$  is the market price for variety  $v$  in country  $i$ . In Helpman et al. (2004) they assume input costs for  $a$  to equal 1 in both countries  $i$  and  $j$ . From this, the authors' derive domestic profits,  $\pi_D = a^{1-\epsilon} B^i - f_D$ , where:

$$B^i = (1 - \alpha) A^i / \alpha^{1-\epsilon} \quad (4)$$

Firm profits in country  $i$  will differ by firm productivity, reflected in the amount of  $a$  used to produce a unit of output. In the export market,  $B^j$  differs from  $B^i$  by demand shifter  $A$ .

Next, are the additional profits earned from exports by country  $i$ . This will take the form  $\pi_X = (\tau a)^{1-\epsilon} B^j - f_X$ , where  $\tau \geq 1$ , and features two aspects worth mentioning. First, additional profits in  $j$  will be affected by transportation costs from  $i$  to  $j$ , which are assumed to be iceberg costs denoted by  $\tau$ . Iceberg costs model transportation costs in terms of additional units that must be shipped from  $i$  to  $j$  in order for one unit of the good to arrive at destination  $j$ . Second, profits in  $j$  will be affected by the elements of measure  $B^j$ . From the definition of  $B$ , additional profits from exporting are affected by price

differences between  $i$  and  $j$ . The effects of exchange rates on trade are well-established. This is an assumption that can be safely made about exporting. In the current setting, exchange rate variability adds an additional source of uncertainty for the producer contemplating exporting to country  $j$ . Exchange rates will affect the numerator through  $E^j$ , or total expenditures. While, they will also affect the denominator of the demand shifter  $A^j$  through variety prices, which in turn will affect the demand measure  $B^j$ . Other forms of export uncertainty that will affect utility include supply and demand shocks, aggregate and per capita income uncertainty, trade policies, and country and political risk.

Another assumption of the model is that the producer in country  $i$  is aware of his firm's productivity denoted as  $1/a$ . If fixed costs of market entry are covered given the firm's productivity, the producer must decide between selling whether to sell to the domestic market, which would mean obtaining known profits  $\pi_D(a)$ . On the other hand, he can export some or all of his output to at least country  $j$ . Additional profits from exporting will be realized from the distribution of  $F(\pi_X(a))$ . If one assumes the producer acts as though he maximizes the expected utility of profit, which is considered rational, he may sell some of his product domestically,  $\lambda$ , and export the remainder,  $(1 - \lambda)$  where,  $0 \leq \lambda \leq 1$ . The producer's objective assuming a CES utility function is to maximize expected utility shown as:

$$\text{Maximize}_\lambda EU(\pi(a)) = EU(1-\lambda)\pi_D(a) + (\lambda)\pi_X(a) \quad (5)$$

There must be an assumption that domestic market parameters are known with certainty. However, uncertainty in export markets can arise from the variables mentioned above,

affecting  $B^j$ , and from uncertain fixed costs from entering the foreign market, represented by  $f_x$ . The above utility maximization can then be altered to take the form:

$$\text{Maximize}_\lambda EU(\pi(a)) = \sum_{i=1}^4 U(1 - \lambda)\pi D(a) + (\lambda)\pi X(a) F(\pi_x(a)) d\pi_x(a) \quad (6)$$

After manipulating the utility function again, the final function to maximize the company's expected utility assuming quartile discrete size is:

$$\text{Maximize}_\lambda EU(\pi(a)) = \sum_{i=1}^4 \sum_{j=1}^4 \frac{U(1 - \lambda)\pi D(a) + (\lambda)\pi X(a) F(\pi_x(a))}{(\lambda) [(\tau a)^{1-\epsilon} B^j - F_x]} f(B_j) f(F_x) \quad (7)$$

The major argument here is that the NDTO affects a company's fixed costs,  $F_x$ , when exporting by changing export costs and export uncertainty. Moreover, this affect on  $F_x$  should be substantial enough to convince the company in country  $i$  that exporting to country  $j$  is now a rational and beneficial decision to try and maximize expected utility.

### 3.1.4. Expected Utility from Profits Function

The utility maximization equation from above can be broken up into utility from domestic revenue and utility from foreign revenue. We are focusing on foreign revenue from exports only, which can be adjusted from Andersson's (2007) version to satisfy the assumption that expected utility is derived from profits. The final version of the profit function in which expected utility is derived from will take the form:

$$E(U_{X,k}) = E(\pi_{X,k}) = (P(Q_j)Q_j - C(Q) - F_x) \quad (8)$$

The utility function will be different depending on the firm size. So, to accurately measure utility for different firm size,  $k$  will be introduced to represent firm size. The revenue function (a positive effect on utility) has the form  $P(Q_j)Q_j$ . The cost function,  $C(Q)$ , has a negative impact on utility, but is not studied in this research. The fixed costs of exports variable,  $F_x$ , is made up of the fixed costs associated with exporting.

The attention of this research is to find the effects that export promotion may have on a company's product demand abroad, or  $Q_j$ . Moreover, it is hypothesized that fixed costs of exports,  $F_x$ , are also decreased by export promotion and the NDTO services, mainly export uncertainty and export promotion costs.

### 3.1.5. Risk Aversion

It is assumed in this research that exporting companies are risk averse. In other words, companies will choose not to export if they feel the risk is too high compared to the reward. By assuming risk aversion this satisfies the above variables included in export uncertainty. When assuming risk aversion, there is a probability of success shown here:

$$\rho = \text{success rate, } 0 < \rho < 1$$

On the alternative side, there is also a chance for failure. This is the level of risk that is involved when a company is deciding to export. This is opposite the success rate as shown here:

$$1 - \rho = \text{rate of failure, } 0 < \rho < 1$$

This will measure the company's overall affect (gain or loss) on utility from making a certain decision. In this research there are two specific choices that a company could make, export or do not export. Each decision has two outcomes, success and failure. The focus here is on the export decision. The firm will either gain utility from exporting successfully or they will lose utility from failing to export. The model for risk aversion after making the decision to export will take the form:

$$U^h(W^*) = \rho[U(W^* + h)] + (1 - \rho)[U(W^* - h)] \quad (9)$$

Because we assume that maximizing profits will maximize utility, the gain or loss in profits from exporting is labeled  $h$ .  $U(W^*)$  is the existing utility from the company which



is then added or subtracted by the firm's success or failure to export, respectively. After the decision has been made, the new utility is  $U^h(W^*)$ . This is the firm's new utility after the effects from the decision to export take place.

### **3.1.6. Variable Justification**

The similarities between this research, Kotabe and Czinkota (1992), Andersson (2007), Dennis and Shepherd (2007), and Das, Roberts, and Tybout (2007) is that these look at entry costs and how state-funded export promotion programs may help reduce the fixed costs of entering foreign markets. The objective here is to determine if export promotion decreases fixed costs that accompany the decision to export. In other words, entry costs are a function of the impact of the export promotion on a company's revenues and investor utility.

Using a firm's shipping, capital, and labor expenses as independent variables represent costs based on the profit function cost side. These are the three most consistent costs in which every firm has. Capital and labor are production costs most firms will have. Measuring the share of export promotion is also a cost, but this is the variable used to test that primary hypothesis so it contains two important justifications. The amount of export promotion expenditures will show how it affects the share of export revenue by differentiating the firms that spend a larger amount to the firms that spend very little on export promotion. Coughlin and Cartwright (1987) and Onunkwo and Epperson (2000) also used export promotion expenditures in the export revenue function. Along with export promotion expenditures, the binary variable measuring NDTO use is vital to show how using these state-funded export services may affect the share of export revenue. The NDTO is measured as a one signifying its use, or a zero showing no use at all. It is binary

because firms only pay one flat fee per year and are exposed to the same amount of services as other firms. Firms either pay the yearly fee and gain access to the NDTO, or they do not use the NDTO for any service. Given this situation, a binary variable is best suited to show which firms use the NDTO.

Export costs are incurred by the firm. Fixed and variable costs include the firm's purchase of capital and labor to manufacture their product(s), and costs are incurred through the transportation of the product to a foreign buyer. Capital and labor are the two costs used extensively throughout the literature to show how they affect the dependent variable. For instance, some authors show the significant effects of labor and capital costs on firm revenues (e.g. Coughlin and Cartwright 1987). Data on shipping and transport costs is also gathered from each firm to show how this may affect the share of export revenues because this cost in particular can be troublesome for a firm when exporting. If a firm's shipping and transport costs are too overwhelming, then profits from exporting will suffer causing a rational firm to exit, or not even enter, a foreign market. This fixed cost is an important part taken into consideration by a firm before exporting.

Diamantopoulos, Schlegelmilch, and Tse (1993) discuss how awareness of export uncertainties is vital for firm success abroad. The variable measuring the awareness of export uncertainties is included to try and find a correlation between the amount of awareness a firm has and the share of export revenue. This variable suggests that the higher awareness a firm has of export uncertainties, the more export revenue the company will see because of the increased knowledge about exporting compared to a company with a lower total awareness.

Binary variables measuring firm size are included to adjust for the affects from the size of a firm on the share export revenues. Theory suggests that the larger the firm, the larger the share of export revenue due to a more established domestic and foreign market (Adams et al. 1997). To show the effects of how firm size is correlated to the share of export revenue, binary variables are used. A one is used for the corresponding observation that has the variable criteria while a zero is used otherwise.

A risk coefficient comprised of many aspects of a country that were rated on a scale, and summed to create a final risk coefficient, are used to adjust for any factors that deter or hinder a firm's success in foreign markets. The theory here suggests that high risk countries affect the share of export revenues more than low risk, stable countries (Hermann et al.(2006). So, firms that export to higher risk countries are hypothesized to have lower shares of export revenues because of the higher risk of credit default (Balkan 1992).

Finally, an aggregated GDP from agriculture from the observation's top foreign countries will be used for each firm to show foreign buying power. The top countries in which the firm exports its product(s) to was collected and each country's GDP in agriculture was gathered. These numbers are then added up to give each firm an overall amount of GDP in agriculture or total buying power. This variable represents the demand for a firm's product(s) which is the revenue generating side of the profit function. The total buying power is said to have a positive correlation on the share of export revenue because increases in buying power will hypothetically increase the amount of exports a firm will sell abroad due to the ability level to purchase goods by the foreign buyer (Onunkwo and Epperson 2000). However, countries with a greater amount of foreign

agricultural income may import fewer commodities from abroad due to the greater amount of domestic production. The affect from foreign agricultural GDP is ambiguous.

Revenue from exports within North Dakota agribusinesses is affected by demand from foreign consumers. Data measuring the quantity demanded by each foreign customer was not available here. The determinant of demand that was available for this research is buying power. Rather than using the amount of a good purchased from a North Dakota firm, we can use a measure of a foreign nation's agricultural income, represented by each respective country's gross domestic product (GDP) in agriculture (United Nations 2009). This will show how much income is generated in any given nation and their ability to "afford" agribusiness products. This measure of wealth is the revenue generating side of the profit function and is an indicator as to how successful a firm exports, given the amount of available GDP in agriculture that its importing partners hold.

## **3.2. Statistical Model**

### **3.2.1. Model Justification**

The total sample size from the survey is small enough to hold some bias in the end regression. There are about 100 agribusinesses in North Dakota that directly export to foreign customers (NDTO 2009). Of that, 28 firms, or about 25-28%, have responded to the survey and answered every question. The main difficulties in creating a large sample are response rate and criteria. Some firms refuse to take the survey due to personal decisions and others are not headquartered in North Dakota making the retrieval of data difficult. Also, the dependent variable, or the ratio of export revenue to total revenue, is truncated to values greater than zero. Unfortunately, this makes the data left-censored. In

other words, no observed value is negative within the sample collected. This can become troublesome for this type of analysis and must be corrected to ensure unbiased results. No observed negative values means that the regression will not account for the effects of negative dependent variable observations assuming only positive values are present. When ordinary least squares (OLS) is used, absent of any negative observations, it creates an inefficient line of best-fit that is not representative of the real pattern or trend happening with the dependent variable. As a result, the coefficients of the independent variables cannot be trusted making the significance biased and inconsistent. OLS treats the observations as actual values and not the lower limits of the companies surveyed; making the range of the share of export revenue smaller than the Tobit regression. The Tobit model takes into account the left-censored answers to construct a more fitting range creating a more accurate line of best-fit.

A Tobit model accounts for the truncated dependent variable and adjusts the line of best fit. Created by Tobin (1958), to show relationships between non-negative dependent variables and independent variables, it also can be used for smaller sample sizes with a non-negative dependent variable. The definition of a dependent variable in a Tobit model is described as such:

$$y_i = \begin{cases} y_i & \text{if } y_i > 0 \\ 0 & \text{if } y_i \leq 0 \end{cases}$$

This says that a variable is either its original value if above zero or equals zero, if its original value is less than or equal to zero. Using the Tobit model will create results that have unbiased and efficient coefficients which, if significant, can be used to explain the independent variables' effect on the dependent. To test significance, a chi-squared value is observed for each independent variable. If the computed chi-squared value is greater

than the chi-squared critical value, the value at which it must be greater to show significance, then the coefficient can be said to have a significant impact on the share of export revenues. The chi-squared test is used because it is an accurate measurement to show how significant a variable is in affecting the dependent variable. A chi-squared statistics measures the contributions from each observation for each independent variable in the regression. For each independent variable, the contributions are summed and measured using the chi-squared statistic. So, if the contribution of a particular observation on the dependent variable is large, then the chi-squared statistic will increase showing a larger impact on the dependent variable as a whole. The larger the chi-square number means the larger the impact that particular independent variable has on the dependent variable, thus making it significant.

This form of regression analysis is taken from Onunkwo and Epperson (2000) but, instead of an ordinary least squares approach a Tobit regression has to be used because of the small sample size and a truncated dependent variable. Simultaneity can be a problem here. However, Binkley (1981) has shown that dealing with export demand can be in single-equation form when the supply of the good(s) to the importing nation is exogenous or, in other words, they are price takers. In Onunkwo and Epperson (2000), an elastic supply curve is assumed. However, their analysis used pecans which are a good that is mostly consumed domestically, leaving little to be exported. Agribusiness products in general are not quite so elastic; meaning the importing nations are not fully committed to taking the price given to them.

Another article addressing state foreign export promotion by Coughlin and Cartwright (1987) uses a cross-sectional OLS model to show if state export promotion

programs do increase state exports. The scope of this paper analyzed manufactured and agricultural commodities. Their main variables were physical and human capital, labor, and export promotion. Heteroskedasticity was a concern for the authors. When heteroskedasticity is present the random sample observations will have differing variances causing bias in the regression results. Using generalized least squares to adjust for heteroskedasticity, Coughlin and Cartwright (1987) concluded that state export promotion programs have a positive effect on export revenue and are significant at a ten percent level. The model in this research will be modeled after this paper because of its use in agricultural commodities. This seems to be the best model to show the effects of export promotion on agribusiness goods in North Dakota. The model also allows for survey data to be easily collected because of the straight forward variables that are used in the regression.

From the theoretical model an empirical model will be formed and used to test the hypotheses created here. The theoretical expected utility function of an exporting firm includes revenue, export demand uncertainty, and export promotion and transactions costs. The utility function is an adaptation from Coughlin and Cartwright (1987) and will take the form presented in equation (1) below:

$$\pi_x = U(Q_j, P_{xj}, EU_{ij}, XP_{ij}, TC_{ij}) \quad (10)$$

$X_{ij}$  is the foreign demand for product X in country j,  $P_{xj}$  is the price of the product X in country j, EU represents the firm's amount of export uncertainty, XP is the amount of export promotion the company used and, TC is the transportation costs of shipping the good abroad. An assumption has to be made that the firm's expected utility is equal to the profits made from the exportation of good X. This assumption unites this version with the

export profit equation in 3.1.1. They are essentially saying the same thing, but the expected utility model here shows what variables will affect firm profits and investor utility.

The area that the scope of this research is analyzing is the variable  $F_X$  in the expected utility function of the firm. This fixed cost of exporting can be broken down into some elements to take the form:

$$F_X = F(\text{new labor, new capital, trade barriers, transactions costs, raw materials})$$

The hypotheses being tested says that the entry costs and some possible trade barriers are decreased, if not eliminated, by the NDTO, resulting in lower fixed costs  $F_X$ , export uncertainty, and higher expected utility for the firm. The literature review showed how trade barriers like poor knowledge of potential markets, the lack of mechanisms to generate trade leads, the lack of staff for export planning and implementation, etc... can hinder, even deter, a company's goals of exporting. The NDTO is assumed to mitigate many of these barriers, making a company fluent in their transition.

The crucial variables in this research are country gross national income (GNI) and GNI per capita, the amount of export promotion expense after using export promotion and/or the NDTO, and the amount of export uncertainty after using export promotion and/or the NDTO. These variables will all be used to try to explain a firm's level of export revenues. The export demand equation for agribusiness products in North Dakota will take the form:

$$\text{Ratio}_{xj} = f(\text{Prom}_{ij}, \text{Ship}_{ij}, K_i, L_i, \text{Aware}_i, \text{NDTO}, \text{Firm}_i, \text{Risk}_i, \text{GDP}_j) \quad (11)$$

Where  $\text{Ratio}_{xj}$  is the ratio of export revenue to total revenue for the firm and, is the dependent variable.  $\text{GDP}_j$  is the total product in agriculture of the importing nation. The



amount of capital investment in 2008 of each firm will be shown by  $K_i$ . Total labor expenses (salaries and benefits) for 2008 is labeled as  $L_i$ .  $Ship_{ij}$  are the share of shipping costs associated with moving the good from country  $i$  to country  $j$ . This is the overall cost to the company for exporting its product abroad.  $Prom_{ij}$  also measures a certain share of export expenses, in particular, the amount spent on export promotion.  $Aware_i$  is the aggregated sum from the survey which measures the effects of the cost of export promotion and the amount of awareness of export uncertainty on total export revenues, respectively. The dummy for measuring whether a firm used or uses the NDTO is denoted by simply NDTO. Firm size may also be a factor so  $Firm_i$  measures the size of the firm and its effect on total export revenue. This particular variable along with the NDTO variable will be dummy variables. An observation will have a one or a zero for its value depending on its size and, it will have a one or zero depending on whether the firm used the NDTO. The Risk variable will measure the effect of the level of risk on the share of export revenue. The Tobit equation will then take the form:

$$ER_{xj} = \beta_0 + \beta_1 \ln K_i + \beta_2 \ln L_i + \beta_3 ship_{ij} + \beta_4 prom_{ij} + \beta_5 aware_i + \beta_6 ndto + \beta_7 firm_i + \beta_8 risk + \beta_9 \ln aggd_p_j + \beta_{10} Risk^2 + \varepsilon \quad (12)$$

The sample sizes for each firm size is too small to run a single regression for each group size, so one regression will be used including size dummies to try and capture firm size effect. The expected sign from each variable can be determined through the theoretical framework and what has been determined about each variable. The expected signs for each variable are shown here in Table 3.2:

**Table 3.2 Expected Impact on Dependent Variable**

<i>Variable</i>	<i>Expected Sign</i>
Prom <sub>ij</sub>	+
Ship <sub>ij</sub>	-
ln K <sub>i</sub>	+
ln L <sub>i</sub>	-
Aware <sub>ij</sub>	+
NDTO	+
Small <sub>i</sub>	-
Medium <sub>i</sub>	-
Risk	-
ln Ag <sub>j</sub>	+
NDTO*Small	+
NDTO*Medium	+
Risk <sup>2</sup>	+

These assumptions of how the variables will affect the dependent variable (export sales) were taken from previous literature and conclusions from other research. One-tailed tests are the appropriate tests to use to determine whether a variable is significant.

As it is shown above, the expected sign of the NDTO and export promotion expenses is hypothesized to have a positive effect on the share of exports. For this to be true, both variables must satisfy certain necessary conditions:

$$\frac{\partial U}{\partial NDTO} > 0 \quad \text{and} \quad \frac{\partial U}{\partial Prom} > 0$$

These conditions will be tested empirically with the use of the Tobit model and will be found to be either true or false depending on the significance and sign of the coefficients from the regression analysis.

### **3.2.2. Export Uncertainty**

Export uncertainty and export promotion can be shown through functional equations to better clarify what components make up these variables. The following

functions will include variables that will be revealed through answers from the survey and may or may not have an effect on a firm's exports. The expected sign of this particular variable is negative. Meaning, as uncertainty increases it will have a negative effect on a firm's overall utility. First, export uncertainty will include the following variables as taken from the literature review:

$$EU_{ij} = f(ER_{ij}, DS_{xj}, Y_j, y_j, SC_j, TB_{ij}, ES_{ij}) \quad (13)$$

The amount of exchange rate awareness is measured by  $ER_{ij}$ , demand shock uncertainty, the shock of too much or too little demand when entering a foreign market, is measured by  $DS_{xj}$ , aggregate and per capita income uncertainty are shown as  $Y_j$  and  $y_j$ , respectively, uncertainty from substitutes and complements abroad is measured by  $SC_j$ , trade barrier uncertainty effects is measured by  $TB_{ij}$ , and uncertainty from unforeseen changes in supply is measured by  $ES_{ij}$ . Together, all these variables make up an aggregate level of export uncertainty for each firm.

### 3.2.3. Model Background

As stated previously, the Tobit model was introduced and used to mitigate bias introduced when the dependent variable is truncated to be greater than or equal to zero. This truncation makes the  $\beta$  coefficients inconsistent thus making the linear regression bias due to the dependent variable including zero as a regular variable value. The model adjusts for this censored version of the dependent variable making the coefficients unbiased and consistent.

In this research, the problem of truncated or censored dependent variable values is created because any negative values of export revenue are ignored if not impossible. So, in this case, a Tobit model would be the best fit for the purpose of this regression to avoid

any unbiased and inconsistent results that could undermined the effect of export promotion on a firm's export to total revenue ratio.

The main problem with a Tobit model is when the dependent variable is not observed then the value is automatically taken as zero. For example, the willingness to pay for an object is usually recorded as what the consumer paid for the object or service. However, if the object was not purchased then zero would be taken as the willingness to pay instead even though no purchase was made. Fortunately, this research does not create this problem because if exports were zero in 2008 for the company then the amount exported was actually zero and this value can be taken for its real interpretation, no exports.

For the maximum likelihood estimators to be as efficient as possible, the true value of each dependent value must be known (Carson and Sun 2006). Again, the survey data was collected straight from the source which enables us to rely on the answers of each firm to provide the most accurate figures short of the exact figures themselves. Knowing the values of the dependent observations allows this analysis to be as true as possible.

There is, unfortunately, a weakness of the Tobit model. The Tobit model makes the same assumptions about error distributions as a standard ordinary least squares model (OLS), but it is much more susceptible to violations of these same assumptions than OLS. For example, if heteroskedasticity is present in a Tobit model, the coefficients are much more biased than an OLS model affected by heteroskedasticity. If this can be corrected for it will not affect the coefficients. However, if untreated, the coefficients are more

misleading than using the original OLS model. An OLS model was ran and the error terms were homoskedastic meaning no signs of heteroskedasticity were present.

### **3.3. Data**

#### **3.3.1. Interviews**

The survey method used here mirrors that of the article by Kotabe and Czinkota (1992) and an article by Wilkinson and Brouthers (2000) both of which survey companies about the use of export promotion and export promotion services. Since cost and export revenue data are not publicly available from North Dakota agribusiness firms on a firm basis, data was gathered via phone survey. A phone survey is a consistent list of questions being asked by the researcher through a phone interview and completed in a timely manner by the sample of interviewees. Phone surveys can be of all lengths in time but, usually the shorter they are in length, the more chance of an adequate response rate (Dillman 1978). The questions on a phone survey need to be fluent, so filling it out will not be confusing and misleading. Easy to follow directions and concise questions also help the interviewee answer to the best of their abilities. After all, the greater the response rate, the larger chance of having an efficient and unbiased model with significant variables.

The objective of the survey is to collect data about the company's performance after exporting has began, how costs may have restricted the company from exporting, and their participation in export promotion and/or the use of programs the NDTO provides. These aspects will be used in determining the effectiveness of export promotion on export revenue share. The information from the surveys will be used in testing the alternative hypothesis that export promotion positively affects the revenues of a company

through lower fixed costs, and possibly higher foreign demand, associated with exporting.

### **3.3.2. Survey Content**

Telephone contact was made with company employees responsible for making decisions about sales to foreign customers. Each respondent was assured that their data would remain confidential. The survey contains questions that reveal a company's performance overall and in the export market. These questions are designed to observe basic dynamics of the company, discrete data revealing performance (export revenue, total revenue, total expenses, etc.), export uncertainty affecting the company (foreign demand, foreign market knowledge, and exchange rate uncertainty), and other interval data only readily available to the company, which will reveal the way the company operates. The questions will be discrete and quick to answer, but will provide data from each company that will be compiled into data sets and used to test the research hypothesis. The best way to avoid biased results is confidentiality. Each question is voluntary and responses are kept confidential so as to minimize bias that may result from any firm providing incorrect or incomplete information.

There are two main sections of the survey, basic information and export uncertainty. The questions in the basic information strictly ask for company statistics from 2008. Most of these numbers are common knowledge in publicly traded firms which the public can access, so the company usually has no problem revealing their performance. However, privately owned firms may have a problem with giving up intimate data because of their privately held status. The first two questions ask for total revenue and revenues from exports. Revenue from exports may not be known off hand so

a percentage of total revenues will suffice. Next, total expenses are asked because this figure is usually known by the firm and, so it can be broken down by the following questions. Total expenses spent on exports are asked as a percentage of total expenses. This is due to the fact that companies do not know how much exactly is spent on exports but, they have a well informed idea. Next, of the expenses spent on exports, total shipping and transport costs are asked as a percentage of export expenses. This is followed by an export promotion expense question. Of the total export expense, how much that is spent on promotion is vital for the research. The answer will show how much the firm pays, in proportion to export expenses, out of pocket for promotion of their good. Next, total capital (property, plant, and equipment) expense is asked to gather a figure measuring the company's expenditures on capital for 2008. The same is asked for total salaries and benefits paid out for 2008 along with the number of employees that the firm had in 2008. Finally, they are asked if they have used or use the NDTO for export promotion. This is to capture any effects the NDTO may have had on the company's export promotion and export revenues. For the purpose of gathering secondary data, the companies are asked their top three exporting partners.

The second section is about certain aspects of export uncertainty. Here, the goal is to measure the company's overall awareness of export uncertainties. Each question is ranked from zero to six, six being total awareness. Then, the numbers are aggregated to provide an overall figure measuring the firms' awareness. Higher awareness of these uncertainties shows lower uncertainty. This will show if export promotion and/or the NDTO have any effect on the awareness of export uncertainties and if the level of awareness has any effect on export revenues.

The companies to be studied include agribusiness firms within the state of North Dakota. The only criteria are that the company must export their agribusiness product and be located within North Dakota. Any agribusiness firm will be used, including firms that are using or have used the NDTO. The amount of use is not of concern because it is assumed that the firms pay one rate and receive the same amount of services. The agribusiness sector is targeted because foreign market participation can become clouded from sector to sector (Wilkinson and Brouters 2000). The hope here is to provide data that accurately portrays how export promotion can help a particular sector increase exports and help its firms become increasingly efficient at doing so. This analysis can be replicated for any industry. However, in North Dakota, agribusiness is a vital industry throughout the entire state.

Data are gathered from agribusiness firms which export their agricultural product directly to a foreign consumer. As a result, this excludes sales to domestic firms, since these firms act as middlemen during the sale and increase the value of the good. Also, retail firms are not included because they, again, did not produce the tangible good themselves and act as a middleman reaping some of the revenues made from the sale of the good not allowing the producer to absorb all of the benefits from exporting. Firm's that have home offices in another state are also excluded for two reasons. First, the firm's revenues are not solely made within North Dakota lines making it quite hard to know the total export revenue from just North Dakota. Second, it is quite difficult to contact the individual with the knowledge needed seeing that they may be located in an entirely different state. Firm's offering an agricultural service such as planting patterns, soil testing, etc... are not allowed in the sample either. These firms do not have a tangible



good that was produced making it difficult to measure export revenue and costs of exporting. In the agribusiness sector, taking these firms out of the sample leaves mainly producers of a good that export to foreign customers where the demand is present.

Cost data are gathered from interviews with agribusiness companies which make direct sales to foreign customers. Data on company-level export promotion expenses are gathered to show how these certain expenses may impact the level of export revenues a firm receives. The share of export promotion is used to differentiate the level of export promotion expenses relative to the firm's overall expenses. Next, total capital and labor expenses are collected to show if there is any impact from the amount of these two operation expenses on export revenues. The share of shipping expenses is another operational expenditure that is correlated with export revenue. The share of total expenses is used to differentiate the amount used relative to the firm's total expenses. This figure is collected because the absence of the variable leaves too much noise in the regression and must be accounted for since it is of high importance and represented in a company's profit function.

The dependent variable is the ratio of export revenue on total revenue. This ratio is a better indication as to how export promotion may actually help a firm because it shows how export promotion may increase or decrease the share of export revenue. Measuring export revenues in this manner reveals more about company success abroad than simply measuring total export revenues. The ratio shows the total share of revenues coming from foreign buyers, while overall export revenues only show the amount purchased. Export revenue, alone, is lacking the ability to show how well the company is doing abroad relative to their domestic market. So, if export revenues may increase, but

domestic revenues increased even more at a faster rate, than the firm would actually be doing worse abroad than it looks even though export revenues may have increase some. In this case, the share of export revenues would decrease even though it shows increases in both markets. Theory suggests that when a firm chooses to export they already have a well-established domestic market (Moner-Colonques et al. 2008). By having a well-established domestic market the firm can use it as a stabilizing tool while creating a foreign market because they already have revenues being generated domestically. It could also be used as a driving force to get foreign customers to believe in their product. So, increasing exports would increase total revenue but, but was well as, the ratio of export revenue on total revenue, or share of export revenue.

We also account for variations in demand from foreign customers. A variable will be included measuring total company awareness about export uncertainties. There are seven aspects of export uncertainty that a company may take into account when exporting. They are asked to rank the awareness from zero, being no awareness, to six indicating full “awareness.” After asking the questions, an amount is aggregated by adding the values from each question to show a final “awareness” total. This total will be used to show how “aware” the firm is about uncertainties that can accompany exporting. The higher the aggregate number for each firm, the higher the “awareness” that is present for that particular company.

Finally, firm size dummies will be used to see if the firm size has an impact on the export to total revenue ratio. A value of one will be used for each firm to determine whether it is a small, medium or large firm based on the amount it exports (export revenue). Export revenue is used as an indicator of firm size because it directly correlates

to the dependent variable providing insight as to how firm size affects the overall share of export revenues.

Along with total export promotion, a dummy variable is used to show whether a firm used the services of the NDTO. A value of one measures if the firm has used some or all of the services at some point, and a value of zero measures if they have never had NDTO assistance. This method is used because either a firm pays the fee to use the NDTO and receives total access to all the export promotion services, or they do not participate in the NDTO assistance.

### **3.3.3. Secondary Data**

Secondary data will also be collected to gather any other effects on the dependent variable and to add to the significance of the data gathered from the surveys. Foreign nations' gross domestic product (GDP) in agriculture was gathered along with the survey data to be used as a proxy of a nation's buying power for the goods exported by the companies included in the analysis. Total GDP in agriculture of importing nations will show how income may affect North Dakota agribusiness exports. The higher a nation's total GDP in agriculture the more capable it is in purchasing agricultural products from North Dakota agribusinesses.

A country risk index was constructed using economic, financial, and political risk figures (PRS Group 2009). The risk index shows how an exporter from North Dakota may act when there may be more risk to bare due to these certain aspects of risk that effect the way a country may operate its import business. The index is comprised of many characteristics of a nation to determine how much risk a nation may have toward an outside country. First, each country was measured on a scale (value in parentheses) of

economic components to construct an economic risk coefficient. This coefficient shows how stable an economy was at that time. Gross domestic product (GDP) per head of population (5), real annual GDP growth (10), annual inflation rate (10), budget balance as percent of GDP (10), and current account as percent of GDP (15) were added up to make a final score out of 50 which would constitute the nation's overall economic risk. The higher the number would mean the lower the economic risk. A similar scoring system was also used to construct a financial risk coefficient. This measured how financially sound a country was at the time. The financial risk was made of scores from; total foreign debt as percent of GDP (10), debt service as percent of exports of goods and services (10), current account as percent of exports of goods and services (15), international liquidity as months of import cover (5), and exchange rate stability as percentage of change of previous year (10). Again, the higher the coefficient would mean the lower the financial risk. The higher score possible in determining financial risk is 50.

Finally, a political risk rating was calculated to show how much risk is associated with a nation's political stability. This risk coefficient was made of five components all containing three major issues in each component. Overall, there were 15 total issues created by the PRS Group that decided how risky a nation's political system could be viewed. The minimum score is zero and the maximum is four for each issue in each component. The first component is government stability. This is made up of the level of government cohesion, legislative strength, and popular support. The second component measures socioeconomic conditions and is comprised of the level of unemployment, consumer confidence, and the poverty rating. The third deals with investment and measures contract viability, repatriation, and payment delays. The fourth component

measures a nation's internal conflict ranking civil war disputes, terrorism, and civil disorder. Finally, external conflict is measured by ranking a nation's participation in war, cross-border conflicts, and foreign pressures. Again, the higher the score the lower the risk within a nation's political framework.

The economic and financial indices are out of 50 points, in which 50 is the lowest risk possible. Political risk, however, is weighted to be out of 100 points, with 100 points being the lowest risk. These three risk indices, economic, financial, and political, are all added up then divided by two to get a total country risk figure that can be used to measure how risky a nation is relative to others. These figures are computed annually to show any change in a nation's risk over time. In this research, 2008 was the only year of scope. The values were inversed to create a risk coefficient that could be translated as the higher the coefficient, the higher the risk, making it easier to interpret in the final results.

#### **3.3.4. Statistics Summary**

The dependent variable is a measure of the total export revenue from a firm divided by their total revenue generated. This is the share of revenues that are attributed to exports. The idea is that export promotion and state-funded export assistance increase export revenue, and ultimately the share of export revenue, or the dependent variable. Instead of using only export revenue for the dependent variable this provides a closer look into how export revenue may be affected.

The independent variables consist of revenue generating variables such as the buying power of foreign countries and costs associated with exports like capital, labor, and shipping. These variables are important because they cover both the revenue and expense side of the profit function. The foreign agricultural GDP is the sum of the

agricultural GDP of all the countries the firm exports to. Dummy variables are used to measure any effects from firm size. Firms were put into one of three categories; small firms had total revenues between zero and five million dollars, medium firms had total revenues between five and fifty million dollars, and large firms had total revenues over fifty million dollars. Theory shows the higher the export revenue, the larger the firm (Coughlin and Cartwright, 1987). A dummy variable is also used to measure whether the firm used the NDTO, and their overall expense on export promotion to show the effects of using export promotion through state-funded offices or through the company. An aggregated number from seven questions ranking zero to six for each question is used to measure the amount of awareness the firm is said to have about export uncertainties. The higher the number indicates the higher awareness of uncertainties. Finally, the risk each firm is exposed to is made up of the top three countries the firm exports to and is weighted to come up with an overall total risk figure.

The sample size consists of 28 agribusiness firms in the state of North Dakota. These firms export their product abroad directly to buying customers. There are about 100 agribusiness firms of this sort within North Dakota making the sample size about 25-28%. The sample consists of sixteen small firms, eight medium sized firms, and four large firms. The size was based on how much the company exported in 2008. Small firms had total revenue that was less than five million dollars in 2008, medium firms had total revenue between five and fifty million dollars in 2008, and large firms had over fifty million dollars of total revenue in 2008. There are enough firms from each size to make appropriate conclusions from the data. Although 28 firms is a small sample size, it is fine relative to how many firms exist within the state.

There are some interesting facts and patterns from the data collected. For many small companies, using the NDTTO was the extent of their export promotion expense. The larger companies spent company money above the cost of the NDTTO to further promote their product(s). Another pattern that came from the data shows that the number of employees was usually correlated with the amount of export revenue; indicating that firms may establish a domestic market before selling outside the United States. However, export revenues were apparent among small and medium sized firms which may be attributed to the NDTTO or some sort of export promotion.

## **CHAPTER 4. RESULTS AND INTERPRETATIONS**

I introduced in previous chapters that the dependent variable was a ratio of export to total revenue for each firm surveyed. This was to be regressed on many independent variables including shipping, labor, capital, and export promotion costs, a dummy measuring North Dakota Trade Office (NDTO) use, an awareness level from each firm about export uncertainties, and firm size dummies.

The sample of North Dakota firms is comprised of strictly agribusiness firms that export out of the state of North Dakota. This means there are no other industry sectors included in the survey data. Agribusiness firms are the firms that export some type of agricultural commodity or service, a cooperative, a value-adding firm, and any firm manufacturing farm machinery. Firms that are a retail establishment are not included because they are usually a middleman to the producing firm and the importing country. The types of firms included in the survey are very important entities in the North Dakota agribusiness sector.

### **4.1. General Statistics**

General statistics, such as averages and relative firm size, are a good indication of how firms are performing abroad. One would expect larger firms to dominate in all categories due to the relative accessibility of resources, manpower, and market share. Patterns that are apparent in general statistics may reinforce the findings by revealing certain patterns and correlations. Table 4.1 illustrates each average depending on the size of the firm. In addition, the overall average is shown to illustrate spending habits of North Dakota firms.



**Table 4.1 Average Statistics for Firm Sizes**

	<b>Firm Averages</b>			
	<u>Small Firms</u>	<u>Medium Firms</u>	<u>Large Firms</u>	<u>Overall Average</u>
<i>N obs.</i>	16	8	4	---
<i>Total Shipping Costs<sup>1</sup></i>	\$19,949	\$76,151	\$3,061,009	\$491,153
<i>Total Promotion Costs<sup>2</sup></i>	\$3,321	\$25,816	\$79,362	\$63,885
<i>Total Capital Costs<sup>3</sup></i>	\$141,270	\$358,624	\$5,355,978	\$1,056,478
<i>Total Labor Costs<sup>4</sup></i>	\$331,840	\$1,519,476	\$5,070,768	\$1,755,965
<i>Awareness<sup>5</sup></i>	21.273	29.25	26.75	25.643
<i>NDTO Use<sup>6</sup></i>	54%	66.67%	50%	60.71%
<i>Risk<sup>7</sup></i>	41.96	54.88	52.93	49.12
<i>Foreign Ag GDP<sup>8</sup></i>	\$76,047,644,386	\$219,696,316,992	\$145,912,317,233	\$147,359,160,111
<i>Export Revenue<sup>9</sup></i>	\$207,142	\$4,118,000	\$47,320,822	\$8,892,066
<i>Exp.Rev./Tot. Rev. Ratio<sup>10</sup></i>	18.15%	31.32%	23.55%	24.81%

<sup>1</sup> Measures total shipping expenses for each firm in 2008.

<sup>2</sup> Measures total export promotion expenses paid by each firm in 2008.

<sup>3</sup> Total capital expenditure, including depreciation, for each firm in 2008.

<sup>4</sup> Total labor compensation and benefits paid by each firm in 2008.

<sup>5</sup> Measures the amount of awareness for export uncertainties for each firm.

<sup>6</sup> Determines whether a firm has used or uses the NDTO.

<sup>7</sup> A risk coefficient measuring the amount of risk each firm is exposed to based on top exporting countries.

<sup>8</sup> An aggregate total of foreign agricultural GDP from each firm's top exporting countries.

<sup>9</sup> Measures each firm's overall revenue from exports in 2008.

<sup>10</sup> Shows the share of total revenue going to export revenue in 2008.

Many of the outcomes from the table are to be expected. Such as larger firms have larger averages. However, there are some surprising results. For instance, the level of awareness about export uncertainties for medium firms was greater in this sample than larger firms suggesting medium firms in the sample are more “aware” of the uncertainties that could affect their exports. This may suggest that medium firms need to be more “aware” to ensure success in foreign markets, and large firms lose awareness over time because they have already established foreign markets. Larger firms may also have designated personnel working with exporting rather than the President, CEO, or office manager of the firm. Foreign agricultural income is also greater for medium firms possibly saying that medium firms export to less developed countries. This is also apparent because the average level of risk is greater for medium firms than larger or smaller firms. Medium firms may be trying to establish trade with developing countries because they have more agricultural income; which results in these firms being more aware due to the greater level of risk that is associated with these less developed countries.

#### **4.2. Correlation Matrix**

Although correlations are not too important when it comes to equation estimation, they do reveal some relationships between variables. However, significant correlations only show similar patterns, and do not reveal any causality within the variables that show correlation.

The dependent variable, the share of export revenue to total revenue, is positively correlated with awareness, total risk, and foreign agricultural income, showing that upward growth in all three variables is correlated with the size of the share in export

revenue at a firm. The positive correlation shows an upward trend between the two variables. This was to be expected with the level of awareness and foreign agricultural income, but being positively correlated with total risk is opposite of what was expected. Assuming risk aversion would create an expectation that the share of export revenue is negatively correlated to the amount of risk a country has.

Next, shipping expenses are positively correlated with the amount capital and labor expenditures a firm had in 2008. In other words, as capital and labor expenditures increased in the sample, the amount of shipping expenses increased as well. This was also true for promotion, but only for 2008 labor expenditures. These positive correlations are not surprising seeing that capital and labor increases usually mean an increase in production, which may constitute a complementary increase in exports, hence the positive correlation with shipping expenses.

Other notable and expected correlations were between firm sizes and other variables. The dummy measuring small firms were negatively correlated with the amount of capital and labor expenditures, which makes sense because smaller firms will have smaller expenses. Also, small firms were negatively correlated with the amount awareness in export uncertainties showing smaller firms have lower awareness of the uncertainties that accompany international trade. However, medium firms showed a significant positive correlation with awareness of export uncertainties revealing a shift in export education as firms become larger.

Finally, and probably the most interesting correlations, are between the use of the NDTO and other variables. For firms that used the NDTO in 2008 there was a positive and significant correlation between the amount of total risk the firm is exposed to and the

amount of foreign agricultural income the firm is exposed to. This shows an upward trend between firms using the NDTO and the level of total risk that is associated with exporting to many countries. The positive correlation with foreign agricultural GDP and the use of the NDTO shows an upward trend between using export promotion services and the amount of foreign agricultural income a firm is exposed to.

### 4.3. Univariate Regression Results

A quick analysis of each independent variable independently regressed on the dependent shows the relationship between the two variables without the other independent variables present. The other independent variables are not included here in Table 4.2 strictly to show how the single independent variable will affect the share of export revenues.

**Table 4.2 Univariate Regression Results**

	<b>Univariate Regression Results</b>		
	<i>Parameter Estimate</i>	<i>Standard Error</i>	<i>Chi-Squared Statistic</i>
Ship	0.0000	0.0000	1.5135
Prom	0.0000	0.0000	0.0046
LnK	-0.0015	0.0153	0.01
LnL	-0.0286	0.0294	0.95
Aware	0.0115	0.0046	6.26**
NDTO	0.2975	0.0606	24.13***
Small	0.1815	0.0968	3.51**
Medium	0.3814	0.0963	17.18**
Risk	0.0040	0.0022	3.36*
LnAg	0.0126	0.0050	6.26**
Small*NDTO	0.2948	0.1610	3.99**
Medium*NDTO	0.3494	0.1105	18.44***
Risk2	0.0000	0.0000	1.9167

Note 1: \*, \*\*, \*\*\* shows significance at the 10, 5, and 1 percent, respectively.

Note 2: Results are rounded to four decimal places.

The results from the univariate regressions in Table 4.2 above, illustrates each relationship based on the linear trend from a single independent variable and the dependent variable. The objective is to find any relationship between the univariate and multivariate results suggesting possible correlations between the independent variables and the dependent variable.

The chi-squared statistic is used in Tobit models because it measures the total effect of the variable, by summing all of the effects from each observation, to generate a statistic to show how much impact the independent variable has on the dependent variable. So, as the chi-squared statistic increases, the more significant the independent variable is on the dependent.

#### **4.4. Multivariate Regression Results**

Certain patterns and correlations can be seen in the data collected from the surveys. First, larger firms are more capital intensive. There is also a relation between the size of the firm and the amount of awareness about export uncertainties the firm has. As firm size increases, the more awareness of possible export uncertainties that was present. Lastly, the amount of total revenue had a modest relation to the amount of export promotion used by the firm. However, this has no relation with the share of export revenue and export promotion.

The final results from the Tobit regression are shown in Table 4.3 below. The significance of the variable is based on the Chi-squared statistic which measures the sum of the contributions from the independent variable. The dependent variable is a ratio, so variables without the natural log function will have an effect on the dependent variable

that is also in this similar decimal format. Variables with the natural log function will show the percentage change effect it has on the dependent in the regression.

**Table 4.3 Final Regression Results**

<u>Parameter</u>	<u>Estimate</u>	<u>Standard Error</u>	<u>Chi-Squared</u>
C	0.9349	0.3797	6.06**
Ship	0.0000	0.0000	0.11
Prom	0.0000	0.0000	0.75
ln K	0.0337	0.0104	10.44**
ln L	-0.1001	0.0236	18.06***
Aware	0.0098	0.0028	11.89***
NDTO	-0.3394	0.1563	4.71**
Small	-0.2722	0.1519	3.21*
Medium	-0.4773	0.1538	3.25*
Risk	-0.1343	0.0308	18.98***
ln Ag GDP	0.1518	0.0347	19.10***
Small*NDTO	0.4171	0.1809	5.32**
Medium*NDTO	0.4048	0.1785	5.14**
Risk2	0.0012	0.0003	20.04***

Note 1: \*, \*\*, \*\*\* shows significance at the 10, 5, and 1 percent, respectively.

Note 2: Results are rounded to four decimal places.

#### **4.4.1. Insignificant Results**

The first result that is insignificant is the amount of shipping costs (Ship) a firm had in 2008. This is not surprising seeing that many firms did not pay shipping costs. The foreign customers of many North Dakota firms were required to pay the shipping costs to get the good to them. The burden of payment was put on the foreign consumer rather than the firm. Also, many value-added firms that were surveyed did not pay the fee for shipping; it was provided by the customer that sold the product to the value-added firm in North Dakota. Given that much of the shipping costs were absorbed by other firms, it is not surprising that the variable is insignificant and does not impact the share of export

revenue. However, it is still a cost to the firm, and is an important aspect of exporting a product so it must be included.

Next, overall promotion expenditures (Prom) do not affect the share of export revenue. These expenditures were quite small as well, making the expected impact small and insignificant. Many of the firms were small and medium sized firms which make it difficult for them to afford export promotion. This is one of the theories behind why state-funded export assistance is vital for establishing markets abroad. Here, the sample is constructed of relatively smaller firms that cannot afford large amounts of firm-funded export promotion, so the insignificance of this variable is not surprising.

#### **4.4.2. Significant Results**

The natural log of labor expenditures (ln L) for 2008 is significant and negative at the one percent level. Previous studies have predicted labor to negatively affect revenues at a firm. Coughlin and Cartwright (1987) theoretically expect labor to have a negative affect because the United States has a comparative disadvantage in the production of goods using a relatively large amount of labor, holding other production inputs constant. Thus, states that have a relatively large amount of labor tend to produce smaller amounts of goods for export. Labor intensive firms have been shown to export less because labor becomes quite costly for firms when trying to increase production and expand abroad. So, as the amount of exporting at a firm increases, the amount of labor expenditures relative to the amount of revenues usually decreases. Here, for every one percent increase in 2008 labor expenditures the share of export revenue decreases by 0.1001 percent. This is a change, holding other revenue sources constant, of about \$141, \$359, and \$5,361 for small, medium, and large firms, respectively.

Capital (ln K) is hypothesized to positively affect the share of export revenues (Coughlin and Cartwright 1987). In other words, as capital expenditures increase, the amount of export revenue relative to total revenue will increase. Here, capital is significant and positive at the five percent level. A one percent increase in capital expenditures, in 2008, increases the share of export revenue by 0.0337 percent. That comes out to an average increase in the share of export revenue, holding other revenue sources constant, of about \$47, \$155, and \$1,805 for a small, medium, and large firm, respectively. Remember, small firms have total revenues from zero to five million dollars, medium firms have total revenues from five million to fifty million dollars, and large firms include firms with total revenues over fifty million dollars.

The amount of awareness about export uncertainties (Aware) is significant at the one percent level on the share of export revenue. This means that the amount of awareness North Dakota firms have about exchange rates, supply and demand uncertainties, foreign price uncertainty, etc. is positively significant in increasing the share of export revenue. For every one point increase (out of a seven point ranking system for each uncertainty measured) in awareness of export uncertainties, the share of export revenue increases by 0.98 percent. On average, the marginal increase on export revenue, holding other revenue sources constant, is about \$2,021, \$40,356, and \$463,744 for small, medium, and large firms, respectively. The result indicates knowledge of uncertainties that accompany exporting will help a firm increase their share of export revenue making them a bigger market player abroad.

The variable measuring firms that use the NDTO turns out to affect the overall share of export revenue in a negative manner. Here, it is significant at the five percent



level, but is negative, showing that firms that use the NDTO have smaller shares of export revenue by an average of about 33.94%, or \$3,017,967. This may account for the smaller firms that use the NDTO which, on average, have smaller ratio by about 6%.

Firm size has also been shown to have a significant impact on the amount of export revenue (Andersson 2007). To capture any effects that can be attributed to firm size, small and medium dummy variables were used. The final regression shows firm size to be significant at the ten percent level. If the observed firm is considered small, given a value of one, then the average share of export revenue will decrease by 27.22 percent. This means that smaller firms, on average, have a smaller share of export revenue by about \$2,420,420 compared to an average larger firm that exports. An average exporting firm in this sample receives 24.33 percent of their total revenue from exports, but small firms from this sample average only 18.15 percent of their total revenue going to exports. For a medium firm, the same holds true as for small firms. If a firm is considered to be a medium sized firm, and given a value of one, then their share of export revenue will be about 27.73 percent lower than a larger firm. So, a medium firm will also have export revenues of about \$2,465,770 less than an average firm that exports. This result from the firm size dummy variables from the regression is supported by the previous literature explaining how small and medium firms will have less export revenue because the main focus for them is the domestic market (Adams et al.1997). Before firms venture into foreign markets they must have a solid foundation within their domestic market to ensure a steady stream of revenue will come into the firm to support foreign market ventures.

Risk is a major factor for a firm to consider when exporting goods. Greater risk results in lower shares of export revenue because firms do not want to risk losing money;

therefore, making firms decide not to export (Balkan 1992). Risk is significant here at the one percent level, and it negatively affects the share of export revenue. A one point increase in the amount of risk a firm is subjected to will decrease the share of export revenue by 13.43 percent. This can be translated into an average decrease in export revenue, holding other revenue sources constant, of \$27,819.17, \$553,047.40, and \$6,355,186.40 for small, medium, and large firms, respectively. Many North Dakota agribusinesses in this sample only ship their exports when payment has been received making risk a very small negative influence. In addition, many North Dakota firms do export to developing economies which increases country risk, but because of the payment-before-shipping method they have adopted, these high risk countries are not a factor explaining why the more risk that is present, the higher the share of export revenue. Ultimately, this says that the more developing countries North Dakota agribusinesses decide to export to, the higher their share of export revenue will be due to risk not being a factor. Perhaps the greater the risk, the more likely the firm will implement a pre-pay, and work with only guaranteed buyers. The risk variable measuring the exponential level of risk is also significant at the one percent level. The result is a positive increase of 0.12 percent in the share of export revenue when the level of squared risk is increased by one. The result is an increase of \$248, \$4942, and \$56,785 for small, medium, and large firms, respectively. This particular variable shows when risk increases to such a high level, it actually effects the share of export revenue in a positive manner. Moreover, it says that risk eventually levels off and plateaus showing when a firm exports to risky countries, the reward of revenue is higher than the risk of failure.

The amount of foreign agricultural gross domestic product (In Ag GDP) measures the foreign firms buying power and its affect on the share of export revenue at North Dakota agribusinesses. Affirmative to the theory of more available income leads to buying more goods from a firm (Onunkwo and Epperson 2000), this variable turns out to be significant and positive at the one percent level. A one percent increase in foreign agricultural GDP yields a 0.1518 percent increase in the share of export revenue. The average foreign agricultural GDP for small, medium, and large firms are about \$76 billion, \$219.7 billion, and \$146 billion, respectively. So, an increase of one percent in these totals would result in an increase in the share of export revenue, holding other revenue sources constant, by \$314, \$6,251, and \$71,833 for small, medium, and large firms, respectively. This result shows the more developed a country becomes, then the greater the amount of goods they will purchase from North Dakota agribusinesses. The result from this variable may reinforce the result from the variable measuring risk. Remember, the results indicated that an increase in risk will decrease export revenue, holding total revenue constant. More developed countries are less risky, so higher risk countries with less foreign agricultural income will purchase less goods from North Dakota agribusinesses than countries that have relatively high agricultural GDP and that are less risky.

The set of interaction terms introduced into the model takes the small firms that use the NDTO (Small\*NDTO) and regresses them on the dependent variable to show the effect from this certain firm. Export promotion has indicated to work better for smaller and medium sized firms when trying to increase the amount exported increasing the overall share of export revenue. Both interaction terms were indicated to be significant at

the five percent level. The small firms that use the NDTO show that when this is the case their share of export revenue is increased by about 7.77% (\$16,094), relative to small firms that do not use the NDTO. Moreover, the variable measuring medium firms that use the NDTO (Medium\*NDTO) is also positive, by almost 15 percent more than medium firms that simply export without using export promotion services. If a medium firm exports, using the NDTO, their share of export revenue is about 6.54 percent greater than a medium firm that does not use the services of the NDTO. This is an average increase of about \$269,317, holding other revenue sources constant. Although the affect is less for medium firms in percentage terms, the change in export revenue is substantially more, revealing medium firms are more justified than smaller firms in paying the fee and using the NDTO simply because each firm, large or small, pays the same fee.

Large firms are the only firms that do not benefit from using the NDTO, according to the sample. Large firms using the NDTO have a lesser share of export revenue of about 33.94%. Perhaps, large firms are already well established in export markets and do not need to use the NDTO. However, 50% of large firms in the sample admitted to using the NDTO, so these large firms may have a smaller share of export revenue because they are trying to become major exporters.

#### **4.5. Managerial Implications**

Managers running an agribusiness company have many obstacles to overcome when trying to increase exports. There must be a demand to justify the firm's attempt at increasing production to supply the foreign customers with what they demand from North Dakota companies. Once a firm decides to try and export more, they have many areas that need to be changed within the firm to adjust for the increase in the amount of goods

that are needed to be supplied. Many aspects contribute to these obstacles and it was the objective of this research to try and show the effect of some of these.

Many aspects of supplying goods to foreign customers exists that decrease the revenue companies receive from exports. First, labor intensive firms have a comparative disadvantage of production due to the high cost of labor, relative to the output achieved. As the amount of labor increases for a firm, the amount of revenue from exports will decrease. The reason for this decrease is from the high marginal cost associated with labor as an input for production. Labor increases the marginal cost per good in production making the amount of revenue received from the goods lower than if labor was not used in production.

Next, the amount of risk a North Dakota firm subjects itself to will have a negative impact on the amount of export revenue relative to total revenue at the firm. When a firm is exporting, or decides to export, risk can be a large determinant to how the firm chooses to export. There is a risk of credit default, supply and demand shocks, uncertainty in pricing, and competition uncertainty. The coefficient is quite large showing that even a small increase in the amount of risk will decrease a firm's share of export revenue. It is an aspect of exporting that managers of a firm would have to take into consideration when choosing to export, or export more of their goods abroad.

Finally, if a manager plans on becoming a major player in foreign markets the main issue is increasing the firm size overall. As seen above, small and medium firms have a significantly smaller amount of export revenue than larger firms. So, if a firm manager is expected to increase foreign market share and foreign revenue, then the main aspect is to increase the size of the firm overall. Larger firms have more capital and

market power to assist them in foreign relations and obtaining information about new markets; therefore, making their transition to, or expansion of, the foreign market easier than for a smaller firm.

Capital, as an input of production, is a significant variable to increase the share of export revenue. Labor, as described earlier, can be a very expensive input of production when production needs to increase substantially. Capital is marginally cheaper than labor, making it a “great production” input to increase the amount of goods sold abroad in a short period of time. Managers of a firm could invest in capital inputs, increasing production at a lower marginal cost than labor increasing the firm’s overall revenue.

If increasing production is not a viable option for a firm, then the firm could increase their awareness as to how to export more successfully. The analysis shows that the level of awareness about export uncertainties has a significant impact on the share of export revenue. A manager and their staff that understands more of the complexities when exporting will have a larger share of export revenue than a firm that does not. One way to increase export revenue, besides increasing demand and production, could be to increase the awareness of certain export uncertainties that could decrease the amount of export revenue possible. This may result in changes in pricing, policies, contracts, quality of their goods, and other aspects that affect the firm’s export market.

Finally, small and medium firms were shown to be significantly impacted in a positive manner when using the NDTO for export promotion. Managers at firms could very easily take advantage of the NDTO services and increase export revenue by simply using the NDTO and following their steps in successful export promotion. The NDTO provides marketing, counseling, trade leads, trade missions, etc. to broaden the firm’s

reach into foreign markets and introduce them to possible customers that the firm may not even know existed. All of this is provided at a flat-rate fee and the firm only needs to participate in the services to reap the benefits of the state-funded agency. This is an easy and inexpensive way for a firm to increase their share of export revenue and become a larger exporter in the state of North Dakota. The main question is whether using the NDTO is justified, or does the benefit outweigh the cost? In the case of the small and medium North Dakota firms it seems the gains in export revenue compared to the cost of using the NDTO in 2008 does in fact justify the use of the NDTO export assistance services. Small firms gained an average of \$16,000 and medium firms about \$270,000, holding other revenue sources constant. Based on these findings, small and medium firms should use the NDTO for export promotion.

Breaking down the per dollar gains from using the NDTO is a useful tool in showing how effective the export promotion services are for North Dakota agribusinesses. For firms, the 2008 investment of \$2,500 to cover the yearly fee for using the NDTO can easily be broken down into per dollar returns. For small firms, one dollar invested in the NDTO yielded a \$6.44 increase in export revenue, holding other revenue sources constant. Medium firms, however, saw a larger effect due to the relative capacity they are able to produce and export. For every one dollar invested in the NDTO, the medium firm saw a \$107.73 increase in export revenue, holding other revenue sources constant. The return on investment makes it quite rational for small and medium firms in North Dakota to invest in the NDTO for export promotion services.

## CHAPTER 5. CONCLUSION

Export promotion is still a very new subject for many firms today. Many previous studies including Coughlin and Cartwright (1987) have emphasized the need for research in this area to try and develop arguments either for or against its use. The main use for export promotion is to get the name of the firm to foreign customers otherwise not familiar with the product or service. In the past, much of export promotion was provided by state government export offices and federal agencies. However, there has been an increase in state-funded agencies providing firms with export promotion services and firm-level export promotion paid primarily by the firm themselves. Today, export promotion is undertaken by every level of firm size and is believed to increase a firm's exports because it reaches foreign consumers that otherwise had no idea such products were available. Although the empirical research on export promotion is scarce, there have been attempts to try and quantify what export promotion does for a firm and whether it is significant in helping firms' increase export revenue. The objective of this research was to try and show if export promotion was effective for North Dakota agribusiness firms in 2008, and whether using a state-funded agency can affect a firm's share of export revenues.

### 5.1. Overview

Results from our regression analysis were supported by results found in previous research, some of which are explained in the literature review. Labor was found to have a negative impact on export revenue because it is expensive to provide more labor to increase a firm's exports. On the other hand, capital was found to have a positive effect on the share of export revenue. Foreign agricultural income (buying power) was



positively significant showing how important the level of income abroad is to a firm's level of export revenues. The greater the foreign income abroad increases the share of export revenue. Onunkwo and Epperson (2000) also found a foreign income measurement of their own to be statistically significant and positive on export revenue. The size of the firm is significant in determining the level of export revenues. Also shown by Adams et al. (1997) small and medium firms are negatively related to the size of the share of export revenues compared to a large firm. Moreover, large firms have larger shares of export revenues than small and medium firms because they export more and make exporting a major portion of business. Previous literature by Francis and Collins-Dodd (2004) found this to be significant, also, saying that smaller firms are more focused on domestic prosperity before turning attention to foreign customers. Country risk was shown to have a negative significant impact on North Dakota agribusiness firms. However, when risk reaches exponential levels, firms actually benefit. The share of export promotion expenditures by firms' is not significant on the share of export revenues. A North Dakota agribusiness firm that invests in export promotion does not succeed at increasing their share of export revenues. Although promotion expenditures were seen in Coughlin and Cartwright (1987), Onunkwo and Epperson (2000), and Le et al. (1998) to be significant, it may not be the case here because of the presence of the North Dakota Trade Office (NDTO) in North Dakota. The dummy measuring large firms that have used the NDTO, the partially funded state export promotion agency, actually affected the share of export revenues in a negative sense saying that a firm that uses the NDTO will have a smaller share of export revenue than a firm that does not use the NDTO. Either the NDTO does harm to firms exporting, which seems unlikely, or the

effects have not yet been felt by the firms using the NDTO. Moreover, the sample size of large firms may have been too small to accurately measure the NDTO effect. However, the cross term between NDTO use and firm size show interesting results. Small and medium firms that use the NDTO are affected in a positive manner. Their share of export revenues is larger than small, medium, and large firms not using the NDTO. Wilkinson and Brouthers (2000), Richards et al. (1997), and Gençtürk and Kotabe (2001) also found state-sponsored export promotion to be positive and significant in affecting export revenue for firms in Ohio reinforcing the empirical evidence supporting the argument for such programs.

## **5.2. Research Shortcomings**

The main shortcoming that accompanies this type of research analysis is conducting strong statistical relevance of such programs that promote firms' products abroad. The question that arises asks is the benefit from export promotion services or firm growth? Past research has seen this type of problem, and this research is not immune. By satisfying these aspects it took time and effort away from collecting intimate data from each firm about the programs and services they used through the NDTO and through the export promotion the firm purchased. On top of the time constraint, firms that use or used state-sponsored agencies were allowed to use any service for a flat-rate fee meaning, every firm pays the same amount to use any, or all, of the services offered at the NDTO. This makes it very difficult for the firm to really measure how effective a service is and to what extent it worked because the flat-rate fee exposes the firm to every service causing a blending in quality across services.

Another shortcoming of this research is the sample size collected. North Dakota is not a large state with a large supply of exports leaving. Even though agribusiness is a large sector in North Dakota there are many firms that have not yet marketed overseas, so the number of exporting agribusinesses is smaller than preferred. A state-funded research project relating to this research may find different results due to a better response rate. However, the companies that did respond, although nameless, are leaders of the state within the agribusiness sector. In the end, the greater the response rate means the greater the sample size resulting in a fairer analysis of the sector.

Finally, an arguable problem with this research is the use of telephone surveys to collect the data needed. It can be argued that telephone surveys are not intimate enough and do not provide enough time to find the concrete data from each firm. Even though each survey was conducted with the chief executive officer, chief financial officer, lead accountant, or office manager using their 2008 financial statement there may be some misinterpretations of the questions asked over the phone causing skewed results from the data. This is a problem in many forms of research to date, and may exist here as well.

### **5.3. Future Research**

The possibilities for this type of analysis are still abundant. This is a relatively new concept of research for many states, and the advantages are still not yet fully understood. States alike can benefit from knowing how these state sponsored export promotion agencies affect firm output and overall export revenue. The same goes for firms investing in firm-funded export promotion. The benefits and costs must be known before they are weighed to see if the expense is worth the effort.

Future research could focus on how each service of the NDTO affects the share of export revenue. This involves putting a value to each service in order to show how the share of export revenue is affected by each service, instead of simply using the agency. Although finding the overall effect of using the agency is not without worth, finding out how impactful each service can be will show which service should be implemented more than others. Research such as this gives firms an intensive look at how their funds can be used correctly making export promotion more efficient which can lower costs and increase returns.

Another aspect open to future research can hinge upon a state-wide data collection in which every firm is asked by state-sponsored researchers to participate and provide data which, in the end, may allow for more precise results and better knowledge of the effect of export promotion on North Dakota agribusinesses. Research like this can become quite beneficial in this sector because North Dakota hinges on the fact that agribusiness is such a successful sector in today's economy. If export promotion can be empirically proven to benefit this sector, then it is nothing but in the state's best interest to find out if there can be more revenues to reap from certain export promotion services.

Finally, not only can future research increase the preciseness of results, but it can also expand the results from the effects of export promotion use. Agribusiness is not the only sector in North Dakota, but there is medical, aviation, and other manufacturing goods produced in the state. An area of future research would expand this analysis of export promotion in North Dakota to every sector to show how firms in every sector may benefit from export promotion services. If export promotion is effective at the macro level, then North Dakota and firms within the state are justified to spend accordingly. The

research presented here is an account of one sector of industry within the state, and an important aspect to look at is how the state can benefit as a whole by providing export promotion to every type of business within the state.

Identifying future research is not identifying flaws or holes within the present research. However, it does identify ways to expand this research to areas that will only make the topic stronger. Each research area brings a topic like export promotion closer to understanding the total benefits of such a adolescent revenue generating tool. These areas of future research were not explored within this research, but leave room for further growth within the topic of export promotion. Intimate knowledge of this topic can benefit firms and states alike by reaping the benefits of reaching new markets and capturing larger shares of many markets.

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## APPENDIX A. SURVEY INSTRUMENT

*The survey used to gather company data for the purpose of this research*

### **Company Data**

- 1) Title of the person filling out the survey?  
\_\_\_\_\_
- 2) What were the company's total revenues last fiscal year?  
\_\_\_\_\_
- 3) What were the company's total export revenues last fiscal year?  
\_\_\_\_\_
- 4) Total company expenses last fiscal year?  
\_\_\_\_\_
- 5) What was your percentage of total expenses spent on exports last fiscal year?
  - a) 0 – 10%
  - b) 10 – 20%
  - c) 20 – 30%
  - d) 30 – 40%
  - e) 40 – 50%
  - e) > 50%
- 6) Total percentage of export expenses going to shipping/transport costs associated with company exports last fiscal year?
  - a) 0 – 10%
  - b) 10 – 20%
  - c) 20 – 30%
  - d) 30 – 40%
  - e) 40 – 50%
  - e) > 50%
- 7) Total percentage of export expenses going to export promotion (advertising, client meetings, trade shows, trade missions, etc...)?
  - a) 0 – 10%
  - b) 10 – 20%
  - c) 20 – 30%
  - d) 30 – 40%
  - e) 40 – 50%
  - e) > 50%
- 8) Total property plant and equipment expenses last fiscal year?  
\_\_\_\_\_
- 9) Number of employees at the company? \_\_\_\_\_
- 10) Total salaries and benefits costs last fiscal year? \_\_\_\_\_

11) The company uses, or has used, the North Dakota Trade Office (NDTO) export promotion services?

a) Yes

b) No

12) What top 3 countries or regions do you currently export to?

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**Export Uncertainty**

<i>Rank the level of awareness at which the company exports</i>	None			Some		Large	
	0	1	2	3	4	5	6
1) Awareness of average exchange rate last year previous and years?	( )	( )	( )	( )	( )	( )	( )
2) Awareness of how unforeseen changes in demand for exports can affect your company	( )	( )	( )	( )	( )	( )	( )
3) Awareness about how unforeseen changes in buying power in other countries, affects the demand for exports from your company?	( )	( )	( )	( )	( )	( )	( )
4) Awareness of the impact of competition on the pricing of goods in foreign countries?	( )	( )	( )	( )	( )	( )	( )
5) Awareness of unforeseen changes in trade barriers (tariffs, quotas, policies...)?	( )	( )	( )	( )	( )	( )	( )
6) Awareness regarding the probability of credit defaults due to political and/or country risk and uncertainty?	( )	( )	( )	( )	( )	( )	( )
7) Awareness of how unforeseen changes in foreign supply for your products can affect your company?	( )	( )	( )	( )	( )	( )	( )

## APPENDIX B. CORRELATION MATRIX

**Table 4.7 Correlation matrix of the variables**

<b>Correlation Matrix</b>						
	Ratio	Ship	Prom	LnK	LnL	
Ratio	1.0000	0.2265	0.0128	-0.0184	-0.1809	
Ship	0.2265	1.0000	-0.0304	0.3233*	0.3612*	
Prom	0.0128	-0.0304	1.0000	0.20480	0.4108*	
LnK	-0.0184	0.3233*	0.2048	1.0000	0.6428***	
LnL	-0.1809	0.3612*	0.4108**	0.6428***	-0.0355	
NDTO	0.2630	-0.2692	0.2232	-0.1459	0.0051	
Aware	0.4273**	0.0538	0.1281	-0.0978	0.0941	
Small	-0.2295**	-0.1958	0.2036	-0.4668**	-0.5734**	
Medium	0.24016	-0.1958	0.2036	0.1597	0.1872	
Risk	0.3274	-0.01814	-0.0051	0.2046	0.2365	
LnAg	0.4274**	0.09136	0.1009	0.0926	0.1568	

<b>Correlation Matrix (cont'd)</b>						
	NDTO	Aware	Small	Medium	Risk	LnAg
Ratio	0.2630	0.4273**	-0.2295	0.24016	0.3274	0.4274**
Ship	-0.2692	0.0538	-0.2034	-0.1958	-0.0181	0.0914
Prom	0.2232	0.1280	-0.2292	0.2036	-0.0051	0.1009
LnK	-0.1459	-0.09778	-0.4668**	0.1597	0.2046	0.0926
LnL	0.0051	0.0941	-0.5754**	0.1872	0.2365	0.1568
NDTO	1.0000	0.1442	-0.1016	0.1623	0.3226*	0.4510**
Aware	0.1442	1.0000	-0.4061**	0.3610*	0.1528	0.1677
Small	-0.1016	-0.4067**	1.0000	-0.7489***	-0.3043	-0.2184
Medium	0.1623	0.3610*	-0.7489***	1.0000	0.2404	0.1076
Risk	0.3226*	0.1528	-0.3043	0.2404	1.0000	0.8926***
LnAg	0.4510**	0.1677	-0.2184	0.1076	0.8926***	1.0000

Note 1: \*, \*\*, \*\*\* shows significance at the 10, 5, and 1 percent, respectively.

Note 2: Figures rounded to the fourth decimal place.

## APPENDIX C. SAS PROGRAMMING FOR TOBIT MODEL

### *SAS Procedure for running Tobit regression*

```

PROC IMPORT OUT= WORK.exporters5
            DATAFILE= "E:\THESIS\Survey Data\Excel Spreadsheets
3\export
ers5.xls"
            DBMS=EXCEL REPLACE;
            RANGE="Sheet1$";
            GETNAMES=YES;
            MIXED=YES;
            SCANTEXT=YES;
            USEDATE=YES;
            SCANTIME=YES;
RUN;
proc print data=exporter5;
title 'exporters5';
var Ratio ship prom LnK LnL Aware NDTO Small Medium Risk LnAg
Small*NDTO Medium*NDTO Risk2;
run;
proc lifereg;
model Ratio = ship prom LnK LnL Aware NDTO Small Medium Risk LnAg
Small*NDTO Medium*NDTO Risk2/d=normal covb itprint;
run;
proc reg data=exporters5;
model NDTO = prom;
run;
proc reg data=exporters5;
model Ratio = ship prom LnK LnL NDTO Aware Small Medium Risk LnAg;
run;
proc lifereg;
model Ratio = ship/d=normal covb itprint;
run;
proc lifereg;
model Ratio = prom/d=normal covb itprint;
run;
proc lifereg;
model Ratio = LnK/d=normal covb itprint;
run;
proc lifereg;
model Ratio = LnL/d=normal covb itprint;
run;
proc lifereg;
model Ratio = NDTO/d=normal covb itprint noint;
run;
proc lifereg;
model Ratio = Aware/d=normal covb itprint;
run;
proc lifereg;
model Ratio = Small/d=normal covb itprint noint;
run;
proc lifereg;
model Ratio = Medium/d=normal covb itprint noint;
run;
proc lifereg;

```

```
model Ratio = Risk/d=normal covb itprint;
run;
proc lifereg;
model Ratio = LnAg/d=normal covb itprint;
run;
proc lifereg;
model Ratio = Small*NDTO/d=normal covb itprint noint;
run;
proc lifereg;
model Ratio = Medium*NDTO/d=normal covb itprint noint;
run;
proc lifereg;
model Ratio = Risk2/d=normal covb itprint;
run;
```



## APPENDIX D. SAS PROGRAMMING FOR DESCRIPTIVE STATISTICS

### *SAS procedure for running descriptive statistics*

```
proc corr;
var Ratio ship prom LnK LnL NDTO Aware Small Medium Risk LnAg;
run;
proc univariate;
var Ratio ship prom LnK LnL NDTO Aware Small Medium Risk LnAg;
run;
proc chart;
hbar Ratio/levels=20;
run;
proc plot;
plot (Ratio)*(ship);
run;
proc chart;
hbar ship/levels=20;
run;
proc plot;
plot (Ratio)*(prom);
run;
proc chart;
hbar prom/levels=20;
run;
proc plot;
plot (Ratio)*(LnK);
run;
proc chart;
hbar LnK/levels=20;
run;
proc plot;
plot (Ratio)*(LnL);
run;
proc chart;
hbar LnL/levels=20;
run;
proc plot;
plot (Ratio)*(NDTO);
run;
proc chart;
hbar NDTO/levels=20;
run;
proc plot;
plot (Ratio)*(Aware);
run;
proc chart;
hbar Aware/levels=20;
run;
proc plot;
plot (Ratio)*(Small);
run;
proc chart;
hbar Small/levels=20;
run;
proc plot;
plot (Ratio)*(Medium);
```

```
run;
proc chart;
hbar Medium/levels=20;
run;
proc plot;
plot (Ratio)*(Risk);
run;
proc chart;
hbar Risk/levels=20;
run;
proc plot;
plot (Ratio)*(LnAg);
run;
proc chart;
hbar LnAg/levels=20;
run;
proc plot;
plot (Ratio)*(Risk2);
run;
proc chart;
hbar Risk2/levels=20;
run;
```