

Location, Firm Size and International Trade: Simultaneous Measurement of the Effects of Internal and External Scale Economies on Exporting

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Clemson University Center for International Trade Working Paper 0030115

Abstract

This study examines, simultaneously, the effects of internal and external scale economies upon export decisions. Combining previous results of exporting studies with the predictions of advances in trade theory and economic geography, this study finds that large firms are more likely to export than small firms, urban firms are more likely to export than rural firms, and firms in geographically concentrated industries are more likely to export than those in dispersed industries.

This project was funded in part by the United States Department of Agriculture's Hatch Act (SC-1100572) and was supported by the offices of the Clemson University Center for International Trade, the South Carolina Department of Commerce and the South Carolina State Ports Authority.

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INTRODUCTION

The purpose of this paper is to examine, simultaneously, the effects of internal and external scale economies on U.S. manufacturers' decisions to export. Scale economies are reductions in unit costs that result from an increased scale of operation. Internal (or production) scale economies result from increases in plant size or improvements in process because of increases in scale of production, while external scale economies are increasing benefits accrued by a firm because of its location in a metropolitan area, or near other firms in the same industry (Berry, Conkling and Ray, 1997). While internal production scale economies are a cornerstone of business globalization practice (c.f., Levitt, 1983), to date little international business research has focused on the interaction of firm size and location on the decision to export. Most of the business export literature dealing with scale economies has focused on the internal conditions necessary for export success, but not on the choice to export. Even less research exists in the area of international business on the effects of external scale economies on export decisions.

Recent research on firm size and exporting indicates that large firms are more likely to export than small ones (Mittelstaedt, Harben and Ward, 2003). We also know that the export decision process is different for large firms than it is for small firms, since the advantages, disadvantages and options for international trade differ for large and small firms (Pope, 2002; Wolff and Pett, 2000). In the new trade theory that parallels the new economic geography literature, external scale economies and their effect on patterns

of international trade have been considered. However, these advances largely have been theoretical, and generally their implications are for nations rather than firms.

To date, no study in international business or economic geography has evaluated simultaneously the effects of internal and external scale economies on export decisions. By examining the decision to export of 2,777 firms, across 87 industries, this paper calculates the effects of firm size, urbanization and industrial concentration on decisions to export. Results indicate that external economies of scale affect export choices of manufacturers, and that the effects of external scale economies vary by firm size.

The format of this paper is as follows. Initially, the relationship between firm size and the benefits of exporting are explored. Second, the renaissance in economic geography is discussed, along with its consequences for export decisions. Two models are developed to measure, simultaneously, the effects of internal (size) and external (geography) scale economies on export decision making. Results are reported, and conclusions are drawn concerning the effects of firm size and location on exporting. Finally, limitations and directions for future research are addressed.

FIRM SIZE, LOCATION, CONCENTRATION AND THE BENEFITS OF EXPORTING

Firm Size and Scale Economies of Production

Traditionally, scale economies of production have been represented by the size of the firm, including employment. Though industries vary in terms of labor and capital intensity, within any industry larger firms are assumed to benefit more from production scale economies than smaller ones. Most research on firm size and exporting has focused on the relationship between firm size and export success. Much attention has been

devoted to factors that distinguish successful exporters from unsuccessful ones (c.f., Bijmilt and Zwart, 1994; Leonidou, Katsikeas and Samiee, 2001; Moini, 1995; Ogbuhi and Longfellow, 1994; Wolff and Pett, 2000). In most of these studies firm size is treated as a contributing variable. “Success” is usually defined in terms of export performance or export intensity. Results of these studies are mixed. Some studies find no relationship between firm size and export success (Bilkey and Tesar, 1997; Bonaccorsi, 1992; Cavusgil, 1982; Czinkota and Johnson, 1983; Diamantopoulos and Inglis, 1988; Holzmuller and Kasper, 1991; Moini, 1995; Moon and Lee, 1990). Others have found a positive relationship between firm size and export success (Abdel-Malik, 1974; Christensen, De Rocha and Gertner, 1987; Kaynak and Kothari, 1984; Lall and Kumar, 1981; Reid, 1982; Tookey, 1964), while still others have found an inverse relationship (Cooper and Kleinschmidt, 1985). This literature deals with export performance among those that have made the choice to export, but does not examine the effects of these factors on the choice to export.

Little research, has been devoted to the question of why firms choose to export. That which does exist compares small exporters to large firms, or exporters to non-exporters. Cavusgil (1976) proposed that a lower bound exists below which it is inefficient for firms to export. Mittelstaedt, Harben and Ward (2003) identified that lower boundary as approximately 20 employees. Additionally, they found that firms with fewer than 20 employees exported at a rate of less than one in five, while firms with more than 500 employees export at a rate of more than three in four.

Recent studies have examined the decision processes of small firms who export, comparing them to larger firms in similar industries. Wolff and Pett (2000) concluded

that the decision process to export for small firms is dissimilar to that of large firms. Most recently, Pope (2002) asked large and small firms why they export. Small firms identified unique competencies as their reason to export, while large firms indicated scale economies as important to their export decision process.

Finally, some research finds that firm size plays a role in the process firms follow to become exporters. A variety of models (Bilkey and Tesar, 1977; Cavusgil, 1982; Crick, 1995; Czinkota, 1982; Moini, 1995; Moon and Lee, 1990; Rao and Naidu, 1992) have emerged in the international and small business literatures addressing the issue of firm size and the exporting process, each adding descriptive insight into the process by which firms evolve into exporters. The results of this research suggest that large firms move through the process more quickly than small firms, that large firms are better at identifying export opportunities, have more resources to devote to the export process, and are more successful in achieving advanced states of exporting than are their smaller counterparts.

Firm Size and Exporting

From this literature we can conclude that firm size is a necessary, as well as sufficient, condition for both the choice to export and export success. Large firms appear to be more likely to choose exporting as an option, and more successful at managing the export process. Further, large firms are more likely to pursue exporting to find sufficient demand for their proportionally larger output. Thus, whether because of opportunity or necessity, larger firms are more likely to export than smaller firms:

H₁: As the size of a firm increases, so does the likelihood that it will export.

Location, Proximity and the Benefits of Exporting

Until the middle of the 20th Century, geography and its effects on the location of factors of production was an important question in economic thought. In the latter half of 1900's, however, economic geography fell out of fashion among economists, followed by business scientists generally. This is striking, given the historic relationship between geography and economic development (Diamond, 1997; Landes, 1998; 2000). We know, for example, at the macroeconomic level 50% of the world's gross domestic product is produced by 15% of the world's population, occupying just 10% of the world's land area (Henderson, Shalizi and Venables, 2001). At the level of the firm we know that in the United States a higher proportion of urban firms export than rural firms, and that more export firms are urban than rural (Ward, 2000).

Still, until the last 10 years, most economists themselves have tended to ignore questions of geography, trade and economic development. The effects of geography on industrial organization, patterns of trade and economic development were set aside when the mathematics of economics could not deal with them easily. However, because of advances in economic modeling it is now increasingly possible to derive the effects of economic geography on the organization of production and trade. Building from Dixit and Stiglitz's (1977) model of monopolistic competition and optimum product diversity, Fujita, Krugman and Venables (1997) have developed a coherent theory of spatial economics, examining the centripetal and centrifugal effects of location, in the presence and absence of internal economies of scale. From this they have put forward a set of propositions concerning industrial organization and international trade. Their work, however, is largely theoretical. Our interest here is to understand the possible effects of

internal and external scale economies on decisions of firms to export, and to measure empirically their simultaneous effects on export decisions of manufacturers.

Urbanization and Exporting

Urban areas possess advantages for firms, external to their own means of production, from which they can derive increasing returns. When urbanization scale economies are present, a “circular causation” (Myrdal, 1957) or “positive feedback” (Arthur 1990) develops: manufacturers concentrate where there is a large market, and in turn markets develop where manufacturing is concentrated. This urbanization effect need not be specific to a particular industry. Indeed, these external scale economies result from breadth of production capacities, rather than depth within a specific industry (Berry, Conkling and Ray, 1997).

All else being equal, urbanization is an external economy of scale that can reduce the cost of doing business. Urbanization reduces the cost of inputs, since the transportation costs of delivering inputs from firms in the same city are low. Urban areas attract well-educated workers, who believe that their chances of being continuously employed are higher than in rural areas, and where more productive workers can command higher wages for their efforts. Further, cities offer a wider range of business services (accounting, legal, consulting, etc.) than found in rural areas, and these services improve the likelihood that other businesses will survive and succeed. As efficiency increases, firms are more likely to expand their markets, and engage in export activities. Thus,

H₂: The more urban the location of a firm, the greater the likelihood that it will export.

Industrial Concentration and Exporting

In addition to these advantages of urbanization, the “new” economic geography is concerned with localization of specific industries. In and of itself, this argument is not new; Marshall (1920) himself discussed the advantages for firms in an industry locating close to one another.

Several types of external economies are gained when firms in an industry cluster together (Berry, Conkling and Ray, 1997). In the presence of external, localization economies of scale, the clustering of firms creates stable markets for specialized labor to the benefit of firms (e.g., software engineers in Silicon Valley, or reed makers in Elkhart, Indiana), and the development of supporting industries that supply unique services at rates lower than firms could provide for themselves (e.g., bottle makers in Burgundy, or tanners in Florence). Firms benefit, as well, from knowledge spillovers, as firms observe and copy (or steal) the best practices of others in their industry (e.g., weaving techniques in Dalton, Georgia). Because of these factors, regional reputations develop (e.g., Venetian glass, Bordeaux wine, Swiss watches), so products carry with them an aura of quality, deserved or not. As well, firms become more efficient, and thus better able to compete in foreign markets. Finally, the drive to be competitive domestically may induce firms to export, hoping to gain a competitive advantage in their home market (c.f., Porter, 1990).

These production clusters affect the competitiveness of those firms located away from the cluster, as well as those within the geographic proximity, for local efficiencies set the standard of competition in an industry, regardless of firm location. At the national level, these localization effects are what Porter (1990) describes as the competitive

advantages of nations. In this context, advantages are seen as absolute and increasing, rather than comparative and constant.

Because of better inputs, intense rivalry and higher standards of production, regions or nations benefit from the ability to set global standards for competition. While plausible in theory, research findings linking industrial concentration is limited and lacks conclusive findings (Zhao and Zou, 2002). Some have found a positive relationship between industrial concentration and exporting (Geroski, 1982; Glejser, Jacquemin and Petit, 1980), while others have found the opposite (Koo and Martin, 1984). In the most rigorous study to date, Zhao and Zuo (2002) found a negative relationship between industrial concentration and propensity to export in China. They point out, however, that the most concentrated industries in China are state-owned monopolies, with little or no incentive to pursue export opportunities. They suggest that the opposite is likely true in competitive, market economies. Thus,

H₃: The more concentrated an industry, the higher the likelihood that a firm in that industry will export.

Centripetal and Centrifugal Forces, and Firm Size Effects

These two forms of external economies of scale, and their relationship to the geography of economics, are important to the interplay between two competing, but opposite forces of geography on markets. In any market, there is a *centripetal* force that tends to pull production and people into agglomerations. This centripetal force stems from the external economies of localization and urbanization, from the backward linkages of market demand, and the forward linkages of related and supporting industries.

Conversely, there is a *Centrifugal* force that tends to tear apart concentrations of industry and population. This centrifugal force stems from the diseconomies of congestion and pollution, high land prices or rents, and the high cost of competitive wages. Because external scale economies are centripetal by nature, in their absence the advantages of production dispersion outweigh the advantages of agglomeration. Why pay high rents and wages if you don't have to? In the presence of external scale economies, the picture is more complex.

Do the effects of centripetal and centrifugal forces on export decisions differ for large and small firms? In all likelihood, yes. Large firms have the capacity to internalize many of the advantages of agglomeration (labor talent, access to markets, business services), while smaller firms do not. As a consequence, scale economies that may be external to small firms are likely internal scale economies for large firms. Thus, while smaller firms are willing to endure the diseconomies of urbanization to gain otherwise unavailable external scale economies, large firms are able to shield themselves from the diseconomies of agglomeration by internalizing external scale economies. This, in part, explains why the location decision processes of large and small firms differ (Wolf and Pett, 2000). Hence, while urbanization effects may be important for smaller firms, they should play a weaker role in export decisions for larger firms.

H₄: Urbanization scale economies are more important for smaller firms than for larger firms, in terms of export decision making.

Finally, like the effects of urbanization, localization may be more important for smaller firms than for larger ones. Because large firms hire many people, they lead (rather than follow) the formation of specialized labor markets (e.g., Microsoft in

Seattle). Additionally, they may actually incur harm from knowledge spillovers, since they are more likely to be the ones “spilling.” Large firms benefit from knowledge spillovers by acquiring firms, not individual laborers. As in the case of urbanization economies, small firms rely on the external scale economies of localization, while large firms internalize these scale economies as competitive advantages without having to either locate in urban areas or near like firms, so,

H₅: Localization scale economies are more important for smaller firms than larger ones, in terms of export decision making.

The hypotheses are summarized in Table One.

Insert Table One about here

MEASURING THE EFFECTS OF SCALE ECONOMICS ON TRADE

The purpose of this study was to measure, simultaneously, the effects of internal and external scale economies on export decisions of manufacturing firms. Manufacturing firms in South Carolina were used to test internal and external scale economy effects. In this section, we describe the data used in this research, the operationalization of important variables, and the models developed to test the hypotheses.

The Data

Manufacturing firms in South Carolina were used to test internal and external scale economy effects. To examine these effects, data were collected from three sources. Export decisions were reported in the data set provided by the South Carolina Department of Commerce (2000). Along with information on size, location and product

line (categorized by Standard Industrial Classification (SIC) numbers), firms indicated whether or not they engaged in export. This latter variable of interest is dichotomous, and so a logistic regression analysis was used to assess the impact of independent variables on this choice. Of the 4,516 manufacturing firms identified by the Census Bureau in 1999 (U.S. Bureau of the Census, 2001a), 3,997 (88.51%) are listed in the data set. Records were excluded for those industries where means of production are tied to the land, and thus immobile. These industries include agriculture, forestry and mineral extraction. Complete records on 2,777 (61.56%) manufacturing firms existed for their inclusion in this analysis. Firms included in the Directory are self-described exporters (or non-exporters). Since this is an internally imposed designation, these firms are assumed to be in more advanced stages of the exporting process (Leonidou and Katsikeas, 1996).

Variable Operationalization

Firm size was used as an indicator of internal scale economies. Firm size was operationalized as the number of employees (South Carolina Department of Commerce, 2000). While labor intensity varies from industry to industry, larger numbers of employees indicate larger scale operations, within any given industry (differences among industries is captured below). These data were logged to adjust for non-normality (Judge, et al., 1988).

Because the location of each firm was known, county populations were used as the indicator of urbanization. County populations were drawn from U.S. Census Bureau estimates (U.S. Bureau of the Census, 2001b).

The effects of industrial localization were measured at the 3-digit SIC level for each firm. Gini coefficients, reported by Krugman (1991) were included to measure the

degree of localization in each industry. These data were logged to adjust for non-normality (Judge, et al., 1988).

Finally, industry effects independent of those related to scale economies are included as a post hoc question of interest, though no specific hypotheses are developed. Industries were aggregated to the 2-digit SIC level, primarily defined in terms of materials and means of production. Table Two summarizes the industries included, the numbers of firms, average firm size and the proportion of firms exporting.

Insert Table Two about here

Modeling Scale Economies and the Propensity to Export

To test the hypotheses related to firms choices to engage in exporting, we examined the export propensity of South Carolina manufacturers, measured by a dichotomous variable using logistic regression models, described below. Given the dichotomous nature of export decisions, logistic regression analysis relates the likelihood of exporting to firm size, urbanization, industrial concentration and other observable factors. The logistic probability function takes the following basic form:

$$P = 1/(1 + e^{-\sigma}),$$

where P is the likelihood that a firm will export, and σ is a vector of factors hypothesized to affect the export decision. Three equations are developed to estimate σ :

$$\sigma = \beta_0 + \beta_1(\text{Firm Size}) + \beta_2(\text{Urbanization}) + \beta_3(\text{Concentration}) + \varepsilon, \quad (1)$$

where Firm Size is the number of employees in a firm (H_1), Urbanization reflects the external scale economies derived from concentrated population (H_2) and Concentration reflects the external scale economies of concentrated industries (H_3).

As indicated by prior research, our hypotheses expect different effects of internal and external scale economies on the decisions of larger and smaller firms (H_4 and H_5). Consistent with the recommendations of Wolf and Pett (2001), we classified firms in four groups: “micro” firms were defined as those firms with fewer than 20 employees, “small” firms as those with 20-99 employees, “medium” firms with 100-499 employees, and large firms with 500 or more employees. While labor productivity varies among industries, Mittelstaedt, Harben and Ward (2003) found these classifications nevertheless provided robust conclusions across industrial classifications. Logistic regression analysis is used to assess the differential effects of urbanization and industrial concentration on micro, small, medium and large firms,

$$\sigma = \beta_0 + \beta_1(\text{Urbanization}) + \beta_2(\text{Concentration}) + \epsilon. \quad (2)$$

Finally, though no hypotheses are developed for individual industries, we expect that industries possess unique characteristics related to inputs that affect decisions to export, independent of size, location or concentration. Equation 3 accounts for differences among 2-digit SIC defined industries:

$$\sigma = \beta_0 + \beta_1(\text{Firm Size}) + \beta_2(\text{Urbanization}) + \beta_3(\text{Concentration}) + \beta_j(\text{Industry}_j) + \epsilon. \quad (3)$$

where Industry_j is a vector of classification variables designed to assess the effects of 2-digit SIC categories.

RESULTS

Three sets of regressions were conducted. Initially, regressions were conducted to assess the effects of internal and external scale economies on export decisions. The effects of urbanization and localization were examined for micro, small, medium and large firms. Finally, industry specific effects for 87 different 3-digit industries were examined. The findings are reported below.

Means and standard deviations of independent variables are reported in Table Three. While correlations among firm size, urbanization and concentration are significant, they are low. Tests of variance inflation indicated that multicollinearity was not a problem.

Insert Table Three about here

Internal and External Scale Economies

Logistic regression results for model 1 are reported in Table Four. The model fit was significant at $p < 0.0001$ (Wald's $\chi^2_{df=3, n=2762} = 343.5653$). The intercept was negative, indicating that the normal condition for firms is to not export. The effects of employment, urbanization and clustering were all significant, and odds ratio's were all greater than one. These results indicate that larger firms are more likely to export than smaller ones; the greater the urbanization of a firm's location the greater the likelihood that they will export; and the more concentrated an industry the higher the likelihood that a firm will export.

Insert Table Four about here

External Scale Economies and Firm Size

Logistic regression results by firm size (model 2) are reported in Table Five. In the cases of micro and small firms, the model fits are significant (Wald's $\chi^2_{df=2, n=1161} = 48.4925$ and Wald's $\chi^2_{df=2, n=895} = 13.8290$, respectively). The intercepts are negative, indicating micro and small firms are more likely not to export than to export, more so in the case of micro firms than small firms. The effects of urbanization and clustering are positive and significant in both cases, indicating that as urbanization and/or industrial clustering increase so does the likelihood that micro and small firms will export.

In the case of medium firms, the model fit is significant at $p < 0.01$ (Wald's $\chi^2_{df=2, n=604} = 9.4366$). The intercept is positive, indicating that medium sized firms are more likely to export than not. The effects of population were not significant, indicating that urbanization does not play a role in export decision making for medium sized manufacturing firms. The effects of clustering were significant and negative, indicating that medium sized firms are more likely to export if their industry is dispersed than if their industry is concentrated. This may reflect the fact that, in concentrated industries, medium sized firms have internalized the advantages of external scale economies, and either do not rely on export markets to maintain domestic competitiveness or do not make these decisions independent of their domestic strategy.

In the case of large firms, the model fit was not significant (Wald's $\chi^2_{df=2, n=120} = 0.7676$). The intercept is positive and significant, reflecting the fact that nearly 76% of

large firms export, but neither urbanization nor clustering were significant variables, indicating neither of these factors play a role in their export decisions. Why is this the case? Perhaps it reflects a fact that large firms make such decisions on a larger canvas (global orientation, not export), that large firms make location decisions among nations, not between urban and rural locations, or that the scale of their operations is such that external scale economies have been internalized—not just for export competitiveness but for domestic competitiveness, as well. These explanations are consistent with prior theoretical explanations of differences between large and small firms, and the processes by which they make decisions.

Insert Table Five about here

Industry-Specific Effects

Table Six summarizes the effects of industry-specific factors, independent of size or location. Note that in some cases, industry specific factors add additional explanation to the results observed, while in other cases they do not. This suggests that the effects of internal and external scale economies are different across industries – a reasonable conclusion.

Insert Table Six about here

FINDINGS AND CONCLUSIONS

What can we conclude? Consistent with the previous international and small business literatures, and the expectations of this paper, there is a significant, positive relationship between firm size and the propensity to export. The larger the firm, the higher the likelihood that it will choose to engage in exporting. While most of the literature on the effects of firm size on exporting focuses on export performance or export intensity, the results here indicate that firm size affects the choice to make exporting a part of a firm's business strategy. This is an important finding because factors affecting choice precede factors affecting success.

Consistent with the predictions of the new economic geography, the likelihood of exporting increases as urbanization increases, indicating that the centripetal force of urbanization outweighs its centrifugal force, at least in terms of export decision making. This is especially true for micro and small firms, where reliance on external business services is most important. For medium and large firms, however, the advantages of external scale economies appear to be internalized, and for these firms the benefits of urban location disappear. The data indicate that, in the case of micro and small firms, the centripetal force of urbanization outweighs the centrifugal force of urbanization, but in the case of medium and large firms no such advantage exists.

Localization affects export decisions, as well. The greater the geographic concentration of an industry, the higher the likelihood that firms will export. This is true especially of micro and small firms. In the case of medium firms, however, the effect is the opposite, and for large firms there is no significant effect. Consistent with the expectations of new economic geography, more concentrated industries generate forward

and backward linkages that benefit smaller firms. These firms benefit from the presence of specialized labor and services, and this makes them more likely to export. Medium firms, however, apparently internalize many of these external scale economies, and are more likely to export if they are competing in industries where other, smaller firms do not benefit from localization scale economies. Scale economies of localization appear to be irrelevant to the export decision process of large firms. For these firms the benefits available to them from internal scale economies are so great that they swamp any potential benefits from clustering.

While there were no hypothesized effects of industry specific factors, we recognize that such factors are important, and we observe that the effects vary substantially among industries. These observed differences reflect capital and labor intensity differences among industries, government policies affecting export attractiveness, and global competitiveness differences among U.S. industries.

Managers of very small manufacturing firms considering export markets should learn from this research that they are better positioned to succeed in exporting if they are located in urban areas, and if they are located near other firms in their industry. For these firms, the ability to export depends on opportunities to externalize scale economies, both in terms of general business services and channel specific services.

As firms become larger, external scale economies become less important to export propensity. As firms grow in size they are able to internalize scale economies important to export decisions. Firms with 20-100 employees appear to be able to internalize scale economies more rapidly than their smaller counterparts, but less well than larger firms. Urbanization effects appear to be irrelevant to export decisions for manufacturers with

more than 100 employers, while localization effects actually work against decisions to export. The efficiency effects of localization are likely to be disproportionate for medium sized firms, compared to their smaller counterparts (this is the very essence of the notion of scale economies). Increased efficiency increases their competitive advantage in domestic markets, reducing the need for exporting (while having the opposite effect on their smaller counter parts). For very large manufacturers, neither urbanization nor industrial concentration appears to be relevant to the export decision process. These firms have internalized all possible scale economies, which changes the export decision calculus. Consistent with the findings of Wolff and Pett (2000), large and small firms use very different export decision processes. In sum, location matters more for smaller firms than larger ones in a globalizing economy.

In terms of economic development policy, rural communities offer no geographic scale economies to manufacturers, and as a result need to focus on recruiting large manufacturing firms that can provide for themselves the scale economies otherwise afforded through urbanization. Rural communities are unlikely to attract medium sized manufacturers, but may use tax and other incentives to encourage small or micro manufacturers to co-locate near large manufacturers, gaining returns from industrial concentration. Large communities can best encourage exporting by supporting the development of a range of business services that allow firms, small and large, to export. The availability of banks with international departments, export management companies, freight forwarders, customs houses, and attorneys with international legal expertise make exporting possible for existing businesses in a community, and make large communities

more attractive as a location for new businesses. In sum, location matters for how counties, towns and cities market export development to new and existing businesses.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Several limitations to this research should be noted, since they point to directions for future research in this area. First, the data are all from South Carolina firms, and caution should be exercised when generalizing findings to other geographic areas. However, results of this study are consistent with previous findings, including those of Zhao and Zou (2002), suggesting an emerging consensus on the effects of location on export decisions. There now exists a need to replicate these findings across other geopolitical locations.

Second, this research focused only on the propensity to export, and not on the effects of location on trade intensity. This is an important distinction, since studies like Zhao and Zou (2002) indicate that factors affecting trade intensity are different from those affecting the propensity to export. Hence, conclusions regarding trade intensity should not be drawn from this study. Future research is needed to examine, directly, the simultaneous effects of internal and external scale economies of production on export intensity.

Third, this study contains enough firms to calculate concentration statistics at the 3-digit SIC level, but not enough to assess 3-digit differences in the propensity to export (model 3). A larger data set is needed to address hypotheses related to industry specific effects on export propensity.

Finally, economic theory argues that while there are external scale economies from which businesses can benefit, there are as well external diseconomies of scale that

must be considered. The diseconomies of congestion, rents and labor costs in large, urban areas should serve as centrifugal forces, encouraging firms to exit urban areas for rural locations (Krugman and Livas Elizondo, 1996; De Robertis, 2001). The population of South Carolina is not large enough, or concentrated enough, to identify the diseconomies of congestion. Additional research in more heavily congested areas is needed to find the limits of the results observed in this study.

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Table One
Summary of Hypotheses

Hypothesis	Evidence
H₁ : <i>As the size of a firm increases, so does the likelihood that it will export.</i>	Significant, positive effect of Firm Size on decision to export
H₂ : <i>The more urban the location of a firm, the greater the likelihood that it will export.</i>	Significant, positive effect of Urbanization on decision to export
H₃ : <i>The more concentrated an industry, the higher the likelihood that a firm in that industry will export.</i>	Significant, positive effect on decision to export
H₄ : <i>Agglomeration effects are more important for smaller firms than for larger firms, in terms of export decision making.</i>	Significant, positive urbanization effects for smaller firms, but not for larger ones
H₅ : <i>Localization scale economies are more important for smaller firms than larger ones, in terms of export decision making.</i>	Significant, positive localization effects for smaller firms, but not for larger ones

Table Two
2-Digit Industries Included in Analysis

SIC	Industry	Number of Firms	Average Firm Size	% of Firms Exporting
22	Textile Mill Products	329	214.66	47.1
23	Apparel and Other Finished Products Made From Fabrics and Similar Materials	170	85.25	30.6
25	Furniture and Fixtures	73	65.51	32.9
27	Printing, Publishing and Allied Industries	352	28.87	6.0
28	Chemicals and Allied Products	257	110.30	63.8
30	Rubber and Miscellaneous Plastic Products	214	117.11	54.7
31	Leather and Leather Products	3	11.33	100.0
33	Primary Metal Industries	112	98.27	42.9
34	Fabricated Metal Products, Except Machinery and Transportation Equipment	396	68.26	33.8
35	Industrial and Commercial Machinery	544	71.96	46.6
36	Electronic and Other Electrical Equipment and Components	142	184.23	58.0
37	Transportation Equipment	128	197.71	59.4
38	Measuring, Analyzing and Controlling Instruments	57	145.70	57.9

Table Three
Descriptive Statistics, Corrected for Non-Normality

Variables	Mean	Standard Deviation	1	2	3
1. Employment	3.4067	1.5332	1.000		
2. Population	174397	117399	-0.077 ^a	1.000	
3. Concentration	-1.6302	0.4738	0.297 ^a	-0.098 ^a	1.000

^a p < 0.01; ^b p < 0.05

Table Four
Logistic Regression Results Predicting Likelihood of Exporting

Industry	Non-Standardized β	Odds Ratio
Firm Size	0.5185 ^a	1.680
Urbanization	1.99x10 ⁻⁶ ^a	1.000
Concentration	0.2077 ^a	1.231
Intercept	-3.1402 ^a	
-2LL	3344.034	
Model Fit (Wald's χ^2)	343.5653 ^a	
% Correctly Predicted	71.9	

^a p < 0.01; ^b p < 0.05, ^{ns} not significant

Table Five
Logistic Regression Results Predicting Likelihood of Exporting, by Firm Size

Variable	Micro Firms		Small Firms		Medium Firms		Large Firms	
	β	Odds Ratio	β	Odds Ratio	β	Odds Ratio	β	Odds Ratio
Population	2.47×10^{-6} ^a	1.000	1.95×10^{-6} ^a	1.000	1.95×10^{-6} ^{ns}	1.000	6.08×10^{-7} ^{ns}	1.000
Concentration	0.9499 ^a	2.586	0.2876 ^b	1.333	-0.4464 ^a	0.640	-0.4033 ^{ns}	0.668
Intercept	-4.3319 ^a		-1.3965 ^a		1.7270 ^a		2.3801 ^{ns}	
n=	1161		895		604		120	
-2LL	1256.110		1219.681		793.000		131.933	
Model Fit	48.493 ^a		13.829 ^a		9.437 ^a		0.768 ^{ns}	
% Exporting	25.06		45.59		61.92		75.83	
% Correctly Predicted	64.0		57.3		57.6		55.2	

^a p < 0.01; ^b p < 0.05, ^{ns} not significant

Table Six
Logistic Regression Results Predicting Likelihood of Exporting (n=2762)

Variable	Non-Standardized β	Odds Ratio
Firm Size	0.5185 ^a	1.680
Urbanization	1.99x10 ^{-6 a}	1.000
Concentration	0.2077 ^a	1.231
Intercept	-3.1402 ^a	
<u>Industry Effects</u>		
22 - Textiles	1.0106 ^a	2.747
23 - Apparel	1.1074 ^a	3.027
25 - Furniture	0.8057 ^b	2.238
27 - Printing	2.5006 ^a	12.193
28 - Chemicals	-0.3463 ^{ns}	0.707
30 - Rubber & Plastics	-0.0229 ^{ns}	0.977
31 - Leather	-12.3643 ^{ns}	<0.001
33 - Primary Metal	0.6461 ^b	1.908
34 - Fabricated Metal	0.7483 ^b	2.113
35 - Machinery	0.0576 ^{ns}	1.059
36 - Electronics	-0.0211 ^{ns}	0.979
37 - Transportation	0.2288 ^{ns}	1.257
 (The null case is for 38 - Measuring, Analyzing and Controlling Equipment)		
-2LL	3083.824	
Model Fit	432.8357 ^a	
% Correctly Predicted	77.0	

^a p < 0.01; ^b p < 0.05, ^{ns} not significant