Impacts of Globalization on E-Commerce Adoption and Firm Performance: A Cross-Country Investigation

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Kenneth L. Kraemer, Jennifer Gibbs and Jason Dedrick
Center for Research on Information Technology and Organizations
University of California, Irvine

Address correspondence to: Kenneth L. Kraemer, Director, CRITO and Professor, Management & Computer Science, University of California, Irvine, 3200 Berkeley Place, Irvine, CA 92697-4650, Tel: (949) 824-5246, Fax: (949) 824-8091, kkraemer@uci.edu

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Abstract

This paper develops and tests a model examining the relationship between firm globalization, e-commerce adoption and firm performance, using data from a large-scale cross-country survey of firms from three industries. We find that globalization leads to both e-commerce adoption and improved performance, measured as efficiency, coordination, and commerce (sales and market position). E-commerce adoption also leads to greater firm performance of all three types. Globalization has differential effects on B2B and B2C e-commerce, however, such that highly global firms are more likely to do B2B but *less* likely to do B2C. Our findings provide support for Porter's (1986) thesis that upstream business activities (namely, B2B) are more global while downstream business activities (B2C) are more local or multi-domestic.

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Introduction

Two powerful and sometimes controversial current social and economic trends are globalization and the widespread adoption of information and communication technologies (ICTs). Many argue that these two trends are closely associated, each driving the other forward, and both being driven by other common forces, such as trade liberalization, deregulation, migration, and the expansion of capitalism and democracy (c.f., Held et al., 1999). Pohjola (2002) argues that the twin forces of globalization and the ICT revolution are combining to create the so-called New Economy, marked by higher rates of economic and productivity growth. Technology is both driven by and a driver of globalization, as both forces continually reinforce one another (Bradley et al., 1993).

The process of globalization creates new challenges and opportunities for firms. The opportunities include access to new markets that were previously closed due to cost, regulation, or indirect barriers, the ability to tap resources such as labor, capital, and knowledge on a worldwide basis, and the opportunity to participate in global production networks that are becoming prevalent in many industries such as automotive, electronics, toys and textiles. Challenges come from foreign competitors entering firms' domestic markets, and from domestic competitors reducing their costs through global sourcing, moving production offshore or gaining economies of scale by expanding into new markets. Globalization challenges firms to become more streamlined and efficient while simultaneously extending the geographic reach of their operations.

Responding to these opportunities and challenges increasingly requires a fundamental restructuring of organizational strategy and processes (Bradley et al., 1993). Due to increased competitive pressure, companies are using new technologies to extend their products and operations into the international marketplace (Snow et al., 1996). They are also using these technologies to achieve new innovative transnational organizational forms (Boudreau et al., 1998; Sturgeon, 2002).

The adoption of ICTs such as the Internet makes it cheaper and easier for firms to extend their markets, manage their operations and coordinate value chains across borders (Cavusgil, 2002; Williams et al., 2001; Globerman et al., 2001). As Alan Greenspan (2001) has said, "By lowering the costs of transactions and information, technology has reduced market frictions and provided significant impetus to the process of broadening world markets". ICT adoption fosters globalization by reducing transaction and coordination costs and creating new and expanded markets with economies of scale (Mann et al., 2000; Steinfield & Klein, 1999).

This paper focuses on the relationship between globalization and the adoption of a particular set of ICTs, namely the Internet and electronic commerce, at the firm level. The goal is to move beyond general arguments about these "megatrends" and to look at their actual dynamics in the operations of business establishments. This requires thinking about the impacts of the two separate but interrelated forces on individual firms. Much of the literature on globalization and IT is lacking in empirical analysis, but implicitly treats globalization as the dependent variable and examines the impacts of IT and the Internet. While we acknowledge that there is a reciprocal relationship between the two, we examine the impacts of globalization on e-commerce and firm performance as the process of globalization has preceded the adoption of the Internet and e-commerce in time and it is still too early to observe reciprocal effects.

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Based on a multi-country survey of firms from three industries using the Internet for business, we find that highly global companies (those that have operations abroad, buy and sell abroad, and face more intense foreign competition) utilize the Internet for business-to-business (B2B) e-commerce more than their less global counterparts. On the other hand, highly global firms are actually *less* intensive users of the Internet for business-to-consumer (B2C) e-commerce than less global firms. This suggests different patterns of e-commerce activity for global and local firms. Global firms (the largest share of which are in manufacturing) are more likely to integrate their operations and automate transactions through B2B e-commerce in order to compete in a global marketplace. On the other hand, local firms may have an advantage in the B2C arena due to established physical infrastructures, local knowledge of consumer preferences, language and culture, and brand recognition and trust.

Global companies also report greater performance improvements from the adoption of e-commerce, in terms of greater efficiency, better value chain coordination, increased sales and improved competitive position. Further, we find that adoption of B2B e-commerce by all firms leads to improved sales, coordination and efficiency, while adoption of B2C improves sales and efficiency but has no impact on coordination.

Conceptual Framework

Globalization has been defined as the growing interconnectedness of the world through cross-border flows of information, capital, and people (c.f. Held et al., 1999). While globalization affects economic, social, cultural, political, and other aspects of contemporary life, we focus here on the economic aspects, using the firm as the unit of analysis. Furthermore, since we are investigating impacts at the firm level, we do not attempt to measure the process of globalization directly but rather the degree to which companies are globalized, in terms of the

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internationalization of their operations, revenues, and the competitive pressure they face. Taken together, these factors provide an indication of the level of company globalization. The objective is to better understand the relationship of globalization to the adoption of e-commerce by firms and its impacts on firm performance.

There is macroeconomic evidence that countries with more globally-oriented economies (open in terms of trade and foreign investment) have higher levels of ICT investment (Caselli and Coleman, 2001; Shih et al., 2002). Since it is firms that are making most of these investments, it is reasonable to expect that more globally-oriented firms would be more likely to adopt technologies such as the Internet and e-commerce. Empirical studies at the country level also support the argument that the opening of markets to trade and foreign investment leads domestic firms to invest in ICTs to remain competitive (e.g., Dedrick et al., 2001). Thus, the process of globalization is logically a powerful driver for firms to adopt specific ICTs such as the Internet and e-commerce.

The analysis in this paper is based on a conceptual framework that relates globalization, e-commerce adoption and impacts on firm performance, shown in Figure 1. The framework posits that the degree to which a firm is already globalized will influence the extent to which it adopts e-commerce and the types of e-commerce activities it undertakes. It also posits that the degree of globalization will influence firm performance directly as well as indirectly, by influencing the extent and nature of firm e-commerce activities, which also influence impacts on firm performance. The key variables in the framework are defined below in the methodology section. We construct hypotheses from the relationships among the variables in the model, as represented by the arrows in Figure 1.

Globalization and E-Commerce Adoption

Firm globalization is heralded as a key driver of e-commerce diffusion (Steinfield & Klein, 1999). We expect that highly global firms are likely to employ e-commerce more intensively than less global firms, for several reasons. First, firms facing foreign competition are under greater pressure to adopt technologies such as e-commerce that enable them to protect or expand market share and operate more efficiently. Competitive pressure has been identified through numerous studies as an important determinant of IT adoption, whether EDI diffusion (Banerjee & Golhar, 1993; Ramamurthy et al., 1999; Webster, 1995), adoption of IT innovations (Gatignon & Robertson, 1989; Grover, 1993), degree of computerization (Dasgupta et al., 1999) or e-business adoption (Zhu et al., 2002). We would expect that this is true for e-commerce as well.

Second, firms doing business outside their own country may be more motivated to lower their transaction costs (such as search for information, negotiation, and monitoring of performance) by using information technology (Malone, et al., 1987). We would expect that this is true in the specific case of Internet-based e-commerce. Using the Internet for transactions and coordination can save time and money on delivery of goods by using rich information flows to simplify and streamline the flows of physical goods in the supply chain (Dedrick & Kraemer, 2002; Sturgeon, 2002). Finally, firms that buy and sell in international markets are under pressure from trading partners to adopt e-commerce (especially B2B) to improve coordination with other members of the value chain. This is especially true in the case of global production networks dominated by multinational corporations (MNCs) that may require partners to adopt e-commerce in order to do business with the MNC (Chen, 2002). These considerations lead to our first hypothesis.

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H1. Firms that are highly global will have a greater overall level of e-commerce
adoption.

It is often assumed that e-commerce adoption is a global process, driven by a common set of actors, primarily the MNCs who control global production networks and whose influence transcends national boundaries. However, there is a theoretical basis for expecting that some industries and business activities will tend toward global convergence while others will be marked by local divergence.

Porter (1986) distinguishes between global industries, in which firms gain competitive advantage by integrating their activities worldwide, and multidomestic industries, in which competition occurs independently within each country. Further, he divides the value chain into upstream and downstream activities. Upstream activities such as inbound logistics and operations are not dependent on location, and can be organized globally to achieve economies of scale. On the other hand, downstream activities such as marketing, sales and customer service, are dependent on location, and must be organized on a multidomestic basis.

Globerman et al. (2001) apply Porter's theories to e-commerce specifically. They contend that the impacts of e-commerce differ across various stages of an industry's value chain, and that purchase of business inputs (B2B) is becoming globalized while purchase of end services by consumers (B2C) tends to remain localized. They focus on the retail brokerage industry and conclude that retail (B2C) e-commerce is relatively unaffected by globalization and is characterized by multi-domestic competition due to the heterogeneity of consumers and different national regulatory systems. By contrast, they find that e-commerce for wholesale brokerage activity (B2B) is more globalized. As a result, they argue that e-commerce is not inherently a globalizing force, but one that can actually enhance local competitive advantage.

Steinfield & Klein (1999) argue similarly that rather than fostering seamless global markets equally open to all businesses, much e-commerce activity (particularly B2C) is regionally focused. Steinfield and his colleagues furthermore argue that local businesses can develop Web strategies that successfully leverage their local physical presence (Steinfield et al., 1999; Steinfield & Whitten, 1999). Thus, firms that leverage their local presence with their online business strategy may have a competitive advantage over firms with only a virtual presence, for several reasons. First, embeddedness in pre-existing relationships enhances consumer trust and recognition of online firms. Second, integrating online business with local presence helps to serve diverse consumer preferences and shopping habits and takes advantage of local knowledge. Finally, such firms can take advantage of an existing infrastructure for delivering physical goods and services (Steinfield & Whitten, 1999).

Research at the country level suggests that global convergence may be taking place in B2B e-commerce through integration of business processes and systems, but B2C e-commerce seems to remain more of a local phenomenon due to national divergence in consumer preferences and habits (Gibbs et al., 2003). Based on the combination of theory and limited empirical findings, we hypothesize that globalization has different effects on B2B versus B2C e-commerce adoption, with highly global companies engaging more in B2B and less global companies engaging more in B2C. Since B2B e-commerce constitutes the large majority of e-commerce activity, this is consistent with hypothesis 1, as the higher levels of B2B carried out by global firms would dwarf the advantage of local firms in B2C, leading to higher overall e-commerce adoption by global firms.

H2a. Firms that are highly global will have higher levels of B2B e-commerce adoption.

H2b. Firms that are highly global will have lower levels of B2C e-commerce adoption.

Globalization and Firm Performance

We also expect that there will be a direct relationship between firm globalization and firm performance. We would expect highly global firms to perform better in terms of increased sales, lower costs, and improved competitive position. It is likely that global firms will realize greater impacts on performance, because they can employ knowledge and resources developed throughout their global operations to improve business processes and more effectively deploy e-commerce technologies. Global firms are also in a better position to benefit from e-commerce as they can achieve economies of scale and global reach. Globalization should also have an indirect effect on performance through e-commerce adoption, since highly global firms will use e-commerce more extensively, and more extensive use will result in improved performance. E-commerce adoption will thus mediate the effects of globalization on firm performance. These direct and indirect effects of globalization should have additive functions. This leads to our third and fourth hypotheses.

H3. Firms that are highly global will experience greater performance improvements since adopting e-commerce.

H4. E-commerce adoption will mediate the impacts of globalization on firm performance.

E-Commerce Adoption and Firm Performance

Adoption of new information technologies is expected to result in improvements in firm performance, such as reducing transaction costs and closer coordination of economic activity among business partners (e.g., Malone et al., 1987; Mukhopadhyay et al., 1995). E-commerce specifically (especially B2B) is predicted to result in lower coordination or transaction costs due to automation of transactions online, as well as productivity and efficiency gains (Amit & Zott, 2001; Lucking-Reiley & Spulbur, 2001; Wigand & Benjamin, 1995). E-commerce also is

expected to facilitate entry into new markets or extension of existing markets (Garicano & Kaplan, 2001), and greater integration of systems with suppliers and customers (OECD, 1999; Timmers, 1999; Wigand & Benjamin, 1995).

We would thus expect the extent to which firms adopt e-commerce to lead to specific types of performance improvements. To illustrate, we would expect a firm that uses the Internet for sales and marketing, for procurement, and to coordinate and share information with suppliers and customers would see greater impacts on performance than one that simply has a website with marketing information. If this is the case, then there should be a direct relationship between level of adoption and firm performance, in terms of increased efficiency, coordination, and sales and market position. This leads to our fifth hypothesis.

H5. Firms with a greater level of e-commerce adoption will experience greater impacts on performance.

Methodology

This paper is part of a study of the globalization of e-commerce in ten countries. The research employs a mix of quantitative and qualitative methods, and levels of analysis (country, industry, and firm).

Survey Design and Sample

Data were gathered through a telephone survey of 2,139 establishments in 10 countries— Brazil, China, Denmark, France, Germany, Japan, Mexico, Singapore, Taiwan, and the United States—that use the Internet to buy, sell, or support products and services. Data collection took place from February to April 2002. A stratified random sample was used, drawing from company lists representative of each local market and stratified by industry and firm size within each country. The overall response rate was 13%. Response rates varied by country, ranging from 8%

to 39%. Countries were selected to include developed, newly industrializing and developing

nations in the three major regions of the world. Establishments were selected from three major

industry sectors that are known to be more advanced users of e-commerce—manufacturing,

distribution (wholesale and retail), and finance (banking and insurance). The sample breaks

down into approximately 300 establishments in the U.S. and 200 in each of the other countries,

and is evenly split by industry as well as firm size (from 25 to 249 and 250 or more employees)

in each country (Table 1). Respondents were primarily CIOs, CEOs, or IS managers who were

responsible for making the firm's IT-related decisions.

The survey covers a number of topics related to adoption and impacts of the Internet and

e-commerce. This paper addresses only the relationships between globalization, e-commerce

adoption, and firm performance.

Concepts and Measures

Through exploratory factor and reliability analysis, we identified several dimensions of

globalization, as well as e-commerce adoption and impacts. Indices were created for each of the

independent and dependent variables and tested for reliability using Cronbach's alpha. Table 2

displays summary statistics (means, standard deviations, and alphas) for the research variables.

Firm Globalization. We conceptualize firm globalization as the degree to which firms

conduct business internationally and face international competition. This includes the extent to

which they buy and sell abroad, have operations in multiple countries, and compete with foreign

firms, either in domestic or international markets. We measure the degree of firm globalization

through five items: (1) whether the company has its headquarters abroad; (2) whether it has other

establishments abroad; (3) international sales as a share of its total sales; (4) international

procurement as a share of its total procurement, and (5) degree of international competitive

pressure facing the firm. A Globalization Index was created to measure the level of globalization. Scores for each of the five items were rescaled to a 0-1 scale and aggregated, such that the index ranges from 0-5. A higher score indicates a greater degree of company globalization. Reliability analysis confirmed a relatively high alpha of .7 and provided justification for combining these items into an index of firm globalization.

E-Commerce Adoption. We define e-commerce broadly as the use of the Internet to buy, sell, or support products and services. We conceptualize adoption in terms of the use[1] of e-commerce, and we measure 1) the overall level of adoption and 2) the type of e-commerce adoption (B2B versus B2C). Both level and type of use are categories commonly used in the innovation, IT and e-commerce literatures (c.f., OECD, 1999; Shaw et al., 2000; Timmers, 1999; Wigand & Benjamin, 1995).

We define *level of adoption* as the extent of use of e-commerce for a number of different business activities such as sales, marketing, procurement, and sharing information. The overall level of e-commerce adoption was measured by an E-Commerce Adoption index that was created by aggregating seven items regarding types of Internet use for business. The items are use of the Internet for: 1) advertising and marketing, 2) online sales, 3) after-sales customer service and support, 4) online purchases, 5) exchange of operational data with suppliers, 6) exchange of operational data with business customers, and 7) integration of the same business processes with suppliers or other business partners. The overall level of adoption is the total number of Internet uses, ranging from 0-7.

Type of adoption is based on a different set of questions that distinguish between use for business-to-business (B2B) commerce and business-to-consumer (B2C) commerce. This distinction is drawn to account for fundamental differences in terms of the size and types of

transactions involving businesses as opposed to consumers. We created a set of indices

distinguishing B2B and B2C e-commerce adoption by aggregating responses to a different set of

items on e-commerce sales and services and then dividing responses into 0-2 where 0 is no e-

commerce, 1 is either sales or services, and 2 is both sales and services. Two variables were

created, called "B2B E-Commerce Adoption" and "B2C E-Commerce Adoption". The first

variable consists of B2B sales and B2B services, and the second one is comprised of B2C sales

and B2C services.

Firm Performance. We focus on three dimensions of firm performance. The first is

operational *efficiency,* which refers to more efficient processes and greater staff productivity. The

second dimension is *coordination*, which includes both lower procurement and inventory costs

and improved coordination with suppliers. The third performance dimension is expansion of

commerce, in terms of increased sales, widened sales area, improved customer service and

competitive position. The specific aspects of firm performance measured by each of these

categories have been discussed in previous research (c.f., OECD, 1999; Timmers, 1999; Wigand

& Benjamin, 1995).

We measured firm performance impacts through a set of 10 items. These items concerned

the degree to which the firm had experienced the following since adopting the Internet for

business: 1) more efficient internal processes, 2) increased staff productivity, 3) increased sales,

4) widened sales area, 5) improved customer service, 6) increased international sales, 7)

decreased procurement costs, 8) decreased inventory costs, 9) improved coordination with

suppliers, and 10) improved competitive position. Items were rated on a 5-point Likert scale

ranging from 1=not at all to 5=a great deal.

An exploratory factor analysis of the 10 items using varimax rotation (with Eigenvalues of 0.96 or higher) identified three factors, which were called Efficiency, Commerce, and Coordination. Factor loadings are reported in Table 3. All three indices are highly reliable. The Efficiency index consists of items 1 and 2 and has a reliability of .77. The Commerce index consists of items 3-6 and 10, and it has a high alpha of .83. Finally, the Coordination index consists of items 7-9 and has a high reliability of .79.

Control Variables. We also tested for effects of *firm size* and *industry* in our models. Firm size has been identified in previous research on IT adoption and diffusion as an important predictor. Larger organizations have been found to be more likely to adopt ICTs as they possess greater resources and knowledge to invest in and implement technology (Dasgupta et al., 1999; Iacovou et al., 1995; Kuan & Chau, 2001; Tornatzsky & Fleischer, 1990; Rogers, 1983). We included firm size in our models to ensure that firm globalization was not just a proxy for size. Firm size was operationalized in terms of the number of worldwide employees in the organization.

E-commerce adoption and performance impacts are also likely to vary across industries. For example, EDI adoption has been particularly strong in the manufacturing industry, used to integrate production activities with the supply chain. Manufacturing firms are thus likely to make heavier use of B2B e-commerce to coordinate activities with their trading partners. Service-based industries such as retail and finance, on the other hand, are more likely to do B2C e-commerce with their customers. We included industry as a control variable in the models we tested. Industry was measured by a dummy variable created for manufacturing firms. Due to our interest in examining B2B and B2C separately, we distinguished between manufacturing, which is more business-focused, and distribution and finance, which require interaction with

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consumers. The industry variable thus distinguishes between manufacturing and non-manufacturing firms.

Analysis and Results

Data Analysis

The analysis used correlation, chi square, and regression methods. Correlation analysis was used to test simple relationships between firm globalization, adoption of e-commerce (total, B2B and B2C), and impacts (total, efficiency, coordination, and commerce). Chi square analysis was used to compare differences between "high global" (top 25%) and "low global" or local (bottom 25%) segments of the sample. Hypotheses were tested using linear multiple regression analysis. Models were run for both measures of e-commerce adoption – level of adoption and type of adoption (B2B vs. B2C). Each model examines the combined impacts of firm globalization and e-commerce adoption (level or type) on firm performance, measured by efficiency, coordination and commerce impacts.

Results

Preliminary Analyses. Before testing the hypotheses through regression analyses, preliminary analyses of the data were conducted. Descriptive statistics revealed that the highly global firms in the sample were heavily weighted toward foreign manufacturing companies, as 55% of them were headquartered abroad and 48% were from the manufacturing industry. The global firms in the sample did an average of 45% of their sales and 40% of their procurement internationally, compared to less than 1% each for local firms. Local firms, by contrast, were primarily in the finance industry (54%), and did more business with consumers. Firms in the distribution industry were evenly split between high and low global, presumably due to the balance between wholesale and retail in our sample. Whereas both global and local firms sold

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products and services to businesses (92% of global versus 75% of local firms), significantly more local firms (75%) sold to consumers compared to global firms (49%).

Correlations were calculated for the main study variables and provide initial evidence in support of all hypotheses (see Table 4). Additionally, both size and industry (manufacturing) were significantly correlated with globalization ($\underline{r}$ = .19 and $\underline{r}$ = .22, $\underline{p}$ < .001), although the correlations are low enough to suggest that the measures are independent of one another. Firm size was not associated with either level or type of e-commerce adoption, though it was correlated to a small but significant extent with the commerce ($\underline{r}$ = .06, $\underline{p}$ < .01) , and coordination ($\underline{r}$ = .10, $\underline{p}$ < .001) dimensions of firm performance. Compared to distribution and finance, manufacturing firms were likely to have a lower level of e-commerce adoption ($\underline{r}$ = -.05, $\underline{p}$ < .05), especially B2C e-commerce ($\underline{r}$ = -.21, $\underline{p}$ < .001), but more likely to adopt B2B e-commerce ($\underline{r}$ = .08, $\underline{p}$ < .01). Industry did not make a difference in terms of firm performance, except in the case of coordination improvements, which were experienced more by manufacturing firms ($\underline{r}$ = .07, $\underline{p}$ < .01).

Hypothesis Testing. Tables 5, 6, and 7 summarize the results of the regression analyses for both models. The three regressions in Table 5 and the four regressions in Table 6 show the interrelationships between globalization, level of e-commerce adoption, and the three dimensions of firm performance and address H1, H3, and H4. The five regressions in Table 7 show interrelationships between globalization, B2B, B2C, and firm performance and address H2a, H2b, H3, and H4.

H1, that firm globalization would lead to a greater level of e-commerce adoption, was confirmed. Table 6 shows that more globalized firms tended to have higher levels of e-commerce adoption ($\underline{b}$ = .10, $\underline{p}$ < .001), when size and industry were controlled. Independent size and

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industry effects were also apparent, as larger firms were likely to have higher e-commerce adoption ($\underline{b}$ = .07, $\underline{p}$ < .01) while manufacturing firms were likely to have lower e-commerce adoption ($\underline{b}$ = -.07, $\underline{p}$ < .01).

H2a and H2b address a different e-commerce indicator, type of adoption (B2B or B2C). H2a predicted that globalization would have a positive effect on B2B e-commerce adoption. As shown in Table 7, this hypothesis was strongly supported ($\underline{b}$ = .16, $\underline{p}$ < .001). Size and industry had no effect on B2B adoption. Support for H2b, predicting a negative effect of globalization on B2C adoption, was also evident, as higher globalization led to less B2C e-commerce adoption ($\underline{b}$ = -.05, $\underline{p}$ < .05). A strong industry effect was evident with regard to B2C, as manufacturing firms were much less likely to adopt B2C e-commerce ($\underline{b}$ = -.20, $\underline{p}$ < .001). This effect is probably explained by the fact that manufacturing firms deal with consumers much less often than firms in the distribution and finance industries. Size also had a moderate effect and was a positive predictor of B2C e-commerce adoption ($\underline{b}$ = .06, $\underline{p}$ < .05).

H3, that globalization would lead to greater impacts, was also substantiated. Table 6 shows that, controlling for the effects of e-commerce adoption, size, and industry, globalization had a significant positive direct effect on all three types of performance, efficiency ($\underline{b}$ = .13, $\underline{p}$ < .001), coordination ($\underline{b}$ =. 15, $\underline{p}$ < .001), and commerce ($\underline{b}$ = .18, $\underline{p}$ < .001). Similar results are evident in Table 7, when controlling for B2B and B2C e-commerce adoption, as well as size and industry. Both the size and industry controls were unrelated to any of the performance dimensions ($\underline{p}$ > .10).

H4, that e-commerce adoption would act as a mediator between globalization and firm performance, was supported as well. To test for mediation, additional analyses were run regressing the dependent variables (the three dimensions of firm performance) on globalization

and the two control variables. Results of these regressions are reported in Table 5. According to

Baron & Kenny (1986), mediation can be established by showing that the effect of the

independent variable on the dependent variable is less when the mediating variable is included in

the regression model than without it. Following their recommendations, we compare the

relationship of the dependent variable (performance) to the independent variable (globalization)

with and without the mediating variable (e-commerce adoption). Comparing the regression

coefficients for globalization and all three dimensions of performance in Table 5 (without the

mediator) and Table 6 (with the mediator), it is evident that the effects of globalization on each

performance dimension are less when e-commerce adoption is included in the model. This

indicates that e-commerce adoption somewhat dampens the effects of globalization and mediates

its relationship with firm performance.

H5 predicted that e-commerce adoption would also have a positive effect on firm

performance. This hypothesis was also supported, as the level of e-commerce adoption had

strong positive impacts on all three types of firm performance. Table 6 indicates that controlling

for the impacts of firm globalization, size, and industry, level of e-commerce adoption had

significant effects on all three types of impacts: commerce ($\underline{b}$ = .33, $\underline{p}$ < .001), efficiency ($\underline{b}$ =

.23, $\underline{p}$ < .001), and coordination ($\underline{b}$ = .24, $\underline{p}$ < .001).

In terms of type of adoption, Table 7 shows that the adoption of B2B e-commerce had

significant impacts on commerce ($\underline{b}$ = .16, $\underline{p}$ < .001), coordination ($\underline{b}$ = .08, $\underline{p}$ < .01) and

efficiency ($\underline{b}$ = .07, $\underline{p}$ < .05). Adoption of B2C had significant positive impacts on commerce ($\underline{b}$ =

.19, $\underline{p}$ < .001) and efficiency ($\underline{b}$ = .10, $\underline{p}$ < .01), but no significant relationship to coordination ($\underline{b}$

= .02, $\underline{p}$ > .10). Thus H5 was supported, but with some qualifications: while level of adoption

predicted all three dimensions of performance and both B2B and B2C e-commerce led to

commerce-related impacts such as increased sales, B2B (but not B2C) adoption was likely to lead to increased coordination, while B2C adoption had a stronger effect on efficiency.

Discussion

Each of the five hypotheses was supported by the analysis. The following is a discussion of the findings, including additional data comparing characteristics of "high global" and "low global" firms. These comparisons provide a richer and more detailed picture of the data, and provide a basis for explaining the results.

Globalization and E-commerce Adoption

H1. Firms that are highly global will have a greater overall level of e-commerce adoption.

H1 was supported, as firm globalization was a significant predictor of the level of e-commerce adoption. This is consistent with the view that global firms face increased pressure to adopt e-commerce as a response to international competitive pressure, and to coordinate operations more effectively across national borders.

Looking specifically at the types of activities that global firms conducted on the Internet, we found that the difference between the two groups was explained by a particular set of activities that global firms were more likely to carry out online. Figure 2 shows that highly global firms were significantly more likely to use the Internet for exchanging information with customers and suppliers, integrating business processes, and after sales service and support, but not for sales, procurement and marketing. This might be explained by the fact that business processes of global companies are more difficult to integrate, and they must coordinate with more business partners over greater distances. Thus global firms can reap greater benefits from

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using the Internet as a tool for integration and coordination. Sales and marketing, on the other hand, are more local in nature, so potential benefits are similar for both global and local firms.

It is somewhat surprising that there is no difference in online procurement, as one might expect that global firms are buying from a more geographically-dispersed set of suppliers and could achieve greater impacts in terms of reducing procurement costs by utilizing the Internet. One explanation might be that global firms are more likely to be already using EDI. If this is the case, they may be using the Internet in the search and negotiation process, but using EDI for the actual transaction.

H2a. Firms that are highly global will have higher levels of B2B e-commerce adoption.

H2b. Firms that are highly global will have lower levels of B2C e-commerce adoption.

H2a and H2b were confirmed as well. This supports the argument that upstream activities, which involve B2B relationships, are more global in nature, while downstream activities that involve consumer interactions are more local or multi-domestic (Porter, 1986). B2B e-commerce can be applied in a standardized way on a global basis and thus benefits from economies of scale, while B2C e-commerce requires significant adaptation for each local environment and does not result in economies of scale. Instead, local firms may have inherent advantages over global firms in doing business online with consumers. These could include better knowledge of consumer preferences, established brand names, and effective distribution channels that can be used to support a "click and mortar" strategy for e-commerce.

These findings are likely to be partially explained by industry effects; namely, the highly global firms tend to be concentrated in the manufacturing industry and engage in more business-to-business commerce in general than low global firms (which are dominated by finance), which do more business with consumers. However, globalization did have significant effects on B2B

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and B2C adoption, over and above the evident industry effects. Globalization also had effects on e-commerce adoption that were independent of firm size. These findings suggest that globalization is more than a proxy for industry or firm size.

Looking at the differences between high and low global firms at a more detailed level yields more interesting findings. As Figure 3 shows, high global firms were more likely to engage in both B2B sales and services than low global firms. But looking at B2C, we find that the two groups were actually equally likely to engage in B2C sales. This implies that any advantages or greater motivation local firms have in the consumer market do not make a difference in terms of actually selling online. Instead, the big difference is in B2C services, which local firms were significantly more likely to conduct online via their websites.

One explanation may be that highly global firms (over half of which were foreign headquartered) provide fewer services overall to consumers, and that they are more likely to outsource the services they do provide in other countries rather than doing them directly. If this is the case, the difference is simply explained by the fact that local firms are more service-oriented, not that they have a higher proclivity for providing those services online.

On the other hand, it may be that for any given level of consumer services, local firms are more likely to provide them online. The reasons could have to do with better ties to local supply chain partners. Two examples are product availability information and order tracking, both of which are common services offered on B2C web sites. Providing these services online requires integration with warehouses, distribution centers and shipping companies to track inventory and shipment information. This may be easier for local firms that have well-established relationships with local partners.

Global firms may also see less payoff or competitive advantage in providing online services to consumers. Knowledge of B2C is less transferable from country to country, and it is expensive to get local knowledge. Global firms may be deterred from providing B2C e-commerce services by challenges due to national differences in language, culture and regulations, which may be especially important in the often highly-regulated financial sector.

Our findings confirm previous theories and findings that B2B e-commerce supports upstream activities and tends to be more global, whereas B2C supports downstream activities and tends to be more localized (Globerman et al., 2001; Porter, 1986), as well as arguments for the advantage of local presence for B2C e-commerce, in particular (Steinfield et al., 1999; Steinfield & Whitten, 1999).

Globalization, E-commerce Adoption and Firm Performance

H3. Firms that are highly global will experience greater performance improvements since adopting e-commerce.

H4. E-commerce adoption will mediate the impacts of globalization on firm performance.

The third and fourth hypotheses were also supported. The findings show that global firms enjoyed greater positive impacts on firm performance, in terms of efficiency, coordination and commerce. This effect is, however, mediated by e-commerce adoption. The fact that e-commerce is a mediator means that globalization also has an indirect effect on performance. Globalization leads to higher levels of e-commerce adoption, which in turn has positive impacts on performance. Comparing high and low global firms, Figure 4 shows that high global firms were more likely to experience improvements on every item surveyed than low global firms. Differences were significant for all types of performance, but were most pronounced regarding increased international sales, improved coordination with suppliers, and decreased procurement

and inventory costs. Globalization thus appears to lead to performance improvements, particularly in terms of increased coordination.

There are two likely explanations for these differences. First, global firms may have greater opportunities for performance improvement. This may be because they are more inefficient and ineffective in each area and have more room for improvement. On the other hand, their scale and scope may give them more opportunities to realize benefits from using the Internet than local firms with more limited scale and scope. A second explanation, posited earlier, is that global firms have access to a larger reservoir of knowledge and experience to draw on when implementing IT innovations such as the Internet, and thus have an advantage in effectively deploying the technology and in making needed process changes to reap the benefits from adoption.

H5. Firms with a greater level of e-commerce adoption will experience greater impacts on performance.

The fifth hypothesis was supported as well, with important qualifications. The level of e-commerce adoption was positively associated with improved firm performance. This shows that more broad-based use of e-commerce (i.e., use of the Internet for a wider range of activities) results in greater performance gains.

The separate analysis of B2B and B2C e-commerce reveals that the two different types of adoption were linked to different performance dimensions. Both B2B and B2C adoption drove commerce-related performance improvements. B2B adoption led to greater coordination and cost reduction, while B2C adoption was more likely to result in improved efficiency and productivity. Overall, B2B adoption appeared to have more fundamental impacts on firm performance, as it led to a broader range of improvements (sales and market position, coordination, and efficiency).

The impacts of B2C adoption were more limited to sales and competitive position and efficiency, although it did have a stronger association with each type of impact than did B2B adoption.

It is not surprising that B2C e-commerce would not have major impacts on coordination with suppliers and customers, as sales to consumers do not require coordinating activities in the same way as supply chain activities with business partners, which are facilitated by B2B e-commerce. The finding that B2C e-commerce was associated with efficiency gains supports arguments that providing services online can lead to major cost savings; for instance by eliminating the need for customer service and technical support staff (Kraemer, et al., 1999; Kraemer and Dedrick, 2001). Online banking is supposed to reduce the need for customers to visit branches or use call centers, while online retailing likewise reduces the need for in-store or call center staff. Overall, the greatest impact from e-commerce adoption was improved sales and competitive position, which resulted from adoption of both B2B and B2C.

It must be noted that this study is limited in several ways. First, the results are based on a cross-sectional survey conducted at one point in time. As such, they cannot establish causality. We rely on the logical argument that the process of firm globalization has been occurring longer than Internet-based e-commerce has been in existence, so it precedes it chronologically. However, it could also be argued that greater e-commerce adoption leads to greater firm globalization in turn. Furthermore, due to the methodology used, the models explain only a low amount of variance. We chose to focus on the effect of firm globalization on e-commerce adoption and impacts, rather than being explicitly interested in a range of factors explaining different types of impacts. Given the robustness of our estimates, the results indicate that globalization does have an effect on e-commerce adoption. It also has an impact on firm performance, both independently and through the mediating influence of e-commerce adoption.

Conclusions and Implications

This research shows that the relationship between globalization and e-commerce is complex and varied. Among firms that use the Internet to conduct business, global firms use the technology more intensively, engaging in a wider variety of e-commerce activities than less global firms. However, when e-commerce is broken down in terms of the type of business relationship involved, we find a very different picture for B2B and B2C e-commerce, with global firms more likely to engage in the former and local firms in the latter. The findings provide empirical support for Porter's (1986) thesis that upstream activities, which involve B2B transactions, are more global in nature, while downstream activities involving B2C interactions are more local, or multidomestic. The empirical findings reinforce qualitative research on e-commerce that suggests that global convergence is occurring in B2B through the coordination and integration of business processes and operations, but that B2C remains more of a local phenomenon due to divergence in consumer preferences and habits (Gibbs et al., 2003). This research represents the first effort to test the effects of globalization on e-commerce empirically, through a large-scale study across ten countries and three industries.

Although globalization has a negative effect on B2C, firms derive most of their performance benefits from B2B rather than B2C, so the net effect of globalization seems to be a positive one on firm performance. Local firms do appear to be benefiting from e-commerce though, especially B2C services, which drive increased sales. Global firms get more performance improvements from e-commerce than local firms, as they tend to adopt B2B, which has greater impacts across a broader range (efficiency, coordination, and commerce) than B2C, which is a driver only of increased sales and efficiency. Global firms also get more direct impacts from e-commerce, presumably as they have greater resources and scope to use it better.

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Overall, the findings support the notion that e-commerce is reinforcing rather than transforming existing commerce patterns. Our major finding is that B2B e-commerce sales and services tend to be global, while B2C tends to be local or multidomestic, which matches the pattern hypothesized for upstream and downstream business activities (Porter, 1986); namely, global firms (particularly manufacturing firms) are more likely to do business with other businesses, while local firms (especially finance and distribution) are more likely to provide sales and services to consumers.

Managerial Implications

The finding that global firms are the ones primarily engaging in B2B – which constitutes the majority of all e-commerce – implies that e-commerce will reinforce existing international competitive advantages rather than leveling the playing field and enabling local firms to compete with global firms in international markets. Doing business across national borders involves more than simply setting up a web site and offering products or services to the world. The virtual world of commerce must be supported with physical, financial and information processes that global firms are more likely to already have in place, and which local firms cannot duplicate easily or cheaply. This challenges claims by Cavusgil and many in the popular press, e.g., "e-commerce is a great equalizer! It creates a level playing field between small and large firms, experienced and inexperienced, and domestic and foreign" (Cavusgil, 2002, p. 24).

On the other hand, these inequalities do not preclude local firms from participating in e-commerce. In fact, as Porter and others suggest, local firms may have valuable resources that put them at a competitive advantage in their home markets. These include local knowledge, strong brand names, distribution channels and service infrastructure. These resources can be an advantage in B2C e-commerce and are not easy for global firms to replicate in each national

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market around the world. This implies that less global firms can look for opportunities in local markets rather than trying to use the Internet to reach far-flung international markets. If these firms do want to expand into global markets, they are more likely to do so by adopting B2B e-commerce to break into the global production networks for multinational corporations than by trying to sell directly to foreign consumers.

The Internet is still relatively new as a medium for conducting business, having been opened to commercial use less than ten years ago, and its ultimate impacts are still to be seen. In time, it may have a transformative effect on many industries, just as earlier innovations such as railroads, electricity, the telephone, and computers have done. For now, however, the changes are more supportive than disruptive of existing industry structures and competitive environments.

Notes

1. Earlier studies of EDI and e-commerce have conceptualized adoption in terms of "intent to adopt." This was primarily due to the fact that these studies were conducted early on in the adoption of the technology and researchers were trying to understand the factors that might lead to adoption. We focus on firms already using e-commerce, so it is appropriate for us to study use or adoption rather than intention to adopt.

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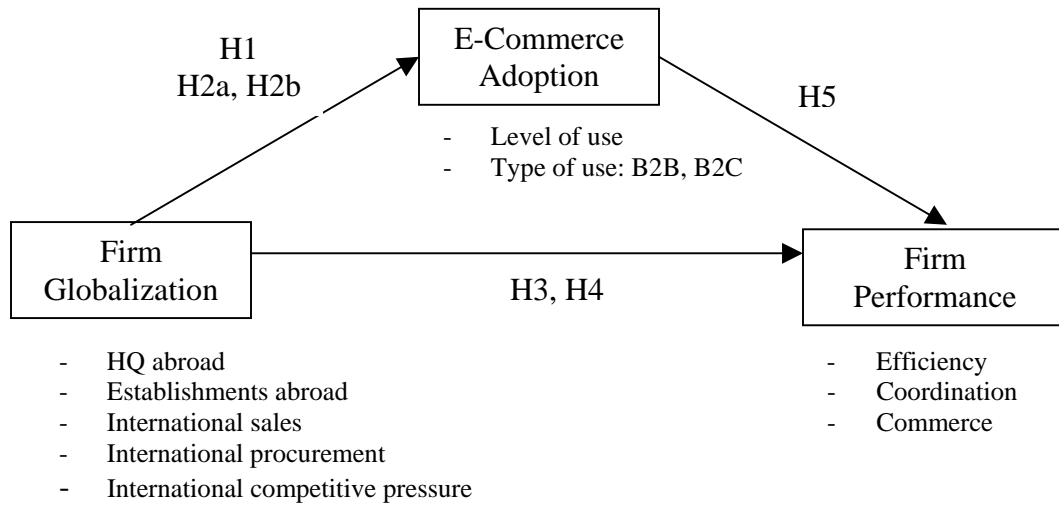
Figure 1. Conceptual Framework

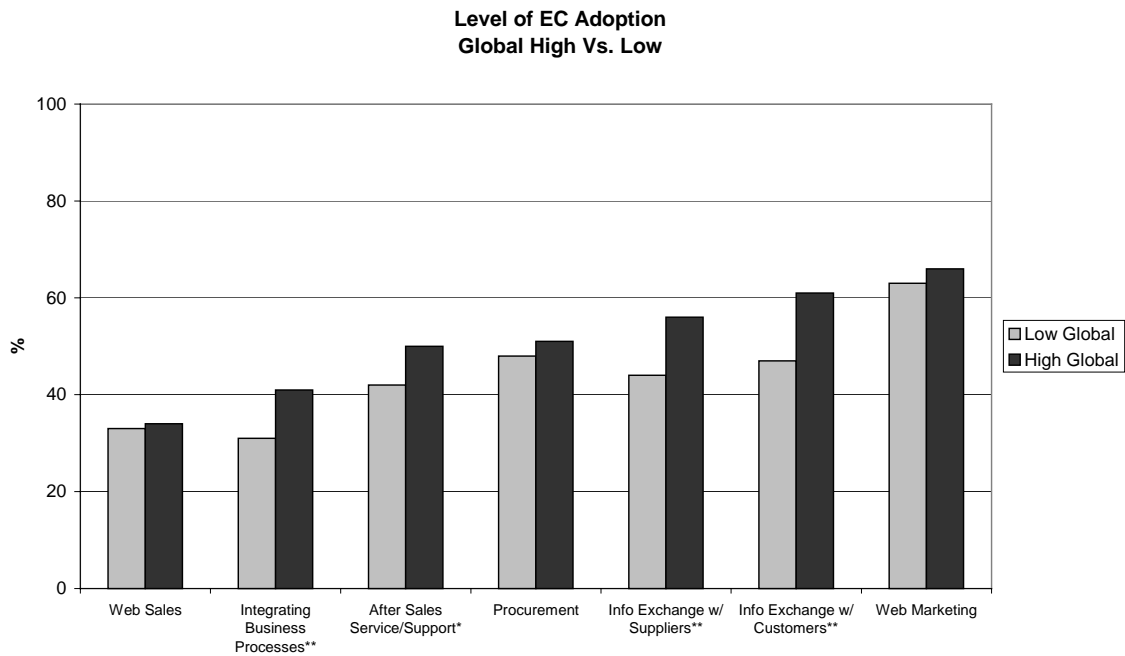Figure 2. Level of E-Commerce Adoption, High Vs. Low Global Firms

Note: *p<.05, **p<.01, ***p<.001

Figure 3. B2B Vs. B2C E-Commerce, High Vs. Low Global Firms

B2B vs. B2C E-Commerce
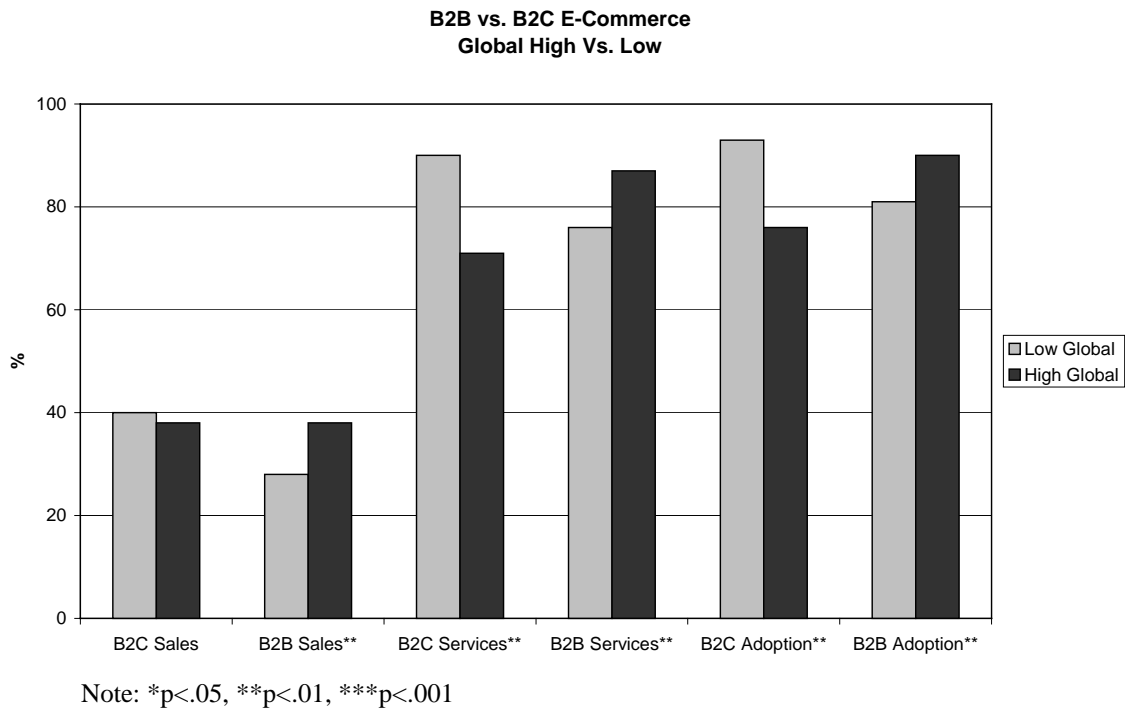**Global High Vs. Low**

Note: *p<.05, **p<.01, ***p<.001

Figure 4. Firm Performance (% High Impact), High Vs. Low Global Firms

Impacts (% High)
Global High Vs. Low

Note: *p<.05, **p<.01, ***p<.001
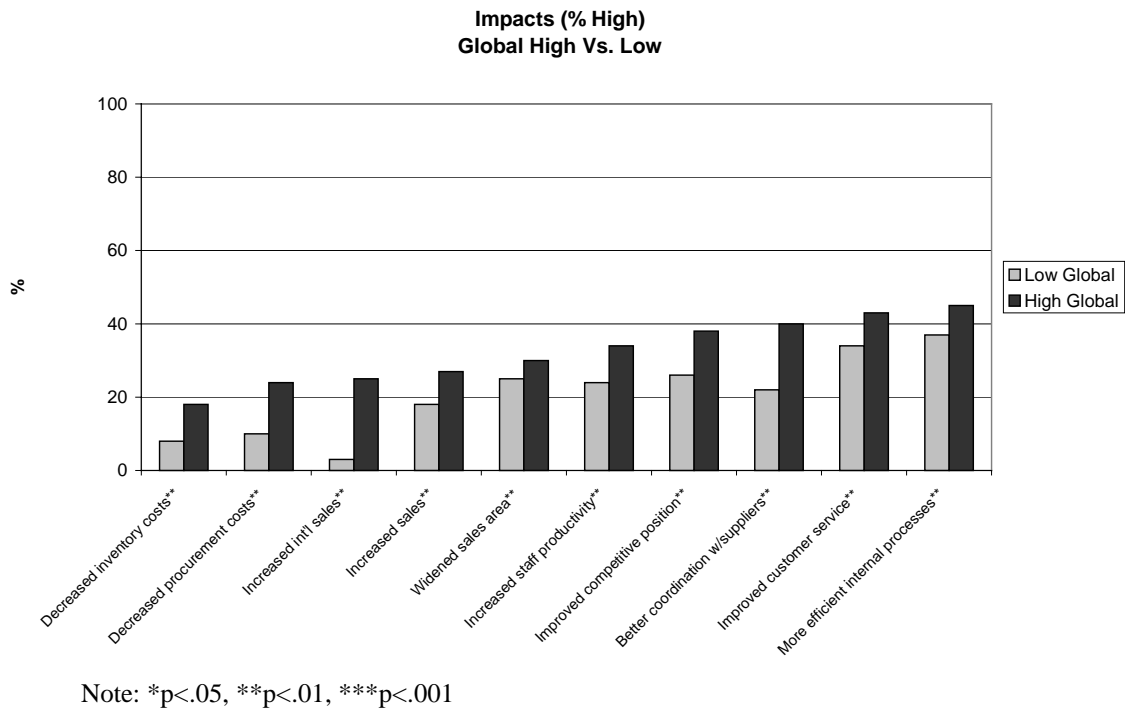
Table 1. Sample Composition

	Manufacturing	Distribution	Finance	Total
Small Firms (25-249)	364	357	365	1086
Large Firms (250+)	379	344	330	1053
Total	743	701	695	2139

Table 2. Summary Statistics of Research Variables

Variables	N	Mean	Standard Deviation	Standardized Alpha	Number of Items in Scale
Firm Globalization[1]	1745	1.18	1.16	.70	5
Level of EC Adoption[2]	2075	3.26	1.92	--	7
Type of EC Adoption					
B2B Adoption[3]	2124	0.77	.759	--	2
B2C Adoption[3]	2124	0.71	.769	--	2
Firm Performance					
Commerce[4]	2006	2.64	0.98	.83	5
Efficiency[4]	2052	2.88	1.13	.77	2
Coordination[4]	1981	2.42	1.06	.79	3
Controls					
Size (# of Employees)	2007	10072.44	56489.79	--	1
Industry (Mfg.)	2139	0.35	.476	--	1

[1]Score ranges from 0 "low globalization" to 5 "high globalization"
[2]Score ranges from 0 "low EC adoption" to 7 "high EC adoption"
[3]Scores range from 0 "no adoption" to 1 "sales or services adoption" to 2 "both sales and services adoption"
[4]Scores are based on a 5-point Likert scale, where 1 is "no impact" and 5 is "great impact"

Table 3. Factor Loadings of Firm Performance Variables[1]

Variables	Factors		
	1	2	3
Commerce			
Widened Sales Area	.831		
Increased Sales	.748		
Increased International Sales	.665		
Improved Competitive Position	.644		
Improved Customer Service	.546		
Coordination			
Decreased Procurement Costs		.845	
Decreased Inventory Costs		.795	
Improved Coordination w/ Suppliers		.641	
Efficiency			
More Efficient Internal Processes			.825
Increased Staff Productivity			.774

[1] Principal component analysis with Eigenvalues set at 0.96. Factor entries are varimax rotated loadings. Three factor solution explained 69% of variance. N=1910.

Table 4.   Intercorrelations Among Study Variables (N=2139)

Variables	1	2	3	4	5	6	7	8
1. Firm Globalization	--							
2. Level of EC Adoption	.10	--						
Type of EC Adoption								
3. B2B Adoption	.17	.45	--					
4. B2C Adoption	-.08	.39	.35	--				
Firm Performance								
5. Commerce	.20	.33	.26	.23	--			
6. Efficiency	.13	.23	.14	.11	.57	--		
7. Coordination	.19	.25	.13	.05	.58	.53	--	
Controls								
8. Size (# Employees)	.19	.04	.02	.03	.06	.04	.10	--
9. Industry (Mfg.)	.22	-.05	.08	-.21	.00	.00	.07	-.03

Note: $r > .04$, $p < .05$; $r > .05$, $p < .01$; $r > .09$, $p < .001$

Table 5.   Regression Coefficients for Globalization and Firm Performance

Variables	Efficiency	Coordination	Commerce
Firm Globalization	.149***	.180***	.213***
Size – Total Employees	.007	.037	.013
Industry – Manufacturing	-.040	.015	-.047
F	11.911	20.538	24.825
Sig.	.000	.000	.000
df	3	3	3
Std. Error	1.117	1.042	.957
Adj. R^2	.02	.04	.04

Note: *p<.05, **p<.01, ***p<.001

Table 6.   Regression Coefficients for E-Commerce Adoption Model

Variables	E-Commerce Adoption	Efficiency	Coordination	Commerce
Firm Globalization	.101***	.126***	.153***	.181***
E-Commerce Adoption	--	.230***	.244***	.330***
Size – Total Employees	.072**	-.013	.009	-.021
Industry – Manufacturing	-.066**	-.022	.038	-.023
F	11.214	31.359	40.051	69.193
Sig.	.000	.000	.000	.000
df	3	4	4	4
Std. Error	1.863	1.088	1.010	.898
Adj. R^2	.02	.07	.09	.15

Note: *p<.05, **p<.01, ***p<.001

Table 7.   Regression Coefficients for B2C Vs. B2C Model

Variables	B2B Adoption	B2C Adoption	Efficiency	Coordination	Commerce
Firm Globalization	.160***	-.050*	.141***	.168***	.198***
B2B Adoption	--	--	.065*	.079**	.158***
B2C Adoption	--	--	.095**	.021	.189***
Size – Total Employees	.030	.056*	-.001	.034	-.004
Industry – Manufacturing	.043	-.199***	-.025	.016	-.016
F	18.820	28.453	12.848	14.781	44.574
Sig.	.000	.000	.000	.000	.000
df	3	3	5	5	5
Std. Error	.747	.752	1.110	1.041	.918
Adj. R^2	.03	.05	.04	.04	.12

Note: *p<.05, **p<.01, ***p<.001