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S.C Ho

Robert John KAUFFMAN

Singapore Management University, rkauffman@smu.edu.sg

T.P. Liang

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Citation

Ho, S.C; KAUFFMAN, Robert John; and Liang, T.P.. A Growth Theory Perspective on the International Diffusion of Electronic Commerce.. (2007). *Electronic Commerce Research and Applications*. 6, (3), 237-259.

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A Growth Theory Perspective on the International Diffusion of E-commerce

Shuchun Ho
Information Management
National Sun Yat-Sen University and
Shu-Te University
Kaohsiung, Taiwan, China
sch@mail.stu.edu.tw

Robert J. Kauffman
MIS Research Center
Carlson School of Management
University of Minnesota
Minneapolis, MN 55455 USA
rkauffman@csom.umn.edu

Ting-Peng Liang
E-Commerce Research Center
Information Management
National Sun Yat-Sen University
Kaohsiung, Taiwan, China
liang@mis.nsysu.edu.tw

ABSTRACT

This research explores the reasons why electronic commerce practices have diffused around the world at the national level of analysis, due to forces that are both internal and external to the countries in which diffusion is observed to occur. We propose two related growth theories that contribute contrasting viewpoints about the origins of the drivers of diffusion: endogenous growth theory and exogenous growth theory. We use the former theory to argue that the primary drivers of diffusion stem from economic forces that are internal to a country, including its government policies (e.g., tax on online stores), wealth, infrastructure, readiness, education levels, and so on. The latter theory suggests that the primary drivers are external to the economy, and may reflect the forces present in the regional economy, international drivers of technological change, trade flows and so on. We explore the efficacy of these alternative perspectives in a set of propositions for the drivers of national-level diffusion of e-commerce that spans developed and developing nations.

Categories and Subject Descriptors

J.4 [Social and Behavioral Sciences]: Economics

General Terms

Economics, Management, Theory

Keywords

E-commerce; Economic theory of growth; Technology diffusion

1. INTRODUCTION

The emergence of e-commerce has radically transformed the global economic landscape over the past decade. Although e-commerce experienced a boom-and-bust business cycle in its transition from the DotCom bubble in 2000 and 2001 back to an economy with more modest expectations for technology-led value, e-commerce is achieving steady growth in the global setting. Nevertheless, the diffusion of e-commerce so far has mostly been limited to developed countries and is relatively slow in developing countries. The recent *E-Commerce and Development Report* by the United Nations Council for Trade and Development [46] suggests that the majority of developing countries face limitations for the advancement of their digital

economy. They stem largely from low income levels, low literacy rates, a lack of payment systems that can support online transactions, and cultural resistance to online transaction-making. These constraints on e-commerce growth in developing countries have been conjectured by various researchers, but they have not been examined them in any detail, and there are few empirical results available [26]. This highlights the importance of investigating macro-level factors affecting cross-national e-commerce diffusion.

Prior studies have explored the facilitating and inhibiting factors for e-commerce adoption and diffusion across countries. However, there still is a lack of theory that can explain the different observed levels of e-commerce growth and diffusion across countries. This research presents two contrasting macro-level theories for understanding business-to-consumer (B2C) e-commerce growth and diffusion in the cross-national context.

They are endogenous growth theory and exogenous growth theory [2, 7, 41]. An endogenous growth-theoretic explanation of e-commerce development suggests that the primary drivers of growth are internal to an economy. The United States, where the Internet and e-commerce were largely created, is such an example. The primary drivers of e-commerce growth have all been internal, for example, the technology labor, Internet technology and managerial vision all came from here. In contrast, an exogenous growth-theoretic explanation of e-commerce development would be more appropriate for Canada, which was greatly influenced by various elements of the digital economy in the United States. The same is true for many other countries in the global economy. In other places around the world, the extent of growth and diffusion of Internet-based shopping is more likely to have a blend of endogenous and exogenous growth influences. Therefore, a hybrid explanation may be appropriate in some cases. In addition, it is possible too that the drivers of growth will change over time, so yet another view may be appropriate as well: a temporally-shifting growth-theoretic explanation.

With this brief orientation to the issues in mind, we intend to fill in this knowledge gap, by trying out some new theoretical perspectives that can provide a clearer picture of how e-commerce grows at the country-level of analysis. Specifically, we seek answers to the following research questions related to information and communication technologies (ICTs) in these contexts:

- Is growth theory a useful perspective for investigating B2C e-commerce diffusion and growth across countries? What does it offer beyond current theories that are discussed in this context?

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ICEC'05, August 15–17, 2005, Xi'an, China.

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- To what extent, do the variants of growth theory that we described above explain the extent to which growth is driven internally or externally across countries? Can we show the manner in which regional contagion effects operate in e-commerce diffusion?
- How do endogenous growth theory and exogenous growth theory help to organize our thinking about the factors (e.g., demographics, geography, education, ICT investments, lifestyles, domestic policy, and culture issues) that have been examined in various e-commerce adoption studies? What new explanatory capabilities do the theories offer?

This research will permit us to understand the extent to which the growth of B2C e-commerce is driven by factors that are internal or external to the countries in our data set. This perspective in research can be found in the work on regional contagion theory by Techatassanasoontorn [45], and other work on the application of macroeconomic econometric methods involving the analysis of B2C e-commerce diffusion shocks by Kauffman and Techatassanasoontorn [25] and network technology by Kauffman and Wang [27]. We specifically employ a growth theory perspective from Development Economics as the basis for eliciting answers to the research questions.

The remainder of the paper is laid out as follows. First, we will review the development of e-commerce and its diffusion and growth across countries. Second, we introduce the background and applications of growth theory and illustrate why it is appropriate to apply to e-commerce growth. We further discuss the characteristics, strengths, and weaknesses of the exogenous growth theory and endogenous growth theory to provide different perspectives in investigating country. This will help us to formalize the theoretical thinking for the next stage our work. Third, we review the factors that are broadly agreed to innovation, technology diffusion and e-commerce adoption in the cross-country context. They inform us about the modeling of factors that affect e-commerce adoption relative to the insights that endogenous growth theory and exogenous growth theory can offer. Fourth, we will present an exploratory theoretical framework that incorporates these theories into a meaningful explanation of e-commerce diffusion in the global context. We conclude with thoughts about the new opportunities that the theoretical perspectives that we offer for research in this area.

2. GLOBAL E-COMMERCE DIFFUSION

We next provide some factual background on the adoption of the Internet around the world, discuss the current status of e-commerce diffusion and growth, and assess the main thrust of empirical research to date on international aspects of e-commerce.

2.1 Background on Global Internet Adoption

According to a recent white paper published by the International Telecommunication Union (ITU), nearly 676 million people (or 11.8% of the total population of the world) had access to the Internet by the end of 2003 [47]. The distribution and growth of Internet users in different regions, however, are quite uneven. (See Table 1.) Internet users from the developed countries contribute to 58% of global connectivity and those from developing countries accounted for

more than 36% by the end of 2003. The developing countries' share of global Internet users was nearly 50% in 2000 and 2003, but the users were concentrated in a few nations (e.g., China, Republic of Korea, India, Brazil and Mexico, which accounted for nearly 62% of all Internet users in the developing world).

Table 1. Internet Users by Region and by Level of Development, 2000-2003 (thousands)

COUN-TRIES	2000	PCT GROWTH	2001	PCT GROWTH	2002	PERCENT GROWTH	2003
<i>Regions of the World</i>							
Africa	4,559	34	6,119	63	9,988	21.38	12,123
Asia	109,257	38	150,535	40	211,202	15.25	243,406
Europe	110,824	30	143,584	23	176,232	7.24	188,997
L. Amer.	17,673	65	29,224	45	42,439	4.19	44,217
N. Amer.	136,971	14	156,823	12	175,110	NA ^(a)	NA ^(a)
Oceania	8,248	16	9,601	21	11,607	1.88	11,825
Total	387,532		495,886		626,579 ^(b)		675,678
<i>Developed, Developing and Other Countries</i>							
Developed	285,480	19	339,427	15	388,746	2.06	396,754
Developing	94,352	48	139,317	50	209,556	17.53	246,290
Others	7,700	123	17,142	65	28,277	15.41	32,634
Total	387,532	27.96	495,886	23.36	626,579 ^(b)	7.84	675,678
<p>Source: UNCTAD (2004). (a) North American Internet user data in 2003 were unavailable. (b) Small differences may be due to rounding errors.</p>							

Nevertheless, the surge in worldwide Internet usage does not necessarily correlate directly with observed growth in the volume of e-commerce transactions or revenues. Internet users often investigate what they should buy, but their actual purchases are often made in physical stores. This is similar to the "look-to-book" phenomenon that we saw towards the end of the 1990s in the United States, when air travelers searched for attractive airfares on the Internet, but actually booked through traditional bricks-and-mortar travel agencies. In fact, the growth of e-commerce in developing countries lags far behind the rate of increase in the number of Internet users [46].

An increase in the number of Internet users typically paves the way for e-commerce growth [55]. However, the countries with the highest Internet user penetration rates are not necessarily the ones that have the most adoption of online shopping. Take Norway and Denmark, for example. They had the highest proportion of Internet usage in 2001 and 2002 [44]. However, the United States had the greatest proportion of Internet users who were also online shoppers from 2000 to 2002. In the United States, online shopping among Internet users occurred was 32%, more than twice the global average. Along with the United States, a leader in economic growth, South Korea, Germany, Norway and the United Kingdom had the highest proportions of Internet users who also were online shoppers.

2.2 Growth and Diffusion of E-Commerce

New ICTs have led to the creation of new means to create wealth in the business economy and higher levels of social welfare. As a result, however, we have witnessed an accelerating economic gap between developed and developing countries. Recognizing this, the United Nations (UN) and the international and non-governmental organizations have put a lot of effort to exploring the drivers of e-commerce development

across countries and providing funding to improve the information and telecommunication infrastructure in many developing countries. The United Nations Development Programme [48] has also been acting to eliminate the *digital divide* between the developed and developing countries.

Almost all official estimates of e-commerce activities refer to the high-income market economies. The available evidence on productivity gains related to the use of ICTs is still highly concentrated in a small group of developed countries, led by the United States, and in selected emerging economies, such as Singapore and South Korea. According to Baumol [8], the world is divided into distinct groups of countries with their own common trends. This is true for technology adoption and diffusion, too. Technological innovations are only adopted and diffused in countries which have high productivity [52]. Technology adoption and diffusion in the developing countries lag far behind. Moreover, some regional economists claim that the adoption of innovative technologies is no longer beneficial everywhere. Instead, it depends crucially on the prices of factors of production. These, in turn, depend on country parameters, especially productivity (and refer to geographical features, such as land quality, climate, access to sea, resource endowments, natural resource, and infrastructure) and the cost of financial capital [52]. As a result, some producers and consumers in some countries may not wish to adopt new technologies. When this is the case, technology adoption and diffusion may amplify differences in productivity between countries, and will explain why there are large observed differences in e-commerce growth across countries.

2.3 E-Commerce Adoption and Diffusion Research

To date though, most researchers have been focusing on e-commerce research at the *individual* level [3, 29], the *organizational* level [10, 12], and the *interorganizational* level [4, 13]. Little is known about the *aggregate* level of national economies in the global setting, however. Despite the current state of research, there is a pragmatic need for national policy-making relative to e-commerce adoption and diffusion at the national level, which highlights the importance of conducting cross-country e-commerce studies.

In recent years, a few researchers have sought to understand factors that affect e-commerce adoption across countries [19, 30]. In Appendix 1, we summarize the research questions and purpose, theoretical framework, research methodologies, countries, and explanatory variables associated with cross-country e-commerce adoption studies. Xu, et al. [51], Zhu, et al. [53], and Kraemer, et al. [30] provide valuable insights on firm-level e-commerce adoption across countries. They applied the *technology-organization-environment framework* to identify inhibitors and facilitators of firm-level e-commerce adoption across countries.

However, in our view, there is still a need for a more integrative theoretical framework that can bring e-commerce-related technology adoption and diffusion patterns at the country-level into better focus. This is where growth theory comes in.

3. GROWTH-THEORY EXPLANATIONS FOR B2C E-COMMERCE DIFFUSION

We believe that there may be some opportunities to provide a broader-based theoretical perspective which defines the level of

the nation as the primary unit of analysis, and permits us to elicit useful information on the inhibitors and enablers of e-commerce diffusion and growth.

3.1 Theories of Economic Growth

Growth theory provides a theoretical vantage point to observe and interpret e-commerce development in the global economy. *Growth theory* is generally associated with models, explanations and predictive framework that characterize the factors which drive a country's growth. Aghion and Howitt [2] point out that the process of technological innovation transforms the economic systems that create it. The most fundamental proposition of growth theory is that there must be continual advances due to technological progress. The advances take the form of new goods, new markets, and new processes to sustain a positive growth rate of output per capita in the long run. This fits with our assessment of the drivers of e-commerce growth. Internet technologies create the basis for the continual advance of new goods, new markets and new business models in e-commerce. However, the increasing gap in cross-national economic growth highlights the importance of understanding the digital roots. Thus, we focus on investigating the key determinants of B2C e-commerce growth.

There have been many attempts to identify the factors that drive economic growth and performance, and to provide suggestions to policy makers to eliminate the gap between developed and developing countries. The increasing availability of standardized data sets has led to a burgeoning empirical literature on cross-country growth. Many of these papers have examined empirically whether economic growth is converging relative to the United States and what the forces are that may lead to convergence [6, 15, 16, 32]. A variety of different variables, including labor, land, capital, infrastructure and technology, have been measured and evaluated in terms of their contribution to the international difference of productivity. We next examine one variant of growth theory more closely, exogenous growth theory, as a means to begin our exploration of where the key drivers of e-commerce diffusion are likely to be operative and how they work.

3.2 Exogenous Growth Theory

During the 1950s, Solow [41] and Swan [42] constructed the first general equilibrium models of economic growth. The *Solow-Swan model* is most representative of *exogenous growth theory*. Today, this body of knowledge is known as *neoclassical growth theory*. The exogenous growth theory assumes technological progress as an exogenous component in the production function. Since technology change is constrained to be exogenous and costless in the model, national-level technology policy cannot affect the long-term growth rate of per capita income (even though it may not be logical to view the process this way). Without technological progress in the model, output and employment grow at the same rate steady state, which implies that the level of output per worker also will remain constant. In the neoclassical growth model, per capita output grows in the long run only because of exogenous technological progress. This model demonstrates that the effects of diminishing returns will cause economic growth to slow or stop without technological progress. One implication is that capital accumulation and population growth are insufficient to explain continuing increases in per capita incomes, and that government policy will not affect long-term per capita growth.

The Solow-Swan model of economic growth typically is expressed in the Cobb-Douglas production function format as $Y(t) = K(t)^\alpha(A(t)L(t))^{1-\alpha}$, where α denotes aggregate output, capital stock, labor supply, level of technology, and a production parameter at time t . Output grows at a rate equal to the sum of the growth rate of the population and the exogenous component of technology progress [41]. According to Mankiw, et al. [32], the Solow-Swan model does well in explaining the cross-country distribution of growth in per capita income, and the convergence rates of countries to their steady state growth rates. Exogenous growth theory accounts for economic growth based on sustained growth, a constant capital-output ratio, a constant labor share, and stable interest rates on capital [24].

Under other circumstances, exogenous growth theory may not apply so well. For example, consider labor as human capital or knowledge. In the current economy, labor is human capital because knowledge from employees can be accumulated within a firm and stored within in the systems of a firm. Another issue with exogenous growth models is that they tend to treat the key engine of growth, technological change, as a “black box,” and are not able to offer policy makers with workable controls. Another weakness of exogenous growth theory is that it does not address some of the complicated issues that arise in the economic analysis of the production and the diffusion of technology, knowledge, and information [2]. Finally, Solow’s original model does not consider that countries are likely to differ in the amount of technology that they use, which might help to explain international differences in income and social welfare over time.

Although there are arguments about the limitations of exogenous growth theory in explaining long-term growth, recent empirical cross-country studies have tried to identify exogenous variables that are explanatory of international differences in economic output [22, 33, 38, 40, 52]. These studies demonstrated that variables such as geography, resource endowments, infrastructure, and political regime cause much of the international productivity differentials. Sachs and Warner [38] use exogenous variables such as geography, resource endowments, and economic policies to measure their relation to long-term productivity across countries. Hall and Jones [22] examine reduced-form equations that show the relationships of capital inputs and multifactor productivity to measures of infrastructure across countries. Zeria [52] examines how considering innovations that substitute for existing inputs affects the analysis of technology adoption and economic growth. The exogenous variables in some of these studies are similar to the factors that affect technology adoption and the diffusion of innovations in cross-country studies in Marketing and IS.

We now turn to a discussion of a contrasting theoretical perspective, endogenous growth theory, which has a different fundamental assumption about the role of technological progress in the production function.

3.3 Endogenous Growth Theory

This theory was developed in the mid-1980s in response to criticisms of the neoclassical growth model associated with exogenous growth. *Endogenous growth theory* argues that economic growth is an endogenous outcome of an economic system, instead of the result of forces and factors that impinge from outside [36, 37]. The main theme of endogenous growth theory is that economic growth involves a two-way interaction

between technology and economic life: technological progress transforms the very economic system that creates it [2]. Lucas [31], Grossman and Helpman [20], and Aghion and Howitt [1] have provided guidance on how to endogenize technological changes to create new explanations for economic growth, for example, that technological innovations are driven by the profit motives of agents within an economy, and government policies on how technological innovation can affect long-run growth.

A key characteristic of endogenous growth models is the absence of diminishing returns to capital. The simplest version of a production function without diminishing returns is one in which output is a function of capital, $Y = AK$, where A is a positive constant that reflects the leverage on economic growth that the technology creates. Endogenous growth also means that, on balance, output growth is more responsive to factors that occur within an economy than outside it. This implies that exogenous factors also play some role in contributing to the growth rate of output. We can leverage the understanding that endogenous growth theory has established for the links between technological knowledge and various economic and social structural characteristics, and how such interactions result in economic growth. In addition, endogenous growth theory also predicts positive externalities and spillover effects from the development of a high value-added knowledge economy [2, 21].

Endogenous growth theory has been widely applied in different cross-national studies that involve the effects of technological diffusion on economic growth. Grassman and Helpman [20] and Rivera-Batiz and Romer [34] assess the effects from diffusion of knowledge under the condition of steady-state growth. Barro and Sala-i-Martin [6] construct a model that combines elements of endogenous growth with convergence implications of the neoclassical growth model and further analyze the transitional paths and consider the role of technological diffusion as a determinant of conditional convergence across economies. They claim that the rate of international economic growth is driven by discoveries that occur in the leading technological economies, and the following countries converge toward the leaders because technological imitation tends to be cheaper than technological innovation.

These endogenous growth models have the characteristic that cross-country differences in policies and preferences may lead to permanent differences in growth rates of per capita output. Several of the endogenous growth models also can be interpreted as models of technology adoption, because they recognize that there is an accumulation of intangible capital. However, there also is a weakness that relates to endogenous growth theory: it loses predictive capability for explaining conditional convergence, where there is an allowance made for the heterogeneity of economies and their different growth trajectories toward a steady-state level of growth [6]. This highlights its supplementary role relative to exogenous growth theory in explaining economic growth.

The growth theories that we have discussed provide us with different and useful perspectives on the potential drivers of e-commerce adoption across countries. Exogenous growth theory has proven to be powerful in accounting for the patterns of economic development and explaining why convergence in growth rates is observed across developing and developed economies. In contrast, endogenous growth theory assists our understanding of the growth in global knowledge and the transition of the global economic, even though it has not been

useful for understanding the cross-national convergence of economic growth rates in different countries.

We now identify drivers of the diffusion of B2C e-commerce to support a growth-theoretic cross-national level of analysis.

4. E-COMMERCE DIFFUSION DRIVERS

There has been much attention given to multinational studies of technology adoption and innovation diffusion [14, 19, 23, 28, 43]. These studies identify significant drivers across countries and found diverse macro-level country environment factors (Figure 1). These variables include gross domestic product (GDP) per capita, geographic and demographic characteristics, urbanization, information infrastructure, cost to shop on the Internet, adequacy of economic and financial resources, cosmopolitanism, education, and human capital. An issue is the extent to which we might associate these and other factors with exogenous or endogenous growth.

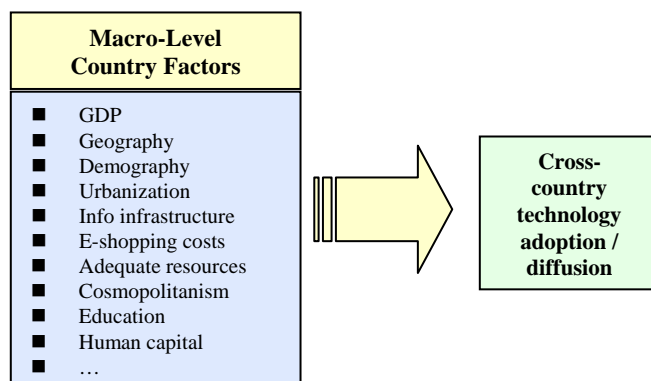


Figure 1. Macro-Level Factors Affecting Cross-Country Technology Adoption / Diffusion

First, various studies suggest that GDP per capita [17, 23, 28, 30, 43], and the related gross national product (GNP) per capita [14, 25] are drivers of national wealth. They are likely to affect the extent of observed new product or technology development in a country. Other diffusion research [35] has indicated that a high standard of living usually promotes faster rates of adoption, so country wealth is likely to be an important driver of B2C e-commerce diffusion across countries. The reader should recognize that GDP per capita internal to a country is likely to be an endogenous driver of growth. However, it is also possible that high levels of GDP per capita that exist in neighboring countries may encourage some spillover effects for the adoption and diffusion of e-commerce.

Second, geographic and demographic characteristics are likely to act as indirectly enhancing or constraining conditions for e-commerce development [30, 49]. Countries such as Singapore and Germany, with high population densities and high wealth per capita, have well-developed ICT infrastructures [30]. However, high population density also may explain the well-developed traditional retailing networks that are observed in these countries, such as in France and Taiwan, China. These countries have efficient and convenient traditional retailing channels that reduce the need for online shopping [30].

Third, Calem and Carlio [9] have shown that urban areas typically have greater infrastructure and economies of scale. As a result, the penetration potential for various kinds of

technologies will be higher in countries with higher levels of urbanization. The degree of urbanization, measured in terms of the percentage of the population that is living in urban areas [50], has also been used as a ceiling parameter in models to explain global cellular telephone adoption [14]. We expect that a country with a higher degree of urbanization should exhibit more rapid B2C e-commerce diffusion and growth.

Fourth, the availability of information infrastructure also has been demonstrated as an enabler of B2C e-commerce diffusion [30]. People cannot shop on the Internet if they don't have telephone lines or Internet access. So ICT infrastructure is a basic requirement for B2C e-commerce development. Thus, we expect that a country with a well-developed ICT infrastructure would likely have higher B2C e-commerce diffusion and growth.

Fifth, the cost to shop on the Internet, which can be thought of in both micro-impact and macro-impact terms, is likely to hamper e-commerce development at the level of the economy. The cost of online shopping includes access fees and the transaction cost impacts associated with privacy, risk and security issues on the Internet [20, 28, 44]. But, we also must note that the Internet has offered customers many "workarounds," for example, by creating offshore gambling Web sites, avoiding taxes by making shopping available across different geographies, and so on.

Sixth, adequacy of economic and financial resources will have direct effects in shaping e-commerce diffusion [20, 49]. Global economic slowdowns and regional recessions appear to reduce e-commerce sales in many countries, but electronic payment capabilities such as credit cards and other online shopping payment support are likely to accelerate online transaction-making. Data on the penetration of credit card shopping and related data on the number of credit cards per capita are readily available.

Last, the average level of education [28], and the quality of human capital [10] within a country also may be influential. This is because the technical knowledge that is necessary for the creation of e-commerce-related infrastructure may not be available in countries with poorly educated populations [18]. High levels of education attainment are proven to be critical in the extent of computer technology adoption in a country [10]. In addition, human capital is widely recognized as a key input to the research sector in a country, which usually generates the new ideas and products associated with technological progress. The reader should recognize that the educational capabilities and human capital resources that are most likely to influence the growth of e-commerce in a country are likely to occur within it. However, it also is clear that the knowledge necessary for the development of Web sites for Internet-based selling and other support services has been diffusing internationally as well.

5. THEORETICAL FRAMEWORK

Applying the factors identified above, we next offer a new theoretical perspective for the growth and diffusion of cross-national B2C e-commerce that is based on growth theory. The primary aim is to characterize how growth-theory thinking can be adapted (rather than literally applied) for the purpose of structuring models that will provide an over-arching way to understand how e-commerce diffuses. To do this requires us to bring together the various recommended drivers of diffusion

with the exogenous and endogenous growth perspectives, especially as a means to identify external drivers and internal drivers, and explain how they relate to one another for e-commerce growth.

5.1 A Growth Model of B2C E-Commerce

We conceptualize a country as a system that has both internal forces (such as government policies, information and telecommunication infrastructure, and culture) and external forces which affect e-commerce growth and diffusion. If growth is generated within the country’s domestic system, these internal forces typically will dominate the country’s e-commerce growth.

On the other hand, there are also external forces that affect the country (such as international trade, and e-commerce development in other countries) and the diffusion rate of e-commerce growth in a country. These are exogenous factors that arise in other countries and have an impact on growth.

5.2 Endogenous Model of E-Commerce Growth

An *endogenous explanation* of e-commerce growth suggests that the primary forces of growth are internal to an economic system. Thus, the forces within country will dominate its e-commerce growth. (See Figure 2). Take the United States as an example of the endogenous growth of e-commerce. This is where the Internet and e-commerce were created, so the U.S. must be at the origin of e-commerce diffusion. The primary elements of e-commerce growth in America have been internal. They include the venture capital, technology labor capital, Internet technology and entrepreneurial vision for e-commerce.

The idea behind our endogenous growth theory interpretation of e-commerce growth is that the key drivers of e-commerce growth function are internal to the country. We can represent this in terms of a production function, $Y_i=f(X_i,Z_i,\varepsilon)$, with Y_i as the growth of e-commerce in country i . X_i is a vector of production inputs, Z_i represents a set of endogenous growth drivers, and ε is an error term. The kind of endogenous growth drivers that we have in mind include: country wealth, ICT infrastructure investment, the availability of online stores, computer per capita, etc. In this function, all elements are internal to the country and are entirely responsible for driving e-commerce growth. Other internal factors include culture, country wealth, information infrastructure, education, government policy, urbanization, cost to access the Internet, and economic and financial resources.

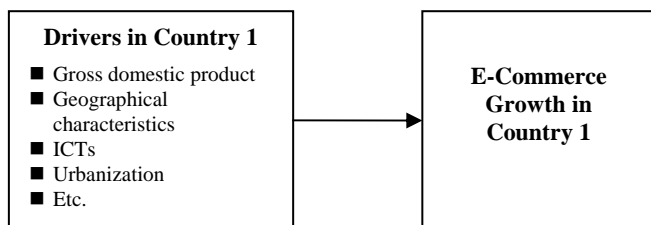


Figure 2. Endogenous Growth Theory Interpretation

5.3 An Exogenous Growth Theory Interpretation

In contrast, an *exogenous growth theory explanation* of e-commerce growth argues that growth is primarily driven by forces from other countries. The basic idea of exogenous growth for B2C e-commerce in a given country i is that the primary forces affecting growth emanate from another country (or countries) j . (See Figure 3.) Assuming just one other country has an influence, we can again represent this with a production function, $Y_i=f(X_i,Z_j,\varepsilon)$, with Y_i as the growth of e-commerce in country i . X_i is a vector of production inputs in country i , but now Z_j reflects the fact that exogenous growth drivers from another country j impact the production mapping from inputs X_i to the growth of e-commerce, Y_j . ε again is an error term. A simple example is the growth of e-commerce in Canada in the mid-to-late 1990s. The impetus for growth—beyond the basic production process involving indigenous labor and capital, $f(X)$ (indicated by the dotted arrow below)—came largely from the United States, where the e-commerce revolution was occurring. More generally, the reader should imagine that e-commerce growth in country i is largely driven by external forces from a subset of some other countries $j \in \{2, \dots, n\}$ (indicated by the solid arrows).

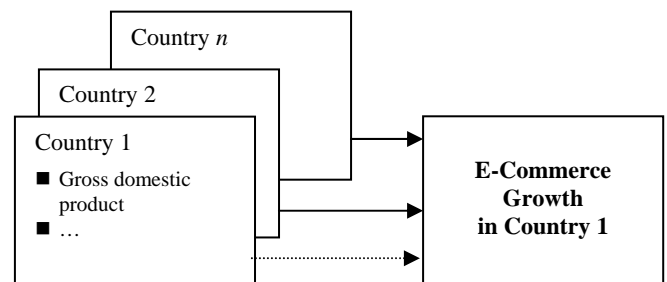


Figure 3. An Exogenous Growth Theory Interpretation

However, in other places around the world, the extent of growth and diffusion of Internet-based shopping is more likely to have been driven by a blend of endogenous and exogenous growth influences. (See Figure 4). So a hybrid explanation may be more appropriate for explaining the e-commerce growth in some countries.

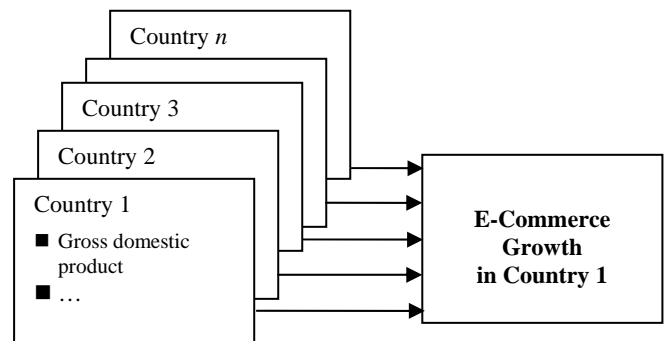


Figure 4. Hybrid Growth Model

6. CONCLUSION

In the past decade, the emergence of e-commerce has dramatically changed the global business landscape. The development of e-commerce created a means of conducting

new kinds of business transactions, while it expanded the digital boundaries of the global marketplace. Meantime, the diffusion and growth of e-commerce among developed countries, such as the United States, Korea, Germany, Norway, etc., have been converging. The United Nations has been researching ways to eliminate the digital divide in e-commerce diffusion among developed and developing countries. Such efforts will contribute to the capabilities of government policy makers and business leaders to speed the development of e-commerce in the developing countries. On the other hand, the lack of theory to explain cross-national e-commerce diffusion also underscores the significance of our proposed new theoretical framework, and the opportunities that exist to explore means for empirical analysis to reveal new knowledge in this area.

In this paper, we sought to explain e-commerce diffusion across countries from the point of view of growth theory in Economics. Specifically, we proposed explanations for e-commerce diffusion based on endogenous growth theory and exogenous growth theory. The former explanation of e-commerce diffusion suggests that the primary drivers of growth are internal to an economic system. The latter theory of e-commerce diffusion suggests that the primary drivers of a country's e-commerce growth are external forces. Both perspectives assume that there is a basic production process that maps inputs for production in a country to its e-commerce outcomes. The exogenous and endogenous drivers that the theories describe provide a new way to think about and test for the sources of e-commerce growth and diffusion across countries.

Although the ideas that we have set forth are only preliminary, our hope is to provide the audience with a report on their use in exploratory empirical analysis. Our research process will involve: (i) the specification of more detailed models that permit the testing of the alternative theories of growth across a sample of countries; (ii) identification of the core endogenous and exogenous drivers of e-commerce growth; (iii) consideration of the convergence of growth rates across them, as a means to provide insights on changes in the digital divide in e-commerce. We will also need to characterize the baseline production function with appropriately operationalized measures of the basic input-output mapping. Finally, we appreciate the need for more carefully distinguishing between the basic elements of production, and the associated exogenous and endogenous drivers of e-commerce growth. And so we plan to report on a process that we are developing that will achieve this purpose.

7. ACKNOWLEDGMENTS

Shu-Chun Ho acknowledges the support of National Science Council in Taiwan under the grant #094JFA08014 related to her visiting research activities at the MISRC. Rob Kauffman acknowledges partial support from the MISRC and the E-Commerce Research Center of National Sun Yat-Sen University in Kaohsiung, Taiwan.

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APPENDIX. A Summary of Cross-Country E-Commerce Adoption and Diffusion Studies

AUTHOR	RESEARCH QUESTIONS	THEORY OR FRAMEWORK	METHOD	COUNTRIES	EXPLANATORY VARIABLES
Gibbs, et	• What environment and policy forces affect cross-	Conceptual	Firm-level case	10	• Global environment

al. [19]	<p>national e-commerce adoption?</p> <ul style="list-style-type: none"> • What factors affect e-commerce adoption? 	framework	studies		<ul style="list-style-type: none"> • National environment • National policy
Kraemer, et al. [30]	<ul style="list-style-type: none"> • What are the impacts of globalization on e-commerce growth and firm performance? 	Conceptual framework	Firm-level survey	10	<ul style="list-style-type: none"> • Firm globalization
Xu, et al. [51]	<ul style="list-style-type: none"> • How can different levels of organizational adoption of e-business practices be explained? • What is role of contextual factors in e-business adoption? • How do these relationships vary across different economic environments? Between developed, developing countries? 	Technology-organization-environment framework	Firm-level survey	2 (China, US)	<ul style="list-style-type: none"> • Tech. competence • Firm size • Global scope • Enterprise integration • Competition intensity • Regulatory environment
Zhu, et al. [53]	<ul style="list-style-type: none"> • What is an appropriate theoretical basis for studying e-business adoption? • What facilitators and inhibitors can be identified within the theoretical framework? • How do the adoption patterns change across different national environments? 	Technology-organization-environment framework	Survey of business execs and consumers	8 (European)	<ul style="list-style-type: none"> • Tech. competence • Firm scope and size • Consumer readiness • Competitive pressure • Trading partner readiness