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Understanding the global diffusion of B2B E-commerce (B2B EC): An integrated model

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Abstract

Using institutional theory, this study offers an integrated framework that describes the diffusion of business-to-business e-commerce within a country. The model specifies the role of national institutional frameworks, international institutional pressures, and market complexity in business-to-business e-commerce diffusion. We test this model using archival, cross-sectional data from 146 countries for the period from 2013 to 2016. The study also compares the roles of these factors in business-to-business e-commerce diffusion across developed and developing countries. The results suggest that national institutional frameworks, international institutional pressures, and market complexity contribute positively to business-to-business e-commerce diffusion and that the influence of these variables varies according to the degree of a country's development. Theoretical, research, and managerial implications of the study are also discussed.

Keywords

Business-to-business e-commerce, diffusion factors, innovation diffusion, institutional theory, country comparison

Introduction

Business-to-business e-commerce (B2B EC) systems are electronic information systems designed to handle in an effective manner transactions between trading partners (Sila, 2013, 2015). Previous literature suggests that the implementation of these technologies can revolutionize a firm's performance, specifically by decreasing costs, reducing marketing time, ensuring quicker decision-making, improving control, reducing the "bullwhip effect," reducing inventory, improving the firm's bureaucratic systems, and even enhancing efficiency and productivity (Alsaad et al., 2018; Elia et al., 2007; Ranganathan et al., 2011; Sanders, 2008; Yao and Zhu, 2012). Over the last 10 years, we have seen a marked increase in the significant use of B2B EC. For example, worldwide B2B EC transactions in 2015 alone accounted for over $15 trillion (UNCTAD, 2015). In the United States alone, this figure reached $780 billion in 2015, accounting for 9.3% US B2B transactions. It is estimated that in less than 5 years, this value may rise to as much as 12.1%. In Canada, almost 63% of transactions across all the provinces in 2013 were conducted using B2B EC. This figure was 53% and 91% for South Korea and Russia, respectively (Forrester Research, 2015).

However, the use of this technology is not balanced globally, with many economies still not utilizing the full potential of these systems. 75% of B2B EC transactions made globally are concentrated in the United States, Japan, the United Kingdom, and China alone (United Nations, 2015), while less than 20% of Macedonian, Slovakian, Greek, and Cypriot firms use e-commerce (Eurostat, 2015). A comparable picture is reported in the Middle East and North Africa region, where the volume of B2B EC transactions is relatively low, amounting to about $9 billion in 2012 (GetElastic, 2015). Indeed, transactions via e-commerce are nearly nonexistent in African and Latin American countries (Zhu and Thatcher, 2010), and

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this gap in B2B EC usage across different countries or regions is getting wider (Alsaad et al., 2018; Doong and Ho, 2012; Kyriakidou et al., 2011).

Unevenness in the diffusion of B2B EC worldwide has produced a series of studies intended to understand, manage, and predict its diffusion. An extensive body of research on this issue has significantly enhanced our understanding of how this technology is diffused among firms in a particular economy and of the role of several technological, organizational, and environmental contingencies (Alsaad et al., 2017; Sila, 2013). Beyond this, scholarly attention has recently shifted from the microscopic to the molar view as research broadens its focus to investigate how B2B EC is diffused on a global scale. This stream of research has focused on the cultural frameworks, normative systems, and regulative processes that shape the development and the usage of information systems in general and precisely in B2B EC (Teo and Srivastava, 2010; Zhu et al., 2015; Zhu and Thatcher, 2010).

Generally, most of the contributors to research on B2B EC global diffusion hold one of two distinct views. The first explores the global diffusion of B2B EC by questioning how e-commerce organizations at the country level are assisted or restricted by national institutional frameworks (NIFs). These frameworks refer to the general sociocultural, political, and legal factors, or to business-related frameworks such as the infrastructure and economic factors (Alsaad et al., 2018; Kshetri, 2001; Kshetri and Dholakia, 2002; Oxley and Yeung, 2001; Teo and Srivastava, 2010; Zhu and Thatcher, 2010). Indeed, these institutions are shaped distinctively for different countries and bear the characteristics of that society. Researchers adopting the second view understand the global diffusion of B2B EC as part of the global technological advancement (Crenshaw and Robison, 2006b; Gibbs et al., 2003; Kshetri and Dholakia, 2002). The proponents of this approach tend to exclusively view the source of organizational actions toward the adoption of B2B EC in a given country as stemming from the international context. For instance, Alsaad and Taamneh (2019) find that "cohesive trade ties between countries, as a source of coercive and normative pressures, provide a learning channel that contributes significantly to the diffusion of B2B EC globally." Likewise, competition between role-equivalent countries tends to encourage firms within those countries to imitate the B2B EC technologies used by firms in the other competitor countries (Alsaad and Taamneh, 2019). These findings are consistent with the key tenet of new institutionalism, which emphasizes the importance of coercive, normative, and mimetic pressures induced by the surrounding environment. In this article, we refer to these collectively as international institutional pressures (IIPs).

Given the distinct focus of each of the abovementioned approaches, prior models have usually made certain simplifying assumptions about the global diffusion of B2B EC, treating these assumptions as essentially invariant rather than being mutually exclusive. Alsaad and Taamneh (2019) contend that theories that fail to account for the influence of normative, political, and competitive activities in international settings take the *national* out of *international* and leave the analysis as a simple extension of market theories. In this sense, the aforementioned approaches, each for want of being sufficiently comprehensive, might bias the empirical results of prior research. Surprisingly, literature lacks breadth of research that adopts a theory-focused framework to integrate both approaches into a single model that fully accounts for the global diffusion of B2B EC. Moreover, useful as these bodies of literature are, they have surprisingly little to say about the conditions under which the pressures induced by international institutions as well as by NIFs clarify B2B EC global diffusion.

The purpose of this study is, therefore, to contribute to the literature by elucidating these areas of tension. We have done so as follows. First, we contend that the diffusion of B2B EC in a country is neither entirely due to NIFs nor uniquely a response to international pressures. Both dynamics are tightly linked and interact with each other to explain the underlining phenomenon. This effort reduces concerns for potential statistical bias induced by the omission of important variables. Second, we put forward the idea that the level of the development of an economy could determine the extent to which the diffusion of B2B EC can be explained by NIFs and IIPs. A developed economy may have previously created more ideal institutional environments that make their firms more prone to innovation. In this sense, firms operating in such an economy could be more likely to adopt B2B EC by way of the national institutional environment (NIE) rather than international pressures. In contrast, developing economies are less likely to have institutional environments that incentivize innovation, suggesting that firms in such economies are more likely to follow practices and innovations diffused globally. We also contend that the diffusion of B2B EC is not merely influenced by institutional factors. The need to enhance the capacity and efficiency of transactions in complex economies also engenders wider B2B EC diffusion. Adding all of these ideas to the existing body of knowledge and incorporating them in the proposed model increase the predictive power of our model and the accuracy of the generated results.

This study will contribute to theory by determining the effects of a more comprehensive set of the antecedents of the diffusion of B2B EC than previous studies. This will be carried out by integrating the effects of both national and international forces using the framework of institutional theory, as well as the efficiency considerations required by market complexity, an approach that has not been taken before. This will provide us with a more complete picture and a better understanding of the B2B EC diffusion process. Gorla et al. (2017) also argue that the exclusion of all these factors could lead to wrong adoption decisions and affect

organizational performance negatively. In addition, taking an integrated approach to innovation diffusion research enables us to overcome "pro-innovation" bias that is common in innovation diffusion research (Frambach, 1993).

In addition, our study will identify the extent of the significance of these antecedents across developed and developing countries within the same study, contributing to our knowledge of B2B EC diffusion based on the degree of a country's development. To the best of our knowledge, this has not been done before in that previous studies mainly focused on either developed or developing countries. Although a study by Gibbs and Kraemer (2004) involved comparisons across 10 countries, this is the first large-scale study that compares B2B EC diffusion across the two country categories at the aggregate level.

By developing and testing a more integrated framework, our study will also contribute to research in both the specific B2B EC diffusion and the general IT innovation diffusion domains. King et al. (1994) argue that neoclassical economics and organization theory are not sufficient to account for the dynamics involved in actual innovation change in the IT field. They further contend that a broader perspective is needed that derives from economic history and the new institutionalism in sociology to better understand the role of institutions in IT innovation. However, previous studies in this area have not used an integrated model where the effects of IIPs are combined with NIFs and market complexity to achieve a more holistic understanding of the global diffusion of B2B E-commerce and IT in general. Consequently, our study will lay the groundwork for conducting extension studies in this area.

Furthermore, this study will contribute to managerial understanding of the set of interrelated national and international factors that affect the diffusion of B2B—in particular, for those international organizations looking to expand their operations abroad. It will also equip policymakers with the knowledge needed to set up the required structures for the acquisition and diffusion of innovations.

Theoretical perspective

A number of previous studies have sought to understand, manage, and predict the global diffusion of e-commerce in general and B2B EC in particular (Alsaad et al., 2017; Sila, 2013). An extensive review of the relevant literature reveals that institutional theory is one of the predominant theoretical lenses used to investigate the diffusion of general information and communication technologies (ICTs) and e-commerce in particular (Alsaad et al., 2014; Robey et al., 2008). The institutional perspective suggests that social actors seeking legitimacy over efficiency accept and follow environmental institutions (DiMaggio and Powell, 1983; Scott, 1995; Teo et al., 2003). Institutions involve a set of cognitive, regulative, and normative structures that afford the social actors lines of actions or orientations, which limit and control their behavior (Scott, 1995). New institutionalists suggest that compliance with the institutions in the social actors' environment will lead to homogenized and standardized structures of behavior and practice. In terms of institutional theory, the process by which practice, behavior, and innovations become homogenized is known as *isomorphism* (DiMaggio and Powell, 1983; Mignerat and Rivard, 2009). This process is driven by conformity to three mechanisms or pressures. These include *coercive pressures* induced by the agency of influential organizations or actors, *normative pressures* brought about by knowledge-bearing professions, and *mimetic pressures* initiated in the connectedness to networks or commercial ties (DiMaggio and Powell, 1983). These mechanisms link adopters to nonadopters and induce social actors in a given population to copy systems of behavior that are widely practiced (DiMaggio and Powell, 1983; Guler et al., 2002; Matten and Moon, 2008). The study of innovation diffusion as suggested by institutionalists, whether across or within nations, needs identification and measurement of those channels and agents of diffusion (Currie, 2009; Guler et al., 2002; Henisz et al., 2005).

The application of institutional theory to understand the diffusion of e-commerce can be viewed from two perspectives. From the first perspective, researchers have emphasized the role of economic and infrastructure-related factors, sociocultural factors, and political and legal factors (Billon et al., 2009, 2010; Crenshaw and Robison, 2006a, 2006b; Demoussis and Giannakopoulos, 2006; Dewan et al., 2005; Forman, 2005; Teo and Srivastava, 2010; Zhu and Thatcher, 2010). These institutional factors represent forms of coercive or normative pressures for adoption of e-commerce. This large body of literature views the diffusion of e-commerce to be a product of nationally based institutions, which are distinct for and characteristic of every individual society. While this approach provides us with one piece of the puzzle, it neglects the institutional forces stemming from the global environment. The second view is that e-commerce diffusion is a function of global spread and transfer of innovation. Researchers have explored the prominent role of normative, cognitive, and regulatory institutions originating from the global environment on the global diffusion of e-commerce. In a recent study, Alsaad and Taamneh (2019) find that coercive pressures exercised by economically predominant countries, competition among role-equivalent countries, cohesive trade ties between countries, and globally shared knowledge among professionals significantly contribute to e-commerce diffusion.

However, as mentioned previously, only a few studies have adopted a theory-focused framework so far that considers the totality of the complex environments in which B2B EC operates; most studies use only one of the above-mentioned approaches in isolation, risking a generic, inaccurate analysis and bias in their empirical results (Weber and Kauffman, 2011).

To fill these gaps in the literature, we offer an integrated model that incorporates the two approaches into a single

theoretical model. Our model identifies three key features of NIFs that are deemed important for the diffusion B2B EC. Building upon prior work, these institutions include ICT infrastructures, governmental policies and vision, and national legal systems. NIFs refer to the systems of formal laws, procedures, regulations, customs, norms, and informal conventions that form socioeconomic activity and behavior in a particular country (King et al., 1994; Matten and Moon, 2008; Oxley and Yeung, 2001). Previous literature suggests that the diffusion of innovation in a country is largely affected by NIFs. A basic premise behind this suggestion is that firms are embedded in country-specific institutional arrangements, which either provide incentives or impose constraints that influence the ability of firms to innovate (Oxley and Yeung, 2001; Zhu and Thatcher, 2010).

In line with Alsaad and Taamneh (2019), our model also incorporates the role of coercive pressures exercised by economically predominant countries, foreign competition, and cohesive trade ties between countries to capture the institutional influences stemming from international settings. In addition, the model includes a country's level of development as a condition that determines the extent to which the diffusion of B2B EC can be explained by NIFs and IIPs. We discuss the model in more detail below.

NIFs

1. *ICT infrastructures.* ICT infrastructures are one of the most influential national institutions that determine the adoption of ICT within a country (Alsaad et al., 2018). These infrastructures offer a medium to facilitate electronic transactions. They are composed of physical and virtual resources that support the storage, processing, flow, and analysis of electronic transactions. ICT infrastructures like computer resources, Internet availability, and communications systems are highly important to handle online transactions (Durbhakula and Kim, 2011; Oxley and Yeung, 2001; Teo and Srivastava, 2010; Zhu and Thatcher, 2010). In many countries, particularly those in the developing world, the lack of ICT infrastructures is undoubtedly one of the greatest obstacles to the development and use of e-commerce among businesses in those countries. Prior research has also found that there is a positive relationship between the availability of ICT infrastructure and the adoption of e-commerce by firms in a country (Durbhakula and Kim, 2011; Oxley and Yeung, 2001; Teo and Srivastava, 2010; Zhu and Thatcher, 2010).
2. *Legal environment.* Equally important to the B2B EC diffusion within countries is the legal environment. As an NIF, the legal environment refers to a broad system of rules that govern and regulate businesses, their behavior and decisions (Oxley and Yeung, 2001; Zhu and Thatcher, 2010). A well-developed legal environment has the potential to support engagement in e-commerce transactions by both individual users and organizations. In a supportive legal environment, all parties feel confident in conducting their operations electronically without fear of being exploited and rest assured that those committing fraud can be held liable. Oxley and Yeung (2001) examine the barriers to e-commerce adoption and provide empirical evidence that a transparent, impartial, and mature legal system is vital for e-commerce adoption and development. The authors argue that a developed legal system can enhance e-commerce transaction integrity in three ways. First, the robustness of the legal system is reflected in the transparency of online behavior, which, in turn, increases users' confidence in utilizing such technology. Second, the system in place to catch and punish fraudsters facilitates the building of a reputable e-commerce environment. Third, such a strong system affects the attitude of the general public toward e-commerce and builds trust in online transactions. Thus, the availability of such a system encourages various parties to engage with and utilize the e-commerce platform.
3. *Governmental policy and vision.* Another important NIF that may play a role in diffusion of B2B EC is governmental vision and policies. Many governments have formulated policies and regulations aimed at developing e-commerce practices (Durbhakula and Kim, 2011; Zhu and Thatcher, 2010). Iacovou et al. (1995) found that governmental support was a chief determinant of the pace of e-commerce adoption in Canada. According to Fraser and Wresch (2005), actions such as government-funded training and education, reductions in telecom costs, and improvements to telecom services are vital for increasing e-commerce adoption among leading companies in the Caribbean region (Fraser and Wresch, 2005). The measures taken by the Singaporean government has helped the country rank among the world's best e-commerce performers (Mia and World Economic Forum, 2006). Among the initiatives undertaken were setting a clear national vision and strategy for e-commerce, providing training and education for citizens, and encouraging foreign companies to consider Singapore as a prime location for conducting e-commerce in Asia through tax incentives (Thatcher et al., 2006).

Differences in NIFs may bring about different levels of B2B EC diffusion. ICT infrastructures, the legal environment, and government vision and policies will facilitate a firm's ability to adopt e-commerce and ultimately increase

e-commerce diffusion. Herein, we argue that B2B EC diffusion can in part be attributed to supportive institutional frameworks that enhance firms' ability to undertake technologies that support B2B EC. Accordingly, we propose the following hypothesis:

Hypothesis 1. The level of B2B EC diffusion will be higher in countries with supportive NIFs.

IIPs

An extension of new institutionalism is the world society approach (Meyer et al., 1997). It anticipates that any firms operating in a highly interdependent international system will experience increasing isomorphism in terms of structures, practices, and behaviors due to being prompted to adopt and acquiesce to certain models considered legitimate in international society (Drori et al., 2006; Guler et al., 2002; Meyer, 2010; Meyer et al., 1997). We describe the international institutions considered important to the diffusion of e-commerce below:

1. *Coercive pressures from international institutions.* Trade between countries is one of the most important mechanisms that link a nation to its international settings and by which practices and technology between national and international spheres are transferred (Guler et al., 2002; Zhou and Park, 2012). Typically, trade between countries is manifested via powerful corporations in both countries such as multinational corporations (Guler et al., 2002). Such corporations are widely recognized as key actors in transferring these practices across home borders as they carry out these practices with the host countries' organizations (Jandhyala and Phene, 2015; Kostova, 1999; Neumayer and Perkins, 2005). This kind of technology transfer can occur in the form of coercion wherein multinational corporations impose certain procedures and standards that suppliers or subordinate firms must adopt to work with them (Alsaad et al., 2018; Zaheer et al., 2002). In the case of B2B EC, many powerful corporations have experienced considerable benefits from their use of e-commerce technologies, and there is significant evidence that multinational corporations induce their suppliers around the world to exchange data and documents using electronic means (Gibbs et al., 2003; Hara et al., 2003; Totonchi and Manshady, 2012). As multinational corporations are engaged in transactions with several suppliers around the world, they contribute to the rationalization and normalization of new practices throughout the global economy.
2. *Competitive pressures posed by foreign competition.* Intense competition within the international arena is another factor that contributes to technology diffusion across national boundaries (Gertler, 2001; Guler et al., 2002; Henisz et al., 2005; Neumayer and Perkins, 2005). This stems from the fact that firms compete over import and export markets at an international level, exposing local firms to new ideas to achieve higher profits and performance and to new technologies and practices adopted by foreign competitors (Cao and Prakash, 2011; Gertler, 2001; Guler et al., 2002; Jandhyala and Phene, 2015). To secure critical market resources, local firms are more likely to imitate the practices of competing firms that are highly reputed in the global market. There is also evidence that actors competing for the same market resources adopt similar patterns of behavior and practices to their peers even if such practices may not be the best for their own welfare (DiMaggio and Powell, 1983; Lieberman and Asaba, 2006; Teo et al., 2003). An example of this mimetic behavior across countries is some large Japanese companies that induced their trading partners in East Asia to adopt B2B EC, imitating the American companies with which they were in competition (Hara et al., 2003; Totonchi and Manshady, 2012). Thus, competitive pressures within international markets may trigger the adoption of B2B EC technologies to improve efficiency as firms gain new insights into the performance and revenues of other competing firms (Cao and Prakash, 2011; Guler et al., 2002; Henisz et al., 2005).
3. *Normative pressures from global cohesive trade relationships.* A basic notion of new institutionalism is the awareness that proper practices and behaviors are socially constructed (DiMaggio and Powell, 1983; Meyer et al., 1997; Meyer and Rowan, 1977). There is evidence that trade facilitates international technology diffusion by giving local firms access to new technologies incorporated in imported machinery and equipment and by allowing them to reverse engineer products produced abroad (Hoekman and Javorcik, 2006; Keller, 2004). Exporting can also encourage technology adoption and improvement (Hoekman and Javorcik, 2006), but evidence from micro data connecting exporting to learning effects is weaker (Keller, 2004; MacGarvie, 2006).

The existence of a cohesive trade relationship between two firms in different countries contributes to the exchange of social values, common practices and behaviors, knowledge, and technologies, which are key factors in developing common sociocultural values for these firms. Moreover, shared norms are subsequently developed and similar patterns are adopted for B2B EC usage in these countries (Gibbs et al., 2003; Kshetri and Dholakia, 2002). The close interaction of two countries will stimulate knowledge exchange and congruent legitimated models. Consequently,

there is the possibility that the behavior of the firms of two countries operating under similar conditions will be alike (Guler et al., 2002; Jandhyala and Phene, 2015). In this sense, it can be argued that the transfer of B2B EC knowledge and experience is accomplished through cohesive trade relationships between two countries. However, developing countries, which are farther from the technological frontier, benefit more from these relationships by adopting the new foreign technologies embedded in the intermediate goods they import. On the contrary, developed countries, which are close to the technological frontier, grow by developing new technologies through R&D (Santacreu, 2015). International trade, especially with developed countries, also emboldens a country to employ ICT as a tool for coordinating its transactions with its trading partners (Liu and San, 2006). Technology diffusion is particularly faster in countries with more open trade policy regimes (Liu and San, 2006; Pissarides, 1997; Reppelin-Hill, 1999). Accordingly, we posit the following hypothesis:

Hypothesis 2. The level of B2B EC diffusion will be higher in countries that experience high IIPs.

The complexity of markets

As discussed above, new institutionalism suggests that innovation diffusion may take place in an institutional context where gaining legitimacy is an imperative valued over efficiency. This view disregards the rationale whereby innovation diffusion takes place within a technical context wherein organizations are remunerated for effective and efficient work processes (Alsaad et al., 2018; Guler et al., 2002). As this study is designed to provide an integrated model to explain the diffusion of B2B EC, we have also included the efficiency motive. Since efficiency is an imperative for firms working in complex markets, it is logical to argue that the propensity for B2B EC diffusion increases in complex markets. Such markets form a system of commercial relationships between participating parties including customers, suppliers, and support agencies (Coviello and Munro, 1995; Wong et al., 2015), who are forced to exert extra efforts and costs for coordinating and planning market relationships. For example, some of the previous empirical studies that tested the effects of complexity on IT found that top managers, in highly complex environments, were more likely to realize the significance of IT (Kearns and Lederer, 2004; Kearns and Sabherwal, 2007).

With increased complexity of the market, uncertainty for supply chain decision-makers increases (Drees and Heugens, 2013; Wong et al., 2015); there are higher information processing needs, and adoption of effective market mechanisms for such environments becomes a must. Since supply chain partners must share proprietary information to design and produce complex and customized products (Bensaou, 1999; Novak and Eppinger, 2001) and since demand for these products is not certain (Saeed et al., 2005), supply chain partners are faced with more pressure to have closer collaboration to reduce coordination costs (Closs et al., 2008). As a result, actors working in multifaceted markets conditions often obtain B2B EC benefits such as tighter information processes and linkages between partners, thus increasing control and reducing processing time and errors (Alsaad et al., 2015; Dong et al., 2009; Kurnia et al., 2015; Shi and Liao, 2015). Therefore, we would expect B2B EC diffusion to be higher for market economies with more complex market conditions.

Hypothesis 3. The level of B2B EC diffusion will be higher in countries that have complex markets.

The differences between developed and developing economies

While both national-based institutions and international institutions are equally important to understanding the diffusion of e-commerce, we contend that the influence of these institutions differ as per the level of the respective country's development. Many countries around the world are striving to improve the innovativeness of their economies by developing and (re)designing appropriate NIFs, including their technological infrastructures, policies and regulations, and legal environment that promote innovative activities. This suggests that a firm's success in innovation in a particular country is linked to the existence of institutional frameworks within that country that promote and facilitate innovativeness (Oxley and Yeung, 2001).

According to Hempel and Kwong (2001), emerging or non-western economies such as those in Asia face various challenges in setting up electronic marketplaces, since they deal with a very different business context, mainly due to their less developed financial, physical, and legal infrastructures. They also have different business attitudes and cultures, as well as a lack of basic business services that are readily available in developed countries. The authors conducted a case study of a B2B marketplace in China, which provided evidence for these arguments. Other countries such as Singapore and Sweden have successfully developed institutional frameworks that are advancing e-commerce usage among businesses in their countries (Chinn and Fairlie, 2006; Kshetri, 2001; Mia and World Economic Forum, 2006). This suggests that firms operating in a country that demonstrates, enables, and rewards innovation are more likely to adopt e-commerce and reach a high level of e-commerce usage. On the contrary, developing countries are less likely to provide an institutional environment that incentivize innovation. Indeed, firms in such economies are more likely to be influenced by external institutions in the adoption and diffusion of practices and innovations. Accordingly, we predict the following:

Hypothesis 4A. In developed countries, the level of B2B EC diffusion will be determined more by NIFs and the motive of achieving greater efficiency than by international institutions.

Hypothesis 4B. In developing countries, the level of B2B EC diffusion will be determined more by international institutions than by NIFs.

Methodology

This study utilizes archival data to examine the proposed hypotheses. Archival data offers several advantages over other data types including the capacity to generalize the results arising from larger datasets, easy reproducibility (Kiecolt and Nathan, 1985; Krishnan et al., 2013), and robustness to common method bias (Krishnan et al., 2013). Cross-sectional data from 146 countries for the period between 2013 and 2016 has been used to examine the hypotheses. A multiyear coverage provides more stable and accurate estimates than single-year datasets (Krishnan et al., 2013). In this study, we have followed the examples of previous studies examining e-government, e-business, and corruption, among other subjects. The primary sources of data used were the Global Information Technology Report (GITR; World Economic Forum, 2016), the UN Statistics Division's (UNSD) Comtrade database (Comtrade, 2015), the International Monetary Fund's (IMF) World Economic Outlook database (IMF, 2017), and the Global Competitiveness Index (GCI) Report (World Economic Forum, 2015).

Measurements and operationalization

Dependent variable

B2B EC diffusion is taken at country-time level to represent the dependent variable. In this study, we define the diffusion of B2B as the extent to which B2B EC technologies are used in the processes and operations of organizations in a particular country. This definition is in line with the operational definition prevailing in diffusion research (Jeyaraj et al., 2006; Mohamad and Ismail, 2009). In this study, we obtained data for 146 countries from the GITR (World Economic Forum, 2016) over a 3-year period (2013–2016) and measured the diffusion of B2B EC for each country i at a time t. This report includes aggregated annual data on the extent of ICT usage for conducting B2B transactions within organizations in a given country. This survey used a 7-point Likert-type scale, where 1 denotes "not used at all" while 7 denotes "used to great extent."

Independent variables

We have three independent variables: the NIFs, IIPs, and complexity of markets (MC). We constructed the first two variables from several components using principal component analysis (PCA). Our reason for this decision is based on the following grounds. Institutional theories define environment—either national or international—as an integrated set of social, political, legal, and economic conventions that form the base of a productive business environment (Lai et al., 2006; Oxley and Yeung, 2001). In this definition, a supportive environment for innovation diffusion is derived from multiple components. As in the case of the NIE, Oxley and Yeung (2001) suggest that a supportive environment is a product of ICT infrastructure, legal environment, and governmental policy, and vision. Meanwhile, the international environment that facilitates technology transfer is composed of several international coercive, normative, and competitive pressures. However, prior research has modeled these components as separate independent variables influencing the diffusion of innovation. The findings of prior research have acknowledged that these components are distinct yet interrelated and that they co-vary (Hossain and Quaddus, 2014). This suggests a high possibility of multicollinearity, which causes instability in the estimated coefficients. Therefore, to model the contribution of external environments to innovation diffusion, an integrated set of components should be considered together. We therefore posit two composite variables that summarize the component variables' variation into a single index. The first construct is the NIE, which captures the NIF components including ICT infrastructure, legal environment, and governmental policy and vision; the second construct is IIPs, which captures all related components including the coercive pressure of international institutions, pressures from foreign competition, cohesive trade relationships, and globally shared knowledge among professionals. We construct the abovementioned variables using PCA. PCA is useful to select those variables that contain the most variation in a data set and to remove any redundancy in the data set. PCA summarizes the major variations existing in several dimensions into a reduced number of uncorrelated dimensions. The results of the PCA are described in the data analysis section. A detailed description of the measurement of the components mentioned above and other variables is presented below.

1. *ICT infrastructure (ICTI)*. We employed the infrastructure index as assessed by the GITR (World Economic Forum, 2016) to examine the role of ICT infrastructure. In the GITR, the infrastructure pillar captures the development of ICT infrastructures (including mobile network coverage, secure Internet servers, international Internet bandwidth, and electricity production; World Economic Forum, 2016). The data were obtained from the report for 2013–2016 wherein the ICT infrastructure pillar is assessed using a 7-point scale (1 = "not developed at all"; 7 = "extremely well developed").

2. *Legal environment (LE).* We measured the legal environment by how developed a country's laws are relating to the use of ICTs (e.g. e-commerce, consumer protection, digital signatures). The data were obtained from the GITR for 2013–2016 and assessed using a 7-point scale (1 = "not developed at all"; 7 = "extremely well developed").
3. *Governmental policy and vision (GPV).* We measured governmental policy and vision by the extent to which the country's government has a clear implementation plan for utilizing ICTs to improve the country's overall competitiveness. The data were obtained from the GITR for 2013–2016 wherein it was assessed using a 7-point scale (1 = "not at all"—"there is no plan"; 7 = "to a great extent"—"there is a clear plan").
4. *Coercive pressure of international institutions (CPII).* In line with Guler et al. (2002), we measured the coercive effect of international institutions by the value of inward foreign direct investment (FDI) stock. Guler et al. (2002) noted that FDI depends almost entirely on the presence of foreign multinationals and thus is a good predictor for the coercive effect of the presence of foreign multinationals. The data were obtained from the UN World Investment Report for 2013–2016.
5. *Pressures from foreign competition (PFC).* This variable is measured based on the level of intensity of foreign competition as reported by GCI for 2013–2016. GCI reports an index that provides an indication of the extent of foreign competition for each country listed in the report. The index is based on a 7-point scale (1 = "not intense at all"; 7 = "extremely intense").
6. *Cohesive trade relationships (CTR).* Following the example of Guler et al. (2002), we developed a construct to predict to how strong one country's ties to others are, and to what extent B2B EC has already diffused within the other countries. Thus, this construct focuses on a country's trade relationships with countries that use B2B EC, not on the offline trading channels that may exist between these countries. Bilateral trade is expressed in equation (1) where $B2B\ EC\ adoption_{j,t-1}$ expresses B2B EC adoption level in country j at time $t-1$; $Trade_{ij}$ denotes country i's trade (as import and export) to country j at time $t-1$; and $Trade_{i}$ denotes country i's total trade volume at time $t-1$. For this component, we obtained bilateral trade data from the UNSD's Comtrade database (Comtrade, 2015)

$$Country\ trade\ cohesion_{it} = \sum_{j} B2B\ EC_{j,t-1} \times \left(\frac{Trade_{ij,t-1}}{Trade_{i,t-1}} \right) \quad (1)$$

7. *Market complexity (MC).* To capture the magnitude of market complexity, we follow Drori et al. (2006) and use total imports and exports as a proportion of gross domestic product (GDP). The larger a country's volume of imports/exports, the more likely that the country has complex patterns of relationship with other parties and the larger the number of products it is expected to have. The quantity of imports and exports for each country i at a time t was taken from UNSD's Comtrade database (Comtrade, 2015).
8. *Country development level.* We distinguish countries' development based on their general level of political and economic development, as measured by the gross national income provided by the World Bank for each country. Countries are classified into developed countries (high-income group) and developing countries (middle- and low-income groups) based on the World Bank's criteria.
9. *Control variables.* Country-level control variables for this study model were based on Internet access and economic development. Countries with a high level of Internet access tend to have firms which experience more e-commerce technology usage. Data were obtained from the GITR to measure Internet access, valued as the percentage of households with home-based Internet access. We also utilized GDP per capita as a means of measuring the economic development level of a country. GDP values were obtained from the IMF's World Economic Outlook database (IMF, 2017). However, since there was a high correlation between GDP and Internet access ($R = 0.771$) and a high correlation between Internet access and ICTI ($R = 0.91$), we removed these control variables to avoid multicollinearity. Finally, since industry impacts B2B EC adoption (Malone et al., 1987; Son and Benbasat, 2007), for each one-digit standard international trade classification (SITC) level—except industry category number 9[1]—we created a variable that accounts for the trade share of country *i* for each industry category as proportional to country 's total trade. We initially used industry as a control variable, but since it increased multicollinearity to an unacceptable level, we excluded it from the model.

Out of 585 observations made for 146 countries over 3 years (2013–2016), the final sample considered for analysis was 475 after dropping all observations with missing values. The descriptive statistics are shown in Table 1.

Data analysis and discussion of results

Initially, we performed PCA to construct the NIE and IIPs. In a PCA, the number of components extracted is similar to

Table 1. Descriptive statistics.

Variable	Mean	SD	1	2	3	4	5	6	7	8	9
GDP (1)	16,603.99	20,807.47	1								
Internet access (2)	42.02	31.24	0.772**	1							
LE (3)	4.01	0.91	0.700**	0.747**	1						
GPV (4)	3.97	0.79	0.492**	0.449**	0.805**	1					
ICTI (5)	4.20	1.50	0.794**	0.910**	0.778**	0.459**	1				
CTR (6)	3.56	0.80	0.255**	0.320**	0.253**	0.149**	0.301**	1			
PFC (7)	4.62	0.67	0.511**	0.544**	0.681**	0.526**	0.582**	0.156**	1		
CPII (8)	−1,520,000,000	28,100,000,000	0.087	0.100*	0.02	0.007	0.105*	−0.001	0.022	1	
MC (9)	230,000,000,000	538,000,000,000	0.321**	0.312**	0.327**	0.207**	0.341**	0.148**	0.114*	−0.035	1

GDP: gross domestic product; LE: legal environment; GPV: governmental policy and vision; ICTI: information and communication technologies infrastructure; CTR: cohesive trade relationships; PFC: pressures from foreign competition; CPII: coercive pressure of international institutions; MC: market complexity.
*Correlation is significant at the 0.05 level (two-tailed).
**Correlation is significant at the 0.01 level (two-tailed).

Table 2. Results of the principal component analysis for components of the national environment.

Component	Eigenvalue	Difference	Proportion	Cumulative
PC1	2.372	1.83	0.7908	0.7908
PC2	0.540	0.454	0.1803	0.9711
PC3	0.087		0.0289	1.00
Principal components (eigenvectors)				
Variable		PC1	PC2	PC3
LE		0.63	−0.0217	−0.7746
GPV		0.55	−0.688	0.4703
ICTI		0.54	0.7254	0.4228

PC: principal component; LE: legal environment; GPV: governmental policy and vision; ICTI: information and communication technologies infrastructure.

the number of observed variables being analyzed. Typically, the first principal component (PC1) resulting from the analysis is the best synthetic indicator of the range of variability of the variables considered. The PC1 can be considered a kind of synthetic index that condenses or combines, in a single variable, the consistent information originally spread over the multiple variables. To make sure that the PC1 accounts for most of the variance in the postulated data set, we examine the eigenvalues for each component produced by the PCA. We analyzed the components of national environment and international environment separately. The results are presented in Tables 2 and 3, respectively. With regard to national environment, the eigenvalue of the PC1 was significantly above the cutoff (eigenvalue >1); meanwhile, the eigenvalues of the other components fell below the threshold. Since PC1 accounted for a large percentage of the variance (79.1%) in the data set, we retained it to represent the NIE. For the international environment, the PCA indicated that two of the resulting factors have eigenvalues greater than 1. PC1, PC2, and PC3 account for 38.4%, 33.3%, and 28.1% of the variance in the data set, respectively. This suggests that each variable related to the international environment explains unique variance in the data set and that it is not reasonable to merge these variables into a single factor. Therefore, we retained the original variables to account for all of the variance in the IIPs.

Since this study employed a multi-nation panel data, we utilized panel analysis to capture unobserved heterogeneity and country-specific effects. We used the Hausman test to select the appropriate estimator by comparing the fixed- or random-effects estimation models. The results indicated that the fixed-effect estimator is more appropriate. Moreover, we evaluated the assumptions of normality and heteroscedasticity. The normality assessment indicated that CTR, CPII, and MC were not normally distributed. We utilized the two-step approach for transforming continuous variables to normal, which involves transforming the prospective variable into a percentile rank and then applying the inverse-normal transformation to the result in the first step (Templeton, 2011). By doing so, the transformed variables become normally distributed. The transformed values were then used in the subsequent analysis. In addition, White's test for heteroscedasticity does not provide support for constant variance. To deal with this issue, we analyzed our models with robust standard errors. Robust standard errors overcome limitations inherent when the assumptions of errors independence is violated (Lin and Wei, 1989).

Four models have been used to examine our hypotheses. The first model is the full model, which estimates the suggested model using the full data. The second and third models are designed to examine the determinants of B2B EC diffusion according to the level of a country's development (measured by a country's gross national income). The last model examines whether the differences between developing countries and developed are significant using interaction strategy. More specifically, we first created a dummy variable called Developed that was coded 0 for developing countries and 1 for developed countries. We then created an

Table 3. Results of the principal component analysis for components of the international environment.

Component	Eigenvalue	Difference	Proportion	Cumulative
PC1	1.15	0.15	0.3847	0.3847
PC 2	1.00	0.15	0.3335	0.7181
PC3	0.85		0.2819	1
Principal components (eigenvectors)				
Variable	PC1	PC2	PC3	
CTR	0.700	−0.142	0.700	
PFC	0.094	0.990	0.106	
CPII	0.700	−0.142	0.700	

PC: principal component; CTR: cohesive trade relationships; PFC: pressures from foreign competition; CPII: coercive pressure of international institutions.

interaction term between Developed and each predictor. This practice allows a researcher to include the interaction term and the dummy variable in the regression model as independent variables. In this way, the coefficient of the interaction term displays the differences between the coefficients of developing and developed countries. If the coefficients of the interaction terms are statistically significant, then there are statistically significant differences between developed and developing countries (Cox, 1984; Overton, 2001).

We considered all of the abovementioned models to evaluate the true effect of the postulated variables. This helped us rule out the alternative explanations. Panel analysis results are presented in Table 4. As shown in the table, the positive and significant coefficient ($\beta = 0.212$, $p < 0.01$) for the reported NIE in the full model indicates that NIE is positively correlated with B2B EC diffusion in a country. This result provides empirical support for Hypothesis 1. It also suggests that variations in NIFs across diverse countries may bring about different levels of B2B EC diffusion across these countries. Supportive ICT infrastructures, legal environment, and government vision and policies will facilitate a firm's ability to adopt e-commerce and thus increase B2B EC diffusion. This finding is consistent with the findings of prior research that argued for the importance of NIFs for the diffusion of e-commerce (Durbhakula and Kim, 2011; Oxley and Yeung, 2001; Teo and Srivastava, 2010; Zhu and Thatcher, 2010).

Our results also provide support for the effects of CTR ($\beta = 0.070$, $p < 0.05$) and PFC ($\beta = 0.342$, $p < 0.01$). The positive and significant coefficients for the reported CTR and PFC in the full model indicate that CTR and PFC are positively correlated with B2B EC diffusion in a country. This suggests that international forces might affect national practices as far as B2B EC is concerned. Integration of countries into international systems often involves the adoption of B2B EC by firms in these countries as a response to market demands induced by international society. Our results also indicate that competitive and normative pressures are important mechanisms when considering social change and technology transfer as they facilitate B2B EC diffusion in different countries. This finding is consistent with the world society perspective which predicts that countries embedded and operating in highly interdependent international systems will be increasingly prompted to adopt and isomorphically acquiesce to legitimate models of international society (Drori et al., 2006; Guler et al., 2002; Meyer, 2010; Meyer et al., 1997). The result is also in line with empirical findings of prior research (Cao and Prakash, 2011; Prakash, 2007; Prakash and Potoski, 2006). Unexpectedly, the effect of CPII was nonsignificant ($\beta = 0.008$, $p > 0.05$), suggesting that CPII does not affect the diffusion of B2B EC in different countries. CPII may only play a positive and significant role in the diffusion of B2B EC when this technology has not yet been strongly institutionalized. If the B2B EC technology was highly institutionalized, one would expect companies not to force their business partners to conform because they would voluntarily adopt B2B EC simply because it is taken for granted as the legitimate and appropriate way of conducting business in the industry (Hertwig, 2012). Accordingly, Hypothesis 2 was partially supported.

Results for Hypothesis 3 reveal that MC has a significant effect on B2B EC diffusion. As shown by the positive and significant coefficient ($\beta = 0.378$, $p < 0.01$) associated with MC, which provides support for Hypothesis 3, this result suggests that the rationalization of B2B EC in a country is largely driven by the increasing development of complex economic structures. Such complexity entails the rationalization of B2B EC so as to enhance capacity and efficiency. This finding is in agreement with the key tenet of economic rationalistic models of innovation that emphasize the technical efficiency and capability of technology to rationalize e-commerce (Alsaad et al., 2018). This result is comparable with the outcomes of Alsaad et al. (2018), which highlights that the use of B2B EC increases when businesses in a country are more involved in complex interfirm transactions across countries.

In addition, the differences in the effects of NIE ($\Delta\beta = 0.081$, $p > 0.05$), CTR ($\Delta\beta = -0.103$, $p > 0.05$), and PFC ($\Delta\beta = -0.071$, $p > 0.05$) on B2B EC diffusion across developed and developing countries were nonsignificant.

Table 4. Results of the panel analysis with fixed effect estimator.

Independent variable	Overall model N = 475	Developed countries model N = 123	Developing countries model N = 252	Differences	VIF
	Coefficient (SE)				
NIE	0.212*** (0.054)	0.281*** (0.101)	0.200*** (0.064)	0.081^{ns} (0.199)	2.39
CTR	0.070** (0.033)	−0.021^{ns} (0.052)	0.082** (0.040)	−0.103^{ns} (0.066)	1.91
PFC	0.342*** (0.108)	0.299* (0.166)	0.370** (0.149)	−0.071^{ns} (0.222)	1.42
CPII	0.008^{ns} (0.011)	−0.0126^{ns} (0.009)	0.069*** (0.026)	−0.082*** (0.026)	1.13
MC	0.378** (0.146)	0.793*** (0.229)	0.315* (0.176)	0.478* (0.287)	1.04
_cons	3.285*** (0.501)	3.106*** (0.730)	3.210*** (0.692)	–	–
Adjusted R^2	0.70	0.45	0.50	–	–

SE: standard error; NIE: national institutional environment; CTR: cohesive trade relationships; PFC: pressures from foreign competition; CPII: coercive pressure of international institutions; MC: market complexity; VIF: variance inflation factor.
*Coefficient is significant at the 0.1 level (two-tailed).
**Coefficient is significant at the 0.05 level (two-tailed).
***Coefficient is significant at the 0.01 level (two-tailed).
^{ns}Nonsignificant.

Nevertheless, the effect of NIE was slightly higher in developed countries as compared to developing countries ($\beta_{\text{Developed countries}}=0.281$, $p<0.01$; $\beta_{\text{Developing countries}}=0.200$, $p<0.01$). The effect of PFC was slightly higher in developing countries as compared to developed countries ($\beta_{\text{Developed countries}}=0.299$, $p<0.1$; $\beta_{\text{Developing countries}}=0.370$, $p<0.05$). CTR was a significant predictor in developing countries but not in developed countries ($\beta_{\text{Developed countries}}=-0.021$, $p>0.05$; $\beta_{\text{Developing countries}}=0.082$, $p<0.05$). The results also revealed that the effect of CPII and MC significantly differed across developed and developing countries. The effect of CPII was significantly higher in developing countries as compared to developed countries ($\beta_{\text{Developed countries}}=-0.0126$, $p>0.05$; $\beta_{\text{Developing countries}}=0.069$, $p<0.01$; $\Delta\beta=-0.082$, $p<0.01$). Meanwhile, the effect of MC was significantly higher in developed countries as compared to developing countries ($\beta_{\text{Developed countries}}=0.793$, $p<0.01$; $\beta_{\text{Developing countries}}=0.315$, $p<0.01$, $\Delta\beta=0.478$, $p<0.1$). These results suggest that the diffusion of B2B EC in developed countries is more likely to be influenced by NIE, PFC, and MC. Meanwhile, the diffusion of B2B EC in developing countries is more likely to be influenced by national and international institutions as well as MC. Accordingly, Hypothesis H4 was partially supported.

Robustness check

Relying on the time-oriented dataset compiled here risks producing results that suffer from endogeneity problems thus undermining theory testing. In particular, the dependent variable (B2B EC diffusion) might have unnoticed correlational links with the error terms of independent variables (IIP, MC, NIP, or CPII). Endogeneity might happen as a result of hidden variables that play a role in the studied relationships in the theorized research model or because of the existence of bidirectional relationships. Theoretically speaking, the possibility that any of these two factors may have an effect on the results casts doubts on the robustness of the theoretical extensions provided by this study. To guard against this possibility, the authors utilized the two-stage least squares (2SLS) method. Accordingly, exogenous variables that might exhibit correlations with error terms are swapped with instrumental variables. It is worth noting that the later kind of variables should be uncorrelated with the error term of the endogenous variable and correlated with the omitted exogenous variable. The 2SLS estimation was done using the Internet variable as the instrumental variable. Results obtained (Table 5) show a slight difference between 2SLS results and baseline results. Accordingly, we can claim that our results are robust against endogeneity problems.

Discussion and implications

In general, our findings show that with the exception of CPII, NIFs and IIPs have significant positive and substantial effects on the diffusion of B2B EC in the 2013–2016 period. The key finding of this study is that both NIFs and linkages

Table 5. Results of the 2SLS estimation of the full model.

Independent variables	Coefficient	SE	z	$p>z$
NIE	0.214	0.041	5.230	0.000
CTR	0.072	0.033	2.140	0.032
PFC	0.341	0.082	4.150	0.000
CPII	0.008	0.015	0.550	0.583
MC	0.376	0.127	2.960	0.003
_cons	3.288	0.379	8.680	0.000

NIE: national institutional environment; CTR: cohesive trade relationships; PFC: pressures from foreign competition; CPII: coercive pressure of international institutions; MC: market complexity; SE: standard error; 2SLS: two-stage least squares.

to world society contribute to the diffusion of B2B EC in countries around the world. NIFs can offer companies the opportunity to undertake B2B EC and can sometimes compel them to do so. In line with the findings of some of the previous studies (e.g. Chen, 2003), supportive NIFs, including ICT infrastructure, legal environment, and governmental policy and vision, will facilitate the diffusion of B2B EC in both developed and developing countries. Since developing countries tend to have less supportive NIFs, the diffusion of B2B EC in these countries is more likely to occur in response to external pressures including competitive pressures and cohesive trade relationships.

The effect of PFC on the diffusion of B2B EC is significant in both developed and developing countries. This result for developed countries is consistent with the finding of Oliveira and Martins' (2010) study of B2B e-adoption in 2459 firms belonging to EU27 countries across two industries, who found that competitive pressure was a significant driver. However, within a developing country context, Zhu et al.'s (2014) study of Chinese firms indicated that although pressure from competitors did not drive a firm's B2B EC usage, pressure from business customers did. The latter finding was also supported by Tan and Ludwig's (2016) study of regional adoption of B2B EC in China.

Moreover, our results confirm that interaction with global society through embeddedness in cohesive trade relationships and FDI affects the diffusion of B2B EC in developing countries, which agree with the findings of Shih et al. (2008). Such interaction induces firms in a local county to adopt B2B EC in the form of demands, standards, and procedures exercised by various international institutions. This finding also provides support, to some extent, to the view that business relationships with other economies offer opportunities to be influenced by, interact with, and learn from practices prevailing in foreign countries.

Our framework also accounted for the rational view of innovation by investigating the role of MC. MC was found to be an influencing factor to the diffusion of B2B EC in all models. The diffusion of B2B EC is principally a consequence of endogenous MC in both developed and developing countries. For the sake of efficiency, actors operating in complex markets will recognize the advantages of adopting B2B EC technologies. This agrees with the finding of Sila and Dobni (2012) who, using Canadian data, reported that e-leaders (companies with the highest level of B2B EC usage and integration) operated in complex markets.

Overall, the findings of this study offer several implications for both theory and practice.

Theoretical and research implications

These findings extend theoretical research in this area by showing that NIFs, IIPs, and MC are all important antecedents influencing the diffusion of B2B EC within countries. They also demonstrate that these variables of B2B EC differ according to the degree of the country's economic advancement. Our account of these variables moves the discussion further away from traditional functionalist explanations emphasizing the fundamental importance of endogenous factors such as NIFs. It also offers a shift away from essentialist explanations, such as those assuming that the diffusion of B2B EC is basically driven by social and market complexity within a country. Our analysis reveals that in contemporary conditions, involvement in the general web of international commercial contacts inspires commitment to the prevailing models of B2B EC used in global business. Therefore, the diffusion of B2B EC is neither entirely accounted for by NIFs, MC, or IIPs. This integrated framework can also be extended to the analysis of the diffusion of other ICTs and innovations such as e-government and social media, where the analysis of the set of diffusion factors and contextual factors used in previous studies is still not comprehensive.

Furthermore, our comparison between developed and developing countries contributes to theory by suggesting that some of the determinants of B2B EC differ according to the degree of a country's economic development. Future research on B2B EC diffusion should take these differences into consideration so as to increase the generalizability and accuracy of results.

Our study also highlights the importance of considering the environment as an integrated set of components. This provides the ability to theorize about the environment at a high level of abstraction instead of considering each element alone. This also accounts for the overlap between the various components of an environment and reduces concerns regarding several methodological issues such as multicollinearity and bias of omission.

Managerial implications

Our findings also provide several implications to practitioners. First, since e-commerce in general and B2B EC in particular has an immense impact on the global economy, and due to the fact that such technology has changed the way organizations and countries do business, policymakers in the countries studied and especially in developing ones are encouraged to offer a business environment that facilitates the proliferation and adoption of B2B commerce. This could be achieved for instance by developing the required structures to facilitate the acquiring and transfer of innovation. The need for effective action to overcome such obstacles has been documented by previous studies in developing countries such as Costa Rica, the Dominican Republic, India, Armenia, China, and Nepal (Travica, 2002), as well as Iran (Mohtaramzadeh et al., 2018). Moreover, the country's education system could be utilized to increase people's awareness of the importance of B2B EC. Second, the level of international B2B trade has reached unprecedented levels and is expected to continue rising. Therefore, for international organizations pursuing the expansion of their operations abroad, this research provides useful information regarding the current state of B2B EC diffusion and the interrelated national and international factors driving such diffusion.

Research limitations and suggestions

This research carries a number of limitations that may trigger future researchers' interest in building on the work carried out here. For instance, both national and international institutions are focal points of interest here; however, little attention is given as to how B2B EC translates to different contexts around the world. Findings support the notion that firms' ability to respond to international pressures is likely to become more limited in case of domestic adjustment. Therefore, future research should study the factors that hinder the full absorption of B2B commerce in a given country, such as political, financial, education and labor, and cultural environments, market orientation, as well as characteristics of its industries—factors which characterize that particular national context. By doing so, we can develop a clearer picture of what drives and impedes B2B EC diffusion. Some of the previous empirical research on B2B EC adoption (e.g. Sila, 2013) and innovation diffusion (e.g. Zhu et al., 2006) also showed that these phenomena could be better understood by the inclusion of various contextual factors.

Another interesting idea that future research in this area could pursue is the effect of time on the mechanisms of isomorphism. Several IT researchers (e.g. Mignerat and Rivard, 2005; Robey and Boudreau, 1999; Zucker et al., 1989) emphasized the importance of the time dimension in institutional analyses. Contemporary institutional theory exhibits a logic of opposition (in contrast to a logic of determination), which explains organizational change by analyzing forces that both facilitate and impede change. Organizations respond to these forces with various strategies to maintain their legitimacy. The interplay between such opposing forces can best be understood by using a longitudinal research design (Mignerat and Rivard, 2005; Robey and Boudreau, 1999). In addition, given that the adoption of B2B EC is not a one-shot process and involves several stages (e.g. see Banerjee and Ma, 2012; Chan et al., 2012), we argue that in an uncertain environment that offers little information about a given innovation, organizations tend to mimic such innovation despite the lack of sufficient information. On the contrary, when an innovation is dominant in a particular context and the norms of the new innovation have been set, which happens in the early stages of diffusion, organizations find themselves in a position wherein they are obliged to adopt such innovation. In general, previous research has omitted the effect of time on isomorphism and the stages of innovation diffusion.

Conclusion

This study was designed to provide an integrated model describing the diffusion of B2B EC at country level. It also investigated how the suggested determinants vary according to the degree of a country's development. Grounded in both a new institutionalist and world society perspective, we examined the effects of both the pressure from NIFs and the pressures from international institutions. We considered ICT infrastructure, legal environment, and governmental policy and vision as integrated components to model the effect of NIFs. We furthermore considered the pressures from foreign competition, cohesive trade relationships, and globally shared knowledge among professionals to model the effect of IIPs. Along with the institutional pressures mentioned above, our framework examined the effect of MC so as to include the rational view of innovation diffusion in our model. The findings supported all of the four hypotheses, suggesting that NIFs, IIPs, and MC contribute positively to B2B EC diffusion and that the influence of these variables on diffusion varies according to the degree of a country's development. Overall, this research provides strong contributions to the field by developing and testing a more integrated theoretical model than previous studies to enhance our understanding of the global diffusion of B2B e-commerce and of innovation diffusion in general. Thus, it lays the groundwork for future research and theory development in this area.

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Note

1. "Standard International Trade Classification (SITC) includes 10 broad industries that are 0—Food and live animals; 1—Beverages and tobacco; 2—Crude materials, inedible, except fuels; 3—Mineral fuels, lubricants, and related materials; 4—Animal and vegetable oils and fats; 5—Chemicals; 6—Manufactured goods classified chiefly by material; 7—Machinery and transport equipment; 8—Miscellaneous manufactured articles; 9—Commodities and transactions not classified elsewhere in the SITC.

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