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Abstract

Compared to business-to-consumer (B2C) e-commerce, business-to-business (B2B) e-commerce is larger, growing faster and has less unequal geographical distribution globally. In this paper, we examine the current stage of B2B e-commerce development across four global regions and propose a model to explain the magnitude and global distribution of B2B e-commerce activities. Our analysis indicates that increase in the freedom of the movements of goods, services, capital, technology and people coupled with rapid technological development resulted in an explosion of global B2B e-commerce. In fact, globalisation has higher impact on B2B e-commerce than on B2C e-commerce. Likewise, the relative advantage and result demonstrability of e-commerce technologies are higher for organizations than for individuals. Geographical distribution of B2B e-commerce, on the other hand, is influenced by economic factors such as firm size, the availability of venture capital and credit, and technological and logistical infrastructure; political factors such as governments' macroeconomic linkages, tariff and non-tariff barriers, and emphasis on human capital development; the support provided by international agencies; and cultural factors.

Keywords: Globalisation, B2B e-commerce, FDI, MNC, technology

Introduction

Compared to business-to-consumer (B2C) e-commerce, business-to-business (B2B) e-commerce is larger, growing faster and has less unequal geographical distribution globally. An estimate suggests that B2B e-commerce accounted for 80 % of all e-commerce in 2000 and the proportion would increase to 87 % by 2003 (Nua Internet Surveys 2000a). Another study by Gartner Group indicated that the worldwide B2B e-commerce market registered a 189 % growth in 2000, reaching US$ 433 billion, and is estimated to reach US$ 919 billion in 2001, US$ 1.9 trillion in 2002, US$ 3.6 trillion in 2003, and US$ 6 trillion in 2004 (Nua Internet Surveys 2001b). Whereas the share of Africa, Latin America and the lagging Asian countries in the global B2C e-commerce in 2003 is estimated to be 0.1 percent, their B2B market share is expected to be slightly higher (Computer Economics 2000; Nua Internet Surveys 2000b).

For technology firms involved in international business, a clear knowledge of the mechanisms by which environmental forces affect B2B e-commerce diffusion is critical for making the country entry decisions and selection of business models. Without such knowledge, technology firms run the risk of suboptimizing their approach to international markets. Although some studies have analysed various environmental forces influencing the diffusion of the Internet and e-commerce in general (e.g., Hogan 1999; Kshetri 2001; Shabazz 1999), unique aspects of the global diffusion of B2B e-commerce have not been examined. This paper seeks to fill the research gap by analysing the factors that influence the global diffusion and adoption of B2B e-commerce. We examine the factors that are fuelling the rapid diffusion of B2B e-commerce as well as factors that determine the share of global B2B e-commerce an economy is likely to receive.

The rest of this paper has three sections. First, we examine briefly the global distribution of B2B e-commerce. Next, an analysis of the forces that influence the diffusion pattern of B2B e-commerce is presented. Finally, some conclusions are provided.

Global distribution of B2B e-commerce

Estimating B2B and B2C e-commerce transaction volumes to a reasonable level of accuracy has been a challenge. Based on data triangulation from several sources, it appears that the global distribution B2B e-commerce is somewhat more even than that of B2C e-commerce. Although North America dominates the global B2B e-commerce, the gap between North America and rest of

the world is much smaller for B2B e-commerce than for B2C e-commerce (see table 1). Moreover, the inequality is narrowing rapidly. For instance, North America's share in B2B market was 66%, twice the share of rest of the world in 1999 (BCG 1999). This is estimated to shrink to 39 % by 2004 (Lewis 2000).

Table 1: A comparison of the geographical distribution of B2B and B2C e-commerce

Region	B2C e-commerce	***B2B e-commerce***
North America (5.6 % of world Population)	$38 billion in 2000, and projected to reach $184 billion by 2004 (1.2 % of total retail revenue in 1999) Average per capita revenue: $100 in 1999	59% of global B2B e-commerce in 2000 (projected 52% in 2001) B2B e-commerce was 7% of total North American B2B market in 1999, projected to reach 24% in 2003 and 36% in 2006. Revenue: $1.2 trillion in 2000, projected to reach $4.8 trillion in 2004
Europe (13.5 % of world Population)	$3.5 billion in 1999 (0.2 % of total retail revenue)	17% of global B2B e-commerce in 2000 (projected 20% in 2001) B2B e-commerce was 3 % of total European B2B market in 1999, projected to reach 11 % in 2003 Revenue: $3.75 billion in 1998, projected to reach $174 billion in 2002
Asia-Pacific (60.2 % of world Population)	$2.8 billion in 1999 (0.1 % of total retail revenue) Average per capita revenue $0.98 in 1999	22% of global B2B e-commerce in 2000 (projected 24% in 2001) B2B e-commerce was 2 % of total Asia-Pacific B2B market in 1999, projected to reach 9 % in 2003 Revenue: $9.2 billion (excluding Japan) in 1999, projected to reach $430 billion in 2003 and $1 trillion in 2004
Latin America (8.3 % of world Population)	$77 million in 1999, projected to reach $3.8 billion by 2003	2% of global B2B e-commerce in 2000 (projected 4% in 2001) B2B e-commerce was 2% of total Latin American B2B market in 1999, projected to reach 7% in 2003 Online B2B transactions are predicted to total $76 billion by 2004.

Source: Several studies of Boston Consulting Group (www.bcg.com), Forrester Research (www.forrester.com), EIU Ebusiness forum (http://www.ebusinessforum.com), http://www.worldtrademag.com, and authors' research.

While the numbers in Table 1 point to the dominant but shrinking position of North America – in terms of B2B e-commerce – vis-à-vis the rest of the globe, there are also qualitative differences across the regions of the world. Table 2 provides our assessment of the patterns of B2B e-commerce in these four regions in terms of leading sectors driving B2B e-commerce, geographic focus (global/regional/local), driving forces, types of B2B transactions, and constraints.

Table 2: Qualitative profiles of B2B e-commerce in four global regions

Region	*Profile of B2B e-commerce in the region*	*Comments*
North America	***Leading Sectors:*** Automotive, computer and telecommunications, aerospace and defence, metals and mining, and chemicals. ***Geographic Focus:*** Global ***Driving Forces:*** Internet-centric investment and IT spending focused on operating cost reduction and demand generation. Internet Tax Freedom Act stipulates that there should be no new taxes on the Internet. ***B2B Model Types:*** Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement ***Constraints:*** Human capital, reduced financial market liquidity, weakened consumer confidence, and reduced capital and marketing expenditures.	Venture capita funds are driving IT business in the US. Covisint, a B2B e-marketplace formed by DaimlerChrysler, Ford, GM, Renault, and Nissan, plans to funnel $300 billion worth of supply and material purchases; and has driven B2B e-commerce in automotive sector. Cost saving has been a major motivation of B2B e-commerce adoption.
Europe	***Leading Sectors:*** Petrochemicals, motor vehicles ***Geographic Focus:*** Regional/national ***Driving Forces:*** Internet-centric investment and IT spending focused on operating cost reduction and demand generation for brick-and-mortars ***B2B Model Types***: Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement. ***Constraints***: Budget, lack of right skills in-house, multiple languages, legal and business climate less favourable to entrepreneurs than that of the US, lack of infrastructure.	Venture capital much less than in the US Pre-Internet B2B systems, such as Minitel in France, continue to hold strong legacy positions. No central package tracking system Europe's industrial selling experience, especially in dealing with small firms across highly divergent cultures, will help in developing regional B2B e-commerce.
Asia-Pacific	***Leading Sectors:*** Utilities, agricultural, construction. ***Geographic Focus***: Global ***Driving Forces:*** Region's strong manufacturing sector; market retrenchment during the 1997-98 recession, Internet-centric investment. Also, pressure from US-based firms to be on the Internet. ***B2B Model Types:*** Seller-governed e-distribution, community-governed e-marketplaces, and buyer-governed procurement. Most e-marketplaces are vertical and specific to industry sectors. ***Constraints:*** Lack of logistical infrastructure, multiple languages and character sets, low credit card penetration, low Internet adoption rate.	Led by Japan (70% of B2B e-commerce in Asia Pacific). Broadband market, which is set to grow by nearly 600 percent by 2006, is expected to drive B2B. 35-40% business transactions in Asia are conducted on cash basis compared to 3% in the US. Governments' initiatives to develop human capital and other policies are driving B2B e-commerce in some countries (e.g. Taiwan).
Latin America	***Leading Sectors:*** Financial services; maintenance, repairs and operations (MRO); agriculture. ***Geographic Focus:*** Regional/national ***Driving Forces:*** Largely funded from abroad. ***B2B Model Types:*** Mainly bilateral vertical portals. E-marketplaces less likely to be popular. ***Constraints:*** Lack of intra-regional economic	Banks positioned to be leaders in e-marketplaces and in e-payment solutions. Currently dominated by Brazil. Mexico likely to dominate in future. Vertical portals are mainly established by brick-and-mortar

	integration, differences in customs and tariff policies, weak technology infrastructures, red tape in dealing with local authorities, inadequate credit facilities.	companies. Dominant businesses hesitate to enter into ventures in which they do not have majority control. Businesses mainly conducted on cash basis.

Source: several publications of the EIU Ebusiness forum (http://www.ebusinessforum.com), McEwan (2001), BCG (2000), and authors' research.

Factors influencing the diffusion of B2B e-commerce

A host of environmental factors influence the magnitude and global distribution and forms of B2B e-commerce. We can divide these factors into two categories (Kshetri 2001):

1. Factors affecting the magnitude of global e-commerce: globalization and the characteristics of e-commerce technology
2. Factors influencing the geographical distribution and forms of B2B e-commerce: economic, cultural, political and legal factors; and the activities of international institutions

While these general factors are applicable to all forms of e-commerce, the specific mechanisms by which they influence the B2B e-commerce are likely to be different from the mechanisms influencing B2C e-commerce. Figure 1 represents our proposed model of the determinants of the locus of global B2B e-commerce. We examine the elements of this model, starting first with factors affecting the magnitude of B2B e-commerce.

Rapid globalization

Rapid globalization following the World War II resulted in a high degree of freedom in the movements of goods, services, capital, technology, and people – accelerating the global diffusion of modern technologies.

Free movements of goods and services

Several rounds of trade negotiations conducted since 1948 resulted in an addition of 119 new members to the 23 General Agreements on Trade and Tariff (GATT) founders. Tariffs on industrial products in developed countries fell steeply from 50% in 1948 to about 4% in 1999 (WTO 1999), leading to the expansion of global trade by fifteen-fold compared to a six-fold increase in the size of the world economy. A large proportion of the global trade is B2B in nature.

An estimate suggests that the global value of goods and services traded between businesses exceeds US$60 trillion (Durlacher 2000). These huge offline revenue of B2B e-commerce, coupled with higher capability of organizations (in comparison to individuals) to adopt e-commerce technologies, set the stage for a rapid growth of B2B e-commerce.

Rapid increase in global trade has also provided opportunities for the firms from developing countries to sell to the companies located in industrialised nations. Trading relationship between two firms is a function of the degree of "fit" between the technologies used by them or what Ford et al (1998) refer to as "technological distance". Weak bargaining position (UNCTAD 2001) forces companies from developing countries to adopt modern technologies that reduce the "technological distance" to counterpart firms in developed countries. Pressure from US-based firms, for example, has forced early adoption of B2B e-commerce by some Asian suppliers. For instance, American multinationals such as Wal-Mart and JC Penney require their foreign suppliers to transact on the Internet. Their suppliers, mainly from developing Asian countries, are adopting the Internet-based B2B transaction methods sooner rather than later because of such pressures (Woodall 2000). Another study found that some organisations from developed countries accepted new suppliers only if they could demonstrate an electronic data interchange (EDI) capability (Schware and Kimberley 1995). The study pointed out cases of companies that "have gone out of business because of inability, or unwillingness to comply or disbelief in the need to comply" (p. 19).

Free movements of capital and technology

Globalisation resulted in the free flows of not only goods and services but also of capital and technology. During the 1980s and 1990s, Foreign Direct Investment (FDI) grew four times as fast as GNP and, since 1985, much faster than international trade (Dicken 1994). Driven by 60,000 MNCs with over 800,000 affiliates abroad, FDI registered 18% growth rate in 2000 reaching a record US$1.3 trillion (UNCTAD 2001). In 2000, 71% of world inflows and 82% of world outflows of FDI took place in the US, the European Union (EU), and Japan (UNCTAD 2001). A large proportion of global B2B commerce takes place between MNCs and a significant proportion of this is intra-firm in nature. For instance, more than 25% of exports are estimated to be intra-firm, the global average being much higher for capital and technology-intensive industries (Ostry 1998). Similarly, about half of manufacturing exports and over 60% of imports of the US-based MNCs represent intra-corporate flows (Ostry 1998). The dominance of the world FDI inflows and

outflows by the US, EU and Japan; along with the increase in B2B commerce between MNCs and MNCs' capability to adopt e-commerce technologies, explain the global dominance of B2B e-commerce by the US and Europe (Table 1) and the dominance of the Asian B2B e-commerce by Japan (Table 2). Furthermore, the UNCTAD estimate also suggests that about $617 billion FDI inflows in 2000 were stimulated by the progress in regional integration in the EU. This explains why the B2B e-commerce in Europe is regional in nature (Table 2).

Such investment-led globalisation is spawning global production networks and accelerating global diffusion of technology (Ostry 1998). US-based MNCs are rapidly transferring technology to their foreign subsidiaries. A study found that the proportion of technology transferred to subsidiaries in developed countries by US-based MNCs increased from 27% in the 1960-69 period to 75% in the 1969-78 period (Mansfield et al. 1982: 209). The same study found that in 25% of the cases, the technology transfer hastened foreigners' access to these technologies by at least two and a half years. Similarly, Vernon (1982: 151) found that innovations are being transferred more rapidly than in the past and more so in firms with high R&D expenditures (the high tech firms).

Moreover, all of the top 10 MNCs (ranked by revenues), except for Wal-Mart Stores, are either in automobile or petrochemical sectors (Fortune.com 2001). Leading MNCs in both of these sectors are forming e-marketplaces to facilitate B2B e-commerce. For instance, to save money and improve supply-chain efficiencies, DaimlerChrysler, Ford, GM, Renault, and Nissan launched Covisint, a B2B e-marketplace, which is expected to facilitate the transaction of US$300 billion worth of supply and material purchases, once the site is fully operational (Enos 2001). Likewise, fourteen chemical and petroleum companies agreed to form a global e-marketplace. Their site, Envera, will link suppliers, customers, logistics service providers and financial institutions into a network enabling a variety of B2B e-commerce transactions between trading members which is expected to save up to 80% of the processing and invoice cost (Chang 2000). These facts explain why leading sectors in B2B e-commerce in North America and Europe are the automobile and petrochemicals sectors.

Also B2B e-commerce in the Asia-Pacific and Latin America is being driven to a great extent by FDI inflows. Such expansion of B2B e-commerce would not have been possible had there been restrictions on the movement of capital and technology. MNCs based in developed

countries are bringing money as well as the latest technologies to their subsidiaries or partners in developing countries.

Free movements of people

With the exhaustion of national reserves of skilled labour, companies in advanced countries are hiring an increasing number of migrant workers from developing countries to gain and maintain competitiveness in global markets (Chew 1998). A large proportion of these migrant workers are in high-tech sectors. Thanks to incentives provided by several governments in developing countries, an increasing number of these migrant workers are returning to their home countries after working for a number of years in developed countries. For instance, a major factor leading to Taiwan's position as a global leader in B2B e-commerce is a group of managers with work experience in Silicon Valley who have been attracted back to their home country through generous incentives provided by the government (Foster et al 2000).

Rapid development of e-commerce technology and its interaction with B2B e-commerce

In general, organizations are more capable than individuals of adopting and assimilating e-commerce technology. Rapidly falling costs of technology and the availability of user-friendly software have made the adoption of B2B e-commerce by SMEs easier. Moreover, the 'observability' (Rogers 1983) or 'result demonstrability' of e-commerce technology is higher in B2B transactions than in B2C transactions. B2B e-commerce produces readily observable results such as lower purchasing costs, reduced inventory levels, and shorter cycle times (Gekos and Harper 1999). In the US industries, for example, cost savings from B2B e-commerce – as a percent of total input costs – vary from 2% in coal to 40% in electronic components (Coppel 2000). In fact, such cost savings have been a key driver of B2B e-commerce in the US companies.

Web-based procurement and "eSynchronized supply chains" have enhanced result demonstrability, relative advantage and observability of B2B e-commerce. Web-based procurement is changing companies' economic bases as well as the relationships with suppliers. Ad-hoc procurement of low value items is generating instant savings in the 5-15 % range and offering a greater opportunity for efficiency (Anderson Consulting 1999), justifying the investments in B2B e-commerce. eSynchronized supply chains and e-marketplaces are linking "suppliers' suppliers" and "customers' customers" more closely and facilitating new levels of information sharing, interaction, and supply chain integration (Anderson Consulting 1999). Many

companies are forming networks that perform different steps in the value-added chain, enjoying the "coordination and scale of large firms and the flexibility, creativity, and low overhead of small companies" (Johnston and Lawrence 1989).

B2B e-commerce, however, has some drawbacks as well. It consists of hundreds of smaller vertical markets, each requiring deep industry knowledge (Gurley 1999). Amazon.com, for example, started with books and utilizing the customer base, expanded into music, videos, electronics, and toys. B2B players, however, cannot expand as easily into multiple markets.

Political and cultural factors

Government policies directly and indirectly influence the diffusion of B2B e-commerce. First, customs and tariff policies influence the availability and price structures of ICT products needed for B2B e-commerce systems. Higher tariff and customs on ICT products are hindering the growth of B2B e-commerce in Latin America. Second, availability of human capital for B2B e-commerce is largely determined by governments' policy on human resource development. Even in the US, the world leader in B2B e-commerce, there is a shortage of human resources to properly use the B2B e-commerce technology. On the other hand, economies with lower per capita income but higher emphasis on human capital development are performing well in B2B e-commerce. For instance, Taiwan's emphasis on technology-oriented curricula at higher levels and incentives to scholars and researchers (UNDP 2001) have made it a global leader in B2B e-commerce. Third, government macroeconomic policies may influence firms' microeconomic policies and investments in technology and R&D. Again, in addition to emphasis on human capital development, with its "macroeconomic linkages", the Taiwanese government has been able to steer firms' microeconomic policies related to technology adoption (Wade 1990). Similarly, the US governments' Internet Tax Freedom Act has been an important factor driving B2B e-commerce. Finally, organization-level politics also play a major role in the adoption of B2B e-commerce. For instance, labour union protests in 1999 stopped Hyundai Motors in South Korea from implementing its marketing plan to form a strategic alliance with an Internet company (Business Korea 2000).

Cultural factors also play an important role in the diffusion of B2B e-commerce. For example, multiplicity of languages has been a major obstacle to the achievement of economies of scale in B2B operations in Asia-Pacific and Europe (Table 2).

Economic and infrastructure related factors

Firm size is one of the most important predictors of technology adoptions by organizations (e.g. Mansfield 1961). In general, larger firms tend to locate in richer and populous countries which partly explains the dominance of the global B2B e-commerce by the US and EU based companies; the dominance of Asian B2B e-commerce by Japan; and of Latin American B2B e-commerce by Brazil and Mexico. Furthermore, the largest MNCs are in petrochemical and automobile sectors, which partly explains the dominance of global B2B e-commerce by automobile and petrochemical companies.

Market and infrastructure factors that 'control the availability of the innovation to the potential adopters' (Brown et al 1976: 100) influence the diffusion patterns of innovations. Market and infrastructure related factors influencing the profitability and relative advantage of B2B e-commerce include availability of venture capital, technology infrastructure, credit facilities, and logistical infrastructure. The US ranks number 2 in the world in terms of technology achievement (UNDP 2001); it has solid delivery and logistical infrastructure; the credit card penetration rate is very high and the firms have easy access to venture capital. These factors explain the US dominance in B2B e-commerce. Europe, despite its better transportation infrastructures, lacks central package tracking systems and also has relatively low usage rates of credit cards. In Asia and Latin America, business transactions are mainly conducted on a cash basis and thus readily not convertible to electronic methods. In addition, lack of logistical and technological infrastructures is hampering the growth of B2B e-commerce in these regions. For instance, lack of reliable domestic transport system to handle express documents and packages is found to be the major obstacle for China's B2B e-commerce growth (Cheung 2001). In addition, interrelated factors such as the performance of financial markets, marketing expenditure of firms, and the level of consumer confidence affect the diffusion of B2B e-commerce.

Support of international institutions

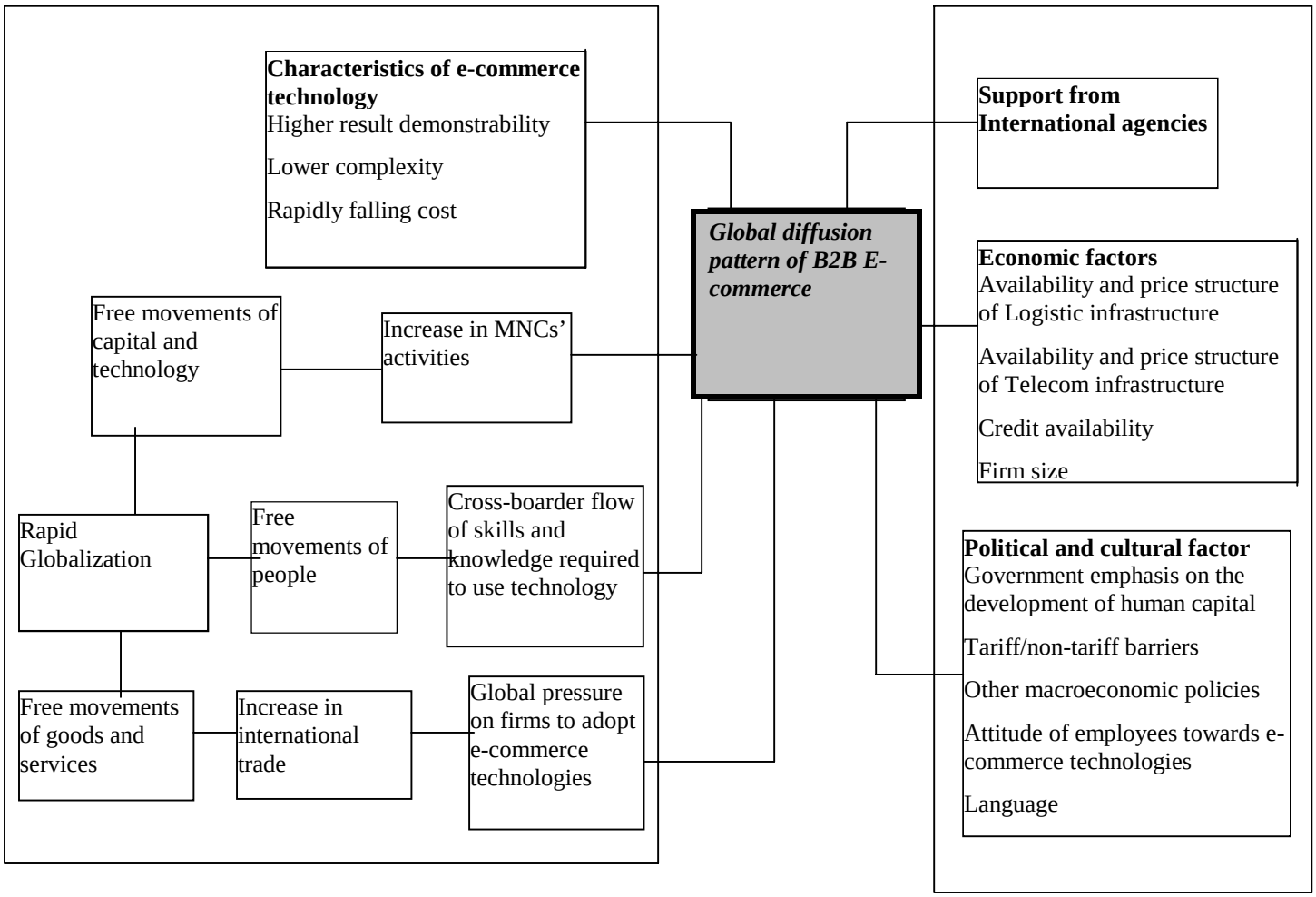
Small and medium sized enterprises (SMEs) are at a disadvantage when adopting the Internet because of the gap between knowledge required for Internet-based operations and the existing knowledge base of SMEs (Gatignon and Robertson 1985), and because of economic factors such as expected profitability and investment (Mansfield 1961). Whereas about a quarter of SMEs in the US are already using the Internet to provide customer services and support (Nua Internet Surveys 2001a), the proportion of SMEs using the Internet is very low in the rest of the world.

Several international institutions are helping SMEs to overcome such barriers to Internet adoption. For instance, in 1992 the United Nations Conference on Trade and Development (UNCTAD) launched Global Trade Point Network (GTPN) to facilitate SMEs' access to international markets using e-commerce technologies. As of 2000, GTPN's electronic trading opportunity (ETO) system connected more than 20,000 trade organizations worldwide. Through the trade points, SMEs can get access to the latest e-commerce technologies, enabling them to publicize their products to potential customers and to locate business partners worldwide. UNCTAD smart cards facilitate payment flows. Similarly, ITU launched E-Commerce for Developing Countries (EC-DC) program in 1998. Thanks to such programs, SMEs in developing countries such as Bangladesh, China, Mexico, Pakistan, Russia, South Africa, and Thailand have already sold several products online using secured payment systems (UNCTAD 2000). An estimate by IDC suggests that businesses with fewer than 100 employees will generate 30% of global e-commerce by 2003, up from 17% in 1997 (Ah-Wong et al 2001).

Conclusions

In this paper, we have examined the current stage of B2B e-commerce development across four global regions and proposed a model to explain the magnitude and global distribution of B2B e-commerce activities. Our analysis indicates that increase in the freedom of the movements of goods, services, capital, technology and people coupled with rapid technological development resulted in an explosion of global B2B e-commerce. Geographical distribution of B2B e-commerce, on the other hand, is influenced by economic factors such as firm size, the availability of credit and venture capital, and technological and logistical infrastructure; political factors such as governments' macroeconomic linkages, tariff and non-tariff barriers, and emphasis on human capital development; the support provided by international agencies; and cultural factors.

Figure 1: A proposed model to explain the global diffusion of B2B e-commerce technology



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