Effect of Information and Communications Technology on Stock Market Development: Evidence from Emerging Markets and High-Income Economies

Christopher Ngassam
Department of Finance and Entrepreneurship
School of Business, Norfolk State University
cngassam@nsu.edu
and
Azmat Gani
Department of Economics
School of Social and Economic Development
University of the South Pacific
Gani_A@usp.ac.fj

Abstract

This paper investigates the links between information and communications technology (ICT) and stock market development in a sample comprising of high-income and emerging market economies. The empirical results of the least squares dummy variable model confirms that personal computers and internet hosts as the two ICT variables having strong positive effects on stock market development. The results also revealed strong positive effects of market capitalization and credit to the private sector as non-ICT contributors to stock market development. Controlling for income and technological differences, our results lead us to conclude that emerging market economies have already seized an opportunity to leap frog the high-income countries that is, by going straight from underdeveloped networks to fully digitized networks, bypassing the traditional analog technology. As such this leap frogging is positively enhancing their stock markets. Some policy implications are drawn.

1. Introduction

Numerous studies pertaining to the literature on stock market development have emphasized the impact of several financial and economic variable (see for example, Levine, 1991, p. 1445; Bhide, 1993, p. 2; Atje and Javanovic, 1993, p. 632-38; Harris, 1997, p. 139-140; Levine and Zervos, 1998, p.3-4; Beck, Levine and Norman, 2000, p. 195-93; Arestis, Demetriades and Luintel, 2001, p. 20). A factor that in recent times seems to have a possible strong impact on growth and development of stock markets is the new information and communications technology (ICT): mobile phones, personal computers and internet hosts. At the theoretical level, some studies have presented arguments in favor of the possible beneficial effects of information technology on an economy's financial sector. For example, Levine (1997, p. 942-43) notes that changes in telecommunications and computers, among other factors, influence the quality of financial services and the structure of the financial systems. In additions, the World Bank (1998, p.12) notes that advancements in communication have for long been a major driving force bringing about positive economic changes to many countries. Further, the *Human Development Report 2001* (UNDP, 2001, chapters 2 and 3) gives a comprehensive account of how new technologies, including information and communication technology, work for the betterment of an economy. The rapid pace in dissemination of vast amounts of vital information on the performance of stock and financial markets is possibly contributing to the speed of the development of stock markets.

However, at the empirical level, the literature is still rare particularly in terms that support the theoretical contention as indicated above. One reason for this rarity is the lack of long-term time data series particularly on the modern instruments of ICT (mobile phones, personal computers and Internet hosts) necessary to validate the theoretical contention. While some data have recently

been made available on some of the modern instruments of ICT, an empirical investigation into ICT and stock market relationships would perhaps be a modest start to ascertain the impact of new information technology on the growth of stock markets. Such useful attempts would also complement the current discussions on information technology and its role in spreading financial knowledge.

Thus, the primary aim of this paper is to examine the contribution of ICT on stock market development in emerging markets and high-income economies. To that end, in section two, we discuss some theoretical arguments on information technology and stock market knowledge linkages. A discussion of the estimation methodology, data and empirical findings are presented in section three. A conclusion and policy implications are provided in section four.

2. An Overview of ICT and Stock Market Developments

One of the support systems of a country's financial market is the stock market. The stock market certainly is important to every individual and firm and the economy in general. Research confirms that countries with more developed financial institutions grow faster, and countries with weak ones are likely to have financial crises, with adverse effects on long-term growth and development. John Hicks (1969, p. 36) argued that the financial system played a critical role in boosting industrialization in England by facilitating the mobilization of capital for immerse works. Several researchers have shown positive evidence of finance-growth relationships. Among the notable works are Goldsmith (1969, p. 1-12), Levine and Renelt, (1992, p. 960-63), Roubine and Sala-I-Martin (1992, p. 5), King and Levine (1993, p. 538-40), Easterly (1993, p. 187), Levine and Zervos (1996, p. 1-3), Levine (1997, p. 723) and Ndikumana (2000, p. 381).

For long, stock markets were largely concentrated in high-income countries. The transition towards the global economy saw many newer economies developing their own stock markets and making them globally competitive. Many countries around the world are now recognizing the potential benefits of stock markets to their growth and development process. In recent times, stock markets have emerged in some of the low and middle-income economies.

Table 1 presents aggregate data on stock markets in a variety of income categories. Between 1990 and 1999 stock markets grew rapidly in low and high-income economies. For example, stock market capitalization of listed companies as a share of gross domestic product (GDP) increased from almost 10 to 32 in low-income countries and from 55 to 139 in high-income countries. On the other hand, the number of listed domestic companies showed tremendous increase in the lower-middle-income group of countries during 1990-99 (Table 1).

Table 1. Selected indicators of stock market development by country income level.

Income Level	Stock market capitalization of listed companies (% of GDP)			umber of listed domestic companies		
	1990	1999	% change	1990	1999	% change
Low Income	9.8	31.7	223.47	3446	8332	141.80
Lower-middle Income	….	31.0	….	1833	11420	523.02
Upper-middle Income	27.3	49.8	82.42	3081	5119	66.15
High Income	55.3	138.7	150.81	17064	24741	44.99

…. Indicates data unavailable. Source: The World Bank (2001)

Although several factors have been identified in previous studies that contribute to stock market development, to the best of our knowledge, no empirical study has attempted to investigate the relationship between information technology and stock market development. In a recent study Levine (1997, p. 725) concluded that the financial system is shaped by non-financial developments. Changes in telecommunications and computers, among other factors, influence the quality of financial services and the structure of the financial systems (Levine, 1997, p. 688-90). In a similar vain, the World Bank (1998, p.16) notes that advancements in communication have long been a major driving force bringing about positive economic and social changes to many countries.

Following past breakthroughs in communication modes, for example, telephone, telegraph, radio, and television, such instruments have brought profound changes to the conduct of business in many countries globally. The continual advances in communicaiton evident today, for example, fully digitized wireless networks, are bringing about rapid economic and social change in many countries. These new technologies are contributing to the creation of global market place and are also actively contributing to globalization. Many countries are also taking advantage of such technologies and developing their own markets. Although new technologies are being applied to several disciplines, for example, education, environment, income generation and research and development, the financial sector is the one growth area in many countries that is making major use of new technologies in a vast range of financial activities.

For example, with the growth in worldwide stock markets, many people are getting educated about stock markets and are now investing in stocks traded in a country's stock markets. Investors on the other hand are in a dire need of information about companies, markets and opportunities available to them. Newspapers have for long been the main providers of stock market information. Given the rapid pace of developments taking place in the business sector as well as the increasing demand for vital information by financial markets participants, this mode of communication may not suffice for information hungry investors seeking stock market updates. Thus, the role of new ICT: mobile phones, personal computers and the Internet provide easy and cheap access to the daily performance of markets. New technologies have a wider reach, are time saving and cost effective. For example, inhabitants of remote areas typically lack information about current stock markets or development of new ones. ICT is a powerful instrument for remedying such information deficiencies.

Data on the distribution of worldwide information technology instruments is presented in Table 2. The means of using information technology in the new global economy are very unequally distributed as revealed in Table 2. High-income economies are the dominant users of new information technology. The average high-income economy has over 100 times more computers per capita than the average low-income country (The World Bank, 1998, p. 27).

The world-wide information technology market – whose products include personal computers and work stations, multi user computer systems, data communications equipment and packaged software, grew by about 12.2 percent a year in real terms between 1985 and 1995(The World Bank, 1998, p. 57). Although the production of information technology remains highly concentrated largely in OECD countries, the use of modern communications media is expanding rapidly in other countries, particularly in the lower and upper middle-income economies as shown in Table 2. However, large gaps exist for line phones, mobile phones, computers and Internet hosts between low and high-income countries. Several factors contribute to these low numbers in low-income economies: inadequate human capital, low purchasing power, and poor competition and regulation. The number of cellular phones per fixed line in some low and middle-income countries is already as high as in some industrial countries, notable in Latin America and Africa. By the same token, several developing countries in these regions with low density in both traditional telephone service and cellular phones are now investing in cellular technology at a very fast rate (UNDP 2001, Chapter 1).

Table 2. Selected indicators of information and telecommunications penetration by county income level.

Income Level	Television Sets (per 1,000 people)		Telephone Main Lines (per 1,000		Mobile Telephones (per 1,000		Personal Computers (per 1,000 people)		Internet Hosts (per 10,000 people)	
	1990	1999	1990	1999	1990	1999	1990	1999	1995	1999
LI	42	86	11	27	0	3	….	4	0	0.3
LMI	160	273	32	102	0.1	33	1	18	0.2	2
UMI	204	304	100	190	0.6	136	10	61	4	27
HI	569	693	465	583	12.8	377	115	346	106	604

LI=low income; LMI=lower middle income; UMI=upper middle income; and HI=high income.
Source: The World Bank (2001).

3. Estimation Methodology, Data and Results

The theoretical arguments relating to ICT and stock market development can be traced from economic growth literature emphasizing the role of technology. Solow (1956, p. 65-70) clarifies the role of the accumulation of physical capital and emphasizes the importance of technological progress as the ultimate driving-force behind sustained economic growth. Following several years of ongoing work within the confinements of the Solow model, Mankiw, Romer and Weil (1992, p. 434-36) evaluate the empirical implications of the Solow model and note that the fit could be improved by extending it to include human capital.

While the role of human capital has received extensive attention in recent times. Recent contributions to the endogenous growth literature, pioneered by Romer (1986, p. 1103 and 1994, p. 3-4) and Lucas (1988), provide new ways of conceptualizing how human capital might contribute to self-sustaining growth. The endogenous growth theory has certainly reawakened interest in the role of human capital providing ample evidence that technology and human capital play an essential role in a country's development (Barro, 1991, p. 438-41).

Because several factors contribute to higher levels of human capital, this aspect is of prime importance. For example, the new-growth theory gives significant weight to human capital – creating agents who can become more productive through their acquisition of knowledge and increased skills. In this study, we hypothesize that ICT technology plays a vital role in enhancing financial and economic knowledge for participants who deal with stock market as well as other markets. As with human capital, technology including the new ICT is equally important in nation building. The new-growth theory explains that technical progress is determined by the "accumulation of knowledge by forward-looking profit maximizing agents" (Romer, 1986). Technological progress is considered to generate productivity gains, as is an component behind sustained economic growth.

Although a country's level of achievement and development in technology can be a result of advancements in several physical and natural disciplines, the focus is narrowed to developments in information technology and its vital role in accelerating the dissemination of essential knowledge. Such knowledge may include financial and stock market movements and developments, among others. Communication instruments like newspapers, televisions and line phones can play a vital role in improving financial markets in many countries aiming to improve

and achieve a higher level of development of stock markets through transfer of essential financial information and knowledge. The World Bank (1998, p.6) and UNDP (2001, p. 5-12) note that advances in communication technology (referring largely to old technology) have for too long been a major driving-force in bringing about positive economic change in many countries. Developments including line telephones, telegraph and radio and today's advancements in wireless, fully digitized networks are likely to bring about profound economic and financial changes in many countries.

The hypothesis concerning advances in digital information technology, that is, mobile phones, personal computers and access to internet, is that it allows the processing, dissemination and storage of vast amounts of information together with fast, effective and cheap distribution systems such as cellular telephones, personal computers and Internet hosts. Thus digital communication networks are likely to have a favorable impact on the economic and financial markets of many nations: the creation of new opportunities for individuals to improve participate in share markets, expand knowledge, speed business transactions and enhances the development of the financial sector. This is achieved through the use of cellular telephones, personal computers and Internet hosts provide easy and cheap access to information, information dealing with economic fundamentals and financial markets development. These technologies have wide implications, are timesaving and cost-effective as can be seen in Internet usage and in the ability of the World Wide Web to deliver vital information to the poor at any locality, globally.

Our estimation procedure begins with a primary model that takes the following general form:

$$SMD_{it} = \Pi_0 + \Pi_1 X_{it} + \mu_{it} \qquad (1)$$

Where, SMD is stock market development; X is a vector of stock market control variables; Y is a vector of ICT variables; i is the country identifier; and t is the time identifier. The error term follows the classical assumptions, expressed as

$$E(\mu_{it}) \sim N(0, \sigma^2)$$

The variables that contribute to the primary model in equation (1) is described by equation (2).

$$vst_{it} = \alpha_0 + \alpha_1 mc_{it} + \alpha_2 cps_{it} + \alpha_3 tml_{it} + \alpha_4 tv_{it} + \alpha_5 mp_{it} + \alpha_6 pc_{it} + \alpha_7 inet_{it} + \mu_{it} \qquad (2)$$

where,

vst = total value of stock traded as percent of gross domestic product (GDP)

mc = market capitalization of listed domestic companies as a percent of GDP. We define stock market capitalization as the sum of the market capitalization of all firms on domestic stock exchanges, where each firm's market capitalization is its share price at the end of each year times the number of shares outstanding.

cps= credit to the private sector as a percent of GDP

tml= all telephone main lines that connect a customer's equipment to the public switched telephone network , per thousand people.

mp= mobile phones, referring users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the public switched telephone network, per thousand people.

pc = personal computers. This is the estimated number of self-contained computers designed to be used by a single person, per thousand people.

in = Internet. This is the number of computers directly connected to the worldwide network of interconnected computer systems, per thousand people.

For our analysis, we chose a sample of economies from emerging markets and the high-income category based on data availability. The sample of emerging market economies include: Argentina, Brazil, Chile, China, Colombia, Egypt, Hong Kong, India, Indonesia, Israel, Malaysia, Mexico, Peru, Philippines, Poland, Russia, Singapore, South Africa, Thailand, Turkey, and Venezuela. The sample of high-income economies include Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States of America. The data

source for all dependent and independent variables is World Bank's *World Development Indicators CD-ROM* (2001).

Due to the unavailability of long-term data series on some of the explanatory variables (mobile phones, personal computers and Internet hosts), we adopted the common practice of pooling data for our chosen sample countries. Since the data relates to countries over time, there is bound to be heterogeneity in these sets. By combining time-series of cross-section observations, panel data give more information data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.

Based on equation (2), Table 3 presents the ordinary least squares *(OLS)* estimates for the primary model. The reported results show that the two stock market control variables carry the expected signs and are statistically insignificant. Variables, *pc* and *inet* has the desired positive effect but statistically insignificant. Variable *mp* has a negative sign (opposite to the expected effect) indicating that it is not a major factor contributing to stock market development.

The primary model estimated is considered to be simple as it disregards the cross-sections and time dimensions. It is quite likely that because of its simplicity, the true picture may be distorted. Therefore, what is needed is to find a way to account for the specific nature of different cross-sectional units among the countries in our sample. Thus, we adopt the least squares dummy variable regression (LSDV) model, also known as the fixed effects model (see for example, Greene, 2000, p. 560). The assumption here is that there are differences among the cross-sectional units, that is, our selected sample of countries differ amongst each other. The LSDV model takes into account the individuality of each country. As such we introduce two separate dummy variables, *dum1* and *dum2*. The hypothesis behind *dum1* is that countries in high-income category have an added advantage in stock market development because of income differences. This matters more to high-income countries than to emerging market economies, which are largely, middle income categories.secondly, we include *dum2* to take into account of technological advancements. Technologically advanced countries have an edge in terms of ICT and stock market development than those that are not. We consider the following countries to be more technologically advanced: Australia, Austria, Belgium, Canada, Finland, France, Germany, Ireland, Japan, Netherlands, Norway, United Kingdom and United States of America. Thus, equation (3) represents the LSDV models.

$$vst_{it} = d_1 mc_{it} + d_2 cps_{it} + d_3 dum1_{it} + d_4 dum2_{it} + d_5 tml_{it} + d_6 tv_{it} + d_7 mp_{it} + d_8 pc_{it} + d_9 inet_{it} + m_{it} \quad (3)$$

We conduct a formal test of the primary and the LSDV model using the restricted F test as follows

$$F = \frac{R^2_{UR} - R^2_R / m}{(1 - R^2_{UR}) / (n - k)} \quad (4)$$

where R^2_{UR} and R^2_R are, respectively, the R square values obtained from the unrestricted and restricted regressions. It should be noted that

$R^2_{UR} > R^2_R$ and

$\sum \hat{m}^2_{UR} \leq \sum \hat{m}^2_R$

On the basis of equation (4), the F-value is 9.4, statistically significant and therefore the restricted regression involving model (equation 2) seems to be invalid.

Table 3 shows the empirical results of the LSDV model considered to be more robust than the primary model. The stock market control variables, *mc* and *cps* carry the expected signs and

reveal statistically significant effects on stock market development. The explanatory power improves compared to the primary model. The results of the stock market control and the ICT variables explain their contribution to stock market development. The statistical significance of variable *cps*, *pc* and *inet* improve too. While *mc* and *cps* have produced the desired effect, they are also statistically highly significant. In general, the results of the stock market control variables suggest their importance in the development of stock market suggesting that market capitalization and credit to the private sector are important in the growth and expansion of stock markets.

Turning to the ICT variables, *mp, pc* and *inet* show consistent patterns in their coefficient signs from the primary model. The coefficient *mp* has a negative sign in both cases, contrary to our theoretical exceptions. The result of this variable is not surprising as mobile phones have a low diffusion rate largely in the emerging market economies. On the other hand, *pc* and *inet* have the excepted positive effect of stock market development and both are statistically significant.

Our LSDV model is more relevant here as we control for the cross-sectional effects in two ways: the income and technological differences. Variable *dum1* taking into account of the income differences did not reveal any positive effect, thus, the results of this variable indicated that country differences on the basis of income levels are not a significant factor in terms of stock market development. When technological achievement is controlled by variable *dum2,* it also did not reveal any positive effect.

To provide some additional support to primary and the LSDV models, we also adopt a third estimation procedure; the panel corrected standard errors (PCSE). Equation (2) was re-estimated using the PCSE procedure. For example, it has been noted that in cross-country comparison, there may be a variation in the scales of the variables in the model with expected cross-section heteroskedastic-consistent covariance matrix of pooled regression models where the covariance matrix estimates gives the PCSE. The PCSE are obtained as the square roots of the diagonal matrix as follows:

$$\text{cov}(b) = (X'X)^{-1}(X'(\Phi \otimes I_T)X)(X'X)^{1}$$

where Φ is an N x N matrix with the (i,j)th element estimated by:

$$(\sum_t^T = 1 \hat{e}_{i,t}\ \hat{e}_{j,t}) / T$$

Results obtained for the PCSE model are reported in Table 3. The expected effects are same as the LSDV model as discussed above. Comparing the results of PSCE with the LSDV model, the LSDV model is more robust.

The results revealed by the sample of high-income and emerging market economies are quite unique. Theoretically, one would expect high-income economies to be leaders of dominant in terms of stock market development given their high-income levels and infrastructural development in communications technology and industry. Our findings show this aspect is not so important as emerging market economies with lower levels of income and technological capacity are quickly seizing an opportunity to *leap frog* the industrial or high-income countries, that is, by going straight from underdeveloped networks to fully digitized networks, bypassing the traditional analog technology that still forms the backbone of the system in most industrialized countries. In fact in 1993 some two dozen or more developing countries already had fully digitized networks, while the level of digitization in the OECD countries averaged just 65 percent (The World Bank, 1998, p. 57).

We also noted in section two (see Table 1), that the upper middle-income economies have experienced rapid growth in stock markets. Our sample also revealed that several economies in the emerging market category also fell in the upper middle-income category. Therefore, the high

level use of new information technology and rapid growth in stock markets side by side adds more sense to the strength of the results obtained.

Further, our results certainly support the views expressed by Levine (1997, p. 723-25). Levine (1997, p. 688-89) argued that the finance-growth link goes beyond the relationship between finance and shorter-term fluctuations. He further notes that a financial system is shaped by non-financial developments. Among other factors, changes in telecommunications and the number of computers influence the quality of financial services and the structure of financial systems. Our results obtained here certainly provide additional support for Levine's (1997, p. 688-89) arguments that are discussed above.

Table 3. Results

Variables	**Primary Model**	**LSDV Model**	**PCSE Model**
mc	0.43012 (10.19)*	0.37684 (6.116)*	0.43012 (6.702)*
cps	0.15580 (2.583)*	0.21484 (3.795)*	0.15580 (2.834)*
dum1	….	-2.9584 (0.3853)	….
dum2	….	-25.852 (5.626)*	….
tml	0.0288 (1.057)	0.0268 (1.405)	0.0288 (1.086)
tv	-0.0012 (0.0543)	0.0303 (2.343)**	-0.001248 (0.1049)
mp	-0.0133 (0.6530)	-0.0238 (0.7514)	-0.013352 (0.4073)
pc	0.00807 (0.2039)	0.0452 (1.665)***	0.0080 (0.3159)
inet	0.2295 (1.336)	0.275 (2.724)*	0.22951 (2.283)**
constant	-14.336 (2.604)	-21.264 (7.305)*	-14.336 (6.453)*
R-square	0.66	0.69	0.66
Number of Observations	205	205	205

*,**, and *** indicates statistically significant at the 1, 5 and 10% levels respectively.

The results of our information technology measures, in particular, personal computers and internet, are no doubt a part of the non-financial sector that has a positive influence on growth and development of the financial sector. This is allowing some emerging markets to leapfrog their counterparts in high-income countries. Such evidence is supported by the phenomenal increase in the magnitude of equity flows in Asia (for example, China) and Latin America (for example, Mexico). Information technology does certainly assist in the flow of capital across borders.

Private capital outflows are important for emerging market economies and their importance continues to increase over time, particularly in two of the emerging regions – Asia and Latin America. International portfolios in these markets are more concentrated in equities than in bonds. However, these regions have experienced significant increases in portfolio investments (bonds and equity). The relative importance of mutual funds has also grown substantially. Emerging markets in Asia that capture large share of mutual funds are Hong Kong, Korea, Taiwan and Malaysia while in Latin America, its Brazil and Mexico. Kaminsky, Lyons, and Schmukler (2001, p. 25-36) note that in absolute values, bond and equity flows since 1994 in Latin America. These authors further note that overall bond and equity flows to Latin America declined between 1996 and 1998 from about $44 billion to about $15 billion and bond and equity flows to Asia collapsed in 1998 to $9 billion from their peak in 1996 if #38 billion. In general, equity investment in emerging markets has grown rapidly in the 1990s with large proportion of equity flows channeled through mutual funds. Mutual funds hold a sizeable share of market capitalization in emerging countries. These funds in general have been experiencing rapid growth. Asian and Latin American funds achieved the fastest growth but their size remain small compared to domestic US international funds.

It is also worthy to note in regard to financial market developments that over the past decade some developments in international finance have been crucial particularly in China. Of foremost importance is its dominant positioning receiving foreign direct investment (FDI) in the world. According to UNCTAD (1998, p. 10-12), accumulated FDI flows into China during 1992-97 were $196 billion, constituting over 30% of total FDI into all developing countries closely allied to the developments and progress in FDI flows, China in recent times have also experienced phenomenal growths in its equities market. Several factors seem to have contributed to this development. For example, in regard to FDI boom, Zhang (2001, p. 336-38) notes that China's liberalization of investment regime (for example, the promulgation of Sino-Foregin Joint Venture Law), explosive growth of the domestic economy and a stable political environment have all contributed to its phenomenal growth in FDI inflows. These developments are also likely to have significant spillover effects as evidenced by the case of China.

4. Conclusion and Policy Implications

Using panel data from high-income and emerging market economies, this paper carries out an empirical investigation of the links between new information technology and stock market development in emerging and high-income economies. Three different estimation procedures: a primary OLS model n LSDV and a PSCE are adopted. The LSDV model produced the most robust results. Based on this, personal computers and Internet hosts are the two ICT variables that showed strong positive influence on stock market development in our sample countries. The results also revealed strong positive effects of market capitalization and credit to private sector as a non-ICT contributor to stock market development. Mobile phones did not show any positive effect. Controlling for income and technological achievements, our results lead us to conclude that the emerging market economies have already seized in an opportunity to leap frog the industrial or high-income countries, that is, by going straight from underdeveloped networks to fully digitized networks. Such a move is having a tremendous positive effect on the financial sector of emerging market economies. Our results also support some policy implications particularly to the lesser-developed economies.

Financial systems are shaped indeed by non-financial developments. Recent advancements in telecommunications, computers, electronic communications, among other factors, are catalyst for stock market development in emerging economies. Such developments are likely to add further impetus to the growth and devilment of many emerging market economies.opportunities are also great for many low and middle-income countries to take advantage for the new information and

communications technologies in disseminating financial knowledge and expanding their stock markets thus enhancing their financial growth and development process.

The main policy implication for the lesser developed countries and those with low levels of ICT diffusion is to act quickly to seize the opportunity for information technology development by investing in the physical as well as human capital infrastructure of a modern and perhaps fully digitized communication networks. Such a move will certainly have a favorable effect not only on promotion and development of stock markets but also on overall economic growth.

Secondly, maintaining a robust economic environment is essential, not only to promote stock market development but to create opportunities for useful ICT innovations to be created and diffused. Growth and market conditions leased to technology creation, which attracts domestic and global corporations and enhances the growth and development of stock markets. Therefore, greater ICT diffusion as well as stock market development would require flexible, competitive and dynamic economic environments. The implications for countries who are lagging behind in terms of their stock market growth is to implement policy reforms that emphasize openness to new investors, ideas, and products especially in communications an information technology areas. Adherence to closed market policies towards ICT and stock market development while promoting policies that favor government monopolies will surely isolate countries from foreign capital as well as global ICT networks.

Although the benefits of information technology for stock market development are still in infancy in many lesser-developed economies, tremendous potentials lie ahead. These will directly assist in extending beneficial spillover effects in other areas of financial markets, for example, banking, trade and foreign exchange. We conclude that increasing the level of ICT diffusion is essential for productivity gains and improvements economic performance in emerging economies/markets. From a global business perspective high level of ICT diffusion capability is indicative of its level of ICT infrastructural development. This in turn serves as a positive signal to domestic and foreign investors seeking to expand globally.

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