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Digital Divide: An Econometric Study of the Determinants in Information-poor Countries

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There can not be two opinions on the importance of Information and Communication Technology (ICT) for economic development. However, real disparities exist in access to and use of ICT across countries. The digital divide is a complicated matter of varying levels of access, basic usage, and applications of ICT among countries and peoples. Using the Gompertz Technology Diffusion model, this paper attempts to measure the contribution of factors such as affordability, knowledge, infrastructure, human capital, trade openness, and economic and social environment in the technology diffusion process, specially in the case of information-poor countries.

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I. INTRODUCTION

The need for access to Information and Communication Technology (ICT) for accelerated economic development has increased manifold in the information age. Not only are the new technologies considered a key to unlocking economic growth, they impinge on and can impact virtually all aspects of development. In this regard, a number of well-known declarations concerning developmental applications of Information and Communication Technology (ICT) rest on the experiences of high- or middle-income countries, and are simply assumed to be valid in other settings as well.

With its power to influence profoundly every sector of the economy, improved access to information and communications is central to improving the lives of people in the third world. And institutions in these countries, ranging from public bureaucracies and large enterprises, to small businesses and NGOs have the obvious need to improve their efficiency and effectiveness through access to modern means of communication i.e. computers, basic software and internet. All of this and much more, would be done if there were no constraints (or relatively malleable constraints) on governments, communities and individuals attempting to improve the quality of life in the developing world—just as it has been done in the advanced industrial world. However, there are extremely serious constraints on using ICT to improve the lot of most people in the Third World. These constraints are only partially technical and to a greater extent, they are economic, social and political. They flow not only from unresolved problems of poverty and economic inequality in particular countries and regions, but also from the structure and dynamics of

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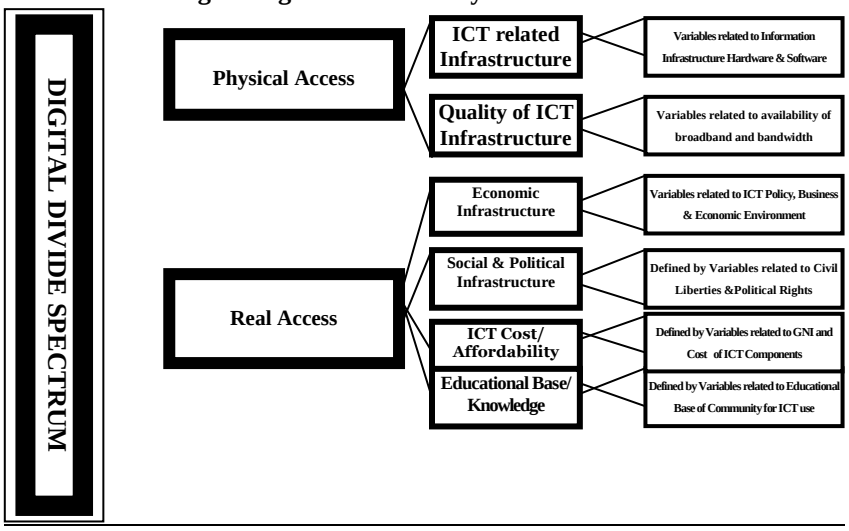
the global economic system. Furthermore, whatever efforts are made to improve access to ICT in these countries, these take place within extremely varied cultures and social structures which shape the outcome of technological change in particular ways. Both the need for certain ICT products and their use may, thus, differ markedly from what might be expected in advanced industrial societies.

Thus far the gains of the digital revolution have been confined to a comparatively small group of countries, mainly in the industrialised world. The unequal distribution of the new and old the ICT across countries and associated efficiency gains go by the name of Digital Divide. It is the logical consequence of the social and economic imbalances that already exist within and across the countries. Although broadening of physical access to information and communication technologies is often a *necessary* step in reducing the digital divide, it is almost never *sufficient* to do so because the problem goes beyond the physical access and is related to real access. Physical access is determined by the availability of ICT related to infrastructure and its quality. But 'Real Access' is determined by: affordability; knowledge; IT training; its usage; human capital; sociopolitical conditions; and economic infrastructure available in a country.

Section I introduces the problem and gives the analytical framework used in the papers. Section II details the methodology. Section III describes the variables included in the study in the light of the literature review. This section also analyses the data sources. Section IV reports empirical findings of the study, and Section V summarises the findings of the study.

Figure 1 below throws light on the digital divide spectrum.

Fig. 1. Digital Divide Analytical Framework



A glance at Figure 1 shows the presence of two sets of physical and real factors which influence countries access to ICT. We use this framework to place different information poor countries along Digital Access Index (DAI) ranking scale across countries. This is shown in Table 1.

Table 1

'Information-poor Countries' included in Analysis with Digital Access Index (DAI) Score Less than or Equal to 0.37 out of 1

Country	Score	Country	Score	Country	Score	Country	Score
African Countries							
Algeria	0.37	Djibouti	0.15	Madagascar	0.15	Sudan	0.13
Benin	0.12	Egypt	0.40	Malawi	0.15	Tanzania	0.15
Burkina Faso	0.08	Equatorial Guinea	0.20	Mali	0.09	Uganda	0.17
Burundi	0.10	Ethiopia	0.10	Mauritania	0.14	Zambia	0.17
Cameroon	0.16	Gambia	0.13	Mozambique	0.12	Zimbabwe	0.29
Central African Rep.	0.10	Ghana	0.16	Nepal	0.19		
Chad	0.10	Guinea	0.10	Niger	0.04		
Comoros	0.13	Guinea-Bissau	0.10	Nigeria	0.15		
Congo	0.17	Kenya	0.19	Rwanda	0.15		
Côte d'Ivoire	0.13	Lesotho	0.19	Senegal	0.14		
Asian Countries							
Armenia	0.30	Pakistan	0.24				
Azerbaijan	0.24	Syria	0.28				
Bangladesh	0.18	Tajikistan	0.21				
Bhutan	0.13	Turkmenistan	0.37				
Cambodia	0.17	Uzbekistan	0.31				
Georgia	0.37	Viet Nam	0.31				
India	0.32						
Indonesia	0.34						
Kyrgyzstan	0.32						
Lao P.D.R.	0.15						
American Countries							
Haiti	0.15						
Honduras	0.29						
Nicaragua	0.19						
European Country							
Moldova	0.37						
Oceania							
Papua New Guinea	0.26						

Source: International Telecommunication Indicators 1998–2003.

Note: Scores are on a scale of 0 to 1 where 1 = highest access and 0 = lowest score. DAI values are shown to hundreds of a decimal point. Countries with the same DAI value are ranked by thousands of a decimal point by ITI.

Because of considerable differences in physical and real access across countries, it would be important to estimate the relative significance of various determinants of digital divide. This should help in identifying the factors that shape the environment in which modern ICT get diffused into the economies and what makes particular applications and services useful, especially in the case of information poor countries.

II. METHODOLOGY

Using Gompertz Technology Diffusion model, this study estimates factors that are responsible for the slow technology diffusion process in the information poor countries. This kind of model was used by [Stoneman (1983)] for modeling spread of computers. The specifications of the model are as follows:

T_{it} is an indicator of Information and Communication Technology (ICT) in a country $_i$ in year '*t*' and T_i^* be its post diffusion or equilibrium level or value (T_i^* or equilibrium level of ICT in country '*i*' will be a function of exogenous demand side variables).

Most of the models of technology of technology adoption assume that over time T_{it} tends to T_i^* along an S-shaped path i.e. this model assumes that spread between the value of the ICT indicator in year '*t*' and its value in year '*t*–1 'is a function of the spread between a target value (or post diffusion value) T^* and value in year *t*–1.

$$\ln T_{it} - \ln T_{it-1} = \alpha_i (\ln T_i^* - \ln T_{it-1}) \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where α_i is the speed of adjustment taken to be constant in our analysis.

Moreover we assume that most of the explanatory variables change over time. We may say that T_i^* is time dependent and express it as:

$$\ln T_{it}^* = \beta_{io} + \beta_{i1} \ln Y_{it} + \gamma' Z_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where post diffusion level of technology is a function of Y_{it}, i.e. the national income of the country '*i*' in year '*t*' and Z_{it}, which is the vector of other possible variables describing the demand or supply conditions e.g. infrastructure, openness to international trade, economic freedom, knowledge or educational base of country 'i' in year '*t*'.

The estimable equation is obtained by inserting (2) in to (1).

$$\ln T_{it} - \ln T_{it-1} = \alpha_i \beta_o + \alpha_i \beta_{i1} \ln Y_{it} + \alpha_i \gamma' Z_{it} - \alpha_i \ln T_{it-1} + \varepsilon \quad \ldots \quad (3)$$

where ε is a white noise i.e. where the error terms are uncorrelated with zero mean and σ^2 variance.

III. DESCRIPTION OF THE VARIABLES AND DATA SOURCES

The estimates of Gompertz Technology Diffusion model are reported in Section IV of this research paper for four ICT indicators i.e. cellular mobile subscribers per 100 inhabitants, personal computers per 100 inhabitants, internet hosts per 10,000 inhabitants, and internet users per 10,000 inhabitants. The data on these variables are for the period 1998–2003. The first three variables are taken as indicators of the state of the ICT infrastructure, so they will help to study the diffusion process of ICT infrastructure, while the fourth indicator, internet users, measures access to the internet. It is worth noting that the difference between communication technology and information technology has become blurred. For example, mobile phones are primarily tools of communication, but with the advent of wireless applications, consumers can access data and information via

cellular phone. The internet is mainly an indicator of information technology, yet, many internet users communicate with other users from their personal computers. Thus, all three information indicators: internet hosts, internet users and personal computers have also become tools of communication.

The first explanatory variable in estimable equation is Gross National Income (GNI) per capita measured in international dollars. This variable is included to capture affordability. GNI is converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a U.S. dollar has in United States. Purchasing power parity (PPP) rates provide a standard measure allowing comparison of real price levels between countries, just as conventional price indices allow comparison of real values over time. Data for GNI is taken from world development indicators database, 2003. Historical data from developed nations indicate that adoption and diffusion of ICT is highly correlated with income. Countries with higher per capita income invest more in research and development and, hence, are more able to discover and use advanced information technologies. Prior to the spread of the internet, fixed telephones Hardy (1980) and telephone infrastructure Norton (1992) were used to model communication effects on economic growth. Since mid-1990s however other indicators of ICT began to be emphasised and more robust econometric tests are being employed. In general, the association between ICT and income is expected to be strong and positive.

The first variable in vector '*Z*' is education. Low levels of education and literacy are expected to hinder both real accessibility and dissemination of ICT. Since the use of knowledge-based products requires a basic level of literacy, we would expect to see higher education causing higher ICT use and its consumption. Diffusion of ICT may require higher or tertiary education, and scientific research. Kiiski and Pohjola (2002) showed that, in a sample including developing and OECD countries, tertiary education had a positive and statistically significant influence on ICT diffusion. In contrast, Hargittai (1999), and Kiiski and Pohjola (2002) have found that in the case of industrial countries, education did not seem to influence ICT diffusion. These conflicting results suggest that this can be an important explanatory variable and need to be empirically tested. Also, in a sample that included both developed and developing countries, Norris (2000) shows that education did not have a significant influence on ICT diffusion. Consistent data on tertiary education are not available for all the countries in the sample. This study uses adult literacy and the education index instead. This index is also used by UNDP in generating the human development index (HDI).

This study uses three freedom indicators, which in fact represent the economic, social and political infrastructure in the economy that create an environment conducive for the spread of modern technologies i.e. ICT. The first indicator is the index of economic freedom published by the Heritage Foundation. This index is an average score of 10 indexes measured on a one-to-five scale, with 5 indicating the highest level of economic freedom. The 10 indexes assess trade policy, monetary policy, capital flows and foreign investment, wage and price control, banking and financial regulations, intellectual property and black markets, property rights, regulation, transparency and bureaucracy, government intervention in the economy, and the fiscal burden of the government (taxes and government expenditure). At least in cross-sectional analyses,

greater (higher index) economic freedom is expected to be associated with higher GDP, higher levels of education or literacy rates, and stronger ICT indicators.

The other freedom indicators are the index of political rights and the index of civil liberties. By including these indices, we follow the work of Norris (2000) and try to explore whether countries with higher levels of civil and political freedom could also have greater ICT diffusion. These two indexes are measured on a one-to-seven scale, with 7 indicating the highest degree of freedom. The correlation between these indices and income is expected to be positive.

The other variables included in vector '*Z*' are trade policy indicators. Openness to international trade is one of two trade policy indicators used in this study. It is measured as the ratio of the sum of exports and imports to GDP in world prices. The role of trade policy is important. For example, Jussawalla (1999) claims that East Asian nations fostered ICT production through openness and export-oriented investments. Both exports and imports may offer a channel for increased adoption and diffusion of ICT. Some imported goods and services require the existence of specific ICT to be operational. In some cases, ICT may be embodied in the imported products. Similarly, to enhance their exports, firms find it increasingly necessary to make use of ICT. Mobile phones, internet use, computerized operations are all tools used to improve the efficiency of conducting business in the global market. These tools tend to reduce the level of imperfect information and incomplete markets. As argued by Stiglitz (1989), imperfect information results in less trade. Thus, we would expect a positive and significant correlation between ICT and openness to international trade. The second international trade variable is foreign direct investment (FDI). Inward FDI usually allows recipient economies' access to advanced technologies, managerial skills and higher level of know-how. Transnational corporations tend to standardise their operations around the world and train workers in host countries according to their skill standards, including the use of ICT. Moreover, FDI may replace ICT as a medium for information and knowledge diffusion in cases where information and knowledge associated with ICT have a proprietary feature. As emphasised by Bedi (1999), '...in such cases, the role of ICT in enabling access is limited, and other measures such as trade and foreign direct investment may be appropriate conduits for disseminating information and knowledge'. Thus, it is reasonable to expect higher inward FDI to contribute to ICT diffusion.

Other variables which have been emphasised in the literature as potential determinants of ICT diffusion include knowledge of English language Kiiski and Pohjola (2002), income distribution [Bedi (1999); Hargittai (1999) and Pohjola (2000)], and competition in the telecommunication industry [Hargittai (1999); Jayakar (1999); and Kiiski and Pohjola (2002)]. The empirical evidence on the impact of these variables, particularly in developing countries, is ambiguous or more in support of their insignificance. So, they are not included as explanatory variables.

IV. EMPIRICAL RESULTS

The results from the linear estimation of Gompertz Technology Diffusion model exploring the factors that influence ICT diffusion are reported in Tables 2–5. To test the robustness of the model, four equations were estimated. As mentioned earlier, the use of ICT in an economy can be seen through four indicators i.e. internet users, internet hosts,

number of personal computers and mobile phone subscribers. Table 2 displays the statistical results from estimating the model with internet use as the relevant ICT variable. Table 3 reports the findings when personal computers were the relevant ICT indicator. Tables 4 and 5 report the results associated with internet hosts, and mobile phones, respectively.

Equations /columns (1) and (2) in each table differ in terms of right hand side variables because in each table (except internet hosts) the first equation reports the findings about those right hand side variables selected as a result of stepwise model selection procedure from all entered variables. Here one thing is worth mentioning that the selected model in above mentioned three cases as a result of stepwise selection

Table 2

Estimates of the Gompertz Technology Diffusion Model

Cross-section Results for Countries with DRI Score Less than or Equal to 0.4		
Dependent Variable (Internet Users) ln U_2 – ln U_{98}		
	(1)	(2)
Speed of Diffusion	0.718***	0.780***
	(0.070)	(0.072)
Constant $\alpha\beta_0$	–3.918**	–4.267**
	(1.943)	(1.947)
GNI per Capita $\alpha\beta_1$	0.549***	0.491***
	(0.200)	(0.202)
Adult Literacy		
Secondary and Tertiary Education		
Education Index		1.097**
		(0.573)
Civil Liberties		0.06347
		(0.057)
Economic Freedom		0.08149
		(0.071)
Foreign Direct Investment		
Openness to International Trade	0.567***	0.383**
	(0.172)	(0.185)
Personal Computers -98		0.163*
		(0.097)
Internet Access Cost	–0.295***	–0.230**
	(0.109)	(0.113)
F-Test	32.163***	18.450***
R	0.879	0.902
R^2	0.772	0.813
Adjusted R^2	0.748	0.769
Number of Observations	42	42

Note: Standard errors are in parentheses.* =Significant at (0.10), i.e., at 10 percent, **=Significant at (0.05), i.e., at 5 percent and ***=Significant at (0.01), i.e., at 1 percent.

Table 3

Estimates of the Gompertz Technology Diffusion Model

Cross-section Results for Countries with DRI Score Less than or Equal to 0.4

Dependent Variable (Personal Computers) $\ln PCs_{02} - \ln PCs_{98}$

	(1)	(2)
Speed of Diffusion α	0.810***	0.804***
	(0.115)	(0.118)
Constant $\alpha\beta_0$	–4.734***	–3.991***
	(1.526)	(1.507)
GNI per Capita $\alpha\beta_0$	0.561***	0.537***
	(0.184)	(0.189
Adult Literacy	0.01483***	0.01311***
	(0.005)	(0.005)
Secondary and Tertiary Education		
Education Index		
Political Rights		
Civil Liberties		
Economic Freedom	0.155**	
	(0.088)	
Foreign Direct Investment		
Openness to International Trade		
Personal Computers -98	0.334***	
	(0.087)	
Internet Access Cost		
F- Test	13.935***	15.748***
R	0.812	0.794
R^2	0.659	0.630
Adjusted R^2	0.612	0.600
Number of Observations	41	41

Note: Standard errors are in parentheses.* =Significant at (0.10), i.e., at 10 percent, **=Significant at (0.05), i.e., at 5 percent and ***=Significant at (0.o1, i.e., at 1 percent.

Table 4

Estimates of the Gompertz Technology Diffusion Model

Cross-section Results for Countries with DRI Scores Less than or Equal to 0.4

Dependent Variable Internet Hosts ($\ln H_{02} - \ln H_{98}$)

Speed of Diffusion α	0.379***
	(0.139)
Constant $\alpha\beta_0$	–6.659***
	(2.484)
GNI per Capita $\alpha\beta_1$	0.889***
	(0.291)
Economic Freedom	0.295***
	(0.166)
F- Test	4.068***
R	0.508
R^2	0.259
Adjusted R^2	0.200
Number of Observations	38

Note: Standard errors are in parentheses.* =Significant at (0.10), i.e., at 10 percent, **=Significant at (0.05), i.e., at 5 percent and ***=Significant at (0.01), i.e., at 1 percent.

Table 5

Estimates of the Gompertz Technology Diffusion Model

Cross-section Results for Countries with Low DRI Scores Less than or Equal to 0.4

Dependent Variable Mobile Phones ($\ln M_{02} - \ln M_{98}$)

	(1)	(2)
Speed of Diffusion α	–0.330	–1.958
	(0.908)	(1.768)
Constant $\alpha\beta_\circ$	0.400***	0.455***
	(0.086)	(0.099)
GNI per Capita $\alpha\beta_1$		0.217
		(0.203)
Openness to International Trade	0.573**	0.549**
	(0.264)	(0.265
F- Test	11.677***	8.191***
R	0.560	0.574
R^2	0.314	0.330
Adjusted R^2	0.287	0.289
Number of Observations	53	53

Note: Standard errors are in parentheses.* =Significant at (0.10), i.e., at 10 percent, **=Significant at (0.05), i.e., at 5 percent and ***=Significant at (0.01), i.e., at 1 percent. (This should be cleared.)

procedure is also consistent with the model selected through forward selection procedure i.e. the both methods select the same explanatory variables. Equation (2) provides the estimates of the model including those explanatory variables selected as a result of backward model selection procedure. Moreover all the four estimated equations satisfy the basic assumptions of linear models as all have been duly checked (checking includes co-linearity diagnostic through VIF(variance inflate factor), and autocorrelation through Durbin-Watson test.

The underlying assumption here is that the diffusion process is the same in all countries i.e. the parameter values of Gompertz Technology Diffusion model take the same value for all '*i*' or countries, moreover the speed of diffusion is assumed to be constant over time. However it would be more appropriate to make it time dependent as suggested by Kiiski and Pohjola (2002), but in order to make the analysis simple it is assumed so.

Table 2 displays the statistical results of internet use as the relevant ICT indicator. The empirical results indicate that in case of internet users both of the equations show that model adequately captures the diffusion process since the speed of diffusion or adjustment (coefficient on the lagged value of this variable) is highly significant in both cases. Speed of diffusion is 0.718 in case of Equation (1) and 0.780 in case of Equation (2) and in both cases significant at 99 percent confidence level. Moreover income, education, openness to international trade, stock of personal computers and internet access cost turn out to be highly significant i.e. at 99 percent confidence level in both equations. However civil liberties and economic freedom come up with correct signs, but are not as significant explanatory variables. If we make a comparison of two selected models, the model selected through backward selection procedure (Equation 2) is a little better than one selected through stepwise procedure (Equation 1) as it slightly improves the value of adjusted R-squared i.e. from 0.75 in Equation (1) to 0.77 in Equation (2).

Table 3 displays the results of the model where ICT is represented by the number of personal computers per 100 inhabitants. Again in this case the speed of diffusion (α) is highly significant in both the selected models as it is 0.180 in case of Equation (1), and 0.804 in the case of Equation (2) and is significant at 99 percent confidence level. In the case of internet users income, adult literacy, economic freedom, internet users turn out to be highly significant at 99 percent confidence level. Moreover out of the two models selected through two different selection procedures, Equation (1) is more appropriate i.e. selected through stepwise and forward selection procedures as it gives slightly improved value of R-square (i.e. 0.612) as compared to 0.6 in the case of Equation (1).

Table 4 displays the results when internet hosts was the ICT indicator in an economy or dependent variable. Although the speed of diffusion is significant at 99 percent confidence level in the selected model but the value of R-square is very low. However the results suggest that income and economic freedom are other important significant explanatory variables that too are significant at 99 percent confidence level. Moreover model fails to provide support for the influence of education or literacy on internet host diffusion.

Finally, Table 5 reports the findings when mobile phone is an indicator of ICT. Again in this case speed of diffusion adjustment is significant at 99 percent level of confidence, but model captures weakly the diffusion process because here again the value of adjusted R-square is low. Moreover, this is the only ICT indicator where income does not come out to be significant. The only significant variable is openness to international trade which is significant at 95 percent level of confidence.

In summary, the empirical results provide support for the role of income as a major determinant of ICT diffusion because it comes out to be significant at 99 percent confidence level in the case of internet use, internet hosts and personal computers. This is consistent with the conclusions in Niininen (2001), Hargittai (1999), Quah (2001), Norris (2000), and Kiiski and Pohjola (2002). Thus showing that adoption and diffusion of modern information and communication technology is highly correlated with income level. Countries with higher per capita income invest more in research and development therefore are able to acquire and use advanced information technologies.

In addition, education and literacy, especially adult literacy, appears to have direct impact on dissemination and personal computers, thus showing that education influences technology adoption. However we do not find evidence that education is a significant explanatory variable of mobile phone use. This may be due to the reason that use of mobile phones does not need as much educational or training skills as it is required in case of computer or internet use. Undoubtedly education must have a role in diffusion of information and communication technologies for at least two reasons. Firstly, education directly contributes to basic literacy and reading and writing skills which are essential in use of modern ICT as knowledge-based products. More educated people are likely to be quicker to adopt new innovations than people with less education. Secondly, based on the facts that the early users of the internet were people working in higher education and research academic institutions may play an important role in spreading of ICT. However, our findings that education is important in technology dissemination is consistent with the earlier findings of Barrow and Lee (2000) and Duncombe (2000), Caselli and Coleman (2001) and Wong (2001) and is in sharp contrast with the findings of Hargittai (1999) and

Norris(2000), as they concluded that education is not important in technology dissemination.

It is surprising to find that there is no support for the influence of FDI on ICT diffusion. As mentioned earlier, FDI is an important channel through which technology enters a country and gets disseminated. Perhaps, there is a threshold that most developing countries in the sample have not yet reached or that FDI in the countries under study targets labour-intensive sectors that require negligible levels of ICT. In fact, since FDI is accounted for in the index of economic freedom, the findings do not necessarily imply that this variable has no impact on ICT diffusion.

Moreover, the estimation yields values for the speed of diffusion adjustment (α) that are consistent with the increased adoption of ICT. In a cross-sectional model including 75 developed and developing countries, Kiiski and Pohjola (2002) report values for the speed of diffusion that range from 0.186 to 0.527. However the empirical results in this research paper find that the speed of diffusion can vary from 0.400 to 0.455 for mobile phones, from 0.804 to 0.810 for personal computers and from 0.718 to 0.780 for internet use. However, given that the RHS variables are not the same, it is difficult to make a more meaningful comparison of the results derived in the two studies.

V. SUMMARY

This study has six important findings. First, income is a major determinant of ICT diffusion. Income influences both ICT infrastructure as it is shown to cause higher internet use, use of personal computers and internet hosts and access to ICT since it has an effect on internet use. Second, there is a positive impact of government trade policies on ICT. Openness fosters the adopting and adapting of technology. Third, at least in the case of two ICT indicators (mobile phones and internet hosts) political rights and civil liberties have a strong influence. Fourth, there is evidence supporting that education (literacy) has a positive impact on ICT diffusion. Moreover, the above conclusions highlight the role of demand in the market for knowledge-based products, and are consistent with the propositions in Quah (2001). It is important to note that for mobile phones openness to international trade and for internet hosts, economic freedom are important factors, while GNI does not seem to have an effect on mobile phones.

In addition, the speed of diffusion in the case of Internet users and Personal computers is shown to be much higher than in the case of internet hosts and mobile phones. This finding may reflect the recent trend in large cities where *cyber cafés* are mushrooming. However, it is feared that a faster diffusion of internet users (relative to internet hosts) may lead to saturation and poor access to information. The present findings seem to provide elements for hope and concern at the same time. On the one hand, there is evidence through earlier researches that ICT enhances income, and hence, it can provide an additional source of economic growth. Due to its pervasive nature, ICT diffusion may allow a *leapfrogging* process to occur. On the other hand, the finding that trade policies and social development variables are important determinants of ICT diffusion, as well as economic development, implies that countries with poor performance in these variables may sink even further in the *information-poor* and *non-communicating* side of the digital divide.

Notes: Information-poor countries considered in this research paper for the purpose of analysis are low-access economies, i.e., the countries have a score value of less than 0.37 according to the Digital Access Index (DAI) of ITU, 2002-03. A complete list of these countries along with their scores can be seen in Table 1. Countries in this category are the poorest in the world and most are LDCs. They have a minimal level of access to the information society. The Digital Access Index (DAI) measures the overall ability of individuals in a country to access and use information and communication technologies. The DAI combines eight variables, covering five areas, to provide an overall country score. The results of the Index point to potential stumbling blocks in ICT adoption.

APPENDIX

Mathematical Derivation of Results

Details of Model Selection Procedure When Internet Users Are the Relevant n ICT Indicator

Variables Entered / Removed (a)			
Model	Variables Entered	Variables Removed	Method
1	LN-USERS-98	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	LN-Avg GNI	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	ln-OPEN	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	ln_internet tariff	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

(a) Dependent Variable: USERs (LN02-98).

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.525(a)	.276	.258	.89848688218940
2	.818(b)	.669	.652	.61554392824644
3	.853(c)	.728	.707	.56438514885354
4	.879(d)	.772	.748	.52380532999675

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-Avg GNI.
(c) Predictors: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN.
(d) Predictors: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN, ln_internet tariff.

ANOVA(e)						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.626	1	12.626	15.640	.000(a)
	Residual	33.098	41	.807		
	Total	45.724	42			
2	Regression	30.569	2	15.284	40.339	.000(b)
	Residual	15.156	40	.379		
	Total	45.724	42			
3	Regression	33.302	3	11.101	34.849	.000(c)
	Residual	12.423	39	.319		
	Total	45.724	42			
4	Regression	35.298	4	8.825	32.163	.000(d)
	Residual	10.426	38	.274		
	Total	45.724	42			

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-Avg GNI.
(c) Predictors: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN.
(d) Predictors: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN, ln_internet tariff.
(e) Dependent Variable: USERs (LN02-98).

Coefficients (a)

Model		Unstandardised Coefficients B	Unstandardised Coefficients Std. Error	Standardised Coefficients Beta	t	Sig.
1	(Constant)	1.708	.351		4.869	.000
	LN-USERS-98	–.411	.104	–.525	–3.955	.000
2	(Constant)	–6.780	1.257		–5.396	.000
	LN-USERS-98	–.671	.081	–.858	–8.323	.000
	LN-Avg GNI	1.022	.149	.709	6.882	.000
3	(Constant)	–8.138	1.242		–6.553	.000
	LN-USERS-98	–.679	.074	–.868	–9.186	.000
	LN-Avg GNI	.963	.138	.668	6.997	.000
	ln-OPEN	.541	.185	.249	2.929	.006
4	(Constant)	–3.918	1.943		–2.016	.051
	LN-USERS-98	–.718	.070	–.918	–10.241	.000
	LN-Avg GNI	.549	.200	.381	2.745	.009
	ln-OPEN	.567	.172	.261	3.307	.002
	ln_internet tariff	–.295	.109	–.376	–2.698	.010

(a) Dependent Variable: USERs (LN02-98).

Excluded Variables (e)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	LN-PCs-98	.533(a)	4.388	.000	.570	.827
	LN-Avg GNI	.709(a)	6.882	.000	.736	.781
	CL-c	–.196(a)	–1.494	.143	–.230	1.000
	ECF-c	–.079(a)	–.589	.559	–.093	.991
	ln-fdi	.378(a)	2.996	.005	.428	.928
	ln-OPEN	.336(a)	2.693	.010	.392	.985
	ln_internet tariff	–.694(a)	–6.423	.000	–.713	.762
	Education index	.520(a)	4.212	.000	.554	.823
2	LN-PCs-98	.274(b)	2.592	.013	.383	.651
	CL-c	.048(b)	.487	.629	.078	.857
	ECF-c	.011(b)	.117	.908	.019	.970
	ln-fdi	.120(b)	1.147	.259	.181	.755
	ln-OPEN	.249(b)	2.929	.006	.425	.964
	ln_internet tariff	–.349(b)	–2.240	.031	–.338	.311
	Education index	.265(b)	2.520	.016	.374	.660
3	LN-PCs-98	.225(c)	2.242	.031	.342	.628
	CL-c	.037(c)	.410	.684	.066	.855
	ECF-c	.039(c)	.451	.655	.073	.959
	ln-fdi	.124(c)	1.299	.202	.206	.755
	ln_internet tariff	–.376(c)	–2.698	.010	–.401	.310
	Education index	.177(c)	1.632	.111	.256	.567
4	LN-PCs-98	.160(d)	1.588	.121	.253	.571
	CL-c	.030(d)	.357	.723	.059	.854
	ECF-c	.075(d)	.931	.358	.151	.934
	ln-fdi	.065(d)	.693	.493	.113	.702
	Education index	.148(d)	1.448	.156	.232	.560

(a) Predictors in the Model: (Constant), LN-USERS-98.
(b) Predictors in the Model: (Constant), LN-USERS-98, LN-Avg GNI.
(c) Predictors in the Model: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN.
(d) Predictors in the Model: (Constant), LN-USERS-98, LN-Avg GNI, ln-OPEN, ln_internet tariff.
(e) Dependent Variable: USERs (LN02-98).

Variables Entered / Removed (b)

Model	Variables Entered	Variables Removed	Method
1	Education index, ECF-c, CL-c, ln-fdi, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff(a)	.	Enter
2		ln-fdi	Backward (criterion: Probability of F-to-remove >= .100).
3		CL-c	Backward (criterion: Probability of F-to-remove >= .100).
4		ECF-c	Backward (criterion: Probability of F-to-remove >= .100).
5		Education Index	Backward (criterion: Probability of F-to-remove >= .100).
6		LN-PCs-98	Backward (criterion: Probability of F-to-remove >= .100).

(a) All requested variables entered.
(b) Dependent Variable: USERs (LN02-98).

Model Summary

Model	R	R-Square	Adjusted R Square	Std. Error of the Estimate
1	.904(a)	.816	.766	.50435849610735
2	.902(b)	.813	.769	.50178824801358
3	.898(c)	.806	.767	.50357515882357
4	.894(d)	.798	.765	.50591094508067
5	.887(e)	.787	.758	.51361817779732
6	.879(f)	.772	.748	.52380532999675

(a) Predictors: (Constant), Education index, ECF-c, CL-c, ln-fdi, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(b) Predictors: (Constant), Education index, ECF-c, CL-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(c) Predictors: (Constant), Education index, ECF-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(d) Predictors: (Constant), Education index, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(e) Predictors: (Constant), ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(f) Predictors: (Constant), ln-OPEN, LN-USERS-98, LN-Avg GNI, ln_internet tariff.

ANOVA (g)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.330	9	4.148	16.306	.000(a)
	Residual	8.394	33	.254		
	Total	45.724	42			
2	Regression	37.163	8	4.645	18.450	.000(b)
	Residual	8.561	34	.252		
	Total	45.724	42			
3	Regression	36.849	7	5.264	20.759	.000(c)
	Residual	8.876	35	.254		
	Total	45.724	42			
4	Regression	36.510	6	6.085	23.775	.000(d)
	Residual	9.214	36	.256		
	Total	45.724	42			
5	Regression	35.964	5	7.193	27.265	.000(e)
	Residual	9.761	37	.264		
	Total	45.724	42			
6	Regression	35.298	4	8.825	32.163	.000(f)
	Residual	10.426	38	.274		
	Total	45.724	42			

(a) Predictors: (Constant), Education index, ECF-c, CL-c, ln-fdi, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(b) Predictors: (Constant), Education index, ECF-c, CL-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(c) Predictors: (Constant), Education index, ECF-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(d) Predictors: (Constant), Education index, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(e) Predictors: (Constant), ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(f) Predictors: (Constant), ln-OPEN, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(g) Dependent Variable: USERs (LN02-98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.366	1.961		–2.227	.033
	LN-PCs-98	.183	.101	.188	1.811	.079
	LN-Avg GNI	.472	.204	.327	2.309	.027
	CL-c	5.910E-02	.057	.088	1.031	.310
	ECF-c	7.594E-02	.071	.085	1.066	.294
	ln-fdi	4.281E-02	.053	.075	.809	.424
	ln-OPEN	.383	.186	.176	2.063	.047
	ln_internet tariff	–.199	.119	–.254	–1.668	.105
	LN-USERS-98	–.779	.072	–.995	–10.755	.000
	Education index	1.034	.581	.190	1.781	.084
2	(Constant)	–4.267	1.947		–2.192	.035
	LN-PCs-98	.163	.097	.168	1.676	.103
	LN-Avg GNI	.491	.202	.341	2.433	.020
	CL-c	6.347E-02	.057	.095	1.118	.271
	ECF-c	8.149E-02	.071	.091	1.155	.256
	ln-OPEN	.383	.185	.177	2.076	.046
	ln_internet tariff	–.230	.113	–.293	–2.042	.049
	LN-USERS-98	–.780	.072	–.997	–10.828	.000
	Education index	1.097	.573	.202	1.917	.064
3	(Constant)	–3.680	1.881		–1.956	.058
	LN-PCs-98	.144	.096	.148	1.495	.144
	LN-Avg GNI	.443	.198	.307	2.238	.032
	ECF-c	8.180E-02	.071	.091	1.155	.256
	ln-OPEN	.421	.182	.194	2.311	.027
	ln_internet tariff	–.244	.112	–.312	–2.178	.036
	LN-USERS-98	–.758	.070	–.969	–10.898	.000
	Education index	.925	.553	.170	1.671	.104
4	(Constant)	–3.531	1.886		–1.873	.069
	LN-PCs-98	.154	.096	.158	1.597	.119
	LN-Avg GNI	.460	.198	.319	2.323	.026
	ln-OPEN	.410	.183	.189	2.242	.031
	ln_internet tariff	–.224	.111	–.285	–2.010	.052
	LN-USERS-98	–.754	.070	–.964	–10.806	.000
	Education index	.796	.544	.146	1.461	.153
5	(Constant)	–3.670	1.912		–1.919	.063
	LN-PCs-98	.155	.098	.160	1.588	.121
	LN-Avg GNI	.521	.197	.361	2.648	.012
	ln-OPEN	.509	.172	.235	2.958	.005
	ln_internet tariff	–.241	.112	–.307	–2.142	.039
	LN-USERS-98	–.735	.070	–.939	–10.564	.000
6	(Constant)	–3.918	1.943		–2.016	.051
	LN-Avg GNI	.549	.200	.381	2.745	.009
	ln-OPEN	.567	.172	.261	3.307	.002
	ln_internet tariff	–.295	.109	–.376	–2.698	.010
	LN-USERS-98	–.718	.070	–.918	–10.241	.000

(a) Dependent Variable: USERs (LN02-98).

Excluded Variables (f)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	ln-fdi	.075(a)	.809	.424	.139	.643
3	ln-fdi	.084(b)	.909	.370	.154	.648
	CL-c	.095(b)	1.118	.271	.188	.765
4	ln-fdi	.094(c)	1.014	.317	.169	.655
	CL-c	.095(c)	1.117	.272	.186	.765
	ECF-c	.091(c)	1.155	.256	.192	.890
5	ln-fdi	.106(d)	1.136	.264	.186	.661
	CL-c	.055(d)	.652	.518	.108	.828
	ECF-c	.065(d)	.815	.420	.135	.927
	Education index	.146(d)	1.461	.153	.237	.560
6	ln-fdi	.065(e)	.693	.493	.113	.702
	CL-c	.030(e)	.357	.723	.059	.854
	ECF-c	.075(e)	.931	.358	.151	.934
	Education index	.148(e)	1.448	.156	.232	.560
	LN-PCs-98	.160(e)	1.588	.121	.253	.571

(a) Predictors in the Model: (Constant), Education index, ECF-c, CL-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(b) Predictors in the Model: (Constant), Education index, ECF-c, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(c) Predictors in the Model: (Constant), Education index, ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(d) Predictors in the Model: (Constant), ln-OPEN, LN-PCs-98, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(e) Predictors in the Model: (Constant), ln-OPEN, LN-USERS-98, LN-Avg GNI, ln_internet tariff.
(f) Dependent Variable: USERs (LN02-98).

**Details of Model Selection Procedure When Personal Computers Are the Relevant n ICT Indicator*

Variables Entered / Removed (b)

Model	Variables Entered	Variables Removed	Method
1	LN-USERS-98, CL-c, ln-OPEN, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff(a)	.	Enter
2		ln-OPEN	Backward (criterion: Probability of F-to-remove >= .100).
3		CL-c	Backward (criterion: Probability of F-to-remove >= .100).
4		ln_internet tariff	Backward (criterion: Probability of F-to-remove >= .100).
5		ln-fdi	Backward (criterion: Probability of F-to-remove >= .100).

(a) All requested variables entered.
(b) Dependent Variable: PCs (LN-02-LN98).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816(a)	.666	.573	.66636793146906
2	.816(b)	.666	.584	.65712443521351
3	.815(c)	.664	.595	.64888374965131
4	.814(d)	.662	.604	.64129107982249
5	.812(e)	.659	.612	.63495693384361

(a) Predictors: (Constant), LN-USERS-98, CL-c, ln-OPEN, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(b) Predictors: (Constant), LN-USERS-98, CL-c, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(c) Predictors: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(d) Predictors: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI .
(e) Predictors: (Constant), LN-USERS-98, ECF-c, LN-PCs-98, Adult literacy, LN-Avg GNI.

ANOVA (f)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.396	9	3.155	7.105	.000(a)
	Residual	14.209	32	.444		
	Total	42.605	41			
2	Regression	28.355	8	3.544	8.208	.000(b)
	Residual	14.250	33	.432		
	Total	42.605	41			
3	Regression	28.290	7	4.041	9.598	.000(c)
	Residual	14.316	34	.421		
	Total	42.605	41			
4	Regression	28.211	6	4.702	11.433	.000(d)
	Residual	14.394	35	.411		
	Total	42.605	41			
5	Regression	28.091	5	5.618	13.935	.000(e)
	Residual	14.514	36	.403		
	Total	42.605	41			

(a) Predictors: (Constant), LN-USERS-98, CL-c, ln-OPEN, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(b) Predictors: (Constant), LN-USERS-98, CL-c, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(c) Predictors: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(d) Predictors: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI.
(e) Predictors: (Constant), LN-USERS-98, ECF-c, LN-PCs-98, Adult literacy, LN-Avg GNI.
(f) Dependent Variable: PCs (LN-02-LN98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	–4.567	2.621		–1.742	.091
	LN-PCs-98	–.842	.135	–.887	–6.244	.000
	LN-Avg GNI	.554	.273	.393	2.027	.051
	CL-c	2.519E-02	.076	.039	.332	.742
	ECF-c	.166	.094	.190	1.762	.088
	ln-fdi	–4.733E-02	.071	–.085	–.666	.510
	ln-OPEN	7.357E-02	.244	.035	.301	.765
	Adult Literacy	1.528E-02	.006	.327	2.451	.020
	ln_internet tariff	–7.059E-02	.160	–.092	–.442	.661
	LN-USERS-98	.324	.096	.424	3.394	.002
2	(Constant)	–4.442	2.553		–1.740	.091
	LN-PCs-98	–.834	.130	–.878	–6.411	.000
	LN-Avg GNI	.560	.269	.398	2.084	.045
	CL-c	2.887E-02	.074	.044	.391	.699
	ECF-c	.164	.093	.187	1.768	.086
	ln-fdi	–4.734E-02	.070	–.085	–.676	.504
	Adult Literacy	1.592E-02	.006	.340	2.754	.009
	ln_internet tariff	–6.409E-02	.156	–.084	–.411	.684
	LN-USERS-98	.322	.094	.422	3.429	.002
3	(Constant)	–4.161	2.418		–1.721	.094
	LN-PCs-98	–.840	.128	–.884	–6.581	.000
	LN-Avg GNI	.537	.259	.381	2.074	.046
	ECF-c	.164	.092	.187	1.791	.082
	ln-fdi	–4.466E-02	.069	–.080	–.649	.521
	Adult Literacy	1.546E-02	.006	.331	2.767	.009
	ln_internet tariff	–6.630E-02	.154	–.086	–.431	.669
	LN-USERS-98	.331	.090	.434	3.685	.001
4	(Constant)	–4.939	1.587		–3.112	.004
	LN-PCs-98	–.820	.118	–.863	–6.958	.000
	LN-Avg GNI	.605	.203	.429	2.978	.005
	ECF-c	.157	.089	.179	1.761	.087
	ln-fdi	–3.462E-02	.064	–.062	–.541	.592
	Adult literacy	1.522E-02	.005	.325	2.770	.009
	LN-USERS-98	.337	.088	.441	3.830	.001
5	(Constant)	–4.734	1.526		–3.103	.004
	LN-PCs-98	–.810	.115	–.853	–7.029	.000
	LN-Avg GNI	.561	.184	.398	3.045	.004
	ECF-c	.155	.088	.177	1.762	.087
	Adult literacy	1.483E-02	.005	.317	2.750	.009
	LN-USERS-98	.334	.087	.437	3.843	.000

(a) Dependent Variable: PCs (LN-02-LN98).

Excluded Variables (e)

Model		Beta In	T	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	ln-OPEN	.035(a)	.301	.765	.053	.787
3	ln-OPEN	.041(b)	.364	.718	.063	.808
	CL-c	.044(b)	.391	.699	.068	.793
4	ln-OPEN	.034(c)	.311	.758	.053	.821
	CL-c	.046(c)	.411	.684	.070	.794
	ln_internet tariff	–.086(c)	–.431	.669	–.074	.245
5	ln-OPEN	.036(d)	.330	.744	.056	.822
	CL-c	.038(d)	.349	.729	.059	.805
	ln_internet tariff	–.042(d)	–.226	.822	–.038	.277
	ln-fdi	–.062(d)	–.541	.592	–.091	.727

(a) Predictors in the Model: (Constant), LN-USERS-98, CL-c, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff.
(b) Predictors in the Model: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI, ln_internet tariff .
(c) Predictors in the Model: (Constant), LN-USERS-98, ECF-c, ln-fdi, LN-PCs-98, Adult literacy, LN-Avg GNI .
(d) Predictors in the Model: (Constant), LN-USERS-98, ECF-c, LN-PCs-98, Adult literacy, LN-Avg GNI .
(e) Dependent Variable: PCs (LN-02-LN98).

Regression

Variables Entered / Removed (a)

Model	Variables Entered	Variables Removed	Method
1	LN-USERS-98	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	LN-PCs-98	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	LN-Avg GNI	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	Adult Literacy	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

(a) Dependent Variable: PCs(LN-02-LN98).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.365(a)	.133	.112	.96071574101738
2	.656(b)	.431	.401	.78867872347214
3	.756(c)	.572	.538	.69261008796680
4	.794(d)	.630	.590	.65275801844985

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.

ANOVA (e)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.686	1	5.686	6.161	.017(a)
	Residual	36.919	40	.923		
	Total	42.605	41			
2	Regression	18.347	2	9.173	14.748	.000(b)
	Residual	24.259	39	.622		
	Total	42.605	41			
3	Regression	24.376	3	8.125	16.938	.000(c)
	Residual	18.229	38	.480		
	Total	42.605	41			
4	Regression	26.840	4	6.710	15.748	.000(d)
	Residual	15.765	37	.426		
	Total	42.605	41			

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.
(e) Dependent Variable: PCs (LN-02-LN98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.489	.379		3.929	.000
	LN-USERS-98	.279	.112	.365	2.482	.017
2	(Constant)	1.565	.312		5.023	.000
	LN-USERS-98	.470	.102	.615	4.626	.000
	LN-PCs-98	–.569	.126	–.599	–4.512	.000
3	(Constant)	–4.021	1.599		–2.514	.016
	LN-USERS-98	.366	.094	.479	3.906	.000
	LN-PCs-98	–.774	.125	–.815	–6.194	.000
	LN-Avg GNI	.676	.191	.480	3.545	.001
4	(Constant)	–3.991	1.507		–2.647	.012
	LN-USERS-98	.335	.089	.438	3.748	.001
	LN-PCs-98	–.804	.118	–.846	–6.789	.000
	LN-Avg GNI	.537	.189	.381	2.846	.007
	Adult literacy	1.311E-02	.005	.280	2.404	.021

(a) Dependent Variable: PCs (LN-02-LN98).

Excluded Variables (e)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	LN-PCs-98	–.599(a)	–4.512	.000	–.586	.827
	LN-Avg GNI	.093(a)	.552	.584	.088	.781
	CL-c	.045(a)	.304	.763	.049	1.000
	ECF-c	.105(a)	.708	.483	.113	.991
	ln-fdi	.109(a)	.711	.481	.113	.928
	ln-OPEN	–.010(a)	–.067	.947	–.011	.985
	Adult literacy	.202(a)	1.290	.205	.202	.872
	ln_internet tariff	.073(a)	.430	.670	.069	.762
2	LN-Avg GNI	.480(b)	3.545	.001	.499	.614
	CL-c	–.127(b)	–1.003	.322	–.161	.912
	ECF-c	.075(b)	.609	.546	.098	.988
	ln-fdi	.158(b)	1.267	.213	.201	.921
	ln-OPEN	.124(b)	.987	.330	.158	.933
	Adult literacy	.382(b)	3.158	.003	.456	.811
	ln_internet tariff	–.341(b)	–2.211	.033	–.338	.558
3	CL-c	–.016(c)	–.133	.895	–.022	.838
	ECF-c	.127(c)	1.184	.244	.191	.970
	ln-fdi	–.020(c)	–.158	.876	–.026	.740
	ln-OPEN	.106(c)	.964	.342	.156	.931
	Adult literacy	.280(c)	2.404	.021	.368	.735
	ln_internet tariff	.022(c)	.109	.914	.018	.285
4	CL-c	.038(d)	.337	.738	.056	.805
	ECF-c	.177(d)	1.762	.087	.282	.938
	ln-fdi	–.056(d)	–.469	.642	–.078	.728
	ln-OPEN	.025(d)	.222	.825	.037	.825
	ln_internet tariff	.013(d)	.067	.947	.011	.285

(a) Predictors in the Model: (Constant), LN-USERS-98.
(b) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.
(e) Dependent Variable: PCs (LN-02-LN98).

Regression

Variables Entered / Removed (a)

Model	Variables Entered	Variables Removed	Method
1	LN-USERS-98	.	Forward (Criterion: Probability-of-F-to-enter <= .050)
2	LN-PCs-98	.	Forward (Criterion: Probability-of-F-to-enter <= .050)
3	LN-Avg GNI	.	Forward (Criterion: Probability-of-F-to-enter <= .050)
4	Adult literacy	.	Forward (Criterion: Probability-of-F-to-enter <= .050)

(a) Dependent Variable: PCs (LN-02-LN98).

Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.365(a)	.133	.112	.96071574101738
2	.656(b)	.431	.401	.78867872347214
3	.756(c)	.572	.538	.69261008796680
4	.794(d)	.630	.590	.65275801844985

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.

ANOVA (e)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.686	1	5.686	6.161	.017(a)
	Residual	36.919	40	.923		
	Total	42.605	41			
2	Regression	18.347	2	9.173	14.748	.000(b)
	Residual	24.259	39	.622		
	Total	42.605	41			
3	Regression	24.376	3	8.125	16.938	.000(c)
	Residual	18.229	38	.480		
	Total	42.605	41			
4	Regression	26.840	4	6.710	15.748	.000(d)
	Residual	15.765	37	.426		
	Total	42.605	41			

(a) Predictors: (Constant), LN-USERS-98.
(b) Predictors: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.
(e) Dependent Variable: PCs (LN-02-LN98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.489	.379		3.929	.000
	LN-USERS-98	.279	.112	.365	2.482	.017
2	(Constant)	1.565	.312		5.023	.000
	LN-USERS-98	.470	.102	.615	4.626	.000
	LN-PCs-98	–.569	.126	–.599	–4.512	.000
3	(Constant)	–4.021	1.599		–2.514	.016
	LN-USERS-98	.366	.094	.479	3.906	.000
	LN-PCs-98	–.774	.125	–.815	–6.194	.000
	LN-Avg GNI	.676	.191	.480	3.545	.001
4	(Constant)	–3.991	1.507		–2.647	.012
	LN-USERS-98	.335	.089	.438	3.748	.001
	LN-PCs-98	–.804	.118	–.846	–6.789	.000
	LN-Avg GNI	.537	.189	.381	2.846	.007
	Adult literacy	1.311E-02	.005	.280	2.404	.021

(a) Dependent Variable: PCs (LN-02-LN98).

Excluded Variables (e)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	LN-PCs-98	–.599(a)	–4.512	.000	–.586	.827
	LN-Avg GNI	.093(a)	.552	.584	.088	.781
	CL-c	.045(a)	.304	.763	.049	1.000
	ECF-c	.105(a)	.708	.483	.113	.991
	ln-fdi	.109(a)	.711	.481	.113	.928
	ln-OPEN	–.010(a)	–.067	.947	–.011	.985
	Adult literacy	.202(a)	1.290	.205	.202	.872
	ln_internet tariff	.073(a)	.430	.670	.069	.762
2	LN-Avg GNI	.480(b)	3.545	.001	.499	.614
	CL-c	–.127(b)	–1.003	.322	–.161	.912
	ECF-c	.075(b)	.609	.546	.098	.988
	ln-fdi	.158(b)	1.267	.213	.201	.921
	ln-OPEN	.124(b)	.987	.330	.158	.933
	Adult literacy	.382(b)	3.158	.003	.456	.811
	ln_internet tariff	–.341(b)	–2.211	.033	–.338	.558
3	CL-c	–.016(c)	–.133	.895	–.022	.838
	ECF-c	.127(c)	1.184	.244	.191	.970
	ln-fdi	–.020(c)	–.158	.876	–.026	.740
	ln-OPEN	.106(c)	.964	.342	.156	.931
	Adult literacy	.280(c)	2.404	.021	.368	.735
	ln_internet tariff	.022(c)	.109	.914	.018	.285
4	CL-c	.038(d)	.337	.738	.056	.805
	ECF-c	.177(d)	1.762	.087	.282	.938
	ln-fdi	–.056(d)	–.469	.642	–.078	.728
	ln-OPEN	.025(d)	.222	.825	.037	.825
	ln_internet tariff	.013(d)	.067	.947	.011	.285

(a) Predictors in the Model: (Constant), LN-USERS-98.
(b) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98.
(c) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI.
(d) Predictors in the Model: (Constant), LN-USERS-98, LN-PCs-98, LN-Avg GNI, Adult literacy.
(e) Dependent Variable: PCs (LN-02-LN98).

Details of Model Selection Procedure When Internet Hosts Are the Relevant n ICT Indicator

Variables Entered / Removed (b)

Model	Variables Entered	Variables Removed	Method
1	LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI, Education index(a)	.	Enter
2	.	Education index	Backward (criterion: Probability of F-to-remove >= .100).
3	.	FDI-Avg	Backward (criterion: Probability of F-to-remove >= .100).
4	.	CL-c	Backward (criterion: Probability of F-to-remove >= .100).
5	.	LN-PCs-98	Backward (criterion: Probability of F-to-remove >= .100).
6	.	OPEN-Avg	Backward (criterion: Probability of F-to-remove >= .100).

(a) All requested variables entered.
(b) Dependent Variable: HOSTA (LN02-98).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.543(a)	.294	.106	1.19706115760003
2	.541(b)	.293	.133	1.17892490645525
3	.538(c)	.290	.157	1.16271328411677
4	.532(d)	.283	.174	1.15089924013000
5	.522(e)	.273	.187	1.14159443945720
6	.508(f)	.259	.195	1.13605956508465

(a) Predictors: (Constant), LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI, Education index.
(b) Predictors: (Constant), LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI.
(c) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI .
(d) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-PCs-98, LN-Avg GNI.
(e) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-Avg GNI .
(f) Predictors: (Constant), LN-HOSTS-98, ECF-c, LN-Avg GNI.

ANOVA (g)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.932	8	2.242	1.564	.178(a)
	Residual	42.989	30	1.433		
	Total	60.921	38			
2	Regression	17.835	7	2.548	1.833	.116(b)
	Residual	43.086	31	1.390		
	Total	60.921	38			
3	Regression	17.660	6	2.943	2.177	.071(c)
	Residual	43.261	32	1.352		
	Total	60.921	38			
4	Regression	17.210	5	3.442	2.599	.043(d)
	Residual	43.711	33	1.325		
	Total	60.921	38			
5	Regression	16.611	4	4.153	3.186	.025(e)
	Residual	44.310	34	1.303		
	Total	60.921	38			
6	Regression	15.749	3	5.250	4.068	.014(f)
	Residual	45.172	35	1.291		
	Total	60.921	38			

(a) Predictors: (Constant), LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI, Education index .
(b) Predictors: (Constant), LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI .
(c) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI .
(d) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-PCs-98, LN-Avg GNI.
(e) Predictors: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-Avg GNI .
(f) Predictors: (Constant), LN-HOSTS-98, ECF-c, LN-Avg GNI .
(g) Dependent Variable: HOSTA (LN02-98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	–5.542	3.355		–1.652	.109
	LN-PCs-98	.129	.225	.109	.573	.571
	LN-Avg GNI	.699	.383	.399	1.825	.078
	ECF-c	.326	.188	.300	1.733	.093
	CL-c	–7.102E-02	.141	–.087	–.505	.617
	FDI-Avg	–1.385E-05	.000	–.058	–.368	.716
	OPEN-Avg	6.690E-03	.014	.085	.494	.625
	Education index	.401	1.540	.061	.260	.796
	LN-HOSTS-98	–.398	.166	–.476	–2.407	.022
2	(Constant)	–5.390	3.253		–1.657	.108
	LN-PCs-98	.134	.220	.114	.610	.546
	LN-Avg GNI	.721	.368	.412	1.962	.059
	ECF-c	.310	.175	.285	1.774	.086
	CL-c	–8.097E-02	.133	–.100	–.607	.548
	FDI-Avg	–1.314E-05	.000	–.055	–.355	.725
	OPEN-Avg	8.004E-03	.012	.102	.646	.523
	LN-HOSTS-98	–.380	.147	–.454	–2.578	.015
3	(Constant)	–5.329	3.204		–1.663	.106
	LN-PCs-98	.131	.217	.111	.603	.551
	LN-Avg GNI	.708	.361	.405	1.963	.058
	ECF-c	.310	.172	.285	1.803	.081
	CL-c	–7.534E-02	.131	–.093	–.577	.568
	OPEN-Avg	8.479E-03	.012	.108	.698	.490
	LN-HOSTS-98	–.378	.145	–.452	–2.601	.014
4	(Constant)	–5.902	3.015		–1.957	.059
	LN-PCs-98	.144	.214	.122	.673	.506
	LN-Avg GNI	.763	.344	.436	2.217	.034
	ECF-c	.312	.170	.286	1.830	.076
	OPEN-Avg	8.330E-03	.012	.106	.693	.493
	LN-HOSTS-98	–.392	.142	–.468	–2.765	.009
5	(Constant)	–6.986	2.529		–2.763	.009
	LN-Avg GNI	.883	.292	.505	3.023	.005
	ECF-c	.315	.169	.289	1.865	.071
	OPEN-Avg	9.582E-03	.012	.122	.813	.422
	LN-HOSTS-98	–.394	.141	–.471	–2.801	.008
6	(Constant)	–6.659	2.484		–2.680	.011
	LN-Avg GNI	.889	.291	.508	3.058	.004
	ECF-c	.295	.166	.271	1.775	.085
	LN-HOSTS-98	–.379	.139	–.453	–2.732	.010

(a) Dependent Variable: HOSTA (LN02-98).

Excluded Variables (f)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	Education index	.061(a)	.260	.796	.047	.433
3	Education index	.054(b)	.238	.814	.043	.435
	FDI-Avg	–.055(b)	–.355	.725	–.064	.937
4	Education index	.085(c)	.392	.697	.069	.472
	FDI-Avg	–.044(c)	–.288	.776	–.051	.950
	CL-c	–.093(c)	–.577	.568	–.101	.858
5	Education index	.102(d)	.476	.638	.083	.480
	FDI-Avg	–.038(d)	–.252	.802	–.044	.953
	CL–c	–.103(d)	–.648	.521	–.112	.867
	LN-PCs-98	.122(d)	.673	.506	.116	.664
6	Education index	.147(e)	.744	.462	.127	.554
	FDI-Avg	–.050(e)	–.335	.740	–.057	.963
	CL-c	–.102(e)	–.647	.522	.110	.867
	LN-PCs-98	.141(e)	.796	.432	.135	.680
	OPEN-Avg	.122(e)	.813	.422	.138	.958

(a) Predictors in the Model: (Constant), LN-HOSTS-98, FDI-Avg, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI.
(b) Predictors in the Model: (Constant), LN-HOSTS-98, OPEN-Avg, CL-c, ECF-c, LN-PCs-98, LN-Avg GNI.
(c) Predictors in the Model: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-PCs-98, LN-Avg GNI.
(d) Predictors in the Model: (Constant), LN-HOSTS-98, OPEN-Avg, ECF-c, LN-Avg GNI.
(e) Predictors in the Model: (Constant), LN-HOSTS-98, ECF-c, LN-Avg GNI .
(f) Dependent Variable: HOSTA (LN02-98).

Details of Model Selection Procedure When Mobile Phones Are the Relevant n ICT Indicator

Variables Entered / Removed (b)

Model	Variables Entered	Variables Removed	Method
1	LN-M-98, CL-c, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index(a)	.	Enter
2	.	CL-c	Backward (criterion: Probability of F-to-remove >= .100).
3	.	ECF-c	Backward (criterion: Probability of F-to-remove >= .100).
4	.	ln-fdi	Backward (criterion: Probability of F-to-remove >= .100).
5	.	Adult literacy	Backward (criterion: Probability of F-to-remove >= .100).
6	.	Education index	Backward (criterion: Probability of F-to-remove >= .100).
7	.	LN-Avg GNI	Backward (criterion: Probability of F-to-remove >= .100).

(a) All requested variables entered.
(b) Dependent Variable: M(ln02-ln98).

Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate
1	.602(a)	.362	.248	.92768648860601
2	.601(b)	.361	.264	.91825546325226
3	.598(c)	.358	.276	.91034613791259
4	.594(d)	.352	.285	.90485855365053
5	.577(e)	.333	.279	.90866499916275
6	.574(f)	.330	.289	.90210549580296
7	.560(g)	.314	.287	.90343596063431

(a) Predictors: (Constant), LN-M-98, CL-c, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(b) Predictors: (Constant), LN-M-98, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(c) Predictors: (Constant), LN-M-98, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(d) Predictors: (Constant), LN-M-98, ln-OPEN, Adult literacy, LN-Avg GNI, Education index.
(e) Predictors: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI, Education index.
(f) Predictors: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI.
(g) Predictors: (Constant), LN-M-98, ln-OPEN.

ANOVA (h)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.960	8	2.745	3.190	.006(a)
	Residual	38.727	45	.861		
	Total	60.687	53			
2	Regression	21.900	7	3.129	3.710	.003(b)
	Residual	38.787	46	.843		
	Total	60.687	53			
3	Regression	21.737	6	3.623	4.371	.001(c)
	Residual	38.950	47	.829		
	Total	60.687	53			
4	Regression	21.386	5	4.277	5.224	.001(d)
	Residual	39.301	48	.819		
	Total	60.687	53			
5	Regression	20.229	4	5.057	6.125	.000(e)
	Residual	40.458	49	.826		
	Total	60.687	53			
6	Regression	19.997	3	6.666	8.191	.000(f)
	Residual	40.690	50	.814		
	Total	60.687	53			
7	Regression	19.061	2	9.530	11.677	.000(g)
	Residual	41.626	51	.816		
	Total	60.687	53			

(a) Predictors: (Constant), LN-M-98, CL-c, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(b) Predictors: (Constant), LN-M-98, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(c) Predictors: (Constant), LN-M-98, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(d) Predictors: (Constant), LN-M-98, ln-OPEN, Adult literacy, LN-Avg GNI, Education index.
(e) Predictors: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI, Education index.
(f) Predictors: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI.
(g) Predictors: (Constant), LN-M-98, ln-OPEN.
(h) Dependent Variable: M(ln02-ln98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	–2.680	2.099		–1.277	.208
	LN-Avg GNI	.288	.259	.195	1.112	.272
	CL-c	–2.370E-02	.090	–.035	–.264	.793
	ECF-c	5.048E-02	.118	.055	.429	.670
	ln-fdi	5.578E-02	.085	.096	.659	.513
	ln-OPEN	.652	.297	.293	2.194	.033
	Education index	–3.989	3.670	–.714	–1.087	.283
	Adult literacy	2.992E-02	.030	.610	.998	.324
	LN-M-98	–.462	.108	–.640	–4.279	.000
2	(Constant)	–2.840	1.988		–1.429	.160
	LN-Avg GNI	.303	.250	.205	1.214	.231
	ECF-c	5.129E-02	.116	.056	.440	.662
	ln-fdi	5.321E-02	.083	.091	.639	.526
	ln-OPEN	.642	.292	.288	2.200	.033
	Education index	–3.902	3.618	–.699	–1.078	.286
	Adult literacy	2.964E-02	.030	.604	1.000	.323
	LN-M-98	–.464	.106	–.644	–4.365	.000
3	(Constant)	–2.637	1.917		–1.375	.175
	LN-Avg GNI	.307	.248	.207	1.238	.222
	ln-fdi	5.367E-02	.083	.092	.650	.519
	ln-OPEN	.640	.289	.288	2.213	.032
	Education index	–4.339	3.450	–.777	–1.258	.215
	Adult literacy	3.265E-02	.029	.665	1.141	.260
	LN-M-98	–.462	.105	–.641	–4.387	.000
4	(Constant)	–2.647	1.906		–1.389	.171
	LN-Avg GNI	.347	.238	.235	1.456	.152
	ln-OPEN	.623	.286	.280	2.175	.035
	Education index	–4.398	3.428	–.787	–1.283	.206
	Adult literacy	3.375E-02	.028	.688	1.189	.240
	LN-M-98	–.442	.100	–.613	–4.413	.000
5	(Constant)	–2.293	1.890		–1.213	.231
	LN-Avg GNI	.275	.232	.186	1.189	.240
	ln-OPEN	.605	.287	.272	2.106	.040
	Education index	–.447	.844	–.080	–.530	.599
	LN-M-98	–.454	.100	–.630	–4.535	.000
6	(Constant)	–1.958	1.768		–1.107	.273
	LN-Avg GNI	.217	.203	.147	1.073	.289
	ln-OPEN	.549	.265	.246	2.071	.044
	LN-M-98	–.455	.099	–.631	–4.575	.000
7	(Constant)	–.330	.908		–.363	.718
	ln-OPEN	.573	.264	.257	2.170	.035
	LN-M-98	–.400	.086	–.555	–4.679	.000

(a) Dependent Variable: M(ln02-ln98).

Excluded Variables (g)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
2	CL-c	–.035(a)	–.264	.793	–.039	.826
3	CL-c	–.036(b)	–.277	.783	–.041	.827
	ECF-c	.056(b)	.440	.662	.065	.866
4	CL-c	–.026(c)	–.203	.840	–.030	.838
	ECF-c	.057(c)	.451	.654	.066	.866
	ln-fdi	.092(c)	.650	.519	.094	.682
5	CL-c	–.021(d)	–.160	.874	–.023	.839
	ECF-c	.087(d)	.711	.481	.102	.915
	ln-fdi	.102(d)	.717	.477	.103	.685
	Adult literacy	.688(d)	1.189	.240	.169	4.033E-02
6	CL-c	–.005(e)	–.044	.965	–.006	.879
	ECF-c	.097(e)	.814	.420	.115	.958
	ln-fdi	.091(e)	.649	.519	.092	.696
	Adult literacy	–.032(e)	–.223	.824	–.032	.672
	Education index	–.080(e)	–.530	.599	–.075	.596
7	CL-c	–.047(f)	–.403	.688	–.057	.995
	ECF-c	.077(f)	.652	.518	.092	.978
	ln-fdi	.127(f)	.968	.337	.136	.781
	Adult literacy	.030(f)	.229	.820	.032	.805
	Education index	.005(f)	.035	.972	.005	.767
	LN-Avg GNI	.147(f)	1.073	.289	.150	.713

(a) Predictors in the Model: (Constant), LN-M-98, ECF-c, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(b) Predictors in the Model: (Constant), LN-M-98, ln-OPEN, ln-fdi, Adult literacy, LN-Avg GNI, Education index.
(c) Predictors in the Model: (Constant), LN-M-98, ln-OPEN, Adult literacy, LN-Avg GNI, Education index.
(d) Predictors in the Model: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI, Education index.
(e) Predictors in the Model: (Constant), LN-M-98, ln-OPEN, LN-Avg GNI.
(f) Predictors in the Model: (Constant), LN-M-98, ln-OPEN.
(g) Dependent Variable: M(ln02-ln98).

Resources	Memory Required	5636 bytes
	Additional Memory Required for Residual Plots	0 bytes
	Elapsed Time	0:00:00.00

Variables Entered / Removed (a)

Model	Variables Entered	Variables Removed	Method
1	LN-M-98	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	ln-OPEN	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

(a) Dependent Variable: M(ln02-ln98).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.501(a)	.251	.236	.93508686061264
2	.560(b)	.314	.287	.90343596063431

(a) Predictors: (Constant), LN-M-98.

(b) Predictors: (Constant), LN-M-98, ln-OPEN.

ANOVA (c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.219	1	15.219	17.405	.000(a)
	Residual	45.468	52	.874		
	Total	60.687	53			
2	Regression	19.061	2	9.530	11.677	.000(b)
	Residual	41.626	51	.816		
	Total	60.687	53			

(a) Predictors: (Constant), LN-M-98.

(b) Predictors: (Constant), LN-M-98, ln-OPEN.

(c) Dependent Variable: M(ln02-ln98).

Coefficients (a)

Model		Unstandardised Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.608	.170		9.444	.000
	LN-M-98	–.361	.086	–.501	–4.172	.000
2	(Constant)	–.330	.908		–.363	.718
	LN–M–98	–.400	.086	–.555	–4.679	.000
	ln-OPEN	.573	.264	.257	2.170	.035

a Dependent Variable: M(ln02-ln98).

Excluded Variables (c)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	LN-Avg GNI	.172(a)	1.219	.228	.168	.719
	CL-c	–.047(a)	–.388	.700	–.054	.995
	ECF-c	.044(a)	.363	.718	.051	.993
	ln-fdi	.121(a)	.889	.378	.124	.781
	ln-OPEN	.257(a)	2.170	.035	.291	.955
	Education index	.102(a)	.798	.429	.111	.886
	Adult literacy	.119(a)	.948	.348	.132	.920
2	LN-Avg GNI	.147(b)	1.073	.289	.150	.713
	CL-c	–.047(b)	–.403	.688	–.057	.995
	ECF-c	.077(b)	.652	.518	.092	.978
	ln-fdi	.127(b)	.968	.337	.136	.781
	Education index	.005(b)	.035	.972	.005	.767
	Adult literacy	.030(b)	.229	.820	.032	.805

(a) Predictors in the Model: (Constant), LN-M-98.

(b) Predictors in the Model: (Constant), LN-M-98, ln-OPEN.

(c) Dependent Variable: M(ln02-ln98).

REFERENCES

Barro, R. J. and J. W. Lee (2001) International Data on Educational Attainment: Updates and Implications. *Oxford Economic Papers* 53:3, 541–63.

Bedi, Arjun (1999) The Role of Information and Communication Technologies in Economic Development: A Partial Survey. Centre for Development Reasearch, Universitat Bonn. (Discussion Papers on Development Policy 7.)

Caselli, Francesco and W. John II Coleman (2001) Cross-country Technology Diffusion: The Case of Computers. *American Economic Review* 81, 328–35.

Duncombe, R. (2000) Information and Communication Technology, Poverty and Development in Sub-Saharan Africa. Institute for Development Policy and Management, University of Manchester, UK.

Hardy, Andrew P. (1980) The Role of the Telephone in Economic Development. *Telecommunications Policy* 4:4, 278–286.

Hargittai, Eszter (1999) Weaving the Western Web: Explaining Differences in Internet Connectivity among OECD Countries. Telecommunications Policy.

ITU (1999) Telecommunications Indicator Handbook [Internet]. International Telecommunication Union. Retrieved from the World.

ITU (2000) World Telecommunications Indicators: Chronological Time Series 1960-1999 [STARS Software Package]. International Telecommunication Union.

ITU (2001) Country Data by Region [Internet]. International Telecommunication. Retrieved from the World Wide Web: www7.itu.int/bdt_cds/IDC/Countries.idc.

ITU (2002) International Telecommunication Indicators. Available at: <www.itu.int/ITU-D/ict/statistics>.

ITU (2003) International Telecommunication Indicators. Available at: <http://www.itu.int/ITU-D/ict/statistics>.

ITU Secretariat. (1998) Methodological Note on the Choice of Teledensity Bands Internet International Telecommunication Union Secretariat Study Group 3 Tariff and Accounting Principal. Retrieved from the World Wide Web: <http://www.itu.int/sg3focus/choiceof.htm>.

Jayakar, Krishna P. (1999) Local Exchange Competition in Early US Network Development: Considerations for Developing Countries. *Telecommuni-cations Policy* 23:5, 375–87.

Jussawalla, M. (1999) The Impact of ICT Convergence on Development in the Asian Region. *Telecommunications Policy* 23:3-4, 217–234.

Kiiski, Sampsa, and Matti Pohjola (2002) Cross Country Diffusion of the Internet. Information Economics and Policy.

Niininen, Petri (2001) Computers and Economic Growth in Finland. In M. Pohjola (ed.)

Norris, Pippa (2000) The Global Divide: Information Poverty and Internet Access Worldwide. Available at: <www.ksg.harvard.edu/people/>

Norton, S. (1992) Information Costs, Telecommunications, and the Microeconomics of Macroeconomic Growth. *Economic Development and Cultural Change* 41, 175–96.

Pohjola, M. (2001) Information Technology and Economic Growth: A Cross Country Analysis. In M. Pohjola (ed.) *Information Technology, Productivity, and Economic Growth*. New York: Oxford University Press.

Pohjola, Matti (2000) Information Technology and Economic Growth: A Cross-Country Analysis. In M. Pohjola (ed.) *Information Technology, Productivity, and Economic Growth: International Evidence and Implications for Economic Development.* New York: Oxford University Press. pp. 242–56.

Quah, Danny (2001) Technology and Economic Growth: Some Lessons for the New Economy. Available at: <http://www.econ.lse.ac.uk/staff/dquah/p/ dp0522.pdf>

Stiglitz, Joseph (1989) Economic Organisation, Information and Development. In J. Behrman and T. N. Srinivasan (eds) *Handbook of Development Economic* Vol. 1. Amsterdam: North Holland.

Stoneman, P. (1983) *The Economic Analysis of Technological Change*. Oxford: Oxford University Press.

Wong, P. K. (2001) ICT Industry Development and Diffusion in South East Asia. Helsinki: UNU/WIDER. (WIDER Discussion Paper WDP 2001/08.)