Factors Influencing the Diffusion of Information and Communications Technology: Are Developing Countries Different?

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Abstract

This paper uses a logistic model of technology diffusion to investigate the relationship between rates of mobile phone, internet and broadband use and a number of economic, geographic and institutional variables, in a sample of 144 countries from 1990 to 2013. It pays particular attention to the differences in the process of diffusion between high- and low-income countries The aim of the paper is to identify the main characteristics of countries that have had success in adopting these new technologies in order to gain some insight into the barriers which may be faced by those countries that have been less successful. The results suggest that there are important differences between high- and low-income countries in terms of the factors that influence the diffusion of digital technologies.

Keywords: Digital divide, technology diffusion, mobile phones, internet
JEL Classification: O1, O3, O33

1 Introduction

Over the past couple of decades, digital technologies have spread rapidly throughout the world, bringing with them great opportunities. While there is no doubt that mobile phones and the internet are extremely useful in developed countries, these technologies are arguably even more important in developing countries where the information environment is generally poorer and older communications technologies, such as fixed line telephones, are less widely available. According to the World Development Report, 2016 (p.5) "more households in developing countries own a mobile phone than have access to electricity or improved sanitation." A number of studies have shown that ICTs can have a significant impact on the well-being of individuals in developing countries.[1] These technologies can reduce transaction

[1] Jensen (2007); Goyal (2010); Aker (2010).

costs, help markets to work more efficiently and provide access to important services, e.g., healthcare information and mobile banking. However, while there has been rapid growth in the use of mobile phones and the internet in developing countries over the past few years, adoption is far from universal, with some parts of the world still lagging quite far behind. This means that large portions of the population do not have access to technologies that could be extremely beneficial to them. This is particularly true with the internet which requires more infrastructure and greater skills, including literacy, in order to use it effectively: "nearly 60% of the world's population are still offline and can't participate in the digital economy in any meaningful way" (World Bank, 2016; p. 2).

Even as developing countries are catching up in terms of mobile phone use, newer, more advanced technologies are being introduced all the time such as broadband and next generation mobile technology. When it comes to these new technologies there is a risk that this digital divide could increase. Even though mobile phones have been quite widely adopted, the adoption of next generation technologies may be much slower. Currently, " for every person connected to high-speed broadband, five are not" (World Bank, 2016; p.4). This could lead to a greater digital divide as some parts of the world use technologies that are much more advanced than others.

Because of the potential benefits associated with digital technologies, a digital divide can lead to other inequalities over time. It is important for us to understand what the main barriers to adoption of these technologies are in order to prevent a more significant digital divide.There are potential lessons from the spread of mobile phones and the internet for adoption of new technologies, although of course the benefits of these technologies may be different given that mobile phones are now widespread.

It is important not to automatically treat the process of diffusion of digital technologies the same way in developed and developing countries. Users of digital technologies in developing countries may face institutional and other constraints that are not faced by users in developed countries, thereby leading to differential demand. Many low-income countries have leap-frogged fixed-line telephones and gone straight to adopting mobile phones. This means that the way this technology is being used in low-income countries may be fundamentally different to the way it is being used in high-income countries, where it is a complement to other forms of infrastructure rather than a substitute. Any analysis of the diffusion of ICT should allow for differences in the process between high- and low-income countries.

The technology adoption process is made up of two parts. Firstly, the necessary infrastructure must be in place before anyone can use the technology. This usually involves a significant level of investment. The costs and benefits of this investment may depend on a number of factors including the physical geography of the region and the institutional environment. Secondly, individuals can choose whether or not to use the technology once it is available. This choice will depend on their economic circumstances and the expected

gain to using the technology.

A number of studies have investigated the process of diffusion of ICTs and its relationship with a number of other variables. Many of these studies focus on particular countries or geographic areas, such as the EU or OECD.[2] The evidence on the relationship between rates of ICT use and income per capita is mixed. Some studies have found a positive relationship[3] while others have found no significant relationship between the two.[4] Previous studies have also come to different conclusions regarding the relationship between fixed line telephones and rates of ICT use. Some have found them to be complements[5] while others have found that they are substitutes.[6] A number of studies have investigated the relationship between competition in the mobile phone market and rates of mobile phone use and have generally found that increased competition leads to higher rates of mobile phone use.[7] Rouvinen (2006) differentiates between developed and developing countries to investigate whether or not there is a significant difference in the process of diffusion in poorer countries. He finds that the speed of adjustment is not too different between developed and developing countries but that population size and network effects are more important in poorer countries. Gumboa and Otero (2009) attribute the delayed installation of infrastructure in remote areas of Columbia to the diverse topography of the country. Hyytinen and Toivanenn (2011) find a positive relationship between inequality and mobile phone penetration rates.

This paper will add to this literature by using a logistic model of technology diffusion to investigate the relationship between rates of mobile phone, internet and broadband use and a number of economic, geographic and institutional variables, in a sample of 144 countries from 1990 to 2013. The aim of this paper is to identify the main characteristics of countries that have had success in adopting these new technologies in order to gain some insight into the barriers which may be faced by those countries that have been less successful. The paper will pay particular attention to the main differences in this process of diffusion between high- and low-income countries.

The rest of this paper is organised as follows. Section 2 introduces the logistic model of technology diffusion. Section 3 describes the econometric specification and data used. The results are presented in Section 4 and Section 5 concludes.

[2] Gruber and Verboven (2000); Lee and Cho (2007); Frank (2004); Jang, Dai and Sung (2005).

[3] Lee and Cho (2007); Ding, Haynes and Li (2010); Bohlin, Gruber and Koutroumpis (2010); Lee, Marcu and Lee (2011); Gruber and Verboven (2001); Frank (2002).

[4] Rouvinen (2006); Chu, Wu, Kao and Yen (2009).

[5] Hwang, Cho and Long (2009); Gruber and Verboven (2001).

[6] Lee and Cho (2007); Jang, Dai and Sung (2005); Chu, Wu, Kao and Yen (2009).

[7] Koshi and Kretschmer (2005); Gruber and Verboven (2000); Bohlin, Gruber and Koutroumpis (2010); Lee, Marcu and Lee (2011); Gruber and Verboven (2001); Jang, Dai and Sung (2005); Chu, Wu, Kao and Yen (2009); Hwang, Cho and Long (2009).

2 Model of technology diffusion

2.1 Model

This section will present a logistic model of technology diffusion, as used by Gruber and Verboven (2001). Let y_{it} be the number of adopters of the technology in country i at time t and let y^*_{it} represent the total potential number of adopters. The fraction of adopters to potential adopters is given as follows:

$$\frac{y_{it}}{y^*_{it}} = \frac{1}{1 + exp(-a_{it} - b_{it}t)} \tag{1}$$

This function is an S-shaped curve, with an inflection point at $y_{it} = \frac{1}{2}y^*_{it}$. The shape of this curve makes it very appropriate for representing technology diffusion which tends to follow an S-shaped path, as the rate of adoption increases slowly initially, then much more rapidly, and then slows down again as it approaches the steady state level. This is the model most commonly used in the ICT diffusion literature.

The variable a_{it} is a location variable which shifts the curve forwards or backwards. The variable b_{it} relates positively to the growth rate in adoption of the technology:

$$\frac{\mathrm{d}y_{it}}{\mathrm{d}t}\frac{1}{y_{it}} = b_{it}\frac{y^*_{it} - y_{it}}{y^*_{it}}$$

At the inflection point, the growth rate is equal to $\frac{1}{2}b_{it}$. The variables a_{it} and b_{it} together give us information on the timing of adoption, e.g. the year at which penetration reaches 10% of the potential level can be calculated as:

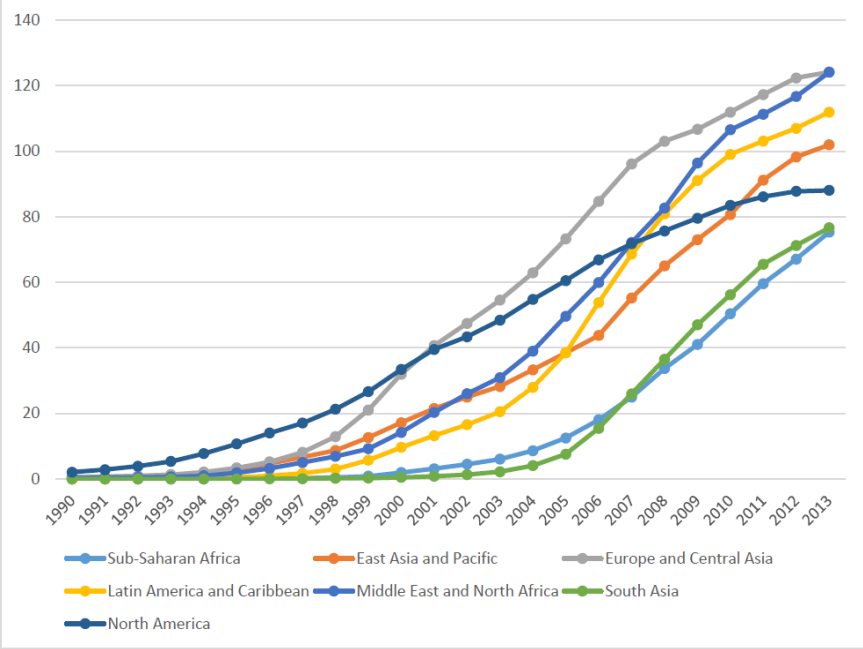
$$t_{0.1} = \frac{(-2.2 - a_{it})}{b_{it}}$$

As most countries have not yet reached the steady state level of adoption of mobile phones or the internet, it will not be possible to say very much about what factors affect this steady state. This paper will focus on understanding which factors are related to the location variable, a_{it}, and the growth variable, b_{it}, both of which affect the transition to the steady state. In the empirical analysis, results will be presented for a number of different possible values of y^*_{it} in order to see how robust the results are to changes in this value. The following section will discuss some of the factors which could explain differences in a and b between countries.

2.2 Explanatory Variables

There is a large amount of variation in the rates of technology adoption in different parts of the world. Figure 1 presents data on the average rates of mobile phone use from 1990 to

Figure 1: Mobile phone subscriptions per 100 by geographic region



2013 in different geographic regions of the world. Figure 2 presents the analogous data for internet use. As can be seen from these graphs, some parts of the world have adopted these technologies at significantly higher rates than others. Figures 3 and 4 present the same data grouped into high income countries and the rest of the world. These graphs demonstrate that poorer countries still lag significantly behind richer countries in the use of ICTs. This gap is particularly stark for internet use.

Even within regions there is still significant variation in rates of ICT use. Figures 5 and 6 present data on mobile phone and internet use respectively for six different countries in sub-Saharan Africa. As can be seen from this graph, the gap between some of the most and least successful adopters is quite high. Figures 7 and 8 present similar data for a selection of countries in the Middle East and, once again, we can see that even within the same region there can be large differences in the rates of ICT adoption between countries.

The aim of this paper is to try and understand what the main differences are between countries who have successfully adopted digital technologies and those who have not. In what follows, the discussion will be focused on three categories of variables which could play an important role in understanding these differences. These categories are as follows: economic, geographic and institutional.

Figure 2: Internet users per 100 by geographic region

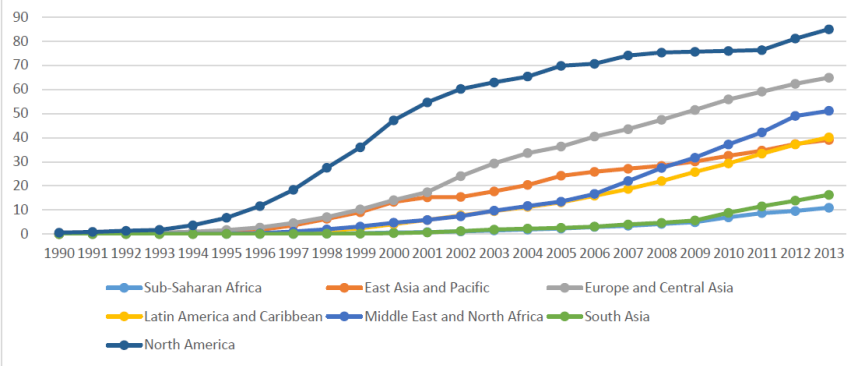


Figure 3: Mobile phone subscriptions per 100 by income level

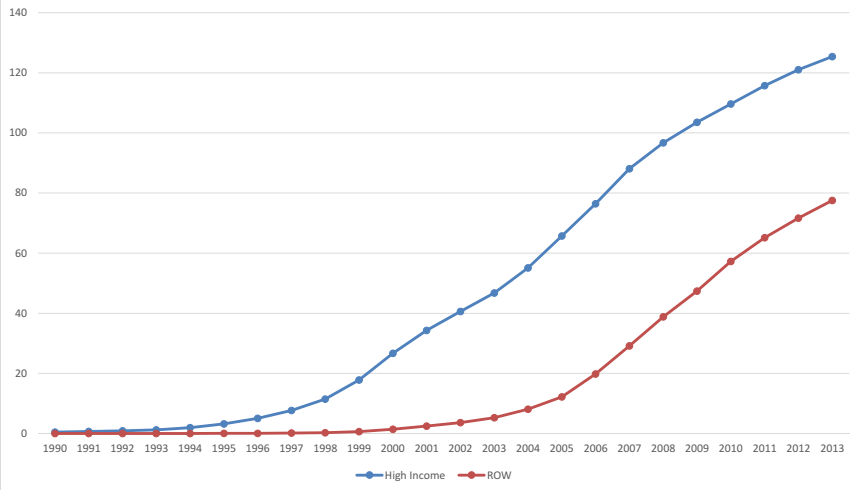


Figure 4: Internet users per 100 by income level

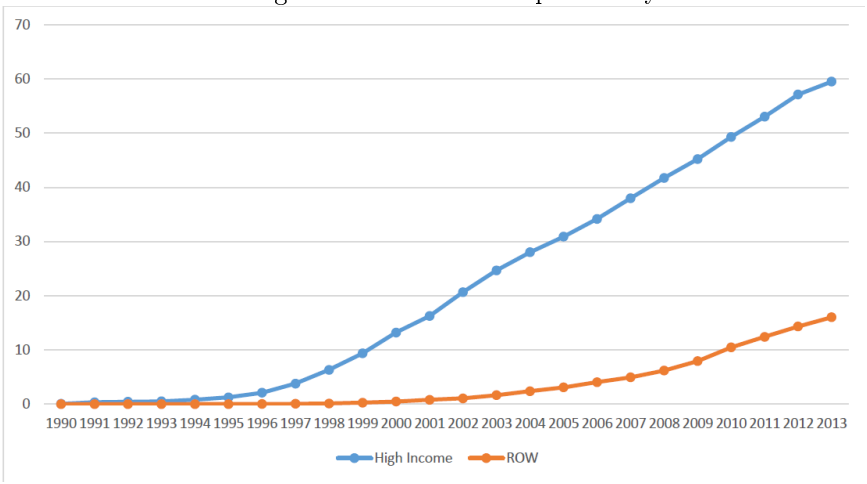


Figure 5: Mobile phone subscriptions per 100 for a selection of countries in Africa

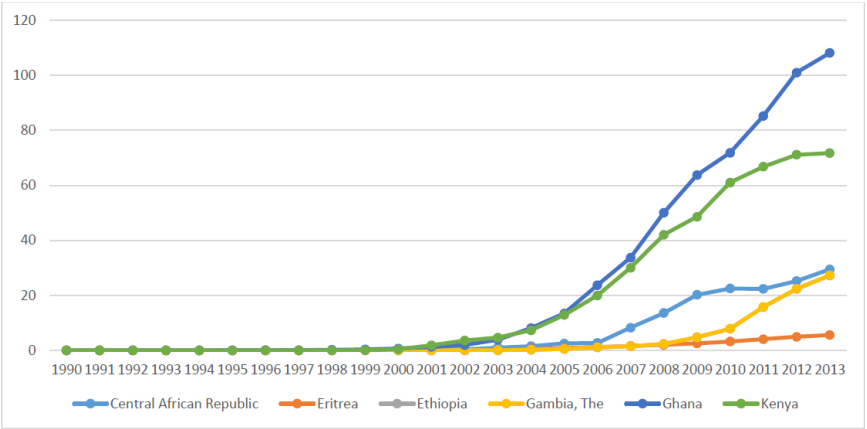


Figure 6: Internet users per 100 for a selection of countries in Africa

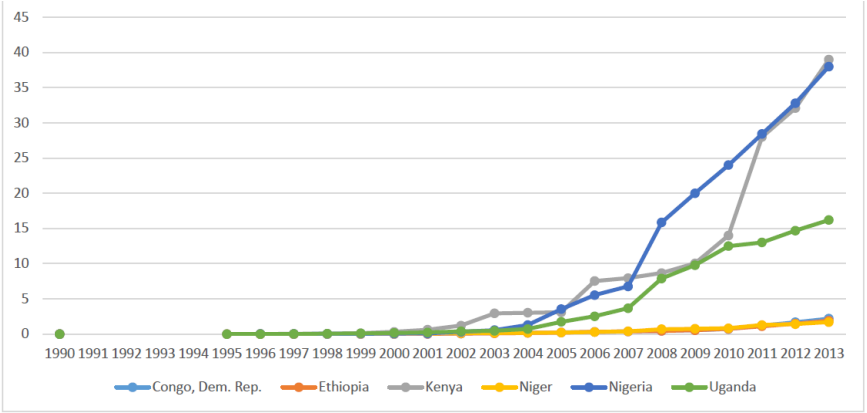


Figure 7: Mobile phone subscriptions per 100 for a selection of countries in the Middle East

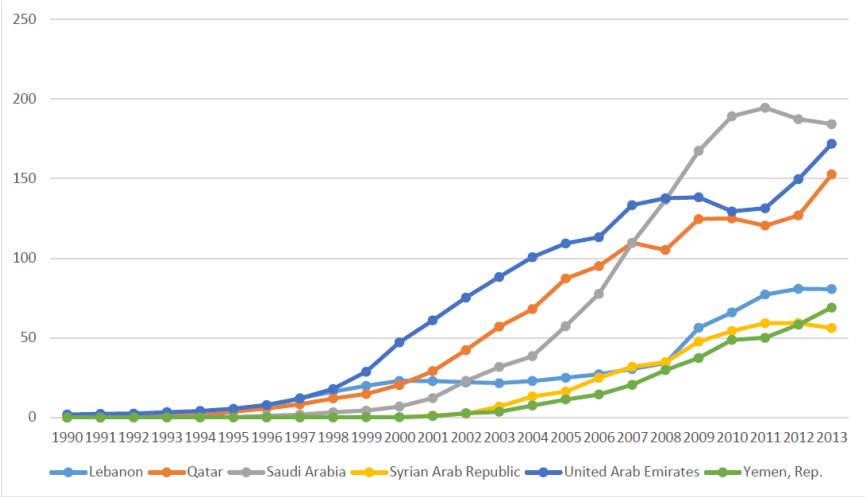
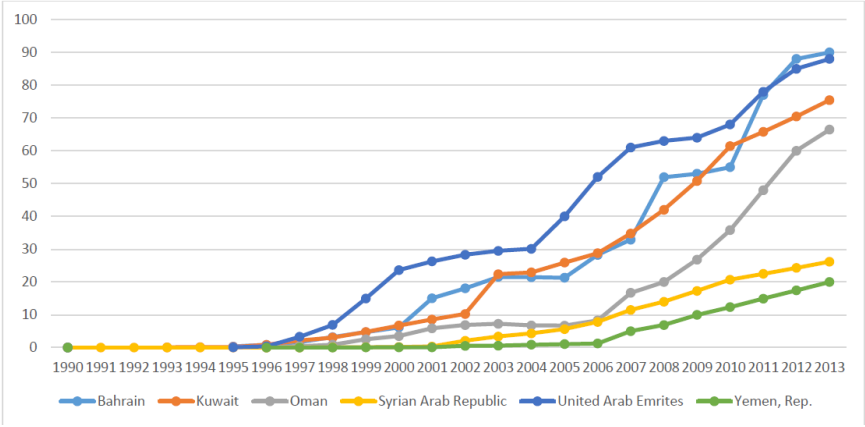


Figure 8: Internet users per 100 for a selection of countries in the Middle East



2.2.1 Economic variables

Using technology is costly both in terms of acquiring the initial infrastructure and using the product. Therefore, it would be natural to expect that richer countries will achieve higher rates of technology use sooner than poorer countries. New information and communications technologies can be particularly useful for individuals in developing countries, however, as they are substitutes for older technologies such as fixed line telephones which are not as widely available in poorer countries. Therefore, it is not clear that we will definitely see a positive relationship between GDP per capita and rates of ICT adoption once we have controlled for other factors that influence the construction of the infrastructure.

The education level of the population will also affect their ability to use digital technologies. It is necessary to be literate in order to use the internet and so we would definitely expect to see a positive relationship between rates of internet adoption and literacy. This is less true for mobile phones although it is necessary for using SMSs which have become an important form of communication. However, as literacy is also a proxy for general level of education, we still may expect to see a positive relationship between mobile phone use and literacy.

The importance of communication varies across sectors of the economy. It is particularly important in the services sector. It is plausible that countries where the services sector forms a larger part of the economy will have a greater incentive to invest in adopting ICTs and will begin to adopt these technologies earlier. Therefore we would expect to see a positive relationship between the percentage of GDP coming from the services sector and rates of ICT adoption. There has been a lot of discussion recently about the importance of ICTs for agriculture so we might also expect to see a positive relationship between rates of ICT use and the percentage of GDP coming from agriculture.

Finally, the decision to adopt a new technology may depend on what other alternatives are available. Fixed line telephones are a partial substitute for other forms of communications technology suggesting a negative relationship between the number of fixed line telephones and the rate of technology adoption. On the other hand, fixed line telephones can be necessary to use the internet and may also be positively correlated with overall investment in telecommunications which could lead to a positive relationship.

2.2.2 Geographic variables

The geographic variables which will be included in this study are an index of ruggedness, distance to coast, population density and the proportion of the population living in rural areas. Each of these variables could be related both to the cost of constructing ICT infrastructure and also to the benefit gained from using this technology.

The shape of the terrain can have an important influence on the cost of building the infrastructure necessary for ICT use. We would expect that countries where the terrain is

more rugged would face higher costs of construction and this could lead to lower rates of adoption. Likewise, the further a country is from a coast, the higher the costs of building infrastructure may be.

Since there is a high fixed cost component to putting this infrastructure in place in a particular area, the per capita cost should be lower in areas where population density is higher. This would lead us to expect to see a positive relationship between adoption rates and population density.

For a similar reason, the proportion of people living in rural areas could have an influence on the cost of providing access to ICT infrastructure to the majority of the population which would lead to a negative relationship between these two variables.

On the other hand, all of these variables also affect the cost of communicating with other people in the absence of digital technologies which means that the benefit of using these technologies may be higher in cases where the cost of building the infrastructure is higher. This will work in the opposite direction to the cost effect described above.

2.2.3 Institutional variables

Adopting ICTs involves a large fixed cost of investing in the infrastructure. This means that the institutional environment could have an important influence on whether or not private firms would be willing to undertake this investment and will also affect the government's decision or ability to carry out the investment itself.

An environment that is conducive to private investment but also ensures that services provided by private firms are affordable and reach most of the population is necessary in order to increase rates of technology use. A number of factors can contribute to this. Usually, it would be wasteful to duplicate the underlying ICT infrastructure which means that the regulatory environment could be very important. This could be affected by the legal environment, the degree of competition between ICT providers and the quality of government regulation. In addition, the type of government regime could also have an influence both on the stability of government and on the incentives that the government faces to encourage the construction of ICT infrastructure.

3 Empirical methodology

3.1 Empirical specification

Equation (1) can be transformed as follows:

$$log\left(\frac{y_{it}}{y^*_{it} - y_{it}}\right) \equiv z_{it} = a_{it} + b_{it}t$$

It is assumed that y_{it}^* is proportional to the total population of country i at time t, i.e., $y_{it}^* = \gamma_i Population_{it}$, where γ_i is the fraction of the population which will eventually adopt the technology. In practice it is very difficult to estimate γ_i, as most countries have not yet reached a sufficiently high level of adoption. In what follows, it will be assumed that γ_i is known and results will be presented for different values of γ_i to see how sensitive they are to this value. The data on mobile phone penetration rates are based on the number of mobile phone subscriptions rather than mobile phone users which means that it is possible to have a value of this variable greater than 100. In fact, for many countries which are highly advanced in their use of this technology, the value of this variable is close to 200. However, the data for internet penetration rates are based on the number of internet users and so the maximum possible value for this variable is 100. In addition to using these values, some specifications will use predicted values of γ_i for each country. These values are based on estimates of the relationship between γ_i and different combinations of the other explanatory variables in a subset of countries who are at advanced stages in the technology adoption process.

The equation to be estimated is:

$$\begin{aligned} z_{it} &= \alpha^o + x_{it}^G \alpha^{\mathbf{G}} + x_{it}^I \alpha^{\mathbf{I}} + x_{it}^E \alpha^{\mathbf{E}} \\ &\quad + (\beta^o + x_{it}^G \beta^{\mathbf{G}} + x_{it}^I \beta^{\mathbf{I}} + x_{it}^E \beta^{\mathbf{E}}) t + \varepsilon_{it} \end{aligned} \tag{2}$$

where x_{it}^G is a vector of geographic variables, x_{it}^I is a vector of institutional variables and x_{it}^E is a vector of economic variables.

3.2 Data

The dataset covers 144 countries for the period 1990-2013. Data on GDP per capita, population density, rural population, services value added, agriculture value added, fixed telephone lines per 100 people and literacy are taken from the World Bank World Development Indicators. Data on literacy are not available on an annual basis. In order to deal with this, dummy variables were created and countries were assigned to the following categories based on the available data: low (0-20%), medium low (20-40%), medium (40-60%), medium high (60-80%) and high (80-100%). Data on literacy rates were not available for many of the OECD countries. However, as literacy is generally high in these countries, they have been assigned to the high literacy category. Countries are classified as high-income if that is how they are categorised by the World Bank.

Data on ruggedness, average distance to ice-free coast and legal origins come from the dataset used by Nunn and Puga (2012). They have constructed a ruggedness index for each country which gives a measure of the average terrain ruggedness of the country's land area.

The units for the terrain ruggedness index correspond to units used to measure elevation differences. Data on the level of competition in the ICT sector come from the International Telecommunications Union World Telecommunication Regulatory Database. Using this data, dummy variables were constructed for whether the type of competition in the ICT sector in a given year is a monopoly, partially competitive or competitive. The regulatory quality indicator comes from the Worldwide Governance Indicators database. The units in which it is measured follow a normal distribution with mean zero and standard deviation of one[8].

Data on the type of political regime come from the Polity IV database. As recommended by the Polity IV project, countries are characterised as 'autocracies' if they have a polity score between -10 and -6, 'anocracies' if they have a score of -5 to +5 or one of the special values of -66, -77 or -88, and 'democracies' if they have a score of +6 to +10. Dummies were constructed to represent each of these categories. Country fixed effects are not included as a number of the explanatory variables do not vary over time. Instead, in order to capture some unobservable time-invariant effects common to countries that are geographically close, regional dummies are included in the regression.

4 Empirical results

When interpreting the results it is important to distinguish between the location parameters and the growth parameters. As mentioned in Section 2, the location parameters shift the diffusion curve. A larger location parameter is associated with an earlier date of initial adoption which means that rates of ICT use will be higher at any point in time, all other things being equal. Therefore, a positive location parameter for a particular variable means that higher values of that variable are associated with higher rates of ICT use and a negative location parameter means the opposite is true. The growth parameters determine the rate at which the use of ICTs increase over time. If the growth parameter for a particular variable has the opposite sign to that of the location parameter, this means that the initial effect of that variable on rates of ICT use will diminish over time. If, on the contrary, the sign of the growth parameter is the same as that of the location parameter, this means that the effect will be reinforced over time.

4.1 GDP per capita

The first relationship that we will investigate is the one between rates of ICT diffusion and income. Table 1 presents the results of regressions for all three types of ICT on GDP per capita. Columns (1), (4) and (7) present results from simple regressions including location and growth variables for GDP per capita and regional dummies for adoption of

[8] Kaufmann et al. 2008

mobile phones, internet and broadband, respectively. As we might expect, the location parameter for GDP per capita is positive for all three technologies, suggesting that richer countries adopted these technologies earlier and have higher rates of ICT use. The growth parameter is negative which means that this income effect should decrease over time and poorer countries should catch up on richer ones in terms of ICT use. The estimates for the location and growth parameters suggest that the effect of income became negligible for mobile phones in 2012 and will become negligible for the internet and broadband in 2023 and 2025, respectively. Columns (2), (5) and (8) present results of the same regression with a dummy variable for high-income countries added. While the location parameter for the high-income dummy is significantly positive, it does not change the magnitude of the location parameter for GDP per capita. Likewise, the growth parameter for the high-income dummy is negative and does not change the magnitude of the growth parameter for GDP per capita. In columns (3), (6) and (9), interaction terms for GDP per capita and the high-income dummy are included. There are two things to note about these results. Firstly, the inclusion of the interaction term increases the magnitude of the location parameter for GDP per capita for low-income countries. Secondly, the location parameter on the interaction term is of opposite sign and similar magnitude to the location parameter on GDP per capita. The combined effect of GDP per capita on high-income countries for all three technologies is still significant but much smaller in magnitude. This suggests that while income per capita is important for explaining rates of ICT adoption at low levels of income, there is a threshold level of income, above which this relationship becomes much less important. We see a similar pattern with the growth parameters.

4.2 Mobile phone diffusion

The estimated location and growth parameters for mobile phone diffusion are presented in Tables 2 and 3. Table 2 presents the results for regressions based on a value of γ equal to 228, which is the maximum value observed. Table 3 presents results for regressions based on different predicted values of γ_i for each country[9]. Column (1) presents results for a regression including all of the economic, geographic and institutional variables described in the previous section. Column (2) introduces interaction terms with the high-income dummy for all variables except literacy. All of the high-income countries fall into the high-literacy category so it is not possible to investigate the interaction in this case. In Table 2, the location parameters for high-income countries are also presented. These are calculated by combining the direct effect of the variable with the coefficient on the interaction term with the high-income dummy. In the discussion that follows we will focus on the results in Table

[9]These values are based on estimates from a regression of mobile phone adoption on GDP per capita, population density and proportion of rural population for a subsample of countries who have achieved very high rates of mobile phone adoption.

2. While some of the magnitudes are different, the results in Table 3 are qualitatively similar to those in Table 2.

4.2.1 Economic variables

The inclusion of additional variables has not significantly changed the estimated location or growth parameters for GDP per capita, suggesting that that relationship remains the same. As before, once the interaction term with the high-income dummy is included, the relationship with income per capita becomes much weaker for high income countries. The location parameter for the number of fixed telephones lines per 100 people is positive and significant. This result is interesting as we might have expected that this relationship would be negative since mobile phones can act as a substitute for fixed-line telephones. However, it is possible that the number of fixed telephone lines is acting as a proxy for the overall level of infrastructure investment in the country which would explain the positive relationship. The growth parameter for this variable is negative, suggesting that the influence of this variable will decrease with time. However, this estimate is not statistically significant. Once the high-income interactions are included, the results imply that this positive relationship is being driven by the low-income countries as the parameter on the interaction term is negative. However, once the interaction terms are included, these estimates are no longer significantly different from zero.

The level of literacy does not seem to influence the rate of adoption of mobile phones. This is perhaps unsurprising since one of the benefits of mobile phones is that you do not need to be literate to use them for voice messaging. In contrast, the structure of the economy does seem to be important for explaining the rate of mobile phone adoption. The location parameters for the percentage of GDP coming from services and agriculture are positive and negative, respectively, and both are statistically significant. The coefficients on the interaction terms suggest that these relationships differ between low- and high-income countries in important ways. Once the interaction term is included, the coefficient on services increases and the coefficient on the interaction term is negative, although smaller in magnitude. Both are statistically significant. The combined effect for high-income countries is positive and significant, but much smaller in magnitude. This implies that this relationship is much more important in low-income countries. The reverse is the case for agriculture. When the interaction term is included, the coefficient for agriculture becomes positive, although insignificant, while the coefficient on the interaction term is much more strongly negative. This suggests that while high-income countries that have higher shares of agriculture in GDP have been later adopters of mobile phone technology, this is not the case for low-income countries. This makes sense as it has been shown that mobile phone technology is quite valuable for farmers in low-income countries, where information on prices and inputs is less easily available and transportation costs are very high. The growth parameters for both

of these variables are of the opposite sign to the location parameters, both for low-income and high-income countries, suggesting that the impact of these variables will diminish over time.

4.2.2 Geographic variables

The location parameter for the measure of ruggedness is positive and significant. Theoretically, this relationship could go in either direction. A high level of ruggedness could make building the necessary infrastructure more expensive, leading to a negative relationship with mobile phone adoption. However, it could also increase the demand for mobile phones as the cost of travel is higher and therefore there is a greater return to being able to communicate over large distances. It seems that the second effect dominates here. The growth parameter for this variable is negative and significant, once again indicating convergence over time. Once the interaction terms are included, these estimates are no longer significant but the positive relationship remains. The combined effect for high-income countries is positive, statistically significant and larger in magnitude than the location parameter for low-income countries, demonstrating that this relationship is stronger in high-income countries. The location parameter for distance from the coast is negative and significant. This is as we might expect as these areas tend be more isolated and therefore it may be more costly to build the necessary infrastructure. When the interaction term is included it suggests that this relationship is being driven by high-income countries. The estimate for low-income countries is in fact positive, although it is not statistically significant. This could mean that for low-income countries, the benefits of connecting remote areas outweigh the costs. The growth parameters have the opposite sign to the location parameters, signifying convergence over time. Population density and the proportion of the population living in rural areas are not statistically significant and don't seem to have an important effect on mobile phone adoption.

4.2.3 Institutional variables

The political regime in the country seems to be an important variable for explaining mobile phone diffusion. The location parameter for the democratic dummy is positive and significant and that for the autocratic dummy is negative, although not statistically significant. The relationship for democratic countries seems to be mainly driven by high-income countries as the combined effect with the interaction term is large, positive and statistically significant, whereas the parameter for low-income countries is smaller and not statistically significant. The growth parameters have the opposite sign for both high- and low-income countries. The relationship for autocratic countries is quite different for low-income countries than for high-income countries. The location parameter is negative and statistically significant for low-income countries. The interaction term is positive, however, and larger in

magnitude. The combined effect for high-income countries is positive although not statistically significant. This suggests that the negative effects of autocracy may be more severe for low-income countries. The growth parameters are of opposite sign to the location parameter implying that the impact of this variable will diminish over time.

The results suggest that regulatory quality has a positive relationship with mobile phone adoption but the coefficient on the interaction term shows that this result is being driven by high-income countries. Once the interaction term is included, the location parameter for all countries becomes negative and insignificant while the coefficient on the interaction term is positive and significant, as is the combined effect for high-income countries. The growth parameters are of opposite sign. However, they are not statistically significant which may mean that the convergence effect is weak. The degree of competition in the mobile market seems to be important for rates of mobile phone adoption. The location parameter for monopoly is negative and significant and that for partial competition is positive and significant. Both of these are compared to the situation of perfect competition. The growth parameters are of opposite sign. The negative effect of monopoly seems to be more severe in low-income countries. The parameter for low-income countries becomes more negative when the interaction term is included and the interaction term is positive, although smaller in magnitude and insignificant. The combined effect for high-income countries is negative and significant, but much smaller than the effect for low-income countries. When the interaction term for partial competition is included, the positive relationship remains for all countries, although the coefficient is a good bit smaller for low-income countries and neither expression is significantly different from zero. The effect of legal origins differs between low- and high-income countries, with a negative effect in high-income countries and a positive effect in low-income countries. However, neither of these estimates are significantly different from zero.

4.3 Internet diffusion

The results for internet diffusion are presented in Tables 4 and 5 in a way analogous to those for mobile phone diffusion. The results in Table 4 are based on a value of γ equal to 95, which is the maximum value observed. The results in Table 5 are based on the predicted values of γ_i for each country[10]. In the discussion that follows we will focus on the results in Table 4. While some of the magnitudes are different, the results in Table 5 are qualitatively similar to those in Table 4.

[10]These values are based on estimates from a regression of mobile phone adoption on GDP per capita, population density and proportion of rural population for a subsample of countries who have achieved very high rates of Internet adoption.

4.3.1 Economic variables

One of the most interesting differences between the results for internet diffusion and those for mobile phones is the relationship with per capita GDP. While the relationship between mobile phone adoption and GDP per capita remained quite stable with the addition of other explanatory variables, this is not the case for internet diffusion. Once other variables are included, the location parameter for GDP per capita actually becomes negative, although it is not statistically significant. When the interaction term is included, the effect for low-income countries is positive and the coefficient on the interaction term is negative and of similar size. However, both coefficients are small and are not statistically significant. The growth parameters are of opposite sign to the location parameters but are also not statistically significant. This suggests that the relationship between income and internet adoption may not be hugely important once other variables that may be correlated with income, such as infrastructure and education, have been accounted for. As was the case for mobile phones, the location parameter for fixed telephones lines is positive and significant. However, it is larger for internet adoption than it was for mobile phones and remains significant once the interaction term is included. This is not surprising as fixed telephone lines are an important part of the infrastructure required for internet adoption. The positive effect seems to be mostly driven by low-income countries, as the coefficient on the interaction term is negative and significant. However, the combined effect for high-income countries is still positive and significant but is much lower in magnitude than the effect for low-income countries. The growth parameter for low-income countries is negative, indicating convergence over time. The growth parameter for high-income countries is actually positive, although it is not statistically significant. But this implies that the number of fixed telephone lines may remain an important variable for internet adoption in high-income countries over time.

The level of literacy seems to be much more important for internet adoption than for mobile phones, as might be expected. In particular, the location parameter for the low literacy dummy is large and statistically significant, suggesting that a very low level of literacy may represent a serious barrier to internet adoption. The growth parameter for low literacy is positive and significant, indicating convergence over time. As was the case for mobile phone adoption, the location parameters for the percentage of GDP coming from services and agriculture are positive and negative, respectively, and both are statistically significant. However, they are smaller in magnitude than the corresponding parameters for mobile phones. The growth parameters are of opposite sign to the location parameters. Once the interaction term has been included, we can see that the positive effect for services is being driven by low-income countries. The coefficient on this term becomes larger and the coefficient on the interaction term is negative and significant. The combined effect for high-income countries is positive but is small and not significant. The reverse is true for the case of agriculture. The negative relationship seems to be coming from high-income

countries. Once the interaction term is included, the effect for low-income countries is actually positive, although statistically insignificant. The coefficient on the interaction term is negative and significant and the combined effect for high-income countries is also negative and significant. This may suggest that these technologies are being used quite differently in high- and low-income countries.

4.3.2 Geographic variables

The results for ruggedness and distance to the coast are qualitatively similar for internet adoption to those for mobile phone adoption, although the magnitudes differ. Ruggedness does not seem to be a very important factor for internet adoption, as all of the estimates are statistically insignificant. However, they are all positive as was the case for mobile phones and which is slightly surprising. Once the interaction term is included, the location parameter for distance to the coast is positive and significant for low-income countries. The coefficient on the interaction term is negative and significant and the combined effect for high-income countries is small and not statistically significant. This implies that this relationship is more important for low-income countries and, similarly to mobile phones, the internet may be important for facilitating communication for more remote areas. The growth parameters for this variable are negative but are not statistically significant. Population density and the proportion of the population living in rural areas both seem to be negatively related to internet adoption and the growth parameters are of the opposite sign. The relationship with population density is not statistically significant for low-income countries but is significant for high-income countries. The negative relationship with the size of the rural population is statistically significant for both low- and high-income countries and is larger in size for low-income countries.

4.3.3 Institutional variables

The results for the democratic and autocratic dummies are very similar for internet adoption to those for mobile phone adoption. A democratic regime seems to be beneficial for internet adoption for high-income countries but not significant for low-income countries. The reverse is true for autocratic regimes. There is a negative and significant relationship for low-income countries, but the combined effect for high-income countries is not statistically significant. The growth parameters for these variables are of opposite sign to the location parameters for both high- and low-income countries, indicating that the impact of these variables will diminish over time.

The impact of regulatory quality is also quite similar for internet and mobile phone adoption. The combined location parameter for high-income countries is positive and significant, whereas the one for low-income countries is negative and not statistically significant. The growth parameters are of opposite sign but are not statistically significant.

For internet adoption, the level of competition in two segments of the market is investigated: the provision of the Digital Subscriber Line (DSL) and Internet Services. A monopoly in the DSL market does not seem to be an important predictor of internet adoption for high- or low-income countries. The location parameter for partial competition in this market is negative and significant for low-income countries but the combined effect for high-income countries is not statistically significant. The growth parameter for low-income countries is positive and significant. For Internet Services, the effect of a monopoly is negative and significant for low-income countries and the combined effect for high-income countries is insignificant. The growth parameters are of opposite sign. There is a positive relationship between partial competition in this section of the market and internet adoption in all countries, but the effect is stronger for low-income countries. Once again, the growth parameters are of the opposite sign, suggesting convergence over time. The relationship between legal origins and internet adoption is not significant for either low- or high-income countries.

4.4 Broadband diffusion

The results for broadband diffusion are presented in Tables 6 and 7. The results in Table 6 are based on a value of γ equal to 43 which is the highest value observed in the data. The results in Table 7 are based on a value of γ equal to 80[11]. As the diffusion of broadband is still in an earlier stage than the other technologies that we have discussed, these results should be interpreted with more caution as it is not yet possible to say what factors are related to high rates of broadband adoption. In the discussion that follows we will focus on the results in Table 6. While some of the magnitudes are different, the results in Table 7 are qualitatively similar to those in Table 6.

4.4.1 Economic variables

The relationship between income and broadband adoption is similar to that for mobile phones. The location parameter on GDP per capita is positive and strongly statistically significant. Once again, this seems to mostly be driven by low-income countries. When the interaction term is included the location parameter for low-income countries becomes larger and the coefficient on the interaction term is negative and of similar size. The combined effect for high-income countries is still positive and statistically significant but is much smaller in magnitude. As with mobile phones, this suggests that once income reaches a certain level, it becomes a less important predictor of broadband adoption. The growth parameters are of opposite sign to the location parameters, suggesting convergence over time.

The relationship with fixed telephone lines seems to be less important for broadband

[11]Since broadband adoption is not particularly advanced yet in any countries, it was not possible to calculate predicted values of gamma for each country

adoption than it was for mobile phones and the internet as none of the estimates are statistically significant.

Unfortunately, because broadband is still in the early stage of adoption in many places, there are no countries with very low literacy levels included in the sample for these regressions. This means that it is more difficult to investigate the relationship between broadband adoption and literacy. The location parameter on the medium-low literacy dummy is negative and significant in column 1, suggesting that literacy may be important for broadband adoption. However, this parameter loses significance once the interaction terms with the high-income dummy are included in the regression, although it is still of a similar magnitude and sign. The results for the percentage of GDP coming from services and agriculture are qualitatively similar for broadband to those for the internet. There is a positive relationship between services and broadband adoption for low-income countries but the combined effect for high-income countries is small and not significant. For agriculture, the location parameter is not significant for low-income countries but the combined effect is negative and significant for high-income countries. The main difference is that the estimate for the location parameter for low-income countries is negative for broadband whereas it was positive for mobile phones and the internet. However, in all cases it was not statistically significant. The growth parameters are of opposite sign to the location parameters for all cases.

4.4.2 Geographic variables

The degree of ruggedness is negatively related to broadband adoption for low-income countries, perhaps reflecting the challenges that it represents to constructing the necessary infrastructure. However, the combined effect for high-income countries is positive but insignificant. The growth parameters are of the opposite sign. As was the case with internet adoption, the location parameter for distance to the coast is positive and significant for low-income countries but the combined effect for high-income countries is negative and significant. The growth parameters are of opposite sign, suggesting that the impact of this variable will lessen over time.

Both population density and the proportion of the population living in rural areas seem to be important for broadband adoption. The location parameter for population density is positive and significant for low-income countries, which is the relationship we would expect as the fixed cost of constructing the infrastructure can be spread over more people. However, this effect is not important for high-income countries as the coefficient on the interaction effect is negative and significant and the combined effect is not statistically significant. The growth parameter for low-income countries is opposite in sign to the location parameter. The growth parameter for high-income countries has the same sign as the location parameter but both are statistically insignificant. The proportion of the population living in rural areas seems to be a more important factor for high-income countries. The location parameter for

low-income countries is positive but not significant. The coefficient on the interaction term is negative and significant, as is the combined effect for high-income countries. The growth parameters are of the opposite sign.

4.4.3 Institutional variables

The impact of political regime on broadband adoption differs slightly to that for mobile phones and the internet. The impact of democracy is positive and significant both for low-income and high-income countries and the growth parameters are negative. The location parameters for autocracy are negative for both low- and high-income countries but are not significant for either suggesting that this effect is less important for broadband. However, this may be a consequence of the fact that a number of autocratic low-income countries have not begun to adopt broadband yet and therefore are not included in the sample.

The results for regulatory quality are similar to the case for mobile phones and the internet. There is a positive effect that is being driven by high-income countries. Once the interaction term is included, the location parameter for low-income countries is negative and insignificant, whereas the interaction effect is positive and significant. The combined effect for high-income countries is still positive, although it is no longer statistically significant. The growth parameter for low-income countries is of the opposite sign and statistically significant. The growth parameter for high-income countries has the same sign as the location parameter but is not statistically significant.

A monopoly in the Internet Services sector is negative and significant both for low- and high-income countries and there does not seem to be a significant effect of partial competition in this market. The growth parameters for monopoly are all positive and statistically significant. Common law legal origins are negatively related to rates of broadband adoption for high-income countries but the relationship is not significant for low-income countries.

5 Discussion

A number of interesting patterns emerge from the results presented above. While the level of income per capita is important for the diffusion of mobile phones and broadband technologies, it seems to be less important for internet diffusion. It is possible that one reason we see this effect is that income per capita may be strongly related to investments in the infrastructure required to use these technologies which is not something that we have a direct measure for. The closest variable that we have is the number of fixed telephone lines per capita, an infrastructure that is much more important for internet adoption than it is for mobile phones and broadband. In addition, the relationship between GDP per capita and rates of mobile phone and broadband adoption seems to be much less important for high-income countries. Again, this could be explained by the fixed costs required to invest

in the necessary infrastructure.

The structure of the economy seems to be closely related to rates of technology diffusion and this is an area where we see interesting differences between high- and low-income countries. For all technologies, a larger services sector is correlated with higher rates of technology diffusion for low-income countries and a larger agricultural sector is correlated with lower rates of technology diffusion for high-income countries. These differences may reflect different ways that the technologies are being used in each sector in low- and high-income countries, as a result of other challenges that may exist in low-income countries, such as the importance of mobile phones for farmers in developing countries when transport costs are extremely high.

Physical geographical obstacles to construction of infrastructure don't seem to be holding back the adoption of these technologies. In fact, the results imply that if anything, these obstacles may lead to greater demand for connecting areas that are more geographically remote. The results presented above suggest that the institutional environment can have a significant influence on the process of technology diffusion. This is perhaps not surprising given the large investment costs required to provide the infrastructure necessary to use these technologies. Some degree of coordination at a national, or at least regional, level is required in order to make sure this infrastructure is in place and the competitive and regulatory environment for the provision of these services could also be very important.

There seem to be important differences in the impact of institutional variables between low- and high-income countries. Variables that we would expect to have a negative effect on technology adoption (such as autocracy) seem to have a more severe impact on low-income countries whereas those that we would expect to have a positive effect (such as regulatory quality) seem to be less important. This may be because of other institutional weaknesses in these countries which influence the effectiveness of these variables but which are not captured here, such as, the level of corruption in the country.

In all cases, the estimated growth parameters are of opposite sign to the location parameters for most variables (or else are statistically insignificant). This suggests that the initial differences between countries in adoption rates for digital technologies should diminish over time. However, it could still take quite a long time for this convergence process to take place and during that time new technologies may be introduced leading to a new digital divide.

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6 Conclusion

Although there has been a rapid increase in the use of ICTs in the past few years, a large portion of the world's population still do not have access to these technologies and we have reason to be concerned that some countries are being left behind. Given the huge

potential that digital technologies have for development, and the frequent introduction of newer technologies, it is important for us to try and understand the main barriers to adoption of these technologies.

This paper used a logistic model of technology diffusion to investigate the relationship between rates of mobile phone, internet and broadband use and a number of economic, geographic and institutional variables, paying particular attention to differences in the diffusion process between high- and low-income countries. The results demonstrate that there may be important differences between the way that digital technologies are being used in high- and low-income countries and that users in these countries may face different kinds of barriers to adoption.

Of course, all of the variables which were investigated may also be correlated with a number of other factors which may influence rates of ICT use and it is very difficult to know the specific ways in which they affect the process of technology diffusion. However, the results from this paper do give us an idea of the main characteristics of countries which have been successful in adopting ICTs. Though perhaps unsurprising, the picture to emerge from this analysis is somewhat discouraging from a development perspective as it seems that the countries which have been most successful at adopting ICTs have also been more successful in a number of other ways. The unfortunate consequence of this could be that individuals who might benefit the most from ICTs are the ones who are least likely to have access to them.

Given that large scale investments in infrastructure are required to ensure access to these technologies, which often require coordination or oversight by governments, a deeper analysis of the policies implemented by governments in countries which have achieved high rates of ICT use could give us greater insight into how this process works. It would be particularly useful to understand why a few countries in sub-Saharan Africa have achieved great success in this regard while most are lagging far behind. Given the great potential that ICTs hold for development it is important for us to try and understand where these differences come from.

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Table 1: GDP per capita and rates of technology adoption

	MOBILE			INTERNET			BROADBAND		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LOCATION									
GDPpc	0.000281***	0.000233***	0.00388***	0.000153***	0.000132***	0.00229***	0.000137***	0.000113***	0.00325***
	(1.66e-05)	(1.62e-05)	(0.000541)	(1.39e-05)	(1.39e-05)	(0.000548)	(1.20e-05)	(1.20e-05)	(0.000420)
High Income		3.578***	6.411***		2.137***	3.968***		2.278***	5.253***
		(0.465)	(0.672)		(0.371)	(0.692)		(0.376)	(0.574)
GDPpc*High Income			-0.00365***			-0.00216***			-0.00314***
			(0.000541)			(0.000549)			(0.000420)
Location parameter for GDPpc for High Income countries			0.000227*** (0.000016)			0.000130*** -0.0000137			0.0001106*** (0.0000117)
GROWTH									
GDPpc	-8.81e-06***	-7.43e-06***	-0.000103***	-4.62e-06***	-4.38e-06***	-8.96e-05***	-5.49e-06***	-5.17e-06***	-0.000184***
	(5.73e-07)	(5.61e-07)	(1.89e-05)	(8.11e-07)	(7.98e-07)	(2.77e-05)	(1.20e-06)	(1.18e-06)	(4.03e-05)
High Income		-0.0999***	-0.165***		-0.0537***	-0.120***		-0.0395	-0.187***
		(0.0166)	(0.0240)		(0.0197)	(0.0368)		(0.0373)	(0.0591)
GDPpc*High Income			9.62e-05***			8.54e-05***			0.000179***
			(1.90e-05)			(2.77e-05)			(4.04e-05)
Growth parameter for GDPpc for High Income countries			-0.00000721*** (05.55e-07)			-4.26e-06*** (7.87e-07)			-4.92e-06*** (1.15e-06)
t	0.458***	0.478***	0.533***	0.388***	0.397***	0.438***	0.360***	0.380***	0.481***
	(0.0127)	(0.0112)	(0.0142)	(0.0161)	(0.0145)	(0.0199)	(0.0361)	(0.0313)	(0.0392)
Constant	-15.63***	-16.30***	-18.45***	-10.92***	-11.28***	-12.40***	-10.80***	-11.34***	-13.26***
	(0.366)	(0.318)	(0.397)	(0.295)	(0.261)	(0.358)	(0.369)	(0.324)	(0.407)
Observations	1,766	1,766	1,766	1,567	1,567	1,567	1,330	1,330	1,330
R-squared	0.791	0.820	0.846	0.789	0.823	0.832	0.759	0.804	0.825

Notes: (i) Regional dummies included in all regressions. (ii) Robust standard errors in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228

	(1)	(2)
LOCATION		
High Income	0.718	14.08***
	(0.472)	(3.223)
GDPpc	8.65e-05***	0.00384***
	(1.77e-05)	(0.000642)
GDPpc*HighIncome		-0.00377***
		(0.000643)
Location parameter for GDPpc		0.0000767***
for High Income countries		(0.0000186)
Fixed Telephones	0.0350**	0.0666
	(0.0166)	(0.0553)
Fixed Telephones*HighIncome		-0.0794
		(0.0550)
Location parameter for Fixed Telephones		-0.0128
for High Income countries		(0.0193)
Low Literacy	-0.748	-0.455
	(0.833)	(0.811)
Medium Low Literacy	-1.475	-0.809
	(1.784)	(1.249)
Medium Literacy	-0.424	-0.148
	(1.346)	(1.124)
Medium High Literacy	0.269	0.212
	(0.723)	(0.710)
Services	0.0628***	0.142***
	(0.0210)	(0.0311)
Services*HighIncome		-0.0867**
		(0.0419)
Location parameter for Services		0.0556*
for High Income countries		(0.0288)
Agriculture	-0.0830***	0.0410
	(0.0177)	(0.0256)
Agriculture*HighIncome		-0.239***
		(0.0450)
Location parameter for Agriculture		-0.198***
for High Income countries		(0.0358)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228 (cont.)

	(1)	(2)
LOCATION		
Rugged	0.311**	0.242
	(0.133)	(0.149)
Rugged*HighIncome		0.168
		(0.266)
Location parameter for Rugged		0.410*
for High Income countries		(0.220)
Distance Coast	-0.795**	0.331
	(0.385)	(0.652)
Distance Coast*HighIncome		-1.685**
		(0.817)
Location parameter for Distance Coast		-1.354***
for High Income countries		(0.483)
Pop Density	-0.000168	0.000586
	(0.000155)	(0.00177)
Pop Density*HighIncome		-0.000792
		(0.00178)
Location parameter for Pop Density		-0.000205
for High Income countries		(0.000175)
Rural Pop	-0.0154	0.00186
	(0.0117)	(0.0193)
Rural Pop*HighIncome		-0.0178
		(0.0242)
Location parameter for Rural Pop		-0.0159
for High Income countries		(0.0143)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228 (cont.)

	(1)	(2)
LOCATION		
Democratic	1.289***	0.626
	(0.411)	(0.448)
Democratic*HighIncome		1.321*
		(0.747)
Location parameter for Democratic		1.948***
for High Income countries		(0.641)
Autocratic	-0.0607	-1.807***
	(0.551)	(0.678)
Autocratic*HighIncome		3.026***
		(1.102)
Location parameter for Autocratic		1.218
for High Income countries		(0.913)
Regulatory Quality	0.694**	-0.0519
	(0.330)	(0.484)
Regulatory Quality*HighIncome		1.052
		(0.673)
Location parameter for Regulatory Quality		1.000**
for High Income countries		(0.466)
Mobile Monopoly	-1.450***	-2.348***
	(0.394)	(0.560)
Mobile Monopoly*HighIncome		0.882
		(0.737)
Location parameter for Mobile Monopoly		-1.466***
for High Income countries		(0.494)
Mobile Partial Competition	0.641*	0.154
	(0.346)	(0.548)
Mobile Partial Competition*HighIncome		0.395
		(0.696)
Location parameter for Mobile Partial Competition		0.549
for High Income countries		(0.446)
Common Law	-0.112	0.661
	(0.346)	(0.524)
Common Law*HighIncome		-1.042**
		(0.472)
Location parameter for Common Law		-0.382
for High Income countries		(0.359)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228 (cont.)

	(1)	(2)
GROWTH		
High Income	-0.0254	-0.448***
	(0.0168)	(0.115)
GDPpc	-3.52e-06***	-0.000123***
	(6.16e-07)	(2.28e-05)
GDPpc*HighIncome		0.000120***
		(2.28e-05)
Growth parameter for GDPpc		-3.03e-06***
for High Income countries		(6.58e-07)
Fixed Telephones	-0.000932	-0.00239
	(0.000578)	(0.00188)
Fixed Telephones*HighIncome		0.00329*
		(0.00188)
Growth parameter for Fixed Telephones		0.000906
for High Income countries		(0..000680)
Low Literacy	-0.00290	-0.00238
	(0.0269)	(0.0264)
Medium Low Literacy	0.0525	0.0350
	(0.0636)	(0.0443)
Medium Literacy	0.0250	0.0108
	(0.0473)	(0.0396)
Medium High Literacy	-0.00871	-0.00697
	(0.0252)	(0.0249)
Services	-0.00297***	-0.00507***
	(0.000752)	(0.00110)
Services*HighIncome		0.00206
		(0.00149)
Growth parameter for Services		-0.00300***
for High Income countries		(0.00103)
Agriculture	0.00183***	-0.00198**
	(0.000632)	(0.000896)
Agriculture*HighIncome		0.00822***
		(0.00168)
Growth parameter for Agriculture		0.00625***
for High Income countries		(0.00138)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228 (cont.)

	(1)	(2)
GROWTH		
Rugged	-0.0116**	-0.00928*
	(0.00468)	(0.00517)
Rugged*HighIncome		-0.00636
		(0.00947)
Growth parameter for Rugged		-0.0156**
for High Income countries		(0.00796)
Distance Coast	0.0222	-0.0171
	(0.0138)	(0.0235)
Distance Coast*HighIncome		0.0615**
		(0.0302)
Growth parameter for Distance Coast		0.0444**
for High Income countries		(0.0185)
Pop Density	5.84e-06	-2.44e-05
	(5.45e-06)	(6.09e-05)
Pop Density*HighIncome		3.28e-05
		(6.11e-05)
Growth parameter for Pop Density		8.34e-06
for High Income countries		(6.16e-06)
Rural Pop	0.000187	-0.000639
	(0.000428)	(0.000687)
Rural Pop*HighIncome		0.000965
		(0.000876)
Growth parameter for Rural Pop		0..000326
for High Income countries		(0.000527)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Mobile phone adoption with γ = 228 (cont.)

	(1)	(2)
GROWTH		
Democratic	-0.0383***	-0.0191
	(0.0146)	(0.0157)
Democratic*HighIncome		-0.0397
		(0.0272)
Growth parameter for Democratic		-0.0589**
for High Income countries		(0.0236)
Autocratic	-0.00513	0.0653**
	(0.0204)	(0.0256)
Autocratic*HighIncome		-0.130***
		(0.0405)
Growth parameter for Autocratic		-0.0647*
for High Income countries		(0.0330)
Regulatory Quality	-0.00783	0.0170
	(0.0118)	(0.0172)
Regulatory Quality*HighIncome		-0.0373
		(0.0244)
Growth parameter for Regulatory Quality		-0.0203
for High Income countries		(0.0171)
Mobile Monopoly	0.0456***	0.0778***
	(0.0157)	(0.0220)
Mobile Monopoly*HighIncome		-0.0293
		(0.0292)
Growth parameter for Mobile Monopoly		0.0485**
for High Income countries		(0.0197)
Mobile Partial Competition	-0.0195	-0.00256
	(0.0123)	(0.0192)
Mobile Partial Competition*HighIncome		-0.0122
		(0.0247)
Growth parameter for Mobile Partial Competition		-0.0148
for High Income countries		(0.0160)
Common Law	0.0137	-0.0126
	(0.0125)	(0.0184)
Common Law*HighIncome		0.0574**
		(0.0262)
Growth parameter for Common Law		0.0448**
for High Income countries		(0.0180)
t	0.521***	0.883***
	(0.0514)	(0.0936)
Constant	-14.71***	-26.16***
	(1.441)	(2.638)
Observations	1,766	1,766
R-squared	0.905	0.915

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Mobile phone adoption with predicted y

	(1)	(2)
LOCATION		
High Income	1.182**	10.94***
	(0.463)	(3.170)
GDPpc	0.000102***	0.00251***
	(1.94e-05)	(0.000610)
GDPpc*HighIncome		-0.00242***
		(0.000611)
Fixed Telephones	0.0333*	0.0192
	(0.0178)	(0.0510)
Fixed Telephones*HighIncome		-0.0274
		(0.0503)
Low Literacy	-0.796	-0.574
	(0.848)	(0.824)
Medium Low Literacy	-1.383	-0.712
	(1.599)	(1.182)
Medium Literacy	-0.206	-0.00712
	(1.241)	(1.082)
Medium High Literacy	0.279	0.414
	(0.711)	(0.699)
Services	0.0760***	0.121***
	(0.0210)	(0.0301)
Services*HighIncome		-0.0681
		(0.0417)
Agriculture	-0.0450***	0.0409*
	(0.0169)	(0.0246)
Agriculture*HighIncome		-0.205***
		(0.0446)
Rugged	0.372***	0.297**
	(0.133)	(0.149)
Rugged*HighIncome		0.316
		(0.296)
Distance Coast	-0.913**	0.198
	(0.396)	(0.657)
Distance Coast*HighIncome		-1.838**
		(0.857)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Mobile phone adoption with predicted γ (cont.)

	(1)	(2)
LOCATION		
Pop Density	-0.000355**	0.000408
	(0.000165)	(0.00170)
Pop Density*HighIncome		-0.000816
		(0.00170)
Rural Pop	-0.00471	0.000180
	(0.0118)	(0.0195)
Rural Pop*HighIncome		-0.0189
		(0.0252)
Democratic	1.136***	0.518
	(0.405)	(0.441)
Democratic*HighIncome		1.144
		(0.779)
Autocratic	0.310	-0.795
	(0.547)	(0.662)
Autocratic*HighIncome		1.422
		(1.119)
Regulatory Quality	0.645*	0.337
	(0.336)	(0.483)
Regulatory Quality*HighIncome		0.422
		(0.694)
Mobile Monopoly	-0.857**	-1.645***
	(0.412)	(0.518)
Mobile Monopoly*HighIncome		1.181
		(0.769)
Mobile Partial Competition	0.275	-0.0791
	(0.352)	(0.534)
Mobile Partial Competition*HighIncome		0.215
		(0.707)
Common Law	-0.255	0.709
	(0.352)	(0.503)
Common Law*HighIncome		-1.054**
		(0.471)
GROWTH		
HighIncome	-0.0419**	-0.306***
	(0.0173)	(0.117)
GDPpc	-3.89e-06***	-6.36e-05***
	(7.14e-07)	(2.27e-05)
GDPpc*HighIncome		6.03e-05***
		(2.27e-05)
Fixed Telephones	-0.000942	-0.00105
	(0.000657)	(0.00178)
Fixed Telephones*HighIncome		0.00166
		(0.00177)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Mobile phone adoption with predicted γ (cont.)

	(1)	(2)
GROWTH		
Low Literacy	-0.00441	0.000188
	(0.0277)	(0.0272)
Medium Low Literacy	0.0481	0.0312
	(0.0569)	(0.0425)
Medium Literacy	0.0156	0.00388
	(0.0439)	(0.0384)
Medium High Literacy	-0.0109	-0.0166
	(0.0256)	(0.0250)
Services	-0.00359***	-0.00418***
	(0.000772)	(0.00109)
Services*HighIncome		0.00121
		(0.00154)
Agriculture	0.000215	-0.00192**
	(0.000615)	(0.000882)
Agriculture*HighIncome		0.00658***
		(0.00173)
Rugged	-0.0148***	-0.0120**
	(0.00484)	(0.00533)
Rugged*HighIncome		-0.0134
		(0.0112)
Distance Coast	0.0243	-0.0146
	(0.0150)	(0.0243)
Distance Coast*HighIncome		0.0687**
		(0.0334)
Pop Density	1.24e-05**	-1.65e-05
	(6.21e-06)	(5.91e-05)
Pop Density*HighIncome		3.20e-05
		(5.94e-05)
Rural Pop	-0.000101	-0.000449
	(0.000451)	(0.000710)
Rural Pop*HighIncome		0.00106
		(0.000945)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Mobile phone adoption with predicted γ (cont.)

	(1)	(2)
GROWTH		
Democratic	-0.0317**	-0.0142
	(0.0148)	(0.0159)
Democratic*HighIncome		-0.0321
		(0.0300)
Autocratic	-0.0210	0.0227
	(0.0210)	(0.0257)
Autocratic*HighIncome		-0.0670
		(0.0430)
Regulatory Quality	0.000103	0.00359
	(0.0125)	(0.0178)
Regulatory Quality*HighIncome		-0.00920
		(0.0264)
Mobile Monopoly	0.0196	0.0471**
	(0.0171)	(0.0206)
Mobile Monopoly*HighIncome		-0.0434
		(0.0320)
Mobile Partial Competition	-0.00441	0.00659
	(0.0130)	(0.0193)
Mobile Partial Competition*HighIncome		-0.00427
		(0.0263)
Common Law	0.0194	-0.0147
	(0.0131)	(0.0179)
Common Law*HighIncome		0.0603**
		(0.0281)
t	0.661***	0.825***
	(0.0511)	(0.0916)
Constant	-17.29***	-24.20***
	(1.398)	(2.517)
Observations	1,766	1,766
R-squared	0.910	0.919

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95

	(1)	(2)
LOCATION		
High Income	-0.293	7.065***
	(0.338)	(2.475)
GDPpc	-1.40e-05	0.000729
	(1.51e-05)	(0.000523)
GDPpc*HighIncome		-0.000735
		(0.000523)
Location parameter for GDPpc		-6.19e-06
for High Income countries		(0.0000158)
Fixed Telephones	0.0708***	0.133***
	(0.0145)	(0.0346)
Fixed Telephones*HighIncome		-0.100***
		(0.0353)
Location parameter for Fixed Telephones		0.0322**
for High Income countries		(0.0162)
Low Literacy	-8.782***	-7.030***
	(0.912)	(1.248)
Medium Low Literacy	-0.975	-0.203
	(1.502)	(1.376)
Medium Literacy	0.971	1.046
	(0.638)	(0.638)
Medium High Literacy	0.222	0.00430
	(0.587)	(0.574)
Services	0.0270*	0.111***
	(0.0155)	(0.0274)
Services*HighIncome		-0.0931***
		(0.0330)
Location parameter for Services		0.0176
for High Income countries		(0.0194)
Agriculture	-0.0500***	0.0264
	(0.0171)	(0.0285)
Agriculture*HighIncome		-0.175***
		(0.0374)
Location parameter for Agriculture		-0.148***
for High Income countries		(0.0250)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95 (cont.)

	(1)	(2)
LOCATION		
Rugged	0.0154	0.0584
	(0.121)	(0.163)
Rugged*HighIncome		0.0680
		(0.204)
Location parameter for Rugged		0.126
for High Income countries		(0.124)
Distance Coast	-0.0212	1.225**
	(0.292)	(0.579)
Distance Coast*HighIncome		-1.621**
		(0.648)
Location parameter for Distance Coast		-0.395
for High Income countries		(0.279)
Pop Density	-0.000152	-0.00154
	(0.000127)	(0.00178)
Pop Density*HighIncome		0.00131
		(0.00178)
Location parameter for Pop Density		-0.000233*
for High Income countries		(0.000133)
Rural Pop	-0.0281***	-0.0437**
	(0.00893)	(0.0187)
Rural Pop*HighIncome		0.0237
		(0.0215)
Location parameter for Rural Pop		-0.0199**
for High Income countries		(0.0101)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95 (cont.)

	(1)	(2)
LOCATION		
Democratic	0.587*	0.167
	(0.311)	(0.428)
Democratic*HighIncome		0.675
		(0.572)
Location parameter for Democratic		0.841**
for High Income countries		(0.425)
Autocratic	-0.879*	-2.216***
	(0.464)	(0.552)
Autocratic*HighIncome		2.397***
		(0.821)
Location parameter for Autocratic		0.181
for High Income countries		(0.613)
Regulatory Quality	0.549**	-0.571
	(0.215)	(0.419)
Regulatory Quality*HighIncome		1.318***
		(0.505)
Location parameter for Regulatory Quality		0.747***
for High Income countries		(0.283)
DSL Monopoly	-0.467	-0.460
	(0.397)	(0.596)
DSL Monopoly*HighIncome		-0.0973
		(0.709)
Location parameter for DSL Monopoly		-0.558
for High Income countries		(0.394)
DSL Partial Competition	-1.120**	-2.091***
	(0.435)	(0.615)
DSL Partial Competition*HighIncome		1.252
		(0.981)
Location parameter for DSL Partial Competition		-0.839
for High Income countries		(0.730)
Internet Services Monopoly	-0.654	-2.016**
	(0.490)	(0.799)
Internet Services Monopoly*HighIncome		1.681*
		(0.923)
Location parameter for Internet Services Monopoly		-0.336
for High Income countries		(0.455)
Internet Services Partial Competition	1.629***	2.103***
	(0.450)	(0.648)
Internet Services Partial Competition*HighIncome		-0.775
		(0.893)
Location parameter for Internet Services Partial Competition		1.328**
for High Income countries		(0.628)
Common Law	-0.0343	-0.103
	(0.306)	(0.445)
Common Law*HighIncome		-0.169
		(0.600)
Location parameter for Common Law		-0.271
for High Income countries		(0.397)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95 (cont.)

GROWTH	(1)	(2)
High Income	0.0329*	-0.278**
	(0.0179)	(0.135)
GDPpc	7.44e-07	-3.40e-05
	(8.08e-07)	(2.73e-05)
GDPpc*HighIncome		3.42e-05
		(2.73e-05)
Growth parameter for GDPpc for High Income countries		2.50e-07 (8.56e-07)
Fixed Telephones	-0.00183**	-0.00475***
	(0.000789)	(0.00173)
Fixed Telephones*HighIncome		0.00502***
		(0.00178)
Growth parameter for Fixed Telephones for High Income countries		0.000275 (0.000875)
Low Literacy	0.943***	0.784***
	(0.110)	(0.151)
Medium Low Literacy	0.0419	0.00653
	(0.0853)	(0.0776)
Medium Literacy	-0.0227	-0.0342
	(0.0377)	(0.0389)
Medium High Literacy	-0.0158	-0.00617
	(0.0321)	(0.0310)
Services	-0.00153*	-0.00481***
	(0.000838)	(0.00147)
Services*HighIncome		0.00343*
		(0.00177)
Growth parameter for Services for High Income countries		-0.00138 (0.00105)
Agriculture	0.00156*	-0.00213
	(0.000931)	(0.00152)
Agriculture*HighIncome		0.00979***
		(0.00209)
Growth parameter for Agriculture for High Income countries		0.00766*** (0.00145)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95 (cont.)

GROWTH	(1)	(2)
Rugged	0.00126	-0.00289
	(0.00665)	(0.00909)
Rugged*HighIncome		-0.00603
		(0.0114)
Growth parameter for Rugged		-0.0089
for High Income countries		(0.00709)
Distance Coast	-0.00303	-0.0413
	(0.0154)	(0.0311)
Distance Coast*HighIncome		0.0412
		(0.0354)
Growth parameter for Distance Coast		-0.000112
for High Income countries		(0.0161)
Pop Density	7.04e-06	5.80e-05
	(7.21e-06)	(9.14e-05)
Pop Density*HighIncome		-4.59e-05
		(9.15e-05)
Growth parameter for Pop Density		0.0000121
for High Income countries		(7.47e-06)
Rural Pop	0.00106**	0.00135
	(0.000482)	(0.00100)
Rural Pop*HighIncome		-0.000544
		(0.00116)
Growth parameter for Rural Pop		0.000804
for High Income countries		(0.000545)
Democratic	-0.0267	-0.00769
	(0.0167)	(0.0226)
Democratic*HighIncome		-0.0305
		(0.0310)
Growth parameter for Democratic		-0.0382*
for High Income countries		(0.0231)
Autocratic	0.0521**	0.159***
	(0.0258)	(0.0324)
Autocratic*HighIncome		-0.173***
		(0.0466)
Growth parameter for Autocratic		-0.0137
for High Income countries		(0.0338)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Internet adoption with γ = 95 (cont.)

GROWTH	(1)	(2)
Regulatory Quality	-0.0100	0.0311
	(0.0116)	(0.0220)
Regulatory Quality*HighIncome		-0.0406
		(0.0270)
Growth parameter for Regulatory Quality		-0.00956
for High Income countries		(0.0157)
DSL Monopoly	0.0122	0.0130
	(0.0221)	(0.0325)
DSL Monopoly*HighIncome		0.0128
		(0.0396)
Growth parameter for DSL Monopoly		0.0258
for High Income countries		(0.0228)
DSL Partial Competition	0.0338	0.0805**
	(0.0235)	(0.0323)
DSL Partial Competition*HighIncome		-0.0410
		(0.0511)
Growth parameter for DSL Partial Competition		0.0395
for High Income countries		(0.0378)
Internet Services Monopoly	0.0637**	0.131***
	(0.0305)	(0.0481)
Internet Services Monopoly*HighIncome		-0.0863
		(0.0571)
Growth parameter for Internet Services Monopoly		0.0446
for High Income countries		(0.0303)
Internet Services Partial Competition	-0.0674***	-0.101***
	(0.0244)	(0.0347)
Internet Services Partial Competition*HighIncome		0.0510
		(0.0484)
Growth parameter for Internet Services Partial Competition		-0.0496
for High Income countries		(0.0346)
Common Law	0.0360**	0.0595**
	(0.0171)	(0.0250)
Common Law*HighIncome		-0.0448
		(0.0334)
Growth parameter for Common Law		-0.0496
for High Income countries		(0.0346)
t	0.284***	0.545***
	(0.0572)	(0.112)
Constant	-7.965***	-13.91***
	(1.081)	(2.046)
Observations	1,567	1,567
R-squared	0.899	0.917

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Internet adoption with predicted γ

	(1)	(2)
LOCATION		
High Income	-0.387	6.453***
	(0.337)	(2.465)
GDPpc	-1.94e-05	0.000593
	(1.56e-05)	(0.000523)
GDPpc*HighIncome		-0.000600
		(0.000523)
Fixed Telephones	0.0716***	0.133***
	(0.0149)	(0.0348)
Fixed Telephones*HighIncome		-0.100***
		(0.0355)
Low	-8.875***	-6.912***
	(0.906)	(1.246)
Medium Low	-0.945	-0.280
	(1.487)	(1.359)
Medium	0.942	1.059
	(0.629)	(0.657)
Medium High	0.236	-0.00330
	(0.582)	(0.575)
Services	0.0263*	0.106***
	(0.0153)	(0.0272)
Services*HighIncome		-0.0890***
		(0.0328)
Agriculture	-0.0484***	0.0256
	(0.0171)	(0.0282)
Agriculture*HighIncome		-0.163***
		(0.0374)
Rugged	0.00947	0.0798
	(0.120)	(0.163)
Rugged*HighIncome		0.0232
		(0.205)
Distance Coast	0.00603	1.210**
	(0.290)	(0.577)
Distance Coast*HighIncome		-1.598**
		(0.650)
Pop Density	-0.000252**	-0.00148
	(0.000125)	(0.00177)
Pop Density*HighIncome		0.00114
		(0.00178)
Rural Pop	-0.0276***	-0.0455**
	(0.00890)	(0.0187)
Rural Pop*HighIncome		0.0262
		(0.0214)

Notes:

(i) Regional dummies included in all regressions.

(ii) Robust standard errors in parentheses.

(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Internet adoption with predicted γ (cont.)

	(1)	(2)
LOCATION		
Democratic	0.547*	0.200
	(0.310)	(0.430)
Democratic*HighIncome		0.524
		(0.577)
Autocratic	-0.855*	-2.202***
	(0.462)	(0.552)
Autocratic*HighIncome		2.377***
		(0.818)
Regulatory Quality	0.514**	-0.512
	(0.216)	(0.416)
Regulatory Quality*HighIncome		1.194**
		(0.504)
DSL Monopoly	-0.396	-0.396
	(0.396)	(0.594)
DSL Monopoly*HighIncome		-0.0849
		(0.705)
DSL Partial Competition	-1.128***	-2.016***
	(0.432)	(0.608)
DSL Partial Competition*HighIncome		1.136
		(0.951)
Internet Services Monopoly	-0.615	-2.033**
	(0.488)	(0.796)
Internet Services Monopoly*HighIncome		1.831**
		(0.915)
Internet Services Partial Competition	1.625***	2.090***
	(0.446)	(0.644)
Internet Services Partial Competition*HighIncome		-0.790
		(0.888)
Common Law	-0.0879	-0.170
	(0.306)	(0.445)
Common Law*HighIncome		-0.105
		(0.603)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Internet adoption with predicted γ (cont.)

	(1)	(2)
GROWTH		
HighIncome	0.0416**	-0.219
	(0.0181)	(0.135)
GDPpc	7.53e-07	-2.43e-05
	(8.56e-07)	(2.76e-05)
GDPpc*HighIncome		2.41e-05
		(2.76e-05)
Fixed Telephones	-0.00158*	-0.00479***
	(0.000829)	(0.00177)
Fixed Telephones*HighIncome		0.00536***
		(0.00181)
Low	0.948***	0.768***
	(0.110)	(0.151)
Medium Low	0.0412	0.0127
	(0.0844)	(0.0765)
Medium	-0.0195	-0.0346
	(0.0373)	(0.0404)
Medium High	-0.0167	-0.00613
	(0.0321)	(0.0314)
Services	-0.00155*	-0.00444***
	(0.000835)	(0.00146)
Services*HighIncome		0.00292
		(0.00178)
Agriculture	0.00148	-0.00202
	(0.000935)	(0.00151)
Agriculture*HighIncome		0.00879***
		(0.00212)
Rugged	0.00146	-0.00438
	(0.00666)	(0.00920)
Rugged*HighIncome		-0.00365
		(0.0117)
Distance Coast	-0.00524	-0.0393
	(0.0155)	(0.0311)
Distance Coast*HighIncome		0.0368
		(0.0361)
Pop Density	1.81e-05**	5.48e-05
	(7.23e-06)	(9.15e-05)
Pop Density*HighIncome		-3.08e-05
		(9.16e-05)
Rural Pop	0.00111**	0.00153
	(0.000487)	(0.00101)
Rural Pop*HighIncome		-0.000706
		(0.00117)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Internet adoption with predicted γ (cont.)

	(1)	(2)
GROWTH		
Democratic	-0.0240	-0.00999
	(0.0168)	(0.0228)
Democratic*HighIncome		-0.0192
		(0.0319)
Autocratic	0.0492*	0.158***
	(0.0259)	(0.0328)
Autocratic*HighIncome		-0.173***
		(0.0469)
Regulatory Quality	-0.00412	0.0269
	(0.0119)	(0.0220)
Regulatory Quality*HighIncome		-0.0277
		(0.0272)
DSL Monopoly	0.00619	0.00980
	(0.0222)	(0.0326)
DSL Monopoly*HighIncome		0.00862
		(0.0397)
DSL Partial Competition	0.0328	0.0754**
	(0.0235)	(0.0319)
DSL Partial Competition*HighIncome		-0.0348
		(0.0502)
Internet Services Monopoly	0.0611**	0.132***
	(0.0303)	(0.0481)
Internet Services Monopoly*HighIncome		-0.0981*
		(0.0565)
Internet Services Partial Competition	-0.0653***	-0.0996***
	(0.0244)	(0.0346)
Internet Services Partial Competition*HighIncome		0.0562
		(0.0486)
Common Law	0.0391**	0.0661***
	(0.0173)	(0.0252)
Common Law*HighIncome		-0.0536
		(0.0339)
t	0.289***	0.507***
	(0.0573)	(0.112)
Constant	-7.726***	-13.18***
	(1.075)	(2.034)
Observations	1,567	1,567
R-squared	0.896	0.914

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with γ = 43

	(1)	(2)
LOCATION		
High Income	-0.218	11.99***
	(0.435)	(3.069)
GDPpc	4.38e-05***	0.00219***
	(1.40e-05)	(0.000563)
GDPpc*HighIncome		-0.00215***
		(0.000563)
Location parameter for GDPpc		0.0000339**
for High Income countries		(0.0000139)
Fixed Telephones	0.0117	0.0415
	(0.0149)	(0.0353)
Fixed Telephones*HighIncome		-0.0583
		(0.0375)
Location parameter for Fixed Telephones		-0.0169
for High Income countries		(0.0146)
Medium Low Literacy	-1.592*	-1.262
	(0.871)	(1.035)
Medium Literacy	1.340	1.457
	(1.241)	(1.214)
Medium High Literacy	0.0297	-0.198
	(0.617)	(0.747)
Services	0.00598	0.0627**
	(0.0173)	(0.0313)
Services*HighIncome		-0.0618*
		(0.0353)
Location parameter for Services		0.000929
for High Income countries		(0.0172)
Agriculture	-0.0834***	-0.0347
	(0.0224)	(0.0325)
Agriculture*HighIncome		-0.172***
		(0.0561)
Location parameter for Agriculture		-0.207***
for High Income countries		(0.0432)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with γ = 43 (cont.)

	(1)	(2)
LOCATION		
Rugged	-0.0389	-0.460***
	(0.108)	(0.158)
Rugged*HighIncome		0.483**
		(0.192)
Location parameter for Rugged		0.0229
for High Income countries		(0.117)
Distance Coast	-0.691**	1.523***
	(0.296)	(0.564)
Distance Coast*HighIncome		-2.847***
		(0.693)
Location parameter for Distance Coast		-1.324***
for High Income countries		(0.379)
Pop Density	0.000242**	0.00342*
	(0.000121)	(0.00201)
Pop Density*HighIncome		-0.00333*
		(0.00201)
Location parameter for Pop Density		.0000849
for High Income countries		(0.000119)
Rural Pop	-0.0274***	0.0122
	(0.0101)	(0.0204)
Rural Pop*HighIncome		-0.0540**
		(0.0228)
Location parameter for Rural Pop		-0.0418***
for High Income countries		(0.010)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with γ = 43 (cont.)

	(1)	(2)
LOCATION		
Democratic	1.002***	1.260***
	(0.345)	(0.425)
Democratic*HighIncome		-0.151
		(0.586)
Location parameter for Democratic		1.109**
for High Income countries		(0.465)
Autocratic	-0.604	-0.349
	(0.579)	(0.719)
Autocratic*HighIncome		-0.960
		(1.065)
Location parameter for Autocratic		-1.309
for High Income countries		(0.828)
Regulatory Quality	0.616*	-0.785
	(0.321)	(0.656)
Regulatory Quality*HighIncome		1.300*
		(0.737)
Location parameter for Regulatory Quality		0.515
for High Income countries		(0.348)
Internet Services Monopoly	-2.157***	-2.117***
	(0.408)	(0.782)
Internet Services*HighIncome		-0.119
		(0.989)
Location parameter for Internet Services		-2.237***
for High Income countries		(0.590)
Internet Services Partial Competition	-0.131	-0.291
	(0.405)	(0.566)
Internet Services Partial Competition*HighIncome		0.495
		(0.837)
Location parameter for Internet Services Partial Competition		0.204
for High Income countries		(0.617)
Common Law	-0.777**	0.0980
	(0.330)	(0.608)
Common Law*HighIncome		-1.060
		(0.757)
Location parameter for Common Law		-0.962**
for High Income countries		(0.420)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with γ = 43 (cont.)

	(1)	(2)
GROWTH		
High Income	0.0731*	-0.733**
	(0.0417)	(0.310)
GDPpc	-4.04e-06***	-0.000171***
	(1.39e-06)	(5.48e-05)
GDPpc*HighIncome		0.000168***
		(5.48e-05)
Growth parameter for GDPpc		-2.82e-06**
for High Income countries		(1.40e-06)
Fixed Telephones	0.00407***	0.00172
	(0.00140)	(0.00341)
Fixed Telephones*HighIncome		0.00488
		(0.00357)
Growth parameter for Fixed Telephones		0.00660***
for High Income countries		(0.00138)
Medium Low	0.169	0.165
	(0.121)	(0.132)
Medium	-0.0660	-0.0846
	(0.122)	(0.115)
Medium High	-0.0174	0.00380
	(0.0673)	(0.0792)
Services	-0.000867	-0.00276
	(0.00178)	(0.00323)
Services*HighIncome		0.000952
		(0.00363)
Growth parameter for Services		-0.00180
for High Income countries		(0.00179)
Agriculture	0.00322	0.000731
	(0.00228)	(0.00333)
Agriculture*HighIncome		0.0135**
		(0.00571)
Growth parameter for Agriculture		0.0142***
for High Income countries		(0.00439)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with y = 43 (cont.)

	(1)	(2)
GROWTH		
Rugged	0.00184	0.0367**
	(0.0102)	(0.0149)
Rugged*HighIncome		-0.0393**
		(0.0190)
Growth parameter for Rugged for High Income countries		-0.00255
		(0.0122)
Distance Coast	0.0512*	-0.144***
	(0.0287)	(0.0549)
Distance Coast*HighIncome		0.265***
		(0.0684)
Growth parameter for Distance Coast for High Income countries		0.121***
		(0.0381)
Pop Density	-2.69e-05**	-0.000346**
	(1.21e-05)	(0.000172)
Pop Density*HighIncome		0.000338*
		(0.000172)
Growth parameter for Pop Density for High Income countries		-8.00e-06
		(0.0000121)
Rural Pop	0.00212**	-0.00182
	(0.000991)	(0.00205)
Rural Pop*HighIncome		0.00525**
		(0.00231)
Growth parameter for Rural Pop for High Income countries		0.00343***
		(0.00104)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Broadband adoption with y = 43 (cont.)

	(1)	(2)
GROWTH		
Democratic	-0.0788**	-0.113***
	(0.0340)	(0.0410)
Democratic*HighIncome		0.0373
		(0.0580)
Growth parameter for Democratic		-0.0759
for High Income countries		(0.0463)
Autocratic	0.0184	0.0519
	(0.0586)	(0.0804)
Autocratic*HighIncome		-0.0119
		(0.112)
Growth parameter for Autocratic		0.0400
for High Income countries		(0.0816)
Regulatory Quality	-0.000636	0.109*
	(0.0314)	(0.0626)
Regulatory Quality*HighIncome		-0.100
		(0.0712)
Growth parameter for Regulatory Quality		0.00845
for High Income countries		(0.0353)
Internet Services Monopoly	0.218***	0.201**
	(0.0494)	(0.0819)
Internet Services Monopoly*HighIncome		0.0887
		(0.122)
Growth parameter for Internet Services Monopoly		0.290***
for High Income countries		(0.0895)
Internet Services Partial Competition	-0.0204	-0.000482
	(0.0416)	(0.0583)
Internet ServicesPartial Competition*HighIncome		-0.0584
		(0.0849)
Growth parameter for Internet Services Partial Competition		-0.0588
for High Income countries		(0.0620)
Common Law	0.0717**	0.0240
	(0.0335)	(0.0616)
Common Law*HighIncome		0.0422
		(0.0766)
Growth parameter for Common Law		0.0661
for High Income countries		(0.0426)
t	0.129	0.859***
	(0.143)	(0.292)
Constant	-6.474***	-16.97***
	(1.408)	(2.937)
Observations	1,330	1,330
R-squared	0.894	0.906

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Broadband adoption with predicted y = 80

	(1)	(2)
LOCATION		
High Income	-0.195	11.89***
	(0.435)	(3.071)
GDPpc	4.99e-05***	0.00219***
	(1.39e-05)	(0.000564)
GDPpc*HighIncome		-0.00216***
		(0.000565)
Fixed Telephones	0.0117	0.0402
	(0.0146)	(0.0354)
Fixed Telephones*HighIncome		-0.0561
		(0.0376)
Medium Low Literacy	-1.586*	-1.260
	(0.878)	(1.033)
Medium Literacy	1.306	1.453
	(1.237)	(1.210)
Medium High Literacy	0.0407	-0.210
	(0.620)	(0.747)
Services	0.00736	0.0624**
	(0.0172)	(0.0313)
Services*HighIncome		-0.0606*
		(0.0352)
Agriculture	-0.0828***	-0.0362
	(0.0225)	(0.0324)
Agriculture*HighIncome		-0.167***
		(0.0560)
Rugged	-0.0287	-0.464***
	(0.109)	(0.158)
Rugged*HighIncome		0.510***
		(0.193)
Distance Coast	-0.698**	1.498***
	(0.295)	(0.564)
Distance Coast*HighIncome		-2.788***
		(0.694)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Broadband adoption with predicted y = 80 (cont.)

	(1)	(2)
LOCATION		
Pop Density	0.000226*	0.00348*
	(0.000119)	(0.00202)
Pop Density*HighIncome		-0.00341*
		(0.00202)
Rural Pop	-0.0271***	0.0134
	(0.0101)	(0.0204)
Rural Pop*HighIncome		-0.0553**
		(0.0229)
Democratic	1.002***	1.260***
	(0.344)	(0.424)
Democratic*HighIncome		-0.183
		(0.585)
Autocratic	-0.591	-0.334
	(0.580)	(0.717)
Autocratic*HighIncome		-0.981
		(1.065)
Regulatory Quality	0.593*	-0.798
	(0.321)	(0.656)
Regulatory Quality*HighIncome		1.309*
		(0.738)
Internet Services Monopoly	-2.185***	-2.130***
	(0.408)	(0.780)
Internet Services Monopoly*HighIncome		-0.168
		(0.993)
Internet Services Partial Competition	-0.189	-0.305
	(0.405)	(0.565)
Internet Services Partial Competition*HighIncome		0.357
		(0.845)
Common Law	-0.738**	0.0830
	(0.330)	(0.608)
Common Law*HighIncome		-0.988
		(0.759)
GROWTH		
HighIncome	0.0735*	-0.721**
	(0.0417)	(0.310)
GDPpc	-5.79e-06***	-0.000173***
	(1.35e-06)	(5.49e-05)
GDPpc*HighIncome		0.000168***
		(5.49e-05)
Fixed Telephones	0.00330**	0.00152
	(0.00137)	(0.00342)
Fixed Telephones*HighIncome		0.00414
		(0.00358)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Broadband adoption with predicted γ = 80 (cont.)

	(1)	(2)
GROWTH		
Medium Low Literacy	0.173	0.164
	(0.123)	(0.132)
Medium Literacy	-0.0629	-0.0841
	(0.122)	(0.115)
Medium High Literacy	-0.0213	0.00293
	(0.0675)	(0.0791)
Services	-0.00111	-0.00281
	(0.00178)	(0.00322)
Services*HighIncome		0.000935
		(0.00363)
Agriculture	0.00297	0.000844
	(0.00228)	(0.00333)
Agriculture*HighIncome		0.0125**
		(0.00568)
Rugged	0.00104	0.0370**
	(0.0102)	(0.0149)
Rugged*HighIncome		-0.0407**
		(0.0188)
Distance Coast	0.0502*	-0.142***
	(0.0284)	(0.0548)
Distance Coast*HighIncome		0.259***
		(0.0684)
Pop Density	-2.40e-05**	-0.000352**
	(1.18e-05)	(0.000173)
Pop Density*HighIncome		0.000347**
		(0.000173)
Rural Pop	0.00209**	-0.00191
	(0.000989)	(0.00205)
Rural Pop*HighIncome		0.00536**
		(0.00232)

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Broadband adoption with predicted y = 80 (cont.)

	(1)	(2)
GROWTH		
Democratic	-0.0782**	-0.113***
	(0.0339)	(0.0409)
Democratic*HighIncome		0.0442
		(0.0579)
Autocratic	0.0225	0.0495
	(0.0587)	(0.0802)
Autocratic*HighIncome		0.000125
		(0.112)
Regulatory Quality	0.00141	0.110*
	(0.0314)	(0.0626)
Regulatory Quality*HighIncome		-0.105
		(0.0714)
Internet Services Monopoly	0.229***	0.203**
	(0.0498)	(0.0818)
Internet Services Monopoly*HighIncome		0.110
		(0.125)
Internet Services Partial Competition	-0.00886	0.00184
	(0.0417)	(0.0581)
Internet Services Partial Competition*HighIncome		-0.0336
		(0.0852)
Common Law	0.0761**	0.0261
	(0.0335)	(0.0615)
Common Law*HighIncome		0.0473
		(0.0768)
t	0.151	0.864***
	(0.143)	(0.292)
Constant	-7.237***	-17.60***
	(1.403)	(2.942)
Observations	1,330	1,330
R-squared	0.884	0.898

Notes:
(i) Regional dummies included in all regressions.
(ii) Robust standard errors in parentheses.
(ii) *** p<0.01, ** p<0.05, * p<0.1.