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TOWARDS UNIVERSAL BROADBAND: UNDERSTANDING THE IMPACT OF POLICY INITIATIVES ON BROADBAND DIFFUSION AND AFFORDABILITY

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Abstract

A new digital divide is emerging both within and between nations that is due to inequalities in broadband Internet access. Most previous research has focused on the broadband divide in developed countries and the role of several factors in bridging this divide, including competition specifically to provide broadband service. There seems to be very little research, however, that provides comprehensive explanations for the global broadband digital divide and, in particular, the impact of national public policy initiatives that seek to increase the availability and affordability of broadband service. Our research examines the broadband digital divide by analyzing the impact of national policies in the form of strategic planning, regulation and investment on the International Telecommunications Union's broadband diffusion and broadband affordability indicators in more than 110 countries. Our multiple regression analysis shows that when controlling for measures of economic, political, social and educational development, there is greater broadband diffusion in countries that encourage competition in their broader telecommunications sector and make a higher shared financial investment in information and communication technologies. Of these two variables, only competition in the telecommunications sector within a country helps make broadband more affordable to its citizens.

Keywords

Broadband Internet, public policy, technology affordability, technology diffusion.

1 INTRODUCTION

Broadband Internet access has become an important public policy issue in the United States (Atkinson, 2007; FCC, 2009; Hudson, 2008) as well as elsewhere in the world (OECD, 2009b). Because of complementary technology trends such as network convergence and open networks, broadband is becoming a preferred means for engaging in communication, commerce, and e-government as well as accessing information and receiving training. Researchers in different disciplines agree on the importance of universal broadband access to the Internet because of the economic, social and political benefits that it promises to deliver (Baliamoune-Lutz, 2003; Crandall, 2005; Gillett et al., 2006; Guillén & Suárez, 2005; ITU, 2003; van Dijk, 2005; West, 2005). Shared concerns about serving the common good by increasing high-speed access to the Internet have developed into a consensus that making the global information society inclusive is both a pragmatic and moral imperative (G-8, 2000; Norris, 2001; OECD, 2001; Tavani & Jamieson, 2007). Hence access to a converged high-speed Internet for both rich and poor citizens worldwide has become one of the priorities for advancing the United Nations Millennium Development Goals (Heeks, 2008; ITU, 2007; World Bank, 2006).

Because universal broadband is such an important development goal, it is essential to have a global understanding of broadband diffusion and broadband affordability (Atkinson, Correa & Hedlund, 2008; Cooper, 2004; Lee, 2008). Of the approximately 200 nations for which information and communication and technology data are reported, about two-thirds of these have some fixed-line broadband Internet access, and between 10 and 20 nations have more than 25% of their population accessing the Internet via broadband technologies (ITU, 2009a; ITU, 2009b). (We focus on fixed-line broadband in this research since there is significantly less data available for global mobile broadband.)

These statistics, however, also point to a global broadband digital divide that is due to inequalities in broadband Internet access. In 2008, the rate of individuals utilizing broadband services in rich nations was eight times greater than the rate in poorer nations, with the gap projected to widen in the near future (UNCTAD, 2009). The most recent International Telecommunication Union (ITU) assessment of the global digital divide indicates that more than 70 countries have no fixed-line broadband service and more than 30 countries have less than one broadband subscription per 100 residents. Fortunately, broadband has become affordable in highly developed countries. This has not been the case in less developed countries, with an annual broadband subscription exceeding the average per person gross national income in more than 50 countries (ITU, 2009b).

To bridge the global broadband divide, organizations and individuals must collaborate to provide broadband access to high-speed Internet service for both rich and poor citizens worldwide. While there is some controversy about the link between the diffusion of information and communication technologies and specific activities such as education, e.g., see (Oppenheimer, 1997), we agree with Tavani & Jamieson (2007) who state that "proponents of universal Internet service policies generally acknowledge that having such policies would not, in themselves, be sufficient to bridge the digital divide; however, they also believe that full Internet service is nonetheless a necessary condition for resolving certain problems that perpetuate the divide."

Our research examines the global broadband divide by analyzing the impact of national policy initiatives on broadband diffusion and affordability. We develop a series of hypotheses on the impact that national strategic planning, deregulation of the telecommunications sector, and financial investment in ICTs have on a nation's performance in achieving universal broadband Internet access for its citizens. To test our hypotheses, we use multiple regression analysis to estimate the effects of policy variables on the International Telecommunications Union's diffusion and affordability indicators for fixed-line broadband service in more than 110 countries. We show that when controlling for measures of economic, political, social and educational development, public policy initiatives at the national level have a significant impact on bridging the broadband divide. The two public policy initiatives that have the greatest impact are (i) the competitive environment in the telecommunications sector; and (ii) shared public and private investment in technological development.

2 BACKGROUND

Research on the digital divide has described the need for solutions that promote digital inclusion (Chinn & Fairlie, 2007; Hudson, 2006; ITU, 2007; Norris, 2001; Servon, 2002). In an attempt to leverage the potential of ICTs for socio-economic development, many countries have crafted strategies and formulated policies to increase the adoption and use of ICTs among their citizens. Few studies analyze the impact of national policies on addressing the broadband digital divide. Recent work by Atkinson, Correa & Hedlund (2008) and Windhausen (2008) are exceptions. In contrast, the majority of studies (Beilock & Dimitrova, 2003; Guillén & Suárez, 2005; Robison & Crenshaw, 2002; Zhao et al., 2007), focus primarily on Internet penetration as a measure of the "classic" digital divide. These studies show that competition to provide telecommunication services lowers the cost of access to ICTs, and that higher income results in higher Internet usage. Furthermore, many studies conclude that Internet access is less costly in countries that are more affluent and that other factors do not make Internet service more affordable (Beilock & Dimitrova, 2003; Fuchs, 2009; Guillén & Suárez, 2005; Hargittai, 1999; Robison & Crenshaw, 2002; Zhao et al. 2007).

Most previous research on the broadband divide, however, has focused on developed countries and the role of several factors in bridging this divide, including different forms of broadband industry competition (Atkinson, 2009; Atkinson, Correa & Hedlund, 2008; Bar et al., 1999; Cherry, 2005; Cooper, 2004; Distaso, Lupi & Manenti, 2005; Hudson, 2008; UNESCAP, 2007; van Eijk, 1999; Windhausen, 2008). This paper is the first work that determines the effect of two important metrics and their role in moving towards universal broadband service. These metrics determine the overall level of competition in the telecommunications sector within a country; and, how much shared financial investment has been made to advance the technological development of a country.

Findings from the studies described thus far suggest that national policy initiatives are instrumental in developing the ICT industries. Although the evidence in previous studies is somewhat mixed with respect to extending the diffusion of ICTs, we hypothesize that after controlling for wealth and other variables explained in Section 3.1 below, that

> (H1): Policy initiatives to promote information and communication technologies increase a nation's broadband diffusion; in contrast,
>
> (H2): Policy initiatives to promote information and communication technologies have no impact on a nation's broadband affordability.

While previous research provides rich detail on the connection between public policy and technological development as well as the challenges to realizing these policy objectives, it is impossible to make any valid generalizations on the contribution that government policies have towards bridging the broadband digital divide relative to other factors. To date, there has not been any research that has used a large-scale, cross-national approach to assess the impact of national public policy initiatives that seek to expand access to broadband Internet service. With data we describe below, we test our two research hypotheses to develop a more comprehensive understanding of the role of policy initiatives in bridging the global broadband divide.

3 IMPACT OF POLICY INITIATIVES ON BROADBAND DIFFUSION AND AFFORDABILITY

3.1 Data and methods

To test our hypotheses that policy initiatives contribute to explaining variation in broadband diffusion, but not broadband affordability, we estimated two multiple regression models that build on the models of Norris (2001) and Fuchs (2009).

First, our indicator for broadband diffusion and dependent variable in the first model is the number of fixed-line broadband subscribers per 100 inhabitants, as reported by the International Telecommunication Union (ITU, 2009b). The large number of countries with little or no broadband service yields a long tail of small values in the distribution of the number of subscribers per 100 people (Mean=8.47; Std. Dev.=10.36; Skew=1.18). We therefore take the natural logarithm of this diffusion variable to be the dependent variable in this first regression analysis.

Our indicator for broadband affordability and dependent variable in the second model is the International Telecommunication Union's fixed broadband sub-basket value. This "value" indicator is the average monthly cost for fixed-line broadband service divided by per person gross national income for comparable performance (256 kbps), where such performance is available (ITU, 2009b). For this broadband value variable, there are a large number of countries in which broadband service is very expensive relative to the per person gross national income (Mean=221.88; Std. Dev.=760.46; Skew=4.95). Hence, as in our first model, we take the natural logarithm of this affordability variable to be the dependent variable in our second regression analysis.

Our independent variables include three policy variables and six variables that have been found to be related to digital inclusion in previous studies. The six non-policy variables are affluence, i.e., GDP Index (Yates, Gulati & Tawileh, 2010), Education Index (Baliamoune-Lutz, 2003; Lee, 2008), income inequality (Fuchs, 2009), urbanization (Forestier, Grace & Kenny, 2002), political freedom (Guillén & Suárez, 2005), and press freedom & civil liberties (Norris, 2001). We describe the three policy variables in the following subsections.

3.1.1 National telecommunications regulatory authority

A review of a number of case studies indicates that nations that have been most successful at utilizing information and communication technologies are those that have established an independent executive-level department or national-level agency responsible for promoting and managing the expansion of telecommunication products and services (Hudson, 2006; ITU, 2007; UNESCAP, 2007; World Bank, 2006). Thus, countries with the presence of some sort of independent regulatory authority should expect to achieve greater broadband diffusion, but not necessary improved broadband affordability. We therefore hypothesize that

> (H1a): An independent national telecommunications regulatory authority increases a nation's broadband diffusion; but
>
> (H2a): A national telecommunications regulatory authority has no impact on a nation's broadband affordability.

To perform our analysis, we encode the independence of each country's national regulatory authority as specified by the ITU (2009a) as:

> "-1" if there is no regulatory authority listed in the ITU ICT database;
>
> "0" if there is a regulatory authority that is not independent; and
>
> "+1" if there is an independent regulatory authority.

3.1.2 Competition in the telecommunications sector

The case studies also reveal that nations with greater technological development are those that have more competition for providing telecommunications services (Atkinson, 2009; Guillén & Suárez, 2005; Hudson, 2006; ITU, 2007; Pick & Azari, 2008). Many of these same studies, and others, highlight the decisions that governments made when the mobile telecommunications industry was in its early stages of development, as the broadband industry is today. Rather than control, subsidize, or try to actively promote competition in the development of the mobile industry, many governments either refrained from regulating the emerging mobile industry or took a more *laissez-faire* approach and allowed the marketplace to allocate resources. The result was the rapid development and diffusion

of mobile access and devices and at a much more accelerated pace than what was seen for basic telephone services (Garrard, 1997; Hudson, 2006). Thus, countries that have a more competitive telecommunications sector should have greater broadband adoption. However, since broadband adoption has not reached a critical mass (Rogers, 1995) in most countries, we expect that the relationship between sector competition and price to be mixed. We hypothesize that

(H1b): Competition in the telecommunications sector increases a nation's broadband diffusion; but

(H2b): Competition in the telecommunications sector has no impact on a nation's broadband affordability.

Because broadband technologies have been deployed by service providers in different industries (e.g., telephone companies, cable television companies, satellite companies, etc.), we use six indicators to measure the extent of competition in the telecommunications sector. In addition, relying on multiple indicators gauges a country's general commitment to privatization, deregulation and promoting market competition in key industries. We aggregate several indicators into an index of competition that takes into account the level of competition in the industries that provide:

(C1) Basic telephone service;
(C2) Mobile services;
(C3) Basic Internet service;
(C4) DSL-based Internet service (which approximates competition in the local loop);
(C5) Cable modem-based Internet service; plus
(C6) Cross-platform competition between broadband Internet service providers.

Data for each of these variables were obtained from the International Telecommunication Union's ICT Eye database (ITU, 2009a). The variables (C1) through (C5) were all coded as follows:

"0" if data were not available in the ITU ICT database;

"1" if the country has a state-owned or private monopoly;

"2" if there is partial competition in a country's industry; and

"3" if there is full competition in the industry.

The last variable, (C6) cross-platform competition, is coded as a "1" if variable (C4) is greater than zero and variable (C5) is greater than zero; otherwise variable (C6) is set to "0". These six variables were subjected to a factor analysis with varimax rotation to confirm that all the items loaded on a single factor. One component was extracted that included all six items, with factor scores ranging from .67 to .87. A factor score coefficient was computed for each country using the regression method (Jackson, 2003). In our analysis we refer to the single value that captures the overall competition in these industries as the *telecommunications competition index*.

3.1.3 Shared financial investment

Previous research is clear that information technology and telecommunication industries have flourished when the public sector has made direct financial investment in the relevant infrastructure and structural resources (Norris, 2001; Servon, 2002). Private sector investment including research and development spending also has been essential in developing these industries (Dutton & Peltu, 1996; Pick & Azari, 2008). However, we do not expect prices for broadband to fall until technology penetration rates are greater than they are today. We therefore hypothesize that

(H1c): Higher financial investment in ICT industries increases a nation's broadband diffusion; but

(H2c): Higher financial investment in ICT industries has no impact on a nation's broadband affordability.

We reviewed a number of indicators in the World Bank's World Development Indicators (WDI) database that could measure the financial investment and economic activity within and around the telecommunications sector. No single indicator provided a comprehensive picture of investment and

related activity, but focused on only a small segment of such investment. To address this concern, we constructed an additive index of seven indicators of a nation's investment related to technological development. These seven indicators are:

(F1) Telecommunications revenue (as a percentage of GDP);
(F2) ICT expenditures (as a percentage of GDP);
(F3) Telecommunications investment (as a percentage of revenue);
(F4) Research & development spending (as a percentage of GDP);
(F5) Natural log of international Internet bandwidth (bits per second per person);
(F6) High-technology exports (as a percentage of manufacturing exports); plus
(F7) Computer, communications and other services (as a percentage of service exports).

Of the nearly 240 variables available in the WDI database, we selected these seven because of their connection to financial investment and induced economic activity in information or communication technology. Because most of the benefits of such investment may not be realized until a few years into the future, we measure investment over a number of years by averaging the data available between 2000 and 2007. The average over this period also was used for practical reasons: the data were not reported in every year for each country. Once averages were computed for each indicator, we computed an aggregate *financial investment index* based on an average of the Z-scores of the seven indicators for each country.

Note that the financial investment index and the underlying indicators measure the overall health of the telecommunications sector as well as how effectively governments and ICT businesses are collaborating to achieve universal broadband. Variables (F1) and (F2), which capture revenue and expenditure, measure the most basic aspects of economic activity. Specifically variables (F1) and (F2), when combined, indicate that telecommunications companies are earning revenue and consumers are spending money on information and communication technologies. Variables (F3), (F4) and (F5) represent a shared investment in physical infrastructure and human capital that we believe is essential to broadband digital inclusion. To achieve universal broadband, governments and businesses must collaborate on short-term and longer-term investment decisions, as captured by variables (F3) and (F4). Deployment of international bandwidth, as measured by (F5), also requires a cooperative effort between national service providers as well as national and municipal governments. Finally, variables (F6) and (F7) capture the ability of a country to export ICT products or services, respectively.

4 DATA ANALYSIS AND FINDINGS

4.1 Broadband diffusion

The results of the regression analysis of the log-transformed value for the number of subscriptions per 100 inhabitants on national regulatory independence, telecommunications competition index, financial investment index and six control variables are reported in Table 1. The nine independent variables together explain 82% of the variance in broadband diffusion rates.

The first four rows of data in Table 1 report the coefficients for wealth, income inequality, education, and urbanization. Since the dependent variable has been log-transformed, the unstandardized beta coefficients (*b*) should be interpreted as the percentage change in the dependent variable associated with a .01-unit change in the independent variable. For a one-unit increase, the percentage change would be 100 * *b* (see, for example, http://www.ats.ucla.edu/stat/).

The coefficients in the first row indicate that there is a strong connection between the affluence of a country and the diffusion of broadband. When holding all other variables constant, a 0.01 unit increase in a country's score on the GDP Index increases the number of broadband subscribers per 100 by 8.23%. The coefficients are statistically significant at the .01 level and provide support for the widespread view that countries with higher levels of wealth will have a larger proportion of its population with access to ICTs. In substantive terms, the effect of affluence is substantial. A wealthy

country such as Singapore, which has the highest score on the GDP Index (1.0), would be predicted to have 295% more broadband subscribers per 100 than a country such as China, which ranks near the mean and median in terms of its score on the GDP Index (0.642). In fact, 20% of people in Singapore have a broadband subscription compared to only 5% of people in China.

	Unstandardized Coefficients			
	b	Std. Err.	Standardized Beta	Sig.
Control Variables				
Affluence (GDP Index)	8.232	1.282	.611	.000
Income inequality (GINI Index)	.004	.012	.013	.763
Education Index (from HDI)	.356	1.090	.023	.744
Urbanization	.019	.009	.152	.029
Democracy (Polity 2)	.003	.016	.008	.870
Political freedom	-.008	.214	-.003	.969
Policy variables				
National regulatory authority independence (H1a)	.091	.198	.022	.649
Telecommunications competition index (H1b)	.570	.153	.174	.000
Financial investment index (H1c)	.577	.273	.098	.037
(Constant)	-7.627	.847		.000
N = 125; Adjusted R Squared = 0.822; Std. Error of the Estimate = 1.223.				

Table 1. The impact of public policy initiatives on per-country broadband diffusion: Multiple regression analysis of log-transformed number of broadband subscriptions per 100 inhabitants.

Surprisingly, the level of income inequality did not have an effect on broadband diffusion. As evident in the second row of data, the coefficients for the GINI Index are not statistically significant. It was expected that in countries where there is more inequality more generally, there would be greater inequality in access to broadband technology. What seems to matter is the amount of wealth in a country, not how that wealth is distributed. The level of education also had no effect on the percentage of people with broadband subscriptions. While countries with a more educated population may face a greater demand for broadband access, the relatively recent introduction of this technology for residential customers may have made it difficult for the public and private sectors to respond to these demands.

The coefficients in the fourth row show that broadband diffusion is more prevalent in countries that have higher levels of urbanization. A one-unit increase in the level of urbanization increases the percentage of broadband subscribers by 1.9% when controlling for all other variables. The coefficients are statistically significant at the .05 level and indicate that emerging ICTs are more available in areas where the population is more concentrated and infrastructure for Internet access already is in place.

The fifth and sixth rows of data report the coefficients for political structure and freedom. Neither of these two political variables is statistically significant. This is consistent with much of the previous research that also has been unable to find a relationship between democratic institutions and technology diffusion even though there are strong theoretical reasons to believe that this should be the

case (Norris, 2001; West, 2005). While a democratic society may create a positive environment and potential demand for broadband access, it is not enough, at this point, to spur actual deployment.

The coefficients for the three policy variables are presented in the next three rows of Table 1. The first of these coefficients indicate that a country's level of broadband diffusion is not affected by the presence or absence of an independent national regulatory authority for telecommunications. This contradicts our hypothesis (H1a) that the presence of an independent agency to guide ICT policy would increase ICT opportunity. Although not shown by this model, it is possible that strategic planning, development and deployment of ICTs can occur with or without the help of a national regulatory authority.

The next row of data reports the coefficients for the telecommunications competition index. These coefficients are statistically significant at the .01 level and indicate that countries that have open competition to deliver ICT services also have more broadband penetration than countries that have a more regulated market. When controlling for the effects of all other variables, a one-unit increase in the competition index leads to an increase in broadband diffusion of 57%. To further illustrate, a country that has the mean value (0.0) on our index of competition would have 111% more residents with broadband access than a country that has the minimum value (-1.95) on our index. And a country that has the maximum value (1.18) would have 67% more residents with broadband than a country with the mean value on our competition index. These results provide support for our hypothesis (H1b) that countries that have competition to provide telecommunication services will have a higher percentage of citizens with broadband service than countries that lack competition.

The coefficients for ICT investment indicate that countries that devote more financial resources to developing and promoting information technology, telecommunications, and related industries also have a larger number of broadband subscribers, thus supporting hypothesis (H1c). When controlling for the effects of all other variables, a one-unit increase in the indicator for ICT investment leads to an increase in broadband diffusion of 58%. In other words, a country that invests the maximum value on our index of financial investment would have 103% more people with a broadband connection than a country that had invested the mean value. This analysis indicates that increased investment in ICTs can help narrow the gap in access to broadband technology.

4.2 Broadband affordability

The results of the regression analysis of the log-transformed value for broadband affordability on the same nine independent variables are reported in Table 2. The independent variables together explain 87% of the variance in the dependent variable.

The coefficients in the first row indicate that there is a strong connection between the affluence of a country and the affordability of broadband service. When holding all other variables constant, a 0.01 unit increase in a country's score on the GDP Index *decreases* the cost of broadband service by 8.39%. The coefficients are statistically significant at the .01 level and provide support for the hypothesis that countries with higher levels of wealth are able to provide broadband service at a lower cost. Comparing Singapore and China once more, broadband service in wealthier Singapore would be predicted to be 317% cheaper than in China. Thus, both the availability and relative cost of broadband service are highly dependent on a country's economic wealth.

As in the model of diffusion, income inequality did not have an effect on broadband price. In contrast to the first model, however, there was a statistically significant relationship between the level of education and broadband affordability. A 0.01-unit increase in a country's score on the Education Index decreases the cost of broadband service by 1.7%. Also in contrast to the first model, there was no significant relationship between the level of urbanization and affordability. Thus, while it is easier to deliver broadband service in urban areas, this ease does not translate to a lower cost for the service. The fifth and sixth rows of data report the coefficients for political structure and freedom. Again, neither of the political variables is statistically significant.

The coefficients for the three policy variables are presented in the next three rows of Table 2. The first of these coefficients indicate that the cost of broadband service in a country is not affected by the presence or absence of an independent national regulatory authority for telecommunications. This supports our hypothesis (H2a) that the presence of an independent agency to guide ICT policy does not necessarily decrease the price of broadband service.

The eighth row of data reports coefficients for the telecommunications competition index. Although these coefficients are statistically significant at only the .10 level, they provide evidence that countries that have open competition to deliver ICT services also have less expensive broadband service than countries that harbour a less competitive market. When controlling for the effects of all other variables, a one-unit increase in the competition index leads to a decrease in price by 23%. This contradicts our hypothesis (H2b) that countries that have competition to provide telecommunication services will not necessarily deliver broadband service at a lower cost than countries that lack competition.

	Unstandardized Coefficients			
	b	Std. Err.	Standardized Beta	Sig.
Control Variables				
Affluence (GDP Index)	-8.386	.991	-.740	.000
Income inequality (GINI Index)	-.005	.009	-.020	.613
Education Index (from HDI)	-1.734	.834	-.136	.040
Urbanization	-.002	.006	-.020	.745
Democracy (Polity 2)	-.004	.011	-.015	.725
Political freedom	-.009	.158	-.003	.955
Policy variables				
National regulatory authority independence (H2a)	-.146	.157	-.038	.354
Telecommunications competition index (H2b)	-.227	.123	-.079	.066
Financial investment index (H2c)	-.182	.202	-.038	.371
(Constant)	10.361	.654		.000
N = 113; Adjusted R Squared = 0.866; Std. Error of the Estimate = 0.866.				

Table 2. The impact of public policy initiatives on per-country broadband affordability: Multiple regression analysis of log-transformed fixed broadband sub-basket value.

Finally, the coefficients for ICT investment indicate that there is no relationship between the amount of financial resources that a country directs to developing and promoting ICTs and the affordability of broadband service, thus supporting hypothesis (H2c). While targeted investment in ICT industries may promote the development of newer generation products and services, it does not seem to have an effect on price, at least not on the price of broadband service.

5 CONCLUSIONS AND FUTURE WORK

The rapid development of information and communication technologies (ICTs) in recent years has created an environment for people to have greater access to telecommunication and Internet services. Much of the previous research suggests that these technological advances have mostly exacerbated

existing inequalities between developed and developing nations and created new inequalities within societies between the information rich and poor. There seems to have been very little research, however, that provides comprehensive explanations for the global digital divide and, in particular, the impact of national public policy initiatives that seek to increase broadband diffusion and improve broadband affordability. Our study is the first large-N study to assess the impact of policy initiatives on improving broadband adoption and affordability.

Our research examined the global broadband divide by assessing the impact of public policies on the ITU indicators for broadband diffusion and broadband affordability in more than 110 countries. Specifically, we developed a series of testable hypotheses on the impact that strategic planning, competition in the telecommunications sector, and financial investment in ICTs have on a nation's performance in promoting opportunities for citizens to participate in the global information society using broadband technologies. We find that polices matter and, as a result, mitigate, to some extent, the advantages enjoyed by the most affluent countries. When controlling for measures of economic, political, social and educational development, there is greater broadband diffusion in countries that encourage competition in their broader telecommunications sector and make a higher shared financial investment in information and communication technologies. Of these two variables, only competition in the telecommunications sector within a country helps make broadband more affordable to its citizens.

Our future research plans are to examine whether the effect of policies varies depending on a nation's level of development. High-income countries tend to score higher on a number of government efficiency measures (Srivastava & Teo, 2007) and, thus, the outcome of policy initiatives to promote broadband access and affordability may be more successful than in low-income countries. In addition, even minor changes in the policy realm in high-income countries may have a profound effect since these countries likely already have advanced ICT infrastructure in place. The findings from this sort of study will have important implications for citizens in the developing world, who continue to fall further behind in access to the latest generation of ICTs and are therefore deprived of access to other resources that could improve their quality of life.

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