Universal Broadband: An Analysis of Global Stakeholders and the Pursuit of the Common Good

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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. We show using data from the OECD and the International Telecommunication Union (ITU) that this new digital divide is a global problem that can be observed in both developed and developing countries. To bridge the global broadband divide, organizations and individuals must collaborate to provide broadband access to a converged high-speed Internet for both rich and poor citizens worldwide. Most previous research has focused on the broadband divide in developed countries and the role of several factors in bridging this divide, including competition to provide broadband service to businesses and consumers. We argue that addressing this global problem is an ethical imperative that requires bridging the perspectives of multiple stakeholders and applying their collective resources, power and will. We develop a comprehensive framework, using stakeholder theory, which identifies the global stakeholders as well as the roles and responsibilities that these stakeholders must assume to balance their self-interest with serving the common good. Our framework also highlights relationships between key stakeholders, namely governments and their citizens, businesses in the information and communication technology (ICT) industries, and other organizations. Using this framework and recent ITU and World Bank data, we make four important observations that can guide governments and other stakeholders in bridging the broadband divide in pursuit of the common good: (1) A national authority that regulates the activities of the many stakeholders within a country's telecommunications sector has a positive impact on broadband adoption. (2) A shared financial investment in the physical infrastructure and human capital required to deploy and operate broadband networks also helps increase broadband diffusion. (3) An independent regulatory authority and shared financial investment are at least as important as telecommunications service provider competition in expanding broadband Internet access. And, (4) service provider competition has a greater impact on broadband affordability than it does on broadband diffusion.

Keywords: Broadband Internet; Common Good; Digital Divide; Public Policy; Stakeholder Theory; 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, 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; Horrigan, 2009; 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., Oppenheimer, 1997), we agree with Tavani (2007, p. 301) who states 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."

Achieving affordable broadband access to the Internet requires addressing not only political, economic and technological issues, but also legal, social and ethical concerns. The *common good* of achieving this

goal is to provide all citizens, and particularly the less fortunate, with information and communication technologies that will help provide:

- employment possibilities;
- educational opportunities;
- healthcare resources; and
- access to government information & services,

to name some of the benefits. We argue below that pursuing this common good is an ethical imperative that requires bridging the perspectives of multiple stakeholders and applying their resources, power and will.

We develop a framework, using stakeholder theory, which identifies the global stakeholders as well as the roles and responsibilities that key stakeholders must assume to balance their self-interest with serving the common good. Our framework also highlights relationships between stakeholders, namely governments and individuals, companies in the information and communication technology (ICT) industries, and other organizations.

Using this framework and also ITU and World Bank data, we make four important observations that can guide governments and other stakeholders in bridging the broadband divide in pursuit of the common good: (1) A national authority that regulates the activities of the many stakeholders within a country's telecommunications sector has a positive impact on broadband adoption. (2) A shared financial investment in the physical infrastructure and human capital required to deploy and operate broadband networks also helps increase broadband diffusion. (3) An independent regulatory authority and shared financial investment are at least as important as telecommunications service provider competition in expanding broadband access. And, (4) service provider competition has a greater impact on broadband affordability than it does on broadband diffusion.

2. BACKGROUND

The common good principle dates back to Plato and Aristotle. The ethicist John Rawls redefined the notion of the common good as "certain general conditions that are … equally to everyone's advantage" (Rawls, 1971). The common good is also defined as "the sum of those conditions of social life which allow social groups and their individual members relatively thorough and ready access to their own fulfillment" (Velasquez et al., 2009). The common good also includes interdependent institutions, social systems, environments, and basic goods and services for individuals. For example, the common good includes the health care system, legislative and judicial systems, political, economic, and legal systems as well as environmental concerns. And we, along with others, e.g., Crandall (2005), the ITU (2007), Schech (2002), van Dijk (2005) and West (2008), argue here that affordable, readily-available broadband access to the Internet has been, is, and will become a necessary element of the well-being of all citizens.

Stakeholder theory and the ethical principle of the common good provide a pragmatic and moral perspective on expanding digital inclusion and thus providing global citizens the widest and most affordable access to the Internet (DiMaggio & Hargittai, 2001; Emiliani, 2008; Leighton, 2001; Yates, Gulati & Tawileh, 2010). Stakeholder theory originated in strategy and has been widely used by various

disciplines, including in the field of corporate social responsibility. Argandona (1998) argues that the foundation of the common good in stakeholder theory extends "from the common good of the company itself to the local community, the country and all humankind, including future generations" (Argandona, 1998, p. 1099). Friedman and Miles (2006) criticize Argandona's arguments as confusing, since Argandona posited that the common good was already embodied within existing social arrangements and independent from others. These authors also attack what they argue is Argandona's notion that the common good can be achieved without substantial social change—why, then, the need for stakeholder theory (Friedman & Miles, 2006, pp. 62-64)? Stakeholder theory and the common good principle are particularly relevant to our study since the goal of having citizens gain affordable high-speed access to the Internet presents multifaceted issues that involve different constituencies. Stakeholder theory provides a framework for identifying who is involved in helping realize this goal, what stakes are involved, and the strategic interactions among stakeholders during the process.

Research on the digital divide has described the need to identify key stakeholders in solutions that might promote digital inclusion (Chinn & Fairlie, 2007; Guillén & Suárez, 2005; Hudson, 2006; ITU, 2007; Norris, 2001; Robison & Crenshaw, 2002; Servon, 2002; Zhao et al., 2007). Study of the broadband digital divide has followed suit (Atkinson, Correa & Hedlund, 2008; Choudrie, Papazafeiropoulou & Lee, 2003; Marsden, 2008). Most previous research on the broadband divide, however, has focused on developed countries and the role of several factors in bridging this divide, including competition to provide broadband service to businesses and consumers (Atkinson, 2009; 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 applies stakeholder theory to understanding and addressing the global broadband divide. We find stakeholder theory particularly useful in developing metrics for determining 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. We now review the state of the broadband divide in developed countries as well as in a global context, before exploring these metrics and discussing their implications in Section 4.

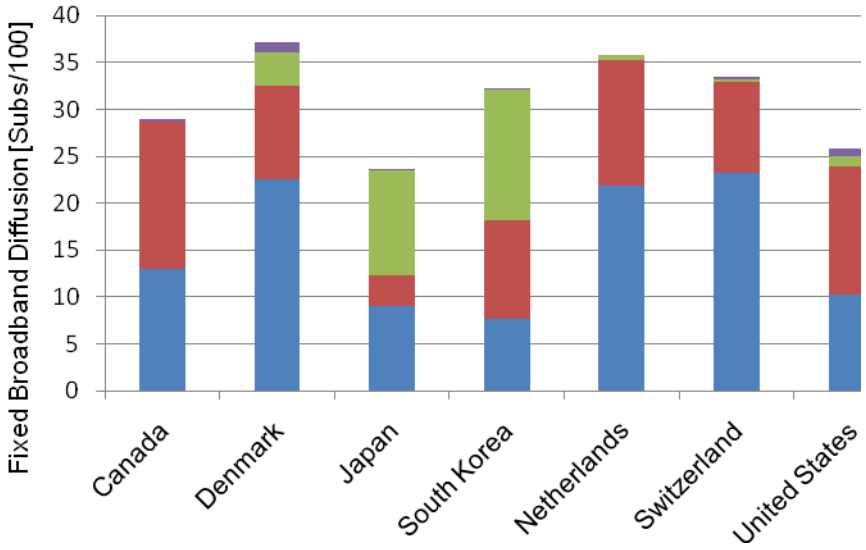

Figure 1. Fixed broadband diffusion in 7 of the OECD-30 countries.

Figure 1 shows fixed-line broadband diffusion in seven of the OECD countries. The units of the vertical axis in this figure are the number of subscribers per 100 inhabitants (Subs/100). All seven of these countries – Canada, Denmark, Japan, South Korea, the Netherlands, Switzerland, and the United States – appear in the top 20 in broadband diffusion reported by the ITU (2009b) and have had some success in bridging the digital divide for their inhabitants. Denmark was one of the first countries to include provisions for broadband in their universal telecommunications service programs (ITU, 2009a). South Korea, Japan and Denmark received the top three scores of the Digital Opportunity Index assessment in 2007 (ITU, 2007). The Netherlands (van Eijk, 1999) and Switzerland (Cherry, 2005) have benefited from their competitive broadband environment. Canada has been praised for ICT development initiatives that have made it one of the most connected countries in the world (Frieden, 2005; Windhausen, 2008) in spite of its significant rural population. Finally, the USA is in the process of formulating a national broadband plan (FCC, 2009; GAO, 2009).

There is up to a 37% difference in broadband diffusion between the seven countries shown in Figure 1 even though they are all highly developed. This clearly illustrates that there is a broadband divide, at least in terms of adoption, between nations in the OECD (OECD, 2009a). The broadband divide, however, is multifaceted in nature. Figure 1 also shows a technology divide between these countries: DSL-based broadband penetration is shown in blue; cable-based broadband in red; fiber optic-based cable in green; and other technologies in purple. Notice that Japan and South Korea have deployed significantly more fiber optic broadband than other nations (Atkinson, Correa & Hedlund, 2008; OECD, 2009a). This technology divide in turn yields a performance divide, even when considering cost (Frieden, 2005; Kushida & Oh, 2006).

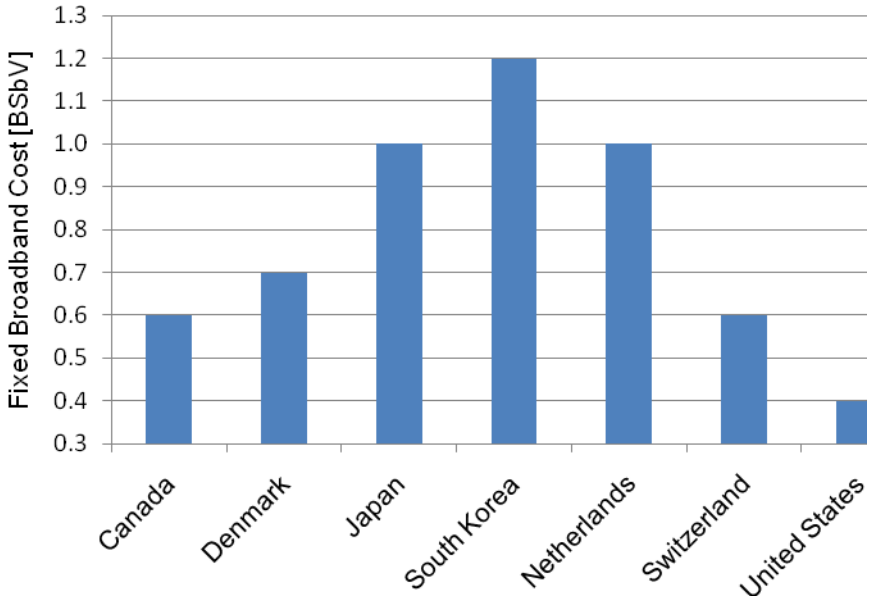

Figure 2. Fixed broadband cost in 7 of the OECD-30 countries.

Affordability is also an important dimension when examining the broadband divide. Figure 2 shows broadband cost normalized by per person gross national income (GNI) for comparable performance (256

kbps), for the same countries as in Figure 1. The cost metric shown on the vertical axis, called the broadband sub-basket value (BSbV), is used by the ITU (2009b) as the indicator of broadband affordability within a given country. Figure 2 shows an even wider gap in performance than Figure 1: Specifically, between the same seven countries there is a 67% gap in the cost of comparable broadband service compared with the 37% gap we observed for broadband adoption.

If there are broadband diffusion and affordability gaps between developed countries, then the same gaps must occur on a larger scale when taking a global view of the broadband divide. We confirm this conjecture in the remainder of this section using the most recent data from the United Nations and International Telecommunications Union (ITU, 2009a; ITU, 2009b).

Other researchers have shown that the digital divide, with respect to Internet access and use, is less pronounced in countries that are more affluent (Beilock & Dimitrova, 2003; Fuchs, 2009; Guillén & Suárez, 2005; Hargittai, 1999; Robison & Crenshaw, 2002; Zhao et al., 2007). Figure 3, which plots per-country broadband diffusion versus GDP Index, shows that the same link exists for the global broadband divide. The countries for which data are graphed in this figure (ITU, 2009b) project their GDP Index onto the *x*-axis in this figure. Similarly, the number of fixed-line broadband subscribers per 100 inhabitants is projected onto the *y*-axis. This figure illustrates that broadband diffusion is clearly correlated with GDP. Specifically, for the data shown, the correlation coefficient for these two variables is greater than 0.72. However, a country's wealth is clearly not the whole story. In Figure 3, there are several nations with a high GDP Index that have vastly different performance in terms of broadband diffusion. For countries with an index greater than 0.95, the top three are Denmark (with 36.0 Subs/100), Sweden (also with 36.0), and the Netherlands (33.5). These broadband diffusion rates are quite high compared with the bottom three, which are Qatar (with 8.4 Subs/100), Brunei (with 2.9), and Kuwait (2.4).

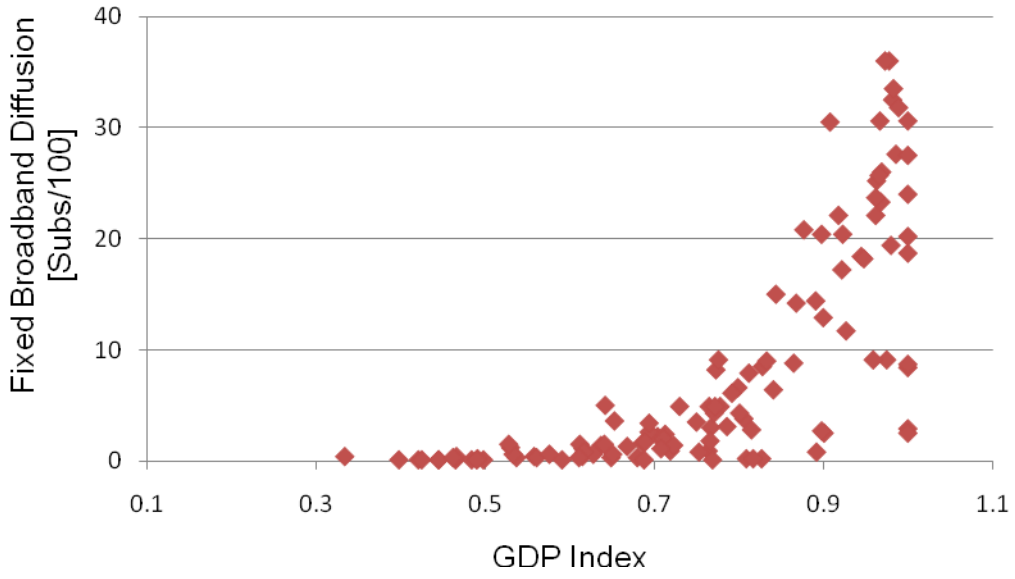

Figure 3. Fixed broadband diffusion versus GDP Index.

The digital divide research to date has focused more on diffusion than affordability. However, recent studies suggest a strong connection between a country's wealth and the affordability of information and

communication technologies (ITU, 2007; World Bank, 2006). Figure 4 shows per-country broadband cost versus GDP Index. Because the global diffusion of broadband is in its infancy, the cost of high-speed Internet service in some countries is extremely high. Hence Figure 4 uses a logarithmic scale on the *y*-axis (in contrast with the linear scale used in Figure 2). Specifically, for the points shown in Figure 4, the *y*-axis values are the natural log of the broadband sub-basket values for each country, which is denoted ln(BSbV). Figure 4 confirms that there is a strong connection between the GDP of a country and the cost of broadband for its citizens, even though the broadband sub-basket costs are normalized by the per person gross national income. In fact, the correlation coefficient of the two variables graphed in Figure 4 is approximately -0.9.

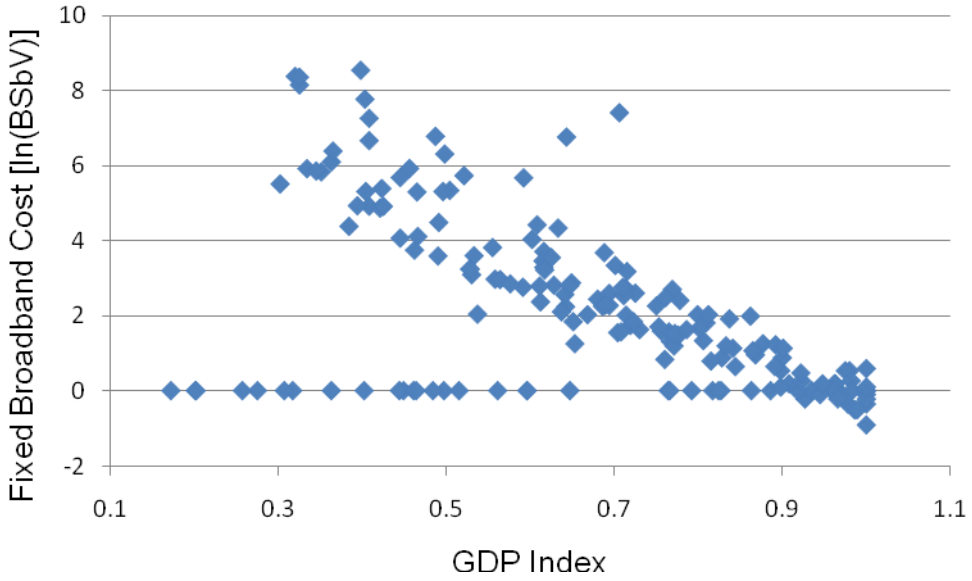

Figure 4. Fixed broadband cost versus GDP Index.

By analyzing data from the United Nations, OECD, and International Telecommunication Union (ITU), we have seen that the broadband digital divide is a global problem that can be observed in both developed and developing countries. In Section 3, we explain how stakeholder theory and the common good connect to provide a practical and ethical framework for empirically studying how broadband access can be expanded globally. We then apply this framework to obtain the results and conclusions presented in subsequent sections of this paper.

3. RESEARCH QUESTIONS AND METHODS

Freeman's classic definition of a stakeholder is any group or individual who can affect or is affected by the achievement of the organization's objectives (Freeman, 1984). The first three steps to stakeholder analysis are straightforward:

- Identify stakeholders;
- Classify stakeholders into meaningful groups; and
- Prioritize them (Harrison & St. John, 1994).

Because of the global nature of the Internet and broadband access, we extend the traditional method of using stakeholder analysis from focusing on a single company as the *focal stakeholder* to include industries and even nations as stakeholders. While Freeman's work on stakeholder theory discusses "narrow and wide" definitions of stakeholders and extends the term to include communities, he does not include nations or industries in this category. Governments and large global companies, however, have since been a part of stakeholder frameworks and analyses (Choudrie, Papazafeiropoulou & Lee, 2003; Sriramesh & Vercic, 2009).

While governments and industries as stakeholders are more aggregated entities than a single company, it can be argued that such groupings do exist, do coalesce on certain policies and strategies, and do influence other stakeholders based on common motivations. It can also be argued that larger stakeholder groups, like single companies, can be disaggregated for further analysis. Not all executives, leaders, and board members in companies always agree on an enacted strategy or policy. Likewise, telecommunications service providers grouped as stakeholders by country, as in this study, could be singled out for study at an organizational level.

The major research questions that we address in our analysis are threefold:

1) What are the causes of the broadband digital divide that can be influenced by the key stakeholders we identify?
2) What actions should our stakeholders take (together or separately) to bridge the broadband divide?
3) What affect do the major stakeholders have on improving broadband diffusion and broadband affordability to individuals, thereby serving the common good?

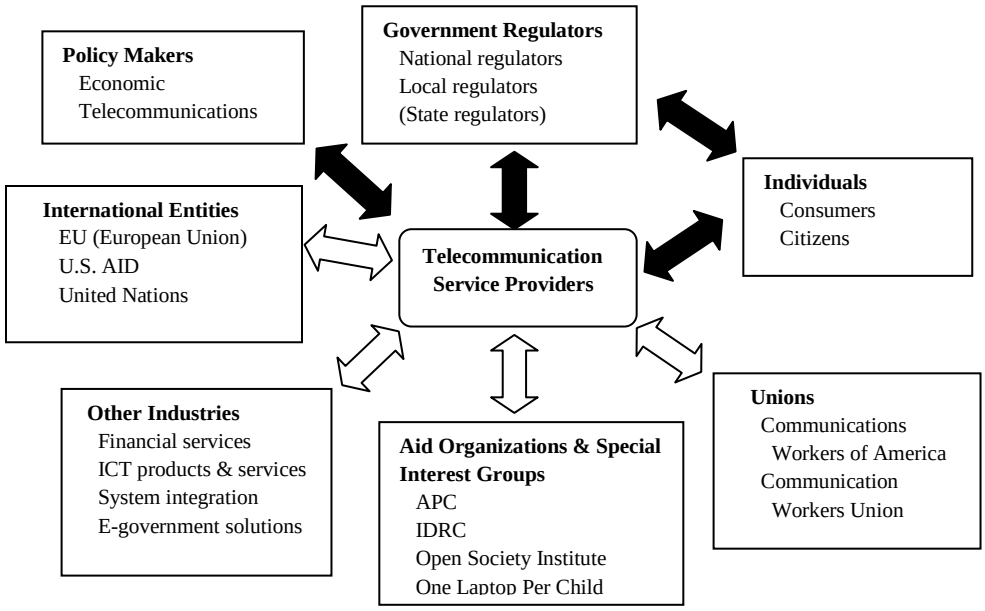

Figure 5. National & international stakeholders in pursuit of universal broadband.

Figure 5 depicts eight stakeholder groups that are identified as the important constituencies with regard to these research questions. Telecommunications service providers (e.g., AT&T, Verizon, Comcast, Time-Warner, etc. in the United States) were selected as the focal stakeholders since they are most directly involved in determining broadband availability and price. The other stakeholders include policy makers; government regulators; individuals; unions; international entities; financial institutions; aid organizations; special interests groups as well as companies in other industries that influence and are affected by the telecommunication service providers.

It is important to note that we use this stakeholder framework assuming a *third party perspective*. In other words, we address the research questions above not from the position or vantage point of any one stakeholder, but from a truly global perspective. For example, we determine necessary conditions for the telecommunication service providers and ICT product and service companies to thrive in an environment that also supports universal service programs for the less fortunate. We also explore other public policy initiatives that improve broadband diffusion and affordability, and quantify to what extent these policies achieve the goal of universal broadband access to the Internet.

4. ANALYSIS AND RESULTS

Stakeholders in pursuit of the *common good* must cooperate and collaborate to achieve universal broadband access to the global Internet. Specifically, the leadership of key stakeholders working to achieve universal broadband not only has an obligation to their own constituents, but also a social and moral responsibility toward citizens, customers, communities, suppliers, vendors, employees, etc. Recent research on management argues that corporate officers and owners who depend on the physical, economic, social, political, and legal resources of local, regional, national and global locations to earn revenues and profits also have a moral responsibility to the well-being of citizens, laborers, communities, and civil servants, since these groups help sustain the environments corporations require—as well as support—to exist (Quinn & Jones, 1995; Svendsen, 1998; Waddock & Graves, 1997). This relationship is not based on welfare or altruism, but on mutual benefit. Related to the concept of the *triple bottom line* (Savitz & Weber, 2006), this philosophy is grounded in the *sustainability imperative*, i.e., the realization that in order for the environment to be preserved and society to benefit from business, companies must respect the "interdependence of various elements in society on one another on the social fabric. Sustainability means operating business in a way that acknowledges the needs and interests of other parties … and that does not fray but rather reinforces the network of relationships that ties them together" (Weiss, 2009, p. 452). Thus, for telecommunication companies (as well as government regulators, financial institutions, unions, special interest groups, aid organizations, etc.), the common good is a goal worth striving towards, not only as an ethical rights or distributive justice obligation, but as pragmatic goal as well.

Our data analysis and findings quantify the outcome of the cooperation and collaboration between the stakeholders described above. Our findings are based on multiple regression analysis of two models. The first model estimates global broadband diffusion and the second model estimates broadband affordability. Both models control for a nation's 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). Of these control variables, the GDP Index, as shown in Figures 3 and 4, is the only

independent variable that is significant in both models. We therefore focus on how three specific multi-stakeholder variables impact broadband diffusion and affordability.

4.1 National Regulation and Broadband Diffusion

Of the stakeholders we have discussed thus far, it is national governments as well as their strategies, policies and regulations that have the most influence over how effectively key stakeholders cooperate and collaborate to promote broadband Internet access. The decisions made by national governments affect resource allocation decisions to serve the public interest of their own citizens (e.g., to support universal service programs) as well as to provide assistance for global citizens (e.g., to support United Nations councils and agencies that are working to bridge the digital divide). Although the focus in this paper is on global deployment of fixed-line broadband Internet technologies, previous work has shown the importance of government policy and regulation in expanding digital opportunity and bridging the digital divide.

Because of the important role and responsibilities of national governments, we wanted to test the theory which asserts that an independent regulatory authority for telecommunications within a country is necessary to create an environment in which stakeholders make the investments required to increase ICT diffusion. To perform this 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.

Figure 6 shows *broadband diffusion* in approximately 150 nations versus the independence of each nation's telecommunications regulatory authority. The broadband diffusion of countries that do not have a national regulatory authority appear "stacked" above the -1.0 label on the *x*-axis in Figure 6. The average number of broadband subscriptions per 100 inhabitants (Subs/100) for these countries is 6.26 and the corresponding range is between 0 and 22.1 Subs/100. There are three countries at the top of this range that are outliers. The first two countries are Japan and Israel, both of which have 22.1 subscribers per 100 people and have achieved this level of broadband penetration without a national telecommunications regulatory authority. The third is Taiwan, which has 20.9 Subs/100 and for whom the ITU does not report regulatory authority information. The broadband diffusions for countries that have a national regulatory authority that is *not* independent appear above the 0.0 on the *x*-axis in the same figure. This set of countries has one outlier, Denmark, which has 36 Subs/100 and does so with its National IT and Telecom Agency reporting to the Danish Ministry of Science, Technology and Innovation. The average number of broadband subscriptions per 100 inhabitants for the countries including Denmark is 4.89. The countries that *do* have an independent regulatory authority (on the right-hand side of Figure 6) have an average of 9.46 broadband subscriptions per 100 people. If one ignores the four outliers in this figure described above, having a telecommunications regulatory (independent or not) clearly has a positive impact on providing broadband access for all citizens within the country. Furthermore, with the notable exception of Denmark, this impact tends to be greater if the telecommunications regulatory authority is independent.

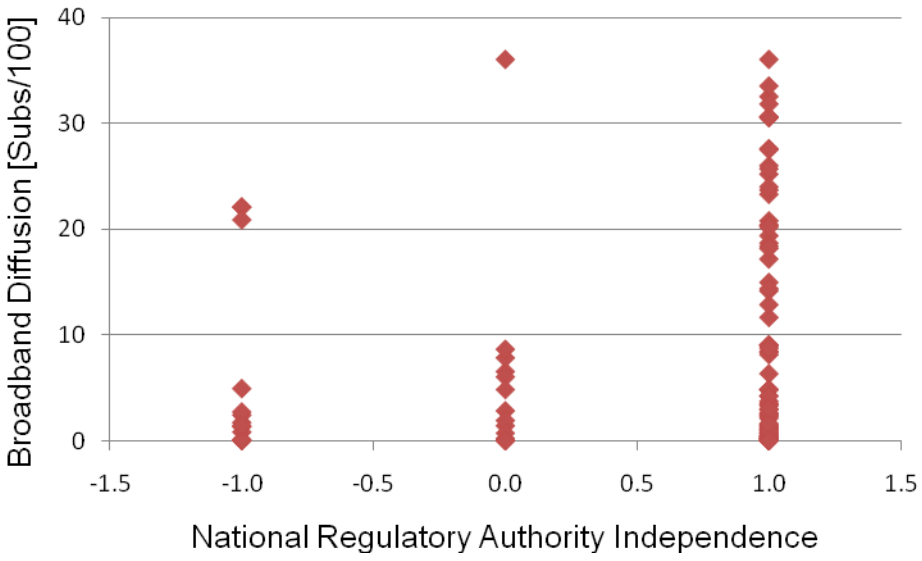

Figure 6. Impact of regulatory independence on broadband diffusion.

4.2 Financial Investment and Broadband Diffusion

Based on earlier research on the digital divide, e.g., (Baliamoune-Lutz, 2003; Beilock & Dimitrova, 2003; DiMaggio & Hargittai, 2001; Forestier, Grace & Kenny, 2002; Norris, 2001; Robison & Crenshaw, 2002), it is clear that the information technology and telecommunication industries have flourished when the public sector has made direct financial investment in the relevant infrastructure and structural resources. Works by Servon (2002) and Hudson (2006) provide a number of case studies that illustrate the positive effects of government-funded investment. Private sector investment in the form of research and development spending also has been essential in developing these industries (Dutton & Peltu, 1996; Pick & Azari, 2008). We expect that the lessons learned in these studies translate to the broadband digital divide.

Another important factor in increasing broadband diffusion is economic activity in industries related to diffusion of technology by industries related to the business of our core stakeholders in Figure 5, namely the telecommunication service providers. These related industries would include companies that develop products for or provide services to broadband Internet service providers. Products and services in this sector create the technological capacity to build the infrastructure necessary for expanding broadband diffusion. In addition, the individual (i.e., consumer and citizen) in Figure 5 must be willing to spend some of his or her income on using broadband service. Furthermore, excess capacity can create the opportunity to export these products and services.

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); and
(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 every year for every country. Once averages were computed for each indicator, we computed an aggregate *financial investment index* based on the average of the Z-scores of the seven indicators for each country.

Note that the financial investment index and the underlying indicators measure the health of some key relationships in the stakeholder map in Figure 5. 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 achieving universal broadband access to the Internet. 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. Breakdowns in relationships between these stakeholders has been one of the reasons that some African countries have been slow to obtain or expand access to the global Internet. Finally, variables (F6) and (F7) capture the ability of a country to export ICT products or services, respectively.

Figure 7 shows broadband diffusion versus the financial investment index. For the 1/3 of countries that have the smallest investment index values, the average number of broadband subscriptions per 100 people is 1.61. For the middle 1/3, there are approximately five (5) subscriptions per 100 people on average. For the 1/3 of countries that have the largest investment index, there is an average of 14.7 subscriptions per 100 inhabitants (Subs/100). These results demonstrate a strong positive relationship between financial investment and related activity in the telecommunications sector and increased adoption of broadband. It is worth noting that this figure provides additional evidence that there is more to achieving universal broadband than the affluence of a country. Even though Figure 3 and Figure 7 plot the same dependent variable, namely broadband diffusion, the two figures have quite different forms. There is also a clear difference between the statistics of the data that are shown in these two figures. Specifically, the correlation coefficient of the independent variables on the *x*-axes of these figures (i.e., the GDP Index and financial investment index) is less than 0.5.

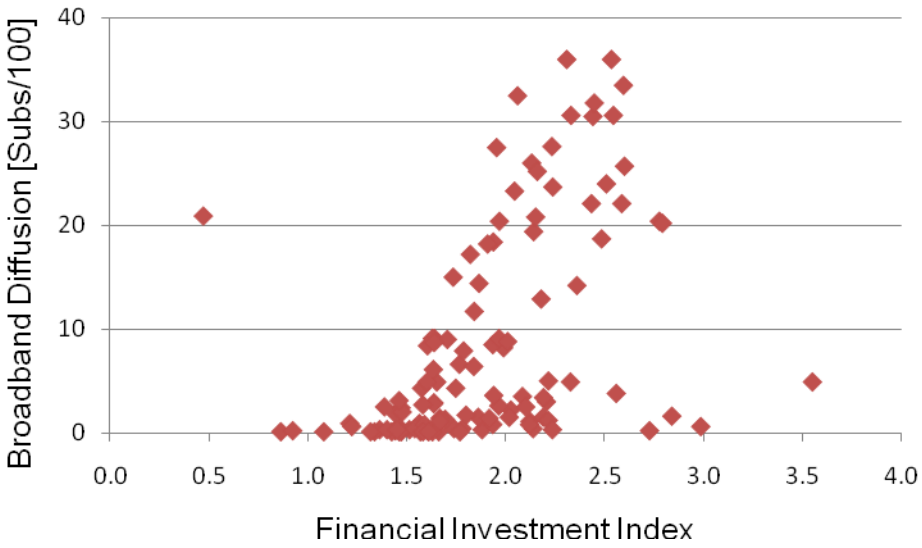

Figure 7. Impact of financial investment and economic activity on broadband diffusion.

4.3 Telecommunications Competition and Broadband Diffusion

Competition between broadband telecommunications service providers involves many of the stakeholders shown in Figure 5. This competition is one part of the competitive environment in the larger telecommunications sector. As with financial investment, government policies and regulations also influence this competitive environment, as does expenditure by governments, businesses and consumers. Because these stakeholders access broadband using technologies that have been deployed by service providers in different industries (e.g., telephone companies, cable television 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*.

Figure 8 shows the level of broadband diffusion versus the telecommunications competition index. For the 1/3 of countries that have the smallest competition index values, the average number of broadband subscriptions per 100 people is 5.61. For the middle 1/3, there are 3.40 subscriptions per 100 people on average. For the 1/3 of countries that have the largest competition index, there is an average of 13.0 subscriptions per 100 inhabitants (Subs/100). Although greater telecommunication competition index values indicate greater broadband diffusion, this impact is weak in the countries that have values in the small and medium regions of our index range. At least some of this is due to some outliers in the data shown in Figure 8. Consider, for example, the three points in the upper left quadrant of this figure that have a broadband diffusion in excess of 20 Subs/100. The country that has a score of zero (0.0) for the competition index is Taiwan. Taiwan has this competition index since the ITU does not report most data for Taiwan separately from data for China, however, broadband diffusion in Taiwan is reported as 20.9 Subs/100 (ITU, 2009b). From left to right the other two outliers are Belgium and Israel. These countries have telecommunications competition index values of approximately 0.60 and 0.77, respectively, yet both countries have achieved broadband penetration rates of greater than 22 Subs/100.

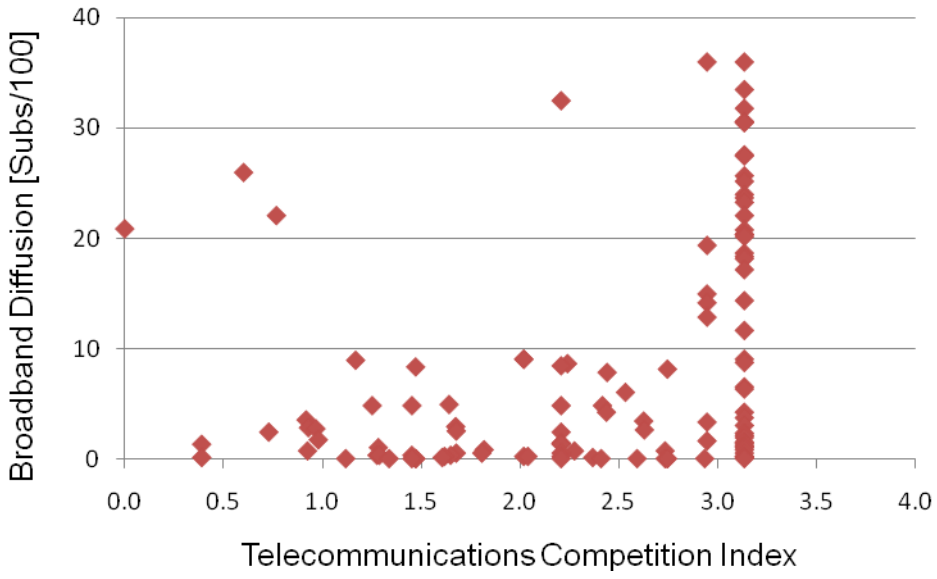

Figure 8. Impact of competition in telecommunications sector on broadband diffusion.

4.4 Telecommunications Competition and Broadband Affordability

We now turn our attention from broadband diffusion within a country to *broadband affordability*. We determined what affect the three variables we have examined thus far have on affordability, namely

regulatory independence, financial investment, and telecommunications competition. Of these three variables, telecommunications competition has the greatest impact on broadband affordability.

Figure 9 shows the cost of broadband versus the telecommunications competition index. In this figure the *x*-axis has a linear scale whereas the *y*-axis has a log scale. A linear *y*-axis would distort the vertical dimension of this figure since in many countries broadband Internet service is only affordable to the wealthiest citizens. For example, the four countries that have broadband cost such that the natural log of the average monthly subscription divided by the average gross national income per person is greater than 8 are Ethiopia, The Central African Republic, Malawi and Burkina (shown from left to right). In the same order, these countries have competition indeces of 0.56, 0.77, 1.08, and 2.73, yet all have ln(BSbV) values that are greater than 8. According to the ITU (2009b), the country with the most affordable broadband is the United States. The U.S. has a competition index score of 3.13 and a broadband sub-basket value such that ln(BSbV) = -0.9. The reason that broadband affordability ranks so well in the United States is due partly to how the ITU defines and measures broadband. A significant fraction broadband technology being deployed in the United States today has higher bandwidth than the 256 kbps definition for broadband speed that is used by the ITU. This means that telephone and cable companies are unable to demand a premium price for this (lower) class of service and hence such DSL or cable service is more affordable.

The recent deployment of more advanced broadband technology in the United States provides evidence to support the critics of how competition was managed (or mismanaged) in the US immediately after the 1996 telecommunications reform in this country (Crandall, 2005). However, many of the problems with how competition was regulated during this era have been corrected by more thoughtful policy and regulation, providing a healthier competitive environment in the US beginning in 2003. Now, more than five years later, consumers in the United States (i.e., the individual stakeholders in Figure 5) have begun to see the benefits of competition among broadband service providers.

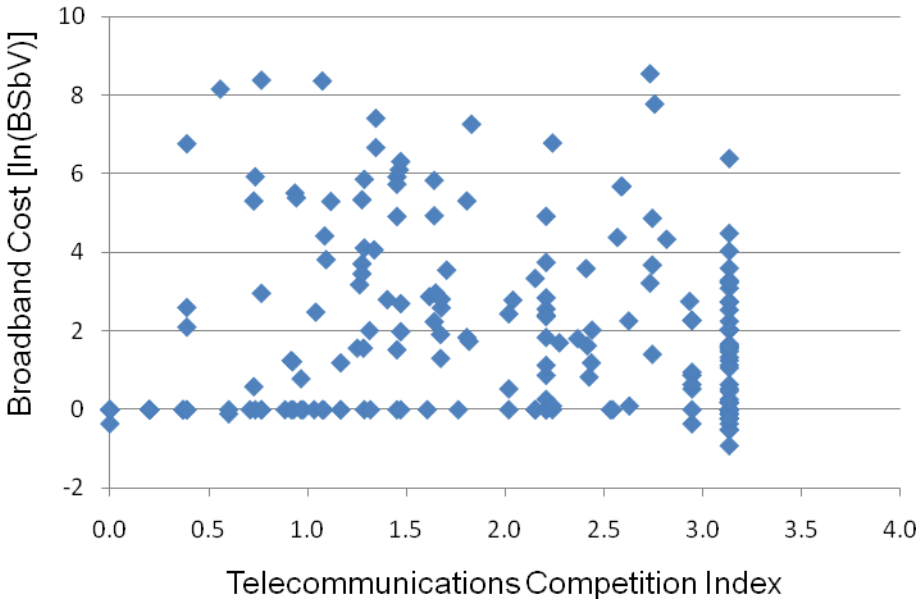

Figure 9. Impact of competition in telecommunications sector on broadband cost.

Prior research on the digital divide has suggested that affordability of information and communication technologies is mostly determined by a nation's wealth. While Figure 4 confirms this theory, the data in Figure 9 suggest that competition plays an important role as well. As economists would predict, a competitive environment in the telecommunications sector lowers the cost of products and services. However, high competition index scores (see Figure 9) do not directly follow from high GDP Index scores. In fact, the correlation coefficient of these two independent variables in our models is less than 0.4.

5. CONCLUSIONS

The ethic of the common good suggests that decision makers take into consideration the intent as well as the effect of their actions on the broader society and the common good of the many (Velasquez et al., 2009). In the case of stakeholders in this study, the common good translates into providing affordable broadband access to the Internet for all people wishing to participate in the global information society (G-8, 2000). Today, availability and affordability of broadband access to the Internet is far from universal. The lack of universal broadband defines a new digital divide, which is a global problem. To bridge the broadband digital divide in pursuit of the common good, a multi-stakeholder, cooperative and collaborative effort is required. This study identifies the primary stakeholders in this effort and determines what factors can facilitate achieving universal broadband. We show that addressing this global need requires bridging the perspectives of multiple stakeholders and applying their collective resources, power and will.

We developed a comprehensive framework, using stakeholder theory, which identified the global stakeholders as well as the roles and responsibilities that these stakeholders must assume to balance their self-interest with serving the common good. Our framework highlights relationships between key stakeholders, namely governments and their citizens, businesses in the information and communication technology (ICT) industries, and other organizations. We utilized our framework to develop metrics for determining the level of competition in a nation's telecommunications sector and the amount of financial investment made to advance technological development.

The results in this study show that some nations have been more successful in pursuing universal broadband for their people than others. We make four important observations that can guide stakeholders in bridging the broadband divide: (1) A national authority that regulates the activities of the stakeholders within a country's telecommunications sector has a positive impact on broadband adoption. (2) A shared financial investment in the physical infrastructure and human capital required to deploy and operate broadband networks also helps increase broadband diffusion. (3) An independent regulatory authority and shared financial investment are at least as important as telecommunications service provider competition in expanding broadband Internet access. And, (4) service provider competition has a greater impact on broadband affordability than it does on broadband diffusion.

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