CENTER FOR GLOBAL DEVELOPMENT **ESSAY**

Overselling Broadband: A Critique of the Recommendations of the Broadband Commission for Digital Development

Charles Kenny

December 2011

www.cgdev.org/content/publications/detail/1425798

ABSTRACT

The Broadband Commission for Digital Development is an ITU (UN International Telecommunications Union) and UNESCO–backed body set up to advocate for greater broadband access worldwide. The commission's Declaration of Broadband Inclusion for All and other reports call for governments to support ubiquitous fixed broadband access as a vital tool for economic growth and to reach the Millennium Development Goals. Examining the evidence, however, shows that the benefits of broadband are being oversold. Several points stand out: (i) the evidence for a large positive economic impact of broadband is limited; (ii) the impact of broadband rollout on achieving the MDGs would be marginal; (iii) there is little evidence ubiquitous broadband is needed for 'national competitiveness' or to benefit from opportunities like business process outsourcing; (iv) the costs of fixed universal broadband rollout dwarf available resources in developing countries; (and so) (v) the case for government subsidy of fixed broadband rollout is very weak. There are, however, some worthwhile policy reforms that could speed broadband rollout without demanding significant government expenditure.

The Center for Global Development is an independent, nonprofit policy research organization that is dedicated to reducing global poverty and inequality and to making globalization work for the poor. CGD is grateful for contributions from the UK Department for International Development and the Norwegian Ministry of Foreign Affairs in support of this work.

Overselling Broadband: A Critique of the Recommendations of the Broadband Commission for Digital Development

The Broadband Commission for Digital Development is an ITU (UN International Telecommunications Union) and UNESCO-backed body set up to advocate for greater broadband access worldwide. It is co-chaired by Mexican telecom magnate Carlos Slim and Rwandan President Paul Kagame. Members included chairmen and CEOs from business, heads of international agencies, regulators and policymakers, and thought leaders from Youssou N'Dour to Jeffrey Sachs and Muhammad Yunus.

At the time of the September UN Millennium Development Goal (MDG) Summit in 2010, the Commission issued their *Declaration of Broadband Inclusion for All* along with the report *A 2010 Leadership Imperative: Towards a Future Built on Broadband*. The Declaration called on World Leaders attending the MDG summit "to embrace a common leadership vision . . . broadband inclusion for all." And it called for "equitable and affordable universal access to broadband networks and broadband-enabled applications." The declaration noted the potential for considerable economic impact of such access: "international estimates suggest that for every 10 per cent increase in broadband penetration we can expect an average of 1.3 per cent additional growth in national gross domestic product." The attached report discussed how broadband is vital to reaching the various Millennium Development Goals, which cover areas such as poverty reduction, primary school completion, child and maternal health, gender equality in schooling, and infectious disease rollback. The report noted that broadband was "a potential solution in the ability to deliver education in developing and developed countries alike . . . key to achieving empowerment and gender equality . . . needed to enable doctors to share images and diagnose patients hundreds of miles away."

"In the 21st Century, broadband networks must be regarded as vital national infrastructure—similar to transport, energy, and water networks, but with an impact that is even more powerful and far reaching," suggested the report. In that regard, *A 2010 Leadership Imperative* cautions against relying on what it saw as inferior quality wireless broadband networks. "Developing countries cannot just 'make do' with mobile broadband as their access network of choice without running the risk of being condemned to a low-speed path in the future information economy," it suggested. Only fixed networks were good enough to ensure all of the immense social and economic benefits of broadband.

The report also called for government investment: “Public-private partnerships (PPPs) can help drive the deployment of broadband, particularly in rural and underserved areas.” In order to ensure broadband inclusion for all, especially in the poorest countries, the report suggested “proactive subsidies by government . . . where there is little or no possibility of attracting private investments.”

This essay examines the evidence behind the contentions of the Broadband Commission—that broadband is a force for rapid growth in developing countries, that it is a key tool to meet the Millennium Development Goals in areas such as health and education, and that governments would be wise (and could afford) to finance roll out universal access to fixed broadband as a more essential national infrastructure than transport, electricity, or water. It finds the evidence base weak or lacking for all of these contentions.

The essay begins with a discussion of the state of play in worldwide ICT and broadband rollout, before looking at the claims made by proponents regarding powerful broadband applications for development, as well as examining what we know about the actual demand and usage patterns for broadband in the developing world. The paper then looks at the macroeconomic evidence linking broadband with economic growth. It discusses the costs associated with universal (fixed) broadband rollout and makes conclusions about the appropriateness of government subsidies toward the aim of universal broadband access.

The State of Play on Broadband Access

Table 1 lays out some data on internet usage rates and related variables calculated from the World Bank *World Development Indicators* for 2001 and 2008. Using a global sample of 173 countries and economies, the table reports predicted levels of ICT penetration and other factors at a given income estimated from a regression analysis.[1] For example, the table suggests that, given the cross-country relationship between mobile subscribers and GDP per capita in 2008, a country with a PPP GDP per capita of about $1,000 (about the level of Nepal or Guinea) would be expected to have about 24 mobile cellular subscribers per 100 people. In some cases the regression model suggests predicted values that are less than zero at an income of $1,000, these cases are marked by “<0.”

[1] The predictions are based on a regression of the variable of interest against a constant and the natural log

Table 1	Year	Predicted Values at Given GDP/Capita				Average Values	
Income level		1,000	5,000	10,000	30,000	Poor	Rich
Secure Internet servers (per 1 million people)	2001	<0	21	38	64	5	66
	2008	<0	109	205	357	15	331
Fixed broadband subscribers (per 100 people)	2001	<0	0.6	1.0	1.7	0.0	1.8
	2008	<0	5.7	10.1	16.9	1.3	16.0
Internet users (per 100 people)	2001	<0	9	15	24	2	25
	2008	<0	24	36	54	12	50
Mobile cellular subscriptions (per 100 people)	2001	<0	21	32	51	6	53
	2008	24	71	91	124	52	115
Fixed line subscriptions (per 100 people)	2001	<0	19	28	42	8.6	41.8
	2008	<0	17	24	37	8.3	35.1
% of Firms Using Email	2009	49	69	77	91	59	81
% of Firms using Own Website	2009	16	39	49	66	27	55
Literacy rate, adult total (%)	2008	66	83	91	103	75	95
School enrollment, tertiary (% gross)	2008	6	32	43	61	20	60
Value Lost Due to Power Outages (% of Sales)	2009	6	4	3	1	6	2
ICT Exenditure ($/capita)	2008	59	290	576	1,714	206	1,429
GDP Density ('000/km)	2008	<0	8,518	17,690	32,229	417	26,926
Rural population (% of total population)	2008	68	48	39	25	57	28
(Average GDP/Capita)	2001					3,526	25,278
	2008					3,553	24,926

The table also reports on average values for each indicator for countries with a GDP per capita below $10,000 ('poor' countries) and above $10,000 ('rich' countries). The average income within each group remained similar between 2001 and 2008—for poor countries it was around $3,500 (equivalent to the income of Honduras) and for rich countries it was around $25,000 (equivalent to the income of South Korea). In 2008, the table suggests the average number of mobile subscribers per 100 people was 52 in poor countries and 115 in rich countries (i.e., there were more subscriptions than people in many rich countries in 2008).

Table 1 suggests how rapidly ICTs have spread across the world in the last few years, including in developing countries. A country with a GDP per capita of $5,000 in 2001 (around the income of Suriname or Albania) would have expected to see around 21 mobile subscribers in 2001. That climbed to 71 in 2008, or more than a threefold increase over seven years. The predicted number of internet users per 100 people for a country with an average income of $5,000 more than doubled over the 2001 to 2008 period, from 9 to 24. The number of fixed broadband subscribers increased almost tenfold to nearly six subscribers per 100 people and the number of secure servers more than fivefold to 109 per million people.

The table also suggests how widespread the use of the internet is for business. Around half of all firms even in the poorest of countries are using email to communicate with their clients, and about one-quarter of all firms in 'poor' countries have their own website. The data suggests that the 'business digital divide' is considerably smaller than the gap in overall usage rates across countries.

The table illustrates strong evidence of convergence in basic ICT usage—with growth rates in mobile subscriptions and internet users more rapid in poor countries than in rich (a six-fold increase in internet users in poor countries compared to a doubling in rich countries between 2001 and 2008, for example). The picture is less clear for secure internet servers and fixed broadband, where every income level appears to have seen about the same tenfold expansion in subscription rates over the seven year period. Having said that, the data suggest that a country with an income of $5,000 in 2008 should expect to see *considerably* more secure internet servers, fixed broadband subscribers, and mobile users than a country with an average income of $30,000 in 2001, and as many internet users as a country six times as rich only seven years before.

The table suggests that there remains a twelve-fold difference in fixed broadband access between poor and rich countries, but this is a very partial accounting. The ITU estimate for 2010 is 4.4 percent for low-income countries to 24.6 percent for high-income countries, suggesting the gap is closing. And looking at broadband including wireless, the picture is even more dramatic in terms of rollout. Between December 2004 and September 2009, the number of broadband subscribers worldwide increased more than fivefold to over one billion subscribers. Mobile broadband penetration is estimated by

the ITU at 51.5 percent in developed and 5.4 percent in developing countries in 2010. Forecasts suggest that global broadband subscription rates will reach 3 billion by 2013. Already, nearly half of all broadband subscribers reside in the developing world; by 2013, it will clearly be the considerable majority.[2] China is already the world's single largest broadband market.

The picture, then, is one of rapid broadband rollout worldwide. And while developing countries may be lagging on fixed broadband, they are still seeing impressive gains, especially in mobile access. This begs the question: where is all of this demand coming from? The next section looks at what broadband is actually used for around the world.

What do most people do with broadband?

There is little reliable survey data on what people in developing countries do with their broadband connections, but we might gain some idea of their likely usage patterns looking at wealthier countries. After all, television usage patterns, for example, are broadly similar across countries.

Jon Kolko's 2010 analysis of U.S. survey responses found that broadband users were more likely to say they were doing every type of online activity than narrowband users. In particular, broadband users were more than twice as likely than dial-up users to say they had downloaded music, gone to a social networking site, or visited an adult entertainment site, and they said they spent about twice as much money online. At the same time, the chance that they reported visiting a government website was only six percentage points higher than for narrowband users (at 26 compared to 20 percent), and the change in those who said they had ever researched a medical condition only increased 12 points (from 47 to 59 percent). Again, those who adopted broadband between 2004 and 2006 were significantly more likely to say they were downloading music, visiting adult entertainment sites, and purchasing goods online after adoption than before. They were also somewhat more likely to say they were using social networking and researching medical conditions. But they were no more likely to say they were visiting government websites.[3] Toyama reports that surveys from developing countries similarly suggest that the dominant use of the internet in telecentres "is by young men playing games, watching movies, or consuming adult content."[4]

[2] Kim et. al., 2010.
[3] Kolko, 2010.
[4] Toyama, 2010.

What *can* you do with broadband?

Even if most actual broadband usage appears to be for entertainment, *A 2010 Leadership Imperative* emphasizes the technology's role as a platform for "service delivery in health, education, business, trade and government." A more recent output by the Broadband Commission, *Broadband: A Platform for Progress,* mentions that the impact of broadband might be felt through mobile payments, health, education, smart grids, and energy efficiency. Such excitement has been shared by a number of other reports discussing the development impact of broadband including the McKinsey report *Mobile Broadband for the Masses*. In fact, there is little evidence that most such applications actually require broadband (and perhaps in particular universal fixed broadband access).

The McKinsey report cites as justification for predicting a broadband productivity impact linked evidence on data services —both phone use to optimize fish-catch landing sites and SMS monitoring for feeding centers. Of course, neither of these applications takes broadband to run, and the report is left to argue that the applications might be "even more powerful" if they used more bandwidth.[5] The Broadband Commission's own contention that mobile payments require broadband is contradicted by the incredibly rapid rollout of MPESA, Kenya's mobile-payments system run over narrowband that now has about 14 million users.[6] Similarly, the notion that smart grids require ubiquitous broadband faces the challenge that Italy's Telegestore project installed 30 million smart meters to enable peak shaving and energy efficiency, meters that used all of 2.4 kbps bandwidth each. Many of them ran over narrowband mobile networks.[7]

Again, there is little evidence that *ubiquitous* speed is necessary for firms to benefit from the real opportunities offered by trade in services via the internet. India has by far the largest share (35 percent) of the global business process offshoring market according to UNCTAD.[8] The IT and ICT-enabled services industry accounted for 16 percent of India's exports in 2008. India also ranks 114 in the world in terms of average connection speed according to Akami's global survey.[9] Surely some firms, and some outsourcing centers, require very fast, very broad, and very reliable internet access to operate. But that is very different from assuming universal access to such high-quality internet services is necessary to gain the economic benefits from connectivity.

Regarding education, the practical impact of broadband on performance is yet to be demonstrated. Rodrigo Belo and colleagues found that more use of broadband in

---

[5] McKinsey, 2009.
[6] Kiragu, 2011.
[7] Rogai, S., 2006 and Rogai, S., 2007.
[8] UNCTAD, 2010.
[9] Business Wire India, 2010.

particular in schools in Portugal was associated with lower test scores.[10] This may be related to the study finding that the five most popular activities for boys on the net were email, chat, MySpace and YouTube, music, and games. A study of the impact of broadband rollout to households in North Carolina 2000–2005 similarly found that student test scores dropped significantly.[11] This echoes earlier results with basic internet rollout. An examination of the e-rate subsidy program in California found that while the program had successfully incentivized schools to roll out the internet in classrooms, the increased connections had no impact on student achievement.[12]

Even were the evidence on educational impact more positive, one has to wonder about the potential cost effectiveness of broadband in developing countries in particular, where per-student equipment expenditures can be a dollar a year or less.[13] Toyama asks: "Does a hundred dollars for a computer make sense when $0.50 per year, per child for deworming pills could reduce the incidence of illness-causing parasites and increase school attendance by 25 percent?"[14] Furthermore, given the Millennium Development Goal for education involves primary completion and gender equality in access, it is worth examining if the largest barrier to enrolling and retaining students really is a lack of broadband-enabled computers in the classroom, as implied by *Broadband: A Platform for Progress.*

A similar concern regards the mismatch between (unproven) broadband potential in medicine and health realities in developing countries. *Broadband: A Platform for Progress* provides a figure to demonstrate "valuable health services" that can be delivered over broadband that are "highly relevant to achieving several of the Millennium Development Goals." According to the figure, those that require over 56 kbps include visual exams, home televisits, basic cardiology, neurology, emergency room consultations, echocardiograms, and cineo-angiography. Those that require over 1 Mbps include professional tele-education, gait analysis, advanced clinical decision-support systems, and interactive 3D brain imaging.

Compare this to the kind of conditions that are responsible for deaths of children less than five years old in developing countries (the fourth MDG is to reduce child mortality by two-thirds). According to the WHO, the most important causes of death in children younger than five were infectious diseases, especially pneumonia, diarrhea, and

---

[10] Belo, Ferreira and Telang, 2010. This result echoes findings regarding the integration of computers in schools in Colombia by Barrera-Osorio and Linden, 2009. See also Malamud and Eleches, 2010, on the impact of computer ownership at home in Romania which found kids spend most of their time playing games (3–4 hours a night) with unsurprising but significant negative impacts on language and math scores.

[11] Vigdor and Ladd, 2010.

[12] Goolsbee and Guryan, 2006.

[13] Grace and Kenny, 2003.

[14] Toyama, 2010.

malaria.[15] Two-fifths of deaths occurred in the neonatal period, during which the greatest single causes of death were preterm birth complications and birth asphyxia, followed by infectious disease. What is required to overcome most of these deaths is fairly simple—vaccination, antibiotics, the presence of trained medical staff at delivery, the use of sugar-salt solutions to counter the effects of diarrhea, and more widespread use of breastfeeding. The role for universal broadband applications in any of these interventions is decidedly secondary.

In McKinsey's *Mobile Broadband for the Masses* report, the team suggests that mobile broadband is required for applications such as online gaming, HD multimedia, and multichannel TV. As we have seen, this appears to fit with current usage patterns. At the same time, one might wonder about the prioritization of multichannel TV or video chat in the developing world where 1 billion people are still malnourished. And one might question an immediate impact on Millennium Development Goal indicators—for all that television can be an incredibly powerful source for social change.

What do we know about the economic impact from macro studies?

Given what we know about actual broadband use and the limited evidence of the kind of exciting new applications which would have a dramatic economic or social impact in developing country settings, perhaps it is unsurprising that the evidence in favor of a big economic payoff to broadband in developing countries is thin.

Of course the internet and the spread of ICTs more broadly have already had a significant development impact in developing countries. Ten African markets alone generate over $1 billion in mobile service revenues each year and the total for the continent is about $45 billion.[16] Looking at IT and business-process outsourcing, this was a $800 billion industry—and offshoring (outsourcing to another country) was close to a $100 billion business in 2009, much of it caught by the developing world. These statistics regarding the size of the ICT business reflect a broader development impact, with mounting evidence that use of mobile phones is connected with enterprise performance and incomes growth, for example.

But our experience with estimates of the impact of mobile telephone penetration on economic performance on the basis of cross-country analysis should nonetheless give us some pause, especially with regard to recent exercises involving broadband. In 2005, Leonard Waverman from the London Business School wrote a paper which suggested that, in developing countries, increasing mobile phone subscriptions by 10 per 100 people would increase growth rates by 0.6 percent.[17] Argentina now has more mobile

[15] Black et al., 2010.
[16] Zibi, 2009.
[17] Waverman et al., 2005

subscriptions than people—117 per 100 citizens. This is up from about one percent in 1995. Were we to believe the Waverman results, Argentina should be growing seven percent faster every year than what it managed before 1995, just thanks to mobile phones. To put that in context, Argentina's average growth over the last 20 years has averaged about 2.4 percent.[18] One more plausible interpretation of these results is that the approach the authors used to handle reverse causality problem (that richer countries will have more mobile phone subscriptions) failed. In fact, with broadband and growth studies to date, there is *significant* evidence of the same problem at work, and very little convincing evidence of a link from broadband to growth.

Using cross-country analysis, Qiang and colleagues estimate that a 10 percent increase in broadband penetration is associated with a 1.38 percentage point increase in per capita GDP growth. This is the "international evidence" presented in the Broadband Commission's report. The analysis is based on growth rates from 1980-2006 and average broadband penetration in the period 1980-2006. Given the late deployment of broadband –concentrated well after the turn of the millennium-- average penetration between 1980 and 2006 will in fact reflect broadband penetration around 2004 or 2005. The more plausible interpretation of Qiang et al.'s results under the circumstances is that countries which grew faster 1980-2006 could afford more rapid rollout of broadband in 2004.[19]

Broadband: A Platform for Progress suggests the international evidence stretches far beyond the Qiang et. al. study, however. It compiles a list of 100 reports "on the economic effects of providing broadband access to the internet, alongside ICT use in general." At the same time, the quality and relevance of those studies to the economic case for broadband in developing countries is questionable. The report highlights nine of these studies in the first table in the executive summary, titled "Broadband's Impact on Economic Growth." Of these studies, one from the World Bank does not discuss a growth impact, two from the Center for Economics and Business Research and Kuyushu University are based on historical evidence regarding the contribution of ICT in general, providing no evidence of the actual impact of broadband, and three do not provide new evidence, merely reusing the coefficients from the Qiang and colleagues study discussed earlier.[20] Of the remaining three, two studies from Columbia Business School and Telecom Advisory Services find an impact based on coefficients from one questionable

[18] World Bank World dataBank, 2011.

[19] Qiang et al., 2009. In fact, across the world as a whole, there is a weak *negative* relationship between fixed broadband rollout in 2001 and GDP growth 2001–2006, a result that holds using 2003 rollout and 2003–2008 growth. Data from World Bank ICT database, 129 countries in 2001 sample, 134 countries in 2003 sample.

[20] World Bank, 2008; Greenwood et al., 2003, and Jitsuzumi, 2009; Zhao and Ruan, 2009, Smith, 2010, and Kelly et al., 2009.

regression subject to no robustness tests,[21] and the final study from LeCG Ltd, which does at least run some robustness tests, finds its results are not robust—indeed it suggests broadband is associated with a negative growth impact in poor countries.[22]

Many of the more careful studies on broadband impact to date involve the United States. In 2006, broadband accounted for about $28 billion in internet service provider revenue in the country. Between $20 and $22 billion of those revenues came from household use, of which $8–11 billion was revenues that service providers only received because they had added broadband provision.[23] Greenstein and McDevitt estimate an additional consumer surplus for household broadband use of $5–7 billion. It is worth noting that the consumer surplus and additional revenues together equal a little over 0.1 percent of U.S. GDP, at a time when nearly half of U.S. households had broadband.[24]

Crandall and colleagues use U.S. state-level data to examine the relationship between broadband subscriptions per capita, employment and output between 2003 and 2005. They found an association between subscriptions and employment that was not robust and no relationship at all with output.[25] Particularly relevant to discussions of broadband subsidy programs, Kandilov and Renkow measure the impact of a U.S. government loan program which provided subsidized capital to telecoms companies to rollout broadband in rural areas. They can find no evidence that the program had an impact on employment, payroll, or business establishment. [26]

It should be noted that few if any results in the broader literature regarding causes of economic growth are robust, either. If the evidence suggests anything it is that causal factors behind growth vary considerably by time and location. In that spirit, the lack of robust evidence for a large economic payoff from broadband should not be taken to imply that investments in fiber access rollout could *never* have a significant economic return, merely that they often (usually?) don't. In turn, that suggests a blanket exhortation to prioritize investment in broadband networks because of a sure-fire economic impact is going to be wrong much, if not most, of the time.

---

[21] Katz et al., 2010, Katz et al., 2009. The regression run in both is similar. For Katz (2010) the dependent variable is GDP growth 2003–6, the independent variables are broadband penetration growth 2002–3 (why this one year period? Why growth not levels?), population growth 2000–6 (why this period?), GDP per capita in 2000 (why not 2003?).

[22] LeCG Ltd, 2009.

[23] Greenstein and McDevitt, 2009.

[24] Total households from http://www.census.gov/population/www/socdemo/hh-fam/cps2006.html.

[25] Crandall, Lehr, and Litan, 2007. See also Kolko, 2010.

[26] Kandilov and Renkow, 2010.

Is there evidence that broadband is needed for 'national competitiveness'?

There is a considerable sense of urgency in the Broadband Report. "In this brave new world of 'digital opportunity,'" it suggests, "we believe the burning issue is what price will be paid by those who fail to make the global, regional, national and local choices for broadband inclusion for all—choices which must be made sooner rather than later."

That countries further behind will be unable to catch up or reap any future benefits of ubiquitous broadband is unsupported by any analysis in the report. It is a little hard to imagine why countries that invest less in broadband today will become unable to invest tomorrow—there is no shortage of companies willing to sell fiber optic cables.

And at least with regard to business, enterprise surveys carried out in developing countries suggest that concerns about telecommunications rank far down on entrepreneurs' own analyses of barriers to their firms' growth. It ranks last out of a list of 14 constraints including factors such as policy uncertainty, corruption, electricity, transportation, and access to land. The average worldwide for the 45 countries for which data existed in 2005 was that only 9.8 percent of companies rated communications as a major or very severe constraint to doing business compared to around 40 percent for the top-ranked concerns of policy uncertainty, macro instability, the tax rate, and corruption, and more than 20 percent for electricity. And the number of enterprises that ranked telecommunications as a barrier dropped to around five percent where there was any private participation in the fixed-line provider in a country (World Bank 2005).

If you ask enterprises, then, it appears that broadband access would likely rank lower on their list of infrastructure concerns than a decent electricity supply. If we must have a sense of urgency over improved infrastructure provision, then, we should panic over power. One has to wonder why one would chose to intervene instead in what is already perhaps the most rapid rollout of a technology in history, when the evidence of a considerable economic impact is missing and enterprises themselves suggest other barriers to growth are more significant.

The primacy of electricity access is perhaps particularly clear compared to fixed broadband access for a second reason: the utility of a broadband connection is going to be considerably lower in the businesses and households that don't have electricity to power computers. That would include about 90 percent of the rural population of sub-Saharan Africa, for example. (Another potentially large barrier to national competitiveness that is also likely to reduce the potential impact of universal broadband access is the high level of functional illiteracy in developing countries.)

The cost of rollout

To some extent the argument pro or con broadband is moot if we include mobile broadband. As noted, this is rolling out incredibly rapidly across countries and it can build on the same infrastructure used to provide 'narrowband mobile' services, although involving the more extensive use of fiber at the back end. As even the cheaper phone models are including increasing internet accessibility, wireless broadband is likely to predominate in developing countries purely on the grounds that there are 4 billion people with mobile subscriptions compared to 1.2 billion fixed-line subscribers. But the Broadband Report strongly asserts that this is not good enough; as we have seen, it suggests the need for fixed access.

Providing broadband over copper where it is in place is not a particularly expensive development. A Digital Subscriber Line (DSL) modem cost $100, and the per-port cost of exchange equipment was $50.[27] Upgrading copper to fiber for superfast broadband is considerably more expensive: Verizon has costed fiber-to-the-home (FTTH) in the region of $2,750 per home connected.[28] But the bigger issue is the limited extent of the copper network in most developing countries.

Table 1 shows the global stagnation in the reach of the fixed-line telecoms network. The number of fixed-line subscribers per capita is actually falling over time in countries rich and poor alike. But poor countries started this decline from a lower base, and now have about eight lines per 100 people compared to 35 in rich countries. Alongside far more limited cable TV networks in many developing countries, this suggests a comparatively limited opportunity to use existing fixed networks to provide broadband services.

The only option is the creation of a new and massively expanded fixed network (which would logically be based on fiber, not copper), something akin to the National Broadband Network in Australia. This is being rolled out at a cost of around $38 billion or $1,727 per person. This per-person expenditure is about 50 percent of GDP per capita for the average developing country, which appears a rather implausible investment to undertake.[29] Table 1 suggests that a country with an average GDP per capita of $1,000 can expect to see yearly expenditures on ICTs of around $59 per head. Compare that to $1,714 per head in countries with an income of $30,000 per capita.[30]

---

[27] Kenny and Kenny, 2011.

[28] From Kenny and Kenny, 2011, based on Verizon's projected 2010 costs per home passed and per home connected, and assuming 33 percent penetration. See http://policyblog.verizon.com/BlogPost/527/WhyweareBullishonFiOS.aspx.

[29] Networks in developing countries will face lower cost of civil works, but higher costs of capital and potentially higher network costs due to larger (low density) rural populations.

[30] At the same time, and despite potentially lower civil works costs, the cost of service provision is likely to be considerably higher. Table 1 suggests that the majority of people live in rural areas in poorer countries

In short, if universal access to broadband is vital to growth and the achievement of the MDGs, developing countries had better hope that mobile broadband is good enough. The costs for universal fixed access are far too high for poor countries to afford.

Policy Conclusions

The remarkably rapid evolution of the 'digital divide debate' from telephones towards broadband internet has been forced by the remarkably rapid rollout of ICTs worldwide, which is almost entirely due to private competitive investment. For those looking for a reason for the government to subsidize something, pretty much the only option at this point is to move on to funding broadband access programs. However, the evidence is not yet there that this is a good use of taxpayer (or donor) resources.

This is not to say that nothing can or should be done by policymakers to speed broadband rollout in the developing world. McKinsey estimates that a combination of adding to available spectrum for mobile broadband, encouraging infrastructure- and spectrum-sharing, reducing coverage obligation, reducing competition, and eliminating spectrum fees could reduce wireless broadband costs by as much as 75 percent. If one is less sanguine about the impact of reduced competition and prefer to see spectrum rights auctioned rather than given away, the impact of the remaining measures could still surpass a 50 percent cost reduction.[31] This suggests there are powerful tools that governments could use prior to diverting scarce revenues towards broadband subsidies.

But more importantly, in the developing world, the more exciting ICT applications have involved doing more with less by, for example, using the basic mobile platform for texts, mobile banking and mHealth. Far cheaper than digging up a country's streets to lay fiber is investment in new compression- and spectrum- sharing technologies, applications that enable ever better m-commerce and m-banking, and so on. If governments want to maximize the benefits of ICT they should focus on using the existing stock of communications infrastructure, not building more in hopes that applications might come.

And for donors, the Broadband Commission's conclusions are based on weak evidence of impact, especially on the subject of broadband's role in meeting the MDGs. This suggests that governments in rich countries should take extreme care in following the report's recommendations to set aid funding priorities.

---

while most are urban dwellers in rich countries. From the point of view of service providers, the important variable is potential income from ICTs in a given area to be serviced. This is considerably lower in poor countries than rich, both because of somewhat lower population densities and considerably lower incomes.

[31] McKinsey, 2009.

Bibliography

Barrera-Osorio, F. & Linden, L., (2009). "The use and misuse of computers in education: evidence from a randomized experiment in Colombia," Policy Research Working Paper Series 4836, The World Bank.

BBC (2010) *iPlayer Monthly Performance Pack*, June 2010 http://www.bbc.co.uk/blogs/bbcinternet/img/Publicity_Pack_June_2010.pdf.

Belo, R., Ferreira, P., and Telang, R. (2010) The Effects of Broadband in Schools: Evidence from Portugal, mimeo, Carnegie Mellon University.

Black, R., Cousens, S., Johnson, H. Lawn, J. Rudan, I., Bassani, D., Jha, P., Campbell, H., Fisher Walker, C., Cibulskis, R., Eisele, T., Liu, L., Mathers, C. (2010). Global, Regional, and National Causes of Child Mortality in 2008: A Systematic Analysis. *The Lancet*, May 12, 2010.

Booz & Co. (2009) Digital Highways: The Role of Government in 21st-Century Infrastructure, mimeo, Booz & Co.

Business Wire India (2010). "Akamai Announces Fourth Quarter 2009 State of the Internet Report." Business Wire India Press Release, 23 April 2010. http://www.businesswireindia.com/PressRelease.asp?b2mid=22347. Last accessed 3 November 2011.

Crandall, R., Lehr, W. and Litan, R. (2007) The Effects of Broadband Deployment on Output and Employment: A Cross-Sectional Analysis of US Data, Brookings Issues in Economic Policy No. 6.

Czernich, N., Falck, O., Kretschmer, T. and Woessmann, L., (2009) Broadband Infrastructure and Economic Growth CESifo Working Paper 2861.

Dahl, C., Kongsted, H. and Sorensen, A. (2010) ICT and Productivity Growth in the 1990s: Panel Data Evidence on Europe, CREATES Research Paper 2010-47, Aarhus University.

Enck, J. and Reynolds, T. (2009) *Network Developments In Support Of Innovation and User Needs,* OECD October 2009 http://www.broadbandcommission.org/resources/network_development.pdf.

Ford, G. and Koutsky, T. (2005) Broadband and Economic Development: A municipal Case Study from Florida, mimeo, Applied Economic Studies.

Goolsbee, A. and Klenow, P. (2006) Valuing Consumer Goods by the time Spent Using Them: An Application to the Internet *American Economic Review* 96, May, 108–113.

Goolsbee, A. and Guryan, J. (2006) The Impact of Internet Subsidies in Public Schools *The Review of Economics and Statistics*, 88(2) 336–347.

Grace, J. and Kenny, C. (2003). A Short Review of Information and Communication Technologies and Basic Education in LDCs – What is Useful, What is Sustainable? *International Journal of Educational Development*, 23, 627–636.

Greenstein, S. and McDevitt, R. (2009) The Broadband Bonus: Accounting for Broadband Internet's Impact on US GDP, Presented at the AEA Annual Meetings, San Francisco, January.

Greenwood, R., Kullar, S., McWilliams, D., Pragnell, M., Walley, D. (2003). The Economic Impact of a Competitive Market for Broadband. CERB and The Broadband industry Group, November 2003.

GSMA (2009) Digital Dividend for Mobile: Bringing Broadband to All, mimeo, GSMA Association.

Hanushek and Woessmann (2010) The Economics of International Differences in Educational Achievement, IZA Working Paper 4925.

Hillestad, R. et al. (2005) Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs, *Health Affairs*, 24, 5 http://www.eecs.harvard.edu/cs199r/readings/RAND_benefits.pdf.

Hitt, L. and Tambe, P. (2007) Broadband Adoption and Content Consumption *Information Economics and Policy* 19, 362–378.

Jitsuzumi, Toshiya (2009). Investment in Broadband Infrastructure: Impacts on Economic Development and Network Neutrality. NTC International Conference, Bangkok, 3 June 2009.

Kandilov, I. and Renkow, M. (2010) Infrastructure Investment and Rural Economic Development: An Evaluation of USDA's Broadband Loan Program *Growth and Change* 41, 2.

Katz, R. and S. Suter (2009) Estimating the Economic Impact of the Broadband Stimulus Plan, mimeo, Columbia University.

Katz, R. Flores-Roux, E., Mariscal, J. (2009). The Impact of Taxation on the Development of the Mobile Broadband Sector. Telecom Advisory Services LLC.

Katz, R., Vaterlaus, S., Suter, S. (2010). The Impact of Broadband on Jobs and the German Economy. Columbia Business School, Telecom Advisory Services LLC, and Polynomics AG.

Kelly, T., Mulas, V., Raja, S. Zhen-Wei, C., Williams, M. (2009). What Role Should Governments Play in Broadband Development? Paper prepared for infoDev/OECD Workshop on "Policy Coherence in ICT for Development," Paris, 10–11 September 2009.

Kenny, R. and Kenny, C. (2011). Superfast Broadband: Is it Really Worth a Subsidy? *Info*, 13 (4) 3–29.

Kim, Y., Kelly, T. and Raja, S. (2010) Building Broadband: Strategies and Policies for the Developing World, Washington DC: World Bank.

Kiragu, P. (2011) Kenya: M-Pesa Moved Sh727 Billion Last Year – CBK. All Africa Global Media. http://allafrica.com/stories/201107050157.html. Last accessed 3 November 2011.

Klonner, S., and Nolen, P. (2010) Cell Phones and Rural Labor Markets: Evidence from South Africa, mimeo, Goethe University.

Koch et al, (2006) How Much the Eye Tells the Brain*, Current Biology* 16, July 25 2006 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1564115/pdf/nihms-11418.pdf.

Kolko, J. (2010) Does Broadband Boost Local Economic Development? Mimeo, Public Policy Institute of California.

Kolko, J. (2010) How Broadband Changes Online and Offline Behaviors, Information *Economics and Policy* 22: 144–152.

LECG Ltd. (2009). Economic Impact of Broadband: An Empirical Study. LECG Ltd. 22 February 2009.

Leida, B. (1998) Cost Model of Internet Service Providers: Implications for Internet Telephony And Yield Management, mimeo, MIT 1998 http://www.tik.ee.ethz.ch/~m3i/related-work/cm/Cost-Model-ISP-Leida-full.pdf.

Malamud, O. and Pop-Eleches, C. (2010). Home Computer Use and the Development of Human Capital. NBER Working Paper 15814.

McKinsey & Co. (2009) Mobile Broadband for the Masses: Regulatory Levers to Make it Happen, mimeo, McKinsey and Co.

NERP (2009) *ICT Provision & Use in 2009/1*0, September 2009 http://www.nerp.org.uk/pdf/ICT2009_NERP.pdf.

Ovum (2009) *Fibre: The Socio-Economic Benefits*, London: Ovum.

Pew Internet (2010) *Home Broadband 2010,* http://www.pewinternet.org/~/media//Files/Reports/2010/Home%20broadband%202010.pdf.

Qiang et al. (2009) Economic Impacts of Broadband in World Bank *Information and Communications for Development: Extending Reach and Increasing Impact.* Washington DC: World Bank.

Rappoport, P. et al. (2002) Residential Demand for Access to the Internet in Madden, G. (ed) *The International Hand book of Telecommunications Economics: Volume II*, Edward Elgar: Cheltenham.

Rodríguez, F. (2006) Cleaning Up the Kitchen Sink: Growth Empirics When the World Is Not Simple, Wesleyan Economics Working Papers 2006-004, Wesleyan University, Department of Economics, revised 17 May 2007.

Rogai, S. (2006) "ENEL Telegestore Project", Presentation to Steering Committee of the Energy Efficiency 21 Project Ad Hoc Group of Experts, Energy Efficiency Investments for Climate Change Mitigation, 31 May, Geneva, Switzerland.

Rogai, S. (2007) "Telegestore Project : Progress & Results", Presentation to IEEE ISPLC, 26 March, Pisa, Italy. Cited in Kenny and Kenny, 2011.

Rosston, G, Savage, S. and Waldman, D. (2010) Household Demand for Broadband Internet Service, mimeo, FCC.

Smith, C. (2010). Meaningful Broadband Report 2.0: Broadband Thailand 2015. Center for Ethics of Science and Technology, Chulalongkorn University.

Stiroh, K. (2008) Information Technology and Productivity: Old Answers and New Questions *CESifo Economic Studies* 2008 54(3):358–385.

Tayoma, K. (2010) Can Technology End Poverty? *Boston Review* November/December.

UNCTAD (2010) Information Economy Report 2010 UN: Geneva.

Vigdor, J. L. and Ladd, H. (2010). Scaling the Digital Divide: Home Computer Technology and Student Achievement. NBER Working Paper 16078.

Wade V., Izzo J. & Hamlyn J., (2008) *Videophone Delivery of Medication Management in Community Nursing*, Health Informatics Society of Australia Ltd, 2008.

Waverman, L., Meschi, M. and Fuss, M. (2005) The Impact of Telecoms on Economic Growth in Developing Countries, mimeo, London Business School.

World Bank (2005) Financing Information and Communication Infrastructure Needs in the Developing World Public and Private Roles World Bank Working Paper No. 65.

World Bank (2008). Broadband as a Platform for Economic, Social and Cultural Development: Lessons from Asia. Joint OECD-World Bank Conference on 'Innovation and Sustainable Growth in a Globalized World', OECD Paris, 18-19 November 2008.

World Bank (2011) World dataBank. http://databank.worldbank.org/ddp/home.do.

Zhao, J. and Ruan, L. (2010). Broadband in China: Accelerate Development to Serve the Public. *Value Partners*, Perspective 2010.

Zibi, G. (2009). The African Mobile Phone Market: Beyond the Boom Phase, Between the Promise and Uncertainty of Maturity. Private Sector and Development, 4, November 2009.