2012

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Recommended Citation
Meah, Mohammed, "THE IMPACT OF INTERNET ON ECONOMIC GROWTH IN BANGLADESH" (2012). CUNY Academic Works.
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THE IMPACT OF INTERNET ON ECONOMIC GROWTH IN BANGLADESH

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SPRING 2012
MAY 13, 2012
Abstract

The purpose of this paper is two fold. The first goal is to reveal that an increase in the number of Internet users has a positive effect on economic growth within a nation. Based on this causality, the next objective is to demonstrate that less developed countries, specifically Bangladesh is in the best position to increase investment in the Internet to experience economic growth. Finally, the implications of Internet penetration on various economic sectors in Bangladesh are discussed. Panel data for 244 countries from the World Bank from 1990-2011 is used to carry out the experiment for the first goal.

The paper is broken down as follows. The first section introduces three studies that have attempted to quantify Internet’s impact. The neoclassical and endogenous growth models are introduced as well as the method and model used in this paper. Furthermore, an econometric discussion is provided as well as a discussion of the results. Finally, we discuss the implications of the Internet on Bangladesh and policies that they have enacted to utilize the Internet in key sectors.

1) INTRODUCTION

There is little econometric literature analyzing the impact of the number of Internet users on economic growth. Two studies have increased interest in researching its significance. The Organization of Economic Cooperation and Development met with leaders of member nations to discuss the contribution of Internet to innovation. The agenda items consisted of broadband access, role of broadband in innovation, economic growth and social development, balancing policy goals to strengthen growth, and policy-
making principles for an open Internet. The second study was conducted by the McKinsey Institute, in which they evaluated the importance of the Internet to growth levels in a set of countries. Their first goal was to show that the impact of Internet on GDP can be quantified. Next, they consider tools governments and businesses can utilize to take advantage of the web as a resource.

A) OECD

First, I will discuss the agenda at the OECD, followed by key takeaways from the discussion. Broadband access was the first agenda item where they discussed past experiences on their initiatives in providing access as well as obstacles they faced. Focus was on setting up national plans to develop and expand access. The next agenda item was the role of broadband in innovation, economic growth and social development, where the focus was discussion on broadband’s part in innovation. Broadband’s effectiveness depends on competitive prices and ease through widespread availability. During this item, there was also discussion around the proper measures that could be used to assess impact on innovation, productivity, and growth.

The third topic was “balancing policy goals to strengthen growth” where discussion concentrated on the openness of the Internet. Balancing openness and security becomes a double-edged sword, as both are essential to the success of the Internet. Too much openness leads to concerns over privacy and fraud. Society depends on the use of the Internet and cyber security is increasingly becoming a priority in national interests.

Dialogue around the openness of Internet was a useful segway into the fourth topic, policy-making principles for an open Internet. Takeaways from these talks centered on ideas to allow small and medium sized businesses to be more competitive in their
industries. The Internet could be used as a resource to reduce barriers of entry and cloud computing further enhances businesses processes. Governments can also take advantage of initiatives to improve the functionalities of their services and provide insight to constituents into their responsibilities. Finally, the sessions concluded with a roundtable, which served as a forum to discuss the value of Internet and steps that government institutions and lawmakers can utilize to advance their ideas. It is important to draw comparisons across countries, which is why common metrics should be established. Open Internet has to be promoted and international cooperation is important for it to thrive.

The future of the Internet was thoroughly explored during an OECD workshop in Paris on March 2006. Representatives from policymaking, experts in research, private sectors, and academia were present to express their opinions and exchange ideas. They initiated talks by discussing the present conditions, followed by a discussion of a cooperative international effort. The first issue explored was whether the Internet is reliable enough to be the sole driver of economic and social issues in world’s societies and economies. The panelists believe Internet supports other critical infrastructure in areas such as transportation, telecommunications, forecasting, banking, finance, and other government services.

B) McKinsey

The United States is another country that embraced the power of the Internet economy and experienced tremendous growth. Professor John Quelch of Harvard Business School emphasizes the potential of the Internet’s multiplier effect on the economy. It is used for online banking, news, weather, product websites, price comparisons, etc. He states, “the internet employs 1.2 million people directly to conduct
advertising and commerce, build and maintain the infrastructure, and facilitate its use. Each Internet job supports approximately 1.54 additional jobs elsewhere in the economy” (Quelch, 2009). It also produces $20 billion in advertising, $85 billion in retail transactions, and $70 billion to Internet service providers in the United States. Quelch also attributes the success of small businesses to the Internet when he says; “the Internet helps the economy by fostering innovation, entrepreneurship, and productivity, particularly among small businesses that create most jobs in the US.” The effects in the United States are far-reaching, and if policies are enacted properly, Bangladesh can also take advantage of the Internet economy.

It is a main contributor to GDP growth in a number of countries already. The graph below from the McKinsey Institute reveals that Internet contribution to GDP growth has increased in many mature countries such as Sweden, Germany, and United Kingdom. Countries are becoming more globalized already and have come to depend on each other. The “global net” will only make that interconnectedness stronger. As they become tied to each other, new ideas will be exchanged in real time. This has become the norm in most developed countries, and the less developed countries can follow suit. Rapid exchange of thoughts paves the way for innovation and productivity. The Internet contribution to GDP is similar to the impact to GDP from the Industrial Revolution. The United States overtook the United Kingdom because it was able to adopt innovations quicker. If Bangladesh is able to quickly adopt similar innovations when it comes to the Information Revolution, the Internet can become a significant contributor to its GDP.
Internet allows small businesses to become more competitive in the market and increases their potential for trade. Firms are able to integrate foreign companies into their supply chain and bring down production costs. Even the financial industry stands to benefit, as there is great potential for online stock transactions (Mandel & Kunii, 1999). Consequently, a number of online brokerages have emerged. For example, Japan has recently adopted E*Trade Japan and Morningstar Japan for stock quotations (Mandell & Kunii, 1999). Their goal is to build on the United States financial services online infrastructure and capitalize on the second mover advantage.

The McKinsey Global Institute’s economics research arm publishes reports to aid leaders in the commercial, public, and social sectors in understanding the global economy so that leaders can make proper management decisions. As part of this effort, they published a report called, “Internet Matters” in time for the G8 debates in Paris in May 2011. Their goal was to provide statistics, data, and evidence, which support the success
of the Internet in the global economy. They attack this argument with three different approaches, the macroeconomic view, the statistical econometric approach, and the microeconomic approach.

1) Three Approaches of Internet to Economic Growth

In the macroeconomic approach, the Internet economy is dissected into service, access, e-commerce, private investment, public expenditure, and trade balance of net related goods. The McKinsey Global Institute then calculates the percentage contribution of Internet to GDP for 13 different countries. Private consumption is the total consumption of goods and services by consumers through the Internet. This consumption takes place through e-commerce or broadband subscriptions by the population. Private investment in internet-related technology such as telecommunications and website design is 29% of Internet’s total contribution to GDP. Public expenditure includes Internet spending for consumption and investment by the government. Trade balance is the export and import of Internet related goods and services such as business-to-business commerce and Internet equipment. According to the Institute’s statistics, Internet contributes 3.5% of total GDP in 2009 in the United Kingdom, which is a greater weight than both agriculture and utilities.
The statistical econometric approach observes the relationship between Internet maturity and a country’s GDP per capita growth through endogenous economic growth theory. This approach is similar to the one undertaken by this paper. Their dependent variable was per capita GDP growth by country by year. The independent variable that was tested was the e3 index. The e3 index is a combination of “e-engagement, e-environment, and e-xpenditure.” The e3 index is made up of data retrieved from the World Economic forum and OECD. The index is an indicator of Internet maturity within a country through its access to infrastructure and usage. Other independent variables were included in the model as controls to account for other factors that contribute to economic growth.

Modeled after the Cobb Douglas Production function, the authors used growth of fixed capital per capita (in 2005 US dollars) and growth of labor per capita from the World Bank database. Their model had an R square of 89 percent, which signifies that the combination of variables is a good predictor of the dependent variable. The e3 index
was statistically significant with a t-statistic of 2.3. Therefore, they establish that Internet maturity within a country increases GDP growth. However, this is enough to say that there is a correlation but that does not necessarily indicate that it is causation. There are other factors that can account for the increase in economic growth that is not explained by this model.

The microeconomic approach analyzed the survey results from 4,800 small and medium sized businesses from 12 countries. They reported that 75% of traditional companies that would have existed even without the inclusion of the Internet have captured Internet profitability. Companies that exist exclusively because they are an online company capture the remaining 25% of Internet profitability. The report also shows that the Internet created 1.2 million jobs and destroyed 500,000 jobs, which is a net of 700,000 new jobs. The argument is that the Internet makes companies more efficient and lowers costs while allowing for the same revenue. This increases profit and the increased capital allows corporations to invest in improving their infrastructure and expanding their business. This in turn creates new roles and functions as the company attempts to branch out.
2) CEOs, Business Leaders, Government Officials

For Internet to be a big contributor to GDP, key policy makers have to embrace its potential. Public spending should drive both the usage and ecosystem of Internet. It is a good medium to attract people and businesses to go online. Increased public expenditure also motivates private corporations to invest more as it legitimizes the industry. Countries such as Sweden and the United States have been big proponents of e-government, which increases their standing in the McKinsey Internet Supply Leadership Index.

A policy that was outlined to increase public involvement are government-sponsored training sessions. Individuals and businesspeople are able to learn of the advantages offered by usage, which consequently gives them the incentive they need to expand and improve infrastructure. In light of this, Sweden enacted a policy to train 75,000 elementary and secondary teachers. They also provided subsidies to stimulate broadband expansion. Government services were moved online and South Korea followed suit in their program called Internet Education. Online homework was their way of boosting Internet usage among young people especially.
The purpose of this report is to reach out to G8 countries and its leaders to embrace new technology to bring the global economy out from the deep recession that followed the financial crisis. Enabling technology can open the door for new growth sectors and create high skilled jobs. Businesses can streamline existing processes to manage supply chains and create new services for customers to become efficient. Policy makers should work closely with leaders and CEOs of the private sector to jointly develop measures to improve the economy. Innovation is the key to economic growth and the Internet plays a vital role in modernizing technological processes in companies.

3) Four Areas to Build Infrastructure

After the McKinsey Institute revealed why they believe the Internet contributes to economic growth using three different approaches, they outlined four critical areas to build a strong Internet supply. The four areas are human capital, access to financial capital, infrastructure investment, and creating the right business environment. The beginning of the paper was the consumption side of Internet contribution to GDP. Then, the authors explore the four areas countries can improve so that the supply of Internet increases to meet growing demands.

To improve human capital, education and talent is essential. High Internet based countries such as the United States and Sweden have top universities and provide attractive scholarships to encourage the best candidates to their countries. High salaries and intense marketing is key in appealing to highly skilled students. Talent pools from abroad are tapped into through immigration policy such as H-1B nonimmigrant visas. Technology clusters such as Silicon Valley in the United States and Bangalore in India
also contribute to increased human capital. Talent from all parts of the world come and interacts in these clusters and share and exchange technological ideas.

The next area that aids in increasing the supply of Internet is efficient access to financial capital. Loans, venture capital investments give small and middle-sized businesses the ability to compete with larger corporations. The source of these funds can be from banks as well as private investors. The Advanced Technology Program in the United States from 1990 bridged the divide between public and private sources. Israel partnered with Silicon Valley venture capitalists to provide funds and stimulate their own technologically skilled entrepreneurs.

Not only is access to capital important to the supply of Internet but also investment in infrastructure. The platform behind the Internet is as important as users and organizations acquiring a connection. In order for this to be successful, it is essential the private sector be involved. In Japan, private telecommunications organizations developed fiber optic networks through governmental policies such as tax incentives and favorable income tax rates. Lower finance costs were available through government organizations and deregulation of the telecommunications industry spurred competition.

Finally, the appropriate business environment is vital in advancing the Internet ecosystem. Tax incentives and anti-corruption policies attract foreign investors to come into a country and invest their resources. Deregulation leads to competition, which motivates existing companies to increase their investments and push for greater innovation. Intellectual property gives corporations the assurances they need to pursue innovation with great rigor. Web intensive companies export twice as much as normal companies and create twice as many jobs. The conclusion is drawn from the SME
Internet Maturity index, which reveals the penetration of Internet technology and usage by employees, clients, and suppliers.

C) South Asia

There has been growing discussion around the state of the Internet in the South Asian region. The International Center for Integrated Mountain Development (ICIMOD) organized a workshop in Dhaka, Bangladesh in 1999 titled, “The Internet in South Asia: Opportunities and Realities.” They preceded their workshop with online conversations on the Pan Asia Networking website. Next, they did preliminary research on their respective countries. Once all of the research was in place, the workshop paved the way for project proposals followed by concrete plans to build on the discussions.

The electronic discussion generated key topics surrounding the state of the Internet. As a result, the participants highlighted seven concepts, access, intranet, quality of infrastructure, ownership, role of government, backbone, awareness, gender, illiteracy, and security. High costs restrict Internet access and as a solution, cyber cafes were proposed. Nepal suggested the intranet, which is appealing because of its easy to navigate layout and emphasis on local content. As far as ownership, they cited private sector involvement as beneficial. The government is essential in fast-tracking telecom projects. And security should be a priority to protect investment in the new infrastructure.

Content was the next focus during the electronic discussion. The four key areas were language, e-commerce, telephone, and gender. English has become the standard language of the Internet, although French and Spanish are becoming increasingly popular. The South Asian countries will have to agree on a common language to have inter-regional connectivity. The impact of e-commerce will not be significant unless
manufacturing of exports is improved. The telephone industry will face reduced prices accompanied by a fall in revenues. To build this infrastructure, nations can look to Indian networks such as Ernet and Nicnet who have experience in setting up infrastructure.

To prepare for the workshop, each country prepared a preliminary country report based on their electronic discussion. The report contained the underlying telecommunications infrastructure, the situation of the Internet in the country, and the prevalence of local content. Pakistan is saturated with private telecom companies, India has only one Internet service provider, Nepal has the intranet, and Bangladesh has taken strides to spread access to the poor. Each country had an incentive to work together and learn from each other in their effort to improve usage.

With the preliminary research complete, speakers from Bangladesh, India, Nepal, and Pakistan gathered in Dhaka. They formulated five project ideas, satellite-based broadcasting of relevant Internet content, data communication backbone, pilot project for telemedicine, e-commerce, and telecenters. The broadcasting would allow people to listen to radio stations in local communities through the Internet. Solid data communication background would expand the reach of the Internet and promote interconnectedness. Telemedicine would be especially useful in mountainous hard to reach areas. E-commerce would provide consumers an easy way to access goods and services, but there were some concerns that it excludes the poor. Finally, telecenters could be a potential launch pad for cyber cafes. As per the project, a few schools have set up space to teach course through a satellite, expanding the content students are exposed to (Mehta & Akter, 1999). The discussions were important because the workshop brought to light concrete policy measures to advance the Internet.
D) The Case for India – Can Bangladesh Follow?

Bangladesh could become a destination for low-tech service jobs such as data entry. This market earns $800 million as an industry in the United States (Kenny, 2003). The World Bank calculated that 5% of all service sector jobs are contestable by less developed countries, which amounts to 12 million positions (World Bank, 2001). India is the prime example as a source for outsourcing through increased Internet infrastructure and knowledge. India has benefited from its increase reliance on the Internet. Its information technology industry and service sector has been the main driver behind their rapid growth. The government contracted their grasp on infrastructure development and allowed private firms to compete.

Banglaore in India enacted these four critical areas to improve their ecosystem. They developed human capital through a network of technical and business educational institutions, which included 12 universities, and over 100 colleges. They created IT and electronic business clusters to build infrastructure, which stimulated private investment to data services. Tax policies on computer hardware and IT companies paved the way for a favorable business environment. Finally, financial capital was eased through Banglaore Stock exchange, which created an influx of venture capital funding to entrepreneurs. As a result, India has experienced a great increase in Internet and its contribution to GDP (Kathuria, 2011).

India is considered a high growth country and has been a hub for acceleration in the Internet economy’s contribution to the world GDP. According to the McKinsey Institute, 4-5% of GDP is driven by Internet contribution in India from 1995-2009, compared to the 3% average of high-growth countries. India is one of the leaders in the
Internet supply ecosystem with a McKinsey Internet leadership supply index of 34, fourth among the thirteen nations studied.

The Internet & Mobile Association of India (IAMAI) and the Indian Council for Research on International Economic Relations (ICRIER) jointly began producing “India: The Impact of Internet” in January 2011. Their goal was to show that Internet and Broadband were catalysts for economic and social development for India. Following previous growth theory studies, they utilized national income (GDP) as a proxy for economic growth. They government has shown interest through their IT mandates in the TRAI Recommendations on a National Broadband Plan in December 2010. Therefore, this reports goal is to estimate the potential impact of policy making to stimulate Internet and in turn economic growth. Similar to the McKinsey Institutes econometric approach, using an endogenous growth model modeled after Barro (1991).

The model specification is as follows, \( \ln GDP \text{Growth} = \ln Invest + \ln Internet + \ln School + e \) for 19 Indian states from 2001 to 2010. Investment and number of year’s education was used as a proxy for human capital and labor and the variable that was tested was the number of Internet subscribers across all states. They utilized a fixed
effect model and concluded that Indian states will grow by 1.08% for every 10% increase in the number of Internet subscribers. They discovered that Internet was significant as we are able to reject the null hypothesis at the 95% confidence interval (Kathuria, 2011).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Co-efficient</th>
<th>t-stat*</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Invfr. (β1)</td>
<td>0.2455</td>
<td>10.04</td>
</tr>
<tr>
<td>In Lfr. (β2)</td>
<td>0.101</td>
<td>2.22</td>
</tr>
<tr>
<td>In Internetfr. (β3)</td>
<td>0.108</td>
<td>5.4</td>
</tr>
<tr>
<td>Constant</td>
<td>4.14</td>
<td>5.82</td>
</tr>
</tbody>
</table>

R-squared .8565  Number of observations: 189  * At 95% confidence intervals

An important part about India’s transition into an economic powerhouse is that it leapfrogged the urban manufacturing period straight to the highly skilled technology growth period. Most of their economic boom is a direct result of their silicon valley like IT infrastructure and source for low cost labor. Many corporations outsource their IT processes to the service sector in India. The country was able to place an emphasis on education and bypass the industrial revolution phase of their heavy growth. Bangladesh is similar in culture and resources but smaller in size and has the potential to follow suit.

Some may argue that the Internet actually stifles growth in less developed countries. Their rationale is that automated and more efficient processes replace unskilled jobs. However, that may not be the case. While it is true that more efficient processes will lead to short term layoffs, but a more efficient country is a more productive country. Resources are used appropriately and profits are maximized. Additionally, it places pressure on the level of knowledge and skill of the labor force to increase to compete
with the increasingly globalized world economies. That is why India had such
tremendous growth in its service sector.

The Internet has only been available in Bangladesh for the last decade and
therefore, an abundance of data is hard to come by when performing analysis for a single
country. Panel-data for the number of Internet users across 244 countries is available
from 1997-2011 from the World Bank. Bangladesh has increased the overall number of
Internet users every year since 1990. Analyzing the data for a single country is not a large
enough sample to hypothesize the effects of Internet on economic growth. Panel-data
improves the quality and richness of data by adding a third dimension of time. It allows
for repeated observations for many cross-sections of data, which allows researchers to
analyze changes even with a short-time period. The initial goal is to discover whether
Internet positively influences economic growth in 244 countries. If a relationship does
exist, analysis can be done on a subset of the data. The next objective would be to group
South Asian countries together. Using this strategy, conclusions can be drawn for the
implications of Internet on economic growth in Bangladesh specifically.

II) Model / Method

A) Growth Models

There are a number of models that economists use in growth theory economics.
The two most popular of which are the neoclassical growth model also known as the
exogenous growth model and the endogenous growth theory model. The original
exogenous growth model explains long run economic growth through measures of
productivity, capital accumulation, population growth, and technological progress. The
endogenous growth model states that human capital, innovation, and technology drive economic growth directly.

The Harrod-Domar model in 1946 addressed economic growth through the level of saving and productivity of capital. The variables used were output (income), capital, total saving, savings rate, investment, and the rate of depreciation of the capital stock (Baumol, 1952). Growth depends on labor and capital, and investment is essential in increasing capital. The implications for less developed countries are that they have an excess of labor but no capital. Consequently, low savings rates impede investment in capital (Baumol, 1952). Therefore, these nations have a large supply of labor but no capital to allocate these resources to. The model does not distinguish economic growth as a subfield of development. It also encourages less developed nations to finance their investment through borrowing, which further exacerbates their debt issues.

To improve upon this model, Robert Solow and TW Swan introduced the neoclassical model. The main addition is the addition of labor as a factor of production. Furthermore, the assumption of diminishing returns to scale for both capital and labor was introduced. In their model, long run growth is determined by factors that are outside the model. The progress of technology is a strong predictor of the economy’s growth rate, which eventually achieves a steady state (Solow, 1956).

The main assumption in the neoclassical model is that in a closed economy, there are diminishing returns to scale. If labor is fixed, output will increase by a smaller amount for each additional unit of capital. When technology and labor is held constant, the economy will reach a point where the new output created will only be enough to replace the amount of capital used at which point, the economy will not grow. The rate of
growth reaches a steady state and levels off to zero per capita economic growth (Solow, 1956).

Technological progress is measured through the Solow residual or the total factor productivity. The different measures used are average labor productivity, which is economic output per labor hour, and the multifactor productivity, which is a weighted average of capital. The factors that are used in the model are GDP, savings function, change in capital, and change in labor. The model predicts that the income levels of less developed countries converge towards the income of rich countries, provided they share similar characteristics. This is known as conditional convergence and it depends on institutional arrangements, free markets, trade policy with other nations, and education policies (Solow, 1956).

The main criticism of the neoclassical model is that it does not account for entrepreneurs. It states that economic growth results from savings rate or the progress of technology but it isn’t able to determine exactly what that is. Furthermore, it doesn’t account for the strength of facilities that foster economic growth. The drawbacks of the neoclassical model paved the way for the creation of the endogenous model, which accounts for technological progress.

Endogenous growth theory depends on human capital, innovation, and technology as predictors of economic growth. Policies such as incentives to promote education and research and development to increase innovation can affect the growth rate in the long term. It implies that the marginal product of capital is greater than zero. Therefore, policies that encourage competition and innovation will allow the economy to grow. Technology is the key to progress, and innovation has to be a continual effort in order for
an economy to grow indefinitely. Investment in human capital with policies emphasizing education is key to properly utilize resources and sustain improved innovation (Romer, 1994).

**B) My Model**

To determine whether the number of Internet users has a positive effect on economic growth, a panel regression analysis was conducted in Stata. The data, World Development Indicators from the World Bank is found for 244 countries and 20 years. To begin, I set the panel variable as country and the time variable as year. Next, I ran the “xtreg command” to run the regression in Stata. For economic growth, I used GDP per capita growth (annual %) as the dependent variable and the independent variable was Internet users per 100 people. Therefore, we begin by attempting to show that the Internet generally has a positive effect on economic growth across countries.

The equation for the fixed effects model becomes:

\[
Y_{it} = \beta_{it} X_{it} + \alpha_{i} + u_{it} \quad \text{[eq. 1]}
\]

Where
- \( \alpha_{i} (i=1,...,n) \) is the unknown intercept for each entity (\( n \) entity-specific intercepts).
- \( Y_{it} \) is the dependent variable (DV) where \( i = \text{entity} \) and \( t = \text{time} \).
- \( X_{it} \) represents one independent variable (IV),
- \( \beta_{i} \) is the coefficient for that IV,
- \( u_{it} \) is the error term

The control variables and the model chosen were based on Robert Barro’s 1996 model in “Democracy and Growth.” He chose male schooling, female schooling, log(life expectancy), log(GDP)*human capital, log(fertility rate), government consumption ratio, public educational spending ratio, investment ratio, terms of trade, black-market
premium, and rule-of-law index. The independent variables used in this model were internetusersper100people, public spending on education, general government final consumption, ln(fertility), ln(life expectancy), labor force with secondary education for males, labor force with secondary education for females, investment ratio, and terms of trade. Barro’s variables black-market premium, rule of law index, and log(GDP)*human capital were left out of this model.

The “Growth of Nations” cites growth models as problematic because of three reasons, simultaneity, multicollinearity, and degrees of freedom. Simultaneity is an issue because it is difficult to ascertain cause and effect. For example, economic growth can result from increased Internet or increased Internet can result from higher economic growth. Multicollinearity exists because many growth determinants are correlated with each other making it tricky to determine the impact of each variable on the dependent variable. Finally, the degrees of freedom changes depending on the model and the number of variables used. Descriptive statistics used in this paper can be found in Figure 1 of the appendix.

B.1 Internet Users

Internet users per 100 people is the main variable to be tested in this model. If the coefficient is positive, it will reveal that an increase in the number of Internet users has a positive effect on economic growth. The remaining variables in the model serve as controls in traditional growth theory. The coefficient on ln(internet) is 0.804, therefore a 10% increase in the number of internet users increases GDP Per Capita Growth by 8.04%. The t-statistic is 2.66, therefore, it appears to be a significant indicator of economic growth.
B.2 Initial Level of Human Capital

Initial human capital is embedded within the model through the labor force with secondary education (total % of labor). As individuals are more educated, they have more knowledge and are thus productive. Life expectancy at birth, total (years) was used as a secondary variable for human capital. These two variables in conjunction serves as a good proxy for the human capital found in the work force. Labor force participation was not significant, neither was ln(lifeexpectancy) in this model.

B.3 Education Spending

Public spending on education, total (% of GDP) is an indicator of the ratio of public educational spending to GDP. Though it is not the perfect substitute for school quality, the rationale is that if the government spending is a significant amount of GDP on education, the institutions are of better quality. The estimated coefficient is negative, and marginally significant.

B.4 Fertility Rate

The log of fertility rate, total (births) per women is used to account for population growth and to identify economy’s investment into new workers as opposed to resources devoted to childrearing. The coefficient for fertility rate is very large and negative, and significant. This is consistent with traditional theory, as more resources will be shifted towards new borns and not the production of goods.

B.5 Government Consumption

General government final consumption expenditure (% of GDP) is a significant component of GDP, which is our dependent variable for economic growth. However, too much government expenditure becomes inefficient. Initially, government spending on
programs to build roads and infrastructure can stimulate the economy. However, it reaches a steady state and eventually becomes inefficient, as there is too much spending. Therefore, the coefficient is negative (-0.37) and significant at p>.10. Therefore, if government expenditure increases, GDP decreases.

**B.6 Investment Ratio**

The savings rate is a good indicator for the amount of investment that goes on within a country in neoclassical growth theory; therefore we utilize gross domestic savings (% of GDP) as a proxy. The coefficient was positive and significant at the 5% level. However, one key item to note is that there is reverse causality between these two variables. It is difficult to ascertain if higher economic growth is allowing for increased investment or vice versa.

**B.7 Terms of Trade**

A positive trade flow is a good indicator for the marketability of a country’s goods. Therefore, exports of goods and services (% of GDP) were used as a measure for terms of trade. It was found to be highly significant and has a positive effect on economic growth. High demand for a country’s goods leads to increased exports and stimulates production within the home nation.

**Figure 2**
Fixed-effects (within) regression

|                | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|----------------|-------|-----------|-------|-----|---------------------|
| lninternet     | .8040396 | .3021454 | 2.66  | 0.008 | .2103423 1.397737 |
| laborforce-n   | .0263787 | .0254479 | 1.04  | 0.300 | -.023625  .0763824 |
| publicspen-f   | -.7542227 | .3465655 | -2.18 | 0.030 | -1.435203 -.0732426 |
| generalgov-o   | -.3739634 | .145982 | -2.56 | 0.011 | -.6608092 -.0871177 |
| grossdomes-p   | .1739666 | .060201  | 2.89  | 0.004 | .0556752 .2922579 |
| exportsogp-p   | .0714694 | .027189 | 2.66  | 0.008 | .0228983 .1200405 |
| lnfertility    | -.16.66229 | 2.305761 | -7.23 | 0.000 | -21.19297 -12.13161 |
| lnlifeexpec    | -.40.28372 | 18.50359 | -2.18 | 0.030 | -76.64214 -.3.925296 |
| _cons          | 185.8197 | 78.69301 | 2.36  | 0.019 | 31.19268 340.4467 |

R-sq: within = 0.2258
between = 0.0109
overall = 0.0819

F(8, 478) = 17.42
Prob > F = 0.0000

F test that all u_i=0: F(96, 478) = 4.09
Prob > F = 0.0000

III) Results / Discussion

A) All Data Points

After the initial summary statistics and trend analysis, estimates for beta coefficients are calculated through an Ordinary Least Squares (OLS) regression as well as a panel regression. Prior running the statistical measures, new variables have to be created. For example, country has to be changed from a string variable to a numeric variable using the “encode” command.

Panel data was used to account for observations over many years across numerous countries. This type of regression multiplies the number of observations and increases the dataset. A fixed effect model was used to analyze the impact of variables that vary over
time. We assume that each country has its own characteristics that may affect our model. Fixed effect controls the impact or bias that the countries may have on our independent and dependent variables. Once controlled for, the regression reveals only the relationship between the independent and dependent variables within each country. Each entity is kept separate and unique and its characteristics do not affect the other countries in the model.

Heteroskedasticity is a common issue with panel data across years and different countries. If present, it causes the variance and standard errors of coefficients to be biased, and not the coefficients themselves (Barro, 1996). The null hypothesis is that there is homoskedasticity or constant variance. Based on the Wald test, our measures are significant at the 5% level. Therefore, we reject the null hypothesis and conclude heteroskedasticity. The command “robust” is used in stata to correct for heteroskedasticity and a new panel regression is recorded.

**Modified Wald test for groupwise heteroskedasticity**
in fixed effect regression model

\[ H_0: \sigma(i)^2 = \sigma^2 \text{ for all } i \]

\[ \text{chi2 (97)} = 6660.42 \]
\[ \text{Prob>chi2} = 0.0000 \]

The new panel regression with the robust command adjusted the standard errors for 149 clusters in country. The coefficients of the regressors indicate how much \( Y \) changes when \( X \) increases by one unit (or percent if dealing with natural log). The \( t \)-values test the hypothesis that each coefficient is different from 0. In order for this to be rejected, the \( t \)-value has to be above 1.96 for a 95% confidence level. As the \( t \)-value increases, so does the significance of the variable measured. The two-tail p-value tests the hypothesis that the coefficient is not zero. If the p-value is below an alpha of 0.05, the
The important thing to note is that correlation does not imply causation. Correlation is the first step in causation, and suggests that there may potentially be a relationship. However, there may be other variables that if included, can change the significance. Therefore, economists include control variables in their model to account for missing regressors. Additionally, simultaneity bias may exist, which is why economists proceed with caution before declaring direct causation.

The Hausman test is used to choose between the fixed or random effects model. It shows that the error terms are not correlated between the countries. It tests whether there is significant correlation between unobserved characteristics of the countries and the independent variables. When there is correlation, the random effects estimates would be incorrect and the fixed effects model is preferable (Mankiw, 1992). The probability chi2 is significant at the 5% level, which signifies that the fixed effect model should be used as opposed to the random effects. Consequently, the fixed effects model “addresses any omitted variables that are constant over time that will not bias the estimates, even if they are correlated with the explanatory variables” (Durlauf et al., 2004)).
Although the fixed effects model can be useful to address omitted variable bias, it has its share of disadvantages. It ignores the between-country variation, which leads to higher standard errors. Therefore, there is a tradeoff between robustness and efficiency. Another issue is serial correlation or autocorrelation, which occurs when error terms from one time period is correlated with future time periods in a time-series data panel (Carkovic & Levine, 2011). The Wooldridge test for autocorrelation in panel data is used to show whether autocorrelation is present. The Prob > F is significant at the 5% level. Based on the results, the null hypothesis of no first order autocorrelation can be rejected, so the data does have first-order autocorrelation. Autocorrelation tends to be an issue when there are 20-30 years of panel data. Serial correlation is problematic because standard errors of coefficients appear to be smaller than they actually are and because it leads to an overstated R^2 calculation (Barro, 1999).

$\text{Wooldridge test for autocorrelation in panel data}$

$H_0$: no first-order autocorrelation

$F(1, 60) = 7.269$

Prob > F = 0.0091

Another issue is that the fixed effects model controls for variables that might not have been controlled for otherwise. More specifically, fixed effects are used to control for individual characteristics among countries (Carkovic & Levine, 2011). However, these characteristics vary from entity to entity and the model is controlling for all of these as a whole. During this process, the model may take into account for the presence of characteristics that are not of particular concern.

The fixed effect models are not effective when there are too many cross-section units of observations, which provides an excess of dummy variables. The surplus of dummy variables reduces the degrees of freedom and consequently the strength of the
statistical tests. There is also a chance of multicollinearity, which occurred in this model where out of the 244 countries, only 70 were not omitted. Furthermore, the dataset needs to be balanced, which is checked using the “tsset” command in Stata. If the set is balance, there is an observation of every unit in every time period. Unbalanced set refers to missing observations for certain years.

**B) South Asia Data Points**

It is important to note that the means and standard deviations for the variables with the smaller subset of data, South Asia, is similar to that of the larger population of all data points. As seen in figure 6 of the appendix, most of the GDP Per Capita growth is clustered around the mean of 4%. Most countries in South Asia have a very low internet use per 100 people value at 7.59 as the mean, compared to the 71 maximum value found for Singapore. Therefore, in figure 6, the South Asian countries generally have a very low number of Internet users and similar rates of GDP growth per capita.

**Figure 3 - Descriptive Statistics for South Asia**

<table>
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<tr>
<th>Variable</th>
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<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<td>14.97646</td>
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<td>71.13171</td>
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<td>14.9683</td>
<td>-32.68122</td>
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<td>48.82607</td>
<td>0.1101963</td>
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<tr>
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<td>0.1397619</td>
<td>2.086665</td>
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<tr>
<td>lnlife</td>
<td>315</td>
<td>4.166336</td>
<td>3.745481</td>
<td>4.402337</td>
<td></td>
</tr>
</tbody>
</table>

The variable, ln(internet) takes on a negative coefficient when the panel data regression is tested for South Asian countries only. South Asian countries were classified based on their status from the OECD. The -4.65 coefficient for ln(internet) states that a
A 10% increase in internet users decreases GDP per capita by -4.65% and is significant at the 5% level. The results for South Asian countries differ from that of the broader population greatly. A possible explanation can be that economic growth in the region has been volatile. Furthermore, Internet has not penetrated into this region. Those that have the Internet available to them do not have low costs or proper access speeds to take full advantage of its potential. It is not available for widespread use, so businesses and governments have not implemented them into their processes.

| gdpperca~l | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|------------|-------|-----------|-------|-------|----------------------|
| lninternet | -4.651084 | 1.554436 | -2.99 | 0.040 | -8.966891 -3.352776 |
| lnfertility | 123.2233 | 37.83862 | 3.26 | 0.031 | 18.16642 228.2801 |
| lnlife     | 802.4342 | 145.5153 | 5.51 | 0.005 | 398.4189 1206.45 |
| exportsofg-p | .0855377 | .0994573 | 1.39 | 0.236 | -.1375999 .4146753 |
| grossdomes-p | -.0455448 | .1697806 | -0.27 | 0.802 | -.516932 .4258424 |
| generalgov-o | -.6095729 | .3267865 | -1.87 | 0.136 | -1.516878 .2977319 |
| publicspen-f | 1.618593 | .7336044 | 2.21 | 0.092 | -.4182197 3.655405 |
| laborforce-n | -.7336007 | .3309954 | -2.22 | 0.091 | -.1552591 .1853899 |
| _cons      | -3478.462 | 638.6441 | -5.45 | 0.006 | -5251.622 -1705.301 |

IV) Implications on Bangladesh

A) Background on Bangladesh

It is a country ravaged by tornados and flooding along with continual poverty. Politics is defined by instability and structure is non-existent. It is a constant struggle between the two main political parties, the Awami League and Bangladesh Nationalist Party. Disputes often lead to violence and protests and government shutdown is the norm. In terms of policies, education is well below proper standards as is human rights. Corruption is the main barrier to progress both politically and economically. Since it gained its independence in 1971, it has struggled to curb corruption and make progress as a country. It is a country known as Bangladesh, described as “the world’s most densely
populated countries, with its people crammed” (CIA Factbook). It is a relatively young country with a weak economy. Their main source of income is agriculture as most of the country is populated with farmers.

Despite Bangladesh’s volatile environment, the economy has grown 5-6% for the last 10 years. It has overcome political unrest, weak infrastructure, and slow economic reforms. During the American recession from 2008-2010, Bangladesh was able to sustain growth with 6% increase in GDP in 2008, 5.8% increase in GDP in 2009, and 6% increase in GDP in 2010. Growth was mainly driven by commodities such as rice as well as textile exports, which contributed $12.3 billion into the economy in 2009 (CIA Factbook). The labor force is mainly concentrated into agriculture, industry, and services with 45%, 30%, and 25% respectively. It has a budget deficit of -4.2% of GDP in 2010 resulting from $11.41 billion in revenue and $15.87 in expenditures. Inflation has been an issue as GDP has increased, inflation has followed suit with 8.1% in 2010, up from 5.4% in 2009.

Bangladesh exports garments, frozen fish and seafood, and leather mainly to countries such as the United States, Germany, United Kingdom, France, and the Netherlands. The country imports machinery and equipment, petroleum products, and cement from neighboring countries such as China, India, Singapore, Malaysia, and Japan. It had a trade deficit of $5.37 billion in 2010. Almost 37% of their exports were to the United States and Germany and 41% of their imports were from China and India in 2010. In terms of foreign direct investment, approximately $5.9 billion was invested in Bangladesh and $92 million abroad (CIA Factbook).
Investment in Bangladesh is particularly important as the country does not generate enough revenue that can be allocated to research and development. For further growth, it is essential that the country innovate in an effort to close the technological gap with the neighboring countries. Innovation is costly as research and development does not provide any returns or value to initial investment. Rather, it is a long run approach and with poverty at record highs, the country struggles to source long-term projects. Therefore, foreign involvement is crucial for Bangladesh to transition into a developing country.

Foreign companies will only enter once the ease of doing business improves. Some reforms that have experienced slow implementation are privatization of the public sector and control of the trade deficit. State owned banks control 75% of consumer deposits and key industries. Access to capital is complex and public employee wage hikes are too common. The country needs to improve their infrastructure (roads and highways), deregulate and eliminate much of the public sector, and gain a grasp on corruption to attract investors. Once they are able to pass strategic reforms and increase the amount of capital flowing into the economy, investment in R&D will rise significantly and consequently innovation. If the country is able to innovate, it will slowly close the technology gap with its neighboring countries and become a more competitive economy.

Even without strong economic reforms, Bangladesh has experienced growth in its manufacturing sector. In the 1990s, the garment industry (mainly privatized) experienced heavy growth. It created 1.5 million jobs, mainly for women (UNICEF, 2011). Literacy rates are much higher for men than women because there are certain cultural restrictions for women when it comes to schooling. Improving the ease of business by providing
transparency through government agency websites will attract foreign companies to
invest in Bangladesh and take advantage of their low wages. Foreign companies will
bring their technical knowledge and implement their business models, which would
improve current business processes in the country by sharing their expertise.

B) Digital Bangladesh

In March 2010, leaders in Bangladesh drafted a plan for “Digital Bangladesh.”
The plan had three main sections, the pillars of Digital Bangladesh, the vital
developmental sectors, and enabling environment. The controlling political party, Awami
league has announced its support and has included it in their charter.

The Pillars of Digital Bangladesh includes human resource development,
connecting citizens, digital government, and ICT in business. In human resource
development, there will be emphasis on e-education. Internet will be used as a tool to aid
in the difficult subjects such as mathematics, science, and languages. To connect citizens,
they will provide local access points in post offices and other government institutions.
Mobile phones, radio and television are other routes to reach and educate citizens. Digital
government was introduced to increase transparency of services offered by local
institutions. By reducing the exposure citizens have to government employees and
agencies, the possibility of corruption is lessened. The Internet aids businesses by
providing them access to markets overseas.

The plan outlined 10 vital development sectors, agriculture, health, land
administration, local government, social safety nets, disaster management, commerce,
law enforcement, parliament, and civil service. Data will be provided online to improve
competitiveness among farmers to assist in real time decision-making. The health sector
can benefit from telemedicine. Land administration can benefit from digital record keeping of maps and taxes. Emergency information can be provided instantly for disaster control. The Internet can be just the innovative feature businesses need to give them a competitive edge. The plan continues with law enforcement utilizing the Internet to schedule and automate hearing days and informing citizens of procedures.

The third and final part of the plan spoke to “enabling environment” as a medium for integrating Digital Bangladesh goals into national developmental policies. The five factors discussed were, institutional framework, policy and legal framework, banking and financial transactions, delivery channels for citizens, and financing strategies for public/private funding. As far as institutional framework, the prime minister has created the National Digital Task Force responsible for monitoring the progress of the plans milestones. Most of the current Internet legislation derives from the ICT Act of 2009. E-banking has taken great strides as financial institutions have shifted their resources online. TV and radio are important sources to assist disenfranchised individuals but cheap mobile prices have been great incentives for private sectors to be engaged in the ICT process. Therefore, the government will focus on trying to stimulate partnerships between public and private institutions to fund ICT projects.

C) Barriers

To achieve Internet penetration, it is necessary for Bangladesh to overcome its many barriers such as weak telecommunications infrastructure, low availability, expensive usage charges, and unfavorable government policies. The government regulated Bangladesh Telephone and Telegraph Board (BTTB) had a monopoly in the telecommunications industry (Azad, 1985). A phone line costs about $500 USD
accompanied by a 10-year waiting period. If the industry was deregulated and privatized, a competitive market place would drive prices to affordable lows and decrease wait times. Most of the country, outside of Dhaka does not have the infrastructure to support Internet access and as a result, users simply do not have access. Consequently, low access speeds deter people from web browsing, relegating the use of Internet to e-mail only. Thirty hours of Internet results in a $150 monthly bill, most of that time being spent on e-mail. Additionally, 83% of Internet time is spent on email. It is up to the government to enact policies that favor privatization to expand infrastructure and reduce service charges. Once accomplished, a national academic network can be forged that contains resources for health institutions and government administrations (Azad, 1985).

In 2002, Bangladesh passed the National ICT Policy. This information and communications technology policy was aimed at improving the country’s infrastructure, human resources development, governance, e-commerce, banking, and public utility services. Section 3.2.17 of the policy states, “Internet will be provided to the educational institutions and libraries. To ensure public access to information, Cyber Kiosks will be set up in all Post offices. Private sector participation will be encouraged to set up these facilities.” However, the country has taken proper steps towards shifting towards technology-based initiatives (Hossain, 2000). They have offered tax exemption on computer goods, and distributed computers to schools. Furthermore, many government offices have strived to provide online services and launch websites ministry, judicial, and legislative websites. Finally, they abolished the state monopoly in telecom by BTTB.

Costs of infrastructure per person can go as high as $20,000 (Kenny, 2003). Even those that have Internet access, only 20% computerized business processes such as
invoicing (Kenny, 2003). Furthermore, there is no system that utilizes the Bengali language, which deters access to people in lower socioeconomic classes. The country has very low literacy rates for the native language, and even lower for English. For example, in 1999 72% of web sites were in English (Kenny, 2002). Consequently, a Bengali interface would be useful in creating demand.

**D) Local Content**

Most of the concern up until now has been providing Internet access to users. What often gets overlooked is the type of content available to those that already have access in the South Asian region. Internet content availability in the south Asian region is scarce. For the Internet to be widely accepted, more material has to be available. Without information that is culturally relevant, users will have no incentive to shift towards the Internet as a source for knowledge (Rao et al., 1999).

The workshop in Dhaka hosted by Nepal’s ICIMOD narrowed down on this issue. They stated, that Internet access in general depends on, “connectivity, content, community, commerce, capacity, culture and co-operation. In other words, national and local connectivity to the Net must also be coupled with locally relevant content, community fora, and economically self sustainable online initiatives.” In order to achieve this goal, they believe technical expertise, leadership at national levels, and regional-cooperation are essential. In 1999, bandwidth in the international Internet has improved, where countries such as India, Pakistan, Bangladesh, and Nepal had 80 mbps, 1.5 mbps, 512 kbps, and 320 kbps, respectively. When the conference occurred, India was the only south Asian nation with a national IT policy in place. Since then, countries in the rest of
the region have taken great strides to implement a draft of their national IT policy (Rao et al., 1999).

To measure market maturity of online content, Rao cited seven measures. The measures consisted of the total number of websites about the country, local relevance, local language, content on states and provinces, search engines, ad revenues generated from these sites, and third party-services for ad revenue auditors and market research groups. The workshop also measured the number of websites specific to each country was 10,000 for India, 2,000 for Pakistan, 1,000 for Nepal, and only 100 for Bangladesh (Rizvi 1999; Subba 1999). The sites that are already published, lack the technical sophistication and visual professionalism of modern websites.

Rao outlines nine categories, which online content can be built around. The categories presented are, news media, public health, academia/education, business, government, NGOs, local languages, rural initiatives, and content from other developing nations. If properly leveraged, websites published for these categories will improve content availability in the south Asian region.

News and General Information is an area that could generate much-needed local content in the South Asian region. As of 1999, most English language magazines in South Asia were available online. They were available for access through sites such as “newslink.org and mediainfo.com,” which served as an aggregated source for news. Nonetheless, there is a niche market for content in the local language that publishers can take advantage of. Their only barrier to entry would be Internet censorship of content subject to cultural restrictions. The government is more focused on drafting regulatory material for Internet service providers so Internet censorship isn’t a priority yet.
The Internet can be a great source for public health information in cases of emergencies and disaster relief, especially in South Asia where cycles are prominent. Websites can be utilized to disseminate important information and gather donations. Education and research is another area for improvement in local content. Many academic journals have not been shifted online. Furthermore, schools and universities do not have the resources to pay for western databases for academic journals.

The government is another sector that can leverage the Internet and increase content. India publishes information on their National Informatics Center, Pakistan leverages pak.gov, and Nepal has NepalNet. India has embraced online trade and investments as well as shifting companies to the Internet. Transparency is the most appealing characteristic of government websites as land records, property taxes, birth and death data, and applications for certificates can all be available. Tourism websites is another area that can prove to be a source of revenue for the various Indian states.

Non-government agencies are able to appeal to its members and get their message across to citizens. The Drik in Bangladesh is an example of an organization that is available online. It is an organization that uses images to speak out against social, political, and economic inequality. Their images spur conversation among people and call people out to action to stand up for what they believe in. Non-government agencies can reach a broader audience by shifting resources online.

Local language content is one of the main categories for improvement in South Asia. Keyboards do not have standard characters and fonts for the region’s languages. According to Rao, India’s Center for Development of Advanced Computing launched a multilingual word processor in Indian languages. In February 1999, the Tamil Nadu
government received a $1.25 million investment for their Tamil Internet Research Center in the World Tamil University. The goal is to work with governments such as Singapore, Malaysia, and Sri Lanka, other countries where the Tamil language is prevalent and come up with a standardized way of introducing local language content. They have met numerous times in conferences to discuss a standardized keyboard layout, a project that should be replicated in other states and countries throughout the region.

Rural areas are a great source for local content development. The DRIK-LEARN initiative in Bangladesh started in 1997 and engages 1,200 students, and 14 computers. The students update information about information databases on population, education, health, and agriculture. They are revised in 6-month intervals with a new set of students each time. This provides great exposure to children in rural areas and it is made possible by the Tree Education Endowment Fund and Global Amitech. India has pursued similar projects by setting up community centers and Internet kiosks near schools and universities.

Business content drives e-commerce in the South Asian region. Researchers expect most of the impact to take place in the business-to-business sector as companies adopt the Internet to cut costs, improve efficiency, and gain entry to new markets. AsianSources.com is a leading international trade website in manufacturing, pharmaceutical, and the apparel sectors. Retail companies have used it for apparel design, development, online branding, visual merchandising, and data warehousing (Rao, 1999). The connection between suppliers, distributors, and retailers becomes solidified through the Internet. India has already taken advantage of these types of transactions in their
movie ticket business and through their online book sales. As a result, schools have offered more courses in Fashion Technology, Internet Marketing, and computer science.

The final category Rao cited was content practices from other developing nations. Mexico has the Monterrey Institute of Technology where 35,000 non-degree students are enrolled as well as the African Virtual University project, which was established to increase access for African researchers to educational journals. Singapore and India has established network services to improve the efficiency of their email services. Peoplinc in Panama gives exposure to handicrafts created by women. The countries in the South Asian region should produce similar projects and make this content available online.

The ICIMOD in Dhaka was able to come up with a number of policy recommendations. First, they suggest publications such as newspapers, magazines and academic journals to publish their information to the web. The export/import sector can benefit from product catalogs, insurance agencies, and shipping and transport services through trade databases such as the United Nations. Non-profit organizations should receive grants to move their information to the web. Content availability during disaster relief needs to be more efficient. Furthermore, education related information should be provided to users and institutes in the countries. Governments can become more transparent by providing information on land registration, tax information, appointments with officials, accounting methods, etc. Standardization of language and fonts for web publishers is essential in incentivizing Internet use.

In order to standardize language, programmers require access to freeware packages, as many do not have the resources to afford commercial versions. Training centers and computer courses in schools are important to increase the number of users.
Countries need to work on legal classifications and policies on what is appropriate content material and regulations on Internet service providers. Online forums to encourage participants to voice their opinions and make them part of the process is important to receive valuable feedback. It is not enough to simply build infrastructure and provide access to the Internet. Emphasis should also be on making content available that is useful and relevant to its users (Rao, 1999).

E) MobiTaka

The Bangladesh Enterprise Institute has introduced e-payment mechanisms as a way to work towards a Digital Bangladesh. Bangladesh Bank initiated an online e-payment system called “MobiTaka,” which is the first online payment method in the country. GrameenPhone, a cell phone company has accepted payments using MobiTaka and is the first company to do so. Additionally, mobile-based payments are accepted for inter-city train tickets, which opens up the possibilities for e-commerce in Bangladesh. The government has voiced their support for private companies to create software to automate their back-end processes. MobiTaka has been useful when it comes to booking railroad tickets for Bangladesh Railway. Users can send a text message to reserve a ticket by paying an extra 20 taka. Upon arriving at the railway station, they simply show them the confirmation number from the text and receive tickets they booked online.

F) E-Banking

The success of e-commerce is dependent on payment mechanisms, which is why e-banking is so important. E-banking cannot succeed without a reliable telecommunications infrastructure at its backbone as well as internet connectivity. The present status of Bangladesh’s e-banking sector can be categorized into online banking,
Internet banking, mobile banking, and tele banking. Currently, 29 banks offer services through their online network. Examples of such services are payment against pay order, demand draft encashment, remote fund transfer, cash withdrawal, cash deposit, account statement, clearing and balance inquiry, etc. Transactions occur through their National Payment and Settlement System, Bangladesh Automated Clearing House, and Bangladesh Electronic Fund Transfer Network (Rahman, 2008).

Internet banking allows customers to access information through the Internet. Seven out of 48 banks provide services through the World Wide Web. They are able to access account balances, transfer funds among accounts, order checkbooks, pay bills, view account details and activity, etc (Rahman, 2008). Through mobile banking, customers are able to use special programs via SMS or Mobile Internet to access card statements, check statuses, balances, payment due dates, etc. The most popular mobile banking service is the peer-to-peer payment, but only a few banks have adopted mobile banking. Tele banking allows customers to access similar information but by dialing into a particular number.

The Bangladesh Bank has supported the government’s Digital Bangladesh initiative in information communications telecommunications infrastructure. The government has waved taxes on computer assets and other equipment, which has assisted the Bangladesh Bank in their investment opportunities for e-banking. They implemented an RPP project to improve the payment system, which makes it mandatory for all banks to be connected to the Bangladesh bank for inter-bank online transactions. They are building their network on the Bangladesh Railway System, which owns high-speed optical fiber parallel to railway paths in Bangladesh. In 2006, Bangladesh was able to
connect itself with international submarine cable system, which paved the way for 159 service providers to be connected.

Of these 159 Internet service providers, 64 are active. They are providing dial up speeds of up to 56kbps, where as broadband speeds range from 64 kbps to 8mbps. Also in 2006, they enacted laws to verify Internet transactions as a security protocol for e-payment. Effort is underway to spread Internet access to other regions connected to this network. Although these speeds are relatively low compared to western nations, banks have adopted this technology and 2,426 out of 6,565 bank branches were computerized (Rahman, 2008).

As a result, many policy implications arise. Bangladesh Bank is in a good position to offer training courses on e-banking’s uses as well as information to customers on its uses and advantages. Risk management policies and security threats should be analyzed before it is fully integrated. Mobile banking is an adequate place to start because it is already a widespread network as it covers 30 million people. IT training and personnel is important in its progress as well as training on basic IT material to staff.

V) Conclusion

Statistically, an increase in the number of Internet users increases economic growth across countries using panel data, although, more analysis should be done to account for endogeneity issues. The coefficient for Internet users on economic growth is negative for South Asian countries. If Bangladesh enacts policies to stimulate Internet expansion, it has the ability to grow at a rapid pace, similar to that of India’s expansion. Sectors in Bangladesh that stand to benefit from Internet expansion are e-commerce, e-government, telecommunications, and infrastructure.
Bibliography


APPENDIX

Figure 1 – Descriptive Statistics for All Data Points

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<tr>
<th>Variable</th>
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<td>1.991321</td>
<td>2.20e-06</td>
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<td>2.20e-06</td>
<td>16.46297</td>
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<td>4.190807</td>
<td>6.291605</td>
<td>2.047121</td>
<td>76.22212</td>
</tr>
</tbody>
</table>

Figure 2 – Regression Analysis for All Data Points

Fixed-effects (within) regression

| Coef.   | Std. Err. | t    | P>|t| | 95% Conf. Interval |
|---------|-----------|------|-----|----------------------|
| lninternet - .040396 | .3021454 | 1.34 | 0.18 | -.329792 | .248625 |
| laborforce-n -.0263778 | .0254479 | 1.04 | 0.30 | -.023625 | .0763824 |
| publicspen-f -.754227 | .3465655 | -2.18 | 0.03 | -1.435203 | -.0732426 |
| generalgov-o -.3799634 | .145982 | -2.56 | 0.01 | -.6608092 | -.0871177 |
| grossdomes-p .1739666 | .060201 | 2.89 | 0.00 | .056752 | .2922579 |
| exportsofg-p .0714694 | .0247189 | 2.89 | 0.00 | .0228983 | .1200405 |
| lnfertility -16.66229 | 2.305761 | -7.23 | 0.00 | -21.19297 | -12.13161 |
| lnlifeexpec -40.28372 | 18.50359 | -2.18 | 0.03 | -76.42414 | -3.925296 |
| _cons 185.8197 | 78.69301 | 2.36 | 0.019 | 31.19268 | 340.4467 |

| sigma_u 8.0261672 |
| sigma_e 2.4824962 |
| rho .91268631 |

R-sq: within = .2258
between = .0109
overall = .0819
H(8,478) = 17.42
Prob > F = 0.0000
F test that all u_i=0: F(96, 478) = 4.09
Prob > F = 0.0000
Figure 3 – Descriptive Statistics for South Asian Data Points

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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Figure 4 – Regression Analysis for South Asian Data Points

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<th>gdppercapi-l</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;</th>
<th>[95% Conf. Interval]</th>
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Figure 5 – Hausman Test Fixed vs Random for All Data Points

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<th>(b) fixed</th>
<th>(B) random</th>
<th>(b-B) Difference</th>
<th>sqrt(diag(V_b-V_B)) S.E.</th>
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Figure 6 – Scatter plot of South Asian Countries