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Abstract

The concept of a 'global digital divide' is now common, and many cross-country studies of determinants of differences in computer and Internet penetration have been performed. The main conclusions and policy implications from these studies are relatively blunt: get richer, have more telephones, and regulate telecommunications better. In this paper, we examine an alternative approach to bridging the digital divide, through organizational innovations that provide low cost Internet access in developing countries, within the existing conditions of income levels, telecommunications infrastructure and regulatory environment. We use survey data from 500 individuals in three South Asian countries, Bangladesh, Nepal and Sri Lanka, to examine factors influencing patterns of computer and Internet use. These individuals were in situations where computer and Internet access has been provided by a developmental agency (government or non-government). We estimate logit and multinomial logit models, using explanatory variables such as income, household size, education, and occupation, as well as infrastructure factors such as quality of electricity supply, and availability of telephones and televisions. Thus we are able to go beyond simple analyses of penetration at the country level, to understand the microeconomics of computer and Internet use in rural South Asia.

JEL Classifications: O1, L86
Keywords: Development, IT, ITC, South Asia, Digital Divide, Internet

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1 Introduction

The concept of a 'global digital divide' is now common, and many cross-country studies of determinants of differences in computer and Internet penetration have been undertaken, attempting to understand what factors shape this aspect of global inequality. For example, in a very recent, comprehensive study, Chinn and Fairlie (2006) examine a data set of 161 countries over the period 1999-2001, and find that a large portion of the global digital divide (measured by levels of computer and Internet peentration) is explained above all by income per capita, with telephone density and regulatory quality following in importance as explanatory factors. This ranking of causal factors, in addition to the use of a more current and broader data set distinguishes the Chinn-Fairlie study from previous analyses, but the main conclusions from all these studies are relatively unsurprising, and the policy implications quite blunt (i.e., get richer, have more telephones, and regulate telecommunications better).

An alternative policy approach to tackling the digital divide is to examine organizational innovations that seek to provide low cost Internet access in developing countries. Thus, rather than waiting for macroeconomic shifts in policy variables, the attempt in these cases is to overcome the digital divide within existing conditions of income per capita, telecommunications infrastructure and regulatory environment. In such cases, it is crucial to understand the factors that affect choices with respect to using computers and the Internet, at the level of individual households.[1] Such an analysis gives a much more fine grained perspective on the factors that can influence the digital divide, beyond obvious ones such as income levels. The driving aim is to generate policy recommendations that are achievable within the existing macro environment and without massive infrastructure investments which may prove unsustainable ex-post.

This research uses survey data from 500 individuals across three different South Asian countries (locations in Bangladesh, Nepal and Sri Lanka) to analyze the household-level determinants of computer and Internet use, in situations where access has been

[1] Some factors affecting supply and the conditions necessary for successful delivery of ITC services by rural Indian entrepreneurs are explored in Kendall and Singh (2006).

provided by a developmental agency (government or non-government).[2] We have data on characteristics such as income, household size, education, and occupation, as well as infrastructure factors such as quality of electricity supply, and availability of telephones and televisions. We also have data on motivations for the use of computers and the Internet, including educational, commercial and governmental purposes. Thus we are able to go beyond simple analyses of penetration at the country level, to understand the microeconomics of computer and Internet use in rural South Asia.

The paper is organized as follows. In section 2, we provide some further discussion of our work and its contribution to the literature. Section 3 describes the data, including variables available, and summary statistics, as well as the econometric techniques used. We use logit and multinomial logit estimations to try and understand the behavioral factors that influence computer and Internet use, as well as patterns of use, in terms of broad categories of purposes. Section 4 presents the results of our econometric analysis. Most significantly, we find that at the micro level, in such situations of , higher incomes do not have positive impacts on computer and Internet use, but education and some degree of English fluency are important positive factors. The results on factors affecting usage patterns are less clear cut, and less uniform across the three sample regions. In particular, the data is not able to provide any indication of usage patterns that might be subject to network economies. Section 5 is a summary conclusion, also outlining suggestions for future research.

2 Motivation and Literature

This paper begins to fill a key gap in the literature on the global digital divide,[3] by providing a microeconometric analysis of the factors affecting computer and Internet use in rural areas of developing countries, where the majority of the world's population still lives. The research also contributes to the debate on the role of IT in development, which has been hampered by the absence of formal econometric studies that provide

[2] Reports on related fieldwork in India include Singh (2004a, 2004b, 2006), which also provide more detailed references to the literature on IT and rural development.
[3] See Chinn and Fairlie (2006) for comprehensive references to the literature.

quantitative estimates of the *microeconomic* impacts and determinants of IT use in the development context.[4] The last two decades have seen the emergence of information technology (IT) as a major force for change in developed countries. While the virtues of IT have sometimes been overblown, one can reasonably argue that IT has begun to have a significant impact on the lives of people in developed, industrialized countries. The potential benefits of IT for developing countries are less clear-cut. IT can improve efficiency, make developing country firms more globally competitive, and bring many benefits to well-off consumers – whose consumption patterns are close to those of the developed world – in these countries. From this perspective, IT is of limited relevance to the poor in developing countries, lacking basic health, sanitation and education. On the other hand, there have been numerous attempts to harness the power of IT in developing countries, to try to improve the delivery of such basic services, as well as provide other services that might have been otherwise inaccessible to poor, isolated villagers. Many case studies, newspaper articles and web sites describe various achievements in the use of IT to improve the lives of the poor in poor countries. While we do not have data to directly measure impacts, we can document the extent and patterns of use.

We can also directly gain insights into the behavior of rural computer and Internet users in developing countries, a group whose choices have not previously been analyzed through formal econometric techniques. These results can have wider implications for understanding the future spread of e-commerce, and also the overcoming of the global digital divide. By examining the motivations for using computers and the Internet in these cases, we expect to improve our understanding of demand side barriers to use, which often arise from network economics. For example, if rural Internet users mainly seek information about global market conditions for their crops, individual adoption does not require other local adopters. On the other hand, if the Internet is used for local communication, commercial transactions, and government services, it will be critical that a sufficient number of other local residents are also users. Recent theoretical research (e.g. Ryan and Tucker, 2006) shows that in an environment where agents are heterogeneous and have diverse needs driving demand for ICT services, welfare can be

[4] Microeconomic studies in the context of developed country firms include Brynjolfsson and Hitt (2003) and Bresnahan, Brynjolfsson, and Hitt (2002).

improved by strategically targeting the right subgroup to stimulate adoption. Our work complements this work by measuring the heterogeneity of consumers and their demand needs. We believe our measurements complement network adoption theories to facilitate the formulation of actionable policy directives.

As noted in the introduction, the Chinn and Fairlie (2006) study is the most up-to-date and comprehensive with respect to global digital divide issues. In addition to the variables mentioned, i.e., income per capita, telephone density and regulatory quality, per capita electricity consumption matters up to a threshold level, while human capital variables have the right sign but are statistically insignificant. Somewhat surprisingly, they find that urbanization rates have a negative impact on Internet penetration, which seems to be counter-intuitive (but see below). Chinn and Fairlie survey and critique many previous cross-country studies on the digital divide, and the reader is referred to those.

One study, by Dewan, Ganley and Kraemer (2004), which is not referenced by Chinn and Fairlie, provides a further dimension of analysis. They use quantile regressions to examine how the impact of individual socio-economic factors varies with the level of IT penetration.[5] Using this technique, they find that not only is the level of IT penetration increasing in GDP per capita, but the influence of this factor is stronger in countries with higher IT penetration. For mainframes and PCs, telephone lines per capita, years of schooling, and trade in goods are found to have had similar but stronger effects in developed countries than in developing countries. On the other hand, for Internet users, telephone costs, years of schooling and trade in goods have a stronger impact in countries at lower penetration levels, even controlling for wealth differences. This study therefore suggests that the factors influencing the digital divide are quite nuanced, and not fully captured by standard cross-country regressions. Dewan et al. also find a negative impact of urbanization on IT penetration, and suggest that other means of communication substitute for IT in urban environments. Note that this result is obtained, as is that of Chinn and Fairlie, controlling for differences in infrastructure and incomes. However, the substitution argument may not be completely compelling.

[5] They also examine IT penetration more broadly than simply Internet penetration.

3 Data and Empirical Methods

Data

The data was collected in field surveys supervised and conducted by one of the authors (P.D. Kaushik). Residents of each survey region were asked a detailed series of questions pertaining to household socioeconomic characteristics, economic activities engaged in, and patterns of use of ICTs. Each of the four samples was collected in an area where a governmental agency or NGO provided computer and Internet access to the surrounding population via centrally located internet kiosk. The computer and media usage patterns of respondents are described in Table 1, which presents sample sizes and some summary statistics. It can be seen from Table 1 that each sample location has a fairly high proportion of computer and Internet users, which reflects the accessibility of the kiosks.

Table 1: Data Overview

Initiative	Sample Size	Computer Users (%)	Internet Users (%)	TV Owners (%)	Newspaper Readers (%)	Telephone Owners (%)
VCIP (Bangladesh)	200	73%	48%	26%	89.5%	33.5%
Indreni (Nepal)	100	71%	63%	76%	60%	36%
e-srilanka (Sri Lanka)	200	62.5%	62.5%	85.4%	38%	32.5%

In addition the sample is reasonably well-off, in the sense of having televisions and (less commonly) telephones. Individuals in the sample also rely to a considerable extent on newspapers for information, though the proportion is lowest for the highest income country in the sample, Sri Lanka. The picture is one of relatively sophisticated media consumers who might have many different reasons for recourse to the internet.

Table 2 provides summary data on the initiatives that supported Internet access in each location. This consists of a mix of government and nongovernmental organizations.

Table 2: Overview of Sample Digital Divide Initiatives

Initiative	Organizational Basis	Number of Centers	Population Served per Center
VCIP	Civil Society – Grameen Communications	1	Tangail district populations
Indreni	Civil Society – Nepal Internet Users Group	10	Kathmandu District population
e-srilanka	Government of Sri Lanka and Private Sector (ICTA)	6	Colombo District population

In addition to information about usage and patterns, we have collected data on various individual or household characteristics. The main variables are summarized in Table 3. More detailed descriptions of the data are in Appendix A.

Table 3: Main Variables

Dependent variables	Independent variables
Use computer or not	Sex
Purpose of using computer	Marital status
Educational	Age
Commercial	Education
Personal	Main occupation
Government-related	Income level
Use Internet or not	Sale or own consumption
Purpose of using Internet	Electricity supply quality
Educational	Household income
Commercial	Newspaper readership
Personal	TV ownership
Government-related	Telephone ownership

Empirical Methods

The empirical analysis proceeds by using logit and multinomial logit regressions to analyze the choice to use computers, the choice to use the internet, and the choice between various categories of internet activity/service. We analyze each location separately, in order to allow for different local effects and the possibility of different structural relationships in each area. This permits us to make comparisons across locations to isolate similarities and differences in the factors that affect computer and Internet use on the demand side.

We perform logit analysis for each of the binary decisions: whether to use a computer or not, and (of computer users) whether to use the Internet or not. For computer and Internet users, we also estimate multinomial logit specifications, taking into account three possible categories of use (see Table 3) to determine what factors drive individuals' internet needs.

Unfortunately the dummy variables in various categories are not perfectly comparable across survey sites. This was in most cases due to lack of responses in certain categories and multicolinearity concerns (e.g. when no respondents indicated having income greater than a certain level, the high income dummy had to be redefined with a lower cutoff for that site). The variable definitions for all sites and regressions were constructed to be as comparable as possible given these constraints. The exact definitions are given in the Appendix.

4 Results

Computer Usage

Table 4 shows results logit regressions for the determinants of computer usage at the three survey sites. While the survey methodology and questions were the same across sites, differences in local conditions in variables such as education and income required us to combine categories differently for the sites in the case of such variables, to avoid multicollinearity problems, or other problems of convergence of estimates due to sparse positive observations. However, education and income categories are ordered in the same manner across regressions (e.g. the dummy Income 1 indicates less income than Income

2 if they are in the same regression, but may not be comparable levels of income across regressions). The omitted dummy in the cases of education and income is the lowest level in the category.

Though the results are not uniform across sites, some patterns do emerge. Higher levels of education are associated with higher computer use, though this coefficient is not significant in Sri Lanka. Reading an English language newspaper has a positive and marginally significant effect on the decision to use a computer as well. This is probably an indicator of the need for some English language fluency to obtain many of the benefits of computer usage.

The data may also lend support to the notion that consumers with high desire for other media and communication services perceive the internet as a complementary good. Telephone ownership has a positive and significant impact on computer use in Bangladesh and Sri Lanka, though it is negative and insignificant (statistically as well as in economic magnitude) in Nepal. Most likely, telephones and internet are both used by relatively more sophisticated individuals who have greater communication needs.

Similarly, the quality of the electricity connection has a positive, though statistically insignificant impact on the likelihood of computer usage in Nepal and Sri Lanka, though it had to be omitted from the Bangladesh regression to obtain convergence of the estimates.

In other cases, there are more striking differences across the three locations surveyed. Greater age is associated with less computer use in Sri Lanka, but age was not a significant explanatory factor for the other two countries, and was omitted to ensure convergence of the estimates. The results for income are also somewhat different. While income has a positive but insignificant marginal effect for Nepal and Sri Lanka, it has a negative and significant coefficient for Bangladesh. It is possible that the particulars of the Bangladesh location, either in terms of income distribution, or targeting of the services by the provider, are what is leading to this result. This result is suggestive of the possibility that targeted interventions to provide IT access can be successful in combating the digital divide.

Interestingly, television ownership has a negative and significant effect on the use of computers in Sri Lanka, in contrast to the positive coefficients for the other two sites. In Kendall and Singh (2006) the authors find that games are among the most frequently listed internet uses reported by kiosk owners in rural India. Many households in the Sri Lanka sample may see internet based entertainment as a substitute for TV ownership given a binding budget, or alternatively, time constraint. We did not find income to be a significant control variable in the Sri Lankan regression, so we can not say much about this hypothesis. The contrast between Bangladesh and Sri Lanka with respect to this variable certainly points to the importance of local factors in understanding patterns of use for information technology. Also, in the case of Sri Lanka, having a cable connection is generally associated with higher computer usage, and it is possible that this variable is picking up some of the positive effect of owning a television. At the other two sites, having a cable connection could not be included because of multicollinearity with owning a television.

Finally, in none of the regressions did we find occupational variables to be significant determinants of likelihood of computer usage. Nor did we find gender to be a significant explanatory variable.

Internet Usage

Table 5 presents results of the internet usage logit regressions. As with the computer usage regressions, the variable definitions are not exactly comparable across sites (see Appendix A for exact definitions).

The results are very similar to those for computer use, and reflect the fact that the choice is framed between using the internet and not for the whole sample, rather than being restricted to computer users. Nevertheless, the exercise serves as a useful check on the previous results. Unsurprisingly, being less educated seems to indicate lower recourse for accessing the internet, the parameters on these variables are significant in 2 of three regressions. Again, respondents who read both English and local language newspapers and those who own telephones use the internet more likely to access the internet. The negative and significant coefficient on TV ownership in Sri Lanka also holds in this

regression. Cable connection and telephone ownership are positive in all regressions and significant in the Sri Lanka regression.

The conclusions drawn from the internet usage regressions are similar to those of the computer usage regressions. We find that "user sophistication" as measured by media and communication consumption as well as education seems to be complementary with internet use with the exception of television ownership in Sri Lanka, possibly due to a budget or time constraint, or the effect of the cable connection variable. Interestingly, income plays almost no role in internet or computer usage in two of the three regressions and is negative and significant in Bangladesh. This is may reflect the fact that internet usage is being subsidized at the sample sites by government or NGO support: major costs are often fixed costs of infrastructure (which are subsidized), and marginal costs of use are relatively low, the latter being reflected in pricing of services offered in such circumstances.

Purposes of Computer Use

The regressions in Table 6 are performed on sub-samples of computer users, and the multinomial logit specifications seek to identify how particular characteristics affect the relative likelihood of different choices. Thus, the coefficients for any explanatory variable sum to zero across the four choices, which are educational, commercial, personal and other uses. Personal use includes general browsing, communication, and so on, while 'other' includes government-related activities, such as filling out application forms.

In two of the cases, Sri Lanka and Nepal, because of insufficient variation within the sample, and multicollinearity problems, we were forced to omit many of the potential explanatory variables in order to achieve convergence of our multinomial-logit estimators. Hence, the final specifications presented in Table 6 vary considerably across the four states. The overall fit and explanatory power of the regressions is also quite low. Nevertheless, a few observations are possible.

Educational use is the most frequently reported reason for both computer and internet use, comprising from 32% of computer users in Bangladesh to 51% of users in Nepal. Both education (significant in the case of Bangladesh) and reading of English

language newspapers (positive in all cases and significant in the case Sri Lanka) are associated with using the internet for educational purposes. This use of the internet is clearly an important one and correlates with evidence of pursuing education on other margins. High income in Bangladesh (the only country where we could include this variable) seems to be associated with less educational use of the internet probably reflecting a working population who are no longer pursuing education.

The age variable is positively and significantly related to using computers for commercial purposes in both Bangladesh and Nepal, possibly reflecting higher rates of business ownership at later stages of life.

English newspaper readership as well as television and cable connection ownership is negatively and significantly associated with commercial activity in Sri Lanka and Nepal. In Bangladesh income is negatively associated with commercial use of computers whereas television ownership is positively associated. The results for Sri Lanka and Nepal may pick up an income effect from ownership of television and cable, though why income would be negatively associated with using the computer for commercial purposes is not clear. One possibility is that higher income individuals are employed and it is lower income farmers or small business people who use computers more for commercial purposes such as document preparation or information gathering.

Finally, cable ownership is negatively associated with personal use of computers. In Kendall and Singh (2006) the authors find that games figure highly in reported internet activities and that users are willing to pay for these services. The negative relationship between cable ownership and personal computer use may reflect a substitution effect among forms of entertainment, especially if budgetary constraints are binding.

Purposes of Internet Use

Table 7 presents the results of multinomial logit regressions which regress the various purposes for which the internet was accessed against individual and household characteristics. Again, there were some problems with convergence of the estimates and the small sample sizes meant that some purposes were hardly represented in the sample.

In the tables A.1-3 we can see summary statistics including the relative frequency of internet vs. computer use. Clearly most computer users also use computers to connect to the internet with the percentage of computer users who also used the internet at 66% for Bangladesh, 88% for Nepal, and reaching 100% of the sample in Sri Lanka.

Potentially due to the smaller sample sizes for internet users, as well as the greater problems of convergence in a multinomial logit estimation, fewer variables register as significant in these regressions. Now, commercial internet use seems to be positively associated with income (in Bangladesh and Nepal) and negatively with television ownership, cable connection ownership, and telephone ownership in all regressions, although these relationships are not all significant at 5%. This is the reverse of the pattern in the purpose of computer use regressions. Why this pattern should reverse is not clear and may not be robust to the addition of more data observations. One possible explanation is that, while individuals in these samples typically use computers for both internet- and non-internet-based purposes, those with higher incomes are more likely to need the internet for communication and more sophisticated information gathering.

Overall, there is not perhaps enough detailed information on usage patterns, or on causal factors behind those patterns, to say anything definitive about the possibility of network effects. However, it does seem that in the three samples considered in this analysis, internet users are tapping into existing networks, and the nature of the interactions is not such as would be inhibited by low levels of local adoption. In addition, there is evidence that non-Internet-based computer uses are also important, and these do not rely on network effects.

5 Conclusions

In this paper, we have used data on 500 individuals across three South Asian countries to examine factors that influence computer and Internet use. By taking surveys in areas where computer and Internet services have been provided by NGOs and/or governmental agencies, we have been able to examine fairly rich usage data. An advantage of this kind of microeconometric exercise is that cross-country differences are irrelevant, allowing one to focus on more precise behavioral effects. In the analysis

undertaken here, access problems have been overcome to some extent, or are fairly homogeneous across individuals in any single location. However, there is still considerable variation in factors such as income and education, and we are also able to examine age and gender effects. Indeed one of our conclusions from this research is that one must take local heterogeneity into consideration when trying to determine what will drive demand for computers and internet services.

The data also support the notion that computer and internet users are generally more educated and "media sophisticated" as measured by television usage and English newspaper reading. There are additional indications that entertainment play a significant factor in driving internet demand, paralleling results elsewhere in the literature.[6]

One important finding is that education seems to be an important positive determinant at the micro level, often more strongly than appears to be the case from cross-country studies. Even more, so, there is evidence that some degree of English language fluency is important for IT usage: this is supportive of the idea that lack of local language content in developing countries may be an important contributing factor to the digital divide on the demand side, even when supply constraints are mitigated by subsidies.

Lastly, respondents at all sites reported education as the most common reason for use of the internet and computers in general, indicating the special role that the internet can play in human capital acquisition in these areas. Given the well known externalities that exist in markets for education services, these results support the role of subsidies to internet and computer access to promote increased education attainment and access to specialized educational opportunities that cannot be provided locally.

[6] See Kendall and Singh (2006).

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Appendix: Tables

Table 4	**Computer Use - Logit - Marginal Effects**		
RHS Variable (std. error)	**Bangladesh** dy/dx	**Nepal** dy/dx	**Sri Lanka** dy/dx
Gender			0.072
			{0.140}
Age			-0.013*
			{0.007}
Education 1	0.072	0.127	0.116
	{0.072}	{0.092}	{0.117}
Education 2	0.118*	0.316***	0.177
	{0.070}	{0.102}	{0.114}
Income 1	-0.488***	0.029	
	{0.098}	{0.082}	
Electricity Connection		0.141	0.289
		{0.120}	{0.210}
English Newspaper	0.190***	0.273***	0.170
	{0.051}	{0.074}	{0.110}
Own Television	0.360***	0.142	-0.244***
	{0.058}	{0.119}	{0.066}
Own Cable Connex.			0.152*
			{0.081}
Own Telephone	0.199***	-0.065	0.332***
	{0.057}	{0.108}	{0.072}
Observations	200	100	199
Pseudo-R-squared	0.2917	0.2548	0.1989

*Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1*

Due to insufficient sample variation, education, income, and occupation dummies are defined slightly differently across provinces (see Appendix A). Lowest category is ommitted when applicable (i.e. no education, low income)

Table 5 **Internet Use - Logit - Marginal Effects**

RHS Variable (std. error)	**Bangladesh** dy/dx	**Nepal** dy/dx	**Sri Lanka** dy/dx
Gender			0.071
			{0.140}
Age		-0.009	-0.013*
		{0.006}	{0.007}
Education 1	0.234*	0.200	0.107
	{0.124}	{0.129}	{0.118}
Education 2	0.209*	0.419***	0.183
	{0.126}	{0.125}	{0.113}
Income 1	-0.773***	0.150	0.127
	{0.064}	{0.105}	{0.082}
Occupation 1			0.118
			{0.078}
Electricity Connection		0.129	0.314
		{0.138}	{0.207}
	{0.103}	{0.081}	{0.106}
Own Television	0.041	0.197	-0.230***
	{0.187}	{0.151}	{0.069}
Own Cable Connex.			0.187**
			{0.084}
Own Telephone	0.146	0.026	0.332***
	{0.115}	{0.120}	{0.072}
Observations	200	100	199
Pseudo-R-squared	0.4281	0.3502	0.2069

*Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1*

Due to insufficient sample variation, education, income, and occupation dummies are defined slightly differently across provinces (see Appendix A). Lowest category is omitted when applicable (i.e. no education, low income)

Table 6 **Purposes of Computer Use - Logit - Marginal Effects (**dy/dx)

RHS Variable {std dev}	Bangladesh Education	Bangladesh Commerce	Bangladesh Personal/ Other	Nepal Education	Nepal Commerce	Nepal Personal/ Other	Sri Lanka Education	Sri Lanka Commerce	Sri Lanka Personal	Sri Lanka Other
Age	-0.005	0.023***	-0.018	0.002	0.012**	-0.014**				
	{0.010}	{0.008}	{0.013}	{0.007}	{0.005}	{0.006}				
Education 1	0.202**	0.005	-0.207							
	{0.104}	{0.094}	{0.132}							
Income	-0.301***	-0.537***	0.837***							
	{0.107}	{0.109}	{0.077}							
English News Paper	0.254	0.084	-0.337	0.065	-0.191**	0.126	0.471***	-0.275***	-0.031	-0.165**
	{0.137}	{0.126}	{0.146}	{0.142}	{0.094}	{0.132}	{0.160}	{0.150}	{0.867}	{0.080}
Own Television	-0.306**	0.475**	-0.170	0.258	-0.451*	0.193*	0.400***	-0.590***	0.055	0.136*
	{0.141}	{0.234}	{0.242}	{0.234}	{0.236}	{0.105}	{0.288}	{0.140}	{0.120}	{0.200}
Own Cable Connex.				0.242*	0.016	-0.258**	0.453***	-0.321***	-0.184**	0.053
				{0.139}	{0.105}	{0.127}	{0.136}	{0.175}	{0.176}	{0.129}
Own Telephone				0.019	-0.156	0.137	-0.347***	0.276**	0.144*	-0.073
				{0.132}	{0.096}	{0.116}	{0.138}	{0.167}	{0.149}	{0.127}
Own Computer	0.192	0.291	-0.483***							
	{0.188}	{0.192}	{0.090}							
Observations	146	146	146	71	71	71	124	124	124	124
Pseudo-R-squared	0.36	0.36	0.36	0.23	0.23	0.23	0.23	0.23	0.23	0.23

*Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1*

Due to insufficient sample variation, education, income, and occupation dummies are defined slightly differently across provinces (see Appendix A). Lowest category is omitted when applicable (i.e. no education, low income)

Table 7 **Purposes of Internet Use - Logit - Marginal Effects (**dy/dx)

RHS Variable	Bangladesh			Nepal			Sri Lanka			
{std dev}	Education	Commerce	Personal/ Government	Education	Commerce	Personal/ Government	Education	Commerce	Personal	Government
Age	0.003	-0.008	0.006	0.004	0.000	-0.004				
	{0.009}	{0.009}	{0.009}	{0.007}	{0.004}	{0.006}				
Income	-0.179	0.430*	-0.251**	-0.023	0.148*	-0.125				
	{0.204}	{0.260}	{0.127}	{0.136}	{0.086}	{0.115}				
English Newspaper				0.123	-0.058	-0.065	0.306*	0.031	-0.064	-0.272***
				{0.135}	{0.087}	{0.120}	{0.122}	{0.111}	{0.065}	{0.066}
Own Television	0.041	-0.275***	0.234				-0.074	-0.159	0.117*	0.116
	{0.229}	{0.088}	{0.237}				{0.160}	{0.131}	{0.062}	{0.088}
Own Cable Connex.				0.293**	-0.190*	-0.103	0.245**	-0.135	-0.047	`-0.063
				{0.136}	{0.106}	{0.125}	{0.111}	{0.091}	{0.070}	{0.087}
Own Telephone	0.031	-0.113	0.082	0.053	-0.124	0.071	0.021	-0.044	0.020	0.003
	{0.111}	{0.096}	{0.107}	{0.130}	{0.085}	{0.111}	{0.113}	{0.089}	{0.071}	{0.088}
Observations	96	96	96	63	63	63	124	124	124	124
Pseudo-R-squared	0.03	0.03	0.03	0.17	0.17	0.17	0.09	0.09	0.09	0.09

*Notes: Standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1*

Due to insufficient sample variation, education, income, and occupation dummies are defined slightly differently across provinces (see Appendix A). Lowest category is omitted when applicable (i.e. no education, low income).

Appendix A
Variable summary statistics and definitions by survey site.

Table A.1 Bangladesh

Variable Name	Variable	Freq./Ave	Codes	Description
	LHS Variables			
Computer Use	use_comp	73% 27%	Yes : 1 No: 0	Did they use a computer?
Purpose of Computer Use	purp_use	32.19% 25.34% 12.33% 30.14%	Education/student : 1 Commercial : 2 Personal / official : 3 Others : 4	What is the purpose of using the computer?
	purp_use 3&4 comined	42.47%		
Internet Use	use_inet	48% 52%	Yes : 1 No : 0	Do they use internet?
Purpose of Internet Use	purp_inet	38.54% 29.17% 20.83% 11.46%	Education/student : 1 Commercial : 2 Personal / official : 3 Government : 4	What is their purpose for using internet?
	purp_inet 3&4 comined	32.29%		
	RHS Variables			
Age	age	Ave:28.29 Range:19-55		Age of the respondent & other members of the family

	educ	0 14.50% 6% 0.50% 9.50% 31.50% 18.50% 19.50%	Illiterate : 0 Semi-Literate : 1 Primary : 2 Middle school : 3 Secondary school : 4 Higher secondary : 5 Graduate : 6 Post graduate : 7 Others : 8	Education level of the respondent & other members of the family
Education 1 in usage	educ3_second_highsec	41%		combined secondary and higher secondary
Education 2 in usage	educ4_grad_postgrad	38%		combined graduate and post graduate
Education 1 in purpose	educ3_4	79%		combined secondary, higher secondary, graduate and post graduate
	en_conn	94.50% 5.50%	Yes :1 No :0	Does the user have electricity connection?
		4.50% 35% 55% 5.50%	Good :1 Avg :2 Poor :3 Unconnected :4	Combined electricity status 1,2,&3 vs. 4
	in_come	59.50% 36.50% 4% 0	< 10,000 :1 10,000-25,000 :2 25,000-50,000 :3 > 50,000 :4	Household income per annum
Income 1	inc_234	40.50%		users with income of <10,000 users in the income levels 2,3,&4 combined
	npap_lang	73.50% 0 16.00% 10.50%	Hindi/Local : 1 English : 2 Both : 1,2 None : 0	Language of the newspaper

	npap_both	16.00%		household receives both hindi/local and english language
English Newspaper	eng_both_npap_lang	16.00%		combined households that receive english and both languages
	occ_main		None : 0	Main occupation of the respondent
		19.50%	Farming : 1	
		1%	Animal Rearing : 2	
		31%	Trade/Business : 3	
		42.50%	Employed : 4	
		0.50%	Student : 5	
		5.50%	Other : 6	
Occupation 1	occ2_farm_anrear	20.50%		combined occupations 1&2
Own Cable Connection	own_cc	21%	Yes : 1	Do they own cable connection?
		79%	No : 0	
Own Computer	own_comp	5.50%	Yes : 1	Do they own a computer?
		94.50%	No : 0	
Own Telephone	own_tel	33.50%	Yes : 1	Do they own a telephone?
		66.50%	No : 1	
Own Television	own_tv	26%	Yes : 1	Do they own TV?
		74%	No : 0	
Gender	sex	95.50%	Male : 1	Sex of the respondent & other members of the family
		4.50%	Female : 0	

Table A.2 Nepal

Variable Name	Variable	Freq./Ave	Codes	Description
	LHS Variables			
Computer Use	use_comp	71% 29%	Yes : 1 No: 0	Did they use a computer?
Purpose of Computer Use	purp_use	50.70% 23.94% 15.49% 9.86%	Education/student : 1 Commercial : 2 Personal / official : 3 Others : 4	What is the purpose of using the computer?
	purp_use 3&4	25.35%		
Internet Use	use_inet	63% 37%	Yes : 1 No : 0	Do they use internet?
Purpose of Internet Use	purp_inet	61.90% 17.46% 9.52% 11.11%	Education/student : 1 Commercial : 2 Personal / official : 3 Government : 4	What is their purpose for using internet?
	purp_inet 3&4	20.63		
	RHS Variables			
Age	age	Average: 33.69 Range:20-58		Age of the respondent & other members of the family
	cr_reason	25% 39% 19% 17%	Sale : 1 Own consumption : 2 Both :1,2 None : 0	Crop reason What is the purpose for the agriculture product?

	sale_cr_reason	25%		crop reason- to sell
	educ	6%	Illiterate : 0	Education level of the respondent & other members of the family
		2%	Semi-Literate : 1	
		5%	Primary : 2	
		7%	Middle school : 3	
		19%	Secondary school : 4	
		20%	Higher secondary : 5	
		25%	Graduate : 6	
		16%	Post graduate : 7	
			Others : 8	
Education 1	educ2_prim_midd	12%		combined primary and middle education
Education 2	educ3_4	80%		combined secondary, higher secondary, graduate and post graduate
Electrictiy Connection	en_conn	79%	Yes :1	Does the user have electricity connection?
		21%	No :0	
		26%	Good :1	Combined electricity status 1,2,&3 vs. 4
		28%	Avg :2	
		25%	Poor :3	
		21%	Unconnected :4	
	in_come	52%	< 10,000 :1	Household income per annum
		39%	10,000-25,000 :2	
		9%	25,000-50,000 :3	
		0	> 50,000 :4	
Income 1	inc_234	48%		users in the income levels 2,3,&4 combined
	npap_lang	34%	Hindi/Local : 1	
		2%	English : 2	
		24%	Both: 1,2	
		40%	None : 0	
	npap_both	3.33%		household receives both hindi/local and english language
English Newspaper	eng_both_npap_lang	26%		combined households that receive english and both languages

	occ_main	8% 21% 1% 22% 43% 0 5%	None : 0 Farming : 1 Animal Rearing : 2 Trade/Business : 3 Employed : 4 Student : 5 Other : 6	Main occupation of the respondent
Occupation 1	occ2_farm_anrear	22%		combined occupations 1&2
Own Cable Connection	own_cc	39% 61%	Yes : 1 No : 0	Do they own cable connection?
Own Computer	own_comp	9% 91%	Yes : 1 No : 0	Do they own a computer?
Own Telephone	own_tel	36% 64%	Yes : 1 No : 1	Do they own a telephone?
Own Television	own_tv	76% 24%	Yes : 1 No : 0	Do they own TV?
Gender	sex	91% 9%	Male : 1 Female : 0	Sex of the respondent & other members of the family

Table A.3 Sri Lanka

Variable Name	Variable	Freq./Ave	Codes	Description
	LHS Variables			
Computer Use	use_comp	62.50% 37.50%	Yes : 1 No: 0	Did they use a computer?
Purpose of Comp Use	purp_use	43.20% 30.40% 10.40% 16%	Education/student : 1 Commercial : 2 Personal / official : 3 Others : 4	What is the purpose of using the computer?
Internet Use	use_inet	62.50% 37.50%	Yes : 1 No : 0	Do they use internet?
Purpose of inet Use	purp_inet	44% 18.40% 12.80% 24.80%	Education/student : 1 Commercial : 2 Personal / official : 3 Government : 4	What is their purpose for using internet?
	RHS Variables			
Age	age	Average: 26.51 Range:19-40		Age of the respondent & other members of the family
	educ	0.50% 10.50% 8% 12% 21.50% 17.50% 18% 11% 1%	Illiterate : 0 Semi-Literate : 1 Primary : 2 Middle school : 3 Secondary school : 4 Higher secondary : 5 Graduate : 6 Post graduate : 7 Others : 8	Education level of the respondent & other members of the family

Education 1	educ2_prim_midd	20%		combined primary and middle education
Education 1 or 2	educ3_4	68%		combined secondary, higher secondary, graduate and post graduate
Electrictiy Connection	en_conn	96%	Yes :1	Does the user have electricity connection?
		4%	No :0	
		14.50%	Good :1	Combined electricity status 1,2,&3 vs. 4
		`35.5%	Avg :2	
		46%	Poor :3	
		4%	Unconnected :4	
	in_come	37.50%	< 10,000 :1	Household income per annum
		37.50%	10,000-25,000 :2	
		24.50%	25,000-50,000 :3	
		0.50%	> 50,000 :4	
Income 1	inc_234	62.50%		users in the income levels 2,3,&4 combined
	npap_lang	24.50%	Hindi/Local : 1	Language of the newspaper
		1.50%	English : 2	
		12.00%	Both: 1,2	
		62.00%	None : 0	
English Newspaper	eng_both_npap_lang	13.50%		combined households that receive english and both languages
	occ_main	1.50%	None : 0	Main occupation of the respondent
		29%	Farming : 1	
		1%	Animal Rearing : 2	
		17.50%	Trade/Business : 3	
		45.50%	Employed : 4	
		0	Student : 5	
		5.50%	Other : 6	
Occupation 1	occ2_farm_anrear	30%		combined occupations 1&2

Own Cable Connection	own_cc	44% 56%	Yes : 1 No : 0	Do they own cable connection?
Own Computer	own_comp	3.50% 96.50%	Yes : 1 No : 0	Do they own a computer?
Own Telephone	own_tel	32.50% 67.50%	Yes : 1 No : 1	Do they own a telephone?
Own Television	own_tv	85.43% 14.57%	Yes : 1 No : 0	Do they own TV?
Gender	sex	90.50% 9.50%	Male : 1 Female : 0	Sex of the respondent & other members of the family