Characteristics of households with ICTs in Latin America and the Caribbean

Observatory for the Information Society in Latin America and the Caribbean (OSILAC)

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Contents

Figures

Tables

I. Introduction

This report examines the availability of information and communication technologies (ICTs) in households in Latin America and the Caribbean region. It draws on household surveys from a number of countries in the region conducted over the last few years. These surveys are contained in the Economic Commission for Latin America and the Caribbean (ECLAC) Database of Household Surveys (BADEHOG, *Banco de Datos de Encuestas de Hogares*), a restricted access database. The ICTs that have been analyzed are:[1]

- Radio

- Television

- Fixed telephone

- Mobile telephone

- Computer

- Internet

The scope of the countries and ICTs covered is presented in Table 1-1. As can be seen, not all countries in the region are included (e.g., Argentina, Ecuador, Panama). Nonetheless, the surveys cover over three quarters of the countries in the region and due to the inclusion of larger countries such as Brazil and Mexico, over 80% of the region's households are included. Not all of the ICTs are available for all of the countries for all of the years. Furthermore, surveys have not been carried out in all years. This limits to some extent the scope of the analysis.

The surveys include household and head of household characteristics allowing ICT information to be cross-referenced with socio-economic data. Due to different classifications and variables that are specific to a country (e.g., ethnic groups), not all of the socio-economic factors

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[1] Other ICTs covered in some surveys by some countries include appliances such as fax, DVD, pager (i.e., beeper), etc. as well as variations on some of the main ICTs the report focuses on (e.g., cable and satellite TV, broadband and narrowband Internet access, etc.). Since these items have not been systematically collected by all countries, they have not been reviewed in this report.

can be directly compared with other countries. However, a number of the other variables are directly comparable (e.g., gender, age, household size).

Section 2 provides an overview of the status of ICTs in households in the region. Section 3 examines socio-economic factors impacting ICT availability. Section 4 provides conclusions and section 5 recommendations.

TABLE 1-1
AVAILABILITY OF ICT INFORMATION IN HOUSEHOLD SURVEYS

	Year(s)	Radio	TV	Fixed Telephone	Mobile	Computer	Internet
Bolivia	2001	Yes	Yes	Any telephone		Yes	No
	2002	Yes	Yes	Any telephone		Yes	No
Brazil	2001	Yes	Yes*	Yes	Yes	Yes	Yes
	2002	Yes	Yes*	Yes	Yes	Yes	Yes
	2003	Yes	Yes*	Yes	Yes	Yes	Yes
	2004	Yes	Yes*	Yes	Yes	Yes	Yes
	2005	Yes	Yes*	Yes	Yes	Yes	Yes
Chile	2000	No	No	Yes	Yes	Yes	Yes
	2003	No	No	Yes	Yes	Yes	Yes
Colombia	2000	Yes	Yes*	Yes	No	No	No
Costa Rica	2000	Yes	Yes*	Yes	Yes	Yes	Yes
	2001	Yes	Yes*	Yes	Yes	Yes	Yes
	2002	Yes	Yes*	Yes	No	Yes	Yes
	2004	Yes	Yes*	Yes	Yes	Yes	No
	2005	Yes	Yes*	Yes	Yes	Yes	No
Dominican Republic	2001	Yes	Yes	Yes	No	Yes	No
	2002	Yes	Yes	Yes	No	Yes	No
	2003	Yes	Yes	Yes	Yes	Yes	No
	2004	Yes	Yes	Yes	Yes	Yes	No
	2005	Yes	Yes	Yes	Yes	Yes	No
El Salvador	2000	Yes	Yes	Yes	Yes	Yes	Yes
	2001	Yes	Yes	Yes	Yes	Yes	Yes
	2002	Yes	Yes	Yes	Yes	Yes	Yes
	2003	Yes	Yes	Yes	Yes	Yes	Yes
	2004	Yes	Yes	Yes	Yes	Yes	Yes
	2005	Yes	Yes	Yes	Yes	Yes	Yes
Guatemala	2000	Yes	Yes	Yes	Yes	Yes	Yes
Honduras	2003	Yes	Yes	Yes	Yes	Yes	No
Mexico	2000	Yes	Yes*	Yes	No	Yes	No
	2002	Yes	Yes*	Yes	Yes	Yes	Yes
	2004	Yes	Yes*	Yes	Yes	Yes	Yes
	2005	Yes	Yes*	Yes	Yes	Yes	Yes
Nicaragua	2001	Yes	Yes	Yes	Yes	Yes	No
Paraguay	2001	Yes	Yes	Yes	Yes	Yes	Yes
	2002	No	Yes	Yes	Yes	Yes	Yes
	2003	No	Yes	Yes	Yes	Yes	Yes
	2004	No	Yes	Yes	Yes	Yes	Yes
	2005	Yes	Yes	Yes	Yes	Yes	Yes
Peru	2000	No	No	Yes	Yes	No	Yes
	2001	Yes	Yes	Yes	Yes	Yes	Yes
	2002	Yes	Yes	Yes	Yes	Yes	Yes
	2003	Yes	Yes	Yes	Yes	Yes	Yes

	Year(s)	Radio	TV	Fixed Telephone	Mobile	Computer	Internet
Uruguay	2001	No	Yes*	Yes	No	Yes	Yes
	2002	No	Yes*	Yes	No	Yes	Yes
	2003	No	Yes*	Yes	No	Yes	Yes
	2004	No	Yes*	Yes	No	Yes	Yes
	2005	No	Yes*	Yes	No	Yes	Yes
Venezuela	2003	Yes	Yes	Yes	Yes	Yes	Yes
	2004	Yes	Yes	Yes	Yes	Yes	Yes
	2005	Yes	Yes	Yes	Yes	Yes	Yes

Source: OSILAC compilation from BADEHOG and National Statistical Offices
Note: * Color television.

II. Overall status
and trends

Table 2-1 summarizes the availability of ICTs in households in the Latin America and Caribbean region (LAC). Since surveys have not been carried out each year for all countries, comparisons are not always possible across the same year. Given that changes in access to ICTs is generally dynamic, care should be taken in interpreting the data particularly when making cross-country comparisons. For example, the only survey for Guatemala is from 2000 and the situation is likely to have changed significantly over the first half of the decade.

There are wide variations in access to ICTs showing that there is also a regional digital divide (Figure 2-1). Some countries have achieved household television penetration of over 90% while others are still below 50%. The differences between the country with the highest penetration and the one with the lowest increases with the sophistication of the ICT. While the difference in household television penetration between the maximum and minimum is around two, for Internet access it is 15. The chart below also shows the general progression in availability of ICTs with televisions being the highest in all countries and Internet access being the lowest. Note that due to definitional and other methodological issues, it is not possible to accurately compare the availability of radios.

FIGURE 2-1
MAXIMUM AND MINIMUM VALUE IN HOUSEHOLD ICT PENETRATION IN LATIN AMERICA AND THE CARIBBEAN, LATEST AVAILABLE DATA
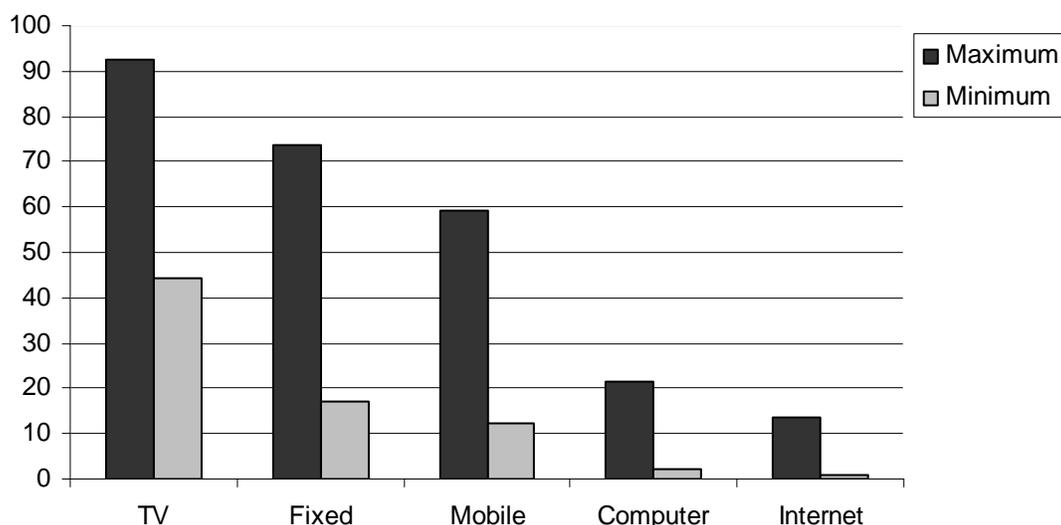
Source: BADEHOG.
Note: This chart shows the minimum and maximum values in the region for each of the ICTs. The data can vary between years so the actual differences may not be as great as if data were available for the same year for all countries for each indicator. The values for TV are not strictly comparable as some countries refer to all TVs whereas others only refer to color TV.

The progression of ICTs in households in the region during the first half of the first decade of the twenty first century has been uneven. In general, "newer" ICTs such as mobile phones and the Internet have grown faster than older ones such as televisions and fixed telephone lines.

The remainder of this chapter looks more deeply into trends in each individual ICT.

TABLE 2-1
PERCENTAGE OF HOUSEHOLDS WITH ICTS

	2000	2001	2002	2003	2004	2005	AAGR†
	Radio						
Bolivia	…	68.1	65.8	…	…	…	
Brazil	…	87.8	87.7	87.7	87.6	87.9	0%
Chile	…	…	…	…	…	…	
Colombia	40.3	…	…	…	…	…	
Costa Rica	50.2	52.5	54.6	…	54.8	55.0	2%
Dominican Republic	75.9	75.9	75.5	72.0	71.6	71.0	-1%
El Salvador	62.2	65.1	58.0	55.3	58.3	…	-2%
Guatemala	25.5	…	…	…	…	…	
Honduras	…	…	…	81.7	…	…	
Mexico	31.4	…	29.4	…	26.3	26.1	-4%
Nicaragua	…	36.2	…	…	…	…	
Paraguay	…	33.2	…	…	…	80.8	25%
Peru	…	73.3	73.7	70.2	…	…	-2%
Uruguay	…	…	…	…	…	…	
Venezuela	…	…	…	78.4	79.0	82.8	3%
	TV						

	2000	2001	2002	2003	2004	2005	AAGR†
Bolivia	…	58.2	57.4	…	…	…	
Brazil*	…	82.8	84.9	85.7	86.8	88.6	2%
Chile	…	…	…	…	…	…	
Colombia*	73.7	…	…	…	…	…	
Costa Rica*	85.3	87.0	89.9	…	90.1	91.3	1%
Dominican Republic	82.3	82.2	81.6	79.7	81.7	80.9	0%
El Salvador	73.8	75.8	76.9	75.9	77.8	…	1%
Guatemala	53.9	…	…	…	…	…	
Honduras	…	…	…	57.0	…	…	
Mexico*	89.6	…	79.8	…	85.2	86.7	-1%
Nicaragua	…	36.4	…	…	…	…	
Paraguay	…	76.0	74.4	75.9	76.1	79.1	1%
Peru*	…	40.9	43.8	44.2	…	…	4%
Uruguay*	…	93.1	92.9	91.4	91.9	92.4	0%
Venezuela	…	…	…	90.2	89.9	91.5	1%
Fixed telephone							
Bolivia	…	…	…	…	…	…	
Brazil	…	51.0	52.7	50.7	48.8	48.0	-1%
Chile	53.9	…	…	51.5	…	…	-2%
Colombia	51.3	…	…	…	…	…	
Costa Rica	57.9	61.4	62.2	…	63.7	64.6	2%
Dominican Republic	35.3	36.2	35.7	29.7	31.3	29.7	-3%
El Salvador	31.8	37.0	38.2	36.0	37.5	…	4%
Guatemala	33.0	…	…	…	…	…	
Honduras	…	…	…	17.3	…	…	
Mexico	39.1	…	41.1	…	45.0	51.1	6%
Nicaragua	…	10.6	…	…	…	…	
Paraguay	…	19.3	14.2	17.4	16.3	18.6	-1%
Peru	23.0	20.4	21.0	22.9	…	…	6%
Uruguay	…	73.8	72.7	71.5	74.0	73.9	0%
Venezuela	…	…	…	29.8	31.9	34.5	8%
Mobile telephone							
Bolivia	…	…	…	…	…	…	
Brazil	…	31.0	34.6	38.5	47.7	59.2	18%
Chile	25.8	…	…	46.6	…	…	22%
Colombia	…	…	…	…	…	…	
Costa Rica	12.7	17.1	…	…	42.6	49.0	31%
Dominican Republic	…	…	…	31.2	40.0	45.3	13%
El Salvador	10.2	10.6	11.9	13.5	24.4	…	24%
Guatemala	9.7	…	…	…	…	…	
Honduras	…	…	…	13.0	…	…	
Mexico	…	…	20.3	…	34.5	41.1	27%
Nicaragua	…	3.4	…	…	…	…	
Paraguay	…	27.7	30.5	31.2	36.0	49.0	15%
Peru	6.5	7.6	8.3	12.1	…	…	23%
Uruguay	…	…	…	…	…	…	
Venezuela	…	…	…	29.6	29.7	25.7	-7%
Computer							
Bolivia	…	6.9	7.1	…	…	…	
Brazil	…	12.6	14.2	15.3	16.3	18.5	10%
Chile	17.5	…	…	24.9	…	…	12%
Colombia	…	…	…	…	…	…	
Costa Rica	13.7	17.3	19.9	…	23.7	26.6	14%
Dominican Republic	…	5.0	6.2	7.6	8.4	8.9	15%
El Salvador	2.7	4.5	5.2	5.5	6.0	…	22%
Guatemala	4.3	…	…	…	…	…	
Honduras	…	…	…	5.2	…	…	
Mexico	10.4	…	13.7	…	16.7	18.4	12%
Nicaragua	…	2.2	…	…	…	…	
Paraguay	…	5.3	5.4	6.3	6.4	8.7	13%

	2000	2001	2002	2003	2004	2005	AAGR†
Peru	…	5.3	6.5	6.6	…	…	12%
Uruguay	…	17.7	17.8	18.6	20.6	21.9	5%
Venezuela	…	…	…	9.9	9.6	10.3	2%
Internet							
Bolivia	…	…	…	…	…	…	
Brazil	…	8.5	10.3	11.4	12.2	13.6	12%
Chile	8.6	…	…	13.1	…	…	15%
Colombia	…	…	…	…	…	…	
Costa Rica	4.0	5.3	7.2	…	…	…	
Dominican Republic	…	…	…	…	…	…	
El Salvador	1.1	1.7	2.3	2.5	2.1	…	17%
Guatemala	0.9	…	…	…	…	…	
Honduras	…	…	…	…	…	…	
Mexico	…	…	5.3	…	7.4	8.1	15%
Nicaragua	…	…	…	…	…	…	
Paraguay	…	1.0	1.2	1.8	1.3	4.5	45%
Peru	0.6	0.5	0.8	1.4	…	…	33%
Uruguay	…	13.2	13.8	13.5	13.4	13.4	0%
Venezuela	…	…	…	2.2	2.2	2.5	7%

Source: Adapted from BADEHOG.

Note: † Annual average growth rate (calculated as the annual growth between the most recent and oldest data for each country).

* Color TV.

1. Radio

Radio should be the most widely available ICT. Radios are relatively inexpensive and do not require electricity nor payments for reception after the device has been purchased. Terrestrial radio broadcasting coverage is also fairly ubiquitous in most countries. Yet according to the survey data, the level of radio penetration in some countries is low. The main reason is that radios can be embedded into a number of devices including hi-fi systems, cars, alarm clocks, etc. Therefore, depending on how the question is asked, the response may not reflect true household ownership of devices with a radio.

The radio question in the surveys is shown in Table 2-2. In Mexico, only 26.3% of households reported having a "radio" less than half the percentage of color televisions (86.7%). On the other hand, the Mexican surveys also include questions on whether the household has stereos, CD components or tape players and it is possible that these devices would also contain radios. For example, 58% of Mexican households reported having a stereo which likely also includes a built-in radio. Adding all household having devices which possibly includes a radio, the INEGI reported 84.0%. For these reasons, the data on radios in households is not optimal. According to the available data, only Bolivia, Honduras and Peru have more "radios" in households than televisions. If we include stereos and tape players, El Salvador, Guatemala and Nicaragua would also have more radio than televisions.

TABLE 2-2
RADIO SURVEY QUESTION

Country	Year	Country Variable	Question	% households
Bolivia	2002	TIENE03	MINICOMPONENTE O EQUIPO DE SONIDO (Pregunta 16: ¿El hogar tiene minicomponente, radiograbadora, equipo de sonido? y Pregunta 17: ¿Cuántos minicomponentes, radiograbadoras, equipos de sonido posee o tiene el hogar?)	65.8%
Brazil	2005	RADIO	RADIO (Pregunta 25: ¿Esta vivienda tiene radio?)	87.9%
Costa Rica	2004	EQUIPO	¿TIENE EQUIPO DE SONIDO? (Pregunta 16: ¿Tienen en esta vivienda equipo de sonido?)	54.8%
Dominican Republic	2004	RADIO	RADIO (Pregunta 1: ¿Tiene usted o algún miembro de su hogar … a. Radio?)	71.6%
El Salvador	2004	RADIO EQUIPO	RADIO (Pregunta 325: Equipamiento del hogar. 01. Radio) RADIO Y EQUIPO DE SONIDO	58.3% 82.1%
Guatemala	2000	TIENE23 TIENE25	RADIO TRANSISTOR (Pregunta 2: ¿Cuántos(as) (radio transistor) tiene este hogar?) RADIO TRANSISTOR Y GRABADORA/RADIOGRABADORA (Pregunta 2:¿Cuántos(as) (grabadora/radiograbadora) tiene este hogar?)	25.5% 68.2%
Honduras	2003	RADIO	¿TIENE RADIO? (Pregunta 11: ¿Tiene en esta vivienda los siguientes bienes? e: Radio)	81.7%
Mexico	2004	EQHOG05N EQHOG03N, EQHOG04N	RADIO (Pregunta 8: ¿Este hogar cuenta con radio? Pregunta 10: ¿Cuántos son?) RADIOGRABADORA (Pregunta 8: ¿Este hogar cuenta con radiograbadora sin reproductor de CD/con reproductor de CD? Pregunta 10: ¿Cuántos son?)	26.3% 84.0%
Nicaragua	2001	RADIO EQSONIDO	RADIO (Pregunta 1: ¿Tiene este hogar radio? y Pregunta 2: ¿Cuántos tiene?) RADIO Y EQUIPO DE SONIDO	36.2% 50.1%
Paraguay	2001	TIENE08 TIENE09	EQUIPO DE SONIDO (Pregunta 27: ¿Tiene el hogar algunos de los siguientes bienes utilizados mayormente por el hogar? 8: Equipo de sonido) EQUIPO DE SONIDO Y RADIO GRABADORA (Pregunta 27: ¿Tiene el hogar algunos de los siguientes bienes utilizados mayormente por el hogar? 9: Radio grabadora)	33.2% 66.2%
Peru	2001	TIENE01	RADIO (Pregunta 612: ¿Su hogar tiene radio? y Pregunta 612-A: ¿Cuántos tiene?)	73.3%
Venezuela	2003	RADIO	RADIO (Pregunta 14.10: ¿De cual de los siguientes artefactos domésticos dispone este hogar?)	78.4%

Source: Adapted from BADEHOG.
Note: Chile and Uruguay did not survey radios.

2. Television

One of the issues in analyzing the availability of televisions in Latin American households are the different variables used in the surveys. Some countries refer to the availability of any television *while* others distinguish between color and black and white. The latter method may have some analytical importance in terms of the modernity of the equipment but the former is more analytically useful and helps to simplify the data set. One shortcoming is that it is often not possible to determine if a household has either a black and white or a color TV.

Over half the households in all countries except Nicaragua (2001) have a television set (Figure 2-2).[2] Many countries in the region have more than three quarters of households with a television and some are approaching nine out of ten households with a television. Overall growth has been low which is not surprising given the relatively high penetration of televisions, particularly in respect to other ICTs. Nonetheless, there is some concern with the low growth, particularly in countries with relatively low television penetration rates. It appears that this may partly be due to a lack of electricity in some households.

FIGURE 2-2
HOUSEHOLDS WITH A TELEVISION, 2005
Percentage
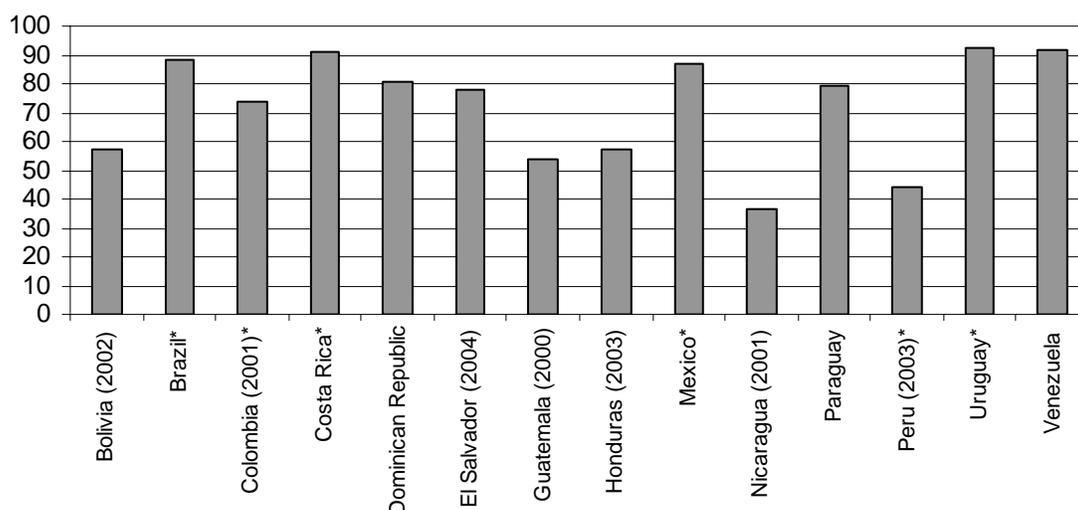
Source: Own calculations based on BADEHOG.
Note: * Color television. Chile did not report this indicator.

Some countries also collect other television related variables such as households with cable television and satellite television. An analysis of this data has not yet been carried out due to the incomplete data set but the availability of multi-channel television and its implications merit further study in the future.

3. Telephone

The availability of fixed and mobile telephones in households have been asked for in most surveys. Home telephone ownership is an important indicator of universal service.

Among countries that have several years of household data and collect the mobile telephone variable, the availability of mobile phones in households is growing. Yet surprisingly, it had not exceeded 50% in 2005, except for Brazil. The nation of Paraguay provides a good example of the popularity of mobile phones and the decline of fixed. Mobile household penetration has continued to increase in Paraguay while by the end of 2005, fixed line penetration was less than where it had been in 2001 (Figure 2-3).

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2   It is assumed that in Peru, the level of total household penetration of televisions is over 50% since most households would not have both a black and white and color TV.

FIGURE 2-3
PERCENTAGE OF PARAGUAYAN HOUSEHOLDS WITH A TELEPHONE
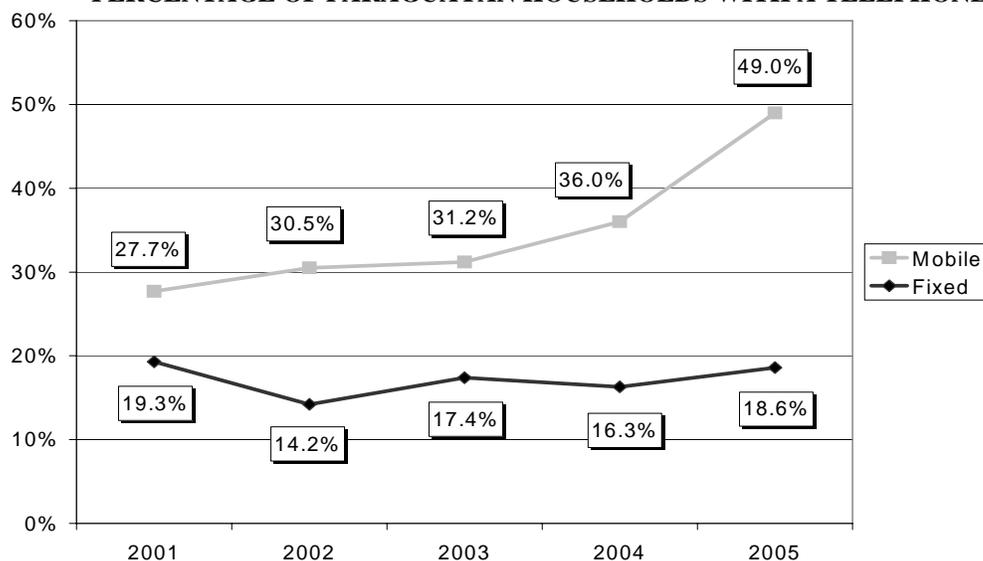
Source: Own calculations based on BADEHOG.

While the availability of fixed or mobile telephones in households are each important, it is also analytically useful to know about the availability of any telephone in the home. For example, in the case of Bolivia, a single household telephone indicator is provided. However, the optimal solution is to ask about the availability of only a fixed phone, only a mobile phone or both. In some cases, the surveys do not allow this type of distinction, however recent household surveys are following the global agreements on the list of core indicators,[3] were fixed telephone and mobile are recommended as separated indicators. In El Salvador, surveys prior to 2004 did have this sort of breakdown (Figure 2-4).

FIGURE 2-4
HOUSEHOLD TELEPHONE PENETRATION, EL SALVADOR, 2003
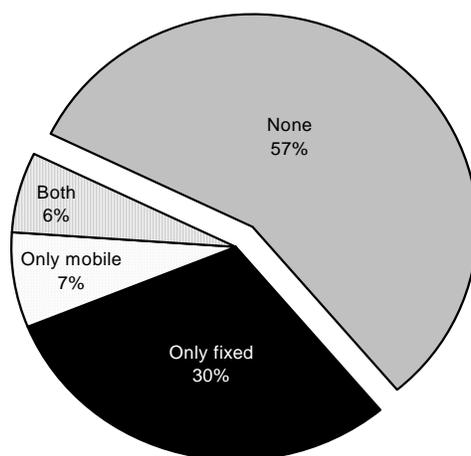
Source: Own calculations based on BADEHOG.

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3   Partnership on Measuring ICT for Development. 2005. *Core ICT Indicators*. http://www.cepal.org/socinfo/ noticias/documentosdetrabajo/6/23116/Partnership%20core%20%20indicators%20English.pdf

Chile provides another perspective on the availability of mobile phones in households by distinguishing between prepaid and contract subscribers. In 2003, 47% of households had a mobile phone of which 70% were prepaid and 30% contract (Figure 2-5).[4]

FIGURE 2-5
MOBILE PHONES IN CHILEAN HOMES BY TYPE OF SUBSCRIPTION, 2003

Prepaid
33%

No subscription
53%

Contract
14%
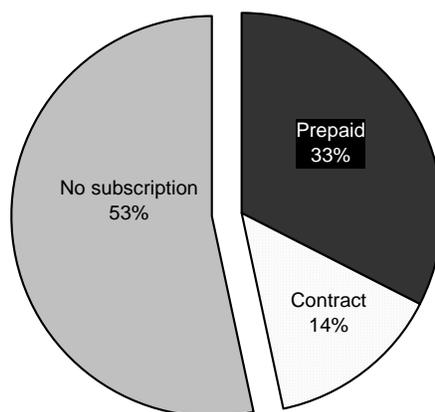
Source: Own calculations based on BADEHOG.

4. Computer

Computers in households have grown at a double digit pace in most countries in the first half of the decade. Two countries—Chile and Costa Rica—already have a quarter of households with a computer. At the other end, about half of the countries analyzed had less than ten percent of their households with a computer. However, in most instances these are countries with older surveys and it is likely that the rate would be higher if the most recent data was analized. It is worth noting that the availability of computers in households is the one ICT that all of the countries except Colombia survey.

5. Internet

Compared to other ICTs, availability of Internet access in the home has the smallest penetration level in Latin America and the Caribbean. Furthermore, the increase in countries with time series data is often low, unchanged or even declining from year to year. One reason is that unlike most of the other ICTs, there are a number of prerequisites—social, economic and infrastructural—for home Internet access. In terms of social factors, there is a strong correlation between education and Internet access in households. Household heads with a high level of education also have the highest level of Internet access. In El Salvador, 18.9% of household heads with a university education have Internet access in the home compared to just 0.7% with basic education. Economically, Internet access requires additional expenditure beyond the income necessary to have a fixed line (for dial-up or ADSL access) and to purchase a computer to access the Internet with. Finally, Internet access from the home requires certain infrastructure prerequisites such as electricity, a computer and a connection (typically a phone line or a cable television or wireless connection).

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[4]   Administrative data compiled by the Chilean Sub-secretary of Communications show that 80% of mobile subscribers were prepaid at the end of 2003. These data are on a individual subscriber basis rather than household. See http://www.subtel.cl/prontus_subtel/site/artic/20070212/pags/2007021218 2348.html#T1

III. Socio-demographic factors and ICTs

This section examines the availability of ICTs by different household and head of household characteristics. As such, it helps to provide the concrete evidence of intuitive observations regarding the digital divide such as urban areas having better access, etc. For countries with time series data, the information also allows analysis of the situation over time.

There are some limitations with cross-country comparisons in that the socio-economic characteristics are not always harmonized across countries. Characteristics about the household such as location (i.e., urban/rural) or size lend themselves to comparisons across countries, whereas head of household characteristics such as ethnicity or income levels are more difficult to compare.

The first part of this section offers a descriptive analysis of the various household and head of household characteristics while the second part expands the analysis through statistical modeling.

1. Descriptive analysis

1.1 Household characteristics

1.1.1 Location

The availability of ICTs in urban and rural areas allows cross-country comparison (although national definitions of rural and urban may differ). As expected, there is a large divide in ICTs between urban and rural areas. This is because there are generally lower incomes in rural areas and the greater difficulty in providing ICTs in remote areas. Furthermore, rural areas are more likely to be without electricity than urban areas. While most of the countries provide a breakdown of households based on geographic zone, Uruguay and Venezuela do not.

TABLE 3-1
HOUSEHOLDS WITH ICTS, SELECTED LATIN AMERICAN AND
CARIBBEAN COUNTRIES, BY REGION

Country	Year	Total households	Region	Radio %	Color TV %	Fixed telephone %	Mobile telephone %	Computer %	Internet %
Bolivia	2001	1,938,753	Total	68.1%	58.2%	23.7%		6.9%	
Bolivia	2001	1,203,707	Urban	75.4%	83.4%	37.3%		11.1%	
Bolivia	2001	735,046	Rural	56.0%	16.9%	1.4%		0.1%	
Brazil	2005	53,141,804	Total	87.9%	88.6%	48.0%	59.2%	18.5%	13.6%
Brazil	2005	44,926,439	Urban	89.1%	92.9%	55.2%	64.7%	21.4%	15.9%
Brazil	2005	8,215,365	Rural	81.3%	64.7%	9.0%	28.8%	2.7%	1.1%
Chile	2003	4,130,404	Total			51.5%	46.6%	24.9%	13.1%
Chile	2003	3,593,856	Urban			57.9%	48.5%	28.0%	14.8%
Chile	2003	536,548	Rural			8.0%	33.6%	4.7%	1.4%
Costa Rica	2005	1,132,019	Total	55.0%	91.3%	64.6%	49.0%	26.6%	
Costa Rica	2005	676,509	Urban	60.9%	94.0%	74.6%	59.0%	35.2%	
Costa Rica	2005	455,510	Rural	46.3%	87.3%	49.7%	34.2%	13.7%	
Dominican Republic	2004	2,332,055	Total	71.6%	81.7%	31.3%	40.0%	8.4%	
Dominican Republic	2004	1,526,444	Urban	74.4%	87.6%	40.9%	46.6%	11.3%	
Dominican Republic	2004	805,611	Rural	66.4%	70.6%	13.2%	27.6%	2.8%	
El Salvador	2004	1,626,036	Total	58.3%	77.8%	37.5%	24.4%	6.0%	
El Salvador	2004	1,022,731	Urban	58.9%	88.9%	50.8%	28.4%	9.1%	
El Salvador	2004	603,305	Rural	57.3%	58.9%	14.8%	17.7%	0.8%	
Guatemala	2000	2,191,451	Total	25.5%	53.9%	17.9%	9.7%	4.3%	0.9%
Guatemala	2000	951,654	Urban	21.5%	80.3%	35.7%	18.5%	9.3%	2.0%
Guatemala	2000	1,239,797	Rural	28.6%	33.6%	4.2%	2.9%	0.5%	0.1%
Honduras	2003	1,359,875	Total	81.7%	57.0%	17.3%	13.0%	5.2%	
Honduras	2003	660,445	Urban	85.2%	83.6%	33.3%	22.0%	10.1%	
Honduras	2003	699,430	Rural	78.3%	31.9%	2.1%	4.5%	0.5%	
Nicaragua	2001	976,667	Total	36.2%	36.4%	10.6%	3.4%	2.2%	
Nicaragua	2001	599,135	Urban	27.5%	52.9%	16.6%	5.2%	3.4%	
Nicaragua	2001	377,532	Rural	50.0%	10.3%	0.9%	0.6%	0.2%	
Paraguay	2003	1,247,957	Total		75.9%	17.4%	31.2%	6.3%	1.8%
Paraguay	2003	737,081	Urban		86.2%	28.1%	39.9%	10.0%	3.1%
Paraguay	2003	510,876	Rural		61.0%	2.1%	18.7%	0.9%	0.0%
Peru	2003	6,184,823	Total	70.2%	44.2%	22.9%	12.1%	6.6%	1.4%
Peru	2003	4,023,165	Urban	68.0%	62.8%	35.1%	18.2%	10.0%	2.2%
Peru	2003	2,161,658	Rural	74.4%	9.6%	0.4%	0.8%	0.3%	0.0%

Source: Own calculations based on BADEHOG.

While the availability of ICTs in rural households is increasing over time, the increase is generally not as rapid as in urban households, particularly for newer technologies. For example, in Costa Rica, the percentage of rural households with a computer increased from 5% in 2000 to 14% in 2005 (Figure 3-1). However, computers in urban households grew from 19% to 35% over the same time period. The difference between urban and rural households was 14% in 2000 but had grown to 21% by 2005.

FIGURE 3-1
COMPUTERS IN HOUSEHOLDS, COSTA RICA, BY LOCATION
Percentage
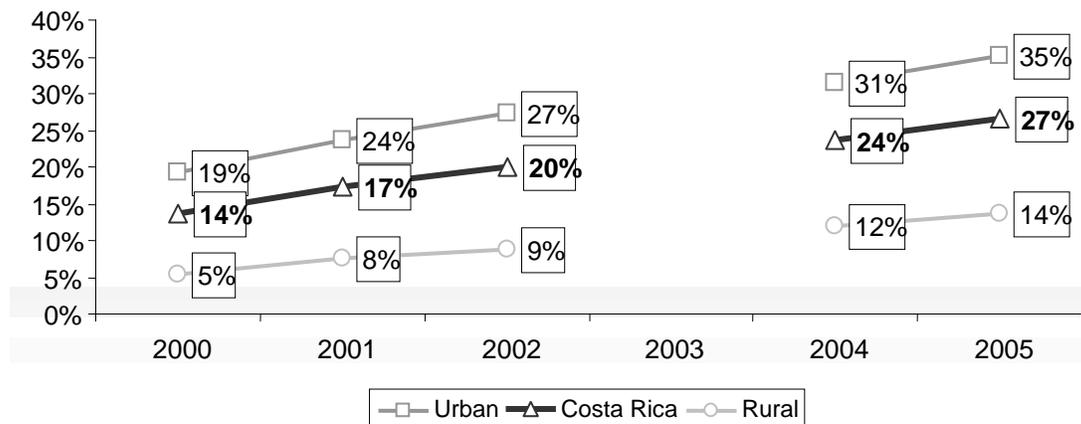
Source: Own calculations based on BADEHOG.
Note: No survey was carried out in 2003.

1.1.2 Electricity

Electricity is assumed to have an impact on ICT take-up because devices such as television or desktop computers require a stable source of energy. The Partnership on Measuring ICT for Development, a group of international organizations involved in identifying key ICT indicators, has included households with electricity as a reference indicator on the grounds that: "Since electricity is not specifically an ICT commodity, but an important prerequisite for using many ICTs, it is not included in the core list, but included as a reference indicator."[5] In this study, electricity is used as an explanatory variable but could also be included as a core reference indicator such as the total number of households in the country.

Even an apparently straight forward indicator such as electricity is not always so directly comparable. Some countries such as Bolivia or Guatemala use a simple yes/no in the surveys while others such as Brazil and Honduras inquire about the specific source of electricity. Overall, the level of household electrification is fairly high in Latin America and the Caribbean compared to other developing regions. Some dozen countries have 95% of their households with electricity. The lowest level was Honduras at 65% in 2003.

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[5]　Partnership on Measuring ICT for Development. 2005. *ibid.*

FIGURE 3-2
HOUSEHOLDS WITH ELECTRICITY, 2005
Percentage
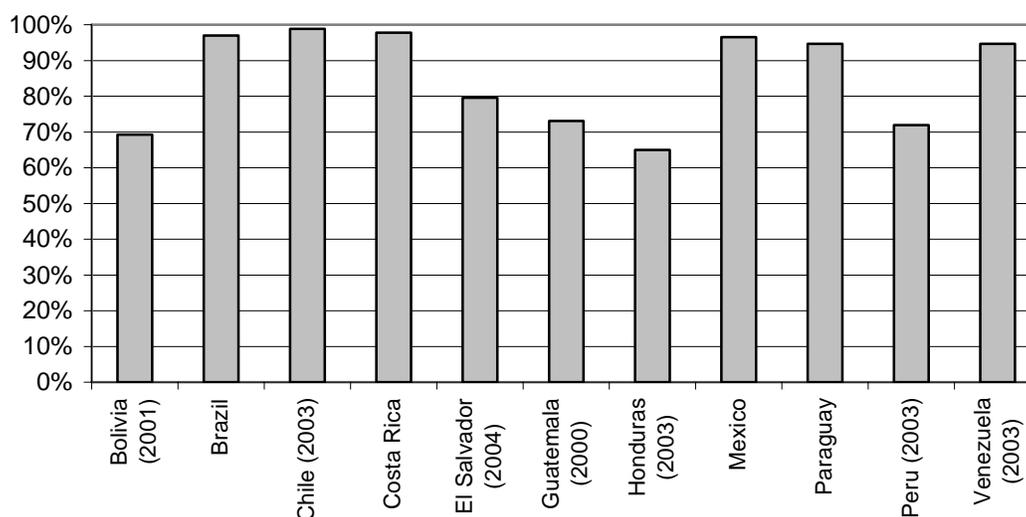
Source: Own calculations based on BADEHOG.

Households without electricity have far lower rates of ICT penetration. Broadcasting devices are more prevalent in homes without electricity than other types of ICTs. Radios, which can run on batteries, are most prevalent in electricity-less households. Although the rate for televisions is low, the data show that there are households without electricity that have televisions. While battery-powered televisions are available, they tend to be very small size and thus not suitable for viewing by a large number of people. Among telephones, households without electricity have higher rates of mobile phone ownership compared to fixed. Unlike a fixed telephone, mobile phones do not require a constant electrical supply and can be recharged from car batteries. Computers and Internet access are virtually non-existent in households without electricity.

TABLE 3-2
ICTs IN HOUSEHOLD BY AVAILABILITY OF ELECTRICITY

Country	Description	% house-holds	% of households with:					
			Radio	TV	Fixed	Mobile	Computer	Internet
Bolivia (2001)	Yes	69%	77.0%	81.7%			10.0%	
	No	31%	47.8%	5.2%			0.0%	
	Total	100%	68.1%	58.2%			6.9%	
Brazil (2005)	Electric (network, generator, solar)	97%	88.7%	91.2%	49.5%	60.8%	19.1%	14.1%
	Oil, kerosene or bottled gas	2%	66.7%	3.0%	0.3%	5.0%	0.1%	0.0%
	Other	0.4%	49.7%	10.5%	0.2%	12.7%	0.0%	0.0%
	Total	100%	87.9%	88.6%	48.0%	59.2%	18.5%	13.6%
Guatemala (2000)	Yes	73%	20.3%	69.8%	20.7%	12.7%	5.7%	1.3%
	No	27%	39.5%	10.7%	0.1%	1.4%	0.3%	0.0%
	Total	100%	25.5%	53.9%	15.2%	9.7%	4.3%	0.9%
Honduras	Public service	64%	85.8%	84.0%	26.5%	19.8%	8.1%	

Country	Description	% house-holds	% of households with:					
(2003)			**Radio**	**TV**	**Fixed**	**Mobile**	**Computer**	**Internet**
	Collective private service	1%	76.7%	75.9%	9.8%	4.5%	0.0%	
	Own plan	0.3%	96.9%	71.3%	8.0%	27.6%	0.0%	
	Solar energy	0.4%	92.2%	69.3%	0.4%	14.8%	0.0%	
	Candle	5%	71.8%	14.6%	1.6%	1.8%	0.0%	
	Oil or gas lamp	21%	78.0%	7.7%	0.8%	0.5%	0.0%	
	Torch	8%	73.4%	1.8%	0.4%	0.0%	0.2%	
	Other	0.3%	74.1%	40.1%	0.0%	11.2%	0.0%	
	Doesn't know / No answer	1%	2.6%	2.6%	1.2%	1.2%	0.0%	
	Total	100%	81.7%	57.0%	17.3%	13.0%	5.2%	

Source: Own calculations based on BADEHOG.

1.1.3 Sanitation

Certain human needs have been categorized as basic human necessities. Availability of a sewer system in the household has been identified as representative of a basic need for this study. Sample data for 2004 for El Salvador is provided below.

El Salvador has several classifications for the availability of sanitary service in households. Some 38% of Salvadorian households have a connection to the sewer system while another 40% use private latrines. Households with a connection to the sewer service have the highest level of ICTs. The level of ICT availability declines as the ICTs progress to more sophisticated. No households without a sewer connection or septic tank have Internet access. These households are also likely to not have electricity. One interesting result of the El Salvador data is the relatively high level of mobile availability compared to fixed telephones in households that share latrines or do not have any sanitary service.

TABLE 3-3
AVAILABILITY OF ICTs IN EL SALVADORIAN HOUSEHOLDS BASED
ON TYPE OF SANITARY SERVICE, 2004
Percentage

	% House-holds	Radio	TV	Fixed	Mobile	Computer	Internet
1: Toilet or sewer	38%	60%	96%	66%	36%	14%	5%
2: Toilet or septic tank	7%	57%	93%	63%	30%	8%	2%
3: Private Latrine	40%	60%	69%	19%	17%	1%	0%
4: Common toilet connected to sewer	2%	55%	77%	4%	18%	1%	0%
5: Common toilet connected to septic tank	1%	62%	77%	15%	20%	0%	0%
6: Common latrine	5%	49%	54%	3%	13%	0%	0%
7: None	7%	50%	33%	2%	10%	0%	0%
TOTAL	**100%**	**58%**	**78%**	**37%**	**24%**	**6%**	**2%**

Source: Own calculations based on BADEHOG.

1.1.4 Size

A fairly substantial list of the number of persons per household is included with the data. For example, depending on the year, Bolivia has household sizes of 1-18, Brazil 1-22 and Costa Rica 1-14. It would be useful to have a cut-off point for the size of a household. As Figure 3-3 shows, households of seven persons and less usually account for over 90% of the households in the country. Therefore it makes sense to combine all household sizes over seven into one category.

FIGURE 3-3
DISTRIBUTION OF HOUSEHOLDS BY SIZE, 2005
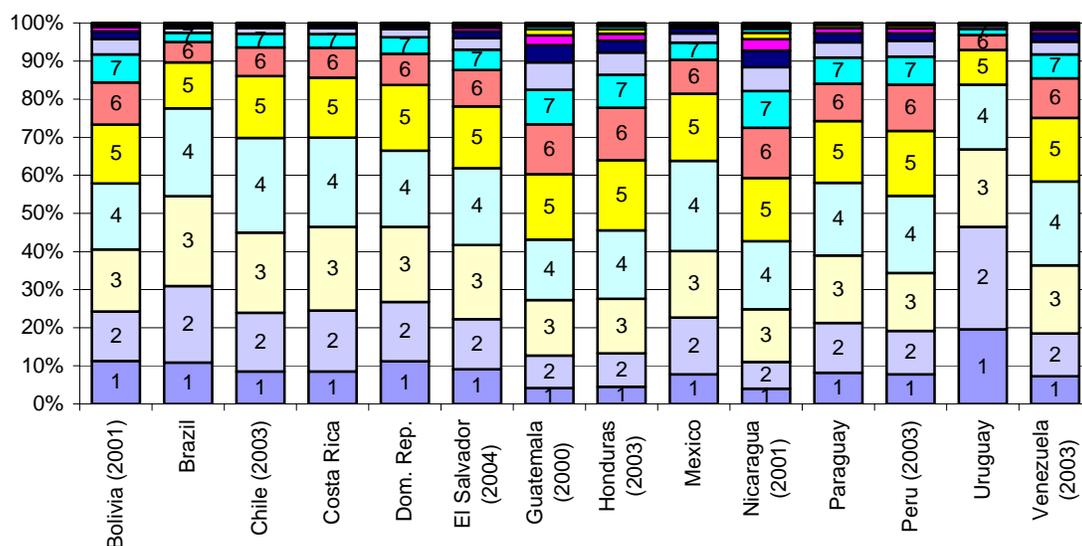
Source: Own calculations based on BADEHOG.

Analysis of household ICT penetration by the number of persons in the home are pretty consistent across the region. The optimum household size in terms of ICT access is four. For example, data on the availability of computers in households show a bell-like distribution with penetration rising as the number of persons in the household increases, peaking at four and then declining again (Figure 3-4). Four person households are likely to include children suggesting that the presence of children leads to higher ICT access. While larger size households also probably include children, they also tend to be poorer and unable to afford ICTs.

FIGURE 3-4
HOUSEHOLD COMPUTER PENETRATION BY HOUSEHOLD SIZE, 2005
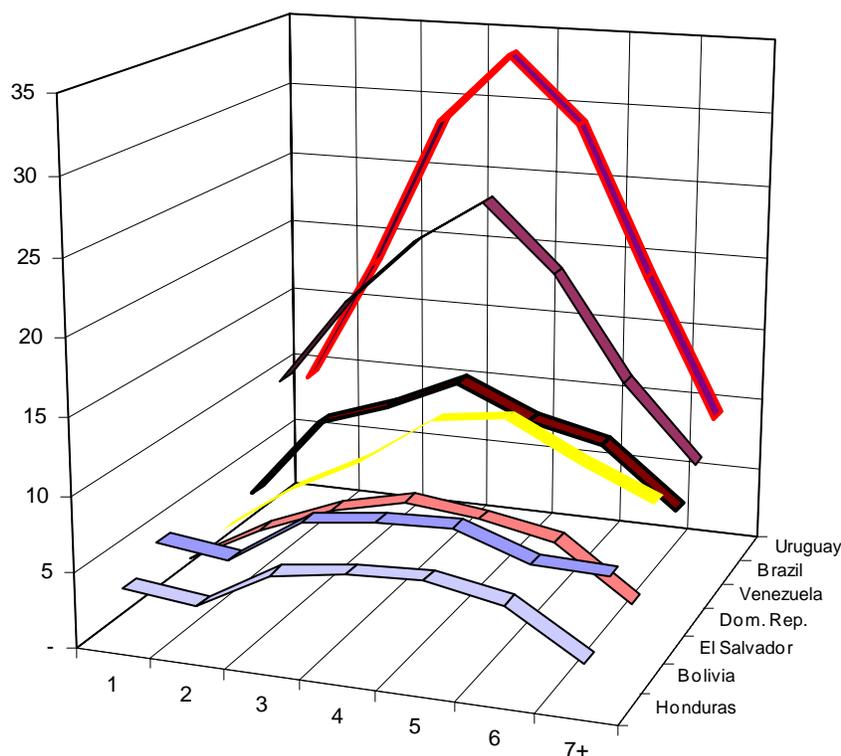
Source: Own calculations based on BADEHOG.

The table below shows results of ICTs in households based on the number of persons in the household for Brazil for the years 2001 and 2005. By 2005, households with five or less persons accounted for 90% of all households in Brazil. The share of smaller households (less than four people) increased from 2001-2005 while larger households decreased. The data show that the optimum household size in terms of ICT availability is *four*. It is also interesting that one person households have the lowest level of radio, televisions and mobile phones but that the largest households (seven or more people) have the lowest level of fixed telephones, computers and the Internet.

TABLE 3-4
ICTS IN BRAZILIAN HOUSEHOLDS BASED ON HOUSEHOLD SIZE, 2001-2005

	2001							2005						
Size	% HH	Radio	TV	Fixed	Mobile	Computer	Internet	% HH	Radio	TV	Fixed	Mobile	Computer	Internet
1	10%	78.7%	69.0%	40.6%	21.0%	7.4%	5.8%	11%	80.4%	78.0%	40.0%	37.1%	10.4%	7.4%
2	18%	88.0%	83.4%	52.2%	29.6%	10.8%	7.5%	20%	87.7%	89.0%	50.4%	54.6%	16.6%	12.2%
3	23%	89.2%	86.2%	53.5%	34.1%	14.1%	9.5%	24%	89.7%	91.4%	51.0%	65.5%	21.2%	15.7%
4	24%	90.4%	87.4%	56.9%	35.3%	16.4%	11.3%	23%	90.2%	92.2%	53.2%	67.1%	24.4%	18.5%
5	14%	89.2%	84.6%	52.6%	32.0%	13.9%	8.9%	12%	89.1%	89.6%	46.5%	63.9%	19.8%	14.1%
6	6%	86.8%	79.5%	44.6%	29.2%	10.0%	6.1%	5%	87.2%	85.8%	39.9%	57.2%	12.7%	8.7%
7+	6%	84.3%	71.2%	34.4%	21.5%	4.9%	3.0%	5%	83.7%	79.9%	30.1%	49.9%	7.5%	4.9%
Total	**100%**	**87.8%**	**82.8%**	**51.0%**	**31.0%**	**12.6%**	**8.5%**	**100%**	**87.9%**	**88.6%**	**48.0%**	**59.2%**	**18.5%**	**13.6%**

Source: Own calculations based on BADEHOG.

1.1.5 Number of children

The presence of children is often mentioned as a factor resulting in higher level of household ICTs. One variable included in the surveys is the number of children in the household. Though a more precise variable such as the number of children of school age or between certain ages would be more analytically useful, the number of children is nonetheless useful as a proxy. The results show that the specific number of children is more important than whether a household has children or not. Households with two children tend to have the highest level of ICT penetration— even higher than households with no children. However, as Figure 3-5 shows for household computer penetration, after two children, penetration drops sharply and by four children the availability of computers is usually less than in households with no children.

FIGURE 3-5
PERCENTAGE OF HOUSEHOLDS WITH A COMPUTER BY THE NUMBER
OF CHILDREN IN THE HOUSEHOLD, 2005
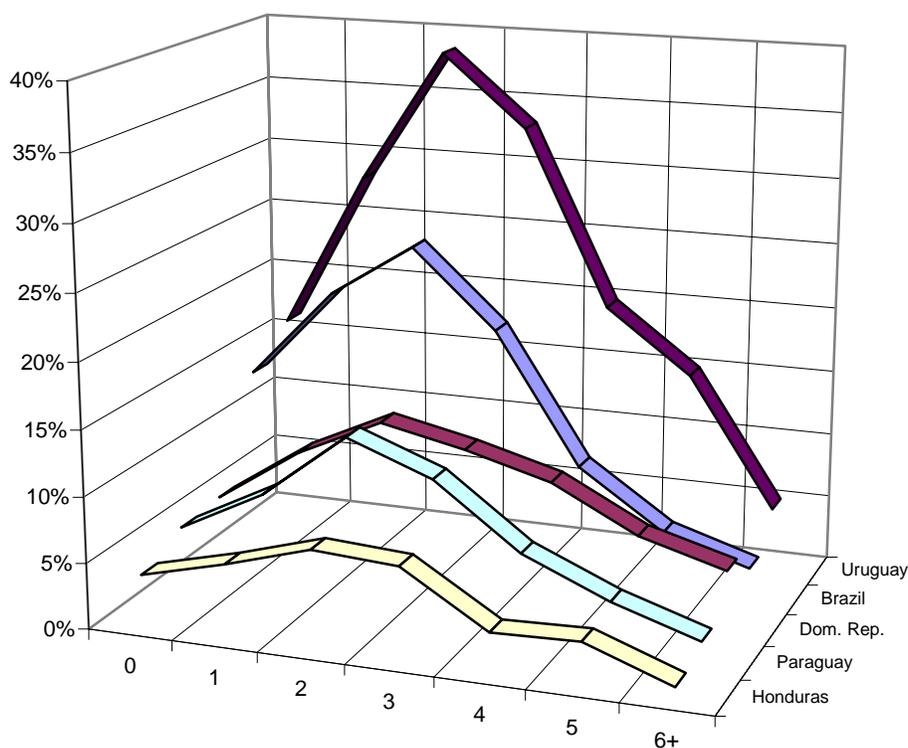
Source: Own calculations based on BADEHOG.

1.2 Head of household characteristics

1.2.1 Gender

Another indicator that allows cross-country comparison is the sex of the head of household. According to the existing data, there does not appear to be much of a gender digital divide in Latin America. One of the interesting observations among the existing data is that except for Uruguay, the ratio of male and female household heads is about 75% and 25%. In practically

every country, the ratio of ICT possession is roughly the same regardless of the sex of the household head. It is worth noting that the penetration of fixed telephone lines is higher in households headed by women.

TABLE 3-5
AVAILABILITY OF ICTs IN HOUSEHOLDS BASED ON GENDER OF HOUSEHOLD HEAD

Country	Year	Gender	% house-holds	Radio	TV	Fixed	Mobile	Computer	Internet
Bolivia	2001	Male	79%	70%	58%			7%	
Bolivia	2001	Female	21%	63%	59%			7%	
Bolivia	2001	Total		68%	58%			7%	
Brazil	2005	Male	72%	89%		46%	60%	19%	14%
Brazil	2005	Female	28%	86%		52%	58%	17%	12%
Brazil	2005	Total		88%		48%	59%	19%	14%
Costa Rica	2005	Male	73%	57%	91%	63%	50%	28%	
Costa Rica	2005	Female	27%	50%	92%	68%	46%	24%	
Costa Rica	2005	Total		55%	91%	65%	49%	27%	
Honduras	2003	Male	74%	82%	55%	16%	13%	5%	
Honduras	2003	Female	26%	80%	63%	22%	13%	6%	
Honduras	2003	Total		82%	57%	17%	13%	5%	
Uruguay	2003	Male	68%			71%		20%	15%
Uruguay	2003	Female	32%			72%		15%	11%
Uruguay	2003	Total				72%		19%	14%

Source: Own calculations based on BADEHOG.

1.2.2 Age

The data on the age of the household head is provided in single years. Brazil for example, has 95 age observations with data from age 12 to age 110. The ages need to be converted to ranges to make the analysis manageable. The Partnership proposes using the following ranges: 16-24, 25-34, 35-44, 45-54, 55-64 and 65-74. However given that data is available for those younger than 16 as well as older than 74, it is proposed to include those but reduce the number of ranges.

The table below provides an example. Despite the belief that younger persons are more keen adopters of ICTs, the data show that those in the 35-54 age range tend to have the highest level of ICTs. This could possibly be related to income, with younger households having less money available for ICTs. One observation is that older household heads (i.e., age 55-74) tend to have higher levels of fixed lines in all countries except Uruguay where the highest penetration rate for fixed lines is even older (i.e., those age 75 and above). Heads of households in El Salvador that are aged 25-34 have the highest level of mobile phones.

TABLE 3-6
ICTs IN HOUSEHOLDS BY AGE OF HOUSEHOLD HEAD, 2005

Country	Value	Total	Radio	TV	Fixed	Mobile	Computer	Internet
Bolivia (2001)	<16	3,102	73.0%	48.0%			0.0%	
	16-24	166,310	65.1%	53.5%			1.9%	
	25-34	443,888	71.0%	63.6%			5.5%	
	35-54	845,210	71.9%	62.2%			9.4%	
	55-74	396,665	61.8%	49.1%			6.1%	
	>74	83,578	48.6%	41.5%			4.1%	
	TOTAL	1,938,753	68.1%	58.2%			6.9%	
Brazil	<16	7,065	66.7%	51.7%	20.3%	20.3%	2.9%	0.0%
	16-24	2,614,436	77.2%	78.4%	17.5%	54.0%	8.6%	5.3%
	25-34	10,286,413	85.8%	87.9%	34.4%	62.4%	14.9%	10.4%
	35-54	24,041,900	90.4%	90.5%	52.5%	66.1%	23.5%	17.5%
	55-74	13,196,425	88.2%	88.6%	56.0%	51.9%	16.6%	12.6%
	>74	2,995,565	82.7%	83.3%	50.5%	29.2%	8.5%	5.6%
	TOTAL	53,141,804	87.9%	88.6%	48.0%	59.2%	18.5%	13.6%
Dominican Republic	<16	741	42.5%	42.5%	20.2%	53.4%	10.9%	
	16-24	107,885	55.0%	58.3%	9.1%	42.4%	5.4%	
	25-34	470,086	65.8%	80.4%	19.4%	50.7%	7.1%	
	35-54	1,087,031	74.8%	84.9%	32.0%	51.0%	11.5%	
	55-74	538,097	72.3%	80.6%	37.5%	36.3%	7.0%	
	>74	145,562	66.6%	70.3%	32.9%	21.0%	5.4%	
	TOTAL	2,349,402	71.0%	80.9%	29.7%	45.3%	8.9%	
El Salvador (2004)	<16	407	21.9%	66.1%	13.0%	0.0%	0.0%	0.0%
	16-24	100,743	50.7%	66.8%	13.2%	20.9%	2.3%	0.6%
	25-34	333,794	55.5%	79.4%	28.4%	27.9%	4.7%	1.3%
	35-54	674,748	60.7%	81.3%	41.2%	27.8%	7.5%	2.6%
	55-74	405,980	59.5%	75.1%	44.1%	19.5%	6.4%	2.7%
	>74	110,364	55.2%	71.4%	39.8%	14.8%	2.7%	0.7%
	TOTAL	1,626,036	58.3%	77.8%	37.5%	24.4%	6.0%	2.1%
Paraguay	<16	2,620	100.0%	94.3%	14.9%	31.8%	0.0%	0.0%
	16-24	65,045	66.5%	57.6%	5.9%	45.7%	3.8%	0.3%
	25-34	245,361	78.4%	80.4%	9.9%	57.3%	6.4%	1.2%
	35-54	649,464	82.5%	80.6%	20.4%	50.4%	11.0%	2.8%
	55-74	305,123	83.9%	79.6%	24.2%	45.6%	7.9%	2.2%
	>74	76,100	73.6%	77.5%	20.8%	27.0%	3.9%	2.4%
	TOTAL	1,343,713	80.8%	79.1%	18.6%	49.0%	8.7%	2.2%
Uruguay	18-24	21,055		84.2%	44.8%		18.3%	8.4%
	25-34	107,016		90.0%	59.3%		24.6%	14.7%
	35-54	333,039		93.7%	74.3%		31.4%	19.0%
	55-74	323,129		92.8%	78.2%		17.3%	10.9%
	>74	134,573		91.2%	78.8%		7.8%	4.9%
	TOTAL	918,812		92.4%	73.9%		21.9%	13.4%

Source: Own calculations based on BADEHOG.

1.2.3 Ethnicity

The World Summit on the Information Society (WSIS) Declaration of Principles states that "*...particular attention must be given to the special situation of indigenous peoples...*"[6] In that regard, data is needed to monitor the availability of ICTs among ethnic groups.

Four countries provide disaggregated ethnicity data (Table 3-7). In Bolivia and Guatemala, the classification is based on indigenous groups whereas in Brazil, the classification is based on race and in Peru, it is a mix of both.

In general, indigenous populations have poorer access to ICTs, a fact noted in various reports.[7]

This is not surprising as they also tend to be lower income and live in rural areas. One exception is Bolivia, where the availability of ICTs among indigenous groups is close to the national average. This is not surprising given that 64% of households are classified as indigenous and thus form the majority. However, non-indigenous households in Bolivia have the highest level of ICT access.

A greater harmonization of ethnic classification is needed to enhance cross-country comparison. The existing classifications are based on national circumstances. There is also a need for consensus on whether the analysis is necessary for just indigenous groups or also different races.

TABLE 3-7
PERCENT OF HOUSEHOLDS WITH ICT, BY ETHNICITY

Country	Ethnic Group / Race	Total	Radio	TV			Telephone			Computer	Internet
				Any	Color	B&W	Any	Fixed	Mobile		
Bolivia (2001)	Quechua	32%	67%	50%			22%			6%	
	Aymará	27%	72%	53%			14%			4%	
	Guaraní	2%	59%	54%			15%			7%	
	Chiquitano	2%	60%	56%			21%			5%	
	Mojeño	1%	70%	60%			32%			4%	
	Other	1%	47%	24%			3%			1%	
	None	36%	68%	71%			34%			10%	
	Total	100%	68%	58%			24%			7%	
Brazil (2005)	Indigenous	0.2%	83%		79%	4%		41%	54%	12%	9%
	White	52%	91%		93%	2%		58%	67%	26%	20%
	Black	7.5%	86%		86%	4%		43%	56%	11%	8%
	Yellow	0.6%	94%		97%	0%		82%	77%	53%	46%
	Mulatto	40%	84%		83%	4%		35%	50%	9%	6%
	Not declared	0.0%	100%		100%	0%		67%	33%	0%	0%
	Total	100%	88%		89%	3%		48%	59%	19%	14%
Guatemala (2000)	K'iche	9%	27%	43%				6%	3%	0.9%	0.0%
	Q'eqchi' (MAYA)	6%	50%	18%				1%	2%	0.2%	0.0%
	Kaqchikel (MAYA)	9%	25%	57%				7%	4%	1.4%	0.3%
	Mam (MAYA)	7%	32%	22%				1%	2%	0.1%	0.0%
	Other Maya (MAYA)	8%	29%	20%				2%	3%	0.8%	0.0%
	Garifuna (NOT MAYA)	0%	24%	79%				49%	25%	0.0%	11%
	Xinka (NOT MAYA)	0%	13%	37%				14%	0%	0.0%	0%
	Not indigenous	61%	22%	67%				22%	14%	6%	1%
	Another country	0%	13%	92%				67%	43%	32%	10%
	Total	100%	26%	54%				15%	10%	4%	0.9%

[6]   World Summit on the Information Society. *Declaration of Principles*. 12 December 2003. http://www.itu. int/wsis/docs/geneva/official/dop.html

[7]   Isabel Hernández, Silvia Calcagno. *Los Pueblos Indígenas y la Sociedad de la Información en América Latina y el Caribe*. March 2003. http://www.icamericas.net/documents/dp_uploads/awards_application/CEPAL-Ex_Summ-_Text-Spanish.pdf

Country	Ethnic Group / Race	Total	Radio	TV Any	Color	B&W	Telephone Any	Fixed	Mobile	Computer	Internet
Peru (2001)	Not applicable	3%	70%		48%	35%		28%	8%	8%	1.2%
	Indigenous of the Amazon	3%	56%		31%	22%		14%	6%	6%	1.2%
	Quechua	29%	77%		26%	39%		10%	4%	2%	0.1%
	Aymara	4%	85%		24%	44%		8%	3%	4%	0.0%
	Black / Mulatto	1%	64%		48%	42%		24%	8%	7%	3%
	Mestizo	56%	72%		49%	36%		25%	9%	6%	0.5%
	Caucasian or white	3%	72%		64%	38%		45%	22%	16%	3%
	Other	1%	65%		30%	39%		18%	8%	7%	0.0%
	Total	100%	73%		41%	37%		20%	8%	5%	0.5%

Source: Own calculations based on BADEHOG.

1.2.4 Income

The link between income and ICTs is well established.[8] Therefore relating income to the availability of ICTs in households is important. However, linking the ICT household data to income variables has proven problematic. One issue is that like the age and household size variables, the income variables are taken at very precise intervals. This greatly expands the size of the data set, making it difficult to manage. For example, Bolivia has survey data based on one Boliviano increments with a resulting 2,650 observations per ICT indicator. Furthermore, the income data are in national currencies. Although this monetary data could be converted to a standard unit like US dollars, the wide variations in income levels between countries make comparisons difficult.

In order to manage the data effectively, income data have been aggregated into quintiles. As Table 3-8 shows, there is a direct relationship between income and the penetration of ICTs in households. As income rises, so does the level of ICTs in households. It is observed that households with no income sometimes have higher penetration rates than those with income in lower quintiles. This could be because some households might be students with no earned income but receiving support from family members.

TABLE 3-8
HOUSEHOLDS WITH ICTs BY QUINTILES OF HOUSEHOLD INCOME, 2005

Country	Quintiles of income	TOTAL	% of households with:					
			Radio	TV	Fixed	Mobile	Computer	Internet
Costa Rica	0	10,778	45.9%	69.4%	40.4%	18.3%	11.0%	
	1	231,542	52.7%	77.6%	41.5%	13.4%	4.3%	
	2	227,987	46.0%	88.8%	52.2%	30.0%	8.4%	
	3	224,911	50.9%	95.1%	68.0%	48.3%	20.1%	
	4	226,773	54.1%	97.0%	75.4%	67.6%	36.7%	
	5	220,806	65.4%	98.6%	87.0%	87.8%	64.8%	
	Total	1,132,019	53.7%	91.3%	64.6%	49.0%	26.6%	
El Salvador (2004)	0	135,449	60.0%	74.6%	41.3%	27.6%	6.4%	2.4%
	1	290,921	51.3%	51.4%	17.2%	10.3%	1.1%	0.3%
	2	302,475	57.4%	68.9%	21.4%	13.5%	0.8%	0.2%

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[8] The relationship between GDP per capita and telephones was first observed in Jipp, A., "Wealth of Nations and Telephone Density," *Telecommunications Journal*, July 1963, pp. 199-201. Since then, numerous studies have confirmed the close link between income and ICTs. For example, see Saunders, R., Warford, J. and Wellenius, B. *Telecommunication and Economic Development*. World Bank: 1994.

	Quintiles of income	TOTAL	% of households with:					
			Radio	TV	Fixed	Mobile	Computer	Internet
	3	293,807	59.0%	82.2%	30.5%	20.9%	2.7%	0.7%
	4	298,356	60.1%	90.6%	45.8%	27.3%	4.5%	0.9%
	5	305,028	62.8%	96.3%	69.6%	48.0%	20.3%	8.1%
	Total	1,626,036	58.3%	77.8%	37.5%	24.4%	6.0%	2.1%
Honduras (2003)	0	6,748	74.3%	68.6%	20.0%	25.4%	9.5%	
	1	270,553	76.8%	22.5%	3.1%	1.7%	0.2%	
	2	270,635	75.2%	39.0%	3.3%	3.1%	0.2%	
	3	268,654	82.5%	61.5%	12.1%	6.7%	1.1%	
	4	272,878	83.6%	75.5%	20.2%	14.4%	4.2%	
	5	270,408	90.4%	86.2%	47.6%	38.9%	19.9%	
	Total	1,359,875	81.7%	57.0%	17.3%	13.0%	5.2%	
Paraguay	0	599	100.0%	100.0%	27.4%	100.0%	72.6%	27.4%
	1	261442	69.1%	52.4%	2.0%	18.4%	0.1%	0.0%
	2	268836	74.1%	71.6%	5.7%	34.3%	1.2%	0.1%
	3	269746	82.7%	83.9%	7.7%	51.2%	2.0%	0.6%
	4	267833	85.4%	90.1%	21.8%	60.7%	6.0%	0.9%
	5	275257	92.4%	96.2%	54.6%	78.7%	33.1%	9.3%
	Total	1,343,713	80.8%	79.1%	18.6%	49.0%	8.7%	2.2%

Source: Own calculations based on BADEHOG.

Data from El Salvador provide an example of the relationship between household income expressed in monetary terms and the availability of ICTs in households. One feature of the El Salvador data is that the income figures are already provided in US dollars enhancing international comparability. The raw data consist of 1,573 income levels between 0 and US$ 8,522. One observation is that 8% of the households have no income. These would likely be students and others receiving support from relatives. The remaining households are distributed by quartiles. This results in four income groups: greater than US$0 and less than US$ 140 per month, greater than US$ 139 and less than US$ 270, greater than US$ 269 and less than US$ 495 and households earning more than US$ 494 per month.

There are three immediate observations to be made from the aggregated data. One is that the ICT penetration in households rises in line with income (Figure 3-6). For example, 54% of the lowest income households have a television whereas 96% of the highest income households have one. Second is that the divide in access to ICTs increases from older (e.g., radio and television) to newer (e.g., computers and Internet) ICTs. For example, the lowest income households have 16% of televisions but only 3% of Internet connections (Figure 3-6). On the other hand, the wealthiest households have 28% of televisions and 75% of all Internet connections.

FIGURE 3-6
HOUSEHOLD ICTs, EL SALVADOR, BY INCOME (US$ PER MONTH), 2004

Percentage of households with ICT

Distribution of ICTs in households
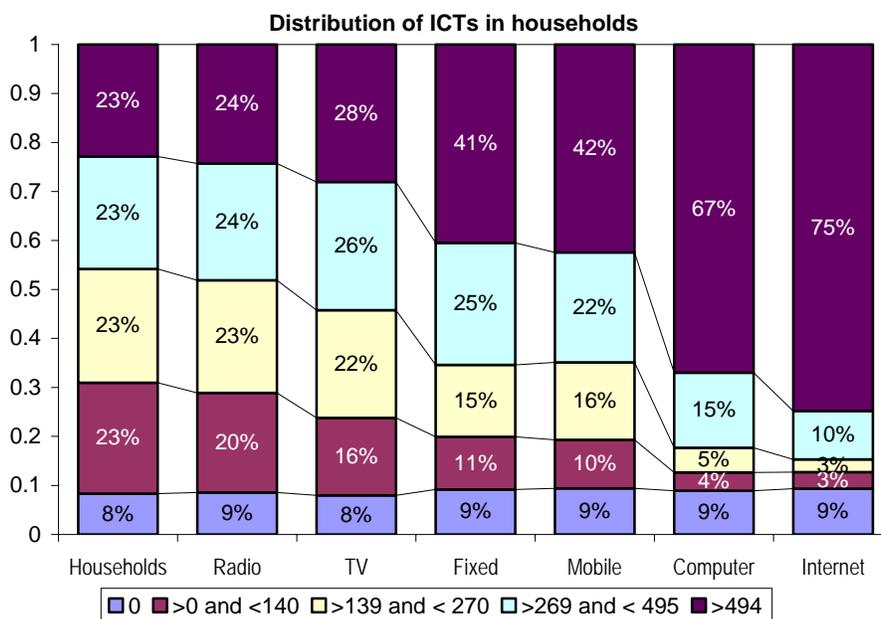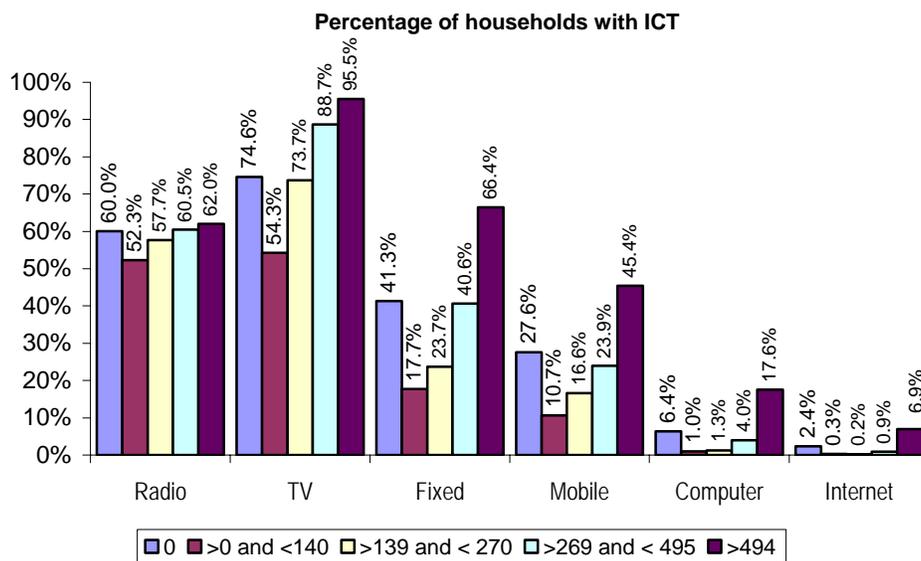
Source: Own calculations based on BADEHOG.

1.2.5 Employment

There are three employment related variables applicable to the head of household. *Category* describes whether the household head is a paid employee or self-employed (with national variations). *Condition* describes whether the household head is economically active. *Occupation* refers to the economic activity employed heads of households are engaged in.

Occupational category

The occupational category variable includes data on whether the head of household is self-employed, employed or an owner of a business. In addition, there are often extra national categorizations. It is interesting to note that self-employed constitute a significant share of household heads among the countries studied. The "not-applicable" category is also significant and includes unemployed as well as students, retirees and others who are not economically active.

Those who are either business owners or government employees tend to have the highest share of household ICTs. Both of these groups would tend to have either high or stable income flows which probably explains the high level of ICT penetration. In addition, business owners would tend to use some ICTs for business operations.

In terms of heads of households with the lowest level of ICTs, there are differences. For more advanced ICTs such as computers and the Internet, domestic workers tend to have low levels of household penetration. However for other ICTs such as televisions and telephones, menial workers tend to have the lowest levels of ICT penetration in their households.

TABLE 3-9
AVAILABILITY OF ICT IN HOUSEHOLDS BY OCCUPATIONAL
CATEGORY OF HEAD OF HOUSEHOLD

Country	Occupation category	Total		TV	Fixed	Mobile	Computer	Internet
Bolivia (2001)	0: No aplicable	238,849	12.3%	74.6%			8.8%	
	1: Obrero(a)	225,191	11.6%	60.2%			0.8%	
	2: Empleado(a)	397,613	20.5%	84.8%			17.2%	
	3: Trabajador(a) por cuenta propia	944,677	48.7%	40.4%			3.0%	
	4: Patrón, socio o empleador que sí recibe salario	15,056	0.8%	84.6%			26.1%	
	5: Patón, socio o empleador que no recibe salario	50,091	2.6%	73.3%			15.3%	
	6: Cooperativista de producciónr	14,055	0.7%	57.8%			0.0%	
	7: Trabajador(a) familiar o aprendiz sin remuneración	35,523	1.8%	75.8%			10.1%	
	8: Empleada(o) del hogar	17,698	0.9%	61.1%			0.0%	
	Total	1,938,753	100%	58.2%			6.9%	
Brazil (2005)	0: No aplicable (< de 10 años y no ocupados)	13,572,170	25.5%	89.0%	54.0%	49.2%	14.4%	10.4%
	1: Empleados	21,892,337	41.2%	91.2%	48.5%	67.0%	21.6%	16.1%
	2: Trabajadores domésticos	1,905,532	3.6%	87.9%	35.0%	55.9%	5.2%	2.7%
	3: Cuenta propia	11,819,255	22.2%	83.2%	39.4%	54.3%	15.0%	10.6%
	4: Empleadores	2,595,242	4.9%	96.2%	71.8%	83.3%	45.7%	36.0%
	5: Trabajadores en la producción y construcción para propio consumo	1,212,818	2.3%	72.1%	24.1%	30.6%	4.7%	3.1%
	6: No remunerado	144,450	0.3%	89.5%	62.9%	58.9%	29.7%	23.0%
	Total	53,141,804	100%	88.6%	48.0%	59.2%	18.5%	13.6%
Guate-mala (2000)	0: No aplicable	271672	12.4%	62.5%	27.0%	5.8%	5.1%	1.1%
	1: Empleado de gobierno	110049	5.0%	82.0%	31.5%	19.2%	12.6%	1.3%
	2: Empleado u obrero de una emp. privada	559184	25.5%	72.7%	18.3%	15.9%	6.1%	0.9%
	3: Jornalero o peón	270065	12.3%	23.2%	0.5%	0.1%	0.0%	0.0%

	Occupation category	Total		TV	Fixed	Mobile	Computer	Internet
	4: Empleado(a) doméstico(a)	29241	1.3%	56.5%	3.9%	0.6%	0.0%	0.0%
	5: Dueño o patrón	133980	6.1%	73.4%	35.9%	29.1%	15.0%	6.3%
	6: Trabajador por su cuenta	779832	35.6%	41.0%	8.5%	5.7%	1.5%	0.3%
	7: Ayudante o trabajador familiar sin remuneración	28866	1.3%	47.6%	12.7%	3.1%	1.1%	0.0%
	8: Ayudante o trabajador sin pago	8562	0.4%	38.5%	12.7%	18.8%	0.0%	0.0%
	Total	2191451	100%	53.9%	15.2%	9.7%	4.3%	0.9%
El Salvador (2004)	0: No aplicable	454,726	28.0%	76.8%	42.1%	20.6%	4.6%	1.3%
	1: Empleador o patrono	80,281	4.9%	92.2%	66.3%	46.5%	16.9%	7.9%
	2: Cuenta propia con local	47,039	2.9%	92.0%	58.2%	33.9%	8.1%	4.2%
	3: Cuenta propia sin local	342,347	21.1%	72.7%	29.7%	19.9%	2.9%	1.0%
	5: Familiar no remunerado	9,254	0.6%	86.3%	48.2%	18.1%	6.8%	2.6%
	6: Asalariado permanente	440,362	27.1%	89.2%	44.6%	33.4%	10.1%	3.7%
	7: Asalariado temporal	211,654	13.0%	56.6%	11.6%	12.5%	1.4%	0.3%
	9: Servicio doméstico	33,821	2.1%	69.0%	18.2%	13.0%	0.6%	0.0%
	10: Otros	4,497	0.3%	92.0%	61.2%	36.2%	1.7%	0.9%
	Total	1,626,036	100.0%	77.8%	37.5%	24.4%	6.0%	2.1%
Venezuela (2003)	No aplicable (< de 10 años y no ocupados)	1,475,025	25%	89.7%	34.0%	24.8%	8.1%	1.7%
	Empleado gubernamental	465,588	8%	97.5%	48.3%	47.2%	26.0%	5.9%
	Obrero gubernamental	163,422	3%	93.2%	27.7%	27.7%	6.2%	0.7%
	Empleado en empresa particular	563,562	10%	96.2%	41.3%	43.8%	20.7%	5.3%
	Obrero en empresa particular	1,028,579	17%	87.1%	14.7%	24.3%	2.3%	0.2%
	Miembro de cooperativa o sociedades de personas	293,504	5%	91.0%	30.1%	29.5%	9.4%	1.6%
	Trabajador por cuenta propia	1,515,488	26%	86.6%	23.3%	25.1%	6.7%	1.4%
	Patrono o empleador	373,455	6%	94.8%	40.9%	39.7%	16.2%	4.8%
	Ayudante familiar o no familiar no remunerado	22,389	0.4%	88.6%	34.5%	21.0%	5.6%	0.5%
	Total	5,901,012	100%	90.2%	29.8%	29.6%	9.9%	2.2%

Source: Own calculations based on BADEHOG.

Activity condition

Between 72-88% of heads of households are "occupied" according to information from the countries studied. As a result, ICT penetration in households headed by an economically active person is generally close to the country average since this group forms the majority of the total households. The remaining activity conditions are not always comparable between countries, impeding the ability to draw conclusions. For example, Brazil only provides a few categories of activity condition whereas Chile offers over a dozen. There do not seem to be major differences in ICT penetration based on the activity condition. In cases where there is a breakdown by retired or student, both of these categories tend to have the highest possession of ICTs. Retirees generally have the highest level of television and fixed telephone lines whereas students tend to have high levels of mobile, computer and Internet access in their households.

TABLE 3-10
ICTs IN HOUSEHOLDS BY ACTIVITY CONDITION

Country	Activity condition	Total		TV	Fixed	Mobile	Computer	Internet
Bolivia (2001)	1: Ocupados	1,699,904	88%	56%			7%	
	2: Cesantes	53,827	3%	74%			5%	
	4: Estudiantes	22,571	1%	73%			10%	
	5: Amas de casa	59,032	3%	72%			7%	
	6: Jubilados o benemérito	54,457	3%	89%			19%	
	7: Otros inactivos	47,186	2%	61%			2%	
	Total	1,938,753	100%	58%			7%	
Brazil (2005)	1: Ocupados	39,569,634	74%	88%	46%	63%	20%	15%
	2: Desocupados	1,693,309	3%	88%	38%	58%	13%	9%
	3: Inactivos	11,873,819	22%	89%	56%	48%	15%	11%
	Total	53,141,804	100%	89%	48%	59%	19%	14%
Chile (2003)	1: Ocupados	2,966,316	72%		52%	54%	29%	16%
	2: Cesantes	168,968	4%		39%	38%	16%	6%
	4: Quehaceres del hogar	188,475	5%		47%	27%	15%	7%
	5: No tiene con quien dejar a los niños	16,656	0.4%		32%	35%	11%	4%
	6: Enfermedad crónica o invalidez	87,037	2%		37%	18%	8%	2%
	7: Estudiantes	19,427	0.5%		42%	94%	63%	26%
	8: Jubilados o montepiadas	592,152	14%		58%	21%	12%	6%
	9: Rentistas	6,871	0.2%		86%	30%	24%	13%
	10: Inactivos con trabajo esporádico	19,624	0.5%		30%	34%	11%	6%
	11: Se aburrió de buscar	10,828	0.3%		56%	37%	25%	13%
	12: No tiene interés	14,466	0.4%		56%	43%	22%	9%
	Total	4,130,404	100%		51%	47%	25%	13%
Costa Rica (2005)	1: Ocupados	867927	76.7%	92%	64%	53%	29%	
	2: Cesantes	25696	2.3%	82%	43%	34%	20%	
	4: Pensionados o jubilados	113363	10.0%	95%	83%	42%	24%	
	5: Rentistas	5147	0.5%	92%	80%	37%	20%	
	6: Estudiantes	4310	0.4%	87%	72%	63%	49%	
	7: Oficios domésticos	71414	6.3%	88%	61%	36%	14%	
	8: Discapacitado permanente para trabajar	17586	1.6%	82%	50%	15%	4%	
	9: Otros inactivos	25720	2.3%	73%	47%	16%	5%	
	Total	1,132,019	100%	91%	65%	49%	27%	
Paraguay (2005)	1: Ocupados	1099042	81.8%	79%	18%	51%	9%	2%
	2: Cesantes	31858	2.4%	79%	20%	45%	6%	1%
	4: Estudiante	6132	0.5%	75%	12%	61%	8%	3%
	5: Enfermo	20819	1.5%	78%	15%	40%	5%	0%
	7: Anciano o discapacitado	46287	3.4%	79%	20%	30%	2%	1%
	9: Labores del hogar	79078	5.9%	75%	16%	36%	5%	1%
	10: Jubilado o pensionado	30157	2.2%	97%	60%	57%	23%	4%
	11: Otra situación	27116	2.0%	72%	17%	48%	6%	1%
	Total	1343713	100%	79%	19%	49%	9%	2%
El Salvador (2004)	1: Ocupados	1,171,310	72.0%	78%	36%	26%	7%	2.5%
	2: Cesantes	64,948	4.0%	72%	25%	18%	3%	0.7%
	4: Estudiantes	5,795	0.4%	76%	58%	49%	33%	2.0%
	5: Obligaciones familiares o personales	11,343	0.7%	83%	46%	20%	1%	0.2%
	6: Enfermedad o accidente	28,620	1.8%	69%	35%	18%	2%	2.7%
	7: Quehaceres domésticos	160,377	9.9%	77%	39%	23%	3%	0.8%
	8: Jubilados o pensionados	75,046	4.6%	94%	72%	28%	12%	3.9%
	9: No puede trabajar (discapacitado, anciano)	94,577	5.8%	69%	36%	11%	2%	0.1%
	11: Otros inactivos	12,478	0.8%	77%	37%	22%	2%	0.4%
	Total	1,626,036	100%	78%	37%	24%	6%	2%

Source: Own calculations based on BADEHOG.

Occupation

The type of occupation that the head of household has can be linked to ICT availability. Brazil has 14 classifications (including those not economically occupied as well as households for which the occupation cannot be specified). In general, the availability of ICTs widens with sophistication. For example in terms of radios, the range is from 82%-94% or only 12% points whereas for Internet access, availability ranges from 34%-2%, or a range of 32%. Those working in the educational and financial sectors tend to have higher levels of access than other groups. Those in the agricultural sector tend to have the lowest level of access. One interesting observation is that though domestic help households tend to have low levels of fixed telephones, computers and Internet access, they have a mobile phone penetration that is not far off the national average (56% versus 59%). Also, those who are not employed also tend to have higher levels of access than expected. Perhaps this is because some of these households are students or retired.[9]

TABLE 3-11
AVAILABILITY OF ICTs IN BRAZILIAN HOUSEHOLDS BY TYPE OF
OCCUPATION OF HOUSEHOLD HEAD, 2005

Economic activity	% of total house-holds	Radio	Color TV	Fixed	Mobile	Computer	Internet
0: No aplicable (menores de 10 años y no ocupados)	26%	86%	89%	54%	49%	14%	10%
1: Agricultura, Pecuaria, Silvicultura y Exploración Forestal; Pesca	15%	82%	68%	13%	29%	4%	2%
2: Industrias Extractivas; Producción y distribución de electricidad, gas y agua	1%	91%	94%	56%	73%	31%	24%
3: Industrias de Transformación	11%	91%	93%	53%	68%	22%	16%
4: Construcción	7%	88%	91%	40%	61%	11%	7%
5: Comercio; Reparación de vehículos automotores, objetos personales y domésticos	13%	90%	94%	54%	72%	23%	17%
6: Alojamiento y Alimentación	3%	88%	94%	48%	68%	16%	10%
7: Transporte, Almacenamiento y Comunicaciones	5%	91%	95%	59%	78%	23%	16%
8: Administración Pública, Defensa y Seguridad Social	4%	92%	96%	63%	77%	34%	26%
9: Educación; Salud y Servicios Sociales	5%	93%	97%	70%	79%	42%	33%
10: Servicios Domésticos	4%	85%	88%	35%	56%	5%	3%
11: Otros Servicios Colectivos, Sociales y Personales	2%	89%	93%	56%	75%	25%	19%
12: Intermediación Financiera; Actividades Inmoviliarias, Arriendos y Servicios Prestados a las Empresas; Organismos Internacionales y Otras Instituciones Extraterritoriales	5%	94%	97%	70%	83%	42%	34%
13: Actividades mal especificadas	0.2%	80%	72%	20%	44%	4%	3%
Total	100%	88%	89%	48%	59%	19%	14%

Source: Own calculations based on BADEHOG.

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[9] One might be able to ascertain this from the employment status but in Brazil the only categories are occupied, inactive or not occupied. In other countries, the employment status contains a breakdown of student, retired, etc.

Education

The level of education has often found to be a determinant of ICT use particularly for newer technologies such as computers and the Internet. There are two head of household variables in the surveys that measure this: the years of study and the last degree completed.

The analyzed data show a strong relationship between the number of years of education of the head of household and the availability of ICTs (Table 3-12). The level of ICT penetration rises in direct proportion to the number of years of education, regardless of the ICT. In Paraguay, heads of households with zero years of education have negligible levels of computers or Internet while in the other countries, the levels are very low. Some nine out of ten households headed by persons with more than 16 years of education have televisions, fixed lines and mobile phones in Brazil and Costa Rica. Except for Paraguay, rates of computer and Internet penetration among households with at least 16 years of education is similar or even higher than in developed countries.
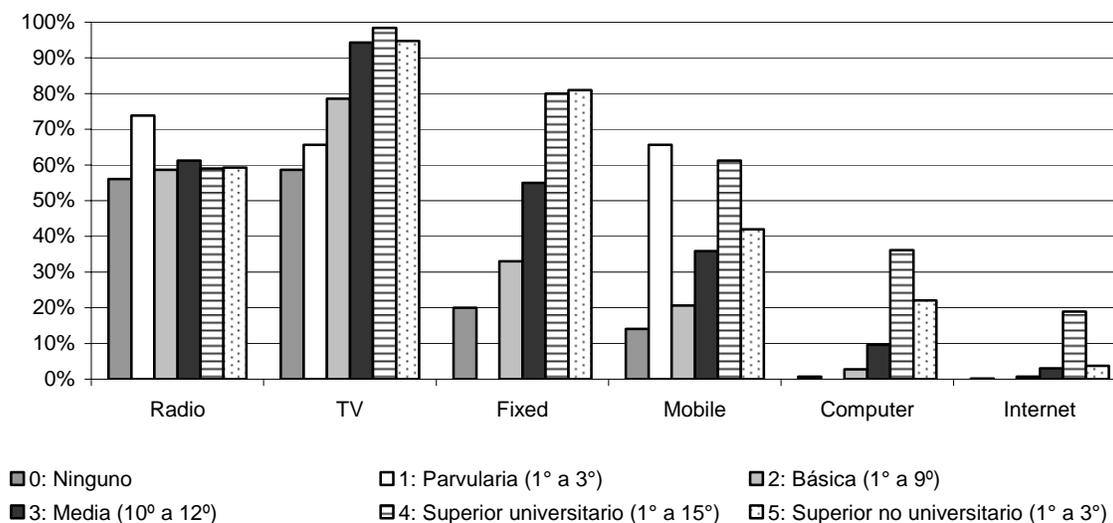
TABLE 3-12
ICTs IN HOUSEHOLDS BY NUMBER OF YEARS OF EDUCATION OF HOUSEHOLD HEAD, 2005

Country	Years of study	Households		Percentage of households with:				
		Total	% of total	TV*	Fixed	Mobile	Computer	Internet
Brazil	0	8,569,584	16.1%	70.8%	21.1%	27.1%	2.1%	1.1%
	6	1,773,065	3.3%	90.1%	38.5%	61.5%	9.4%	5.4%
	9	1,007,330	1.9%	92.7%	45.6%	70.2%	15.8%	9.9%
	11	9,013,928	17.0%	97.0%	64.6%	79.5%	31.0%	22.1%
	16	1,290,775	2.4%	99.2%	91.1%	94.3%	76.0%	66.8%
	17	480,511	0.9%	99.0%	95.7%	96.2%	84.9%	76.0%
	TOTAL	53,141,804		88.6%	48.0%	59.2%	18.5%	13.6%
Costa Rica	0	60307	5.3%	73.2%	36.5%	14.6%	2.8%	
	6	345177	30.5%	90.3%	61.0%	40.8%	15.1%	
	9	74668	6.6%	92.9%	66.4%	52.3%	23.9%	
	11	102266	9.0%	96.2%	71.1%	66.4%	37.8%	
	16	40671	3.6%	97.8%	90.5%	87.0%	70.1%	
	>16	42038	3.7%	98.6%	93.2%	89.3%	80.4%	
	TOTAL	1,132,019		91.3%	64.6%	49.0%	26.6%	
Mexico	0	2727368	10.6%	65.6%	27.2%	16.0%	2.0%	0.7%
	6	4774163	18.6%	87.9%	48.0%	33.8%	8.5%	3.0%
	9	4174074	16.2%	91.7%	49.1%	44.4%	13.8%	4.4%
	12	2313780	9.0%	96.1%	68.9%	56.1%	30.9%	13.4%
	16	1096427	4.3%	96.4%	77.6%	70.6%	59.0%	29.2%
	>16	1,751,948	6.8%	98.3%	83.4%	79.1%	64.2%	35.7%
	TOTAL	25,710,321		86.7%	51.1%	41.1%	18.4%	8.1%
Paraguay	0	58,958	4.4%	54.2%	1.6%	16.1%	0.0%	0.0%
	6	304,676	22.7%	79.3%	11.2%	46.5%	2.5%	0.8%
	9	94,855	7.1%	85.1%	21.9%	58.1%	5.7%	2.2%
	12	150,940	11.2%	91.4%	33.0%	70.5%	17.1%	2.7%
	16	28,185	2.1%	98.0%	62.8%	86.7%	41.0%	12.4%
	>16	60,392	4.5%	96.5%	68.0%	91.9%	56.8%	17.9%
	TOTAL	1,343,713		79.1%	18.6%	49.0%	8.7%	2.2%
Uruguay	0	17168	1.9%	80.1%	54.6%		2.7%	1.2%
	6	237127	25.8%	91.2%	68.7%		8.1%	3.7%
	9	83991	9.1%	94.9%	73.3%		16.2%	6.1%
	12	84705	9.2%	96.9%	87.5%		39.7%	24.7%
	16	37028	4.0%	97.5%	94.1%		54.5%	40.9%
	>16	48363	5.3%	99.1%	97.3%		75.4%	59.2%
	TOTAL	918,809		92.4%	73.9%		21.9%	13.4%

Source: Own calculations based on BADEHOG.

Data from El Salvador based on the educational attainment of the head of household also confirm these findings. El Salvadoran homes headed by those with a college degree tend to have the highest level of advanced ICTs. However, it is interesting to note, that households headed by those having only between one and three years of education have relatively high levels of radio and mobile phone penetration.

FIGURE 3-7
ICTs IN SALVADORAN HOMES, %, 2004, BY EDUCATIONAL
ATTAINMENT OF HOUSEHOLD HEAD

| □ 0: Ninguno | □ 1: Parvularia (1° a 3°) | □ 2: Básica (1° a 9º) |
| □ 3: Media (10º a 12º) | □ 4: Superior universitario (1° a 15°) | □ 5: Superior no universitario (1° a 3°) |

Source: Own calculations based on BADEHOG.

1.3 Statistical analysis

Impact of socio-economic variables on household computer penetration

The analysis of the socio-economic household and head of household variables are built upon to develop a statistical model of household access to ICTs. Variables that can be averaged at a national level are used in the analysis (Table 3-13). A multiple regression equation was generated from the cross-sectional country data using the percentage of households with a computer as the dependent variable. The computer ICT is used for several reasons. First, it is the one variable that is collected by all countries and poses few definitional conflicts.[10] Second, it is a variable that is reflective of "newer" ICTs such as mobile and Internet access. Third, while there are economic constraints to purchase a computer, overall limitations appear to be less than Internet access which requires a communications connection such a telephone line and a subscription.

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[10] As mentioned earlier, radios cannot be compared across countries since some countries only ask for simple radio sets while other ask for sound equipment. Television has the limitation that some countries asked for color and black and white television sets separately and the intersection of the data cannot be determined. Although fixed telephone lines was collected by all of the countries except Bolivia (where the data is combined with mobile), this indicator is on the decline in most countries and therefore not as analytically interesting. Internet was not asked for by all countries.

TABLE 3-13
AVERAGE CHARACTERISTICS OF HOUSEHOLDS AND HEADS OF HOUSEHOLDS

Country	Year	% house-holds with a com-puter (y)	% house-holds with electri-city (n)	% house-holds in urban areas (n¹)	Average house-hold size (n2)	Average age of house-hold head (n3)	% of house-hold heads economica-lly active (n4)	Average monthly house-hold income, US$ (n5)	Average years of education of house-hold head (n6)	Two child house-holds as % of total house-holds (n7)
Bolivia	2001	6.9	69.3%	62.1%	4.3	44.1	88%	$ 283	7.2	25%
Brazil	2005	18.5	97.0%	84.5%	3.5	47.3	74%	$ 628	6.3	35%
Chile	2003	24.9	99.0%	87.0%	3.8	49.4	72%	$ 764	10.0	37%
Costa Rica	2005	26.6	98.0%	59.8%	3.8	47.1	77%	$ 670	8.2	33%
Dom. Rep.	2005	8.9	94.5%	65.5%	3.8	46.9	72%	$ 527	7.0	32%
El Salvador	2004	6	80.0%	62.9%	4.2	47.0	72%	$ 368	5.8	30%
Guatemala	2000	4.3	73.0%	43.4%	5.2	44.3	88%	$ 327	4.1	22%
Honduras	2003	5.2	65.0%	48.6%	5.0	46.5	80%	$ 335	4.7	26%
Mexico	2005	18.4	97.0%	76.5%	4.1	47.3	81%	$ 757	7.5	34%
Nicaragua	2001	2.2	71.0%	61.3%	5.3	46.4	79%	$ 288	4.5	26%
Paraguay	2005	8.7	95.0%	59.1%	4.3	46.5	82%	$ 363	7.3	28%
Peru	2003	6.5	72.0%	65.0%	4.5	49.0	83%	$ 365	7.7	30%
Uruguay	2005	21.9	97.8%	81.3%	3.0	54.8	60%	$ 690	8.6	35%
Venezuela	2003	9.8	95.0%	88.4%	4.4	46.2	75%	$ 318	8.2	33%
AVERAGE			86.0%	67.5%	4.2	47.3	77%	$ 477	6.9	30%

Source: Adapted from BADEHOG and author's compilation.

The multiple regression equation based on the data above is:

$$y = 11.81 + 3.256n - 4.227n1 - 1.124n2 - 0.283n3 - 5.290n4 + 0.033n5 + 1.479n6 - 11.462n7$$

The coefficient signs of the explanatory variables are more or less as expected. Electricity, average monthly household income and the average years of education of the household head all have positive coefficients while the average household size and age of the household head have negative coefficients. In other words, the greater the level of electricity, the higher the income and the more years of education, the more likely a household is to have a computer. Similarly, the smaller the household and the younger the household head, the more likely the household is to have a computer. The latter two merit more explanation. While it is true that analysis of the underlying data suggests that households with four members tend to have the highest level of ICTs, the data drop off sharply after that. So while a one, two or three member household may have a lower level of ICTs than a four member household, smaller households in general have higher shares of ICTs than households that have six or more members. Regarding the household head age, it is interesting to note that although both Chile and Uruguay have national age averages above the regional average, they also have relatively high levels of computer penetration. It would appear that in those countries, older household heads tend to have higher levels of income than in other countries. As shown in the economic activity conditions, households headed by retirees with pensions tend to have above average levels of ICTs. On the other hand, in countries with lower incomes, there are few older heads of households with pensions and thus they are probably still working or receiving support from relatives and likely less able to afford ICTs.

Perhaps surprisingly, the percentage of household heads that are economically active has a negative coefficient. However, as pointed out earlier, some non-economically active categories such as students and retirees tend to have above levels of ICT access. The one true surprise is the percentage of urban households which has a negative coefficient suggesting that non-urban households have higher levels of ICT access. One explanation is the definition of urban. Data from Mexico refer to "high density" which is not exactly the same as an urban area and would tend to distort the results. Similarly, Costa Rica, which has a below average level of urbanization defines urban in terms of facilities available rather than locality size.

The R2 of the multiple regression equation is 0.9 suggesting it has a strong explanatory influence on the availability of computers in households. In terms of individual variables, the one with the most influence is income followed by the average years of education. The variables with the lowest influence are the head of household economically active, share of two child families and the level of electricity. This could be because of the issue of using economically active population as an overall variable. The ICT penetration rates of those who are economically active tend to be close to national averages and do not bring out the subtleties of the higher penetration rates among the retired and students. Similarly, electricity suffers from some definitional issues. In reference to the number of children a household has, as noted, penetration rates drop sharply after five. It could be that the specification of this variable into a national average is not optimum.

Applying the equation to the existing country data yields results showing whether countries are above or below where they should be in terms of household computer penetration (Figure 3-8). In most instances, as expected given the high predictive power of the equation, most countries are within two percentage points of where they should be in terms of household computer penetration. The main exceptions are Costa Rica, which has a household computer penetration of over four percent more than expected and the Dominican Republic and Mexico which have household computer penetration rates of 3-6 points below what would be expected.

FIGURE 3-8
DIFFERENCE BETWEEN ACTUAL AND EXPECTED LEVEL OF HOUSEHOLD COMPUTER PENETRATION, 2005
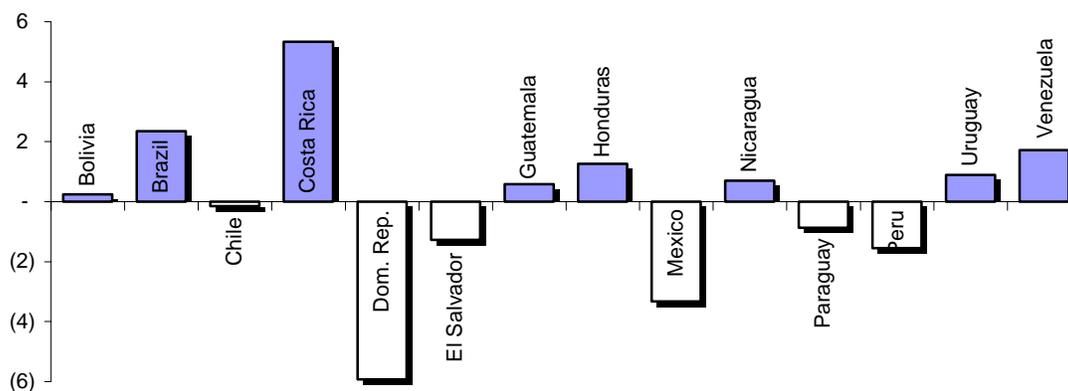
Source: Author's compilation.

A matrix can be composed of whether countries are above or below average in the various explanatory variables (unlike the regression finding, we assume urbanization has a positive impact). No country has yet to achieve an above average value for all eight variables. Neither has any country performed below average on all eight. However, six countries perform above average on seven of the variables and five of those have the highest levels of computer penetration. There thus appears to be a relationship between being above average in the variables and level of computer penetration.

Three groups of countries can be distinguished from the analysis:

1) Those that are above average in most of the socio-economic variables and have relatively high levels of ICT penetration. This includes Brazil, Chile, Costa Rica, Mexico and Uruguay.

2) Those that are above average on between 3-7 of the variables and have a middle level of ICT penetration compared to the other countries. This includes the Dominican Republic, El Salvador, Paraguay and Venezuela.

3) Those that are below average on most of the socio-economic variables and have relatively low levels of ICT penetration. This includes Bolivia and Peru as well as all of the Central American countries except Costa Rica and El Salvador.

The classification is useful since the policy emphasis is different for each group of countries. Those in category 3 are characteristic of low development levels with emphasis needed on raising electrification, incomes and education and reducing household sizes. These development challenges need to be addressed before higher levels of ICT penetration can be achieved.

The challenges facing the middle group of countries (category 2) are mostly of an economic nature since almost all of them have below average levels of income but above average levels on the other factors. That is why three of the four countries in this category, namely Dominican Republic, El Salvador and Paraguay are performing below where they should be based on the econometric model described above. Policies to lower the prices of ICT goods and services might prove successful since other pre-conditions for ICT adaptation such as relatively high levels of household head education already exist.

Finally, the road to higher levels of ICT penetration for those countries that are above average on most of the socio-economic variables and have relatively high levels of ICT penetration are more structural rather than economic or development-oriented. Each country tends to have one socio-economic variable where they are below the regional averages. For example, in the case of Chile and Uruguay, the age of the household heads are relatively high suggesting that policies aimed at bringing older persons online may prove successful. In the case of Brazil, raising educational levels would appear to have a significant impact on boosting ICT penetration.

Inequalities in ICT household penetration based on socio-economic variables

Another statistical analysis that can be carried out is the calculation of Gini coefficients.[11] Although popularly used to measure inequality in income, the Gini coefficient can also be used to calculate the distribution of ICTs in households along different socio-economic variables. A Gini coefficient of 0 represents perfect equality whereas a coefficient of 1 represents total inequality. Gini coefficients were calculated for the different household ICTs by different socio-economic variables as shown in Table 3-14.

The degree of inequality in the distribution of ICTs in households by various socio-economic factors increases as one moves from older (radios, televisions) to newer technologies (computer, Internet). This is to be expected given that new technologies tend to require more income and education (e.g., a computer generally costs more than a radio or television and requires some knowledge of use). The one exception is mobile phones which are more equally distributed than fixed lines. This is because mobile services, particularly those based on pre-paid plans, require less of an on-going expenditure than a fixed line which generally requires a monthly payment. Furthermore, mobile phones provide much more flexibility than fixed lines. Unlike computers and the Internet, a mobile phone does not require much education to use.

Within the different socio-economic variables, the one with the most equality for the distribution of ICTs is the age of the household head. Although newer technologies are more rapidly adopted by younger people, they also cost money which older heads of households are

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[11] http://en.wikipedia.org/wiki/Gini_coefficient

more likely to have. The newer technology appeal to the young is balanced by the higher incomes of the old resulting in greater equality. Television, computers and the Internet are most evenly distributed across the category of head of household age.

Radios are most evenly distributed across ethnic groups. This could be because radios are relatively inexpensive and audio content is more diverse than television or the Internet. Thus ethnic groups who do not have the national language as their first language can probably listen to radio programs in their own tongue. Fixed lines in households are most evenly distributed along gender. This is probably because heads of households that are women stay in touch with support networks more than men. A fixed line might be perceived as more reliable and is typically cheaper under heavy usage than a mobile phone. Mobile phones themselves are most evenly distributed across the education of the head of household. This is because mobile phones do not require a lot of education to use.

The worst distribution of ICTs occurs in the number of children a household has. As seen earlier, after five children, the penetration of ICTs drops sharply and is lower than households with no children. Large households are also typically poorer and thus less able to afford the different ICTs. Surprisingly income ranks as only the third most unequal category, surpassed by electricity. Without electricity, it is difficult to have a television or a computer (and thus Internet access). Even mobile phones become problematic if they cannot be recharged.

TABLE 3-14
GINI COEFFICIENTS FOR ICT IN HOUSEHOLDS

	Indigenous group	Gender - Head of household	Age - Head of household	Years of education - Head of household	Employment Category - Head of household	Income	Location	Electricity	Size	Children	Average
Radio	0.14	0.25	0.18	0.21	0.28	0.18	0.15	0.30	0.25	0.65	**0.26**
TV	0.21	0.24	0.18	0.18	0.26	0.24	0.27	0.42	0.26	0.66	**0.29**
Fixed	0.37	0.18	0.25	0.20	0.32	0.43	0.41	0.50	0.45	0.68	**0.38**
Mobile	0.36	0.25	0.15	0.06	0.29	0.42	0.34	0.48	0.48	0.72	**0.35**
Computer	0.34	0.25	0.17	0.29	0.30	0.62	0.44	0.48	0.44	0.72	**0.41**
Internet	0.44	0.28	0.19	0.35	0.40	0.66	0.49	0.47	0.44	0.73	**0.44**
AVERAGE	**0.31**	**0.24**	**0.19**	**0.21**	**0.31**	**0.42**	**0.35**	**0.44**	**0.39**	**0.69**	**0.36**

Source: Adapted from BADEHOG.

IV. Conclusions

Data limitations constrain the ability to reach definite conclusions about the impact of socio-economic characteristics on ICT penetration in Latin American and Caribbean households. *First*, not all of the countries in the region have carried out surveys. *Second*, in those that have, the years vary. Out of the fifteen countries for which at least one survey includes household ICT information, only seven have sent 2005 data to BADEHOG.[12] *Third*, the type of ICT surveyed varies between countries. Not all of the countries ask for all of the ICTs or the definitions vary (e.g., television versus color TV). *Finally*, the same socio-economic characteristics are not always asked (e.g., up to 2005 Uruguay did not include location). When the socio-economic variables are available, there are often definitional issues that hinder comparability. As a result, there is not a sufficiently large *comparable* data set to analyze and draw firm conclusions.[13]

Despite the limitations, some tendencies are apparent:

- There is a decrease in the availability of "older" to "newer" ICTs in households. Penetration rates of radios and televisions are higher than computers or the Internet. The one exception is mobile phones which are beginning to surpass conventional fixed telephone lines. Furthermore, there is a greater proportional difference in older and newer ICTs both between and within countries.

- The biggest impact on the availability of ICTs in households is income (Figure 4-1) followed by years of schooling of the household head. ICT penetration in households rises in direct proportion to these two variables. On the other hand, the availability of electricity, the proportion of two child households and the employment activity condition of the household head seem to have less impact.

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[12] OSILAC reports that twelve out of this fifteen have included ICT access questions in 2005 household surveys.

[13] OSILAC aims at solving this problem as National Statistical Offices continue including the list of ICT core indicators agreed in a harmonized way. Most of them started to do so in 2005 household surveys and have continued in following years.

- The greatest disparity in ICTs is Internet access at home and the smallest for radios. Mobile phones are more equally distributed across socio-economic variables than fixed telephone lines.

- The area where there is the greatest disparity in the distribution of ICTs is in the number of children a household has. Penetration rates peak at two child households; by the time a household has five or more children, penetration rates are less than households with no children.

- The socio-economic area with the most equal distribution of televisions, computers and the Internet is age of the household head. Radios are more equally distributed along ethnicity, fixed lines along gender and mobile phones along the years of education of the household head.

- Distribution of countries along the availability of ICTs in households suggests *three* groups in the region. The first are those with relatively high regional levels of household ICTs and which perform above average in almost all of the socio-economic variables. This group consists of Brazil, Chile, Costa Rica, Mexico and Uruguay. The second group consists of those countries which perform relatively well in most of the socio-economic variables but which have relatively lower levels of household ICT penetration. This group includes the Dominican Republic, El Salvador, Paraguay and Venezuela. The third group are those countries which perform lower than average in some of the socio-economic variables and have relatively low levels of household ICT penetration. This group includes Bolivia, Guatemala, Honduras, Nicaragua and Peru.

FIGURE 4-1
RELATION BETWEEN HOUSEHOLD AVERAGE INCOME AND HOUSEHOLD COMPUTER PENETRATION, 2005
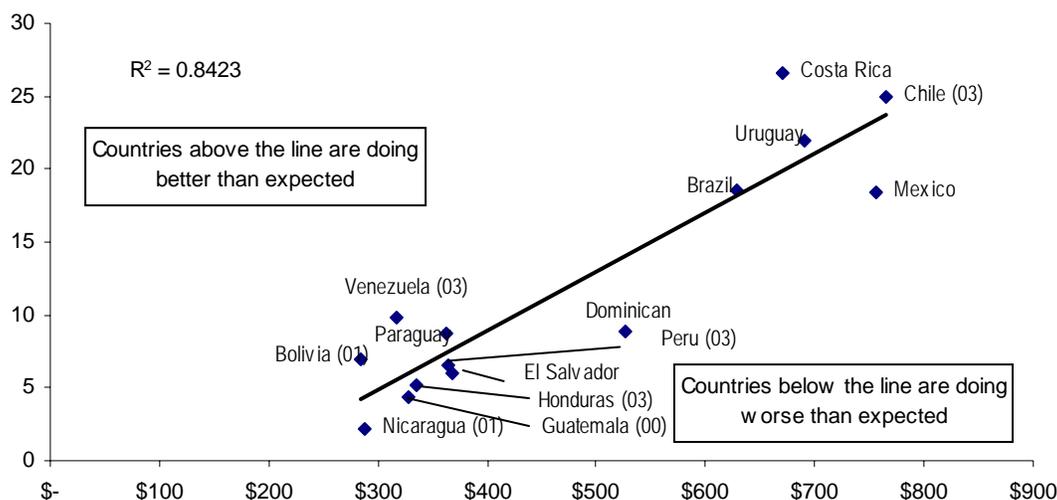
Source: Adapted from BADEHOG.

V. Recommendations

This exercise has analyzed the survey data on ICT in households in the Latin America and Caribbean region. One of the attractions of such an exercise is the ability to compare to other countries. However, existing data limitations constrain the degree of analysis that is currently possible. This could be improved by a higher degree of standardization among the data variables, which is already being looking forward by OSILAC.

One recommendation is to pursue harmonization of the data items. This includes agreement on variables which are comparable but have many observations. The household income, size and age of household are examples. Though ranges have been adopted to facilitate analysis in this report, official agreement would ensure that future studies are harmonized. The table below proposes key socio-economic variables and how they might be standardized.[14]

There is also a need to harmonize and simplify some of the ICT indicators. For example, at this point in time, it is more urgent to have a comparable set of a single television indicator than three possibilities (any television, black and white, color). Alternatively, the data should be structured so that the intersection of the data sets can be obtained (e.g., either a black and white or color television or both). This would also be useful for radio (either a transistor or a stereo component or alarm clock, etc.) and telephones (e.g., only fixed, mobile, both). It should also be considered to include electricity as a reference ICT indicator as proposed by the Partnership rather than a socio-economic variable.

The areas of mobile and Internet access merit more investigation. Although Internet access from homes does not appear to be growing dramatically, surveys on individual use of Internet show usage to be increasing.[15] This implies that users are accessing the Internet from outside the home at work, educational establishments or Internet cafes. Users may also be

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[14] This proposal considers recommendations made by the Partnership on Measuring ICT for development (2005), BADEHOG from ECLAC and OSILAC through the Compendium of Practices on the implementation of ICT questions in households and businesses surveys in Latin America and the Caribbean (2007).

[15] For example, Internet user penetration in Mexico increased 3.6 percentage points in 2005 whereas home Internet access only increased by 0.7 percentage points. See Instituto Nacional de Estadística, Geografía e Informática (INEGI). 2006. *Disponibilidad y uso de tecnologías de información en los hogares en México 2005*.

increasingly using mobile networks to access the Internet given the continual growth of mobile telephony in the region. These factors have been investigated by surveys and administrative data in Peru. For example while only 4.4% of Peruvian households had Internet access during the last quarter of 2005, 33% had at least one member who used the Internet from Internet cafes.[16] According to data from the Peruvian telecommunications regulator, some 65% of all Internet subscribers in 2005 were using mobile Wireless Application Protocol (WAP).[17] It would be useful to apply this to future household surveys with questions such as whether the head of household uses the Internet from outside the home and whether the head of household uses a mobile phone to access the Internet. OSILAC reports that at least 9 countries in the region are doing so.[18] It is recommended that most countries start to implement complete modules with ICT core indicators globally and regionally agreed.

Although beyond the scope of this report, it would be interesting to pursue second level analysis of the variables in the future. Several of the surveys contain additional variables, such as ICT expenditure, etc. For example, given that ICTs are lower in rural than urban households, it would be useful to carry out further investigations of the socio-economic characteristics of households by location to determine which factors may be having an impact on ICT availability. Is it lack of infrastructure (e.g., electricity, mobile coverage or telephone line plant) or income limitations? This could help fine tune policy analysis to deal with the most important bottlenecks.

TABLE 5-1
PROPOSED SOCIO-ECONOMIC VARIABLES

Variable	Note
Size	The number of persons residing in the household. Recommended to aggregate all households with more than 7 persons into a single variable.
Age	Age of the head of household. Proposed grouping is: <16 16-24 25-34 35-54 55-74 >74
Gender	The sex of the head of household (i.e., male or female)
Educational attainment	Highest educational level achieved based on International Standard Classification of Education (ISCED):[19] None Primary Secondary Tertiary
Employment status	Loosely based on ILO International Classification of Status in Employment (ICSE)[20] Paid employee Self-employed Unemployed Not in labor force
Occupation	Based on ILO International Standard Classification of Occupations (ISCO) major groups[21]
Location	The geographical location of the household (urban or rural).

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[16] INEI. *Las Tecnologías de Información y Comunicación en los Hogares*. INFORME TÉCNICO N° 10. Noviembre 2006.

[17] OSIPTEL. "6. INDICADORES DEL SERVICIO DE ACCESO A INTERNET".

[18] OSILAC (2007). Compendium of Practices on the implementation of ICT questions in household and business surveys in Latin America and the Caribbean. First version.

[19] http://www.unesco.org/education/information/nfsunesco/doc/isced_1997.htm

[20] http://www.ilo.org/public/english/bureau/stat/class/icse.htm

[21] http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm

| Income | Quintiles of monthly household income |
| Children | Number of children in household between ages of 6-21. |

Source: Adapted from "Core ICT Indicators" and author's compilation.

TABLE 5-2
INTERNATIONAL STANDARD CLASSIFICATION OF EDUCATION (ISCED)

Level 0	Pre-primary education
Level 1	Primary education or first stage of basic education
Level 2	Lower secondary or second stage of basic education
Level 3	(Upper) secondary education
Level 4	Post-secondary non-tertiary education
Level 5	First stage of tertiary education
Level 6	Second stage of tertiary education

Source: UNESCO.

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