Institute for Advanced Development Studies

Development Research Working Paper Series

No. 11/2010

The Impact of Internet Use on Individual Earnings in Latin America

by:

Lucas Navarro

September 2010

The Impact of Internet Use on Individual Earnings in Latin America[φ]

Lucas Navarro[*]
lunavarr@uahurtado.cl

September 2010

Abstract

This paper uses matching techniques to examine the impact of internet use on individual earnings in six Latin American countries using recent household surveys data. Given their different internet use patterns and their implications, the analysis is done for salaried and self-employed workers separately. While salaried workers users mainly access the internet at work, self employed users access the internet mainly at other places. Therefore, the returns to internet use for salaried workers may be associated not only to individual but also to workplace characteristics. Results indicate a large effect of internet use on earnings for both groups of workers in most of the countries studied. These returns are high compared with estimates for industrialized countries. This could be explained by the much lower prevalence of internet use in the region for the international standards. Additionally, given that the estimations rely on cross-section data, they may not fully control for individuals' characteristics before internet adoption. This calls for the need of panel-data on new ICTs diffusion in the region.

JEL Classification: L86, O33, O54
Keywords: Internet use, Internet Impact, Latin America

[φ] This paper was developed with funding from IDRC-ECLAC, Project "*Observatory for the Information Society in Latin American and the Caribbean* (OSILAC), *Third Phase*". The author thanks Cesar Cristancho for statistical assistance and Matteo Grazzi, Miguel Torres, Sebastián Vergara and Manuel Willington for very helpful conversations. Usual disclaimers apply.
[*] Department of Economics, ILADES-Universidad Alberto Hurtado, Chile. Consultant, Division of Production, Productivity and Management, ECLAC-UN.

1. Introduction

It is widely accepted that the diffusion of Information and Communication Technologies (ICT) is an important determinant of growth and development. In this context, the emergence of the Internet as a means for information exchange has motivated an increasing literature on its benefits. The potential benefits start with the productivity enhancing effect of computer (and Internet) use at the workplace firstly explored by Krueger (1993). Among other impacts, the possibility of working from home and trading on the Internet could have significant effects on the efficiency of use of time (Douma *et al*., 2003; Sinai and Waldfogel, 2003; Goolsbee and Klenow, 2006). For job seekers, search on the Internet could help to improve the efficiency of the firms-workers matching process (Kuhn and Skuterud, 2004; Stevenson, 2009). Internet access related to e-learning can also be a means for children to perform better at school.[1] Also, a lot of procedures for firms and citizens can be simplified due to the Internet.

Despite of the benefits of ICT dissemination, there has been increasing concern in industrialized economies about the "*digital divide*", understood as the gap between those who access and use the ICT and those who not. Presumably, this concern is founded on the premises that if there are gains from the ICT revolution, they are enjoyed only by those who use the new technologies. If that is the case, the digital divide could be a potentially dangerous driver of increased inequality. The evidence on the effects of the digital divide on earnings inequality is scarce and mixed. Borghans and Weel (2007, 2008) and Forman *et al*. (2009) analyze the impact of the speed and rate of computer diffusion on the wage structure. These studies do not find a sizeable effect of the digital divide on wage inequality in developed countries. On the other hand, using data for five European countries, Haisken-DeNew and D'Ambrosio (2003) analyze the impact of ICT on the distribution of wages and they find a positive impact of not using Internet at work on the risk of social exclusion. This effect is related to the Internet and PC usage wage premium at workplace.

Where can we place the developing world, and in particular Latin America, in this context? First, there is no reason to expect that the diffusion of new ICT could not be beneficial for the region.[2] Second, the profound inequality in income and access to education and public services in general is reflected in a high inequality of computer and Internet access as reported by Grazzi and Vergara (2010). Third, if there is a return to use of ICT, the digital divide could be a dramatic source of greater inequality. Moreover, for the case of Latin America we can think of a "*social divide"* that precedes and is more important than the digital divide. The digital divide may be then another reflection of the social divide that would persist as long as the problems of high poverty levels and unequal access to quality education were not tackled. This is probably why, as stated in Adeya (2002) and APDIP (2005), some studies cannot find a solid link between ICT and poverty reduction. In a similar vein, they are not clear on which ICT are relevant under which circumstances.

An implication of these effects is that the greater the impact of Internet use the severer the harmful effects of the digital divide. Then, measuring the impact of ICT is essential to evaluate to what extent the digital divide imposes serious limits to economic opportunities for the excluded. In this respect, the literature on the impact of ICT in Latin America is still in its infancy. In an

[1] Fairlie (2005), Beltran *et al.* (2009) and Fairlie and London (2009) analyze the impact of computer use on educational outcomes.

[2] According to Peres and Hilbert (2009), despite the rates of computer and Internet use in Latin America are converging to the world average, there is a persistent negative gap in the rates of broadband Internet diffusion.

attempt to fill this gap, this study uses matching techniques to investigate the impact of Internet use on individual earnings in six countries of the region. The analysis is performed using recent National Household Survey data for Brazil, Chile, Costa Rica, Honduras, Mexico and Paraguay.

There is an extensive literature on the effects of human capital on productivity and economic growth. Then, if the Internet is a source of knowledge its effective use can be thought of as a channel for productivity and earning increases. Therefore, it would be expected that those who use the Internet may have an earning advantage over the non users. Testing this hypothesis is though problematic because of a double causality problem. The high positive correlation between Internet use and income reflects not only that accessing the web can have an impact on income but also that the prevalence of Internet use is greater among the wealthiest. In panel-data studies this is not a major problem given that it is possible to track individuals' earnings before and after the Internet adoption. Though this is not an option in this study, the use of matching techniques would help to reduce the selection problem. If the question is how Internet users would perform if they were not using the Internet, it is necessary to construct a counterfactual. This is done by identifying groups of treated (Internet users) and controls (non-users) with similar characteristics. These include education, sector of activity, occupation, age and other variables that approximate their wealth before Internet adoption. Subsequently, the treated and control groups are matched according to the nearest neighbor method. Finally, it is computed the average earnings differential between the two groups, which is the measure of the return to Internet use obtained in this study.

To implement the empirical strategy the sample is divided in two groups: Salaried and Self-employed workers. The data for the countries analyzed show clear differences between them in the patterns of Internet use. Indeed, while salaried workers mainly access the Internet at work, the self-employed typically use the Internet at home and at other common access places. There are implications related to Internet adoption associated to this differential behavior. Usually, the decision to adopt Internet at work is made by the employer. This has motivated a literature on the returns to computer and Internet use at the workplace on earnings. Therefore, the impact of Internet use would be related to both firms' and workers' characteristics. In contrast, the self-employed make their adoption decision on their own and incur the corresponding costs. In this case, the returns to use would be explained only by worker characteristics. Also, since most of the Internet use for this group is at home the analysis can better grasp the impact of home access.

The study is organized as follows. The next section discusses the theoretical motivations and the literature on the impact of the ICT of interest on earnings. Section 3 presents the empirical approach followed to tackle the research question. Sections 4 and 5 are devoted to the description of the data and the results, respectively. Finally, Section 6 concludes.

2. Literature

Most of the literature on the impact of ICT on earnings relates to the returns to computer use at the workplace. If computers increase labor productivity workers may ultimately benefit with corresponding higher wages. The empirical studies in this literature rely on cross-section and longitudinal data. The interpretation of the PC use premium as a return to computer use based on results from cross-section data may be difficult for many reasons. It could be the case that computer users were already earning higher wages than non users before computers were adopted. Second, firms adopting new ICT may have been paying higher wages earlier on. Then a worker in a firm that uses ICT would earn more than a worker in a firm with no ICT access before and after adoption. Third, the PC wage premium could reflect a change in the relative

demand for skills (skilled biased technical change). Alternatively, the adoption decision can be related to the preexistent supply of human capital (Doms and Lewis, 2006). Finally, it would still be difficult to control for the effect of unobserved skills on the PC wage premium (Krueger, 1993; DiNardo and Pischke, 1997).

Based on cross sectional data for the US, Goss and Phillips (2002), Freeman (2002) and Mossberger *et al.* (2006) estimate the impact of Internet use. They use data from Current Population Surveys (CPS) in the last decade to measure the salaried wage-premium associated to Internet use. Their estimated returns are in the very close range of 13.5-17%. Among the few studies on the return to computer use in Latin American is the work by Benavente *et al.* (2009) for Chile. Using cross-sectional data for 2000 and 2006, they address the selection problem into computer use by implementing matching techniques. The authors claim that if the ICT adoption by firms is independent of the distribution of workers' skills, it would be less likely that their estimations of return to PC use incur an ability bias. Their estimated returns are in the range 15-45% depending on the matching method and year considered.

Panel-data studies can help to identify unobserved constant worker characteristics using fixed-effects. Using longitudinal information for Ecuador, Oosterbek and Ponce (2009) find evidence of a computer use premium at work mainly explained by unobserved worker/job characteristics rather than by a causal effect of computer use on productivity. These results are in line with what Entorf and Kramarz (1997) find for France and Haisken-De New and Schmidt (1999) for Germany using panel-data. One problem with panel-data studies is that unobservable worker characteristics could change over time. In addition to that, Pabilonia and Zoghi (2005) suggest that the results of previous studies rely on year-to-year changes in computer use, a period of time in which "workers may be bearing the burden of training costs". Therefore, fixed-effects estimates of returns to computer use may be biased downwards. On the other hand, OLS estimates may be biased upwards if skilled workers are selected into computer use. They therefore propose as an instrument for computer use a dummy for the implementation of a new process in production or the improvement of an existing one with a one-year lag. Their results indicate a zero effect of computer use on wages, after controlling for selection into computer use. Rather than a return to use independent of skill, they also observe a positive return to computer skills (approximated by computer experience).

In a recent work, Dostie *et al.* (2009) use matched employer-employee panel-data for Canada during the period 1999-2002. They find a positive return to computer use even after controlling for the selection problem and unobserved workplace and workers characteristics. Interestingly, the authors find that correcting for workplace effects reduces the observed computer wage premium by half. Based on data for two consecutive years of the US CPS, DiMaggio and Bonikowski (2008) find evidence of a positive return for those who use the Internet only at work which is greater than the return for those who use the Internet only at home. Meanwhile, the returns to use both at home and at work are even greater. This indicates that skills and behaviors related to Internet use are rewarded in the labor market. According to the authors, workers may gain earning advantages by using the Internet at home through two mechanisms: social-capital/information-hoarding and cultural-capital/signaling about their qualities.

3. Data

The data used in this study comes from recent National Household Surveys for six Latin American countries: Brazil and Costa Rica for 2005, Chile for 2006, and Honduras, Mexico and

Paraguay for 2007. All the surveys are representative at the national level and contain household and individual level information for many variables like income, economic activity, sector of activity, occupation, etc. With the exception of the Mexican dataset which comes from an ad-hoc ICT survey, the surveys include a section of ICT related questions. Table III.1 gives details on the data sources.

(Table III.1 about here)

As mentioned in the introduction, individual income is the outcome variable used to measure the impact of Internet use. Using income as the outcome variable incurs potentially serious endogeneity and selection problems. One first step to reduce them is to constrain the group of the population under analysis. Indeed, in order to avoid capturing the effect of variables related to gender and labor supply decisions and not ICT, the sample will be restricted when possible to full-time employed men.[3] Moreover, for the analysis of the impact of Internet use among salaried workers, the sample will be restricted even further to urban areas workers. Table III.2 shows information about sample sizes and prevalence of Internet use across the different surveys. The first column breaks down the individuals observations in two groups: Self-employed and Salaried workers. Column two reports the sample sizes of the corresponding groups in the different surveys. On average, self-employed workers represent nearly 30% of the workers in the sample, ranging from around 20% in Costa Rica to 40% in Honduras.

(Table III.2 about here)

As mentioned before, the reason for separating these two employment categories for the analysis is based on the different patterns of Internet use they present. Indeed, columns three to eight report, respectively, the percentage of Internet users, users at work, at home, users only at work, only at other places and individuals who use the Internet both at work and at other places. Use at other places includes access to the Internet at home, educational centers, and communal and commercial common access points. It should be noted that the surveys allow respondents to report Internet use at more than one place simultaneously. Then it must be the case, as can be checked in Table III.2, that the sum of the fractions of Internet users only at work and both at work and at other places should add up to the fraction of Internet users at work.

In all the surveys Internet use prevalence is a lot greater for salaried workers than for the group of self-employed. Indeed, computing a simple average of the data in Table III.2 across the six countries analyzed, only 12% of the self-employed use the Internet compared with more than 25% of users among wage employees. Internet use prevalence for self-employed workers is surprisingly similar in Brazil, Chile, Costa Rica, Honduras and Mexico and a little more spread for salaried workers. On the other hand, Paraguay presents the lowest fractions of Internet users among both types of workers in the sample. Indeed, only 6% and 18% of the self-employed and wage workers, respectively, reported use of the Internet at any place. The higher rate of Internet use among salaried workers is repeated when looking at use according to place of access.

Considering the different use types in relative terms, a clear pattern that emerges from the data is that while typically the salaried workers access the Internet at work, the self-employed access mainly at other places, and in particular at home. This can be observed in Figure III.1 which

[3] Notwithstanding, for the case of Mexico the sample includes all men employed workers because there is no information on hours of work in the survey. In some exercises for the self-employed workers where the sample sizes were otherwise too small, women were included in the analysis. This is the case of Costa Rica, Mexico and Paraguay.

shows the distribution of users by employment category according to place of access. On average, 64% and 32% of the Internet users among salaried and self-employed workers access at work, respectively. The remaining users for each employment category log on the web at other places including home. Figure III.2 displays the percentage of Internet users at home among users in each employment category and country. Comparing the two employment groups across countries, the fraction of users at home is greater, and in some cases by far, for the self-employed.

(Figure III.1 and III.2 about here)

These patterns may also depict different interpretations of the impact of Internet use on income for the two employment categories that justify analyzing them separately. On the one hand, salaried workers do not pay directly for the Internet adoption decision at work. Therefore, the Internet premium could be associated to observables and unobservables for both firms and workers. On the other hand, for the self-employed the adoption decision is completely endogenous and the return to Internet use is more likely to be related entirely to workers' characteristics.

Finally, and particularly in Latin America, it is relevant to focus on the impact of ICT on the self-employed given their disadvantaged status with respect to the salaried workers. Indeed, the literature finds that most of the informal sector workers in the region are self-employed, earn less and have less education than their salaried counterparts (Maloney, 2004). In this context, it would be interesting to analyze to which extent the use of ICT can be a way to escape informality and its related problems. Given this, the present work evaluates the impact of Internet use on income of the salaried and self-employed workers separately. There are different research questions that emerge from the consideration of the two worker groups independently. In the case of wage workers, one question is whether use at home and work are substitutes or complements in terms of their impact on income. For the self-employed workers, given the importance of access at home another question is if there is a return to use of different Internet applications, *e.g.* is there a return to use for entertainment as opposed to use for banking? A third question related to Internet use among independent workers, is about the return to use for those who do not have access at home. This is relevant for public policies, in the sense of having a measure of the social impact of having free Internet access centers in communities.

4. Empirical Approach

Even if Internet use is associated to higher income, it is difficult if not impossible to identify the direction of causality by just observing the data. This reflects a selection problem that has to be dealt with when estimating the impact of Internet use on income. Ideally, one would like to know what would have been the performance of individuals if they did not use the Internet. Given that the Internet adoption decision is not random, it is not possible to observe the outcome for the individuals that do not use the Internet because that would incur a selection bias. We have instead to create a proper counterfactual of the outcome of users conditional on no use. Different techniques can be used to deal with this issue. In our case we implement the *Propensity Score Matching* (PSM) method (Rosenbaum and Rubin, 1983.

The treatment is then a dummy variable U_i (users) which takes a value of 1 if the individual uses the Internet and zero otherwise. The values of U_i determine the assignment of individuals to the treatment and control groups, correspondingly. Let Y^1_i be the outcome of individual i as a result of the treatment. The causal effect of innovation on the outcome of the treatment is then $Y^1_i - Y^0_i$

where Y^0_i is the outcome evaluated in case of no use ($U_i = 0$). Clearly, Y^0_i is not observable. It is standard to define the average effect of the treatment on the outcome variable as

$$E(Y^1_i - Y^0_i \mid U_i = 1) = E(Y^1_i \mid U_i = 1) - E(Y^0_i \mid U_i = 1)$$

While the first term is observed the second term is not. An estimator of this counterfactual widely used in the evaluation literature is,

$$E(Y^0_i \mid U_i = 1) = E(Y^0_i \mid P(X), U_i = 1) = E(Y^0_i \mid P(X), U_i = 0),$$

Where P(X) is the probability of Internet use conditional on a set of observable characteristics X. Note that the average value of the outcome should be independent of the treatment indicator (conditional independence). We also need to consider a range for P(X) such that the comparison of expected values between the control and treatment groups is feasible (common support).

Accordingly, we first estimate a Probit model for the probability of Internet use (propensity score) conditional on a set of observables X. We need then to find a control group very similar to the treatment group in terms of its predicted probability of Internet use (p_i). This requires choosing a set X of variables that are not influenced by the treatment (Todd, 1999), *i.e.* characteristics prior to the treatment. For our study, the elements of X should include variables that are thought to affect the probability of use but not the outcome. We include in the set of observables age, age squared, dummies for educational attainment (8 and 12 years), occupation, sector of activity, house type, house ownership, access to satellite TV, access to a landline telephone line and access to a computer at home.[4] Many of these variables where included in order to control for the individuals' wealth, which is related to past income. Additionally, the Probit estimations for the probability of Internet use for salaried workers include a variable on establishment size to control for workplace characteristics. A description of the variables used in this procedure is presented in Table A.1 in the Appendix.

According to Todd (2008), there is no theoretical basis on how to choose X and which variables are included in X can have important implications for the estimator's performance. Rosenbaum and Robin (1983) propose as a specification (balancing) test to choose a set X such that there are no differences in X between the two groups after conditioning for P(X). In this study we follow the *psmatch2* procedure of *Stata* developed by Leuven and Sianesi (2003) which takes these problems into account. Once we have estimated the propensity scores, we match the groups using the method of the nearest neighbor. That is, for each user with propensity score p_i, an individual *j* is selected such that her propensity score p_j is as close as possible to p_j. After this procedure, we have then matched groups of users and non users. We can finally compute the effect of Internet use by comparing the outcomes of the two groups of matched observations. As commonly referred to in the evaluation literature, this is the Average Treatment on the Treated (ATT).

The procedure described above was run separately for the samples of salaried and self-employed workers in each survey. Before turning to the results, it is useful to evaluate the quality of the matching procedure. For this purpose, for each variable in X is computed the average for the treated and control groups of the matched and unmatched samples and tested for differences in their respective means. This information is partially summarized in Tables III.3 and III.4 for each of the estimates for salaried and self-employer workers, respectively. Indeed, these two tables

[4] The information for house type and ownership is not available for Mexico.

report the standardized differences in the means of a sub-set of the variables included in the X vector. For each variable, the first row displays the mean differences between users and non-users before matching and their statistical significance. Additionally, the second row shows the same information computed with the sub-sample of matched observations.

Looking at the different variables in Tables III.3 and III.4 it is not surprising to note for instance that the percentage of users among the individuals with more years of education is greater (first two variables) in the unmatched sample. It is also observed that Internet usage is greater for younger people (variable Age). Also, those with a telephone and a computer at home are more likely to use the Internet. What the matching procedure does is precisely to select groups of treated and non-treated such that the difference between them in the probability of Internet is minimized. Then, the smaller differences between treated and controls in the matched samples for all the variables are an indication of a good matching quality. Moreover, for most of the variables those differences become not statistically different from zero.[5]

(Table III.3 and III.4 about here)

5. Estimation Results

a) Salaried Workers

Table III.5 summarizes the results for the ATT of Internet use on income for salaried workers and different control groups. There were performed five different experiments using this sample of workers.[6] The first row reports the return to Internet use, where the treatment and control groups include users anywhere and non users, respectively. These results indicate a positive and statistical significant impact of Internet use on earnings for all countries but Paraguay.[7] The earning advantage of salaried users ranges between near 18% in Mexico and around 30% in Brazil and Honduras.

These returns are above the obtained in the literature for developed countries with similar datasets. As mentioned before, Goss and Phillips (2002), Freeman (2002) and Mossberger *et al.* (2006) obtained returns to Internet use of around 15% using similar cross-sectional data for the US. Only the estimated returns for Chile and Costa Rica are near the US estimates. One reason for the higher returns in Latin America may be the lower dissemination of Internet use compared with the developed countries figures. With diminishing returns to use, returns would be expected to decrease over time as prevalence increases. Another factor to consider is that the unmatched differences between treated and non-treated are so large to start with as to also expect large returns based on the matched samples. Indeed, the average differences in income between users and non-users in the matched sample represents between 20 and 35% of the corresponding differences in the unmatched samples (for details see Tables A.2 – A.7 in the Appendix).

(Table III.5 about here)

[5] The only exception is the case of Costa Rica for the sample of salaried workers (see Table III.3). Even though the procedure reduces the mean differences between treated and controls, they remain significant for some variables.
[6] The details for the number of treated and controls before and after matching are in Tables A.2 – A.7 in the Appendix.
[7] Indeed, returns to use for salaried workers in Paraguay is around 14%, but the statistical significance is slightly above the 10% level (see Table A.7 in the Appendix).

Rows two to four of Table III.5 present the results of the ATT of different types of Internet use according to place of access. Indeed, the treatment was decomposed for those who only use the Internet at work (results of row two), those who only use it at other places (row three) and those who access the web both at work and at other places (row four). In a way, the results for the last case may indicate whether uses at work and other places are substitutes or complement. In the three cases considered only the non-users are included in the control group.

The results show that for all countries there is a positive and statistical significant effect of use only at work which is always greater than the return to use only at other places. Furthermore, while the return to use only at work is positive for all countries, the return to use only at other places (mainly at home) is not statistically different from zero in Costa Rica and Paraguay. Notwithstanding, when the use at other places is combined with use at work, the returns on earnings are positive and much higher than the returns to use exclusively at one place for all the countries. In line with what DiMaggio and Bonikowski (2008) find for the US, these results suggest that Internet use both at home and at work are complements in Latin America.

A final exercise evaluates the ATT of Internet use at work and other places simultaneously conditional on using Internet at work. In a way this experiment would control for the potential problem of the previous experiments that use might be correlated with unobserved abilities. This problem is probably mitigated by restricting the sample to those who use the Internet and therefore may have already acquired the skills to do so. Results, reported in the last row of Table III.5, reveal much smaller returns. Indeed, they turned out statistically different from zero only in Brazil, Chile and Paraguay.

b) Self-employed Workers

Table III.6 presents different exercises of the ATT of Internet use for the sample of self-employed workers. As mentioned before, given otherwise too small sample sizes, the dataset for Costa Rica, Mexico and Paraguay includes both men and women. Like in Table III.5, the first row reports the returns to use versus non-use on earnings. As can be noted, the ATT are positive and statistically significant for all the countries but Costa Rica, where it is positive but the small sample size probably affects the standard errors of the estimates. Comparing these results with those of the first row of Table III.5, we observed similar returns to Internet use for the wage workers and the self-employed in Brazil and Honduras, relatively greater returns for the wage workers in Chile and Costa Rica, and exactly the opposite in Mexico and Paraguay.

(Table III.6 about here)

The following rows of Table III.6 display the ATT for four other exercises. Row two shows the ATT of use with no access at home in which case the control group is composed of those with no access who do not use the Internet. Since most of the self-employed do not use the Internet at work and the treatment exclude those with access at home, the results in this case would capture the return to use at common places for those with no access. Notwithstanding, the problem with this exercise is that the ATTs might be contaminated by the ability bias toward users among individuals with no access. Anyway, results indicate a significant positive return in four of the six countries analyzed. Indeed, the returns to use for those with no access at home are particularly high for Brazil (33%), intermediate for Honduras and Paraguay (around 20%) and relatively lower for Chile (14%).

Rows three and four of Table III.6 approximate the returns to use at home among Internet users. As mentioned above, restricting the sample to users would eventually reduce the effect of unobserved variables related to workers' abilities. There are two impact variables considered in this experiment. First, the individual income, and second the income of the other household members. Results in this case are unfortunately not very promising and the reason is probably that the sample sizes are too small probably leading to large standard errors. Furthermore, it was not possible to perform the experiment for Mexico because all the users in the sample use the Internet at home. Anyway, for all the cases the returns on other household members are greater than the ones for the self-employed individuals.

A final exercise of interest for the self employed is to explore whether there is a differential return to the use of different Internet applications. It would be hard to believe that using the Internet for entertainment would have an impact on income. For this reason, the individual who use the web in activities that would have productive purposes –communication, banking and e-government- were grouped in particular category. The last row of Table III.6 displays the ATT of Internet use for productive purposes on individual earnings considering in the control group other Internet users. When data availability made it possible, the treated are those who use the Internet for communication, banking and interaction with the government.[8] Even when for most of the cases the results are not satisfactory because of the small sample sizes, it is observed a positive and statistically significant return to productive use of the Internet on earnings in Brazil and Chile.

6. Concluding Remarks

This paper constitutes one of the first attempts to measure the impact of Internet use on earnings in Latin America. The analysis utilizes cross-sectional data coming from recent household surveys for Brazil, Chile, Costa Rica, Honduras, Mexico and Paraguay. The empirical results reflect a sizable return to Internet use for both salaried and self-employed workers which range between 18 and 30%. These figures are much higher than those obtained for the US using similar data. As mentioned throughout the paper, the lack of information on individual pre-treatment characteristics may bias upwards the estimated returns. For this reason, the results of this study might be taken as an upper bound for the returns to Internet use. Anyway, they are large enough as to suggest that there is a positive impact of web use on earnings in Latin America.

Other relevant results are the following. First, Internet usage at home and usage at work by salaried workers are complements with respect to their impact on earnings. Second, there is a positive return to use on earnings for those self-employed workers who have no access at home and at work. Third, there is some evidence of a positive return to use for productive purposes with respect to use for other reasons among the self-employed. Finally, there is some evidence of a positive return to access at home conditional on use for salaried workers but not for the self-employed.

The findings of this research would be enriched if longitudinal data on ICT usage in the region would be available. Also, in order to have a more accurate measure of the impacts of the new ICT more specific data are needed. This includes for instance having information on ICT usage experience, intensity, and other characteristics. Also, the availability of matched employer-employee data in the region would be also useful to better understand the interaction between

[8] For Costa Rica, there is no information on Internet use for government. For Paraguay and Honduras only use for communication was included.

firms and workers in terms of ICT investments and returns. In some cases this data is partially available but it would be desirable to have a systematic collection of new ICT data in the region.

7. References

Adeya, C. (2002) "ICT and Poverty: A Literature Review", Acacia Initiative, IDRC.

Asia-Pacific Development Information Programme (APDIP) (2005) "ICT for Poverty Reduction: Necessary but Insufficient. A State-of-the-Art Review", *e-Note 6* http://www.apdip.net/apdipenote/6.pdf

Beltran, D., K. Das and R. Fairlie (2009) "Home Computers and Educational Outcomes: Evidence from the NLSY97 and CPS" *Economic Inquiry*. V. 48, I. 3, July, pp: 771–792.

Benavente, J., D. Bravo and R. Montero (2009) "Wages and Workplace Computer Use in Chile", *mimeo*.

Borghans, L. and B. ter Weel (2008) "Understanding the Technology of Computer Technology Diffusion: Explaining Computer Adoption Patterns and Implications for the Wage Structure", *Journal of Income Distribution*, 17 (3-4), 37-70.

Borghans, L. and B. ter Weel (2007) "The Diffusion of Computers and the Distribution of Wages", *European Economic Review*, 51 (3), 715-748.

DiMaggio, P. and B. Bonikowski (2008) "Make Money Surfing the Web? The Impact of Internet Use on the Earnings of U.S. Workers", *American Sociological Review*, 73, 2.

DiNardo, J. and J. Pischke (1997) "The Return to Computer Use Revisited: Have Pencil Changed the Wage Structure Too?", *Quarterly Journal of Economics*, 112: 291-303.

Doms, M. and E. Lewis (2006), "The Diffusion of Personal Computers Across the U.S., 1990-2002", Working Paper Series 2006-18, Federal Reserve Bank of San Francisco.

Dostie, B., R. Jayaranam and M. Trépanier (2009) "What (if any) are the returns to computer use?", *Applied Economics*, 1-10.

Douma, F., K. Wells, T. Horan and K. Krizek (2003) "ICT and Travel in the Twin Cities Metropolitan Area: Enacted Patterns between Internet Use and Working and Shopping Trips", *mimeo*.

Entorf, H. and F. Kramarz (1997) "Does Unmeasured Ability Explain the Higher Wages of New Technology Workers?", *European Economic Review* 41, 1489-1509.

Fairlie, R. (2005) "The Effects of Home Computers on School Enrollment," *Economics of Education Review*, 24(5): 533-547.

Fairlie, R. and R. London (2009) "The Effects of Home Computers on Educational Outcomes: Evidence from a Field Experiment with Community College Students", *mimeo*.

Forman, C., A. Goldbarb and S. Greenstein (2009) "The Internet and Local Wages: Convergence or Divergence?", NBER Working Paper No. 14750.

Freeman, R. (2002) "The Labour Market in the New Information Economy", *Oxford Review of Economic Policy*, 18, 3, 288-305.

Goolsbee, A. and P. Klenow (2006) "Valuing Consumer Products by the Time Spent Using Them: An Application to the Internet", *American Economic Review* 96, 2, 108-113.

Goss, E. and J. Phillips (2002) "How Information Technology Affects Wages: Evidence Using Internet Usage as a Proxy for IT Skills", *Journal of Labor Research* 23, 3, 463-74.

Grazzi, M. and Vergara, S. (2010), "Determinants of ICT Access", in *On the Different Dimensions of ICT in Latin America. Exploring the Benefits and Constraints of Microdata Analysis*, Balboni, M., Rovira, S. and S. Vergara (Eds.), Project Document, ECLAC and IDRC.

Haisken-De New, J. and C. Schmidt (1999) "Money for Nothing and Your Chips for Free? The Anatomy of the PC Wage Differential", *IZA Discussion Paper* 86.

Haisken-DeNew, J. and C. D'Ambrosio (2003) "ICT and Socio-Economic Exclusion", *RWI Discussion Paper* 3.

Krueger, A. (1993) "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984-1989", *Quarterly Journal of Economics*, 108, 33-60.

Kuhn, P. and M. Skuterud (2004) "Internet Job Search and Unemployment Durations", *American Economic Review*, 94, 1, 218-232.

Leuven, E. and B. Sianesi (2003) "PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing" http://ideas.repec.org/c/boc/bocode/s432001.html, version 3.1.5, May 2009.

Maloney, W. (2004) "Informality revisited", *World Development*, 32, 7, 1159-78.

Mossberger, K., C. Tolbert, K. Johns B. and King (2006), "The Digital Divide and Economic Opportunity: Does Internet Use Matter for Less-Skilled Workers", *mimeo*. Paper presented at the Annual Meeting of the American Political Science Association, Philadelphia, PA.

Oosterbeek, H. and J. Ponce (2009) "The impact of computer use on wages in a developing country: Evidence from Ecuador", April, presented at LACEA 2009.

Pabilonia, S. and C. Zoghi (2005) "Returning to the Returns to Computer Use", *American Economic Review*, Papers and Proceedings, 95, 2.

Peres, W. and M. Hilbert (2009), *La Sociedad de la Información en América Latina y el Caribe: Desarrollo de las Tecnologías y Tecnologías para el Desarrollo*, ECLAC Books, Number 98, (LC/G.2363-P), Santiago, Chile.

Rosenbaum, P. and D. Rubin (1983), The Central Role of the Propensity Score in Observational Studies for Causal Effects, *Biometrika*, 70, 1, 41-55.

Sinai, T. and J. Waldfogel (2003) "Geography and the Internet: Is the Internet a Substitute or a Complement for Cities?", *NBER Working Paper* 10028.

Stevenson, B. (2009) "The Internet and Job Search", *NBER Working Paper* 13886.

Todd, P. (1999) "A Practical Guide to Implementing Matching Estimators", *mimeo*, University of Pennsylvania.

Todd, P. (2008) "Matching Estimators", *The New Palgrave Dictionary of Economics*. Eds. Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan.

Tables and Figures

Table III.1
National Household Surveys Description

Country	*Year*	*Survey*	*Institution*
Brazil	2005	Pesquisa Nacional por Amostra de Domicílios (PNAD)	Fundacao Instituto Brasileiro de Geografia e Estatistica (IBGE)
Chile	2006	Encuesta de Caracterización Socioeconómica Nacional (CASEN)	Ministerio de Planificación Nacional (MIDEPLAN)
Costa Rica	2005	Encuesta de Hogares de propósitos múltiples (EHPM)	Instituto Nacional de Estadística y Censos (INEC)
Honduras	2007	Encuesta Permanente de Hogares de Propósitos Múltiples (EPHPM)	Instituto Nacional de Estadística (INE)
Mexico	2007	Encuesta Nacional sobre Disponibilidad y Uso de las Tecnologías de la Información en los Hogares (ENDUTIH)	Instituto Nacional de Estadística y Geografía (INEGI)
Paraguay	2007	Encuesta Permanente de Hogares (EPH)	Dirección Nacional de Estadísticas, Encuestas y Censos (DNEEC)

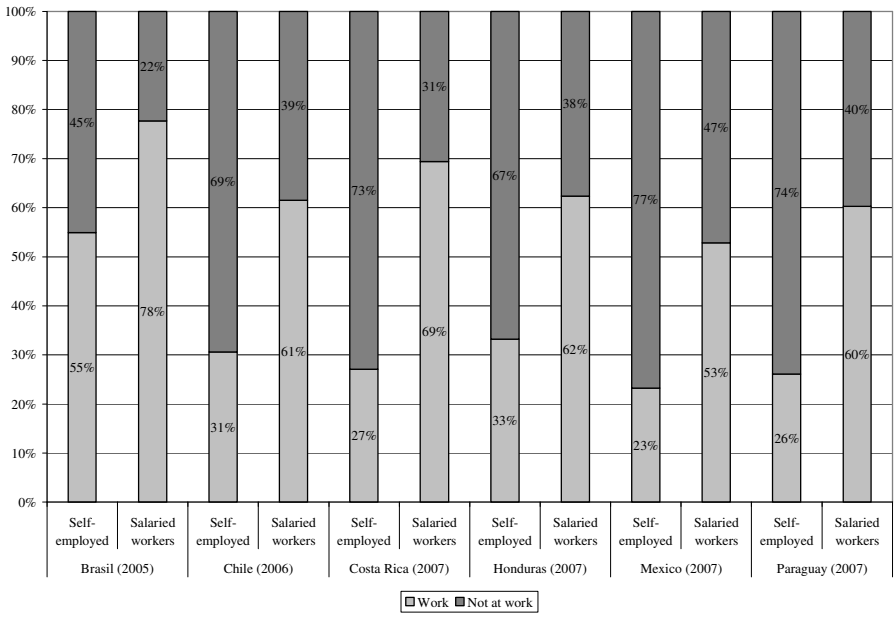
Source: Author's elaboration.

Table III.2
Patterns of Internet Use by Full-Time Employed Men in Urban Areas
(Number and percentages)

Country/Location	N	Internet use (%)					
		Anywhere	Work	Home	Only at Work	Only at Other Places[a]	Work and Other Places
Brazil (2005)							
Self-employed	12,192	12.3%	6.7%	7.8%	1.6%	5.5%	5.2%
Salaried workers	31,212	25.9%	20.2%	12.4%	7.4%	5.8%	12.8%
Total	43,404	22.1%	16.4%	11.1%	5.8%	5.7%	10.6%
Chile (2006)							
Self-employed	5,947	12.6%	3.9%	7.0%	1.9%	8.8%	2.0%
Salaried workers	15,817	23.8%	14.6%	9.8%	9.7%	9.2%	5.0%
Total	21,764	20.8%	11.7%	9.0%	7.6%	9.1%	4.1%
Costa Rica (2005)							
Self-employed	436	13.5%	3.7%	6.0%	1.4%	9.9%	2.3%
Salaried workers	1,787	32.0%	22.2%	10.6%	10.7%	9.8%	11.5%
Total	2,223	28.4%	18.6%	9.7%	8.9%	9.8%	9.7%
Honduras (2007)							
Self-employed	2,116	12.7%	4.2%	5.0%	1.3%	8.4%	2.9%
Salaried workers	3,228	20.0%	12.5%	4.5%	6.5%	7.4%	6.0%
Total	5,344	17.1%	9.2%	4.7%	4.4%	7.8%	4.8%
Mexico (2007) [b]							
Self-employed	382	11.3%	2.6%	5.0%	1.8%	8.6%	0.8%
Salaried workers	1,424	31.4%	16.6%	10.8%	9.7%	14.4%	6.9%
Total	1,806	27.1%	13.6%	9.6%	8.0%	13.2%	5.6%
Paraguay (2007)							
Self-employed	389	5.9%	1.5%	2.1%	1.0%	4.4%	0.5%
Salaried workers	751	18.1%	10.9%	6.3%	8.5%	7.2%	2.4%
Total	1,140	13.9%	7.7%	4.8%	6.0%	6.2%	1.8%

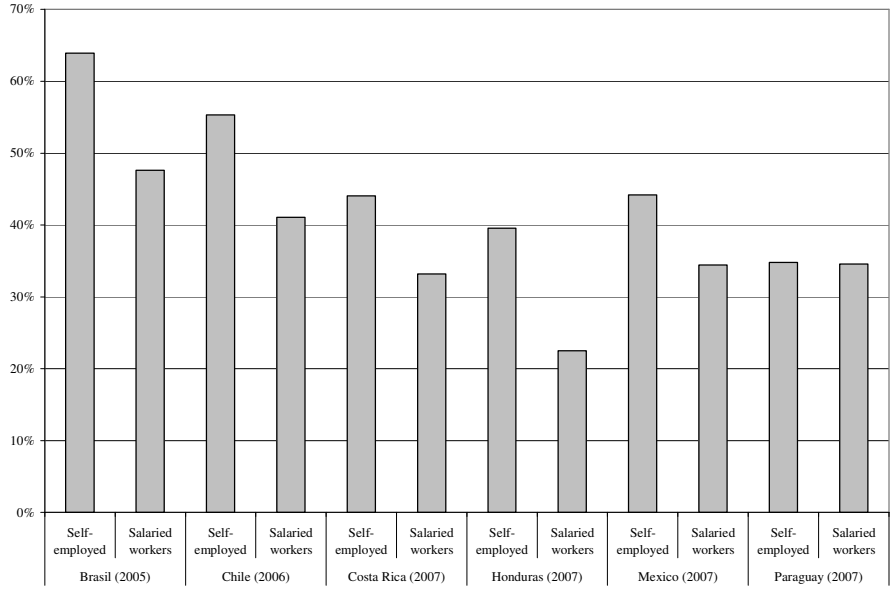
Source: Author's elaboration based on National Household Surveys. [a] Includes access at home, education, public and commercial centers; [b] Full-time and part-time workers were included in the sample, given that there is no information for hours of work.

Figure III.1
Distribution of Internet Users by Employment Category and Access Point
(Percentages)



Source: Author's elaboration based on National Household Surveys.

Figure III.2
Percentage of Users at Home by Employment Category
(*Percentages*)



Source: Author's elaboration based on National Household Surveys.

Table III.3

Percentage Difference in Means Between Treated and Controls before and After Matching
Selected Variables for Salaried Workers

Variable	*Sample*	*Brazil*		*Chile*		*Costa Rica*		*Honduras*		*Mexico*		*Paraguay*	
8 or more years of education [1]	Unmatched	157.0	***	110.9	***	147.3	***	135.8	***	103.6	***	120.9	***
	Matched	-2.1		-0.1		0.6		1.8		-2.6		-2.6	
12 or more years of education [1]	Unmatched	103.7	***	119.5	***	140.9	***	93.1	***	134.8	***	101.0	***
	Matched	1.7		1.9		6.1		4.7		-4.3		-5.4	
Age	Unmatched	-5.4	***	-36.7	***	-3.9		-10.3	*	-11.0		-14.2	
	Matched	-3.5		-1.9		3.2	**	0.8		-7.2	**	-1.2	
Landline telephone at home [1, 2]	Unmatched	79.2	***	65.9	***	39.6	***	65.7	***	59.2	***	68.6	***
	Matched	-0.7		-2.5		16.1	**	-1.0		-5.2		-5.3	
Satellite TV at home [1, 2]	Unmatched	24.6	***	70.2	***	68.5	***	69.4	***	74.9	***	86.0	***
	Matched	0.1		2.6		5.0		-0.2		3.2		2.2	
PC at home [1, 2]	Unmatched	129.8	***	109.2	***	109.4	***	93.5	***	108.9	***	107.1	***
	Matched	-2.1		0.3		-6.3		-2.3		-4.6		-8.1	
Live in house [1, 2]	Unmatched	-62.8	***	-24.4	***	-13.7	***	19.4	***	n.a.	n.a.	-16.2	*
	Matched	-2.3		1.4		-12.6	**	0.9		n.a.	n.a.	-5.4	
Live in apartment [1, 2]	Unmatched	65.8	***	30.0	***	24.9	***	15.5	***	n.a.	n.a.	33.1	***
	Matched	2.3		-1.0		10.0	*	3.2		n.a.	n.a.	11.1	
Property Owner [1, 2]	Unmatched	-11.2	***	-47.8	***	-7.0	***	3.7		n.a.	n.a.	-19.3	**
	Matched	-0.8		1.4		5.8		2.4		n.a.	n.a.	-5.0	
Tenant [1, 2]	Unmatched	8.1	***	24.3	***	8.4	*	-9.3	**	n.a.	n.a.	25.7	***
	Matched	-0.6		1.8		-13.3	**	-0.2		n.a.	n.a.	15.6	
Owner Paying Mortgage [1, 2]	Unmatched	20.7	***	35.3	***	14.7	***	22.4	***	n.a.	n.a.	-2.9	
	Matched	-0.3		-2.4		6.5		-2.8		n.a.	n.a.	1.8	

Source: Author's elaboration based on National Household Surveys.

[1] Fraction of individuals in the sample; [2] Obtained from the corresponding categorical variables used for the matching procedure. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively. Detailed information for all the variables included in the propensity score estimation is presented in the Appendix.

Table III.4

Percentage Difference Between Treated and Controls before and After Matching
Selected Variables for Self-Employed Workers

Variable	*Sample*	*Brazil*		*Chile*		*Costa Rica*		*Honduras*		*Mexico*		*Paraguay*	
8 or more years of education[1]	Unmatched	207.1	***	161.8	***	158.9	***	115.5	***	146.8	***	155.5	***
	Matched	-2.1		0.5		20.4		3.1		4.0		-0.2	
12 or more years of education[1]	Unmatched	111.7	***	115.8	***	119.5	***	65.1	***	124.5	***	114.9	***
	Matched	7.8		-0.9		-7.8		6.3		2.8		-1.2	
Age	Unmatched	-24.5	***	-57.2	***	-23.3	*	-24.2	***	-40.5	***	-38.5	***
	Matched	-5.6	**	-4.5		-0.5		9.5		4.0		-0.3	
Landline telephone at home[1, 2]	Unmatched	126.1	***	112.4	***	33.5	***	105.8	***	61.0	***	79.4	***
	Matched	2.2		2.8		-21.3		-0.2		1.7		0.4	
Satellite TV at home[1, 2]	Unmatched	51.4	***	103.0	***	84.4	***	100.1	***	56.3	***	86.9	***
	Matched	-0.7		-5.5		4.5		3.8		15.5		-5.7	
PC at home[1, 2]	Unmatched	178.0	***	170.6	***	118.6	***	136.2	***	97.7	***	118.4	***
	Matched	-5.3		-0.1		-7.7		-0.2		13.0		-3.5	
Live in house[1, 2]	Unmatched	-73.0	***	-18.8	***	-42.9	***	-3.2	***	n.a.		-25.0	***
	Matched	-3.0		-7.8	*	-12.1		3.8		n.a.		-2.4	
Live in apartment[1, 2]	Unmatched	75.2	***	36.0	***	36.3	***	19.1	***	n.a.		34.9	***
	Matched	3.2		8.5		1.3		-2.8		n.a.		1.2	
Property Owner[1, 2]	Unmatched	-36.1	***	-61.7	***	-46.7	***	-39.2	***	n.a.		-28.8	***
	Matched	2.9		-6.8		-6.8		-0.2		n.a.		0.0	
Tenant[1, 2]	Unmatched	36.7	***	45.0	***	34.0	***	36.2	***	n.a.		44.0	***
	Matched	-9.2	**	4.0		28.1		6.0		n.a.		3.2	
Owner Paying Mortgage[1, 2]	Unmatched	22.8	***	41.2	***	24.9	***	20.4	***	n.a.		4.2	***
	Matched	3.7		4.9		-25.6		-2.1		n.a.		-3.9	

Source: Author's elaboration based on National Household Surveys.
[1] Fraction of individuals in the sample. [2] Obtained from the corresponding categorical variables used for the matching procedure. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively. Detailed information for all the variables included in the propensity score estimation is presented in the Appendix.

Table III.5
ATT of Internet Use for Full-Time Salaried Men in Urban Areas

Groups		**ATT**					
Treated	*Control*	*Brazil*	*Chile*	*Costa Rica*	*Honduras*	*Mexico*[a]	*Paraguay*
Use	Not use	0,297***	0,260***	0,243***	0,302***	0,176***	0.145
Use only at work	Not use	0,253***	0,284***	0,275***	0,371***	0,289***	0,212**
Use only at other places	Not use	0,170***	0,168***	0.039	0,189***	0,122*	0.179
Use at work and other places	Not use	0,420***	0,417***	0,325***	0,356***	0,318***	0,521**
Use at work and other places	Use only at work	0,196***	0,129***	0.034	0.142	0.088	0,458*

Source: Author's elaboration based on estimation results.
[a] Full time and part time workers were included in the sample. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Table III.6
ATT of Internet Use for Full-Time Self-Employed Men

Groups		**ATT**					
Treated	*Control*	*Brazil*	*Chile*	*Costa Rica*[c]	*Honduras*	*Mexico*[c, d]	*Paragua*[c]
Use	Not use	0,271***	0,182***	0.202	0,314***	0,318**	0,236***
Use with no access at home	Not use and no access	0,328***	0,138**	0.162	0,217**	0.252	0,201***
Use at home	Use somewhere else	-0.018	0.133	0.199	0.313	n.a.	0.14
Use at home[a]	Use somewhere else	0.073	0.134	0.813	0,787**	n.a.	0.307
Use for productive purposes[b]	Other use	0,258***	0,188**	0.381	-0.305	0.097	-0.057

Source: Author's elaboration based on estimation results.
[a] ATT on other household members income; [b] Includes use for communication, banking and government; [c] Men and women were included to avoid sample size problems; [d] Full time and part time workers were included in the sample. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Appendix

Table A.1
Description of Variables Included in Propensity Score Estimations

Variables	Description
8+ years of education	1: Yes; 0: No.
12+ years of education	1: Yes; 0: No.
Age	Years of Age
Age squared	Years of Age Squared
Urban Areas	1: Yes; 0: No.
Sex	1: Male; 2: Female.
Sector of Activity (*aggregation of categories may differ across countries*)	1, Agriculture, hunting and forestry; 2, Fishing; 3, Mining and quarrying; 4, Manufacturing; 5, Electricity, gas and water supply; 6, Construction; 7, Wholesale and retail trade; repair of motor vehicles/ motorcycles and personal and household goods; 8, Hotels and restaurants; 9, Transport, storage and communications; 10, Financial intermediation; 11, Real estate, renting and business activities; 12, Public administration and defense; compulsory social security; 13, Education; 14, Health and social work; 15, Other community, social and personal service activities; 16, Activities of private households as employers and undifferentiated production activities of private households; 17, Extraterritorial organizations and bodies;18 Other activities, 99, Unknown; 19, Agriculture, hunting, forestry and fishing; 20, Manufacturing, electricity, gas and water supply; 21, Education, health and social services; 22, Wholesale and retail trade; repair of motor vehicles, motorcycles, hotels and restaurants; 23, Financial int.
Occupation	1, Legislators, senior officials and managers; 2, Professionals; 3, Technicians and associate professionals; 4, Clerks; 5, Service workers and shop and market sales workers; 6, Skilled agricultural and fishery workers; 7, Craft and related trades workers; 8, Plant and machine operators and assemblers; 9, Not qualified workers; 10, Armed Forces; 11, Other activities; 99 Unknown.
Size of Establishment	Different categorical variables for each country.
House Type	1, House; 2, Apartment; 3, Room in a house or shared house; 4, Improvised house; 8, Other; 9, Unknown.
House Ownership	1, Owned- paid; 2, Owned- paying; 3, Rented; 4, Family owned; 5, Owned; 8, Other; 9, Unknown.
Landline Phone at Home	1: Yes, 2: No, 9: Unknown.
Satellite TV at Home	1: Yes, 2: No, 9: Unknown.
Computer at Home	1: Yes, 2: No, 9: Unknown.

Table A.2

ATT Salaried Workers – Brazil

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	7288	23056			
Unmatched	7.393	6.342	1.051	0.009	118.24
ATT	7.320	7.023	0.297	0.022	13.34
b. Users only at work versus non-users					
N	22,658	2,079			
Unmatched	7.114	6.348	0.766	0.014	55.46
ATT	7.039	6.786	0.253	0.020	12.54
c. Users at other places versus non-users					
N	23,035	1,616			
Unmatched	7.033	6.342	0.691	0.015	44.67
ATT	6.978	6.807	0.170	0.025	6.82
d. Users both at work and other places versus non-users					
N	22,692	3,585			
Unmatched	7.718	6.348	1.371	0.011	121.43
ATT	7.683	7.264	0.420	0.039	10.8
e. Users both at work and other places versus other users at work					
N	2,309	3,580			
Unmatched	7.718	7.114	0.604	0.021	28.92
ATT	7.684	7.488	0.196	0.033	5.88

ATT Self-Employed Workers – Brazil

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	1,374	15,784			
Unmatched	7.472	6.148	1.324	0.023	56.63
ATT	7.427	7.156	0.271	0.057	4.75
b. Users with no access versus others with no access					
N	461	15,138			
Unmatched	7.089	6.111	0.978	0.037	26.19
ATT	7.045	6.717	0.328	0.049	6.68
c. Users at home versus users somewhere else					
N	792	128			
Unmatched	7.683	7.487	0.197	0.079	2.48
ATT	7.717	7.735	-0.018	0.092	-0.2
Unmatched*	7.311	7.067	0.244	0.114	2.13
ATT*	7.349	7.276	0.073	0.148	0.49
d. Users for productive purposes versus other users					
N	1,104	298			
Unmatched	7.594	6.990	0.603	0.055	11.04
ATT	7.526	7.268	0.258	0.077	3.33

Notes: The outcome variable is individual income in logs.

* The outcome variable is income for other household members.

Table A.3

ATT Salaried Workers - Chile

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	3,366	11,961			
Unmatched	13.124	12.270	0.854	0.012	70.84
ATT	13.047	12.787	0.260	0.023	11.18
b. Users only at work versus non-users					
N	1,376	11,958			
Unmatched	13.049	12.270	0.779	0.016	47.47
ATT	13.006	12.722	0.284	0.026	10.81
c. Users at other places versus non-users					
N	1,294	11,958			
Unmatched	12.963	12.270	0.693	0.017	40.76
ATT	12.885	12.717	0.168	0.027	6.25
d. Users both at work and other places versus non-users					
N	625	11,626			
Unmatched	13.571	12.276	1.295	0.022	58.08
ATT	13.493	13.077	0.417	0.048	8.64
e. Users both at work and other places versus other users at work					
N	695	1,518			
Unmatched	13.568	13.052	0.516	0.034	15.35
ATT	13.519	13.390	0.129	0.049	2.64

ATT Self-Employed Workers - Chile

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	787	11,058			
Unmatched	13.491	12.485	1.006	0.031	32.14
ATT	13.432	13.250	0.182	0.054	3.4
b. Users with no access versus others with no access					
N	330	10,628			
Unmatched	13.162	12.458	0.704	0.046	15.25
ATT	13.088	12.950	0.138	0.058	2.4
c. Users at home versus users somewhere else					
N	390	360			
Unmatched	13.729	13.210	0.520	0.066	7.9
ATT	13.732	13.599	0.133	0.114	1.17
Unmatched*	12.504	11.805	0.699	0.142	4.93
ATT*	12.554	12.419	0.134	0.203	0.66
d. Users for productive purposes versus other users					
N	509	304			
Unmatched	13.610	13.261	0.350	0.067	5.19
ATT	13.541	13.353	0.188	0.077	2.43

Notes: The outcome variable is individual income in logs.
* The outcome variable is income for other household members.

Table A.4

ATT Salaried Workers – Costa Rica

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	515	1,173			
Unmatched	12.971	12.237	0.735	0.029	25.36
ATT	12.950	12.707	0.243	0.059	4.09
b. Users only at work versus non-users					
N	171	914			
Unmatched	13.032	12.293	0.738	0.042	17.66
ATT	13.011	12.736	0.275	0.079	3.48
c. Users at other places versus non-users					
N	156	1,153			
Unmatched	12.634	12.237	0.397	0.042	9.35
ATT	12.587	12.549	0.039	0.069	0.56
d. Users both at work and other places versus non-users					
N	166	856			
Unmatched	13.205	12.315	0.889	0.041	21.59
ATT	13.188	12.863	0.325	0.095	3.42
e. Users both at work and other places versus other users at work					
N	182	186			
Unmatched	13.205	13.040	0.166	0.064	2.57
ATT	13.199	13.166	0.034	0.083	0.4

ATT Self-Employed Workers – Costa Rica

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	73	893			
Unmatched	12.650	11.696	0.953	0.080	11.94
ATT	12.487	12.285	0.202	0.127	1.6
b. Users with no access versus others with no access					
N	38	847			
Unmatched	12.372	11.677	0.695	0.099	7.04
ATT	12.192	12.030	0.162	0.117	1.38
c. Users at home versus users somewhere else					
N	18	48			
Unmatched	12.830	12.402	0.428	0.133	3.22
ATT	12.810	12.610	0.199	0.234	0.85
Unmatched*	11.890	10.765	1.126	0.395	2.85
ATT*	11.847	11.034	0.813	0.676	1.2
d. Users for productive purposes versus other users					
N	18	53			
Unmatched	12.844	12.197	0.647	0.196	3.29
ATT	12.844	12.462	0.381	0.239	1.6

Notes: The outcome variable is individual income in logs.

* The outcome variable is income for other household members.

Table A.5

ATT Salaried Workers – Honduras

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	549	2,553			
Unmatched	9.336	8.472	0.864	0.030	28.94
ATT	9.299	8.997	0.302	0.049	6.17
b. Users only at work versus non-users					
N	180	2,274			
Unmatched	9.452	8.521	0.931	0.045	20.78
ATT	9.441	9.070	0.371	0.071	5.26
c. Users at other places versus non-users					
N	212	2,340			
Unmatched	9.015	8.515	0.500	0.042	11.84
ATT	8.977	8.789	0.189	0.059	3.19
d. Users both at work and other places versus non-users					
N	151	2,335			
Unmatched	9.646	8.515	1.131	0.049	23.09
ATT	9.602	9.247	0.356	0.088	4.04
e. Users both at work and other places versus other users at work					
N	151	198			
Unmatched	9.658	9.456	0.202	0.080	2.54
ATT	9.676	9.534	0.142	0.096	1.49

ATT Self-Employed Workers - Honduras

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	240	3,473			
Unmatched	9.491	8.041	1.450	0.079	18.25
ATT	9.445	9.131	0.314	0.094	3.35
b. Users with no access versus others with no access					
N	155	3,436			
Unmatched	9.190	8.026	1.164	0.097	11.98
ATT	9.147	8.930	0.217	0.092	2.36
c. Users at home versus users somewhere else					
N	63	107			
Unmatched	10.004	9.366	0.638	0.140	4.55
ATT	9.956	9.643	0.313	0.207	1.51
Unmatched*	9.437	8.166	1.271	0.235	5.4
ATT*	9.386	8.599	0.787	0.383	2.06
d. Users for productive purposes versus other users					
N	139	11			
Unmatched	9.670	9.475	0.195	0.314	0.62
ATT	9.684	9.989	-0.305	0.290	-1.05

Notes: The outcome variable is individual income in logs.
* The outcome variable is income for other household members.

Table A.6

ATT Salaried Workers – Mexico

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	376	921			
Unmatched	8.954	8.419	0.535	0.033	16.38
ATT	8.893	8.717	0.176	0.057	3.09
b. Users only at work versus non-users					
N	115	721			
Unmatched	9.005	8.447	0.558	0.048	11.63
ATT	8.980	8.691	0.289	0.079	3.67
c. Users at other places versus non-users					
N	174	921			
Unmatched	8.787	8.419	0.368	0.041	9.05
ATT	8.749	8.627	0.122	0.068	1.79
d. Users both at work and other places versus non-users					
N	78	437			
Unmatched	9.264	8.497	0.767	0.062	12.33
ATT	9.167	8.848	0.318	0.103	3.08
e. Users both at work and other places versus other users at work					
N	81	124			
Unmatched	9.262	9.014	0.248	0.094	2.64
ATT	9.241	9.154	0.088	0.117	0.75

ATT Self-Employed Workers – Mexico

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	53	765			
Unmatched	8.768	7.917	0.851	0.123	6.94
ATT	8.533	8.215	0.318	0.137	2.32
b. Users with no access versus others with no access					
N	36	721			
Unmatched	8.566	7.895	0.671	0.153	4.38
ATT	8.418	8.167	0.252	0.162	1.56
c. Users at home versus users somewhere else					
N	na	na			
Unmatched	10.208	10.113	0.095	0.964	0.1
ATT	.	.	.	.	.
Unmatched*	9.065	9.234	-0.169	0.634	-0.27
ATT*	.	.	.	.	.
d. Users for productive purposes versus other users					
N	34	23			
Unmatched	8.842	8.605	0.237	0.244	0.97
ATT	8.842	8.745	0.097	0.250	0.39

Notes: The outcome variable is individual income in logs.
* The outcome variable is income for other household members.

Table A.7

ATT Salaried Workers – Paraguay

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	123	579			
Unmatched	14.870	14.145	0.725	0.056	12.87
ATT	14.812	14.667	0.145	0.091	1.58
b. Users only at work versus non-users					
N	58	500			
Unmatched	14.829	14.211	0.617	0.073	8.5
ATT	14.783	14.571	0.212	0.104	2.02
c. Users at other places versus non-users					
N	47	571			
Unmatched	14.798	14.148	0.650	0.084	7.78
ATT	14.749	14.570	0.179	0.123	1.46
d. Users both at work and other places versus non-users					
N	13	222			
Unmatched	15.233	14.353	0.880	0.148	5.93
ATT	15.099	14.579	0.521	0.242	2.15
e. Users both at work and other places versus other users at work					
N	11	46			
Unmatched	15.232	14.837	0.395	0.168	2.35
ATT	15.262	14.804	0.458	0.237	1.94

ATT Self-Employed Workers - Paraguay

	Treated	Controls	Difference	SE	t-stat
a. Users versus non-users					
N	240	2,182			
Unmatched	14.923	13.976	0.948	0.057	16.52
ATT	14.886	14.650	0.236	0.079	3
b. Users with no access versus others with no access					
N	164	2,162			
Unmatched	14.738	13.969	0.769	0.068	11.38
ATT	14.695	14.495	0.201	0.078	2.58
c. Users at home versus users somewhere else					
N	62	93			
Unmatched	15.206	14.815	0.392	0.122	3.21
ATT	15.170	15.030	0.140	0.164	0.86
Unmatched*	14.780	14.280	0.499	0.153	3.26
ATT*	14.763	14.456	0.307	0.209	1.47
d. Users for productive purposes versus other users					
N	167	72			
Unmatched	14.924	14.921	0.003	0.114	0.02
ATT	14.909	14.966	-0.057	0.123	-0.46

Notes: The outcome variable is individual income in logs.
* The outcome variable is income for other household members.