THE EFFECT OF INTERNET AND CELL PHONES ON EMPLOYMENT AND AGRICULTURAL PRODUCTION IN RURAL VILLAGES IN PERU

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Abstract

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JEL codes: L96, J21, J43.

Key words: Internet, cell phones, employment, agricultural production.

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Introduction

There is wide consensus that the best way to fight poverty is by helping the poor to generate their own sources of income. Nevertheless, boosting private sector activity, especially in rural and remote areas, is not an easy task. This difficulty is in large part generated by the isolation of these areas from markets, where clients, suppliers, workers, firms, and information about prices, opportunities, technologies, among others, are concentrated. For this reason, the widespread use of cell phones and Internet, which allows easy access to information and communication with others, without having to travel for several hours to do so, represents an exciting opportunity for the economic development in remote areas.

Important evidence exists testifying to some of the benefits of access to public phones and cell phones in developing countries. Jensen (2007) [9] found that the access to cell phones in some provinces of India reduced the dispersion in fish prices and reduced waste, increasing the welfare of suppliers and consumers. A similar result was found by Aker (2008)[1], who found access to cell phone in Niger reduces the price dispersion of grains. Beuerman (2010) [4] found that having public telephones in rural villages increases prices farmers receive for their products, while reducing the price they pay for their inputs. He also found a reduction in child labor, probably generated by an income effect. Klonner and Nolen (2010) [10] found that access to cell phones increased women's participation in the workforce in rural villages in South Africa. They also found a shift from agricultural employment to other sectors among men. Finally, Aker (2011) [2] found that a program in Niger, in which students learned how to use mobile phones, increased seasonal migration probably for employment purposes.

The effects of Internet access could be potentially higher than the effects of phone access, since it allows a much greater magnitude of information flow and, thanks to the availability of Internet cafes, at a much lower cost for users[1]. However, the education attainment of individuals leaving in remote and poor areas is typically very low and access to Internet requires a minimum level of literacy. Thus, it is possible that Internet has no impact on the economies of poor and remote areas. In fact, in the US, where income and educational attainment is much higher than in developing countries, Forman et al. (2012)[7] find that Internet investment generated wage and employment growth but only in counties with the highest levels of income and education, exacerbating regional wage inequality.

Governments around the world have spent, and continue to spend significant resources subsidizing Internet access. In particular, the Peruvian government has already implemented 9 programs to subsidize Internet connections in various rural areas of the country, with an accumulated budget of $162 millions[2]. In spite of the great interest shown by governments and the amount of resources

[1] Typically one hour of Internet in an Internet kiosk in Peru costs around S/.1, which is equivalent to US $0.33. With the same money you can buy only about 2 minutes of pay-as-you-go cellphone, without including the cost of the equipment.

[2] Source: Fund for Investments in Telecommunications, Peru.

they have invested to expand Internet access, there is, to the best of our knowledge, no rigorous empirical study that shows the effect of Internet access on employment or production in developing countries, especially in rural areas.

In this study we investigate a social program in Peru that subsidize Internet connection to rural and remote areas with no access to any type of communication and information technology. We exploit the estimation errors made in the calculation of the population of the villages in the design of the Program as a random shock, which allow us to construct a comparison group that comply with the same criteria that was used to select the treatment group. We then apply a difference-in-difference strategy. As a typical difference-in-difference approach, we rely on the assumption that in the absence of the program the pattern of growth in the outcome variables would be similar in the two groups. We construct placebos to show that in the previous years of the program this in fact was the case. We also perform a sensibility analysis by changing our sample to include villages with different ranges of population.

One caveat concerning this program is that the technology provided for Internet access increased cell phone and home phone ownership also. In an effort to distinguish the effects generated by the expanded Internet access from the access to cell phones we apply a triple-difference (or a difference-in-difference-in-difference) approach. We show that the Internet usage is concentrated among educated, single and young people, while ownership of home phone and cell phones is widespread among all types of people. Thus, we will test whether the effects of the program are significantly different for educated, single and young people, in which case we will assume that this additional effect is mainly generated by the access to Internet rather than the access to cell phones. This strategy will not result in a perfect identification of the marginal effect of Internet access, but we believe that it will provide some evidence for this conclusion. Furthermore, for public policy purposes, the total effects might be more relevant since in practical terms it is hard to prevent this type of "contamination" in the treatment.

We find several interesting results. First, we find that the program increases for-wage employment but only for educated or single or young individuals. This increment comes in part from people that were self-employed and in part from the unemployed. No part of this increase in employment seems to come from people that were studying. Second, we find that the program generated an increase in the price received by farmers, as well as an increase in the production of more elaborated products. It seems that both telephone and Internet access play a role in generating these effects; cell phones seems to be the main driver in the effects in the case of the agricultural activity, while Internet access seems to be the main driver of the effects on employment, although further research is needed to better understand the marginal effects of each of these technologies.

1 Literature Review

There exists vast and important evidence of the benefits of access to land phones and cell phones in developing countries. Jensen (2007) [9] found that the access to cell phones in some provinces of India reduced the dispersion of fish prices and reduced waste, increasing the welfare of suppliers and consumers. A similar result was found by Aker (2008) [1], where access to cell phones in Niger reduces the price dispersion of grains. Beuerman (2010) [4] found that having a public telephone on rural villages increases the prices farmers receive for their products, while reduces the price they pay for their inputs. He also found a reduction in child labor, probably generated by an income effect. Klonner and Nolen (2010) [10] found that access to cell phones increased women's employment in rural villages in South Africa. They also found a shift from agricultural employment to other sectors on men. Finally, Aker (2011) [2] found that a program in Niger, in which students learned how to use mobile phones increased seasonal migration probably for employment purposes.

However, in developed countries there is mixed evidence of the effects of Internet. Stevenson (2006) [14] finds that Internet users are more likely to change jobs and receive higher wages in these new jobs, and are less likely to become unemployed. To demonstrate causality, she uses the average state ownership rates of household appliances in 1960 as an instrument for the differentiated adoption of Internet by states during the 1990s in the United States. In the same line, Kuhn and Mansour (2011) [12] use a fixed-effect model to show that Internet reduces unemployment duration on the years 2008 and 2009 in USA. One of their main contributions is the analysis of heterogeneous effects by type of use of Internet to search for jobs (for example: contact relatives and friends, looking ads, sent out resumes or filled out applications, etc.). They find that using Internet to contact friends and relatives raises the job-finding rate by 36 percent, while using Internet to send out resumes of fill applications raises the job-finding by 20 percent. Finally, they find no effect on wages, this means that Internet allows finding a new job faster, but not a better job.

In contrast to urban areas, rural areas of developed countries do not have empirical evidence of the positive effect of broadband. For example, Czernich (2011) [5] suggests that DSL availability has no effect on unemployment rates on German rural municipalities in 2006. She uses the distance from the municipality to the location of the closest main distribution frame as an instrument for the availability of Internet on a municipality. The intuition behind this is that DSL network was built on the preexisting network of voice-telephony, so the company needs to gradually replace the existing copper wires with optical fiber. So, the longer the distance, the costly the installation. The results of Czernich are probably biased because distance does not meet the exogeneity assumption of the IV approach. As she noticed, the main distribution frames were set up in municipalities with a higher population density. To address this concern, the sample is split into two subsamples: the ones that are regional center (this means they have a higher population density and also have more firms, shops, etc.), and the other which are not. Still, she finds no evidence that broadband has an effect on unemployment. In addition, Kolko (2012) [11] shows that broadband expansion is positively associated with establishment growth as well as employment growth, while average establishment size is negative. Also, it is associated with a decrease in household income of the local residents despite there is no change on average pay per employee, this means that broadband expansion does not necessarily benefit local residents. Although he uses the local terrain as an instrument for broadband availability, as he suggests, he cannot demonstrate causality because the county's slope might be positively correlated with other variables –such as transport costs –, and these might be negatively correlated with employment growth and also with broadband expansion.

Although most of the literature shows positive effects of Internet, Forman et al. (2012) [7] show that this ICT exacerbates regional wage inequalities in the years 1995 to 2000 in USA. Using an OLS with presample controls, they show that there is no effect when estimating the regression in overall counties, but when they restricted to 163 counties with high income, education, population and TI intensity, advanced Internet has a strong effect on employment and wages. This means that, while Internet investment was widely dispersed, gains were limited to specific areas. They also estimate three IV models as robustness checks. The first instrument they use is the variance in the costs of Internet deployment among establishments in multi establishment firms in the county; the second instrument is the number of local county connections to a data communications network (ARPANET) and finally, is an industry-level proxy of the demand for advanced Internet investment outside the local county.

In developing countries, there is little robust evidence of the impact of Internet on labor market outcomes. Goyal (2010) [8] investigates the impact of daily access to wholesale prices of soybean in a website over the price of this product in India. She exploits the fact that different districts received internet kiosks and hubs at different times and, using fixed effects at district level as well as controlling for district-specific time trends, concludes that information about wholesale prices of soybean decreases the price dispersion of this product. In addition, as the average price of soybean increased after the introduction of internet kiosks, the area cultivated under soy also increases. Since the overall area cultivated is not affected and the area cultivated under rice decreases, the author suggests that farmers are substituting rice with soy. Unfortunately, it is impossible to disentangle the effect from access to Internet, to the effect from particular information provided in the website.

To the best of our knowledge, there is no robust empirical evidence that demonstrates the impact of Internet on employment in isolated communities in rural villages, specially in developing countries[3]. Accordingly, the purpose of this paper is to shed light on how the access to Internet and other ICT in isolated localities in Peru affected the employment and the agricultural production in rural and isolated villages in Peru.

2 The Program

The Broadband Project for Isolated Locations (BAS, for its acronym in Spanish) was created to provide broadband and Internet kiosks to 1,019 villages or "Centros Poblados" (CP) in rural and

[3]In the case of Peru, there are some papers which investigate the impact of ICTs on household income (Medina y Fernández (2011), wages (De los Ríos (2010)), wages inequality (Rodriguez (2008)), etc. but they do not properly solve the reverse causality problem or the endogeneity in the adoption of ICTs.

remote areas of Peru[4]. The Program was designed and financed by the Fund for Investments in Telecommunications (FITEL, for its acronym in Spanish); an office of the Peruvian Ministry of Transportation and Communication that develops telecommunication investment projects in rural areas of the country. The project was carried out by a private operator, who was responsible for the installation of Internet kiosks and training of entrepreneurs who would be in charge of these kiosks.

The beneficiary villages were selected by FITEL prior to the auctioning process according to the following criteria: First, the localities must be technologically isolated. Broadly speaking, this means that due to geographical isolation and other physical constraints the signal of an antenna placed in any another village does not reach this locality[5], which results in a total lack of communication technology. Second, localities must have electricity. Third, localities must have 300 or more inhabitants unless they are district capitals, in which case they will be included regardless of their population. FITEL collected information from different sources (mainly government offices) to establish if the CP were isolated and had electricity. In order to estimate the population of each CP for the year 2007 (the year of the design of the program) they used the Population Census of 1980 and of 1993, calculated an average annual growth in population and assume the same annual growth between 1993 and 2007.

The roll-out of the program occurred between June 2009 and May 2010. Table 1[6] shows the number of beneficiary localities sorted by the month of installation of the broadband and Internet kiosks. It is important to note, however, that according to FITEL officials, the antenna installed for the Internet services could and was used also for home phones and cell phones. We confirmed this information by estimating the effect of the program on telephone and cell phone ownership, as we will see in the Results Section.

[4]The Project also comprise other sections that installed public and subscriber telephones instead of Internet, but we are focusing on the part of the Project that provided Internet access.

[5]In technical terms, the locality does not have "Line-Of-Sight" transmission.

[6]We do not have information about the month the installation finished on one village (Villa Castilla) located on Huanuco department.

Table 1: Roll-out of BAS

Month	**Number of localities**	**Percentage**
June 2009	2	0.2%
July 2009	55	5%
August 2009	122	12%
September 2009	81	8%
October 2009	113	11%
November 2009	89	9%
December 2009	75	7%
January 2010	28	3%
February 2010	106	10%
March 2010	143	14%
April 2010	115	11%
May 2010	89	9%
Total	**1018**	

3 Empirical strategy and Data

3.1 Empirical strategy

We estimate a Difference in Difference (DiD) model using only isolated villages that have electricity (according to the data provided from FITEL)[7] and limit our sample to villages with at most 600 inhabitants in order to make treatment and control group more similar, given that most of the control group's CP have fewer than 300 inhabitants. We also limit our sample to villages with at least 100 inhabitants, because we have no information about isolation and electricity for localities with less than 100 inhabitants. We, therefore estimate a *Local Treatment Effect* of the program for the villages with a population range of 100 to 600 inhabitants. Nonetheless, in section 4 we show that our estimates are robust to changes in the range of population.

[7]Given the selection criteria, could estimate a Regression Discontinuity Design exploiting the population threshold of 300 inhabitants. However, since we are using a survey and we are dealing with very small villages, we do not have enough observations to find significant effects under this strategy.

Figure 1: Distribution of BAS individuals by region

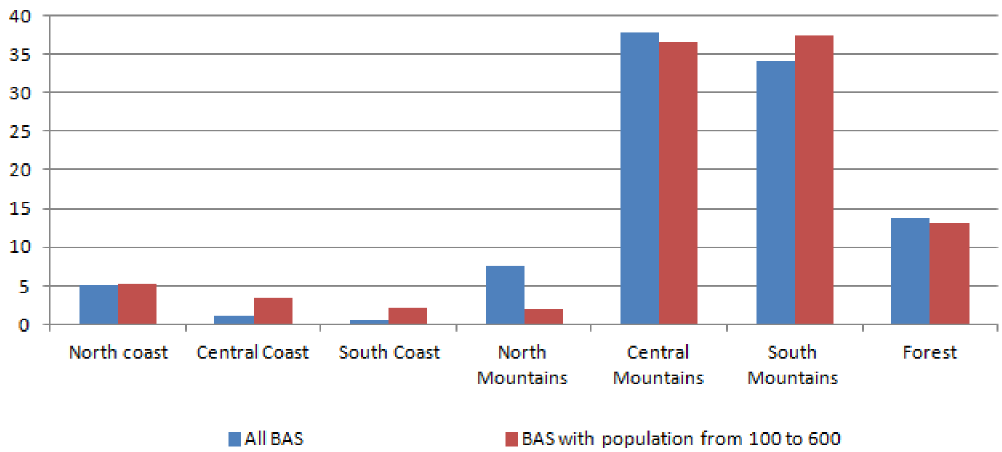
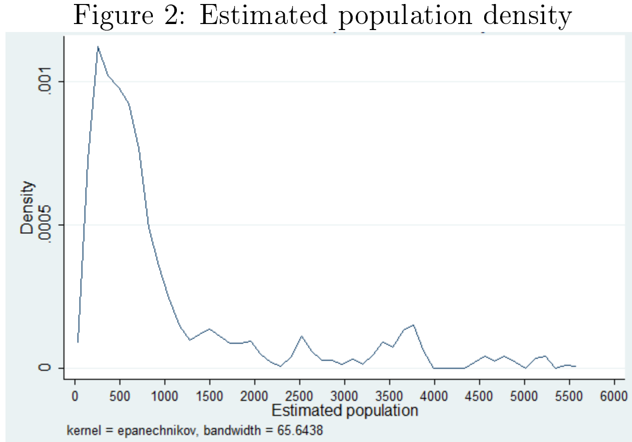


Figure 1 reveals that the regional distribution of the villages in our sample is very similar to the regional distribution for the complete group of treated villages. Additionally, in Figure 2 we can see the population density distribution of all the isolated villages with electricity and note that most of the villages have fewer than 600 inhabitants. However, as we would expect, most of those in the control group have fewer than 300 inhabitants, while most of the treated villages have more than 300 inhabitants (see Figure 3). However, this is based on FITEL's population estimates at the time the program was designed; the Population Census of 2007 was not yet available at that time and so, they estimated the population of the villages with the Census of 1980 and 1993. Figure 4 presents the population density of our treatment and comparison group according to the Census of 2007. As can be seen in the graph, thanks to their estimation error, our treatment and control group have a very similar population distribution. Therefore, our control and treatment groups comprise CPs that are isolated, have electricity, and have a similar distribution of population.

Figure 2: Estimated population density



Population Density Isolated Villages and with Energy

Figure 3: Estimated population density of isolated CP and with energy

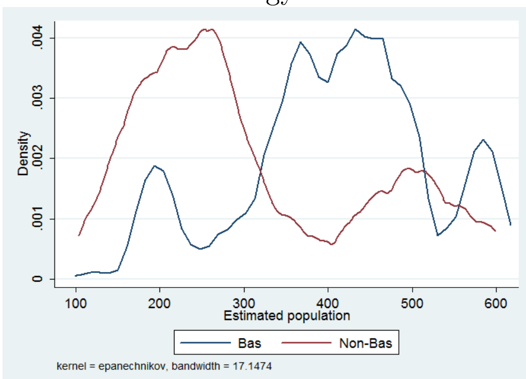
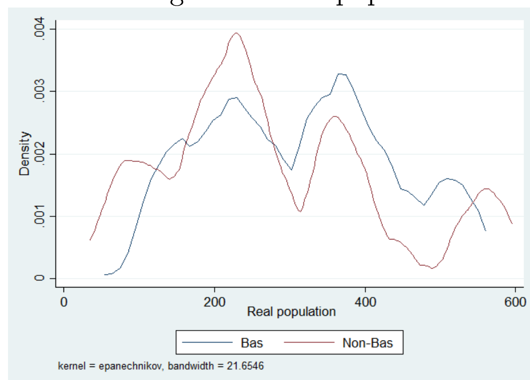


Figure 4: Real population



The Difference-in-difference model we will estimate will look like this:

$$Y_{i,j,t} = \beta_0 + \beta_1 X_{i,j,t} + \beta_2 T_{j,t} + \gamma_j + \delta_t + \varepsilon_{i,j,t} \tag{3.1}$$

where Y_{ijt} is the outcome of interest of the individual i from the village or "Centro Poblado" j in year t. X_{ijt} is a set of control variables including dummies for age group, educational attainment, marital status, gender, maternal language, and whether the house has electrical service. $T_{j,t}$ is a dummy variable which is 1 when the individual was interviewed after the program started in his or her village, and takes 0 when the individual belong to a control village or was interviewed before the antenna was installed. Hence, coefficient β_2 will estimate the impact of having access to Internet. We also include village fixed effects (γ_j) to control for village time-invariant factors and year fixed effects (δ_t). All our regressions are run with cluster errors at the CP level.

In addition to the DiD we are going to apply a triple difference approach or Difference in Difference in Difference (DiDiD). For this strategy, we will take advantage of the fact that Internet usage is significantly heterogeneous by age, marital status and education attainment. Table 2 shows that young (age 14 to 25), educated (at least completed primary school) and single individuals tend to use more Internet than the rest of the population; for this reason, we are going to interact these characteristics with the treated variable explained above (T_{jt}). The model we will estimate will look like this:

$$Y_{i,j,t} = \beta_0 + \beta_1 X_{i,j,t} + \beta_2 T_{j,t} + \beta_3 Z_{i,j,t} + \beta_4 Z_{i,j,t} T_{j,t} + \gamma_j + \delta_t + \varepsilon_{i,j,t} \tag{3.2}$$

where $Z_{i,j,t}$ is a dummy variable for young, educated or single individuals. This strategy has two advantages. First, it will allow us to find heterogeneous effects. As we mentioned before, Internet usage requires a minimum level of literacy, which means we might not find effects on the *average* inhabitant of these villages, but we might find effects on certain groups within this population. Second, the DiDiD allows us to control for time-variable unobservable that are common between groups, for example, between young and old people. With this model, we can relax the assumption that in the absence of the treatment, the outcome variables of the treated localities would have grown by the same amount as did other localities during the same period, but in order to interpret β_4 as the effect of the program, we need to assume that the outcome variables of the two groups of people (for example young and old) living in the *same village* would have grown to the same degree in the absence of the treatment.

Table 2: Heterogeneity in the use/ownership of ICT

	(1) Internet usage	(2) Cell phone ownership	(3) Telephone ownership
Educated	0.106***	0.130***	0.012***
	(0.010)	(0.012)	(0.004)
Single	0.082***	-0.001	0.002
	(0.012)	(0.014)	(0.004)
Age 14 to 25	0.135***	-0.012	-0.001
	(0.014)	(0.015)	(0.005)
Constant	-0.034***	0.051***	0.003
	(0.008)	(0.010)	(0.003)
Observations	3,445	3,603	3,603
R-squared	0.150	0.034	0.003

Standard errors in parentheses
Regression for the years 2007 and 2008.
*** p<0.01, ** p<0.05, * p<0.1

3.2 Data, Summary Statistics and Trends

Our database was constructed using three sources. The first data set comes from National Household Surveys from 2007 to 2011, which contain social demographic information for each individual, their employment status, and a special module for farmers. The second database was provided by FITEL and contains the variables they used for the selection of the beneficiary localities (including projected population for 2007, level of technological isolation, and electricity coverage), the list of beneficiary localities and the date at which the Internet kiosks were installed. Finally, we had access to the real population of the CP from the Census of 2007.

On Table 3 we can observe the summary statistics. The second and fourth columns show the means and standard deviation of the treatment group and the control group, respectively. The third and fifth column show the number of observations. We can see that treatment and control villages have very similar observable characteristics, with the possible exception of agricultural indicators, where we see some significant differences in the means despite the very small number of observations. Nevertheless, our empirical strategy assumes that in the absence of treatment, the outcome variables of the treatment and the control group would show the same growth pattern, not necessarily the same means. While it is not possible to test this assumption precisely we can test a related assumption. We can test if in the previous years to the program the two groups showed the same growth pattern in the outcome variables. We will test this more properly with our placebo regressions in the Robustness Section, but it in Table 4 we can see that there are no significant differences between the growth rates of treatment and control groups in years previous to the treatment, except for differences in the reduction in poverty. The control group had a greater reduction in poverty between 2007 and 2008 than the treatment group, although we do not see any significant difference between 2008 and 2009. Moreover, since we are testing several hypotheses we have a high chance of a type I error.

Table 3: Summary statistics

	Mean 2007 - 2008			
	BAS	Obs.	Control	Obs
Estimated population for 2007	407	1385	316	2029
	(2.83)		(3.04)	
Real population	366	1385	363	1937
	(5.82)		(5.75)	
% Women	0.50	1385	0.51	2029
	(0.01)		(0.01)	
% Married	0.57	1385	0.59	2029
	(0.01)		(0.01)	
Years of education	6.17	1385	6.26	2029
	(0.12)		(0.10)	
Age	39.71	1385	40.84	2029
	(0.53)		(0.45)	
% Spanish	0.38	1385	0.44	2029
	(0.01)		(0.01)	
% Poverty	0.63	1385	0.63	2029
	(0.01)		(0.01)	
% Employed for wage	0.37	1385	0.38	2029
	(0.01)		(0.01)	
% Self-employed	0.38	1385	0.39	2029
	(0.01)		(0.01)	
% Employed in agriculture sector	0.52	1385	0.58	2029
	(0.01)		(0.01)	
% Use of internet	0.10	1385	0.10	2029
	(0.01)		(0.01)	
% Cell phone ownership	0.10	1385	0.14	2029
	(0.01)		(0.01)	
% Telephone ownership	0.00	1385	0.02	2029
	(0.00)		(0.003)	
% Electricity	0.82	1385	0.81	2029
	(0.01)		(0.01)	
Production for sale (traditional goods) - in thousands KG.	1.80	469	3.41	653
	(0.79)		(0.37)	
Implicit sale price (traditional goods)- in Soles	2.72	311	1.66	452
	(0.37)		(0.09)	
Production for sale (processed goods) - in thousands KG.	0.012	339	0.005	483
	(0.002)		(0.001)	
Implicit sale price (processed goods)- in Soles	1.29	29	4.60	32
	(0.16)		(0.76)	

*** p<0.01, ** p<0.05, * p<0.1
Ttest made for localities with more than 100 inhabitants.

Table 4: Summary statistics - growth rate

	Growth 2007-2008			**Growth 2008-2009**		
	Control	BAS	Diff	Control	BAS	Diff
% Women	-0.02	0.00	0.02	0.00	-0.01	-0.01
% Married	0.02	-0.01	-0.02	-0.03	-0.02	0.01
Years of education	0.15	0.10	-0.05	0.29	-0.05	-0.34
Age	0.47	0.45	-0.02	-1.40	0.53	1.93
% Spanish	0.02	0.02	0.00	0.01	0.02	0.02
Household members	0.02	0.20	0.18	0.04	-0.06	-0.10
% Poverty	-0.15	-0.02	0.13*	-0.01	-0.01	0.00
% Employed for wage	-0.02	0.00	0.01	-0.06	-0.08	-0.02
% Self-employed	0.02	-0.01	-0.03	0.01	0.02	0.02
% Employed in agriculture sector	-0.02	0.00	0.01	-0.05	-0.03	0.02
% Use of internet	0.01	0.00	0.00	0.00	0.00	0.00
% Cell phone ownership	0.12	0.05	-0.06	0.17	0.19	0.02
% Land phone ownership	0.01	0.00	-0.01	0.00	0.00	0.00
% Electricity	-0.01	0.03	0.04	0.04	0.05	0.01
Production for sale (traditional goods)	0.21	-0.18	-0.39	-0.10	0.48	0.58
Implicit sale price (traditional goods)	0.27	-0.56	-0.83	0.08	0.30	0.22
Production for sale (processed goods)	0.00	0.00	-0.01	0.01	0.01	0.00
Implicit sale price (processed goods)	0.03	0.92	0.88	1.34	0.38	-0.97

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

In Figures 5 to 13 (see Appendix) we can see the differences in the growth of the outcome variables between the treatment and control group for the entire period of analysis. As we look at the graphs it is important to keep in mind that we do not have a balanced panel of CP, thus some of the variation in the graphs might be generated by changes in the sample of CP per year. We will not have this problem in our regressions since we include a CP level fixed effect. Figure 5 plots the differences between the average levels and growth of Internet usage between 2007 and 2011 from the treatment and the control group. The figure shows that the average usage of Internet of the treatment and control group was very similar until 2009 when the program started but after that the treatment group show higher levels. In Figure 6 we can see that the control group had higher average levels of cell phone ownership than the treatment group in 2007 and 2008, but since 2009 the cell phone usage of the treatment group starts to grow faster than the control group, so that in 2011 the average levels of cell phone ownership are higher in the former. In Figure 7 we can see that the control group had higher average levels of home phone ownership than the treatment group in 2007, 2008 and 2009, but since 2010, the average levels of telephone ownership is higher in the treatment group. In terms of employment, we can see in Figure 8 that employment for wages seems to increase in the treatment group more than the control group both in year 2008 and in 2010, but the increase in 2010 is significantly higher than the one in 2008. In terms of self-employment, Figure 9 shows that there are only very small changes in both groups. In the agricultural sector there was an important increase in prices of traditional goods received by the farmers from the treatment group in 2010, although they declined in 2011, as we can see in Figure 10. In Figure 11 we can see a decline in 2008 and an increase in 2009 in the production of these goods in the treatment group. Finally, in Figure 12 we can see no changes in the prices of processed goods but Figure 13 reveals that in 2010 there was an increase in the production of these goods in the treatment group that was, nevertheless, offset with a decline in 2011.

These graphs serve as an illustration of what happened in the treatment versus the control group in the years before, during and after the program; these averages are, however, were not controlled by differences in important variables between the treatment and the control group, including the CP fixed effects. We are also not showing heterogeneous effects. In the next section we present our formal estimations of the effects of the program.

4 Results

4.1 Telecommunications

In Table 5 the results for the effect of the program on Internet usage are given. The first row shows the percentage of people that use Internet in the year prior to the beginning of the program; approximately 11% of the inhabitants in the treated villages used the Internet in 2008. It is important to remember that there was no Internet access in these places, so presumably they needed to travel to a nearby village in order to use it. Also we can observe that Internet usage is very heterogeneous, as we noted above; on one extreme we find that there are individuals with less than primary education that do not use the Internet at all, while on the other, we find usage rates of approximately 25% among individuals 25 years old or younger. The second and third row of the table give us the results of running the model 3.1 and model 3.2, respectively. We can see that there is a 2 percentage point increase in the Internet usage for the entire population when we do not control for observable time-variant characteristics, and a 1.5 percentage point increase in usage when we add control variables, although these increments are not statistically significant. The effect is greater and significant for the educated, the single and the young people, as we would expect. Note that for uneducated individuals the effect is negative and significant, and for married and not young individuals the effect is also negative although not significant. These results mean that in the control group the increase in Internet usage was higher than in the treatment group. We suspect that the reason for this may lie in the fact that the treatment not only generated access to the Internet but also to telephones and cell phones (as we will see in the next section), so that in these groups there is a substitution effect from Internet toward phones. We can also see that the DiDiD results are all significant and positive, ranging from 6 to 7 percentage points. These results reveal that the heterogeneous effects are significant. Finally, in rows 4 to 7 we can see the effects differentiated according to the time that has passed since the beginning of the treatment. We call the effects estimated right after the treatment and up to a year later *short-run effects*, and those estimated between one year and 30 months after the treatment *medium-run effects*. We find that the estimations lose a little bit of significance but are essentially the same between the short and medium run, thus, there seems to be no fade-out of the effects of the program on Internet usage.

Table 5: Internet usage

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.109		0.00	0.181	0.038	0.201	0.045	0.254
DiD	0.020	0.014	-0.029*	0.037*	-0.016	0.052*	-0.011	0.075*
	(0.019)	(0.016)	(0.016)	(0.021)	(0.016)	(0.029)	(0.014)	(0.039)
DiDiD			0.066***		0.068**		0.086**	
			(0.023)		(0.031)		(0.040)	
DiD (short term)	0.027	0.019	-0.023	0.041	-0.006	0.057	-0.006	0.078*
	(0.021)	(0.018)	(0.015)	(0.026)	(0.017)	(0.036)	(0.016)	(0.045)
DiD (medium term)	0.008	0.005	-0.039*	0.029	-0.029	0.060*	-0.019	0.068
	(0.027)	(0.025)	(0.021)	(0.031)	(0.024)	(0.036)	(0.022)	(0.049)
DiDiD (short term)			0.064**		0.058		0.084*	
			(0.031)		(0.039)		(0.047)	
DiDiD (medium term)			0.068**		0.077**		0.086*	
			(0.028)		(0.037)		(0.046)	
Observations	9,152	9,152	9,152	9,152	9,152	9,152	9,152	9,152
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	137	137	137	137	137	137	137	137

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

In Tables 6 and 7 we can see that the program had also an effect on cell phone and home phone ownership. The first thing to notice is that the effect in the ownership of cell phone is higher then the effect on Internet usage and the effect on home phone ownership. The second thing to notice is that again there seems to be no fade-out in the effects of the program on cell phone and home phone ownership. Finally, we can notice that the effect on cell phone and home phone ownership is less heterogeneous than the effect on Internet access, as we would expect according to what we saw in Table 5 . The only significant difference, i.e the only significant DiDiD effect, is the difference between the effects on non-educated and educated individuals.

Table 6: Cell phone ownership

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.127		0.058	0.169	0.123	0.134	0.120	0.145
DiD	0.113**	0.106**	0.024	0.147***	0.115**	0.094**	0.103**	0.111**
	(0.046)	(0.045)	(0.049)	(0.046)	(0.047)	(0.047)	(0.043)	(0.054)
DiDiD			0.122***		-0.021		0.008	
			(0.035)		(0.027)		(0.028)	
DiD (short term)	0.119**	0.116**	0.044	0.152***	0.127***	0.058	0.118***	0.112*
	(0.046)	(0.045)	(0.049)	(0.048)	(0.046)	(0.037)	(0.043)	(0.061)
DiD (medium term)	0.103*	0.088	-0.001	0.135**	0.095	0.025	0.082	0.104
	(0.060)	(0.057)	(0.064)	(0.057)	(0.060)	(0.040)	(0.056)	(0.068)
DiDiD (short term)			0.108***		-0.025		-0.006	
			(0.038)		(0.027)		(0.041)	
DiDiD (medium term)			0.136***		-0.016		0.022	
			(0.047)		(0.037)		(0.037)	
Observations	9,772	9,401	9,401	9,401	9,401	9,401	9,401	9,401
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	137	137	137	137	137	137	137	137

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Telephone ownership

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.00		0.00	0.00	0.00	0.00	0.00	0.00
DiD	0.038**	0.037**	0.020	0.046**	0.041**	0.033*	0.039**	0.034*
	(0.017)	(0.017)	(0.013)	(0.019)	(0.017)	(0.019)	(0.016)	(0.020)
DiDiD			0.027**		-0.009		-0.005	
			(0.013)		(0.013)		(0.013)	
DiD (short term)	0.034*	0.037**	0.014	0.048**	0.037**	0.021	0.040**	0.029
	(0.018)	(0.018)	(0.014)	(0.022)	(0.017)	(0.021)	(0.018)	(0.025)
DiD (medium term)	0.043**	0.039**	0.026	0.046**	0.047**	0.006	0.039**	0.040
	(0.022)	(0.020)	(0.016)	(0.023)	(0.022)	(0.015)	(0.019)	(0.024)
DiDiD (short term)			0.034*		-0.001		-0.011	
			(0.018)		(0.017)		(0.019)	
DiDiD (medium term)			0.020		-0.017		0.001	
			(0.016)		(0.016)		(0.014)	
Observations	9,772	9,401	9,401	9,401	9,401	9,401	9,401	9,401
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	137	137	137	137	137	137	137	137

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

4.2 Employment

In Table 8 we can see that approximately 37% of the inhabitants of these villages were employed for wage (in all economic sectors), with important heterogeneity going from 31% in the case of not educated individuals to 50% of employment in the case of young individuals. The program increased employment but mainly for educated, single and young individuals and mainly in the medium run, in 9, 14, and 15 percentage points, respectively. Note that these are the same groups of people for which we find the increase in Internet usage. The differences with respect to not educated, married and not young individuals, respectively, are significant. It is important to note that wage employment has not decreased for any group of population, so it does not seem to be the case that business have fired some type individuals to hire another type individuals.

Table 8: Employment for wage

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.374		0.314	0.413	0.319	0.446	0.318	0.502
DiD	0.059	0.051	0.015	0.070*	0.020	0.089*	0.032	0.097
	(0.039)	(0.038)	(0.041)	(0.040)	(0.036)	(0.047)	(0.034)	(0.059)
DiDiD			0.055**		0.069**		0.066	
			(0.026)		(0.032)		(0.043)	
DiD (short term)	0.056	0.048	0.028	0.058	0.054	0.028	0.048	0.048
	(0.039)	(0.038)	(0.042)	(0.042)	(0.037)	(0.043)	(0.034)	(0.061)
DiD (medium term)	0.065	0.056	0.004	0.083*	-0.012	0.139***	0.018	0.153**
	(0.046)	(0.046)	(0.049)	(0.048)	(0.044)	(0.040)	(0.042)	(0.071)
DiDiD (short term)			0.030		-0.015		0.000	
			(0.038)		(0.040)		(0.047)	
DiDiD (medium term)			0.079***		0.152***		0.135**	
			(0.029)		(0.034)		(0.055)	
Observations	9,149	9,149	9,149	9,149	9,149	9,149	9,149	9,149
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	137	137	137	137	137	137	137	137

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Similar to wage employment, there is a significant increment in the number of hours working for wage in single and young individuals in the medium term, in 4.45 and 4.48 per week, respectively. Note that for these regressions we include in the sample individuals that do not work, hence, these effects might come from the increase in employment alone, and might not necessarily reflect and increase in the intensive margin.

Table 9: Hours working for wage

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	12.50		10.45	13.85	10.93	14.55	10.24	17.65
DiD	1.673	1.455	0.954	1.717	0.391	2.776*	0.656	3.376
	(1.406)	(1.386)	(1.539)	(1.462)	(1.404)	(1.658)	(1.321)	(2.084)
DiDiD			0.762		2.385*		2.720	
			(1.108)		(1.280)		(1.694)	
DiD (short term)	1.427	1.239	1.027	1.348	1.093	1.138	0.914	1.994
	(1.362)	(1.366)	(1.591)	(1.562)	(1.364)	(1.570)	(1.282)	(2.181)
DiD (medium term)	2.087	1.818	1.026	2.242	-0.164	4.221***	0.573	5.053**
	(1.800)	(1.760)	(1.940)	(1.841)	(1.769)	(1.515)	(1.753)	(2.509)
DiDiD (short term)			0.322		0.286		1.080	
			(1.633)		(1.556)		(1.849)	
DiDiD (medium term)			1.215		4.454***		4.480**	
			(1.321)		(1.395)		(2.111)	
Observations	9,147	9,147	9,147	9,147	9,147	9,147	9,147	9,147
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	133	133	133	133	133	133	133	133

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Theoretically, there are at least two channels through which ICT can increase employment. The first channel is through a reduction in the cost of getting information and of communicating with other people. As we know, information is rarely complete in goods and labor markets. And as Stigler (1961) [15], first pointed out, people will incur in "searching" to overcome this lack of information. Consumers will search for the lowest price, workers will search for the best job offer, firms will search for the most productive worker, etc. However, search is costly, and the higher the cost for searching, the less individuals and firms are going to search and the sooner they are going to resign to what they find. Thus, a shock in ICT, like access to Internet, reduces the searching cost and increases the probability for a worker to find a job with a wage higher than his reservation wage (or than his current wage), and for a firm to find a more productive worker. Of course, wages is used here in the general sense, including non-pecuniary benefits like social benefits, job security, etc.

The second channel through which Internet access can increase employment is through an increase in the demand for workers with Internet skills. If there is a new technology available in an area and businesses believe they could benefit from it, they will hire individuals that have the skills to use this technology. Thus, access to Internet increases employment of Internet users not because they use Internet to find jobs, but because Internet access increases the demand for workers who know how to use it.

Although, both channels might work together -since they are not mutually exclusive-, we believe the second channel is a more reasonable story for these areas because of three reasons. First of all, in these areas, there are not many online-search options to find a job and not many users of Internet may use them. Second, if the "search story" is true, increasing the access to cell phones should have the same results. Finally, the improvement on matching makes more sense when thinking on an improvement on inter-villages matching, not intra-village matching[8]. This means that, if the "search story" is true, there would be more communication with employers outside the village, so we should see more migration for employment than increase in employment in the same village or an increase in transport expenditures for work or educational purposes.

Unfortunately, we do not have good variables to analyze changes in migration, but we do have information of the household transport expenditures. Table 10 shows that there is no evidence of an increase in the transport expenditure for work or educational purposes. This gives us some evidence that the "search story" might not be the main channel though which ICT increases employment. Perhaps, this results suggests that the program has increased the demand for skilled workers (the ones who know how to use this new technology); unfortunately, we do not have good variables to proof the importance of this second channel and more research is needed.

[8]We must point out that our sample includes small villages (100 to 600 inhabitants) which probably will not need Internet to contact with other inhabitants of the same village.

Table 10: Transport expenditure (work and educational purposes) - in logarithms

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	67.49		68.57	67.22	66.31	68.35	70.03	64.26
DiD	-0.064	-0.108	0.000	-0.139	-0.145	-0.068	-0.113	-0.098
	(0.265)	(0.282)	(0.314)	(0.286)	(0.299)	(0.275)	(0.290)	(0.284)
DiDiD			-0.139		0.076		0.015	
			(0.198)		(0.113)		(0.119)	
DiD (short term)	-0.223	-0.260	-0.391	-0.219	-0.288	-0.092	-0.246	-0.279
	(0.368)	(0.390)	(0.465)	(0.389)	(0.403)	(0.237)	(0.394)	(0.402)
DiD (medium term)	0.131	0.078	0.426	-0.060	0.021	0.169	0.043	0.160
	(0.352)	(0.326)	(0.355)	(0.301)	(0.350)	(0.150)	(0.348)	(0.294)
DiDiD (short term)			0.172		0.056		-0.033	
			(0.316)		(0.165)		(0.162)	
DiDiD (medium term)			-0.485**		0.132		0.117	
			(0.228)		(0.137)		(0.154)	
Observations	913	896	896	896	896	896	896	896
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	93	93	93	93	93	93	93	93

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 11 shows the effect of the program in self-employment. The difference between wage-employment and self-employment is basically that wage employees work for others, while self-employees have no bosses. We can see that some of the increase in wage-employment comes from self-employment, especially in the case of single individuals. Also, note that self-employment for not educated individuals increased. This group of people did not increase their usage of Internet or telephones, thus this might be a general equilibrium result of the program. In Table 12, we can see a similar pattern for hours working as self employed, although the effect on not educated is not significant any more.

Table 11: Self-employment

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.375		0.444	0.330	0.501	0.211	0.509	0.070
DiD	-0.005	0.009	0.068***	-0.022	0.031	-0.019	0.008	0.011
	(0.021)	(0.019)	(0.024)	(0.022)	(0.024)	(0.021)	(0.023)	(0.021)
DiDiD			-0.089***		-0.050**		0.003	
			(0.025)		(0.024)		(0.024)	
DiD (short term)	-0.002	0.013	0.073**	-0.018	0.023	-0.010	0.012	0.014
	(0.022)	(0.021)	(0.031)	(0.023)	(0.025)	(0.022)	(0.025)	(0.021)
DiD (medium term)	-0.009	0.002	0.059*	-0.029	0.036	-0.058**	0.001	0.005
	(0.025)	(0.026)	(0.032)	(0.029)	(0.033)	(0.023)	(0.030)	(0.030)
DiDiD (short term)			-0.091***		-0.022		0.001	
			(0.034)		(0.027)		(0.026)	
DiDiD (medium term)			-0.088***		-0.077**		0.004	
			(0.033)		(0.030)		(0.035)	
Observations	9,149	9,149	9,149	9,149	9,149	9,149	9,149	9,149
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	137	137	137	137	137	137	137	137

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 12: Hours working as self-employed

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	12.50		10.45	13.85	10.93	14.55	10.24	17.65
DiD	-0.904	-0.557	0.502	-1.112	-0.174	-1.034	-0.460	-0.755
	(0.842)	(0.837)	(1.056)	(0.907)	(1.110)	(0.805)	(1.019)	(0.886)
DiDiD			-1.614		-0.859		-0.295	
			(1.009)		(1.041)		(1.076)	
DiD (short term)	-0.863	-0.421	0.845	-1.070	-0.513	-0.166	-0.407	-0.450
	(1.029)	(0.989)	(1.545)	(0.986)	(1.394)	(0.800)	(1.308)	(0.983)
DiD (medium term)	-0.973	-0.788	0.068	-1.254	0.070	-1.830*	-0.605	-1.185
	(1.018)	(1.103)	(1.235)	(1.316)	(1.424)	(1.019)	(1.306)	(1.185)
DiDiD (short term)			-1.915		0.233		-0.043	
			(1.467)		(1.337)		(1.457)	
DiDiD (medium term)			-1.321		-1.935		-0.580	
			(1.402)		(1.347)		(1.346)	
Observations	9,147	9,147	9,147	9,147	9,147	9,147	9,147	9,147
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	133	133	133	133	133	133	133	133

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

One of the things that might worry us, especially for the case of young people is that the program might have made them stop studying in order to work. To test this hypothesis we analyze if the program had an effect in enrollment or attendance. We can see in Tables 13 and 14 that there is no significant reduction in enrollment or attendance in any type of educational activity, specially in the long run that is where we find the main effect in employment. We also run a regression for only individuals from 14 to 20 and from 14 to 18, and there is still no effect in enrollment or attendance[9].

[9] Available upon request. We also estimate a regression only for individual who have 30 years old or older as a robustness check and find no significant effect (available upon request).

Table 13: Enrollment

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single
DiD	-0.039	-0.037	-0.097	-0.034	0.061	-0.037
	(0.047)	(0.045)	(0.153)	(0.046)	(0.369)	(0.045)
DiDiD			0.063			-0.098
			(0.157)			(0.368)
DiD (short term)	-0.037	-0.031	-0.097	-0.027	0.547	-0.038
	(0.055)	(0.054)	(0.082)	(0.056)	(0.327)	(0.054)
DiD (medium term)	-0.042	-0.046	-0.100	-0.044	-0.430	-0.040
	(0.063)	(0.059)	(0.454)	(0.059)	(0.330)	(0.060)
DiDiD (short term)			0.069			-0.047
			(0.065)			(0.125)
DiDiD (medium term)			0.057			0.009
			(0.457)			(0.136)
Observations	1,355	1,355	1,355	1,355	1,355	1,355
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.

Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Attendance

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	12.50		10.45	13.85	10.93	14.55	10.24	17.65
DiD	-0.904	-0.557	0.502	-1.112	-0.174	-1.034	-0.460	-0.755
	(0.842)	(0.837)	(1.056)	(0.907)	(1.110)	(0.805)	(1.019)	(0.886)
DiDiD			-1.614		-0.859		-0.295	
			(1.009)		(1.041)		(1.076)	
DiD (short term)	-0.863	-0.421	0.845	-1.070	-0.513	-0.166	-0.407	-0.450
	(1.029)	(0.989)	(1.545)	(0.986)	(1.394)	(0.800)	(1.308)	(0.983)
DiD (medium term)	-0.973	-0.788	0.068	-1.254	0.070	-1.830*	-0.605	-1.185
	(1.018)	(1.103)	(1.235)	(1.316)	(1.424)	(1.019)	(1.306)	(1.185)
DiDiD (short term)			-1.915		0.233		-0.043	
			(1.467)		(1.337)		(1.457)	
DiDiD (medium term)			-1.321		-1.935		-0.580	
			(1.402)		(1.347)		(1.346)	
Observations	9,147	9,147	9,147	9,147	9,147	9,147	9,147	9,147
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	133	133	133	133	133	133	133	133

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

4.3 Agricultural Sector

In the literature review we saw significant effects of ICT in agricultural prices. Unfortunately, we do not have information about prices in our database. Nevertheless, we constructed a proxy by dividing the total income of the farmer by the quantities of all the products sold in kilos. In this way we obtain an implicit weighted average price received for each kilo of products. In Table 15, we run the regressions for the subsample of farmers in our database. We find a significant increase in these "implicit prices" received by the farmers of around 25%, both in the short and medium terms. These effects are less heterogeneous than the effects on employment, and more concentrated in educated, married, and old farmers, i.e., the same groups that use more cell phones and home phones. It is important to note, however, that this increase might have been generated by an increase in prices or by a relative increase in the production of more expensive goods (or a combination of both). In Table 16, we can see that there is no significant change in the quantity sold, but as we will see in the placebo regressions, it seems that the program stops sales from continuing to fall, especially in the medium run.

Table 15: Implicit weighted average price received per kilo of products

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.139		-0.174	0.398	0.119	0.202	0.133	0.358
DiD	0.237**	0.250**	0.186	0.304***	0.302**	0.093	0.252**	0.135
	(0.107)	(0.109)	(0.117)	(0.117)	(0.122)	(0.098)	(0.110)	(0.151)
DiDiD			0.118		-0.209**		-0.117	
			(0.095)		(0.103)		(0.141)	
DiD (short term)	0.236*	0.248*	0.204	0.285*	0.322*	-0.134	0.252*	0.077
	(0.141)	(0.143)	(0.141)	(0.170)	(0.166)	(0.139)	(0.145)	(0.168)
DiD (medium term)	0.239**	0.253**	0.173	0.322***	0.291**	-0.001	0.254**	0.198
	(0.097)	(0.099)	(0.124)	(0.110)	(0.118)	(0.136)	(0.100)	(0.145)
DiDiD (short term)			0.080		-0.336*		-0.174	
			(0.140)		(0.193)		(0.183)	
DiDiD (medium term)			0.150		-0.119		-0.057	
			(0.130)		(0.166)		(0.136)	
Observations	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	136	136	136	136	136	136	136	136

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 16: Production for sale traditional goods (in kilos)

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	1.045		1.291	0.895	1.646	0.215	1.474	0.009
DiD	-0.926	-1.073	-1.790	-0.419	-1.339	-0.303	-1.073	-1.067
	(0.992)	(1.010)	(1.237)	(1.488)	(1.117)	(1.117)	(1.006)	(1.849)
DiDiD			1.370		1.036		0.006	
			(1.838)		(1.105)		(1.457)	
DiD (short term)	-1.677	-1.769	-2.492	-1.136	-2.674	1.620	-1.862	0.653
	(1.159)	(1.200)	(1.572)	(1.289)	(1.819)	(2.191)	(1.213)	(1.546)
DiD (medium term)	0.295	0.068	-0.679	0.797	0.406	-1.026	0.154	-2.339
	(1.626)	(1.548)	(1.055)	(2.583)	(1.818)	(1.102)	(1.551)	(2.652)
DiDiD (short term)			1.356		3.640		2.515*	
			(1.499)		(3.391)		(1.380)	
DiDiD (medium term)			1.476		-1.651		-2.494	
			(2.454)		(1.853)		(2.386)	
Observations	2,978	2,978	2,978	2,978	2,978	2,978	2,978	2,978
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	136	136	136	136	136	136	136	136

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

In Table 17 we show that there is no significant effect of the program on the prices received for processed goods but, as we can see in Table 18, the program significantly increased the production of processed goods. As we will see in the robustness section this increase in the production of processed goods began after the program was implemented. The effect, however, seems to fade-out after the first year of the program.

Table 17: Implicit weighted average price received per kilo of processed goods

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	7.340		7.44	7.230	7.365	7.216	7.340	0.000
DiD	-0.180	-0.184	-0.376	-0.046	-0.258	0.104	-0.184	-0.557
	(0.411)	(0.379)	(0.443)	(0.359)	(0.383)	(0.515)	(0.379)	(0.372)
DiDiD			0.330		0.362		-0.374	
			(0.253)		(0.374)		(0.317)	
DiD (short term)	-0.261	-0.252	-0.434	-0.153	-0.308	0.120	-0.252	-0.625*
	(0.409)	(0.387)	(0.470)	(0.367)	(0.393)	(0.339)	(0.387)	(0.329)
DiD (medium term)	-0.013	-0.041	-0.256	0.204	-0.117	0.610	-0.041	
	(0.534)	(0.502)	(0.555)	(0.496)	(0.490)	(0.691)	(0.502)	
DiDiD (short term)			0.281		0.240		-0.373	
			(0.291)		(0.321)		(0.319)	
DiDiD (medium term)			0.461		0.624			
			(0.308)		(0.643)			
Observations	189	189	189	189	189	189	189	189
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	58	58	58	58	58	58	58	58

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 18: Production for sale processed goods (in kilos)

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2008	0.010		0.009	0.011	0.009	0.015	0.010	0.000
DiD	0.023	0.022	0.006	0.039	0.023	0.019	0.023	-0.024
	(0.015)	(0.015)	(0.011)	(0.024)	(0.017)	(0.026)	(0.016)	(0.029)
DiDiD			0.033		-0.004		-0.047	
			(0.021)		(0.030)		(0.035)	
DiD (short term)	0.040**	0.039*	0.001	0.073**	0.040*	0.027	0.041*	-0.048
	(0.020)	(0.020)	(0.011)	(0.036)	(0.023)	(0.045)	(0.022)	(0.047)
DiD (medium term)	-0.006	-0.008	0.000	-0.018	-0.007	-0.015	-0.008	-0.016
	(0.016)	(0.017)	(0.017)	(0.017)	(0.018)	(0.010)	(0.017)	(0.020)
DiDiD (short term)			0.073**		-0.004		-0.089	
			(0.036)		(0.050)		(0.058)	
DiDiD (medium term)			-0.018**		-0.004		-0.008	
			(0.007)		(0.010)		(0.012)	
Observations	2,238	2,238	2,238	2,238	2,238	2,238	2,238	2,238
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	122	122	122	122	122	122	122	122

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

5 Robustness checks and sensitivity analysis

5.1 Robustness checks

The empirical strategy of DiD is very common among studies that try to estimate the effect of ICT access on economic development. Nevertheless, this approach is typically not very reliable without further robustness checks, due to the problem of "reverse causality". That is, places with more economic development will demand more ICT, and hence, it is possible that the DiD estimation reflects this fact and not the fact that ICT boost economic development. In order to test if our estimates are biased by this "reverse causality" we construct a placebo test. This placebo test will test whether the villages that receive Internet and Phone access trough the program are villages where, for example, employment was already growing more than in the rest of villages. In order to do this, we run our regressions adding an additional variable called $P_{j,t}$ that replicates the variable $T_{j,t}$ but 2 years before. In other words, it represents a fake program that would have happened between 2007-2008 instead of 2009-2010. If when we include the variable $P_{j,t}$ in the regression the coefficient of $T_{j,t}$ is not significant, we cannot say that the program generated the effect we saw before including $P_{j,t}$.

$$Y_{i,j,t} = \beta_0 + \beta_1 X_{i,j,t} + \beta_2 T_{j,t} + \beta_3 P_{j,t} + \gamma_j + \delta_t + \varepsilon_{i,j,t} \tag{5.1}$$

Table 19 of the Appendix shows that even controlling for this previous hypothetical program, the effect of the real program on Internet access continues to be positive and significant for educated, single, and young individuals. The same happens with the effect of the program on cell phone and home phone ownership, as can be seen in Table 20 and 21 , respectively[10].

In Table 22 we can see also that the coefficients of the fake treatment on wage-employment are not significant and smaller in absolute values than the effects of the real program. In terms of self-employment, we can see in Table 23 that self-employment was decreasing before the program started.

In the agricultural sector we can see that the prices the farmer received for their traditional goods were not increasing significantly more than in the control group before the program started. The level of production, was diminishing before the program started, but stopped after the program, specially in the medium run as we saw in Table 15 of the Results Section. In the case of processed goods, the prices were increasing before the program started, but stop increasing after the program started. Unfortunately, we do not have a good explanation of why this could have happened. Finally, the production of processed goods increased but only for a short period of time after the program was implemented.

5.2 Sensitivity analysis

As we mentioned in the empirical strategy section, when we chose the range of the population for our sample, we tried to restrict the range population so that the treatment group was not so different from the control group but not so much that we encountered efficiency problems. We did not use any special algorithm for this, and the exact selection of 100-600 inhabitants was arbitrary. Hence, in this section we will show that our results are robust to changing the range of population of our sample. Specifically, we estimate the same regressions, but constrain the range of population of the sample to villages that have a population between 100 to 500 individuals, and then between 150 to 450 individuals. We also expand the range of population of our sample to include all the villages with 0 to 700 inhabitants and then with 0 to 800 inhabitants.

Tables 28 to 36 from the appendix present the regressions for all these samples, including our original sample. As we can see, in some cases we lose significance but, in general, the coefficients of the main effects remain very similar across the different samples.

[10] We have also estimate an additional robustness check indcluding all the years analized and the fake program: $Y_{i,j,t} = \beta_0 + \beta_1 X_{i,j,t} + \beta_2 T_{j,t} + \beta_3 P_{j,t} + \gamma_j + \delta_t + \varepsilon_{i,j,t}$. Results remain the same and are available upon request.

6 Conclusions and Discussion

In this study we find that the subsidization of broadband and Internet kiosks in rural and remote areas of Peru increased not only Internet usage but also cell phones and home phones ownership. We also find that the program increased wage employment, the prices farmers received for their traditional products, and the production of more processed goods. The benefits in the agricultural sector are relatively homogenous, but are higher in the same categories of individuals that have greater access to cell phones. As theory predicts, the effects we find in the agricultural sector might be a response of greater information and communication possibilities, which allow the farmers to find clients in other markets that pay more for their products, or to gather better information about prices, which allow farmers to make more efficient decisions about products they should cultivate.

In the case of wage employment, the effects are concentrated only in individuals that are educated, single or young. These groups of individuals are the only groups of individuals in which we find an increase in Internet usage. One possible explanation is that the access to ICT has reduced the search cost and increases the probability of a worker to find a for-wage job, and for a firm to find a worker. Since we find that employment increases within these small villages, it is hard to believe that ICT will greatly improve communication within the inhabitants of such small villages and have such a large impact on employment.

Another possible explanation is that changes generated in the agricultural sector increased the demand for more workers; However, this story would not necessarily explain why we see an effect only on educated, single and young individuals. Finally, it is possible that the program has increased the demand for workers with Internet skills. If a new technology becomes available in an area and businesses believe they could benefit from it, they will hire individuals that have the skills to use this technology. Thus, access to the Internet increases employment of Internet users not because they use Internet to find jobs, but because Internet access increases the demand for workers who know how to use it. Certainly, it is possible that all these channels have worked at the same time, since they are not mutually exclusive.

To summarize, we find evidence that ICT can benefit even poor and remote areas in terms of employment and agricultural activity. Moreover, it seems that both telephones and Internet access are beneficial. Cell phones are more useful for the average inhabitant, specially for farmers, but there also seems to be a demand for Internet and Internet skills. Further research where we can compare the marginal effect of cell phone subsidization in contrast with Internet subsidization would give policy makers more information about what programs should they prioritize.

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Appendix

A. Trends

Growth of the dependent variables from 2007 to 2011

Figure 5: Internet usage

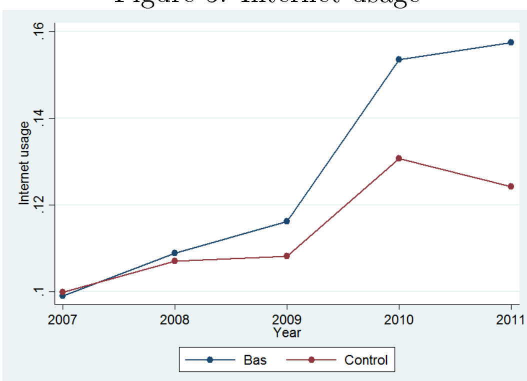


Figure 6: Cell phone ownership

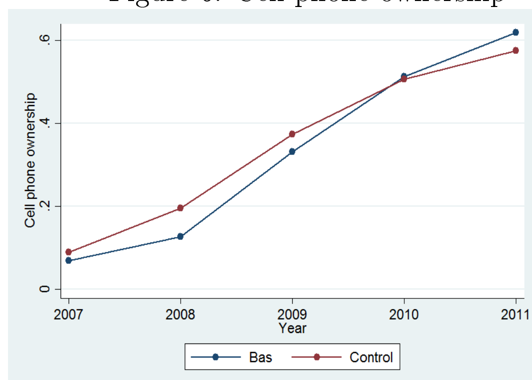


Figure 7: Telephone ownership

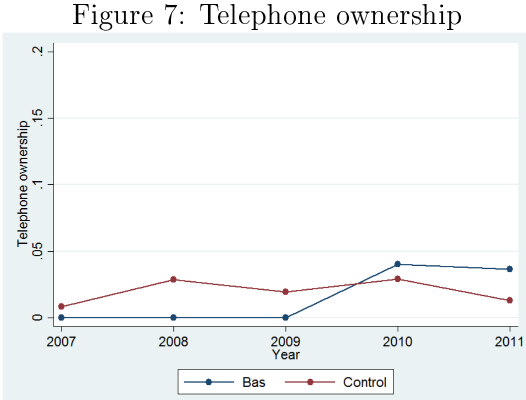


Figure 8: Employment for wage

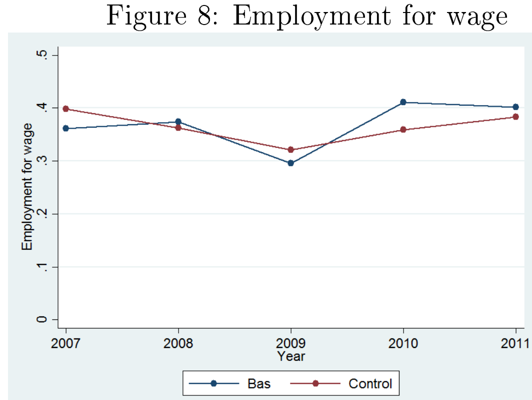


Figure 9: Self-employment

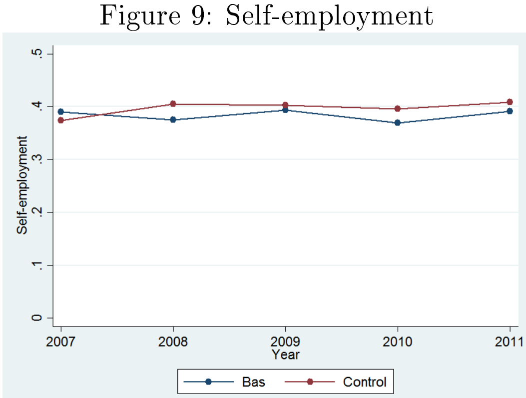
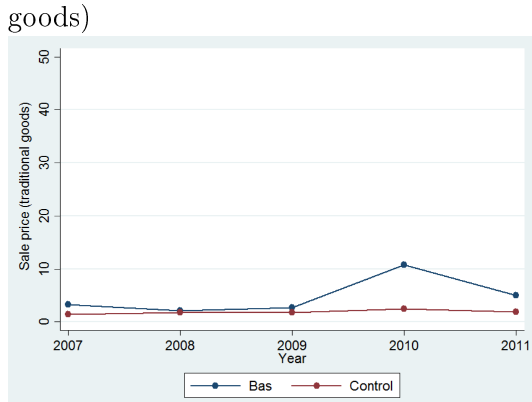


Figure 10: *Implicit* sale price (traditional goods)



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(Continued)

Figure 11: Production for sale (traditional goods)

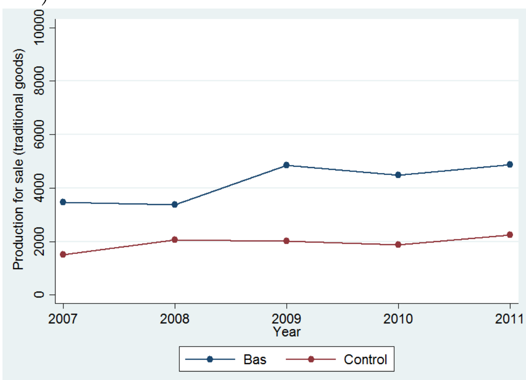


Figure 12: *Implicit* sale price (processed goods)

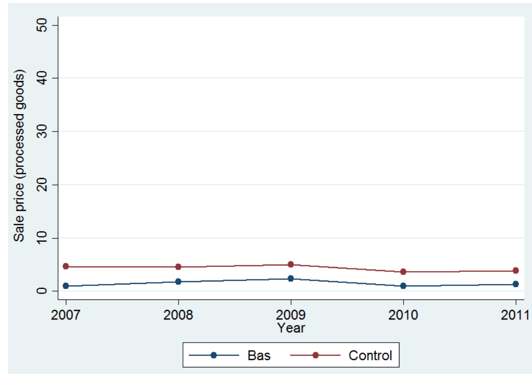
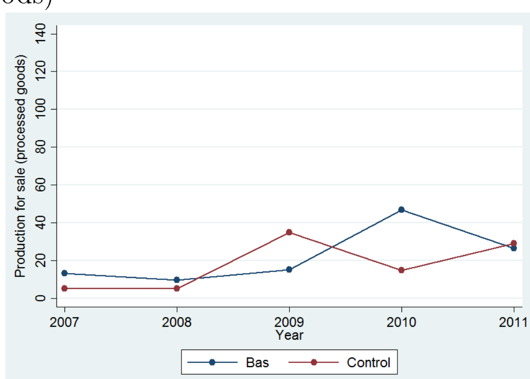


Figure 13: Production for sale (traditional goods)



B. Robustness checks

Table 19: Internet usage robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.099		0.007	0.163	0.042	0.178	0.045	0.234
DiD	0.031	0.023	-0.022	0.046**	-0.008	0.062**	-0.013	0.092**
	(0.019)	(0.017)	(0.017)	(0.021)	(0.017)	(0.029)	(0.017)	(0.041)
Placebo DiD	0.032	0.026	-0.000	0.041	0.020	0.029	0.022	0.026
	(0.026)	(0.024)	(0.018)	(0.035)	(0.020)	(0.039)	(0.019)	(0.055)
DiDiD			0.068***		0.068**		0.104**	
			(0.024)		(0.031)		(0.045)	
Placebo DiDiD			0.041		0.014		0.004	
			(0.035)		(0.038)		(0.052)	
Observations	9,152	9,152	9,152	9,152	9,152	9,152	9,152	9,152
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 20: Cell phone ownership robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.069		0.014	0.105	0.069	0.070	0.057	0.098
DiD	0.102**	0.093**	0.013	0.132***	0.102**	0.035	0.078*	0.123**
	(0.047)	(0.047)	(0.051)	(0.048)	(0.049)	(0.030)	(0.046)	(0.055)
Placebo DiD	-0.033	-0.038	-0.014	-0.057	-0.033	-0.054	-0.023	-0.081
	(0.061)	(0.060)	(0.053)	(0.071)	(0.059)	(0.046)	(0.056)	(0.076)
DiDiD			0.119***		-0.021		0.044	
			(0.035)		(0.027)		(0.029)	
Placebo DiDiD			-0.043		-0.013		-0.059	
			(0.053)		(0.028)		(0.043)	
Observations	9,772	9,401	9,401	9,401	9,401	9,401	9,401	9,401
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 21: Land phone ownership robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.000		0.000	0.000	0.000	0.000	0.000	0.000
DiD	0.034**	0.033**	0.016	0.042**	0.037**	0.012	0.034**	0.032
	(0.016)	(0.016)	(0.012)	(0.019)	(0.017)	(0.013)	(0.015)	(0.021)
Placebo DiD	-0.012	-0.013	-0.003	-0.020**	-0.013	-0.014*	-0.012	-0.014
	(0.008)	(0.009)	(0.008)	(0.010)	(0.009)	(0.008)	(0.008)	(0.011)
DiDiD			0.025**		-0.009		-0.002	
			(0.013)		(0.013)		(0.014)	
Placebo DiDiD			-0.017**		0.002		-0.002	
			(0.007)		(0.005)		(0.006)	
Observations	9,772	9,401	9,401	9,401	9,401	9,401	9,401	9,401
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 22: Employed for wage robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.361		0.272	0.423	0.299	0.448	0.276	0.574
DiD	0.068*	0.058	0.022	0.077*	0.026	0.086**	0.038	0.098
	(0.040)	(0.040)	(0.042)	(0.042)	(0.037)	(0.037)	(0.035)	(0.061)
Placebo DiD	0.026	0.022	0.015	0.024	0.006	0.035	0.037	-0.024
	(0.042)	(0.039)	(0.052)	(0.039)	(0.042)	(0.047)	(0.041)	(0.064)
DiDiD			0.055**		0.073**		0.060	
			(0.025)		(0.032)		(0.046)	
Placebo DiDiD			0.010		0.036		-0.061	
			(0.044)		(0.051)		(0.063)	
Observations	9,149	9,149	9,149	9,149	9,149	9,149	9,149	9,149
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 23: Self-employed robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.390		0.452	0.347	0.484	0.259	0.518	0.071
DiD	-0.018	-0.004	0.053**	-0.032	0.019	-0.039**	-0.001	-0.010
	(0.022)	(0.020)	(0.026)	(0.023)	(0.025)	(0.018)	(0.024)	(0.023)
Placebo DiD	-0.041*	-0.036*	-0.032	-0.035*	-0.017	-0.058**	-0.049**	-0.002
	(0.024)	(0.018)	(0.036)	(0.020)	(0.022)	(0.023)	(0.022)	(0.027)
DiDiD				-0.085***		-0.050**		-0.010
				(0.027)		(0.023)		(0.025)
Placebo DiDiD				-0.003		-0.043		0.047
				(0.042)		(0.028)		(0.033)
Observations	9,149	9,149	9,149	9,149	9,149	9,149	9,149	9,149
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 24: *Implicit* weighted average price received per kilo of products robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.034		-0.165	0.203	-0.127	0.402	0.040	-0.211
DiD	0.269**	0.277**	0.207	0.337***	0.335**	-0.086	0.277**	0.302
	(0.117)	(0.120)	(0.128)	(0.127)	(0.133)	(0.088)	(0.120)	(0.385)
Placebo DiD	0.095	0.089	0.014	0.148	0.133	-0.176	0.095	-0.081
	(0.104)	(0.104)	(0.119)	(0.105)	(0.108)	(0.164)	(0.105)	(0.167)
DiDiD				0.131		-0.232**		0.025
				(0.099)		(0.105)		(0.370)
Placebo DiDiD				0.134		-0.196		-0.176
				(0.086)		(0.168)		(0.149)
Observations	2,054	2,054	2,054	2,054	2,054	2,054	2,054	2,054
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 25: Production for sale traditional goods (in kilos) robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	1.159		1.344	1.040	1.650	0.473	1.641	0.015
DiD	-1.784	-1.991	-2.675	-1.355	-2.264	0.251	-1.991	-1.985
	(1.195)	(1.266)	(1.715)	(1.493)	(1.430)	(0.812)	(1.263)	(2.102)
Placebo DiD	-2.441	-2.606	-2.362	-2.793*	-2.740*	-0.645	-2.617	-2.191*
	(1.583)	(1.604)	(1.836)	(1.599)	(1.478)	(1.577)	(1.621)	(1.197)
DiDiD			1.321		1.063		0.006	
			(1.922)		(1.048)		(1.567)	
Placebo DiDiD			-0.431		0.584		0.426	
			(1.116)		(1.105)		(0.933)	
Observations	2,978	2,978	2,978	2,978	2,978	2,978	2,978	2,978
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 26: *Implicit* weighted average price received per kilo of processed goods robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	6.806		6.831	6.784	6.821	6.771	6.806	
DiD	0.034	0.051	-0.034	0.187	-0.015	0.216	0.051	-0.751
	(0.391)	(0.381)	(0.416)	(0.380)	(0.373)	(0.388)	(0.381)	(0.559)
Placebo DiD	0.692**	0.678**	1.158***	0.245	0.964***	-0.282	0.678**	
	(0.296)	(0.297)	(0.339)	(0.296)	(0.349)	(0.415)	(0.297)	
DiDiD			0.221		0.271		-0.801**	
			(0.243)		(0.367)		(0.406)	
Placebo DiDiD			-0.914**		-1.090**			
			(0.451)		(0.523)			
Observations	189	189	189	189	189	189	189	189
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 27: Production for sale processed goods (in kilos) robustness check

	(1) Simple	(2) W/Controls	(3) Not educated	(4) Educated	(5) Married	(6) Single	(7) Not young	(8) Young
Levels in 2007	0.013		0.012	0.014	0.015	0.007	0.013	0.000
DiD	0.023	0.021	0.005	0.038	0.022	0.010	0.022	-0.024
	(0.017)	(0.018)	(0.012)	(0.026)	(0.020)	(0.027)	(0.019)	(0.028)
Placebo DiD	-0.002	-0.003	-0.003	-0.004	-0.007	0.010	-0.003	0.003
	(0.011)	(0.011)	(0.012)	(0.010)	(0.011)	(0.011)	(0.012)	(0.015)
DiDiD			0.033		-0.002		-0.047	
			(0.021)		(0.030)		(0.035)	
Placebo DiDiD			-0.001		0.019**		0.006	
			(0.007)		(0.009)		(0.014)	
Observations	2,238	2,238	2,238	2,238	2,238	2,238	2,238	2,238
Villages FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

C. Sensitivity analysis

Table 28: Internet usage sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	0.015	-0.022	0.032	-0.007	0.039	-0.003	0.036
		(0.018)	(0.020)	(0.024)	(0.019)	(0.035)	(0.019)	(0.037)
	DiDiD			0.054*		0.046		0.040
				(0.030)		(0.042)		(0.045)
100-500	DiD	0.013	-0.021	0.029	-0.015	0.046	-0.011	0.040
		(0.018)	(0.018)	(0.022)	(0.018)	(0.031)	(0.017)	(0.032)
	DiDiD			0.050**		0.061*		0.051
				(0.024)		(0.035)		(0.036)
100-600	DiD	0.014	-0.029*	0.037*	-0.016	0.052*	-0.018	0.054*
		(0.016)	(0.016)	(0.021)	(0.016)	(0.029)	(0.016)	(0.030)
	DiDiD			0.066***		0.068**		0.072**
				(0.023)		(0.031)		(0.034)
0-700	DiD	0.016	-0.023*	0.038**	-0.013	0.050**	-0.016	0.057**
		(0.013)	(0.012)	(0.018)	(0.012)	(0.025)	(0.012)	(0.026)
	DiDiD			0.062***		0.063**		0.073**
				(0.021)		(0.027)		(0.029)
0-800	DiD	0.014	-0.019*	0.034*	-0.014	0.048**	-0.015	0.053**
		(0.012)	(0.011)	(0.017)	(0.011)	(0.023)	(0.011)	(0.024)
	DiDiD			0.053***		0.061**		0.068**
				(0.019)		(0.025)		(0.027)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 29: Cell phone ownership sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	0.196***	0.101*	0.239***	0.209***	0.181***	0.165***	0.232***
		(0.056)	(0.057)	(0.058)	(0.060)	(0.058)	(0.058)	(0.057)
	DiDiD			0.137***		-0.028		0.066**
				(0.040)		(0.034)		(0.027)
100-500	DiD	0.135***	0.056	0.171***	0.154***	0.112**	0.116**	0.158***
		(0.050)	(0.053)	(0.052)	(0.053)	(0.053)	(0.050)	(0.055)
	DiDiD			0.115***		-0.041		0.042
				(0.035)		(0.031)		(0.028)
100-600	DiD	0.106**	0.024	0.147***	0.115**	0.094**	0.080*	0.138***
		(0.045)	(0.049)	(0.046)	(0.047)	(0.047)	(0.045)	(0.049)
	DiDiD			0.122***		-0.021		0.058**
				(0.035)		(0.027)		(0.024)
0-700	DiD	0.104***	0.029	0.146***	0.120***	0.083**	0.075**	0.142***
		(0.037)	(0.037)	(0.040)	(0.038)	(0.040)	(0.036)	(0.041)
	DiDiD			0.116***		-0.037		0.067***
				(0.029)		(0.025)		(0.021)
0-800	DiD	0.095***	0.026	0.135***	0.107***	0.081**	0.068**	0.132***
		(0.033)	(0.033)	(0.036)	(0.035)	(0.036)	(0.033)	(0.037)
	DiDiD			0.109***		-0.026		0.064***
				(0.026)		(0.023)		(0.019)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 30: Land phone ownership sensitivity analysis

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		W/Controls	Not educated	Educated	Married	Single	Not young	Young
150-450	DiD	0.038*	0.029	0.042*	0.041*	0.035	0.043*	0.033
		(0.022)	(0.020)	(0.024)	(0.023)	(0.024)	(0.023)	(0.023)
	DiDiD			0.013		-0.006		-0.010
				(0.013)		(0.013)		(0.014)
100-500	DiD	0.036**	0.022	0.042**	0.044**	0.027	0.042**	0.029
		(0.018)	(0.016)	(0.020)	(0.020)	(0.019)	(0.019)	(0.018)
	DiDiD			0.020		-0.017		-0.014
				(0.012)		(0.015)		(0.011)
100-600	DiD	0.037**	0.020	0.046**	0.041**	0.033*	0.040**	0.035*
		(0.017)	(0.013)	(0.019)	(0.017)	(0.019)	(0.017)	(0.018)
	DiDiD			0.027**		-0.009		-0.005
				(0.013)		(0.013)		(0.010)
0-700	DiD	0.021	0.006	0.029*	0.026*	0.014	0.022	0.019
		(0.014)	(0.010)	(0.016)	(0.014)	(0.015)	(0.014)	(0.015)
	DiDiD			0.023**		-0.012		-0.003
				(0.011)		(0.011)		(0.008)
0-800	DiD	0.020	0.006	0.028*	0.025*	0.014	0.021*	0.018
		(0.012)	(0.009)	(0.015)	(0.013)	(0.014)	(0.012)	(0.014)
	DiDiD			0.021**		-0.011		-0.003
				(0.010)		(0.009)		(0.007)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 31: Employed for wage sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	0.065	0.021	0.085*	0.029	0.105*	0.038	0.096
		(0.046)	(0.049)	(0.049)	(0.043)	(0.059)	(0.041)	(0.061)
	DiDiD			0.065*		0.075*		0.058
				(0.035)		(0.044)		(0.043)
100-500	DiD	0.087**	0.053	0.103**	0.048	0.134**	0.056	0.123**
		(0.043)	(0.048)	(0.044)	(0.041)	(0.052)	(0.038)	(0.055)
	DiDiD			0.049		0.086**		0.067*
				(0.031)		(0.037)		(0.037)
100-600	DiD	0.051	0.015	0.070*	0.020	0.089*	0.036	0.070
		(0.038)	(0.041)	(0.040)	(0.036)	(0.047)	(0.033)	(0.052)
	DiDiD			0.055**		0.069**		0.035
				(0.026)		(0.032)		(0.036)
0-700	DiD	0.043	-0.001	0.069*	0.025	0.066	0.035	0.054
		(0.037)	(0.037)	(0.039)	(0.034)	(0.044)	(0.032)	(0.049)
	DiDiD			0.070***		0.041		0.019
				(0.021)		(0.026)		(0.032)
0-800	DiD	0.036	0.001	0.057	0.024	0.052	0.030	0.044
		(0.034)	(0.033)	(0.036)	(0.032)	(0.040)	(0.029)	(0.045)
	DiDiD			0.056***		0.028		0.014
				(0.020)		(0.025)		(0.030)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 32: Self-employed sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	-0.001	0.044	-0.021	0.013	-0.016	0.012	-0.015
		(0.025)	(0.032)	(0.027)	(0.035)	(0.024)	(0.029)	(0.028)
	DiDiD			-0.065**		-0.028		-0.027
				(0.032)		(0.034)		(0.029)
100-500	DiD	-0.002	0.048*	-0.025	0.024	-0.032	0.013	-0.019
		(0.021)	(0.027)	(0.023)	(0.028)	(0.022)	(0.024)	(0.024)
	DiDiD			-0.074***		-0.055*		-0.032
				(0.028)		(0.028)		(0.025)
100-600	DiD	0.009	0.068***	-0.022	0.031	-0.019	0.013	0.004
		(0.019)	(0.024)	(0.022)	(0.024)	(0.021)	(0.023)	(0.023)
	DiDiD			-0.089***		-0.050**		-0.009
				(0.025)		(0.024)		(0.025)
0-700	DiD	-0.007	0.050**	-0.040**	0.014	-0.032*	0.005	-0.021
		(0.015)	(0.020)	(0.019)	(0.019)	(0.018)	(0.018)	(0.018)
	DiDiD			-0.090***		-0.045**		-0.026
				(0.025)		(0.021)		(0.021)
0-800	DiD	-0.007	0.047**	-0.039**	0.011	-0.028*	0.001	-0.018
		(0.014)	(0.019)	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)
	DiDiD			-0.086***		-0.039**		-0.019
				(0.023)		(0.020)		(0.019)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 33: *Implicit* weighted average price received per kilo of products sensitivity analysis

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		W/Controls	Not educated	Educated	Married	Single	Not young	Young
150-450	DiD	0.355***	0.222	0.449***	0.427***	0.179	0.361**	0.326**
		(0.133)	(0.138)	(0.142)	(0.156)	(0.110)	(0.143)	(0.162)
	DiDiD			0.227**		-0.248*		-0.035
				(0.111)		(0.138)		(0.167)
100-500	DiD	0.335***	0.289**	0.366***	0.380***	0.192*	0.356***	0.235*
		(0.117)	(0.130)	(0.126)	(0.132)	(0.108)	(0.125)	(0.141)
	DiDiD			0.077		-0.189		-0.121
				(0.105)		(0.118)		(0.138)
100-600	DiD	0.250**	0.186	0.304***	0.302**	0.093	0.260**	0.195
		(0.109)	(0.117)	(0.117)	(0.122)	(0.098)	(0.116)	(0.135)
	DiDiD			0.118		-0.209**		-0.065
				(0.095)		(0.103)		(0.130)
0-700	DiD	0.127	0.059	0.185*	0.156	0.049	0.133	0.087
		(0.088)	(0.087)	(0.102)	(0.102)	(0.077)	(0.092)	(0.126)
	DiDiD			0.127		-0.107		-0.046
				(0.081)		(0.086)		(0.118)
0-800	DiD	0.030	-0.072	0.116	0.064	-0.054	0.030	0.028
		(0.091)	(0.113)	(0.093)	(0.099)	(0.092)	(0.095)	(0.119)
	DiDiD			0.188*		-0.118		-0.002
				(0.103)		(0.081)		(0.110)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 34: Production for sale traditional goods (in kilos) sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	-0.368	-1.318	0.352	-0.650	0.296	-1.619	6.972
		(1.024)	(1.592)	(1.746)	(1.083)	(1.472)	(1.412)	(6.974)
	DiDiD			1.670		0.946		8.591
				(2.680)		(1.409)		(7.831)
100-500	DiD	-1.141	-2.044	-0.474	-1.362	-0.515	-2.039	3.759
		(1.231)	(1.535)	(1.688)	(1.348)	(1.363)	(1.419)	(5.555)
	DiDiD			1.570		0.847		5.798
				(2.113)		(1.287)		(6.089)
100-600	DiD	-1.076	-1.785	-0.433	-1.345	-0.297	-1.826	3.349
		(0.999)	(1.232)	(1.445)	(1.107)	(1.095)	(1.181)	(4.870)
	DiDiD			1.353		1.048		5.175
				(1.784)		(1.088)		(5.356)
0-700	DiD	0.654	0.029	1.266	0.522	1.026	-0.053	5.286
		(0.892)	(0.891)	(1.239)	(0.880)	(1.057)	(0.888)	(4.492)
	DiDiD			1.237		0.505		5.339
				(1.203)		(0.598)		(4.684)
0-800	DiD	0.826	0.262	1.364	0.731	1.076	0.229	4.942
		(0.855)	(0.834)	(1.158)	(0.858)	(0.979)	(0.842)	(4.034)
	DiDiD			1.102		0.345		4.713
				(1.078)		(0.577)		(4.172)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 35: *Implicit* weighted average price received per kilo of processed goods sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	0.230	0.184	0.255	0.097	0.622	0.230	
		(0.396)	(0.492)	(0.379)	(0.372)	(0.611)	(0.396)	
	DiDiD			0.072		0.525		
				(0.300)		(0.445)		
100-500	DiD	-0.170	-0.408	0.002	-0.249	0.157	-0.170	0.000
		(0.376)	(0.486)	(0.323)	(0.361)	(0.561)	(0.376)	(0.527)
	DiDiD			0.410		0.406		0.170
				(0.327)		(0.360)		(0.561)
100-600	DiD	-0.103	-0.329	0.070	-0.164	0.146	-0.103	0.022
		(0.363)	(0.455)	(0.316)	(0.351)	(0.524)	(0.363)	(0.482)
	DiDiD			0.399		0.311		0.125
				(0.304)		(0.350)		(0.547)
0-700	DiD	-0.134	-0.364	0.044	-0.164	-0.016	-0.126	-0.681*
		(0.329)	(0.378)	(0.300)	(0.324)	(0.433)	(0.327)	(0.378)
	DiDiD			0.408*		0.147		-0.555**
				(0.230)		(0.277)		(0.280)
0-800	DiD	-0.163	-0.378	0.002	-0.186	-0.069	-0.154	-0.720*
		(0.326)	(0.377)	(0.298)	(0.322)	(0.429)	(0.324)	(0.368)
	DiDiD			0.379		0.117		-0.566**
				(0.231)		(0.275)		(0.275)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1

Table 36: Production for sale processed goods (in kilos) sensitivity analysis

		(1) W/Controls	(2) Not educated	(3) Educated	(4) Married	(5) Single	(6) Not young	(7) Young
150-450	DiD	0.038**	0.014	0.057*	0.043*	0.027	0.023*	0.134
		(0.018)	(0.009)	(0.031)	(0.022)	(0.035)	(0.013)	(0.082)
	DiDiD			0.043		-0.016		0.111
				(0.031)		(0.042)		(0.081)
100-500	DiD	0.026	0.007	0.042	0.028	0.022	0.014	0.097
		(0.019)	(0.014)	(0.027)	(0.021)	(0.031)	(0.016)	(0.061)
	DiDiD			0.035		-0.006		0.084
				(0.024)		(0.036)		(0.058)
100-600	DiD	0.022	0.006	0.039	0.023	0.019	0.012	0.083
		(0.015)	(0.011)	(0.024)	(0.017)	(0.026)	(0.013)	(0.052)
	DiDiD			0.033		-0.003		0.071
				(0.020)		(0.029)		(0.050)
0-700	DiD	0.029***	0.017**	0.042**	0.032***	0.020	0.021***	0.085*
		(0.011)	(0.007)	(0.018)	(0.012)	(0.019)	(0.008)	(0.045)
	DiDiD			0.024		-0.012		0.064
				(0.017)		(0.022)		(0.044)
0-800	DiD	0.025***	0.015**	0.035**	0.028**	0.017	0.018**	0.075*
		(0.009)	(0.006)	(0.015)	(0.011)	(0.016)	(0.007)	(0.040)
	DiDiD			0.020		-0.011		0.057
				(0.014)		(0.018)		(0.039)
Villages FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Estimated standard errors clustered at CP level in parentheses.
Controls: dummies for: age groups, level of education, marital status, gender, maternal language and electricity.
*** p<0.01, ** p<0.05, * p<0.1