Do Productive Uses of ICT Connect to Income Benefits: A Case Study on Teleuse@BOP4 Survey in Indonesia

analisis hubungan produktivitas penggunaan tik dengan pendapatan: studi kasus survey teleuse@bop4 di indonesia

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***Abstrak*— Pertanyaan apakah sektor telekomunikasi telah benar-benar mendukung pengentasan kemiskinan dan peningkatan kesejahteraan di tingkat rumah tangga, dalam hal penghasilan tambahan di Indonesia masih belum diketahui. Penelitian ini bertujuan untuk menyelidiki apakah akses ponsel dan penggunaan pada fitur produktif/konten/jasa membawa banyak manfaat bagi rumah tangga dalam hal penghasilan tambahan berdasarkan survei yang dilakukan oleh BOP LIRNEAsia dan Lembaga Penelitian Ekonomi dan Sosial, Universitas Indonesia (LPEM FEUI) pada tahun 2011. Studi ini menemukan bahwa responden dengan penggunaan produktif terhadap perangkat mereka memiliki kemungkinan lebih tinggi untuk berkontribusi terhadap pendapatan rumah tangga mereka.**

***Kata kunci*— akses, konektivitas, kemiskinan, telepon genggam, efek perlakuan, propensity score matching (PSM), probit**

***Abstract*— The question whether the telecommunication sector has been really supporting poverty alleviation and increasing welfare at the household level, in terms of an additional income in Indonesia is still undisclosed. This paper aims at investigating whether the mobile phone access and the uses on productive features/content/services have brought many benefits to the households in terms of an additional income based on the BOP survey conducted by LIRNEAsia and the Institute for Economic and Social Research, University of Indonesia (LPEM FEUI) in 2011. The paper found that the respondents with the productive use to their device have a higher likelihood for contributing to their household income.**

***Keywords*— access, connectivity, poverty, mobile phone, treatment effect, propensity score matching (PSM), probit**

I. Introduction

Amid the growing importance of the telecommunication sector in general, studies found a more crucial role for developing the mobile telephony in the future. Granstrand (1999) speculated that the importance of the device could be related to the rationale of "human communication" where electronics media are becoming increasingly embedded with people and that telecommunication systems are becoming more interactive, selective and multimedia, as well as asynchronous at the same time. Hence, mobile telephony is now of a great interest, especially in developing countries, due to the fact that most of these countries are enjoying a technological leap-frogging process. The growing transition to mobile telephone usage is also a quick and inexpensive way to increase telecommunication penetration (Sridhar & Sridhar, 2004) as other studies with the same concerns found similar conclusions, among others; Aker (2008), Muto and Yamano (2009), Vogelsang (2009) and Mbogo (2010) and Gruber and Koutroumpis (2011).

The importance of mobile telephony is also related to the type of technology in comparison to its long rival, fixed-line telephony. It is often proposed that wireless technology plays an increasingly prominent role in the expansion of rural telecommunication networks in the developing countries (Reynolds and Samuels, 2004; Galperin, 2004). More importantly, mobile technologies not only offer a substantial cost advantage over fixed-line infrastructure for rural networks, but they are also better suited to service the demands of rural low-income populations (Proenza, 2006). In relation to this, the International Telecommunication Union (ITU) has stated that while high-speed Internet is still out of

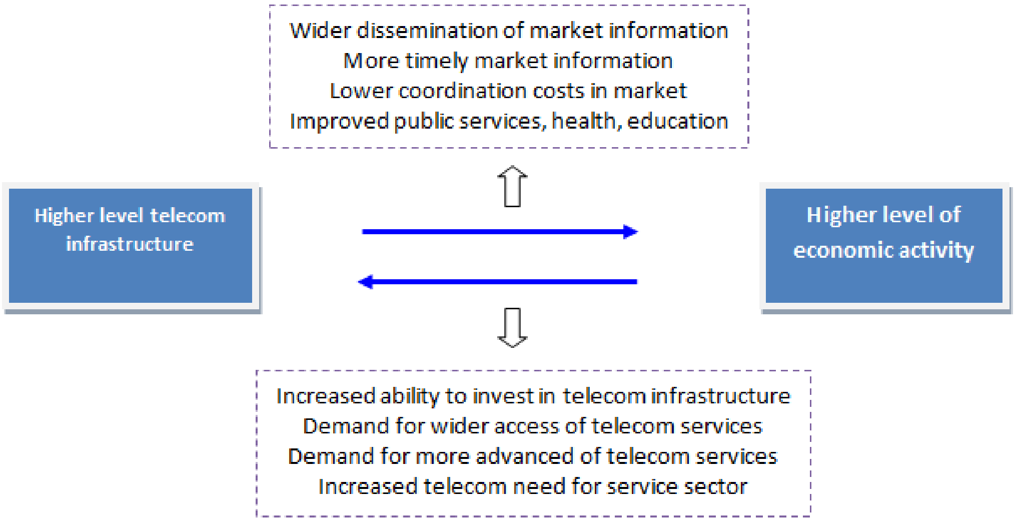


Figure 1. Relationship between ICT investment and economic growth (Dutta, 2001)

reach for many people in low-income countries, mobile telephony is becoming ubiquitous, with access to mobile networks now available to over 90 per cent of the global population. Recent surveys in developing countries show that the mobile phone not only bridges the voice gap but also has begun to close the data gap for the poor, particularly in rural areas (ITU, 2011).

Yet, little attention has been paid to investigate the impact of telecommunication sector in general and mobile telephony in particular for developing socio-economic outcomes, for instance, on household welfare in terms income. In a view of conceptual framework, the importance telecommunication and its relationship with the socio-economic variables can be explained in the following Figure 1 discussed by Dutta (2001).

From the Figure 1, it can be ascertained that there are two-ways direction between a higher telecom infrastructure and the economic activity. A higher economic activity leads to a higher telecom infrastructure through increasing demand of new services and the derived demand from other sectors which is also showing a network externality. In opposite, a higher telecom infrastructure leads to market efficiency thanks to faster information dissemination. Nevertheless, whereas the impact of higher telecom infrastructure to economic activities and market efficiencies has been the focus of investigation (Brynjolfsson & Hitt, 1997; Chacko & Mitchell, 1998; Bresnahan, Brynjolfsson & Hitt, 2000; Dimelis & Papaioannou, 2011), the empirical analysis of telecommunication affecting the household welfare is still somewhat missing in the literature. Some conceptual papers and case studies can be found on how telecommunication sector affects poverty alleviation, education and health (Chakraborty & Nandi, 2011; Dimelis & Papaioannou, 2011) and also to ensure better socio-economic platforms (Wijers, 2010; Kijsanayotin, Kasitipradith, & Pannarunothai, 2010; Crow et al., 2012; Kiiza & Perderson, 2012). Therefore, this study aims at scrutinizing the impact of the access to mobile telephony and the productive use of the device to the household income utilising the treatment effect model in a more empirical manner.

The paper is presented by firstly presenting the portrait of socio-economic profile in Indonesia and the transition of telecommunication industries in the country. The next section elaborates the methodology of survey and data analysis employed to answer the research problem on determining the impact of access and use of mobile telephony to the household income. The results section follows afterwards with a conclusion section presented at the end.

II. TELECOMMUNICATION SECTOR AND SOCIO-ECONOMIC CHALLENGES

Talking about the size to the economy, the telecommunications sector in Indonesia is still relatively small compared with the total value added/GDP. The proportion of GDP was still less than 3% up until 2008 and reaching 3.1% in 2009. Nevertheless, in terms of the growth rate, the sector is far above the national GDP, indicating a massive development of the sector compared with the rest of the economy. The GDP growth is recorded at approximately 5-6% during the period 2004-2009 whereas the telecommunications sector achieved 24%-30% at the same time. Lee and Findlay (2005) identified the development of telecommunications sector in Indonesia has been mainly driven by two phases of reforms. In 1989, private participation was permitted in the fixed-line sector through public-private partnership (PPP) arrangements whereas in 1999, a duopoly structure was created in fixed-line sector operations, accompanied by a pro-competitive regulatory regime. Both policies have been further promoted the diffusion of telecommunication devices.

In relation to this, Eick (2007) added that by introducing the Telecommunications Act No. 36 of 1999 aimed at providing affordable telecommunication access to the urban and rural populations. The access was then built not only in Jakarta and other large cities but also in the thousands of villages throughout the archipelago that continued to lack basic infrastructure and services. Nowadays, partly thanks to these moves, Indonesia's telecommunication sector enjoys a rapid development of, particularly mobile telephony. By the end of 2010, the cellular market had recorded a dramatic boost, with the number of active SIM cards reaching 220 million

However, while ICT development has been growing quite significantly, the transition of socio-economic development progresses far slowly. Recent study by Nugraha and Lewis

(2013) monitored the update of Indonesia development outlook. The study concludes that Indonesia has experienced significant economic growth in recent years (on average, 5% in 2008) akin many people are still living in poverty. To accentuate this aspect, the income inequality measured by the Gini coefficient, has also increased. To add the complexities, a recent study by Dartanto and Nurkholis (2013) maps the determinants of poverty in Indonesia. Based on the data by observing the National Socio-Economic Survey (Susenas) balanced-panel data sets of 2005 and 2007, the study found that 28% of poor households are classified as chronically poor (remaining poor in two periods) while 7% of non-poor households are vulnerable to be being transient poor. In addition, the study found that determinants of poverty dynamics in Indonesia are educational attainment, the number of household members, physical assets, employment status, where in terms of geographical area; Java and Bali are more vulnerable to the external shock than those of other people living outside of these regions.

III. Methodology

The methodology employed in this study is adapted from the model discussing the return to education, thus, measuring the impact of education to the income. For a very long time, at least during the last 50 years economists have devoted their efforts to investigate the impact of schooling (education) to earning at micro level analysis (Guison-Dowdy, 2012),. Variety of models and estimations has been employed to identify the return to schooling to capture the difference of schooling quality, and gap between male–female. However, as stated by Hanushek and Welch (2006), there is always a problem to precisely approach the impact of education as, for instance, people are different in skills (e.g., ability, initial human capital, motivation, and the like). This phenomenon is one of the intuitions concerning the ability bias especially when individuals have multiple skills. Guison-Dowdy (2012) mentioned that the skills level might also relate cognitive competencies (the array of abilities enabling individuals to learn, process, and apply knowledge) which influence individual achievement. That said, the methodology employed in this study is seen as a complementary effort towards the existing studies investigate the impact of education to earning. After controlling all possible factors effecting household income level or covariates consist of education levels, skills (managerial competencies), together with other socio-economic variables (age, gender, type of occupation, marital status, geographical area, and type of housing), this study introduced some additional variables concern with the “additional skills and experiences” thanks to the ubiquity of ICT devices. It is conceived that ICT variables are important to help the prediction of the return to education estimate as the proxy of “skills and experience”. These variables include the access to telephony and the productive uses of the device. The formal derivation of the model is presented in the Appendix.

To operationalize the methodology, a treatment effect model is employed. The basic idea behind the method is to estimate the counterfactual outcome of the income for people who have connected to the mobile would have achieved had they are not connected yet. That said, the methodology will control all possible factors affecting the income level (in this study gender, ages education, geographical location, type of occupation, number of households member skills, and prior ICT assets ownership) in such a way that the income level in two samples are comparable only by looking at the difference on the mobile phone connectivity. The comparison is calculated based on the propensity score matching (PSM) reflecting the likelihood for having the same mentioned socio-economic/demographic factors (covariates).

PSM is widely used for non-experimental analysis intended to evaluate the average effect of a treatment program intervention. The method compares the outcome of program participants with those of matched non-participant chosen on the basis of similarities of observe characteristics. The more traditional method compares the outcome of participant with non-participant whereas a more recent method of PSM pairs program participants with multiple non participants and use the weighted average to contract the matched outcome (Todd, 2010). The main advantage of the matching estimator is they do not require any functional forms of outcome equation and thus not susceptible with misspecification bias along with the dimension (which usually arises when econometric tastings are being employed).

The framework of analysis can be elaborated as follows. Assume there are two potential outcomes, (Y_0, Y_1) represents the states of being without and with the treatment. An individual can only be at one state in a time so only one outcome is observed. The unobserved is then called as a counterfactual outcome. The treatment effect for an individual is:

$$\Delta = Y_1 - Y_0 \quad ...... (1)$$

which is not observable directly. If $D = 1$ represents the person who participate and $D = 0$ otherwise, the observed outcome is then denoted by: $Y = DY_1 + (1 - D)Y_0$. From this, the conditional distribution of $F(Y_1|X, D = 1)$ and $F(Y_0|X, D = 0)$ can be recovered from the data. However, the joint distribution $F(Y_0, Y_1|X, D = 1)$ or $F(Y_0, Y_1|X)$ or the impact $F(\Delta|X, D = 1)$ are not observed. The focus of the study is then to calculate the average impact of treatment on the treated (ATT) denoted by $TT = E(Y_1 - Y_0|D = 1)$. The treatment and matching should also take the assumption that treatment assignment is strictly ignorable given any covariates (observed characteristics, Z, e.g. all socio-demographic and economic variables), such a way that: $(Y_0, Y_1) \perp\!\!\!\perp D|Z$ which can also be represented as $E(D|Y_0, Y_1, Z) = E\ (D|Z)$ or $Pr\ (D = 1|Y_0, Y_1, Z) = Prob\ (D = 1|Z)$.

Propensity score is defined as the conditional probability of treatment given the covariates. It means that, if the treatment group (T) and control group (C) are hugely different in many observed variables (x), e.g., socio demographic aspects (ages, gender, education, geographical area, etc.), the difference in outcome (Y) cannot be associated with the difference in treatment. The solution is possible only by comparing the member of C and T with similar in X (propensity matching estimators). Matching by the propensity score can be done by choosing propensity score p(x) at random. The

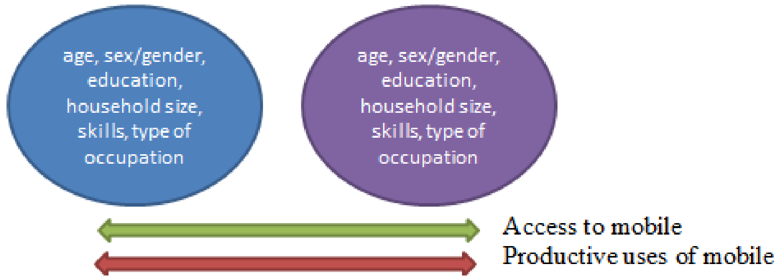


Figure 2. Operationalization of the methodology

operationalization of the methodology is shown in the following Figure 2.

From Figure 2, the treatment effect controls for the possible factors that contribute to income Therefore, the only difference between the two samples is (i) the access to the mobile, for access impact, and (ii) the usage of mobile services, particularly on productive uses.

Some recent studies have adopted the treatment affect model and the used of propensity score matching in particular in many areas of ICT. Beard, Ford, Saba, and Seals (2012) estimate the effect of Internet use on job search. The study indicate broadband use at home or at public locations reduces the probability that the unemployed cease job search by over 50% relative to unemployed persons who do not use the Internet at all. As policy implication even public connections (e.g., at libraries) in unserved and underserved areas may produce substantial social benefits. Hanley and Perez (2012) uses propensity score kernel matching with difference-in-differences to reveal export selection and evidence of ‘technology upgrading’ where export oriented firms are seen to be more innovative.

Grimes, Ren, and Stevens (2012) investigates whether broadband access can be considered as a productivity-enhancing factor. Investigating a large micro-survey of firms and employing propensity score matching is used to control for factors, including the firm's own lagged productivity, that determine a firm's internet access choice, the study indicates that broadband adoption boosts firm productivity by 7-10%; effects are consistent across urban versus rural locations and across high versus low knowledge intensive sectors.

A. Survey methodology

This section will discuss the survey methodology used in Teleuse@BOP for Indonesia case. More particularly, the section elaborates some aspects concerning stratification, sampling frame, sampling method, sample size, weight calculation, and estimation method.

B. Stratification

In general, the Teleuse@BOP survey in Indonesia utilizes the information from SUSENAS[1] 2010 particularly for Java. Based on this national wide survey, households (or person) are classified into “urban” and “rural”. This definition indicates village-level administrative areas where people living in where the category is derived from National Statistical Office (NSO) of Indonesia. In order to determine “urban” or “rural” status of the specific area, NSO uses variables such as population density or number of population living in, number of households use electricity, percentage of agricultural households, number of urban facilities, number of basic facilities such as public school/college, hospital or public health facilities, number of entertainment facilities, hotels and restaurants, number of HH that have an access to telecommunication (fixed lines), land use, etc. A village is scored based on those indicators, ranging from 2 to 26. Villages that have total score of 10 or more are included into “urban” villages whereas those that score are 10 or less are classified into “rural” villages.

C. Sampling Frame

The sampling frame is designed based on unit sample to be selected in the Teleuse@BOP survey. In this respect, unit sample used is districts (Kabupaten/Kota) and households. A district is an area which is equivalent to municipal or regency. District sample frame is a list of urban/rural villages in each stratum including information of number of low-class household (i.e. BOP). In practice, the survey then splits these districts into “urban” and “rural” districts. Furthermore, households sample frame is a list of households in each district (urban and rural district).

D. Sampling Method

The survey applies three stages of stratified random sampling. *At first stage*, it splits areas covered by SUSENAS 2010 into “urban” and “rural” to select specific district. Hence, urban and rural districts are determined independently (to determine district sampling frame only for Java datasets. The next process is to randomly select 35 “urban” and 25 “rural” districts in each stratum using probability proportional to size (PPS)-systematic sampling cutting the households into BOP and TOP. If total household’s expenditure per day divided by total household’s member is less than $US 1.25, the household is, thus, classified as a BOP. *The second stage* is to randomly choose 20 potential respondents in each specific district selected in the first stage. This is listed by simple random sampling method. There are 700 “urban” individual and 500 “rural” individual BOP. In total, 1200 BOP potential respondents are sampled. Finally, *the last stage* is to select household’s member aged 15-60 years old in each specific sample household using Kish Table. By Kish Table, a selected respondent is chosen by using a combination of number of household members and last digit of household’s identity (ID) in SUSENAS 2010. In summary, the sampling plan can be made as the following Table 1.

The sampling fraction of the sampling design can be determined as a product of sampling fraction of each stage, as follow:

$$f = f_1 \times f_2 \times f_3 = \frac{n_h M_{hi}}{M_h} \times \frac{20}{M_{hi}} \times \frac{1}{Z_{hij}} = \frac{n_h 20}{M_h Z_{hij}}$$

Moreover, the weight can be constructed as inverse of this overal sampling fraction as follows:

$$w_{hij} = \frac{M_h Z_{hij}}{n_h 20}$$

[1] SUSENAS is the abbreviation of *Survey Sosial Ekonomi Nasional* (National Socio-Economic Survey). The survey is conducted yearly by the NSO (BPS in this case) and covers all provinces in Indonesia.

TABLE 1 SAMPLING PLAN

Stage	Unit	Population	Sample	Method	Probability	Sampling Fraction
1	District	N_h	n_h	PPS, size: Z_{hi}	$p_1 = \frac{M_{hi}}{M_h}$	$f_1 = \frac{n_h M_{hi}}{M_h}$
2	Households	M_{hi}	20	Simple Random Sampling	$p_2 = \frac{20}{M_{hi}}$	$f_2 = \frac{20}{M_{hi}}$
3	Houhoseld member aged 15-60	Z_{hij}	1	Simple Random Sampling	$p_3 = \frac{1}{Z_{hij}}$	$f_3 = \frac{1}{Z_{hij}}$

E. Sample Size

To determine sample size with certain degree of accuracy, some parameters such as estimation of population proportion (*p*), confidence level, and relative margin of error (*d*) are required. The desired confidence level or level of accuracy for the survey was set to 95% and relative margin of error was 5%. The population proportion was set conservatively to 0.5 which yields the largest sample size (Lwanga & Lameshow, 1991). With these parameters, the minimum sample size was determined by the following equation (Rea & Parker, 1997).

$$n_0 = \left(\frac{Z_{\alpha/2}\sqrt{p(1-p)}}{d}\right)^2 = \left(\frac{1.96\sqrt{0.5(1-0.5)}}{0.05}\right)^2 = 384$$

so that the minimum sample size obtained was 384. To compensate the clustering effect due to the choosen sampling design rather than Simple Random Sampling (SRS), the sample size must be larger than the minimum requirement above. Therefore, if the clustering effect called design effect, or DEFF for short, is 2, the minimum sample size became 384 x 2 = 768 and to account for individuals that have not used telephone services in the period prior to the survey and to compensate for the non response, the target sample was fixed to 1200 households or individuals aged 15 years old or over.

This sample size is then proportionally allocated to the number of population aged 15 to 60 years old to each stratum with the following formula:

$$n_h^{(P)} = n \times \frac{z_h}{\sum_{h=1}^{2} z_h}.$$

Thus, the calculation result using above formula is as on Table 2.

TABLE 2 TARGETED SURVEY RESPONDENTS

Strata	Population 15-60	Proporsional $n_h^{(P)}$	Adjustment
Urban Java	59.094.940	702	700
Rural Java	41.913.343	498	500
Total	101.008.283	1200	1200

F. Estimation Method

Let y_{hij} and x_{hij} be two survey variables resulting from the respondent in household j, district i, and stratum h, ratio estimate $\hat{R}$ for ratio population R is

$$\hat{R} = \frac{\hat{Y}}{\hat{X}}$$

where,

$$\hat{Y} = \sum_{h=1}^{H}\sum_{i=1}^{n_h}\sum_{j=1}^{20} IND_{hij} \times y_{hij}$$

$$\hat{X} = \sum_{h=1}^{H}\sum_{i=1}^{n_h}\sum_{j=1}^{20} IND_{hij} \times x_{hij}$$

With the estimated variance for $\hat{R}$ is

$$\hat{V}(\hat{R}) = \frac{1}{\hat{X}^2}\{\hat{V}(\hat{Y}) - 2\hat{R}\widehat{Cov}(\hat{X},\hat{Y}) + \hat{R}^2\hat{V}(\hat{X})\}$$

If y is dichotomus variable (0 or 1) and x is 1 for each observation, $\hat{R}$ refers to estimated proportion or prevalence. The Table 3 below sumarizes the discussion of methodolody.

TABLE 3 SUMMARY OF THE SAMPLING METHOD

Descriptions	Survey characteristics
Target Population	Individuals aged 15 years or older
Sample Frame	Susenas 2010
Domain	Java
Stratum	Urban, Rural
Allocation	Proportional
Cluster	District
Confidence Level	95%
Design Effect (DEFF)	2
Relative margin of error	5%
Population Proportion	0.5
Minimum Sample Size	768
Target Sample	1200
Sample by Stratum	Urban - 700 ; Rural - 500
Household per cluster	20
District by Stratum	Urban – 35 ; Rural - 25

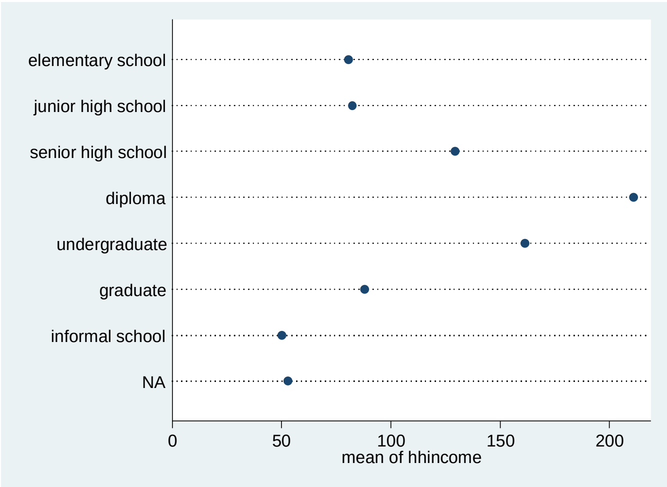


Figure 3 The relationship between income levels and education

IV. RESULTS

The following section discusses the analysis from the survey data based on T@BOP survey in Indonesia. The section is divided into two parts; the first section presents the descriptive analysis of the data whereas the later part shows the results of treatment effect model comparing various scenarios and comparisons. The output from the STATA package is presented further in the Appendix.

A. Descriptive analysis

The following figures show the relationship between some socio-economic factors underlying the household characteristics and their income level. It has been ascertained from many studies that the income level is associated with many socio-economic and demographic factors, among others, education, geographical area and gender.

From Figure 3 it can be seen that, in general, income level is positively trended towards education achievement. Moving from elementary school to diploma, the figure shows a significant increase in the mean of the household income. The pattern is little bit changing when the investigation is continued to the higher degree of education where the mean of income level decreases for respondents falling into undergraduate and graduate degree categories. However, it should be understood that the majority of the respondents obtain the education degree up to diploma where only a slice of them earns a higher degree. The household income level is also visibly different with respect to geographical area as shown in the following Figure 4

As shown in Figure 4, the mean of income level varies greatly between provinces investigated although the respondents have been selected to fully match with the BOP characteristics. To understand the gap, in DKI Jakarta, the average monthly household's income level is around 238.9 USD whereas in West Java, the average income is only 53.1 USD. Nevertheless, it has been taken into consideration, which is however out of the scope for this study, that the price levels in each province also differ very significantly. In DKI Jakarta where the capital city of Indonesia is located, the price is far above any provinces in this study. In addition, when the data is being compared with the urban and rural classifications, it can be seen that the income level is similar in most of provinces except in Banten where the income level in urban is far higher than in the rural, whereas in West Java the tendency is little bit of the opposite.

By combining the figure on education and geographical area as shown in Figure 3 and 4, it can also be inferred the urban-rural income disparity controlled by education as shown in the following Figure 5.

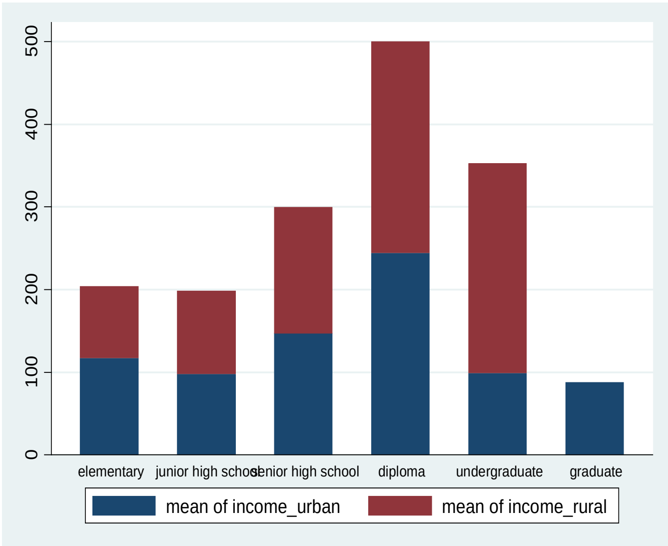


Figure 5. Urban-rural income disparity controlled by education

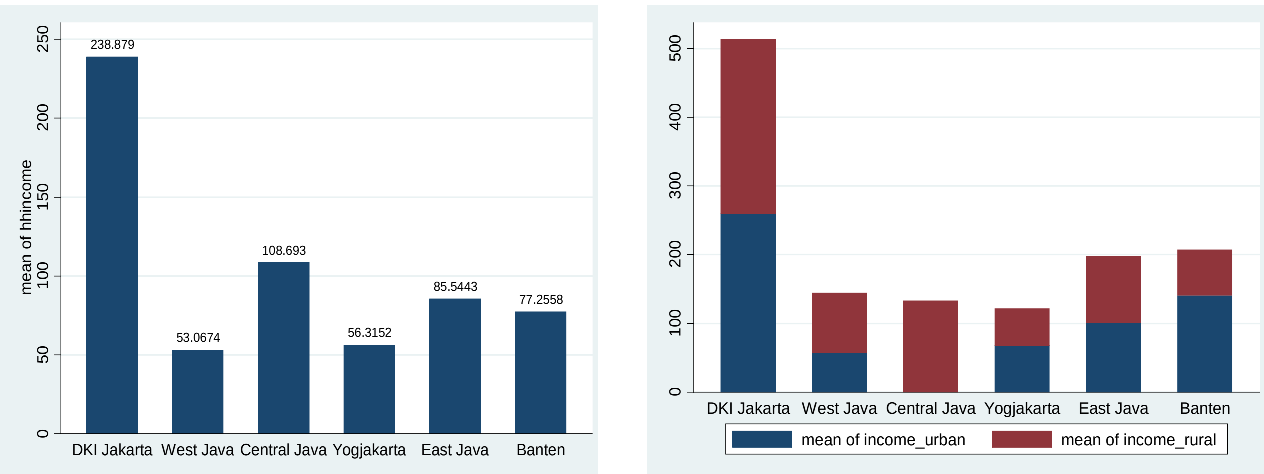
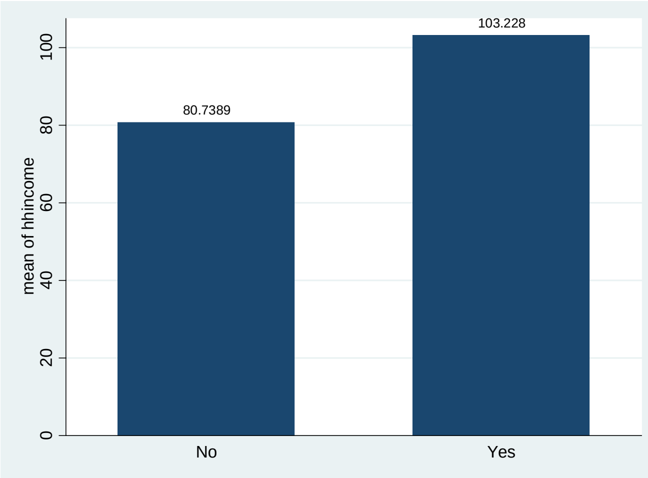


Figure 4 Income level and geographical area



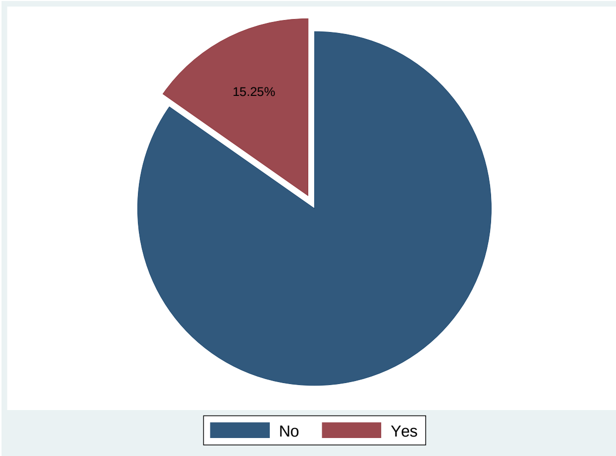


Figure 6 Access to mobile telephony and income level and the productive uses of it

From Figure 5, it can be concluded that education level does play an important role in the sense that the disparity of urban-rural income remains unchanged (note the ratio of the red and blue bars are almost the same for each education level) whereas education has the ability to vary the income level except for undergraduate level. At this level, the mean income in the urban area is much lower than that of in the rural area in addition to the mean values of income that is lower than the diploma.

The following figures, different to previous analysis, show the element of interest in this study on the disparity of the income level in relation to the access to mobile telephony.

From the survey data shown in Figure 6, it can be seen that the disparity of income with respect to the access to mobile telephony is visible. The respondents who have been accessing the device have a greater income level than those of the unconnected ones (103 compared with 81 USD). However, it has to be taken into consideration that this gap is measured without matching the characteristics of these two sub-samples. The gap, thus, might be reflecting the different level of education and other socio-economic variables. Moreover, when the investigation is conducted to see the proportion of the connected respondents who use the device for the productive usages (when the users access to at least one of the following functionalities; information services, banking, government information, health and the payment system), it is found that only 15% of them are familiar and using such services.

B. Propensity score matching

While the detail analysis of treatment effect and propensity score matching estimations are presented in the Appendix, the summary of the analysis is shown in the following Table 4.

In general, as shown in Table 4, the results are classified into two sub-analysis; the access to mobile telephony and the use of mobile telephony. A particular interest is given to compare the impact of the access to bank services for the household livelihood. The average treatment effect on treated (ATT) shows the monetization of the value showing the different impact following the with-and-without scenarios. That said, the ATT for access to mobile telephony denotes the likelihood of a respondent with mobile telephony for having a greater household income in comparison to the other respondent with the same profiles and covariates without the access to mobile telephony. The number of common support shows the total relevant observation to be compared which means that the analysis leaves some portion of samples out of the analysis due to unmatched propensity score. The last column shows the statistical significance of the estimations.

From the table, it can be analyzed that the access to mobile telephony contributes to a higher likelihood for having 26.7 USD monthly household incomes. Moreover, when the analysis is decomposed into the urban and rural area and focused on the "absolute poverty line" of 0.75 USD/day/person (Dartanto & Nurkholis, 2013), the impact is found greater in the urban area than in rural area for the same respondents categorized is the absolute poor. This finding might be supported by the fact that variety of economic activities happens mostly in the city (urban area) than in rural.

TABLE 4 THE SUMMARY ANALYSIS OF THE PSM ESTIMATIONS

No	**Comparison**	**Average Treatment effect on Treated (ATT) (Monthly household income in USD)**	**Number of common support**	**Significance level**
	Access to mobile telephony			
1	All sample	26.668	269/688	5%
1.1.	Among poor urban	34.237	90/171	5%
1.2.	Among poor rural	25.977	148/344	NS

No	Comparison	Average Treatment effect on Treated (ATT) (Monthly household income in USD)	Number of common support	Significance level
2	Usage of mobile telephony			
2.1.	Productive use of mobile	39.037	556/95	10%
2.1.1	Urban	36.889	183/27	NS
2.1.2	Rural	-19.764	295/61	NS
2.2.	Mobile internet	40.574	566/64	NS
	Access to financial sector			
3	Access to the bank	66.744	761/297	1%
3.1.	Urban	66.877	248/84	1%
3.2.	Rural	92.732	383/167	1%

The next analysis is conducted to understand whether a different pattern of usage might lead to a different income level. The results show that the productive use of mobile telephony increases the likelihood for having a greater monetary impact than the access. Around a 39 USD monthly household income would be generated should the user access the mentioned functionality of mobile telephony. However, when the impact is investigated from urban and rural classification the impact becomes nonexistent as neither the impact the use of telephony for the mobile internet.

In contrast, the access to financial sector proxied by whether the respondent has a banking account shows a very substantial and significant result. A bankable respondent has likelihood for having a 66.7 USD more than non-bankable respondent. The impact is even greater in rural area compared with the urban area (92 USD vs. 67 USD) signaling the importance for providing the financial access in rural where infrastructures (bank branches, ATMs) is still limited.

V. Conclusion

The paper is started by a research problem that amid a massive growing of telecommunication sector; the achievement of socio-economic progress is somewhat very slow in Indonesia. Assuming that the relationship of telecommunication sector and the achievement of economic well-beings should follow two-way relationships; the question to be addressed is whether the access and productive usages of mobile telephony have led to a higher household income levels. The study found that the respondents with the access to mobile phone have a higher likelihood for earning a 27 USD household income more than those of the unconnected ones. The study also found the productive uses of it contribute a 39 USD household income more than those who never access these services. In addition, the impact of access is more visible in urban area where economic activities are more available. As the comparison, the study also replicates the investigation on the access to the banking account and found a visible and greater impact of this to income, especially in rural area.

There are some policies can be derived from this study; *firstly*, by promoting local economic development mediated by mobile telephony especially for agriculture sector where the majority of poverty cases in Indonesia are found, especially in rural. The case in India can be put as the lesson learned where both countries have similarities. The agricultural sector which is supported by the role of ICT in India can be seen as a progressing example. India traditionally is an agrarian economy, where 40% of the country's GDP is derived from agriculture and agriculture products. The crafting institution by government and private sectors (industry) has enabled the increased acceptability of the latest mobile innovations and tools by the farmer (Bowonder and Yadav, 2005). *The second policy* is related to enable the BOP users for the access to the ICT devices with a greater link to payment system and to substitute the functionality of baking services in the area where the banking system has not yet developed.

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APPENDIX

A. The covariates of probit model

The micro model is derived from return to education study by Card (1999) on return to education estimation. Lifecycle utility, conditional on schooling *S* and a given consumption profile is:

$$V(S, c(t)) = \int_0^S \left(u(c(t) - \phi(t))\right) e^{-\rho t} dt + \int_S^\infty u(c(t)) e^{-\rho t}\, dt.$$

Under these conditions the intertemporal budget constraint is:

$$\int_0^\infty c(t) e^{-Rt} dt = \int_0^S (p(t) - T(t)) e^{-Rt} dt + \int_S^\infty y(S,t) e^{-Rt} dt.$$

An individual's optimal schooling choice and optimal consumption path maximize

$$\Omega(S, c(t), \lambda) = V(S, c(t)) - \lambda \left\{ \int_0^\infty c(t) e^{-Rt} dt - \int_0^S (p(t) - T(t)) e^{-Rt} dt - \int_S^\infty y(S,t) e^{-Rt} dt \right\}.$$

The derivative of this expression with respect to *S* is

$$\Omega_S(S, c(t), \lambda) = \lambda e^{-RS} \{MB(S) - MC(S)\}$$

where

$$MB(S) = \int_0^\infty \partial y(S, S + \tau)/\partial S e^{-R\tau}\, d\tau$$

represents the marginal benefit of the *S*th unit of schooling (expressed in period *S* dollars)

$$MC(S) = y(S,S) - p(S) + T(S) + 1/\lambda e^{-(\rho - R)S} \phi(S)$$

represents the marginal cost of the *S*th unit of schooling (also in period *S* dollars)

The marginal benefit of the *S*th unit of schooling is

$$MB(S) = f'(S) \int_0^\infty h(\tau) e^{-R\tau} d\tau = f'(S) H(R)$$

where *H(R)* is a decreasing function of the interest rate.

(i.e., $\int_0^\infty e^{g\tau} \times e^{-R\tau}\, d\tau = \int_0^\infty h(\tau) e^{-R\tau} d\tau$).

Under separability, the marginal costs and marginal benefits of additional schooling are equated when

$$f'(S)/f(S) = 1/H(R) \times \{1 + (T(S) - p(S))/f(S) + 1/\lambda e^{-(\rho - R)S}\, \phi(S)/f(S)\}$$

To consider a more general case, assume that $u(c(t)) = \log c(t)$. Then the first order conditions for an optimal consumption profile, together with the lifecycle budget constraint, imply that

$$1/\lambda = \rho \left\{ e^{-RS} f(S) H(R) + \int_0^S (p(t) - T(t)) e^{-Rt} dt \right\} = \rho W(S)$$

where *W(S)* is the value of lifecycle wealth associated with the schooling choice *S*.

An optimal schooling choice satisfies the condition

(1) $f'(S)/f(S) = R - g + \rho e^{-\rho S} \phi(S) \equiv d(S).$

A simple specification of these heterogeneity components is

(2) $f'(S)/f(S) = b_i - k_1 S$,

(3) $d(S) = r_i + k_2 S$,

where b_i and r_i are random variables with means $\bar{b}$ and $\bar{r}$ and second moments $\sigma_b^2, \sigma_r^2, and\ \sigma_{br}$, and k_1 and k_2 are nonnegative constants. These assumptions imply that the optimal schooling choice is linear in the individual-specific heterogeneity terms:

(4) $S_i = (b_i - r_i)/k$,

where $k = k_1 + k_2$ is assumed to be strictly positive.

At the equilibrium level of schooling described by equation (4) individual i's marginal return to schooling is

$$\beta_i \equiv b_i - k_1 S_i = b_i (1 - k_1/k) + r_i k_1/k$$

A more complex expression arises if part time earnings while in school do not fully offset tuition. For example, if tuition costs and part time earnings are constant (*T(t) = T; p(t) = p*) , it can be shown that

$$d(S) = (R - g) \times (1 + (T - p)/f(S)) + \rho e^{-\rho S} \phi(S) \times [1 - (e^{RS} - 1) \times (R - g)/R \times (T - p)/f(S)]$$

If tuition costs are small relative to lifetime earnings, the term in square brackets is close to 1, implying

$$d(S) \approx (R - g) \times (1 + (T - p)/f(S)) + \rho e^{-\rho S} \phi(S)$$

To understand the implications of the preceding model for observed schooling and earnings outcomes, note that equation (2) implies a model for log earnings of the form

$$\log y_i = \alpha_i + b_i S_i - \frac{1}{2} k_1 S_i^2$$

where α_i is a person-specific constant of integration.
It is convenient to rewrite this equation as

$$\log y_i = a_0 + \bar{b} S_i - \frac{1}{2} k_1 S_i^2 + a_i + (b_i - \bar{b}) S_i$$

where $a_i \equiv \alpha_i - a_0$ has mean 0.

To proceed, consider the linear projections of a_i and $(b_i - \bar{b})$ on observed schooling:

(6a) $a_i = \lambda_0 (S_i - \bar{S}) + u_i$

(6b) $b_i - \bar{b} = \psi_0 (S_i - \bar{S}) + v_i$

where $\bar{S}$ represents the mean of schooling and $E[S_i u_i] = E[S_i v_i] = 0$.Substituting these expressions into (5), the earnings function can be written as

$$\log y_i = constant + (\bar{b} + \lambda_0 - \psi_0 \bar{S}) S_i + \left(\psi_0 - \frac{1}{2} k_1\right) S_i^2 + u_i + v_i S_i$$

Under this assumption the probability limit of the ordinary least squares (OLS) regression coefficient b_{ols} from a regression of log earnings on schooling is

(7) $$\begin{aligned} plim\, b_{ols} &= \bar{b} + \lambda_0 - \psi_0 \bar{S} + 2\bar{S} \times (\psi_0 - \tfrac{1}{2} k_1) \\ &= \bar{b} - k_1 \bar{S} + \lambda_0 + \psi_0 \bar{S} \\ &= \bar{\beta} + \lambda_0 + \psi_0 \bar{S} \end{aligned}$$

In the general case the linear projection of S_i^2 on S_i has slope
$2\bar{S} + E[(S_i - \bar{S})^3]/var[S_i]$, and
$cov[v_i S_i, S_i] = E[(b_i - \bar{b})(S_i - \bar{S})^2] - \psi_0 E[(S_i - \bar{S})^3]$
Taking these expressions into consideration, equation (7) includes another term:

$$E[(b_i - b)(S_i - S)^2]/var[S_i] - \frac{1}{2} k_1 E[(S_i - \bar{S})^3]/var[S_i]$$

B. Treatment effect output

1) Access to mobile

a) All samples

use_own_m	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.0299206	.0043776	-6.83	0.000	-.0385005	-.0213406
male	.5959329	.0951334	6.26	0.000	.4094749	.782391
married	.040038	.119831	0.33	0.738	-.1948265	.2749025
hhmember	-.0368026	.0280408	-1.31	0.189	-.0917615	.0181564
unskilled	-.1554681	.1526286	-1.02	0.308	-.4546148	.1436785
edu_years	.1045819	.0196621	5.32	0.000	.0660449	.143119
eth1	-.0247262	.8268212	-0.03	0.976	-1.645266	1.595814
eth2	.036983	.8197426	0.05	0.964	-1.569683	1.643649
eth3	-.1072221	.8473848	-0.13	0.899	-1.768066	1.553622
eth4	-.3374129	.8625053	-0.39	0.696	-2.027892	1.353066
TV	.2877986	.1679103	1.71	0.087	-.0412995	.6168967
computer	.5081382	.2685003	1.89	0.058	-.0181127	1.034389
radio	.184076	.0966629	1.90	0.057	-.0053799	.3735319
electricity	-.2689457	.2283521	-1.18	0.239	-.7165076	.1786163
urban	.1534748	.1168601	1.31	0.189	-.0755668	.3825163
prov1	.090423	.2958017	0.31	0.760	-.4893375	.6701836
prov2	.1776461	.2766948	0.64	0.521	-.3646657	.719958
prov3	.2538388	.2344565	1.08	0.279	-.2056875	.7133651
prov5	-.1777908	.2314612	-0.77	0.442	-.6314463	.2758648
prov6	-.1148018	.2888882	-0.40	0.691	-.6810123	.4514088
_cons	.5030975	.9159855	0.55	0.583	-1.292201	2.298396

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	104.620902	85.8828997	18.7380021	13.6650028	1.37
	ATT	104.860596	78.1919505	26.6686457	13.7452123	1.94

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	269	269
Treated	33	688	721
Total	33	957	990

b) Absolute poverty-urban

```
                                                  Prob > chi2     =     0.0000
Log likelihood = -149.46505                       Pseudo R2       =     0.2083
```

use_own_m	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.034172	.0077861	-4.39	0.000	-.0494325	-.0189115
male	.6740931	.1783213	3.78	0.000	.3245898	1.023596
married	-.2789237	.2092487	-1.33	0.183	-.6890437	.1311962
hhmember	-.0199446	.045525	-0.44	0.661	-.1091718	.0692827
unskilled	.4816845	.2946856	1.63	0.102	-.0958886	1.059258
edu_years	.108214	.0337879	3.20	0.001	.0419908	.1744371
eth1	.5265341	.3856514	1.37	0.172	-.2293287	1.282397
eth2	.4484899	.4022016	1.12	0.265	-.3398108	1.236791
eth3	.4494225	.4465596	1.01	0.314	-.4258182	1.324663
TV	.7557494	.3284196	2.30	0.021	.1120587	1.39944
computer	.4977447	.3976925	1.25	0.211	-.2817183	1.277208
radio	.1722641	.1789019	0.96	0.336	-.1783773	.5229055
electricity	-.67042	.6052015	-1.11	0.268	-1.856593	.5157531
prov1	.0392343	.2929786	0.13	0.893	-.5349933	.6134618
prov5	-.2572839	.2827568	-0.91	0.363	-.811477	.2969092
prov6	-.461919	.3436897	-1.34	0.179	-1.135538	.2117003
_cons	.3775642	.8128055	0.46	0.642	-1.215505	1.970634

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	133.93801	110.913555	23.0244544	17.9177466	1.29
	ATT	128.282984	94.046324	34.2366596	19.3466773	1.77

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	90	90
Treated	55	171	226
Total	55	261	316

c) Absolute poverty-rural

use_own_m	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.0319408	.006676	-4.78	0.000	-.0450255	-.0188561
male	.7610463	.1378134	5.52	0.000	.490937	1.031156
married	.3081134	.182528	1.69	0.091	-.049635	.6658618
hhmember	-.0112734	.0435569	-0.26	0.796	-.0966434	.0740965
unskilled	-.7512377	.2227302	-3.37	0.001	-1.187781	-.3146945
edu_years	.116695	.0291513	4.00	0.000	.0595596	.1738304
eth1	.1593602	.7683567	0.21	0.836	-1.346591	1.665312
eth2	.272056	.7069008	0.38	0.700	-1.113444	1.657556
eth3	-.3733354	.8687941	-0.43	0.667	-2.07614	1.32947
eth6	.1671867	1.067315	0.16	0.876	-1.924713	2.259086
TV	.1847826	.2323623	0.80	0.426	-.2706391	.6402043
computer	.6608916	.4663834	1.42	0.156	-.2532031	1.574986
radio	.3359803	.1398519	2.40	0.016	.0618756	.610085
electricity	-.3330103	.2728222	-1.22	0.222	-.8677319	.2017114
prov1	.2798665	.6106542	0.46	0.647	-.9169938	1.476727
prov2	.4341307	.4393805	0.99	0.323	-.4270393	1.295301
prov3	.4062252	.2735757	1.48	0.138	-.1299733	.9424237
prov5	-.2083337	.2819969	-0.74	0.460	-.7610374	.3443701
prov6	-.0337553	.4681774	-0.07	0.943	-.9513662	.8838555
_cons	-.1283019	.9624644	-0.13	0.894	-2.014697	1.758094

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	123.067028	88.6505408	34.4164869	22.8231665	1.51
	ATT	122.253713	96.2762875	25.9774251	22.7728404	1.14

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	148	148
Treated	26	334	360
Total	26	482	508

2) Productive use of mobile telephony

a) All samples

m_productiv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.0175352	.0087668	-2.00	0.045	-.0347178	-.0003526
male	-.1403943	.1392977	-1.01	0.314	-.4134127	.1326241
married	.3635235	.1852444	1.96	0.050	.0004511	.7265959
hhmember	-.0355704	.0424508	-0.84	0.402	-.1187725	.0476318
unskilled	-.4096448	.2929924	-1.40	0.162	-.9838993	.1646097
edu_years	.0598028	.0266027	2.25	0.025	.0076625	.1119431
n_years	.0724037	.0253684	2.85	0.004	.0226825	.1221248
day_use	-.0099147	.0097208	-1.02	0.308	-.028967	.0091377
eth1	-.0013	.3549371	-0.00	0.997	-.696964	.694364
eth2	.3693201	.4246778	0.87	0.384	-.4630331	1.201673
eth4	.8942686	.5463015	1.64	0.102	-.1764627	1.965
TV	.7401003	.3895538	1.90	0.057	-.0234111	1.503612
computer	-.1502841	.2942743	-0.51	0.610	-.7270511	.4264829
radio	.0897069	.1439022	0.62	0.533	-.1923362	.37175
electricity	-.8739623	.3317488	-2.63	0.008	-1.524178	-.2237466
urban	.1753111	.2035013	0.86	0.389	-.2235441	.5741664
prov1	1.110953	.4253571	2.61	0.009	.2772686	1.944638
prov2	-.6206158	.448733	-1.38	0.167	-1.500116	.2588847
prov3	.8394714	.3649628	2.30	0.021	.1241575	1.554785
prov5	-.2991755	.3843046	-0.78	0.436	-1.052399	.4540476
prov6	.1141127	.4449097	0.26	0.798	-.7578942	.9861196
_cons	-1.543151	.7400161	-2.09	0.037	-2.993556	-.0927459

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	167.190298	95.156457	72.0338408	23.4489529	3.07
	ATT	161.902527	122.865675	39.0368516	25.4670088	1.53

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	556	556
Treated	6	95	101
Total	6	651	657

b) Urban respondents

m_productiv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.0194978	.0138562	-1.41	0.159	-.0466556	.0076599
male	-.2028113	.2622575	-0.77	0.439	-.7168267	.311204
married	.2678067	.3184487	0.84	0.400	-.3563413	.8919547
hhmember	-.0248439	.0632069	-0.39	0.694	-.1487272	.0990393
unskilled	-.5485898	.4287654	-1.28	0.201	-1.388955	.2917749
edu_years	.0973223	.0457574	2.13	0.033	.0076395	.1870052
eth1	.3823838	.4524319	0.85	0.398	-.5043664	1.269134
eth2	.7704703	.545025	1.41	0.157	-.2977591	1.8387
eth4	1.354851	.6793865	1.99	0.046	.0232783	2.686424
computer	-.0205818	.4778762	-0.04	0.966	-.9572019	.9160383
radio	-.6230806	.288434	-2.16	0.031	-1.188401	-.0577604
prov1	1.134203	.4765072	2.38	0.017	.2002664	2.06814
prov2	-.5090626	.5524719	-0.92	0.357	-1.591888	.5737624
prov5	-.3305723	.4674181	-0.71	0.479	-1.246695	.5855503
_cons	-1.571676	.8724989	-1.80	0.072	-3.281742	.138391

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	243.712123	119.099181	124.612942	28.1833423	4.42
	ATT	208.737778	171.848629	36.8891492	42.5801351	0.87

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	183	183
Treated	6	27	33
Total	6	210	216

c) Rural respondents

m_productiv	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.001924	.0107419	-0.18	0.858	-.0229778	.0191297
male	-.1366763	.1781622	-0.77	0.443	-.4858678	.2125153
married	.2098065	.2478419	0.85	0.397	-.2759547	.6955676
hhmember	-.0291645	.0578343	-0.50	0.614	-.1425176	.0841887
unskilled	.1366247	.3452569	0.40	0.692	-.5400663	.8133157
edu_years	.0277851	.0331363	0.84	0.402	-.0371609	.0927311
eth1	-.6266097	1.70357	-0.37	0.713	-3.965546	2.712327
eth2	-.5784887	1.661212	-0.35	0.728	-3.834404	2.677427
eth3	.7214513	1.871006	0.39	0.700	-2.945652	4.388555
TV	.3639571	.3631316	1.00	0.316	-.3477676	1.075682
computer	-.167925	.3988607	-0.42	0.674	-.9496776	.6138276
radio	.3838441	.1881995	2.04	0.041	.0149798	.7527085
electricity	-.3647366	.3589602	-1.02	0.310	-1.068286	.3388124
prov1	2.144538	.7833663	2.74	0.006	.6091682	3.679908
prov2	-.9103171	.7565605	-1.20	0.229	-2.393149	.5725143
prov3	.6461305	.3733171	1.73	0.083	-.0855577	1.377819
prov5	-.8926772	.4742345	-1.88	0.060	-1.82216	.0368053
prov6	.5732538	.6564651	0.87	0.383	-.7133941	1.859902
_cons	-.9391528	1.85919	-0.51	0.613	-4.583098	2.704792

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	142.461618	117.307593	25.1540248	35.3394334	0.71
	ATT	136.503934	156.267911	-19.7639765	31.83395	-0.62

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	295	295
Treated	7	61	68
Total	7	356	363

3) Access to bank account

a) All samples

bank_acc	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0039407	.0042425	0.93	0.353	-.0043744	.0122558
male	-.0677029	.0900131	-0.75	0.452	-.2441254	.1087195
married	.1719176	.1117636	1.54	0.124	-.047135	.3909702
hhmember	.036156	.027042	1.34	0.181	-.0168454	.0891575
unskilled	-.2711128	.1668909	-1.62	0.104	-.598213	.0559874
edu_years	.1503165	.0175704	8.56	0.000	.1158792	.1847537
eth1	.8469399	.403822	2.10	0.036	.0554633	1.638417
eth2	.6962409	.3966807	1.76	0.079	-.0812391	1.473721
eth3	.616637	.4524197	1.36	0.173	-.2700893	1.503363
eth6	1.549212	.8554631	1.81	0.070	-.1274645	3.225889
TV	.8350797	.2317367	3.60	0.000	.380884	1.289275
computer	.8136436	.2076007	3.92	0.000	.4067538	1.220533
radio	.416447	.0926147	4.50	0.000	.2349254	.5979686
electricity	-.0192558	.2134405	-0.09	0.928	-.4375915	.3990799
urban	-.019427	.1146182	-0.17	0.865	-.2440744	.2052205
prov1	.3365871	.2834557	1.19	0.235	-.2189759	.8921502
prov2	.3453155	.269883	1.28	0.201	-.1836454	.8742764
prov3	.6995471	.2265206	3.09	0.002	.2555749	1.143519
prov5	.3192074	.2221446	1.44	0.151	-.116188	.7546029
prov6	.0387612	.2953432	0.13	0.896	-.5401009	.6176233
_cons	-4.442755	.5996357	-7.41	0.000	-5.618019	-3.267491

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	147.306972	75.8018924	71.5050796	12.2063127	5.86
	ATT	148.496229	81.7518575	66.7443718	18.480204	3.61

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	761	761
Treated	20	297	317
Total	20	1,058	1,078

b) Urban respondents

bank_acc	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0071769	.0075374	0.95	0.341	-.0075962	.02195
male	-.3597377	.1723008	-2.09	0.037	-.697441	-.0220344
married	.1681635	.2000688	0.84	0.401	-.2239641	.560291
hhmember	.0976051	.0469596	2.08	0.038	.005566	.1896442
unskilled	-.4227513	.3010252	-1.40	0.160	-1.01275	.1672472
edu_years	.1652809	.031027	5.33	0.000	.104469	.2260928
eth1	.835058	.4808382	1.74	0.082	-.1073676	1.777484
eth2	.3789235	.5022763	0.75	0.451	-.6055201	1.363367
eth3	.2938848	.5446301	0.54	0.589	-.7735706	1.36134
TV	.5616164	.4425783	1.27	0.204	-.3058211	1.429054
computer	.7687965	.3021921	2.54	0.011	.1765109	1.361082
radio	.3867604	.1750633	2.21	0.027	.0436426	.7298782
electricity	-.4491513	.7098774	-0.63	0.527	-1.840485	.9421829
prov1	.3376527	.4374012	0.77	0.440	-.5196378	1.194943
prov2	.3584721	.4453074	0.80	0.421	-.5143143	1.231259
prov5	.2081325	.4021832	0.52	0.605	-.5801321	.9963971
prov6	-.2614169	.4993333	-0.52	0.601	-1.240092	.7172584
_cons	-3.964308	1.084457	-3.66	0.000	-6.089805	-1.838811

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	164.190551	108.849436	55.3411156	17.1110171	3.23
	ATT	170.196073	103.31817	66.8779037	25.1826097	2.66

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	248	248
Treated	7	84	91
Total	7	332	339

c) Rural respondents

bank_acc	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	-.003083	.0061431	-0.50	0.616	-.0151233	.0089574
male	.0592965	.1238536	0.48	0.632	-.1834521	.302045
married	.0998755	.1574183	0.63	0.526	-.2086587	.4084097
hhmember	.0039155	.0395117	0.10	0.921	-.0735261	.0813571
unskilled	-.0738146	.2259907	-0.33	0.744	-.5167482	.3691189
edu_years	.1586981	.0249052	6.37	0.000	.1098848	.2075114
eth1	-1.479137	.8606193	-1.72	0.086	-3.165919	.2076463
eth2	-.9646719	.8044954	-1.20	0.230	-2.541454	.6121101
eth3	-1.099076	.9495787	-1.16	0.247	-2.960216	.7620644
eth4	-2.061983	1.083577	-1.90	0.057	-4.185755	.0617885
TV	.7598757	.289837	2.62	0.009	.1918057	1.327946
computer	.7550666	.3228518	2.34	0.019	.1222887	1.387845
radio	.4854074	.1293146	3.75	0.000	.2319555	.7388593
electricity	.0008283	.2481599	0.00	0.997	-.4855563	.4872128
prov1	-.5759032	.7116388	-0.81	0.418	-1.97069	.8188832
prov2	-.2354548	.4587773	-0.51	0.608	-1.134642	.6637321
prov3	.7658907	.2770756	2.76	0.006	.2228326	1.308949
prov5	.3268476	.28399	1.15	0.250	-.2297627	.8834578
prov6	-.2554802	.4968549	-0.51	0.607	-1.229298	.7183376
_cons	-1.85445	.9913429	-1.87	0.061	-3.797447	.0885459

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
hhincome	Unmatched	173.524426	80.1320628	93.3923631	19.7337829	4.73
	ATT	173.561257	80.8291116	92.7321459	29.6908247	3.12

Note: S.E. does not take into account that the propensity score is estimated.

psmatch2: Treatment assignment	psmatch2: Common support Off suppo	On suppor	Total
Untreated	0	383	383
Treated	16	167	183
Total	16	550	566