

# Supply Analysis of Labor Market in Mongolia\*

Altantsetseg Batchuluun<sup>†</sup>      Bayarmaa Dalkhjav<sup>‡</sup>

## Abstract

For a country with a small population like Mongolia, labor force participation is an important issue. Mongolia was characterized by highly active participation in the previous socialist regime due to the employment policy of "every person should be employed". However, during the transition period between 1991 and 2001, the participation rate has dropped sharply from 87% to 62% with the market system. Since 2001, it has been decreasing gradually with some fluctuations. The current study estimates the labor force participation model using the Labor Force Survey data 2002-2003, 2007-2008 and 2010. The study shows that during the years of extensive cash transfer policy, the labor force participation rate has decreased significantly.

Keywords: Labor Supply, Labor Participation, Earnings, Mongolia.

---

\*Altantsetseg Batchuluun and Bayarmaa Dalkhjav are thankful to ERI, NUM for financially supporting this research. Authors are also thankful to the participants of the 2nd economic research forum in Ulaanbaatar, Mongolia.

<sup>†</sup>Department of Economics, National University of Mongolia, Ulaanbaatar, Mongolia.  
E-mail: [altantsetseg.b@num.edu.mn](mailto:altantsetseg.b@num.edu.mn)

<sup>‡</sup>Department of Economics, National University of Mongolia, Ulaanbaatar, Mongolia.  
E-mail: [dbayarmaa@num.edu.mn](mailto:dbayarmaa@num.edu.mn)

## Абстракт

Монгол шиг цөөн хүн амтай улсад ажиллах хүчний оролцоо маш чухал асуудал байдаг. Өмнөх социалист системийн үед Монгол Улсад “хүн бүр ажилтай байх ёстой” бодлогын нөлөөгөөр ажиллах хүчний оролцоо маш өндөр байсан. Харин эдийн засгийн шилжилтийн үе болох 1991-ээс 2001 онд ажиллах хүчний оролцооны түвшин 87%-аас 62% болж огцом буурсан. Түүнээс хойш ч аажмаар буурах хандлагатай байна. Энэхүү судалгаа нь Ажиллах хүчний судалгааны 2002-2003, 2007-2008 болон 2010 оны тоон өгөгдлийг ашиглан ажиллах хүчний оролцооны загварыг үнэлсэн. Бэлэн мөнгө тараах бодлого эрчимтэй хэрэгжүүлсэн онуудад ажиллах хүчний оролцоо буурсан байгаа нь судалгааны үр дүнгээс харагдаж байна.

# 1 INTRODUCTION

This paper analyzes the individual level determinants of labor force participation and earnings in Mongolia, based on data from the Labor Force Surveys (2002-2003, 2007-2008, 2010), conducted by the National Statistical Office.

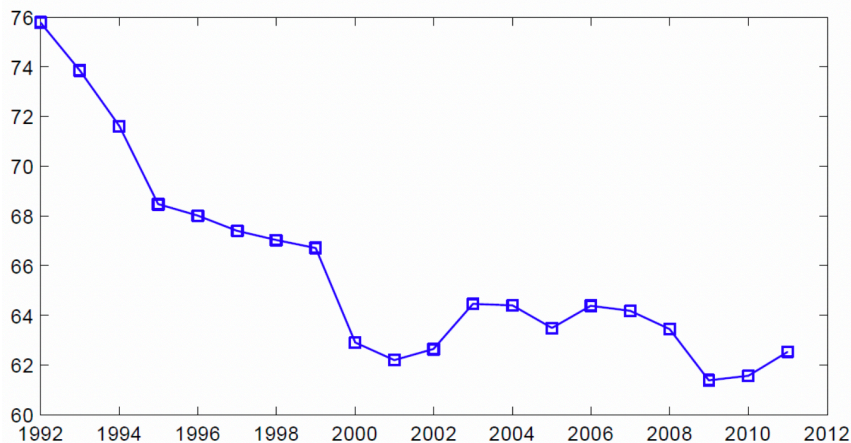
Mongolia is a rapidly growing transition country with small population of over 2.7 million. In 2012, economic growth rate was a record high 17.3 percent. Mongolia experienced a rapid population growth higher than 2.5%, between 1956 and 1990. Due to this high population growth, it has experienced a demographic window for three decades and a share of working age population has increased over 30 years until 2010. According to the Population Census 2010, working age population is 1.9 million and its share in population is 72.7%. Mongolia benefited from this rapid growth during the Socialist Regime as it is a favorable period for economic growth. Unfortunately, Mongolia has not benefited substantially from the last decade of the demographic window due to the transition process. Since 1990, population growth rate has fallen to the annual rate of 1.4%. For a rapidly growing country with small population, labor is an important issue in Mongolia.

Mongolia was characterized by highly active participation in the previous socialist regime due to employment policy of “every person should be employed”. However, during the transition period between 1991 and 2001 the participation rate has dropped sharply from 87% to 62% (Figure 1).

Over the last decade, participation rate has remained relatively low, fluctuating between 61.4% in 2009 to 64.5% in 2003. According to the National Statistical Office, the labor-force participation rate was at its historically low level of 62% in 2010. The labor force participation rate (LFPR) was 62% in 2000 as reported in the Population Census Report by NSO. However, Population Census 2010 reported LFPR to be 56.4%, which was 5.6 percentage points lower than the level in 2000. This falling trend in LFPR was common across urban and rural area.

In order to do a cross-country comparison, we use World Development

Figure 1: Labor Force Participation Rate in Mongolia



Note: Labor force participation rate data are from WDI database, World Bank

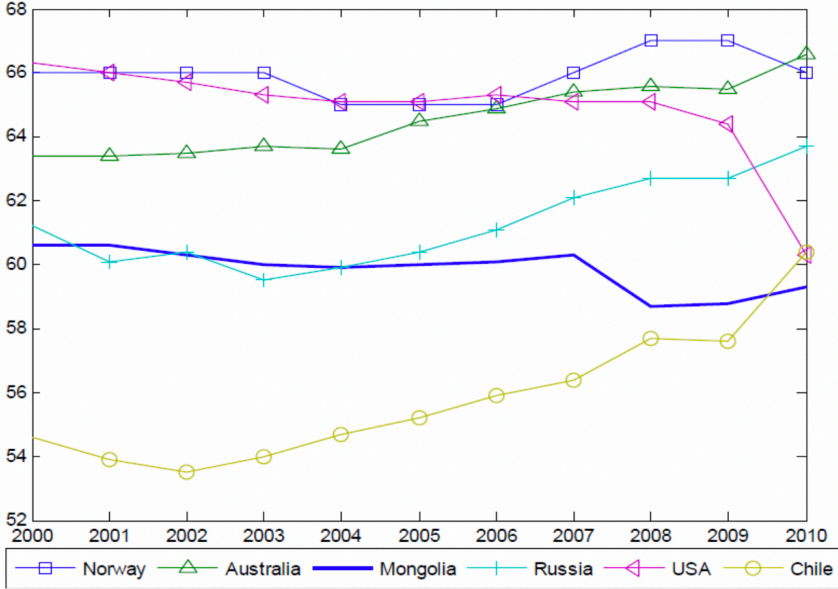
Indicators (WDI) database. According to WDI data, labor force participation has been relatively stable over the last 10 years and the participation rate was 59.3% in 2010 (Figure 2). In 2010, the world LFPR was 64.2% and median LFPR was 64%. Mongolia has LFPR lower than in Russia, Canada, Chile, China, Norway, Great Britain and South Korea. Russia is an interesting country to compare with as it is a transition country like Mongolia. Until 2005, Russia and Mongolia had similar LFPR of around 60%. However, Russia has experienced an increasing participation rate in recent years, while Mongolia has experienced stable or even lower LFPR. In 2010, the difference in LFPR between these two countries reached 4.4%. Australia, Norway, Chile and Mongolia are the countries, where mining sector plays important role in economy. In recent years, Australia, Norway and Chile had increasing trend in their participation rate, while Mongolia had no such trend.

One of the key factors, which influence in labor supply and demand, is state policies and regulations. Policies and regulations influence demand and supply of the labor market directly and indirectly. <sup>1</sup> In recent years,

---

<sup>1</sup>Main laws that regulate Mongolian labor relations are “Law on Labor”, “Law on the

Figure 2: Labor Force Participation in Selected Countries, 2000-2010



Note: Labor force participation rate data are from WDI database, World Bank

there have been substantial changes in labor policies and regulations, especially, in labor promotion policy as the government has started to pay a special attention to labor market issues.

The law on unemployment benefit paid by the social security fund was adopted on July 05, 1994. According to the law, usual duration for unemployment benefit is 76 days. However, from August 1, 2009 to January 01, 2011 the law extended the duration to 126 days in accordance with economic crisis. In 2008, Mongolia has adopted the Millennium Development Goal Based Comprehensive National Development Strategy. According the strategy, the government set goals to increase labor force participation to 70% in 2015 and to decrease youth unemployment (aged 15-24) to 2.5%. In 2010, the Law on the Minimum Wage was adopted.<sup>2</sup> According to the law, a national labor and social agreement committee of three parties shall

---

Minimum Wage”, “Law on Unemployment Benefit Paid by Social Security Fund” and “Law on Labor Promotion”.

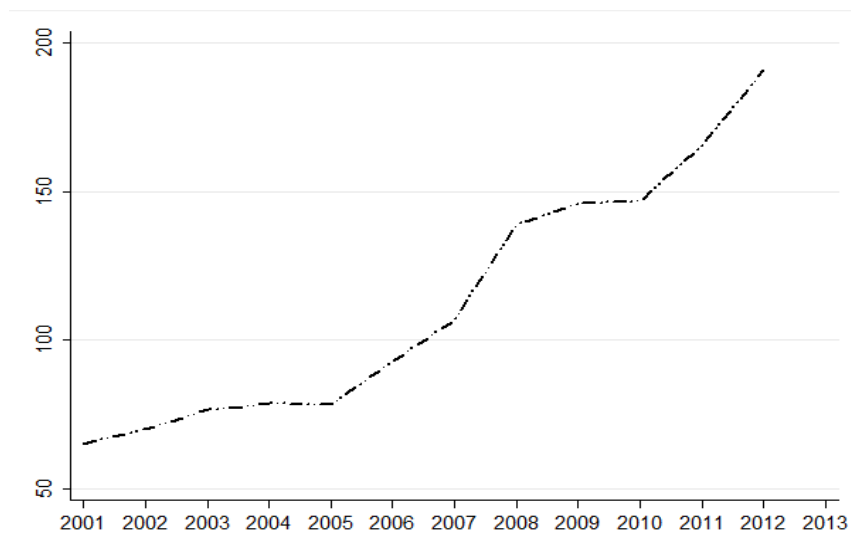
<sup>2</sup>Until 2010, the government used to set the minimum wage.

set the minimum wage. Currently, the minimum wage is 196500 tugrug (approximately 140 USD), which was renewed on April 11, 2013.

In 2011, the law on labor promotion was adopted and it defines labor promotion activities such as labor promotion trainings, small loans with low interest rate, public work program and their funding. Moreover, since 2005, the Government of Mongolia has expanded social welfare programs and has implemented series of cash transfer policies worth of billions of Mongolian tugricks (MNT) such as Child money (2005-2009), Allowances for newly married couples (2006-2010), Allowances for new born babies (2006-2010), Cash transfers to all citizens from Human Development Fund (2010-2012) and so on. However, in the latest national report on Millennium Development Goals' Implementation in Mongolia 2012, the government mentioned a slow progress towards these goals. The aggregate labor force participation has remained relatively constant over the last 10 years despite the major policy changes on the labor market and wage increases. Hence, it is important to do micro analysis and to study the individual level effects on this decrease and the expected dynamics of the labor-force participation rate. Figure 3 shows real wage in Mongolia. The real wage has increased sharply in recent years. In 2012, the real wage was 2.7 times higher than in 2002. The aggregate labor force participation has remained relatively constant over the last 10 years despite the major policy changes on the labor market and wage increases. Hence, it is important to do micro analysis and to study the individual level effects on this decrease and the expected dynamics of the labor-force participation rate. Although, there are many interesting phenomena in labor market of Mongolia, it is one of the least studied areas of Mongolian economy. Currently, there are labor data from surveys conducted by various institutions such as National Statistical Office (NSO), International Labor Organization (ILO), etc. NSO publishes reports on its labor force surveys. We will estimate the determinants of employment and earnings in Mongolia using labor force data.

Many studies have been conducted on labor force participation and labor supply of male and female, especially in USA. Mincer (1962), Heckman

Figure 3: Real Wage



Note: National Statistical Office

(1974) studies labor supply of married women and Juhn (1992) studies male labor market participation and Juhn and Potter (2006) conducts a literature review on labor force participation study. Incentive effects of welfare policies on labor supply are well known. In particular, a simple static labor supply model implies that cash transfer policies reduce labor hours of an agent with low income and empirical studies support this argument. According to Moffitt (1992), the econometric studies show that labor supply is reduced by cash transfer policies such as Aid to Families with Dependent Children and Food Stamp Programs in USA.

On the other hand, there is a little, but growing, literature on the labor markets of developing and transition countries. Li and Zax (2003) studied labor market structure and trends of China based on the two large-scale surveys conducted in 1989 and 1995. They did descriptive analysis of broad range of labor related issues such as labor force participation, working hours, wages, secondary employment, unemployment, labor training and etc. Maurer-Fazio, Hughes and Zhang (2005) studied LFP in China based Chinese Population Census Data for 1982, 1990, 2000. They ana-

lyzed the data by disaggregating by age cohort, marital status, gender and rural/urban location. Disaggregation provided marked changes in labor force participation over the time period. As another country in the process of transition, Noorkõiv and others (1997) studies marginal returns to education in Estonia. They applied a standard Mincerian log wage function to evaluate return to human capital, in particularly, education and experience, in Estonia.

However, there is a lack of researches on labor force participation in Mongolia. Most of the existing literature is limited by reports on surveys conducted by NSO and ILO. While these reports provide useful insights into the overall labor market performance in Mongolia, they suffer from the usual aggregation bias and do not control for individual level effects considered in this analysis. In 2010, Banzragch (2010) studied education and labor market in Mongolia and Tajikistan. Return to schooling in Mongolia was estimated using data from the Living Standard Measurement Survey 2003. She has studied the links between education and earnings in Mongolia and estimated return to education was 5.6 percent to 6.5 percent for wage earners. According to the study, higher participation was associated with higher education.

The rest of the paper is organized as follows. Section 2 discusses labor supply model and estimation methodology. In section 3, we describe data. In section 4, we present estimation results. Concluding comments are in section 5.

## 2 Labor Supply Model

In this research, we closely follow the labor supply model presented in Heckman (1974). Households make labor/leisure decision based on their preference and constraints. Household's preference depends on leisure,  $l$  and a bundle of goods and services,  $X$ . Let us assume that household's utility function,  $U$  is twice differentiable:



$$U(l, X_1, X_2, \dots, X_K)$$

Household has non-wage income,  $A$ , earns wage,  $w$  and faces price vector,  $P$ . Hence, household's budget constraint is given by the following inequality:

$$\sum_{i=1}^K P_i X_i \leq A + wl$$

Moreover, household's working hours,  $h$  and leisure,  $l$  are constrained by available time,  $T$ .

$$h + l = T$$

Household maximizes its utility subject to the budget and time constraints. This problem can be solved using the LaGrangian function as shown in the Appendix A. For any arbitrary  $P$ , we can write the shadow price of time or reserve wage as the following function.

$$W^* = g(h, wh + A, P). \quad (1)$$

Market wage is a function of education,  $E$  and experiences,  $S$  and it is independent of working hours.

$$W = B(E, S) \quad (2)$$

If market wage is greater than the shadow price of time,  $W \geq W^*$ , then the individual chooses to work positive hours at which  $W = W^*$ . If market wage is smaller than the shadow price of time,  $W < W^*$ , then the individual chooses not to work,  $h = 0$ , and one cannot work negative hours. Hence, we have the following slackness condition:

$$h(W^* - W) = 0$$

When the individual supplies positive hours then we observe the reserve wages. However, wages are zero for individuals who supply zero hours and we cannot observe their reserve wages.

$$W_i = \begin{cases} W_i^* & \text{if } W_i^* \leq W_i \\ 0 & \text{if } W_i^* \geq W_i \end{cases}$$

If an individual works, then the equations for shadow price and market wage can determine working hours. We will estimate equations 1 and 2.

The previous model has two endogenous variables: hours worked and wages. The reserve wage equation and market wage equation may be specified in the following form.

$$\log(W_i^*) = \beta_0 + \beta_1 h_i + \beta_2 A_i + \beta_3 X_i + \varepsilon_i \quad (3)$$

$$\log(W_i) = b_0 + b_1 S_i + b_2 E_i + u_i \quad (4)$$

Hours worked,  $h$ , adjusts such that  $\log(W^*) = \log(W)$ . Hence, we can solve for hours and get the following :

$$h = \frac{b_0 + b_1 S_i + b_2 E_i - \beta_0 - \beta_2 A_i - \beta_3 X_i}{\beta_1} + \frac{u_i - \varepsilon_i}{\beta_1}$$

If  $h > 0$ , the person is in the labor force, and we observe  $h$  and  $W$ . If  $h \leq 0$ , the person is not in the labor force. For the observations for which  $h \leq 0$ , we have

$$\frac{u_i - \varepsilon_i}{\beta_1} < \frac{\beta_0 - b_0 + \beta_2 A_i + \beta_3 X_i - b_1 S_i - b_2 E_i}{\beta_1}$$

or

$$u_i - \varepsilon_i < \beta_0 - b_0 + \beta_2 A_i + \beta_3 X_i - b_1 S_i - b_2 E_i$$

because  $\beta_1$  is expected to be positive. If  $Var(u_2 - u_1) = \sigma^2$ , then

$$\Pr(H \leq 0) = \Phi \left( \frac{\beta_0 - b_0 + \beta_2 A_i + \beta_3 X_i - b_1 S_i - b_2 E_i}{\sigma} \right)$$

where  $\Phi(\cdot)$  is the distribution function of the standard normal. Thus, the likelihood function for this model is

$$L = \prod_{H>0} F(W, h) \cdot \prod_{H \leq 0} \Phi(\Delta)$$

where

$$\Delta = \frac{\beta_0 - b_0 + \beta_2 A_i + \beta_3 X_i - b_1 S_i - b_2 E_i}{\sigma}.$$

Heckman estimated this model by maximum likelihood estimation in 1974. The model is subject to selection bias. Hence, in 1976 Heckman suggested two-stage estimation method. We will estimate this model using the two-stage estimation methods. We assume that  $\varepsilon_i$  and  $u_i$  are jointly normally distributed, with mean zero and variance  $V$ . Correlation these errors are allowed.

### 3 Data

In this paper, we use the data from Labor Force Surveys, collected in 2002-2003, 2007-2008 and 2010 by NSO. The original surveys consist of 32,611 households (12,787 in 2002-2003; 7,008 in 2007-2008 and 12,816 in 2010). Before processing data, data cleaning process is implemented. Through the cleaning process, we checked variables for values outside of the expected range, for missing values, for duplicates and for miscalculations of calculated variables. Also, we observed individuals working zero hours, but with positive wages. As we found out, they are those individuals, who didn't work in the last week, but have a permanent job. Therefore, we imputed working hours in a week as 40 hours for those individuals. After cleaning dataset, 81,968 observations are available for analysis. The descriptive statistics of main variables we used are reported in Table 1.

For the sample for analysis, women represent 51 percent and 49 percent is men. Out of all working individuals, 56 percent is married and 34 percent is single or never married. The number of children less than six years old is important factor to labor supply decision, particularly for women, to approximate the constraining effect of children (Heckman, 1974). For our sample, 35.6 percent of households have children under the age of six and 62 percent have at least one child under the age of fifteen. According to the location, 35.6 percent of individuals live in Ulaanbaatar, 22.5 percent

in aimag centers and 42 percent in rural areas.

People without any formal education represent the smallest fraction of individuals by 3 percent. According to education level, 13 percent of individuals have a primary education and 26 percent has a secondary education. The proportion of individuals with high school education is the highest by 29 percent. Furthermore, 16 percent of working age individuals graduated vocational training schools, while 13 percent of them obtained a university degree. Education level of individuals in rural areas is lower than urban areas. For example, the proportion of individuals with lower education than a high school is 26.8 percent for urban areas and 63.9 percent for rural areas. According to gender, 45.9 percent of men and 38.9 percent of women have education level at secondary school and below, while 26 percent of men and 31.7 percent of women have higher education than a high school diploma.

Average age of working age individuals is 35 years old. According to the employment status, 56 percent of individuals are employed and 8 percent of them are unemployed. Although the average salary in rural area is lower than that in urban area, employment is higher in rural areas (69 percent) than urban areas (46.6 percent). Employment rate is higher among men than women, for example, it is 59.7 percent for men and 52.3 percent for women. For employed people, average working hours in a week are 45.5 hours and workers in urban areas tend to work by more hours.

Average weekly salary of wage-earners is 23.7 thousand MNT in 2002-2003, 43.5 thousand MNT in 2007-2008 and 66.1 thousand MNT in 2010. We used real wage for the estimations and chose year 2005 as the base period. In the three surveys, other household members earn wage income of 20.4 thousand MNT weekly on average.

In the sample, non-salaried workers, including self employed or unpaid workers, accounted for 58.2 percent of employed people. In other words, about 60 percent of employed, who work a positive number of hours in the last week, reported zero wage. This may be considered as a missing data problem if it was random. However, data analysis shows that this is not random. In particular, more than 90 percent of people, who reported zero

wages, are either self-employed or workers in agricultural sector. Workers with zeros wages are slightly higher among men than women (54.6 percent for women and 61.5 percent for men). Moreover, 80.6 percent of employed in rural area is non-salaried workers, while it is 34.8 percent in urban area. As a result, this data analysis shows the missing values are non random. In particular, if individuals with lower wage could have been excluded from the data, then it would result in biased estimation. Therefore, research team is looking for solutions to this problem. One possible solution could be finding an approximate estimation of earnings information from other sources.

For an alternative approach of estimation with missing data, we use information from Household Socio-Economic Survey (HSES) of respective years. We compute the average income for self employed individuals by sectors (agriculture and other enterprise) and four regions and complete the LFS sample for self employed individuals' income. Average weekly wage of completed data is higher by 45 percent than average wage for wage-earners in original data. Particularly, average weekly wage in completed data is 66.6 thousands MNT while average wage for salaried workers is 46 thousands MNT.

## 4 Estimation Results

In this section we will present the estimation results and analysis. We estimated the following model using the data of wage earners sample. We have estimated labor force participation and earnings model. In this section, we'll present estimation results of employment and earnings model.

### 4.1 Employment

We estimated the probability model of labor force participation based on entire sample and the results are shown in Table 2. Columns (1) and (3) in Table 2 show the coefficients from least square estimation for male and female and columns (2) and (4) show the marginal impacts estimated from probit model of male and female. The period 2007-2010 is characterized by

large scale cash transfer policies as discussed in section 2. Hence, we will introduce a cash transfer dummy variable for this period.

### **Male**

Let us start with estimation of the male participation model shown in column (1). In order to estimate the impact of cash transfer policy on labor force participation, we introduced a dummy for year 2007-2008 and 2010. The estimated coefficient on cash transfer dummy is significant and negative indicating incentive impact of cash transfer on male labor participation.

A dummy for rural area was introduced to capture variation across urban and rural areas. Estimated coefficients in column (1) on a dummy for rural area is positive and significant indicating higher probability to participate in rural area than in urban area. For males, *ceteris paribus*, a man in rural area are more economically active and the probability is 40 percent higher than a man in urban area. The estimates in column (1) suggest a significant and positive (0.09) impact of marital status on male labor force participation, indicating higher probability of participation of married men than a man with a different marital status. Moreover, being a household head further increases the probability of male participation as the coefficient is positive (0.05) and significant. Labor force participation probabilities form an inverted U-shape with respect to age and coefficients are significant.

In urban area, labor force participation increases with education. However, coefficients on high school level education and lower are not significant and coefficients on vocational and tertiary educations are significant. A person with tertiary education, 14 or more years of schooling, has an about 18 percent higher probability of being in labor force than a person with secondary education.

Coefficients on interaction between a dummy for rural area and education levels are negative except for primary education. Hence, in rural area of Mongolia, higher than primary education seems to diminish labor force participation of men significantly. Scott, Smith and Rungeling (1977) provided similar negative impact of education on participation of teenage (16 – 19 years old) men and women in southern rural counties in USA. As

they pointed

Number of children has a significant impact on the probability of a man being in labor force. A man with a young child (younger than 6 years) has about 3 percent higher probability than a man without children. This is common in urban and rural area. However, number of children younger than 14 years has different impact rural and urban areas. In urban area, it increases probability of participation of men, while in rural area having children younger than 14 years old decreases the probability. In rural area, a man with a child younger than 14 years old has almost a 5 percent higher probability in being in labor force than a man without children. This could be related to the traditional nomadic livestock sector. In Mongolia, the livestock sector is the largest employer constituting more than 30 percent of employee. Livestock eat grass from open pasture land and traditionally older children help their parents by herding the livestock. Hence, older children may partly substitute their father's labor and decrease their probability of participation.

Estimated coefficients on earnings of other household members is significant but small in both urban and rural area. Greater earnings of other household members related to lower participation by men.

Column (2) in Table 2 show the marginal effects of probit estimation of participation model at the sample mean. In general, signs and significances of the estimated coefficients are similar to the least square estimates. However, marginal impacts of cash transfer policy, marital status, household head and number of young children are larger than the linear regression.

The determinants of male labor force participation in urban Mongolia are comparable to the empirical findings in previous studies in other countries. According to Pencavel (1986), education increases participation, greater nonwage income is associated with lower participation and participation probabilities form an inverted U shape with respect to age.

### **Female**

Column (3) show the estimated coefficients for females from a linear regression. The following results for female are quite similar to male. A

significant and negative coefficient on cash transfer dummy indicates incentive impact of cash transfer on female labor participation. A woman in rural area has a about 35 percent higher probability of being in labor force than a woman in urban area. Participation probabilities form an inverted  $U$  shape with age. A married woman is much more likely to be in the labor force than a woman with different marital status. Being a household head increases participation and learnings of other household members have small but negative impact on women's participation.

However, education and number of children have considerably different impact on female participation compared to males. In urban area, labor force participation of women increases with education higher than the secondary level. A woman with tertiary education has an about 25 percent higher probability of being in labor force than a woman with secondary education. As opposed to men, rural women's participation increases with vocational and tertiary education. Hence, educated women are more economically active than the men counterparts. Having children has significant impact on probability of participation of women. In urban area, having children younger than 6 years old decreases the participation of women and a probability of participation of women with a young child is by approximately 7 percent lower than women without children. However, urban women's participation tends to be higher as overall number of children (younger than 14 years) increases. In rural area, having children younger than 6 years old increases the participation of women in contrast to women in urban area. A probability of participation of women with a young child is by about 12 percent higher than the women without children. However, in rural area, women's participation tends to be lower as overall number of children increases contrary as opposed to urban area. This opposite impact of children on women's participation may be due to the difference in economic activity in rural and urban areas.

Marginal effects of probit estimation of participation model at the sample mean are shown in Column (4) in Table 2. Like males, signs and significances of the estimated coefficients are similar to the least square estimates.



However, marginal impacts of cash transfer policy, location and number of young children are larger than the linear regression.

Female labor force participation in urban Mongolia are comparable to the empirical findings in previous studies other countries. According to Killingsworth and Heckman (1986), greater schooling is associated with increases in probability of labor force participation, greater nonwage income is associated with lower participation and presence of young children reduces the probability of participation.

As mentioned in section 3.1, we constructed wage data for the individuals reported positive hours and zero wages. Based on completed wage data we computed wage income of other household members and re-estimated previous models. Estimation results are shown in Table 4.

## 4.2 Earnings

In this section, we will introduce the estimation results of market wage model. 60 percent of employed (56 percent for women and 62.7 percent for men), who work a positive number of hours, reported zero wage. This may be considered as a missing data problem if it was random. However, data analysis shows that this is not random. In particular, more than 90 percent of people, who reported zero wages, are either self-employed or worker in agricultural sector or in service sector. However, at this stage, we will follow the previous researches procedure (B.Otgontugs, 2010; Skoufias, 1994) and treat them as missing data. We estimated the market wage equation for male and female salaried-workers by least square regression and Heckman's two-stage regression. The empirical estimation results are reported in Table 3. Column (1)-(2) show least square estimation results and column (3)-(4) show Heckman's two stage-regression results.

### Male

Let us start with the estimation results of the model for male shown in column (1). We introduced a dummy for the years 2007/2008 and 2010 to capture the changes in market wage with time. Estimated coefficients on the time dummies for 2007/2008 and 2010 are 9 percent and 40 percent re-

spectively. Both coefficients are statistically significant. Hence, real market wage has subsequently increased in 2007 and 2010 compared to 2002.

A coefficient on a dummy for rural areas is negative and significant, indicating lower earnings in rural area than in urban area. A worker in urban area earns an hourly wage about 70 percent higher than in rural area. We use age as a proxy for experience in the market wage model. Estimated coefficients on age and age square are positive and significant. Earnings form an inverted U shape with respect to age and an additional year of experience is rewarded increasingly.

According to the estimated coefficient on education, education lower than the high school level has no significant impact on earnings. However, education higher than the secondary school level has significant positive impact on men's wage. Moreover, the returns to education increases with educational attainments. For example, earnings of a man with tertiary education (14 years or more schooling) is about 34 percent higher than a man with high school level education and approximately 20 percent higher than a man with vocational education. If we convert these returns to education into schooling years, one more year of schooling raises wage rate by about 10 percent. Let us look at the returns to education in rural area. In rural area, returns to education is on average 50 percent higher than in the urban area.

### **Female**

Column (2) in Table 3 show the estimated coefficients of the female model. The coefficients for urban females are very similar to the coefficients for urban males. Coefficients on interaction between a dummy for rural area and education level are not significant. Therefore, the impact of education of women on earnings is similar in both rural and urban areas, whereas men with similar education level get higher wage rate in rural areas than in urban areas.

### **Heckman two-stage**

Least square regression estimators may be biased due to a problem arising from sample selection as pointed in Heckman (1979). The selection

bias arises from estimating wage equations based on only the observed for wage data. We can estimate the model with Heckman two-stage procedure. Column (3)-(4) show the estimated coefficients from Heckman procedure. Column (3) show the results for male model. In general, signs of coefficients are similar to OLS except the coefficient on age and age squared. Moreover, coefficients on education are higher than OLS. Heckman estimation for females are very similar to OLS. Like males, education impacts are larger than OLS.

### **Completed data**

As mentioned before, for the whole sample, including both men and women, only 41.8 percent of the individuals in the sample are wage earners and the remaining individuals are self-employed or unpaid workers. Hence, 60 percent of employed (56 percent for women and 62.7 percent for men), who work a positive number of hours, reported zero wage. In previous section, we treated them as a missing data problem and dropped from the sample. However, data analysis shows that this is not random. In particular, more than 90 percent of people, who reported zero wages, are either self-employed or worker in agricultural sector or in service sector. Thus simply dropping from the sample may lead to biased estimation.

Duflo (2001) studied schooling and labor market consequences of large scale school construction project of the Government of Indonesia using SUPAS data. She faced with same problem due to missing data as 45 percent of the individuals in the sample reported wage and most of remaining individuals were self employed. Duflo imputed an income for self-employed using data from another survey called SUSENAS. Comola and Mello (2010) studied determinants of earnings and employment in Indonesia using same data and proposed to use labor market model with multinomial settings. We will follow Duflo's approach and use data from household socio-economic surveys (HSES) to complete the sample. We computed average monthly income of self-employed individuals in different economic sectors from HSES in 2002/2003, 2007/2008 and 2010 and used it to impute an income of self-employed.

Estimated coefficients from completed sample are shown in Table 5. According to the estimation in the completed sample, increases in wage rate in 2007/2008 and 2010 for both men and women are larger than the estimates from wage-earners' sample. In addition, the returns to education for the completed sample are higher than those for the sample of wage-earners. However, the impact of education on wage rate for men living in rural areas is smaller than that in wage-earners' estimation.

## 5 Wage Gap

In order to analyze the wage gap between male and female workers, we did Oaxaca-Blinder decomposition. Column (Pooled Sample) in Table 6 presents the decomposition output for the sample, which combined three surveys' data. The mean of log wages is 6.48 for men and 6.41 for women. Hence, the wage gap is 0.07 and it is divided into two parts: explained and unexplained. The first part reflects the mean increase in women's wages if they had the same characteristics as men. The decrease of 0.07 indicates that differences in years of education, age, location decreases the wage gap twice as the unexplained part is 0.132. Hence, in Mongolia if women had similar endowments as men, then the wage gap would have been twice larger than the present level. The (geometric) means of wages are 648.9 MNT for men and 607.4 MNT for women, which amounts to a difference of 6.8 percent. Adjusting women's endowments levels to the levels of men would decrease women's wages by 6.4 percent. A gap of 14.1 percent remains unexplained.

In order to see the dynamics of the wage gap, we did decomposition separately for each year. Columns in Table 6 and Table 7 present decomposition output for 2002, 2007 and 2010 respectively. The wage gap was 0.09 in 2002, 0.04 in 2007 and 0.07 in 2010. The explained part (in absolute terms) has increased from 0.03 to 0.09 between 2002 and 2010. The unexplained part was 0.12 in 2002, 0.11 in 2007 and 0.16 in 2010.

## 6 Conclusion

Labor force participation in Mongolia has had a decreasing trend over two decades. This trend is common across urban and rural areas. Extensive cash transfer policies in recent years has played some role in this. Estimations of the participation model indicate from 3.4 to 5.4 percent decrease in labor force participation in the years of expanded cash transfer policies. Labor force participation of male and female in urban areas are different and the difference is comparable to previous empirical findings in countries such as USA, UK and Germany.

Determinants of employment or participation in Mongolia are considerably different across rural and urban areas. For example, presence of young children decreases probability of labor force participation of urban women, while it increases the probability of rural women. On the other hand, greater number of children younger than 15 years associated with increased participation in urban area and decreased participation in rural area. In urban area, labor force participation is strongly related to educational attainment. However, in rural area, labor force participation is lower among men with higher level of education. Characteristics of the nomadic livestock sector, the largest employer in Mongolia, may have some answer to these anomalies. We estimated market wage function. Experience and education are important factors for the market wage. Greater schooling is associated with higher earnings. However, the magnitude of the education impact is different for men and women. Moreover, education impact varies across urban and rural areas

According to Oaxaca-Blinder decomposition, the wage gap is 0.07 and differences in years of education, age, location decreases the wage gap twice as the unexplained part is 0.132. Hence, in Mongolia if women had similar endowments as men, then the wage gap would have been twice larger than the present level.

## References

- [1] Angrist, Joshua D. and Alan B. Krueger, 2001, Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments, *Journal of Economic Perspectives*, Vol.15, No.4, pp.69-85.
- [2] Banzragch, Otgontugs, 2010, Education and the labor market in Central Asia: The cases of Mongolia and Tajikistan, Doctoral Dissertation
- [3] Juhn, Chinhui, 1992, Decline of Male Labor Market Participation: The role of Declining Market Opportunities, *The Quarterly Journal of Economics*, Volume.107, pp. 79-121.
- [4] Juhn, Chinhui and Potter Simon, 2006, Changes in Labor Force Participation in the United States, *Journal of Economic Perspectives*, Volume 20, pp. 27-46.
- [5] Comola, Margherita and Luiz de Mello, 2010, Educational Attainment and Selection into the Labour Market: The Determinants of Employment and Earnings in Indonesia, Working Paper No.2010-06.
- [6] Connelly, Rachel, 1992, The Effects of Child Care Costs on Married Women's Labor Force Participation, *Review of Economics and Statistics*, Vol. 74, No.1, pp. 83-90.
- [7] Cullen Julie B. and Jonathan Gruber, 2000, Does Unemployment Insurance Crowd out Spousal Labor Supply, *Journal of Labor Economics*, Vol. 18, No. 3, pp. 546-571.
- [8] Duflo, Esther, 2001, Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment, *The American Economic Review*, Vol.91, No.4, pp. 795-813.
- [9] Heckman, James J., 1974, Shadow Prices, Market Wages and Labor Supply, *Econometrica*, Volume 42, No.4, pp. 679-694.

- [10] Heckman, James J., 1976, The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models, *Annals of Economic and Social Measurement*, Volume 5, Number 4.
- [11] Heckman, James J., 1979, Sample Selection Bias as a Specification Error, *Econometrica*, Volume.47, pp. 153-191.
- [12] Heckman, James J., Heterogeneity, Aggregation, and Market Wage Functions: An Empirical Model of Self-Selection in the Labor Market, *Journal of Political Economy*, Vol.93, No.6, pp. 1077-1125.
- [13] Li, Haizheng and Jeffrey S Zax, Labor Supply in Urban China, *Journal of Comparative Economics*. 31(4):795-817 Language: English. DOI: 10.1016/j.jce.2003.08.003
- [14] Killingsworth, Mark R., James J. Heckman, 1986, *Handbook of Labor Economics*, Vol. 1, Edited by O. Ashenfelter and R. Layard.
- [15] Margaret Maurer-Fazio, James Hughes and Dandan Zhang, 2005, Economic Reform and Changing Patterns of Labor Force Participation in Urban and Rural China, Working Paper 787, William Davidson Institute.
- [16] Mincer, Jacob (1962). "Labor Force Participation of Married Women." In H. Greg Lewis (ed.), *Aspects of Labor Economics*. Cambridge: National Bureau of Economic Research
- [17] Moffitt, Robert. 1992. "Incentive Effects of the U.S. Welfare System: A Review," *Journal of Economic Literature*, 30(1): 1-61.
- [18] Millennium Development Goals' Implementation: National Report, Mongolia, 2012, Government of Mongolia and UNDP.
- [19] Mroz, Thomas A., The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions, *Econometrica*, Vol. 55, No.4, pp. 765-799.

- [20] Parsons, Donald O., 1980, The Decline in Male Labor Force Participation, *The Journal of Political Economy*, Vol. 88, No. 1, pp. 117-134.
- [21] Pencavel, John, 1986, Labor Supply of Men: A Survey, *Handbook of Labor Economics*, Vol.1, Edited by O. Ashenfelter and R. Layard.
- [22] Scott, Loren C., Lewis H. Smith and Brian Rungeling, 1977, Labor Force Participation in Southern Rural Labor Markets, *American Journal of Agricultural Economics*, Vol. 59, No. 2, pp. 266-274.
- ôiv et al 1997ôiv et al 1997
- [23] Rivo Noorkôiv, Peter F. Orazem, Allan Puur and Milan Vodopivec. 1997. "Employment and Wage Dynamics in the Estonia Transition, 1989-1995"



Table 1. Descriptive statistics

Variables	Mean	Std. Dev.	Ming	Max
Rural	0.42	0.49	0	1
Household head	0.38	0.48	0	1
Married	0.56	0.5	0	1
Single	0.34	0.47	0	1
Children under 6	0.43	0.68	0	5
Children under 14	1.09	1.12	0	8
Age	35.4	14.76	15	80
Female	0.51	0.5	0	1
Primary	0.13	0.33	0	1
Secondary	0.26	0.44	0	1
High school	0.29	0.45	0	1
Vocational	0.16	0.36	0	1
Tertiary	0.13	0.34	0	1
Employed	0.56	0.5	0	1
Labor force participation	0.64	0.48	0	1
Unemployed	0.08	0.26	0	1
Weekly hours	24.68	25.2	0	80
Weekly wage*	10413.3	26100.4	0	933,300
Wage income of other hh members*	20429	43069.4	0	1,922,000
Weekly wage**	35551	111721.3	0	933,300
Wage income of other hh members**	67621.2	170763.6	0	2,737,559

\*expressed in MNT. (In December 2005, 1221 MNT=1 USD) \*\*Computed from the complete data. Note: Weekly wage from complete data is computed using the average income calculated from HSES.

Table 2. Labor Force Participation Model Estimations

Dependent variable: LFP	Male		female	
	LPM	Probit ME	LPM	Probit ME
	(1)	(2)	(3)	(4)
2010	0.011 (0.005)	0.014 (0.007)	-0.004 (0.005)	-0.004 (0.007)
Cash transfer	-0.034 (0.005)	-0.044 (0.007)	-0.036 (0.005)	-0.054 (0.008)
Rural	0.399 (0.023)	0.404 (0.023)	0.350 (0.025)	0.454 (0.028)
Age	0.068 (0.001)	0.077 (0.001)	0.069 (0.001)	0.096 (0.001)
Age2	-0.001 (0)	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)
Primary	0.005 (0.022)	-0.002 (0.027)	0.028 (0.024)	0.015 (0.037)
Secondary	0.026 (0.021)	0.011 (0.024)	0.027 (0.023)	0.042 (0.033)
High school	0.035 (0.02)	0.016 (0.024)	0.045 (0.022)	0.078 (0.032)
Vocational	0.125 (0.021)	0.098 (0.021)	0.182 (0.023)	0.217 (0.027)
Tertiary	0.211 (0.021)	0.178 (0.016)	0.287 (0.023)	0.309 (0.022)
Married	0.095 (0.006)	0.129 (0.008)	0.072 (0.006)	0.079 (0.008)
Household head	0.054 (0.007)	0.072 (0.009)	0.035 (0.007)	0.031 (0.010)

Table 2. (continues) Labor Force Participation Model Estimations

Dependent variable: LFP	Male		female	
	LPM	Probit ME	LPM	Probit ME
	(1)	(2)	(3)	(4)
Number of children under 6	0.029 (0.005)	0.022 (0.007)	-0.068 (0.005)	-0.081 (0.007)
Number of children under 15	0.009 (0.003)	0.009 (0.004)	0.024 (0.003)	0.021 (0.005)
Wage income of other members	-0.004 (0)	-0.004 (0.001)	-0.003 (0.000)	-0.003 (0.001)
Primary in rural	-0.029 (0.025)	0.001 (0.032)	-0.040 (0.028)	-0.018 (0.042)
Secondary in rural	-0.13 (0.024)	-0.128 (0.033)	-0.051 (0.026)	-0.094 (0.039)
High school in rural	-0.169 (0.024)	-0.200 (0.036)	-0.096 (0.026)	-0.183 (0.039)
Vocational in rural	-0.204 (0.025)	-0.178 (0.039)	-0.158 (0.027)	-0.214 (0.039)
Tertiary in rural	-0.246 (0.028)	-0.261 (0.045)	-0.178 (0.029)	-0.222 (0.043)
Children under 6 (rural)	0.005 (0.007)	0.041 (0.011)	0.120 (0.008)	0.143 (0.011)
Children under 15 (rural)	-0.048 (0.004)	-0.054 (0.006)	-0.048 (0.005)	-0.059 (0.007)
Wage income of others (rural)	-0.009 (0.001)	-0.014 (0.001)	-0.014 (0.001)	-0.020 (0.001)
Constant	-0.673 (0.025)	0.014 (0.007)	-0.767 (0.026)	-0.004 (0.007)
Number of observations	40546	40546	41422	41422

Notes: Standard errors are in parenthesis

Table 3. Earnings Model Estimations

Dependent variable:	OLS		Heckman	
	Male	Female	Male	Female
Real wage per	(1)	(2)	(3)	(4)
2007	0.094 (0.017)	0.145 (0.015)	0.258 (0.047)	0.695 (0.067)
2010	0.401 (0.014)	0.398 (0.013)	0.420 (0.040)	0.809 (0.058)
Rural	-0.692 (0.164)	-0.347 (0.194)	-2.498 (0.347)	-2.351 (0.483)
Age	0.030 (0.004)	0.030 (0.004)	-0.077 (0.023)	0.167 (0.052)
Age2 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	-0.002
Primary	-0.015 (0.135)	-0.362 (0.145)	0.402 (0.331)	-0.636 (0.475)
Secondary	0.163 (0.116)	-0.093 (0.124)	0.955 (0.284)	-0.049 (0.424)
High school	0.310 (0.115)	0.094 (0.122)	1.191 (0.282)	0.783 (0.421)
Vocational	0.448 (0.115)	0.265 (0.122)	1.134 (0.289)	1.534 (0.446)
Tertiary	0.655	0.496	1.369	2.246

Table 3. (continues) Earnings Model Estimations

Dependent variable:	OLS		Heckman	
	Male	Female	Male	Female
Real wage per	(1)	(2)	(3)	(4)
	(0.115)	(0.122)	(0.296)	(0.465)
Primary in rural	0.505	0.315	0.074	0.825
	(0.187)	(0.223)	(0.406)	(0.557)
Secondary in rural	0.490	0.248	1.230	1.066
	(0.167)	(0.198)	(0.357)	(0.490)
High school in rural	0.570	0.216	1.663	1.342
	(0.167)	(0.196)	(0.356)	(0.486)
Vocational in rural	0.515	0.275	2.220	1.978
	(0.166)	(0.195)	(0.356)	(0.484)
Tertiary in rural	0.551	0.263	2.212	2.172
	(0.167)	(0.195)	(0.360)	(0.488)
Constant	5.302	5.296	6.722	-0.419
	(0.133)	(0.144)	(0.628)	(1.284)
Number of observations	9022	9545	26166	29956

Notes: Standard errors are in parenthesis

Table 4. Probit Model of Labor Participation

	Probit	
	Male	Female
	(1)	(2)
2010	0.041	-0.010
	(0.021)	(0.019)
Cash transfer	-0.134	-0.141
	(0.021)	(0.020)
Rural	1.353	1.288
	(0.087)	(0.095)
Age	0.233	0.248
	(0.004)	(0.004)
Age2	-0.003	-0.003
	(0.000)	(0.000)
Primary	-0.005	0.038
	(0.083)	(0.095)
Secondary	0.033	0.110
	(0.075)	(0.086)
High school	0.050	0.204
	(0.074)	(0.084)
Vocational	0.321	0.606
	(0.076)	(0.086)
Tertiary	0.653	0.935
	(0.076)	(0.086)
Married	0.386	0.204
	(0.025)	(0.021)
Household head	0.215	0.081
	(0.028)	(0.027)
Number of children under 6	0.067	-0.208
	(0.021)	(0.019)
Number of children under 15	0.026	0.055
	(0.013)	(0.012)

Table 4. (continues) Probit Model of Labor Participation

	Probit	
	Male	Female
	(1)	(2)
Wage income of other members	-0.012 (0.002)	-0.009 (0.002)
Primary in rural	0.002 (0.098)	-0.047 (0.108)
Secondary in rural	-0.365 (0.091)	-0.239 (0.099)
High school in rural	-0.546 (0.092)	-0.463 (0.099)
Vocational in rural	-0.486 (0.099)	-0.543 (0.103)
Tertiary in rural	-0.694 (0.112)	-0.563 (0.113)
Number of children under age of 6 in rural	0.124 (0.033)	0.369 (0.028)
Number of children under age of 15 in rural	-0.164 (0.019)	-0.151 (0.017)
Wage income of other members in rural (log)	-0.044 (0.004)	-0.052 (0.003)
Constant	-3.941 (0.095)	-4.501 (0.103)
Number of observations	40546	41422

Notes: Standard errors are in parenthesis

Table 5. Earnings Equations Estimations from Completed Data

Dependent variable:	OLS		Heckman	
	Male	Female	Male	Female
Real wage per	(1)	(2)	(3)	(4)
2007	1.025 (0.020)	0.999 (0.019)	1.053 (0.027)	1.055 (0.027)
2010	1.380 (0.017)	1.274 (0.016)	1.345 (0.023)	1.291 (0.023)
Rural	-0.493 (0.116)	-0.363 (0.135)	-0.765 (0.157)	-1.472 (0.190)
Age	0.036 (0.004)	0.028 (0.004)	-0.062 (0.009)	-0.125 (0.011)
Age2	0.000 (0.000)	0.000 (0.000)	0.001 (0.000)	0.002 (0.000)
Primary	0.100 (0.127)	0.128 (0.150)	0.322 (0.166)	0.129 (0.201)
Secondary	0.546 (0.113)	0.403 (0.132)	0.765 (0.146)	0.275 (0.177)
High school	0.723 (0.111)	0.732 (0.129)	0.963 (0.144)	0.514 (0.174)
Vocational	0.663 (0.112)	0.747 (0.129)	0.763 (0.147)	0.294 (0.176)
Tertiary	0.760 (0.111)	0.909 (0.129)	0.843 (0.147)	0.329 (0.178)



Table 5. (continues) Earnings Equations Estimations from Completed Data

Dependent variable:	OLS		Heckman	
	Male	Female	Male	Female
Real wage per	(1)	(2)	(3)	(4)
Primary in rural	-0.102 (0.135)	-0.160 (0.158)	-0.302 (0.176)	-0.068 (0.212)
Secondary in rural	-0.470 (0.120)	-0.349 (0.140)	-0.487 (0.157)	-0.019 (0.189)
High school in rural	-0.387 (0.120)	-0.488 (0.138)	-0.412 (0.159)	0.102 (0.188)
Vocational in rural	-0.174 (0.121)	-0.133 (0.139)	0.015 (0.162)	0.692 (0.192)
Tertiary in rural	0.074 (0.127)	-0.017 (0.142)	0.228 (0.172)	0.884 (0.197)
Constant	4.290 (0.125)	4.286 (0.144)	6.265 (0.248)	8.102 (0.321)
Number of observations	23402	21011	40546	41422

Notes: Standard errors are in parenthesis