RETURNS TO EDUCATION
CASE OF UKRAINE

by

Leschenko Natalie

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Abstract

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by Leschenko Natalie

Chairperson of the Supervisory Committee: Professor Serhiy Korablin

[principal researcher at Institute of Economic Forecasting at Academy of Sciences of Ukraine]

Investment in human capital can be important determinant of permanent economic growth (Romer, 1996). Private investments in education theoretically provide an individual with the higher lifetime income level, social status and personal freedom (Filer, Hamermesh, and Rees, 1996).

This paper focuses on the factors that influence private returns to investment in higher education in the case of Ukraine, and hypothesizes that education brings significantly positive private returns in the year 1996. For the above purpose, we use household monitoring survey conducted by World Bank and Kiev International Institute of Sociology in 1996. The results obtained with the help of extended Mincerian earnings function for specific levels of education with Heckman correction procedure suggests that in Ukraine higher education pays negative private returns comparatively to incomplete higher education that occurs to be the most profitable.

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Glossary

Internal rate of return a discount that set present value of future earnings equal to zero.

OLS ordinary least squares.

Present value is discounted stream of earnings

Return to education "…a discount rate that equalises present value of the stream of benefits to the present value of the stream of costs" (Psacharopoulos, 1995)

Tenure is years of working experience spent at a current occupation

Wage arrears part of the wage that is not paid in time

Introduction

"The improved dexterity of a workman may be considered in the same light as a machine or the instrument of trade which facilitates and abridges labor, and which, though it costs a certain expense, repays that expense with a profit."

(Adam Smith, The Wealth of Nations, Book II, Chapter 1 in Berndt, 1991)

Human capital accumulation at the macroeconomic level can be considered as an engine of recovery and rapid economic grows (Becker, 1993). Alternatively, education can be viewed as a signal that reduces information asymmetry at the labor market (Weiss, 1995). Moreover, education of people generates positive externalities to the whole society in terms of nonmonetary returns to education like reduction in the level of crimes, contribution to the results of the voting election procedures, innovations that are difficult to measure (Filer, Hamermesh, and Rees, 1996). Therefore, there should be incentives for people to invest in education. Shouldn't they?

Ukraine is a transition country. On the one hand, since the time the restructuring process began, people got more freedom in their choice to work and live. On the other hand, the year 1996 was a time of high hidden unemployment and increase in the wage arrears that complicates our analysis.

So, the main question of this thesis concerns the magnitude and sign of the private returns to the specific levels of education in Ukraine in the year 1996.

In order to test empirically the hypothesis that education is rewarded with greater earnings in Ukraine, we apply the extended Mincerian earnings function for the

specific levels of education. We use the household survey that was conducted jointly by the World Bank and the Kiev International Institute of sociology in the summer 1996. Furthermore, we correct our estimates (OLS with robusted standard errors) with the Heckman procedure.

The structure of our paper is as follows. The first chapter states the model, provides theoretical justification of the explanatory variables that was originally included into the Mincerian earnings function. The second chapter sheds the light on the previous empirical works in the field of returns to education and weaknesses of the model. Furthermore, we empirically estimate the private returns to education in Ukraine and consider obtained results.

Chapter 1

Education as an investment

The aim of this section is to present theoretical background to answer the main question of this work about the private returns to education in Ukraine. We present the logic of the equation we will estimate and confirm theoretically the inclusion of economic variables into the model.

1.1.Economic justification of the variables included in the model.

Let W be the hourly earnings of particular individual, S-years of schooling, EXPER- experience, TEN – tenure. Then hourly earnings could be written in general form as:

W = f(S, EXPER, TEN, SEX)

Now let us provide theoretical explanation for the relevance of these variables in the earnings distribution among individuals.

Schooling. According to the human capital theory, an individual becomes more productive, the more education he/she acquires (Becker, 1993). The alternative view to the human capital point comes from the "Sorting models" (Weiss, 1995). In these models education does not only increase productivity of employees but also allows employers to screen workers *ex ante*. The decision of more productive individuals should be to invest more in education in order to signal about their working abilities and personal characteristics (Weiss, 1995). Therefore, better–educated people could have a higher reservation wage and require better working conditions as a compensation for the foregone earnings and direct expenses on

tuition during the years of schooling and increased productivity (Filer, Hamermesh, Rees, 1996). Hence, more education should imply higher wages.

Experience. On the one hand, human capital theory suggests that earnings increase with the accumulation of on-the-job training, which makes a worker to be more productive (Becker, 1993). On-the-job training is also considered as investment in human capital that is made during the lifecycle (Mincer, 1958, Becker, 1993). Therefore, the slope of the earnings curve should be steeper for people who had more general education due to the learning effect. Moreover, human capital theory predicts existence of maximum earning point in the lifecycle (ibid.). After reaching some age, earnings decline due to the decrease in productivity and smaller investments in on-the-job training.

On the other hand, there are "matching" and "sorting" theories which explain an increase in earnings with experience as a result of factors other than change in productivity (Neal and Rosen, 1998). "Sorting" models predict that individuals do not know their talents ex ante and learn their earning capacity by choosing better positions each time, hence younger workers would get lower wages. In matching models (Jovanovic, 1979) the worker's wage equals to his/her marginal product, which in turn determined jointly by the worker and the firm. The "match" outcome should be beneficial for both sides. If it is not true, then a worker continues his/her search for a firm where he/she can be more productive (and get higher wage) or a firm continues recruitment for the purpose to get a better "match". Therefore, on average, wage should increase with experience.

Tenure. Human capital theory explains the relationship between earnings and tenure by following. People need time to acquire specific skills for particular occupation and they cannot get them at any other place of work and study (Becker, 1993). This period of time can be considered as an investment period in

an activity that would bring him/her more money in the future. Contrarily, "Sorting models" explains low starting wage as an effect of adverse selection problem that is present at the labor market (Weiss, 1995). Because of asymmetric information employers tend to pay a worker the wage that could be even under the marginal product of the worker at the starting probation period (Loh, 1994 in Weiss, 1995). According to the "matching" models, wage increase with tenure can be explained by the reduction in imperfect information with mutual work experience of the worker and employer (Jovanovic, 1979).

Sex. Many of explanatory theories are developed to interpret this phenomenon. On the basis of those theories there are such explanatory factors as "ability capacities" (Mincer and Polachek, 1974 in Nizalova, 2000), "comparative advantages" (Becker, 1993 in Nizalova, 2000). "Rational investment behavior" (Epstein 1992 in Nizalova, 2000) theory suggests that employers take into account maternity pensions and vocational time needed for women due to the pregnancy period when proposing wages.

1.2.Derivation of the earnings function

Mincer (1958), Shultz (1961), and Becker (1993) extended the analysis of early works in the field of the returns to education and proposed empirical implications of human capital model that became a base for modern empirical studies in this field.

The idea of the investment in education analysis comes from the analogy of rational investment behavior and assumption that individuals are maximizing lifetime earnings and have perfect information (Mincer, 1958). The costs of

investing in education are the direct costs on tuition and also cost of time that could be spent on the work and earning money. The benefit from the investment (incentive to invest) is the stream of higher earnings after getting education due to increase in productivity (Mincer, 1958, Becker, 1993). In this context, the private returns to education is defined as "as the rate of discount (r) that equalizes the stream of discounted benefits to the stream of costs at a given point in time." (Psacharopoulos, 1995).

Theoretically, the returns to education are much higher in a developed economy comparatively to the alternative investment opportunities like bond or stock market (Becker, 1993). The high magnitude of the returns is due to the low liquidity and high risk of investment in education (Kodde, 1986, Becker, 1993). While considering the demand for education David A. Kodde (1986) mentiones four reasons that allow us to think of education as a risky investment. The first two are consistent with the Becker (1993) viewpoint. They are the following:

No one can estimate the length of his/her life with certainty

Not everybody is certain about future earnings due to the imperfect evaluation of personal mental faculties.

The other two reasons are uncertainty about employment opportunities where Kodde (1986) distinguishes between future market conditions and job search outcomes.

Figure 1. Costs and benefits of education (source: Becker, 1962)

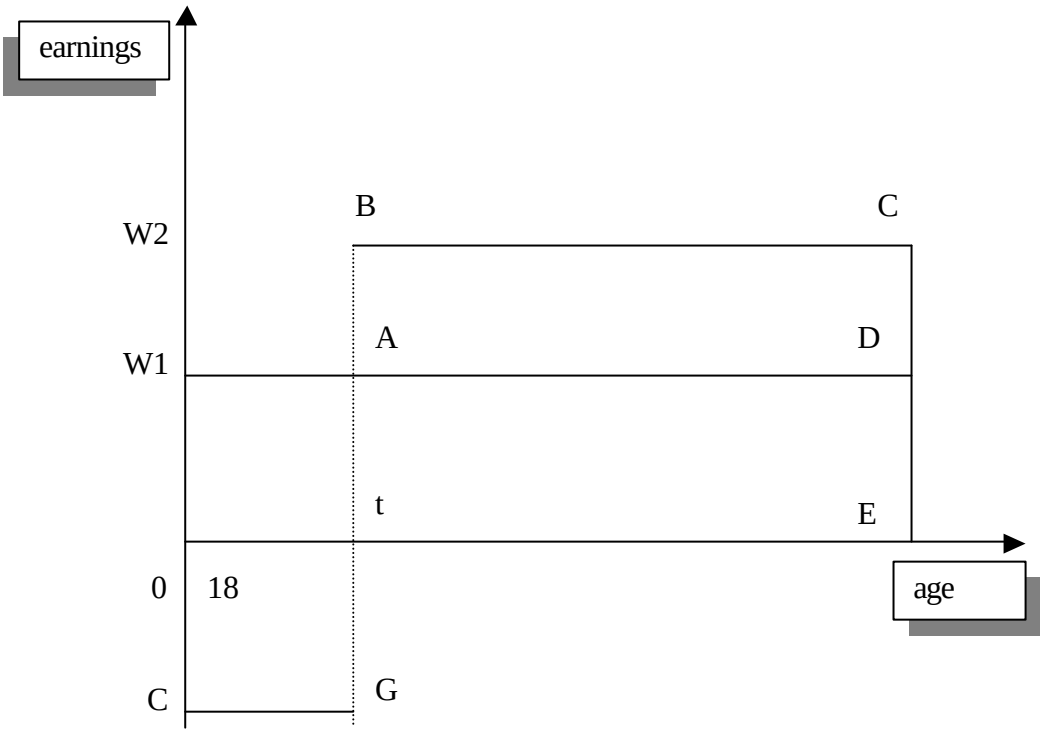
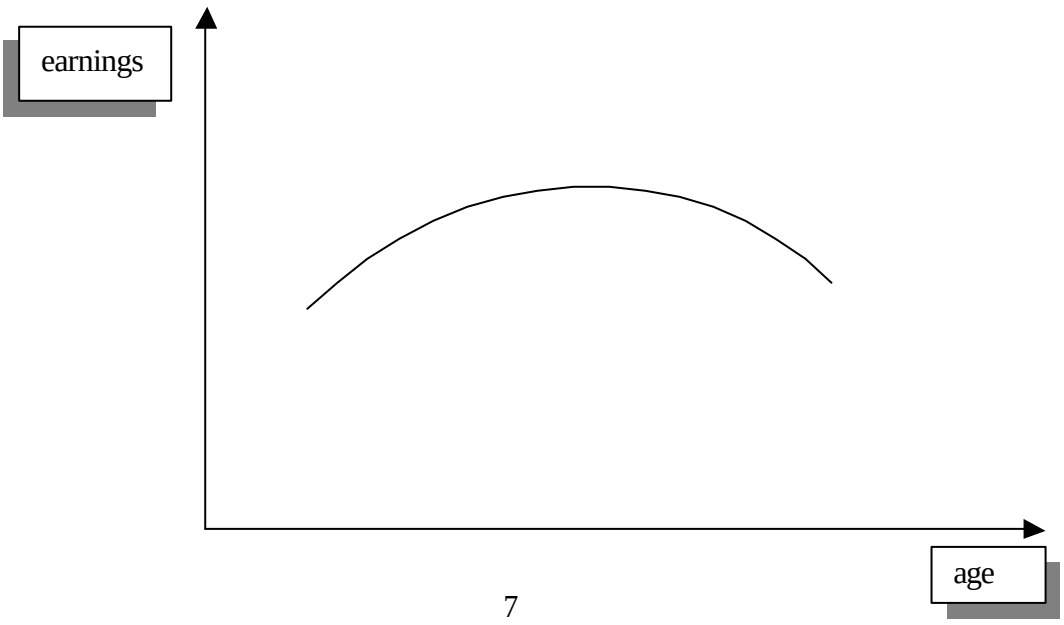


Figure 2. earnings to age relationship (source: Psacharopoulos, 1995)



Graphical illustration of the analysis

In order to make the analysis more vivid, we present graphical illustration (see figure 1) of how the decision about investment in education is made (as in Psacharopoulos, 1995). Let's assume at this stage that the investment is made only at the first period of individual's life.

Let us consider figure1. The vertical axis denotes wage rate while horizontal axis measures age. As it can be seen on the graph, there are two levels of earnings: one for an educated person and the other for a non-educated worker. Education results in higher earnings after reaching age t. An individual that makes positive decision about investing would face direct costs on tuition such as expenses on tuition and training aids (rectangle CGt0) and opportunity costs, i.e. foregone earnings (rectangle 0W2DE). Returns to education are positive when the combined area of rectangles CGt0 and 0W2DE is smaller the area of rectangle ABCD, which denotes the benefits from acquiring high education.

The objection to the earnings function being derived above arises from its flat shape and that is true only if there are no post-schooling investments in skill acquiring process (Becker, 1993). Graphically lifetime earnings path can be presented as at figure 2.

Mathematical derivation of the earnings function

Let us start from the assumptions (Becker, 1993) on which the mathematical model is based:

no direct education costs;

- subjective discount rate is given;
- individuals are similar *ex ante*;
- occupations are homogenous;
- perfect information;
- absence of adjustment costs;
- earnings are set one time only.

Present value of the stream of earnings for the non-educated person is:

$$PV_U = \frac{w_U}{r}(1 - e^{-rT})$$

Present value of the stream of earnings for a person who decided to invest in education is:

$$PV_E = \frac{w_E}{r}(1 - e^{-rT})e^{-rS}$$

In those formulas PV denotes the present value of earnings, r - the discount rate, T - the duration of lifetime of an individual. S is the notation for the number of years devoted to schooling, w_E - the wage rate to educated and w_U -wage rate to uneducated individual.

Since the cost of education is foregone earnings, we can write the present value of net future stream of earnings for an individual who decided to invest in education as the difference in present values of future earnings for two alternatives. Under the definition, the internal rate of return is the discount rate that sets the present value of future stream of earnings to be equal zero (Hirshleifer J., 1958). Therefore, we can do posterior transformations:

$PV_E - PV_U = 0$, hence $PV_E = PV_U$ or $\frac{w_U}{r}(1 - e^{-rT}) = \frac{w_E}{r}(1 - e^{-rT})e^{-rS}$

$w_E = w_U e^{rS}$ and making monotonic transformation that gives us the following equation

$$\ln w_E = \ln w_U + r \cdot S$$

Mincer (1974, in Berndt and Ernst, 1991) has first proposed to introduce in the model a new variable, which reflects the intensity of on-the job training. However, it is hard to obtain intensity itself, therefore, the variable was replaced by worker's experience and squared experience values that allow the earning function to have the parabolic form showed at the figure 2. But the information on the full life experiences is not always attainable, and that is why Mincer (1974, in Berndt and Ernst, 1991) has suggested useful innovation: to include experience measured as the difference between individual's age minus 6 (age at which people start their education) and years spent on education.

Therefore, the Mincerian earnings function then stipulates the relationship between years of schooling and the natural logarithm of earnings, having controlled for regional, field, and firm specific differences. Adding the error term,

that bears the information about influence of unobservable factor on the natural logarithm of earnings, we get the Mincerian earnings function:

$$\ln w_E = b_0 + b_1 S + b_2 EXPER + b_3 EXPER^2 + e$$

Theoretical feedback that supports the above relationship comes from the fact that the abilities of people are distributed normally while the earnings are skewered (Roy, 1950 in Neal and Rosen, 1998, Becker, 1993), hence the logarithm approximation is valid. Moreover, as was noted by Card (1998), this functional form allows us to include dummies instead of exact years of schooling

.

Labor market and education in Ukraine

Ukraine is a transition country where the process of restructuring started in 1985 when the first president of the USSR Gorbachev tried to change the priorities for economic and political development. However, the history of a country Ukraine became independent in 1991. From the former USSR Ukraine has inherited irrational firms' allocation, heavy dependence on energy resources, underdeveloped international trade relations, planned allocation of people and wage tariffs system (Ukrainian Labor code, 1995). On the one hand, transition process has brought to Ukraine more flexibility in wages and working conditions. On the other hand, the probability of being not paid has increased.

After the collapse of the Soviet Union, people were given a choice on their place to live and work. Foreign, privatized, and newly created domestic private firms that came into Ukrainian market created new vacancies, new status like self-employment in private sector appeared. However, as noted in Quarterly predictions (July of 1998) only 1% of all the Ukrainian labor force had skills required by foreign employers. There was a shortage of specialists in advertisement, finance, marketing, management, international accounting, and computer science. Privatised and private Ukrainian firms additionally faced problems with management.

So, the quality and direction of education required radical modifications and adjustment for the labor demand changes. Officially, the government had a monopoly over education supply. The rating of education establishments was based on its students' grades that contained little information on the quality of education provided. This fact made it more difficult for employers to screen at the labor market.

Government also bore all the expenses of education for the Soviet times and for the early nineties. All the people that graduated before the year 1995 enjoyed fully subsidised tuition. The only costs that students had were the foregone earnings for the period of studying. Graduates were facing job allocation imposed by the government. After the above mechanism was destroyed, there were at least two legal reasons for skill mismatch and high unemployment among young specialists. One of them was mandatory military service for men that brought about knowledge deterioration. The second barrier was that employers were prohibited to fire young specialists for three years.

According to the legislation of Ukraine enacted in the year 1996, the wage a worker receives should reflect labor productivity, difficulty of the task, working conditions, output of the firm and has no upper limit. (Decree of Labor of Ukraine 1995). The law about maximum wage allowed lost its power in the year 1995 (ibid.). Year 1996 in Ukraine was marked by continued fall in production and in labor productivity (TACIS, December 1997). Contractual wages were remaining high at the circumstances of very low production. Though, official rate of unemployment was 1% and measured those who registered at the employment office, the number of vacancies offered was much below the number of applicants. The number of unemployed in the first quarter was 199.9 thousands of people with the number of vacancies only 75.4 thousands; the gap became larger in the second quarter with 221.2 thousands of unemployed comparatively to 69.4 thousands of vacancies (ibid.). The costs of layoffs were very high for the firms, therefore lots of workers were forced to take unpaid vacations, short working days or weeks, unpaid wages (wage arrears) that jointly reached UAH2, 616 million at the end of the second quarter of 1996 (ibid.). Intensive downsizes of firms that began the process of reduction of hidden unemployment started only at 1997 (TACIS, December 1997) after the introduction of a new law on social protection.

To conclude, we should note that transition period brings not only positive changes like flexibility in wages and place of work options. New problems also appeared. Among them are labor surplus at the firm level. This situation did not allow increase in wages for most productive employees. Wage arrears could also cause problems in our analysis. Furthermore, skill mismatch due to the transformations in the labor market conditions continued.

Chapter 2

EMPIRICAL PART

2.1. Mincerian human capital earnings function in use

As well as we want to determine returns to education in this work, we want to shed the light on selected previous empirical works that estimate the returns to education. Though, the Micerian earnings function is widely applied by economists conducting the research on the returns to education and experience, recent studies argue about the functional form, explanatory variables included and interpretation of the coefficients. At the end of this section we look at other studies of human capital in transition countries.

The invention of the earnings function by Mincer gives boost to the empirical estimation of the returns to education. Special interest of research in this field is the change of the returns to education and experience over time. As suggested by the theoretical approach, the explanatory variables are the years of schooling, experience, experience squared, gender dummy. For the control groups of variables the following dummies are usually chosen: the city size, region, industry, and occupation to isolate cohorts' training differences. In this way the rise in the returns to skills were found for developed countries like United States. (Chinhui Juhn, Kevin M. Murphy, Brooks Pierce, 1993), for the transition countries only recent results are available.

The form of the earnings function

The earnings function assumes perfect information and homogeneity of individuals with the same level of education. As was noted by Layard and

Psacharopoulos (1974) employers usually do not know the abilities of applicants in the real world. Spence (1973) firstly proposed the alternative to the Mincerian point of view. The idea of the education "Signaling" is based on the fact that the length of education is highly correlated with people productive abilities. The model suggests that individuals continue to acquire education until marginal cost of education is equal to the wage. Since more productive people have lower costs due to their talents, they would have more education in order to signal about their abilities and pretend for a wage that is relatively higher than for low productive workers. "Signaling theory" predicts weak correlation between earnings and experience. Furthermore, there should be no increase in returns to years of schooling in case of dropouts (Weiss, 1995). In empirical implication this means nonlinear relationship between years of schooling and earnings capacity. However, as was noted by (ibid.) both screening as well as human capital theories partly fail. The compromise functional form can be found in "Sorting models" (ibid.). They are the extensions of human capital models and allow not only for increase in hourly wages due to growth in productivity that education provides but also includes the consideration of signal effects of education. New functional form predicts jump up in wages after getting a diploma. One of the examples of the partial theory success is the research done by Thomas Hungerford and Gary Solon (1987) that empirically estimated nonlinear returns to education for white males 25-64 years old. The results showed significant iterations of experience and dummies for 8 and 12 years of schooling that could be due to the increase in earnings because of completed education.

Omitted variables in the earnings function

As any model mincerian earnings function has some weaknesses. The source of them comes from the nature of the assumptions that suggest homogeneous working abilities of people with the same level of education. However, they could be different due to the following reasons:

– Institutional changes over time(Card, 1998)

– Personal unique characteristics (Weale, 1993, Card, 1998).

– Family background (Weale, 1993, Card, 1998)

In empirical implication this assumptions preserve correlation between schooling and error term of the estimated regression (Card, 1998). Therefore, the returns to education could be either over or underestimated. Econometric techniques that allow to isolate the ability bias and family background patterns are the instrumental variables and the twin survey research. One of the examples is Miller, Mulvey, and Martin(1995) analyses of Australian twins' survey. Using the standard in this field functional form, namely the relationship between the difference in earnings and schooling for each pair of twins, the authors investigated that relaxing the assumption about schooling exogeneity in the analysis increases the returns to education from 2.5% up to 5%. According to the studies that use IQ scores as a proxy for ability, the magnitude of the bias is "… on the order of 0.01 on a 0.06 or so coefficient…" (Griliches, 1996). However, the variations in the returns to education could be even smaller if we accept the assumption that people have imperfect information about their talents (Card, 1998). Moreover, the assumption "…that human capital is equally productive in

learning and in the market, this implies that the ability bias is negative!" (Griliches, 1996).

Empirical results in the field of variations of earnings due to the school quality and family background give a wide range of policy implications. The main findings suggest that earnings are influenced by the size of the class (Card and Krueger 1992, in Card, 1998), average spending per student, professors wages (Altonji and Dunn, 1995, 1997 in Card, 1998).

2.2 Estimation of the returns to education in transition countries

Since Ukraine was part of the USSR, it is reasonable to look what is being done in the NIS about returns to education. The biggest concern of the research on the transition countries is the availability and the quality of data. Moreover, labor market conditions should be taken into consideration.

Gregory and Kohlhase (1988) tried to estimate the returns to education for the soviet emigrants' micro data set for years 1979-1982. Their findings obtained with the Mincerian earnings function suggest that in Soviet Union there were no returns to schooling itself but comparatively high returns to the high education due to greater earnings and ability to be employed at higher-paid occupations. According to their estimates, women got about 20% less earnings than men. Furthermore, the returns to the experience were low and earnings were weakly correlated with the experience.

The greatest concern of research that was done in former USSR countries should be due to the data availability and quality. The start of the restructuring process in the countries gives birth to the new data collection, therefore, it become the push factor in research. The other issue that has to be mentioned while estimation and

interpretation of the returns to education in the period of transition is the unique patterns like wage arrears, unpaid vacations, wage grids, and payment in kind. As was noted by Card (1998), the specification of the earnings function allows for dummies instead of actual years of schooling. This specification of the earnings function appears to be convenient for the estimation of the returns to schooling in transition since it require less information though "slightly inferior" comparatively to the semi-log form (Psacharopoulos, 1995).

One of the prominent works is the paper about investment in human capital in transitional Russia (Nesterova D., Sabirianova K., 1998). Their work has six main steps and each step involves extending the Mincerian earnings function in terms of explanatory variables as professions, industry, and types of enterprises. Authors employ both semi-log and extended earnings function in their estimation in order to distinguish returns to schooling and to the specific levels of education. The main finding of their work is growth in the returns to education in Russian Federation. However they emphasize that this increase could not be a result of rise in the demand for skills as it was in developed countries.

Furthermore, the results are adjusted for the unemployment in two ways: in the first case they employ "expected monthly total earnings" and the second case is Heckman correction (Tobit II model) procedures. In the second case, it is assumed that the probability of being employed is a function of marital status (proxy for participation rate) and wage determinants. The econometrical argument for the above amendments is sample selection problem that lead to the rate of return underestimation (in this particular work the magnitude of underestimation is about 0.7% - 0.8%).

The other (later) study that was conducted on the basis of the same Russian Longtitude Survey has to be noted as well. Clark (2000) noted such specifics of

transition countries as wage arrears, employment level. The main idea in the estimation of Mincerian earnings function and the rates of return to education and specific levels of education lies on the individual's ability to attract earnings. For this purpose Clark uses three definitions of wages: from the job that brings the main, second and third incomes. Main findings of his work were consistent with the findings of Nesterova and Sabirianova (1999). However, the adjustment for the sample selection bias with the help of Heckman procedure, using marital status and size of household as proxies for participation rates, showed that OLS overestimates the coefficients of the earnings function.

The other studies on the wage dynamics in transition countries like Estonia (Noorkoiv, Orazem, Vodopivec, 1997) have similar estimation techniques as Nesterova and Sabirianova (1999), Clark (2000) except correction for sample selection biases and suggest that there was increase in the returns to education during transition. The study on wage determinants and gender discrimination in Romania for year 1994 (Paternostro, 2000) findings are difference in the urban and rural returns to education and gender wage gaps are based on the Heckman procedure.

The main problem that researchers face in the transition countries is the poor quality and availability of data. Therefore, the estimates for the private returns to education bear additional biases that are due to the school quality (Weale, 1993) and measurement error. Conducting research on the returns to education in transition having control for the quality of education provided is rather difficult due to the following patterns that are mentioned at the ICPS (1999):

– The ratings of the universities and other educational institutes are based on the students' average grades that could be determined endogenously by university

- The government that monopolizes education distributes financial support for universities unevenly

- One of the proxies for the quality of education is the professors' salaries that was set according to the wage grid and does not reflect the tuition effort.

Empirical estimates

2.3.The data

As we want to determine the returns to education in Ukraine, we can do this as Berndt (1991) suggests by using household or business surveys. Hence, we test our hypothesis with the help of household survey from Kiev International Institute of Sociology that conducted in June and July of the year 1996. The data originally contained information about education, age, monthly wage, occupation, hours and weeks of work for previous 30 days for 5403 individuals that were selected randomly in different regions of Ukraine. After "cleaning up the data set", namely excluding unemployed, households, kids, pensioners and those who did not report about earnings, education, etc. or reported wrongly the level of education we were left with about one forth of the original sample for the running OLS regression.

2.4.The methods and variables

In order to investigate the returns to specific levels of education in Ukraine in 1996 we use extended Mincerian earnings function that includes dummy variables. Mincer (1974, in Clark, 2000) proposed to put on the right hand side hourly earnings as a dependent variable, therefore, our dependent variable is natural logarithm of hourly earnings (LME). The latter is found as the sum of the earnings and payment in kind received from employer for the previous 30 days and divided by the number of previous workweek multiplied by 4 (number of weeks in a month). The volumes are extracted from answers to the following questions:

"How much money (after paying taxes) did you receive at this employment during the last 30 days?"

"Would you please estimate the cost in thousand karbovantsi of the goods received by you from this employment regardless of what you have done with them afterwards?"

We also can treat compensation package as a special part of earnings. Some of people at that time stayed at work because of valuable compensations that were provided by employers. Therefore, we also try to estimate the returns to education taking into account compensation package subjective evaluation. In this case we provide LCE as the notation for the dependent variable. The latter is found as the sum of the earnings and payment in kind received from employer for the previous 30 day, the volume of compensation package (that includes transport, health, product, equipment, kindergarten compensations), that is divided by the number of previous workweek multiplied by 4 (number of weeks in a month).

As was suggested by Nesterova and Sabirianova (1999) we do not adjust earnings for inflation in this particular case due to the following reasons:

1) the level of inflation in two months period was not very high;

2) we can not extract from the questionnaire exact time when individuals get their earnings.

We have to note that reported earnings could contain measurement error because their magnitude depends only on the willingness of the individuals to answer honestly and subjective evaluation of the goods that they received in kind. However, measurement error of the dependent variable leads to inefficient but consistent estimates (Verbeek, 2000).

Besides, we should take into account the Ukrainian specificities for that time. Wage arrears makes our estimates tricky since we have information only about small period of time. Unfortunately, the questionnaire does not contain information on contractual wages.

Let us describe independent variables that are included in the model. They are the following:

Age_i, $Age2_i$ — As the theory suggests, we should include in the model actual or at least potential experience of an individual *i* that could be estimated with the help of Mincer's innovation as follows: Experience=Age-6-years of schooling, where 6 is the starting schooling age. However, questionnaire contains information whether education is complete or not. However, there is no exact specification of the years of schooling. Moreover, correspondence higher education, that exists in Ukraine does not require daily attendance of the students, hence they can earn money and study at a university at the same time. One more thing is to be mentioned is that we have no information about previous participation in the military service, which was mandatory for healthy men that did not attend military classes at educational establishment. Hence, we face the problem that can lead to inconsistent estimates due to the measurement error (Verbeek, 2000). So, we use age as a proxy (Newell, Reilly, 2001) for experience in order to avoid omission variable consequences. According to the theory, we expect positive relationship between earnings and age. Age2 is the variable that allows considering slowdown in individual earnings levels because of human capital depreciation at high age. Moreover, according to the theory (Becker, 1993), investment in on-the-job training is more likely to happen at the early period of life and then decreases.

SEX_i — is the dummy used to allow the difference in the rate of earnings for men and women. It is equal to 1 for men, and 0 for female. The theory suggests that earning levels for men should be higher within

one group of education for men, hence we expect the positive sign of the parameter of SEX in the regression that we estimate.

Dummies for the specific levels of education — The benchmark that is used for the model is the education less or equal to 8 years. For the education we include the dummies that equal to one when an individual has one of the levels of education specified below and zero otherwise:

PTU — Has graduated from vocational training school after 8-9 class of secondary school (8-9 years are spent at the secondary school and 2.5 years are spent at the vocational training school)

SSEC — Has specialized secondary education (10-11 years are spent at the secondary school and 3 years spent at the technical school)

PTUP — Got a diploma of vocational training school after 10-11 years of secondary school (10-11 years are spent at the secondary school and 1.5 years are spent at the vocational training school)

VH — Has higher education (graduated from a university)

CSEC — Has complete secondary education (has 10-11 years of secondary school only)

UH — Acquire incomplete higher education (studied more then 3 but less then 5 years at the university)

TEN — Is the tenure, i.e. the number of years that an employee works for current firm that is calculated as months of work with at the current occupation divided by 12 (number of months in one year).

According to the theory the sign of the parameter for this variable should be positive, since earnings should increase due to the accumulation of occupation specific firm skills with time.

*TEN*2 Tenure squared, we expect the sign of the parameter to be negative

Region We grouped 21 administrative regions of Ukraine into 4 groups: according to the average wage levels in the year 1996 and include dummy for Kiev. As a benchmark we use main group with middle average wage level.

Ownership Second group of control variables is the ownership of the firm that an individual works, they are the following: state owned, local authorities, workers owned, public organizations, cooperatives, and private domestic and foreign firms.

Field Third group of control variables includes dummies for the sector of activity like forestry, industry, construction, transportation, trade, municipal utilities, health care, education, finances, state authorities, other fields.

In kind Since earnings also include the subjective monetary value of the goods that are paid in kind as a part of the wage, therefore it could be subjectively under-or overestimated. For the purpose to reduce this error we introduce dummy that is equal to 1 if an individual got payment in kind and zero otherwise. We expect negative sign of the parameter before this explanatory variable

City Finally, we control for the city type and include dummies for city and settlement using rural areas as a benchmark.

Settlement

Hence we have chosen the following model specification:

$$LME_i(LCE_i) = b_1 + b_2 Sex_i + b_4 AGE + b_5 AGE\,2 + b_6 TEN + b_7 TEN\,2 +$$

$$b_8 PTU_i + b_9 PTUP_i + b_{10} CSEC_i + b_{11} TEH_i + b_{12} VH_i + b_{13} UH_i + b_{14} Inkind_i +$$

$$+ \sum_{J=1}^{2} R_j \,\mathrm{Re}\, gion_i + \sum_{k=1}^{10} F_k Field_i + \sum_{m=1}^{7} O_m Ownership_i + \sum_{s=1}^{2} C_l citytype_i + e_i$$

Though, other studies also employ semi-log form of the mincerian earnings function, we use dummies for the specific levels of education. Firstly, it allows for discontinuity in the earnings and take into account the fact that one year of say specialized secondary education could have different from the one year of university effect on earnings. Secondly, because of data that is available constraints: we do not have information on exact years spent on education.

The null hypotheses are the following: $b_{11} - b_{10} = 0$; $b_{10} - b_9 = 0$; $b_9 - b_8 = 0$; $b_8 - b_7 = 0$; $b_7 - b_6 = 0$.

OLS estimates (with robust standard errors) we represent in the table 1.

2.5. *Results*

Table1 OLS regression with robust standard errors[1]

	LCE coefficient	LME coefficient
Sex	.1608381* .0566767	.173929* .0552223
TEN	.0150505* .0049025	.0141447* .0047567
TEN2	-.0002063* .0000628	-.0001815* .0000598
VH	.414499* .1264334	.5518152* .1230675
UH	.7061701* .1458663	.7650049* .1433396
SSEC	.3259597* .1022848	.4209236* .0992245
PTUP	.058239 .1295808	.121782 .1250158
CSEC	.0357396 .0992941	.0860565 .0977385
PTU	.2780104** .138229	.3131601** .1428045
AGE	.0678435* .0169469	.0524345* .0162914
AGE2	-.000901* .0002105	-.00071* .0002019
In kind	-.0450852 .0843547	-.1662523*** .0864824
Field	F(8, 1289) = 4.98 Prob > F = 0.0000	F(8, 1241) = 5.71 Prob > F = 0.0000
Ownership	F(3, 1289) = 1.88 Prob > F = 0.1309	F(3, 1241) = 2.39 Prob > F = 0.0669
City	.1509507** .0669568	.1230898** .0639219
Settl	.0447353 .0876191	.0150744 .0863624
Region	F(4, 1289) = 1.56 Prob > F = 0.1818	F(3, 1241) = 1.50 Prob > F = 0.2132
_cons	1.999466	2.214975 .3491408
Number of obs = 1320 R-squared = 0.1409		Number of obs = 1272 R-squared = 0.1770
F(30, 1289) = 11.71 Prob > F = 0.0000		F(30, 1241) = 11.95 Prob > F = 0.0000

To denote 1% level of significance we use *; ** is for 5 % level of significance and *** denotes 10% level of significance [1]

2.6. Pros and cons

The techniques we employ in order to estimate private rate of returns to the specific levels of education with the help of extended Mincerian earnings function are consistent with the previous studies in this field. The coefficients we obtain so far have sign that is theoretically suspected.

To control for unobserved heteroskedasticity we use robust technique. As was noted by Verbeek (2000) if we can not determine the form of heteroskedasticity then the technique of robust standard errors could be the best alternative. Let N be the number of observations, e_i - the residual obtained from OLS, x_i the vector of exogenous regressors. The covariance matrix $\hat{V}\{b\}$ now calculated is as follows: "$\hat{V}\{b\} = \left(\sum_{i=1}^{N} x_i x_i'\right)^{-1} \sum_{i=1}^{N} e^2 x_i x_i' \left(\sum_{i=1}^{N} x_i x_i'\right)^{-1}$" (ibid.). The use of the covariance matrix leads to asymptotically efficient estimates under the assumption that coefficients are consistent (ibid.).

Nevertheless, we should note that we do not account for the following:

- school quality,
- individual characteristics like ability bias (Becker, 1993)
- effort made at the time of schooling
- wage arrears. Form the one hand it could lead to underestimate of the coefficients because of imperfect information at the labor market since people are not fully rewarded at the considered period of time. On the other hand, the cost of layoffs were rather high at that times and it was cheaper for

the firms to pay the same part of the wage to both productive and unproductive workers.

Therefore, we can theoretically expect that there is correlation of residuals with education (Card, 1998). Unfortunately the survey does not give us the data on IQ, family background, or school grades, therefore we can not correct our results for such biases. However, as literature suggests the magnitude of the bias is about 1% - 2% on the coefficient (Griliches, 1996).

Moreover, we should note that there could be downward biases due to the self-selection problem (Nesterova, Sabirianova, 1999). "When the sample used in a statistical analysis is not randomly drawn from a larger population, selection bias may arise. That is, standard estimators and tests may result in misleading inferences" (Verbeek, 2000). In other words, our OLS estimates for subsample, which includes only those who get positive earnings, could be not true for the whole sample that is drawn randomly out of population. The reason is that observed outcomes are conditional upon other factors that are not included in the model and subsample is not random (Clark, 2000). It could be the case that higher educated people are more likely to receive positive wage (Nesterova and Sabirianova, 1999). Moreover, women have greater likelihood to be unemployed and have breaks in their experience due to the maternity periods (ibid.). In order to amend our estimates, we use Heckman selection procedure with selection variable for married status and number of children (as in Clark, 2000, Nesterova and Sabirianova, 1999). In Heckman model (as in Verbeek, 2000) the contribution to the maximum likelihood comes from two sources. The first one is probability of the zero earnings outcome in the sample (as a function of marital status, number of children and wage determinants included in OLS regression). The second part is a function of earnings distribution conditional upon positive earnings outcome. Statistically, if there is selectivity problem (our null hypothesis

that we expect to reject is that there is no selectivity problem), then the coefficient on Heckman's lambda that measure the correlation between the errors from the two parts is statistically significant.

The results obtained with the Heckman procedure are presented at the table 4 and 6 in the appendix.

The selection regression estimates are presented at table in the appendix.

Table 2 Comparison of coefficients

	LCE OLS		LCE Heckman	LME Heckman		LME OLS
SEX	.1608381*	<	.1910754*	.214049*	>	.173929*
TEN	.0150505*	<	.0151018*	.0142339*	>	.0141447*
VH	.414499*	<	.439738*	.5813715*	>	.5518152*
UH	.7061701*	<	.7348531*	.8064847*	>	.7650049*
SSEC	.3259597*	<	.3485944*	.4483429*	>	.4209236*
PTUP	.058239	<	.0754853	.1429171	>	.121782
CSEC	.0357396	<	.0547536	.1126802	>	.0860565
PTU	.2780104**	<	.2990775**	.3393663**	>	.3131601**
AGE	.0678435*	<	.0864143*	.0775819*	>	.0524345*

- means 1% level of significance
- ** introduced for 5% level of siginificance
- *** is used to denote that the coefficient is significant at 10% level.

According to our estimates based on the Heckman correction procedure, OLS underestimates the coefficient on specific levels of education (see table 3). The lambda is statistically significant at 1% level, therefore we fail to accept the null hypothesis. So, the results we obtained so far suggest that the coefficient for incomplete higher education has greater magnitude in both our regressions (when we consider compensation package and when we ignore it). Generally, people with complete higher education are better paid then with specialized secondary or vocational training education. Vocational training brings the lowest payment between the educational groups. Though the tenure is statistically significant, in both regressions is has approximately the same and smaller then for age value. However, statistical significance of positive age coefficients could be due to not fully eliminated wage grid system. We fail to reject the hypothesis that earnings vary with ownership of the firm, however, the field of work dummies are significant (this could be due to different working environments). According to our estimates, people employed at the industry are better rewarded than in unproductive sectors that were mainly affected by wage arrears.

Our next step is to test the null hypothesis whether the difference in coefficients to the specific levels of education is statistically significant. Our null hypotheses that we expect to reject are that the following restrictions are true:

coefficients for higher education = incomplete higher education,

coefficient for the incomplete higher education = coefficient on vocational training education,

coefficient for specialized secondary = coefficient on vocational training education.

For this purpose we employ likelihood ratio test, since our estimates are obtained with the help of maximum likelihood. The tests procedure could be described as follows:

Find loglikelihood estimates from the unrestricted and restricted models (i.e. model tha t contains tested restriction for coefficients)

Compute the difference of the maximum loglikelihood values multiplied by 2.

We fail to accept the null hypothesis if the test statistics is greater then chi-squared distribution with 1 degree of freedom (1 is number of tested restrictions).

The results of the tests are reported at the table 4. Though, all the coefficients that we test are significantly different from zero, the test of our null hypothesis suggests that we fail to reject the null hypothesis for higher education. However, the achieved test statistics could be due to the correlation of the variables.

Table 3 Testing the null hypothesis

LCE model	Chi-statistics	Probability>chi2
test VH=UH	chi2(1) = 4.99	Prob > chi2 = 0.0255
test UH=SSEC	chi2(1) = 8.46	Prob > chi2 = 0.004
Test UH=PTU	chi2(1) = 8.79	Prob > chi2 = 0.003
test SSEC=PTU	chi2(1) = 0.18	Prob > chi2 = 0.6705
LME		
test VH=UH	chi2(1) = 3.01	Prob > chi2 = 0.0826
test UH=SSEC	chi2(1) = 9.66	Prob > chi2 = 0.0019
test UH=PTU	chi2(1) = 9.39	Prob > chi2 = 0.0022
Test PTU=SSEC	0.81	Prob > chi2 = 0.3693

Let S(VH), S(UH), S(SSEC), S(PTU) be years of schooling spent on higher education, incomplete higher education, vocational training accordingly. VH, UH, SSEC, PTU are the coefficients for the higher education, incomplete higher education, specialized secondary education, and vocational training obtained with the help of Heckman correction procedure. ROR is the notation for the private return to the specific levels of education.

Now we can calculate and compare the private returns to the high education (Card, 1998) using the following formula:

$ROR_{pVH} = \frac{VH - UH}{S(VH) - S(UH)}$ are the returns to the high education and formally years spent on high education should equal to 15 i.e. S(VH)=15, while years spent on incomplete higher education should equal to 13.

$ROR_{pUH} = \frac{UH - PTU}{S(UH) - S(PTU)}$ are the returns to the incomplete high education, though the survey does not contain the actual years spent by an individual on education, we would approximate (according to the survey this variable is equal to 1 if an individual get more then 3 years of high education and have no diploma) and say that on average people have 3 years of higher education, i.e S(UH)=13. The years spent on vocational training is S(PTU)=10.5.

$ROR_{pSSEC} = \frac{PTU}{S(PTU)}$ is the formula that helps to estimate the returns to vocational training education (For the returns to education calculated see table 4).

Table 4. The returns to education

LCE	Heckman	
VH	.439738	((.414499-.7348531)/2)*100%= -16%
UH	.7348531	((.7348531-.3485944)/2.5)*100%=15.45%
PTU	.3485944*	(.3485944/10.5)*100%= 3.32%
LME	Heckman	
VH	.5813715	((.5813715-.8064847)/2)*100%= -11.26%
UH	.8064847	((.8064847-.3393663)/2.5)*100%=18.68%
PTU	.3393663*	(.3393663/10.5)*100%= 3.23%

However, as was noted in Clark, (2000) this way of rate of return calculation may be inappropriate for NIS system of education since the first decision about further investing in education is made (in Ukraine) after incomplete secondary school graduation (see org chart 1 in the appendix). Compulsory education in Ukraine at that times required 8 years of secondary school attending. After incomplete secondary education, an individual might decide to apply for vocational training school, stop studying, and continue to acquire secondary education. Once an individual complete secondary education he can apply university, vocational training school or acquire specialized secondary education.

The formulas for calculation the rate of returns to the specific levels of education that takes into account specifics of the decision making described above takes the following form (Clark, 2000):

$$ROR_{pVH} = \frac{VH - UH}{S(VH) - S(UH)}; \qquad ROR_{pUH} = \frac{UH - CSEC}{S(UH) - S(CSEC)};$$

$$ROR_{pSSEC} = \frac{SSEC - CSEC}{S(SSEC) - S(CSEC)}; \; ROR_{pPTU} = \frac{PTU}{S(PTU) - S(compulsory)}.$$

New notation is introduced for the years spent on compulsory education and years of complete secondary school: $S(compulsory)$, $S(CSEC)$ accordingly.

Table 5 The returns to education taking into account the time of individual's decision making.

LCE	Heckman	
VH	.439738	((.414499-.7348531)/2)*100%=-16% ((.439738)/7)*100%= 6.28%
UH	.7348531	((.7348531)/5)*100%= 14.69%
SSEC	.3259597	(.3259597/5)*100%= 6.519
PTU	.3485944*	(.3485944/2.5)*100%= 13.9%
LME	Heckman	
VH	.5813715	((.5813715-.8064847)/2)*100%= -11.26% (.5813715/7)*100%= 8.305307%
UH	.8064847	(.8064847/5)*100%= 16.12%
SSEC	.4483429	(.4483429/5)*100%= 8.97%
PTU	.3393663*	(.3393663/2.5)*100%= 13.57%

The calculation shows that the private returns to the high education are negative relative to incomplete higher education. If we take into account compensation package, than the returns to higher education are even lower. First of all the results obtained so far are consistent with Becker (1993): the returns to education fall with the years of schooling acquired because of the increase in the opportunity cost. The negative sign of the returns to higher education is similar with 1994 Russia estimates (Clark, 2000).

Moreover, our dependent variable is the natural logarithm of hourly wages. It is rare case for Ukraine when extra payment for each extra hour of work at one particular firm exists. There could be two reasons for such an outcome. Firstly, people with higher education could invest more time in on-the job training in order to coup with the new technology and that is why their hours worked

increases while the monthly set wage remains the same. On the other hand, there was low demand for skills at the labor market, therefore skill mismatch issue is present. Investment in incomplete higher education brings the highest returns. There could be the case that for younger people it is easier to learn how to use technologies and innovations that are coming from abroad. One more explanatory issue that supports the results we achieve is human knowledge deterioration and difference in quality of schooling. At this point we note that there should be a field for further research that requires data extension.

Conclusions

Ukraine has chosen way of slow reform implementation and faced difficulties in privatization process. As was noted by ICPS (1998), both the labor market policies and educational system required changes toward new requirements in the labor market at the year 1996.

The goal of this work is to estimate private returns to education in Ukraine in transition period, namely in year 1996. For this purpose we used data on household survey of Kiev International Institute of Sociology that had been conducted for the year 1996. The estimated extended Mincerian earnings function for the specific levels of education gives rather interesting results. Namely, the private returns to the higher education are negative comparatively to the incomplete higher education and declining comparatively to the specialized secondary education if we take into account investment in education decision making in Ukraine. The reason for this could be oversupply of specialists that leads to skill mismatch and the value of knowledge under the new conditions provided by the government university. Moreover it could be due to the labor policies that makes it expensive for the firms to get rid of the labor surplus and cause wage arrears problems.

Investment in incomplete higher education occurs to be the most profitable, the return is about 16%. Younger workers could be more able, mobile, and have different quality of education. The returns to the vocational education are about 2.8%. In the case we take into account compensation package, the returns to education are not seriously affected. The order of the magnitude remains the same. Though, the experience obtained during the Soviet times could be irrelevant, in year 1996 wage grid system remained and that is why age (that we use as a proxy for experience) does affect earnings distribution.

Hence, according to our key findings, the returns to education for Ukraine in 1996 were not monotonic in increasing magnitude though higher educated people are rewarded with greater stream of earnings and benefits.

Since we have found that the returns to higher education are greater for people who were studying and have not yet received a university degree in the year 1996, we should presume that university graduates might need retraining.

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Appendix

Table 6. OLS (dependent variable LCE)

	Coef.	Std. Err	T	P>|t|	[95% Conf.	Interval]
Firm owner						
State	.2360592	.1007227	2.344	0.019	.0384609	.4336575
Worker	.1867898	.1169347	1.597	0.110	-.0426134	.4161929
Private	.1603441	.1481388	1.082	0.279	-.1302754	.4509636
Field of work						
Forestry	-.4676042	.0800622	-5.841	0.000	-.6246708	-.3105377
Construction	-.1736795	.1368191	-1.269	0.205	-.4420921	.0947331
Transport	-.0832143	.0925378	-0.899	0.369	-.2647556	.098327
Trade	-.326405	.1037855	-3.145	0.002	-.530012	-.1227981
Municipal	-.1056104	.1126717	-0.937	0.349	-.3266504	.1154296
Health	-.2540942	.124131	-2.047	0.041	-.4976152	-.0105732
Education	-.2386712	.114435	-2.086	0.037	-.4631704	-.0141719
State authority	-.2289352	.1311695	-1.745	0.081	-.4862644	.028394
SEX	.1608381	.0566767	2.838	0.005	.0496494	.2720267
TEN	.0150505	.0049025	3.070	0.002	.0054329	.0246682
TEN2	-.0002063	.0000628	-3.287	0.001	-.0003294	-.0000832
VH	.414499	.1264334	3.278	0.001	.1664612	.6625367
UH	.7061701	.1458663	4.841	0.000	.4200087	.9923316
SSEC	.3259597	.1022848	3.187	0.001	.1252968	.5266226
PTUP	.058239	.1295808	0.449	0.653	-.1959734	.3124514
CSEC	.0357396	.0992941	0.360	0.719	-.1590561	.2305353
PTU	.2780104	.138229	2.011	0.045	.006832	.5491888
AGE	.0678435	.0169469	4.003	0.000	.034597	.1010899
AGE2	-.000901	.0002105	-4.280	0.000	-.001314	-.000488
Outl	2.933874	.3078892	9.529	0.000	2.329856	3.537893
City	.1509507	.0669568	2.254	0.024	.0195945	.2823069
Settl	.0447353	.0876191	0.511	0.610	-.1271563	.2166269
Regfol	.1596292	.0774725	2.060	0.040	.0076433	.3116151
Reglider	.0639657	.0774265	0.826	0.409	-.08793	.2158615
Regout	.112249	.0669422	1.677	0.094	-.0190786	.2435765
Kiev	-.0479958	.1340437	-0.358	0.720	-.3109635	.214972
In kind	-.0450852	.0843547	-0.534	0.593	-.2105728	.1204023
_cons	1.999466	.3578311	5.588	0.000	1.29747	2.701461
Number of obs = 1320				R-squared = 0.1409		
F(30, 1289) = 11.71				Root MSE = .95308		
Prob > F = 0.0000						

Table 7. OLS (dependent variable LCE)

	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Firm ownershi[						
State	.2645752	.102322	2.586	0.010	.063832	.4653184
Worker	.2065431	.1193123	1.731	0.084	-.0275331	.4406192
Private	.1469459	.1509309	0.974	0.330	-.149162	.4430538
Field of work						
Forestry	-.4684077	.0802569	-5.836	0.000	-.625862	-.3109535
Constructio n	-.1335873	.1311774	-1.018	0.309	-.3909412	.1237666
Transport	.034957	.082976	0.421	0.674	-.1278317	.1977458
Trade	-.3305894	.1056373	-3.129	0.002	-.5378367	-.123342
Municipal	-.1026905	.1136848	-0.903	0.367	-.3257262	.1203452
Health	-.12382	.1074699	-1.152	0.249	-.3346627	.0870228
Education	-.2261933	.1115239	-2.028	0.043	-.4449895	-.0073971
State authority	-.1219656	.1201798	-1.015	0.310	-.3577437	.1138125
SEX	.173929	.0552223	3.150	0.002	.0655896	.2822684
TEN	.0141447	.0047567	2.974	0.003	.0048127	.0234767
TEN2	-.0001815	.0000598	-3.034	0.002	-.0002988	-.0000641
VH	.5518152	.1230675	4.484	0.000	.3103719	.7932586
UH	.7650049	.1433396	5.337	0.000	.4837903	1.04622
SSEC	.4209236	.0992245	4.242	0.000	.2262572	.6155899
PTUP	.121782	.1250158	0.974	0.330	-.1234836	.3670476
CSEC	.0860565	.0977385	0.880	0.379	-.1056944	.2778074
PTU	.3131601	.1428045	2.193	0.028	.0329952	.5933249
AGE	.0524345	.0162914	3.219	0.001	.0204728	.0843961
AGE2	-.00071	.0002019	-3.516	0.000	-.0011062	-.0003138
Outl	3.042887	.3632162	8.378	0.000	2.330302	3.755473
City	.1230898	.0639219	1.926	0.054	-.0023171	.2484967
Settl	.0150744	.0863624	0.175	0.861	-.1543581	.1845068
Regfol	.1213836	.0771642	1.573	0.116	-.0300031	.2727703
Reglider	.0748431	.0717451	1.043	0.297	-.0659119	.2155982
Regout	.1116134	.0638804	1.747	0.081	-.0137121	.2369389
Kiev	-.1210282	.1370441	-0.883	0.377	-.3898918	.1478355
In kind	-.1662523	.0864824	-1.922	0.055	-.3359201	.0034156
_cons	2.214975	.3491408	6.344	0.000	1.530003	2.899946
Number of obs = 1272			R-squared = 0.1770			
F(30, 1241) = 11.95			Root MSE = .9085			
Prob > F = 0.0000						

Table 8. Heckman correction procedure (LCE)

	Coef.	Std. Err.	Z	P> | z |	[95% Conf. Interval]	
Firm ownership						
State	.236835	.0995137	2.380	0.017	.0417916	.4318784
Worker	.1873679	.1155386	1.622	0.105	-.0390836	.4138194
Private	.1614573	.1462502	1.104	0.270	-.1251878	.4481024
Field of work						
Forestry	-.4680386	.0791195	-5.916	0.000	-.6231099	-.3129673
Construction	-.1743675	.1353243	-1.289	0.198	-.4395982	.0908632
Transport	-.0841829	.0915066	-0.920	0.358	-.2635325	.0951668
Trade	-.3253113	.1025229	-3.173	0.002	-.5262524	-.1243702
Municipal	-.1046623	.111242	-0.941	0.347	-.3226927	.1133681
Health	-.2544903	.1227241	-2.074	0.038	-.4950252	-.0139554
Education	-.2378097	.1130642	-2.103	0.035	-.4594116	-.0162079
State authority	-.2313066	.1297668	-1.782	0.075	-.4856449	.0230317
SEX	.1910754	.0571084	3.346	0.001	.079145	.3030058
TEN	.0151018	.0048461	3.116	0.002	.0056036	.0245999
TEN2	-.0002067	.000062	-3.333	0.001	-.0003283	-.0000852
VH	.439738	.1258957	3.493	0.000	.1929871	.686489
UH	.7348531	.146082	5.030	0.000	.4485377	1.021169
SSEC	.3485944	.1019176	3.420	0.001	.1488396	.5483491
PTUP	.0754853	.128664	0.587	0.557	-.1766914	.3276621
CSEC	.0547536	.0989654	0.553	0.580	-.139215	.2487222
PTU	.2990775	.1376168	2.173	0.030	.0293535	.5688016
AGE	.0864143	.0179843	4.805	0.000	.0511658	.1216629
AGE2	-.0011342	.0002249	-5.043	0.000	-.001575	-.0006934
Outl	2.935889	.3013484	9.743	0.000	2.345257	3.526521
City	.1508539	.0666437	2.264	0.024	.0202347	.2814731
Settl	.0609377	.086775	0.702	0.483	-.1091381	.2310135
Regfol	.0117147	.1302764	0.090	0.928	-.2436225	.2670518
Reglider	.1583442	.0768369	2.061	0.039	.0077467	.3089417
Regout	.0594117	.076949	0.772	0.440	-.0914056	.2102289
Kiev	.1094382	.0665317	1.645	0.100	-.0209616	.239838
In kind	-.0452565	.0833312	-0.543	0.587	-.2085827	.1180697
_cons	1.468326	.3999969	3.671	0.000	.6843467	2.252306
Rho	.157646	.052438			.0535231	8.2583777
Sigma	.9499281	.0335408			.8864125	1.017995
Lambda	.1497524	.0514189			.0489731	.2505317
Number of obs = 4003						
Censored obs = 1320			Uncensored obs = 2683			
Wald chi2(30) = 357.60			Prob > chi2 = 0.0000			
Log likelihood = -4108.785						

Table 9. Selection equation for Heckman (LCE)

	Coef	Std. E	z	P>|z	[95% Conf. Interval]	
Number of chieldren	-.0834019	.0320444	-2.603	0.009	-.1462078	-.020596
Married	.0117959	.0546848	0.216	0.829	-.0953843	.1189761
SEX	.1606911	.0658347	2.441	0.015	.0316574	.2897247
VH	.2233703	.0857531	2.605	0.009	.0552974	.3914432
UH	.2338676	.1479443	1.581	0.114	-.0560978	.523833
SSEC	.2117138	.0784442	2.699	0.007	.057966	.3654615
PTUP	.1553781	.0961275	1.616	0.106	-.0330283	.3437846
CSEC	.181002	.0752387	2.406	0.016	.0335368	.3284672
PTU	.1983987	.1121762	1.769	0.077	-.0214626	.41826
AGE	.1812111	.0118364	15.310	0.000	.1580122	.20441
AGE2	-.0022537	.0001459	-15.442	0.000	-.0025398	-.0019677
Regfol1	-.0103998	.0635469	-0.164	0.870	-.1349495	.1141499
Reglid1	-.0439073	.0606197	-0.724	0.469	-.1627197	.0749051
Regout1	-.0281344	.0596917	-0.471	0.637	-.145128	.0888592
City	-.009859	.0505611	-0.195	0.845	-.108957	.0892389
Settl	.169243	.0715121	2.367	0.018	.0290819	.309404
Kiev	.6501117	.1084896	5.992	0.000	.437476	.8627474
_cons	-3.901555	.2032525	-19.196	0.000	-4.299923	-3.503188
Athrho	.1589718	.0537752	2.956	0.003	.0535743	.2643693
Lnsigma	-.051369	.0353087	-1.455	0.146	-.1205729	.0178348
Rho	.157646	.052438			.0535231	8.2583777
Sigma	.9499281	.0335408			.8864125	1.017995
Lambda	.1497524	.0514189			.0489731	.2505317
Number of obs = 4003						
Censored obs = 1320				Uncensored obs = 2683		
Wald chi2(30) = 357.60				Prob > chi2 = 0.0000		
Log likelihood = -4108.785						
Wald test of indep. eqns. (rho = 0): chi2(1) = 8.74 Prob > chi2 = 0.0031						

Table 10. Table Heckman correction procedure (LME)

LME	Coef	Std. Err	z	P>|z|	z [95% Conf. Interval]	
Firm ownership						
State	.2661537	.1010548	2.634	0.008	.0680899	.4642176
Worker	.2079209	.1178522	1.764	0.078	-.0230652	.438907
Private	.1489688	.1488845	1.001	0.317	-.1428395	.4407771
Field of work						
Forestry	-.4692535	.079293	-5.918	0.000	-.6246649	-.3138421
Construction	-.1346084	.1297643	-1.037	0.300	-.3889417	.119725
Transport	.0340826	.0819318	0.416	0.677	-.1265007	.194666
Trade	-.3289156	.1042653	-3.155	0.002	-.5332718	-.1245594
Municipal	-.1011591	.1121997	-0.902	0.367	-.3210664	.1187482
Health	-.1243353	.106234	-1.170	0.242	-.3325502	.0838796
Education	-.225176	.1101836	-2.044	0.041	-.4411319	-.0092201
State authority	-.1246423	.1187818	-1.049	0.294	-.3574502	.1081657
SEX	.214049	.0553338	3.868	0.000	.1055966	.3225013
TEN	.0142339	.0047025	3.027	0.002	.0050172	.0234505
TEN2	-.0001823	.0000591	-3.086	0.002	-.0002982	-.0000665
VH	.5813715	.1233952	4.711	0.000	.3395214	.8232216
UH	.8064847	.144703	5.573	0.000	.5228719	1.090097
SSEC	.4483429	.0992191	4.519	0.000	.253877	.6428088
PTUP	.1429171	.1245481	1.147	0.251	-.1011926	.3870268
CSEC	.1126802	.0977754	1.152	0.249	-.078956	.3043165
PTU	.3393663	.1426807	2.379	0.017	.0597173	.6190153
AGE	.0775819	.0176758	4.389	0.000	.042938	.1122258
AGE2	-.0010259	.0002201	-4.661	0.000	-.0014573	-.0005944
Outl	3.04581	.3540755	8.602	0.000	2.351835	3.739785
City	.1297033	.0638329	2.032	0.042	.0045931	.2548135
Settl	.0458627	.0858673	0.534	0.593	-.1224341	.2141595
Regfol	.1225507	.0767156	1.597	0.110	-.0278092	.2729105
Reglider	.0608228	.0719347	0.846	0.398	-.0801666	.2018122
Regout	.1118501	.0637863	1.754	0.080	-.0131687	.236869
Kiev	-.040449	.1315714	-0.307	0.759	-.2983242	.2174262
In kind	-.1669422	.0853805	-1.955	0.051	-.3342849	.0004006
_cons	1.489983	.3977074	3.746	0.000	.710491	2.269475
lambda	.2007154	.0518077			.0991742	.3022567
Number of obs = 4003				Wald chi2(30) = 368.61		
Censored obs = 1272				Prob > chi2 = 0.0000		
Uncensored obs = 2731						
Log likelihood = -3946.548						
Wald test of indep. eqns. (rho = 0): chi2(1) = 15.08 Prob > chi2 = 0.0001						

Table 11. Selection equation for Heckman (LME)

	Coef	Std. E	z	P>|z	[95% Conf. Interval]	
Number of chieldren	-.0950706	.0327225	-2.905	0.004	-.1592054	-.0309357
Married	.0217894	.0542759	0.401	0.688	-.0845894	.1281683
SEX	.1362099	.0667032	2.042	0.041	.0054741	.2669457
VH	.1865	.0864012	2.159	0.031	.0171567	.3558432
UH	.2494847	.1486067	1.679	0.093	-.041779	.5407484
SSEC	.1912656	.0795151	2.405	0.016	.0354189	.3471123
PTUP	.1425837	.0971608	1.468	0.142	-.0478479	.3330153
CSEC	.1907562	.0760653	2.508	0.012	.0416709	.3398414
PTU	.1850017	.1136292	1.628	0.103	-.0377074	.4077108
AGE	.1827309	.0119385	15.306	0.000	.1593319	.2061298
AGE2	-.0022709	.0001472	-15.431	0.000	-.0025594	-.0019825
Regfol1	.010732	.0636082	0.169	0.866	-.1139378	.1354018
Reglid1	-.0992326	.0613333	-1.618	0.106	-.2194437	.0209784
Regout1	-.0002053	.0599298	-0.003	0.997	-.1176654	.1172549
City	.0396759	.0509163	0.779	0.436	-.0601182	.1394699
Settl	.236317	.0718	3.291	0.001	.0955916	.3770424
Kiev	.6615626	.1098486	6.022	0.000	.4462634	.8768619
_cons	-3.978263	.2055536	-19.354	0.000	-4.381141	-3.575386
athrho	.2235692	.0575754	3.883	0.000	.1107235	.3364148
lnsigma	-.0913633	.0387047	-2.361	0.018	-.1672231	-.0155034
rho	.2199173	.0547908			.1102733	.3242729
sigma	.9126861	.0353253			.8460108	.9846162
lambda	.2007154	.0518077			.0991742	.3022567

Number of obs = 4003	Wald chi2(30) = 368.61
Censored obs = 1272	Prob > chi2 = 0.0000
Uncensored obs = 2731	
Log likelihood = -3946.548	
Wald test of indep. eqns. (rho = 0): chi2(1) = 15.08 Prob > chi2 = 0.0001	

Org chart 1. The way decision about investing in education usually made