PRIVATE RETURNS TO EDUCATION IN GEORGIA

by

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Abstract

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This thesis studies the marginal private returns to education in Georgia for the years from 1997 to 2006. Using the sample selection correction procedure, the returns to additional year of schooling in 2006 are estimated to be 6.2% for both, men and women. The marginal private returns to higher education were found to be the largest compared to other educational levels and constituted 6.6% for men and 7% for women, pointing that incentives to acquire higher education are in place. These returns were also estimated to be increasing over time, suggesting that education in Georgia gets increasingly valued as the transition process progresses.

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GLOSSARY

Internal Rate of Return – The discount rate for which the total present value of future cash flows equals the cost of the investment[1];

Present value – The current value of future cash payments, discounted at some appropriate interest rate;

Private Rate of Return to Education – the annual yield to an individual from investment in education;

[1] http://www.solutionmatrix.com/internal-rate-of-return.html

Chapter 1

INTRODUCTION

"..the ability to deal successfully with disequilibria is enhanced by education."
Theodore W. Schultz

The instability caused to Georgia by the collapse of the Soviet Union was greatly amplified by the two ethnic conflicts and a civil war following the break-up. Output crumbled, hitting the 30% level of the 1991 GDP in 1994[2]. The employment declined moderately compared to the output, relying mostly on the relocation towards the small scale agriculture and labor hoarding.

In contrast with pre-transition period, where wages were predetermined by the soviet grid system[3] the individual earnings became significantly correlated with skills[4] as the recovery began. As expected, inequality increased reflecting the heterogeneity of individuals, which was less pronounced during the soviet era.

The pioneer of the human capital studies, Jacob Mincer in 1962 estimated that about 2/3 of variation in earnings could be explained by just education and its informal counterpart, on the job training, pointing at the undisputable link between earnings and education, either formal or informal. As noted in the epigraph, it is logical to expect that education has enabled people to better cope with the macro and micro insta8bility that followed the Soviet era. Studying its

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[2] See Figure B.1 in Appendix B.

[3] Industry workers were more favored compared to others; special bonuses were paid for working in the unsettled regions.

[4] See Table B.2 in Appendix B.

effects on earnings, the indicator of mentioned better coping with disequilibria, would offer interesting insights on specific education levels rewarded more generously by the transition process, enabling the design of policies targeted on boosting the economic performance for the groups less fostered by the market economy.

Despite the fact that human capital concept has been intensively studied for about 50 years already, there still is a debate regarding the nature of returns to education levels and the policy recommendations implied by it. On the one hand there are influential reviews by Psacharopoulos (1993) and Psacharopoulos and Patrinos (2002) of studies for a large number of countries stating that returns from investment in education, like those from conventional capital, decline with the level of education and per capita income. This leads to the policy implication that developing countries should focus on primary education. In contrast, the evidence from Urban Papua New Guinean (Gibson and Fatai, 2005), African Sub-Saharan countries (Bennel, 1996) and Asian countries (Bennel, 1998) imply just the opposite: the returns to education exhibit increasing marginal return, suggesting that the primary focus of education policy should be made on higher levels.

The absence of studies that focus on returns to education for Georgia makes it impossible to characterize the nature and size of returns to education levels the country. The only return to education estimate available for Georgia is due to Yemtsov (2001)[5] in the study of inequality and income distribution in the country using the household data for 1997-1998. But since the primary focus of

[5] Yemtsov (2001) reports a less than 4.9% increase in earnings due to additional year of schooling acquired in 1997-1998.

his research is not human capital as such, the nature of the returns and its implications are not considered in detail.

The goal of the given thesis is to estimate the private marginal returns to education in Georgia for the current period (2006) and to study the evolution of these returns across time, testing the hypothesis of increasing returns to education as the transition to the market economy progresses.

The paper is organized as follows. Chapter 2 presents the literature survey of the relevant studies followed by methodology in chapter 3. The data used for the research is described in first part of the chapter 4, while second and third parts offer empirical analysis for years 2006 and 1997-2005 respectively. Chapter 5 concludes the thesis.

Chapter 2

LITERATURE REVIEW

The fundamental considerations of human capital concept were first presented by Adam Smith in his path breaking book in 1776. The "Wealth of Nations" addresses the heterogeneity of labor and distinguishes skilled workers, those who used time and resources to invest in productivity enhancement, from the "common" laborers. The author stresses that jobs requiring more skilled workers resulted in higher remuneration.

The modern human capital concept was very much shaped by Jacob Mincer. His theoretical and empirical elaborations of the matter (Mincer 1957, 1958, and 1962), suggest that the decision of investment in human capital is a free choice resulting from the profit-maximizing nature of the individual. The famous and widely used Mincerian function, derived from the author's theoretical model presents the earnings as a function of education, experience and its square term. The presence of the experience term reflects the fact that education can be acquired formally through education system or informally, by on-the-job training. The ease of use and interpretation of the given specification resulted in overwhelming body of literature estimating returns to education using Mincerian function. Mincer also managed to capture the concavity of the life time earnings by including the squared experience term, thus recognizing that individual earning rise up to some threshold level and when the health and ability effects begin to adversely influence the productivity – start to fall.

Mincer (1962) also elaborated on the labor heterogeneity concept to recognize that individuals are endowed with different abilities. The author observed that

abler individuals tend to obtain more schooling, suggesting endogeneity[6] of the whole human capital accumulation process.

Another important contribution in shaping the modern human capital theory is due to Becker (1962, 1964), where the author extends the previous developments of the subject. The author focuses on on-the-job training, which is further used as a basis for exploring formal schooling implications. Becker describes two types of training: general and specific and suggests that while firms bear the specific training costs, the general training expenditures are committed by the workers. The author also offers explanation for the unequal and skewed earnings distribution. According to it, even when the ability is "systematically and not too unequally distributed", abler persons invest more in human capital enhancement and thus income distribution has rather uneven and skewed nature.

While Mincer (1957, 1958, and 1962) and Becker (1962, 1964) focused on human capital using micro approach, Schultz (1960) considered education and human capital in general from broader perspective and argued that schooling increased individual's ability to deal with disequilibria. He also examined the growth in US total output and estimated that one-fifth of it was attributable to human capital enhancement by education system.

Advances in econometrics allowed tackling some draw-backs of Mincerian earnings specification. In this context, schooling endogeneity issue should be discussed initially. As Becker (1962) reinforces Mincer's (1962) observation stating that abler persons get more education, the concept of "ability" bias inevitably becomes associated with the Mincerian function estimation. According to Griliches (1977) the simplest solution to this problem would be

[6] See methodology part for more detailed discussion;

inclusion of some ability measure (IQ or similar test results) into the Mincerian earnings equation. But since IQ test scores are rarely reported in the standardized surveys, Instrumental Variables approach is usually used. The variable to be instrumented is ability and the instrument under interest is such that, correlated with the ability, remains uncorrelated with the earnings. However, Card (1999) stresses that the resulting coefficients must be interpreted carefully, because "Even IV estimation based on ideal instruments will typically recover a weighted average of the returns to education for people whose education choices were affected by the instrument, rather than the average marginal return to education in the population." While in case the instruments are weakly correlated with the schooling variable, the ability bias will be attenuated in the resulting estimates. This argument is Card's (1999) explanation for estimates based on family background IV procedure being systematically greater than corresponding OLS estimates: "If the OLS estimator is upward biased by unobserved ability, one would expect an IV estimator based on family background to be even more upward biased." To avoid ability bias attenuation, Card (1999) suggests using twin's education or geographical proximity to college as instruments for schooling.

Another issue concerning the Mincerian function estimation is selectivity bias. The concern arises when the sample under the consideration (employed workers in this case) is not randomly drawn from the population (pool of employed and unemployed individuals). Verbeek (2000) states that "the presence of non-random selection induces a fundamental identification problem and, consequently, the validity of any solution will depend upon the validity of the assumptions that are made..." The given problem has been extensively studied by Heckman, who first proposed the two-stage selection model in 1977.

The further extension of the Mincerian specification can be achieved by relaxing the assumption of homogeneous returns to each additional year of schooling and replacing the flat number of years studied by highest educational attainment dummies, thus introducing some non-linearity into the equation, as strongly advised by Psacharopoulos (1993). The author criticizes the researchers who do not "go to the trouble of specifying the education variable as a string of dummies in order to estimate the marginal effect of each level of education on earnings". Even having done this, the coefficients of the dummies can not be labeled as rates of return to education because costs of education should also need to be accounted for. Author suggests that if only the forgone earnings are considered as the cost of education, the difference between education level dummy coefficients divided by the incremental years required to achieve the higher level of the two would give the returns to education parameter.

Following the above methodology and also augmenting the Mincerian function by demographical characteristics Psacharopoulos (1993) and Psacharopoulos and Patrinos (2002) estimate the returns to education for large number of countries and find that primary education yields highest returns in developing states and that they decline by the level of schooling and per capita income. This conclusion yields rather important policy implication that the developing countries should focus on primary education.

In contrast, the evidences from Urban Papua New Guinean (Gibson and Fatai, 2005), African Sub-Saharan countries (Bennel, 1996) and Asian countries (Bennel, 1998) imply just the opposite: the returns to education exhibit increasing marginal return, thus suggesting the primary focus of education policy be made on higher levels. Adding more heat to the debate Curtin and Nelson (1999) argue that donors' lending policies restricting public spending on primary education level perpetuate poverty. The authors stress that these

policies are due to erroneous interpretation of human capital theory focusing only on "marginal internal rates of return on public investments in successive levels of schooling and ignores the opposite message of the increasing marginal net present values of those investments." These arguments suggest a strong need in reexamination and even revision of donor's and governments' policy towards education.

The transition countries provided a unique natural experiment to researchers, which they did take advantage of. In contrast to the Soviet period, when labor market was suppressed (Orazem and Vodopivec, 1994) and education was weakly correlated with earnings (Nesterova and Sabirianova, 1998), the market liberalization boosted the wage dispersion and provided better incentives for the individuals to invest into human capital by generating more-or-less competitive returns to skills supplied. While overall increase in returns to education would be natural to expect, the observed higher premium associated with university diploma makes the evidence from transition countries more in line with one from Papua New Guinea and Asia.

Table 2.1 Estimates of returns to education in transition countries (Selected Studies)

Author	Country	R%	Data
Orazem and Vodopivetc (1994)	Slovenia	0.111	1987 & 1991 surveys
Chase (1997)	Czech R.	0.055	1993 microdata
	Slvak R.	0.051	1993 microdata
Clark (2000)	Russia	0.052	RLMS, 1994-98
Nesterova and Saibirianova (1998)	Russia	0.078	RLMS, 1995
Saibirianova and Gorodnichenko (2004)	Russia	0.097	RLMS, 2002
	Ukraine	0.048	ULMS, 2002
Yemtsov (2001)	Georgia	0.049	1997 Survey

Orazem and Vodopivec, (1994) using the dataset for Slovenia, find that as transition progressed, average returns to education for more educated individuals rose considerably relative to earnings of least educated group. Further, individuals with 4 years of university education gained the most[7] from transition in terms of relative wages. Authors also find that "women gain relative to men, primarily because women occupy sectors less adversely affected by transition" and that experience was highly appreciated in the yearly transition period for Slovenia. The finding of increasing return pattern to experience contrasts that of Flagnan (1993) who found negative returns to experience in East Germany.

Chase (1997) estimates the returns to education and experience in Czech and Slovak Republics using four micro datasets and concludes that returns to education doubled during the transition (1994) compared to pre-transition period (1982), while the returns to experience fell most probably due to the low compatibility of experience acquired during the previous regime with the market economy. Authors' finding of particularly large increase in returns to general secondary education compared to elementary and technical secondary education is also inconsistent with declining marginal returns observed by Psacharopoulos (1993) and suggests that this type of education enabled workers to "respond more effectively to emerging opportunities."

Russian human capital under transition was studied by Nesterova and Sabirianova (1998) using RLMS data for the years 1992-1994. The results confirmed authors' initial hypothesis that transition shifted the returns to education in favor of more educated workers. A more recent study by Clark (2000) also confirms significant, positive returns to human capital in Russia that "are comparable in magnitude to other transition countries". While the concrete estimates for various education

[7] + 27% compared to individuals with less than elementary education.

levels vary according to the definition of wages, the study suggests increasing returns for education acquired beyond the compulsory level.

Gorodnichenko and Sabirianova (2004) provide the set of return to schooling estimates for 1985-2002 years for Russia and Ukraine using extended Mincerian function. They find positive and increasing returns for both countries, but the rates of return for Ukraine appear to be way modest than those for Russia. This finding is especially interesting since the skill composition in the two countries is similar. In addition to augmented Mincerian earnings function estimation used by studies described above, the authors extend the research by employing semi-parametric estimation technique and construct counterfactual wage distributions for Ukrainian workers with secondary and higher education using the distributions of Russian workers' characteristics. The simulation enables the authors to decompose the differences in returns to schooling between Russia and Ukraine into price effect (due to labor market returns), residual effect (due to differences in unobservable characteristics) and composition effect (due to labor force composition). The price effect was found to be the strongest contributor to the differences in the returns to schooling between the countries.

The absence of explicit returns to education study for Georgia makes it impossible to characterize the nature of present returns to education levels. The only returns to education estimate available for Georgia is due to Yemtsov (2001) in the labor market and inequality context concerning year 1997. The nature of the returns and its implications are still to be considered and the present study intends to fill the existing gap in the literature regarding returns to education in Georgia during middle and late (1997-2006) transition period.

Chapter 3

METHODOLOGY

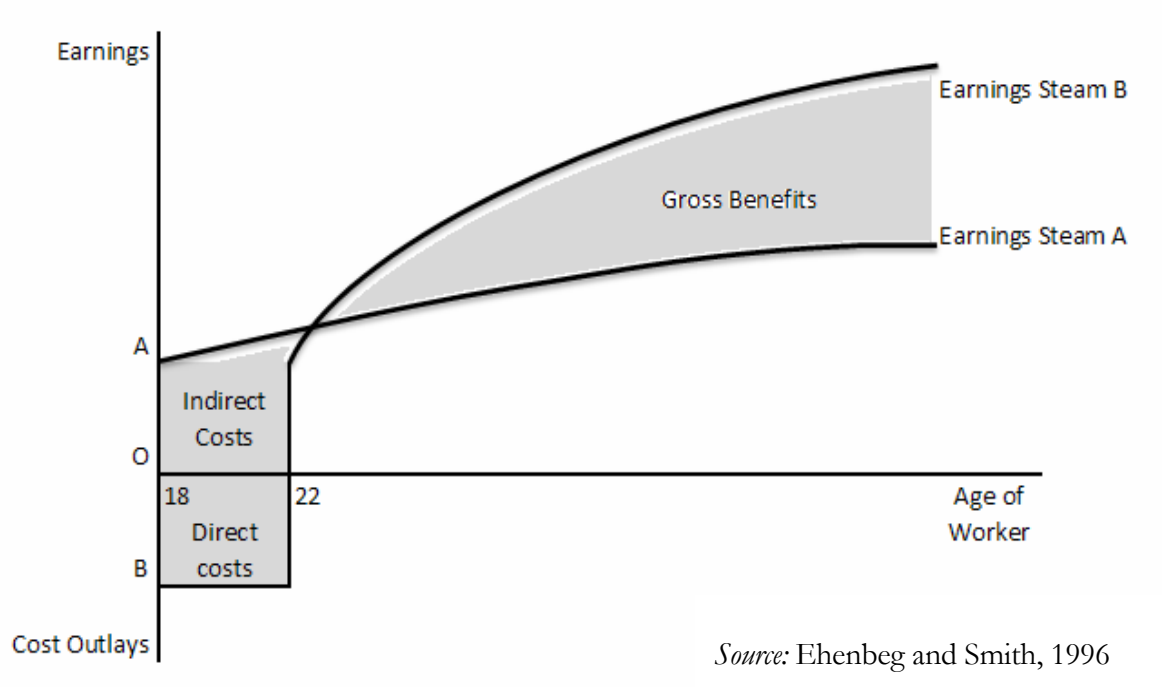
Since acquiring an educational degree is an investment project, it is clear that any rational individual faces the problem of choosing the most profitable educational degree. According to investment theory, the only valid criterion in evaluating the alternative investment projects is the net present value method (Brealey and Myers, 1996). The given method calculates the present value of the steam of future earnings net of project (education level's in this case) costs and enables an individual to choose the alternative which maximizes the present value of lifetime earnings.

In order to illustrate the issue of project profitability evaluation more vividly, consider the behavior of an 18 year-old high school graduate, facing the choice either to continue studies at university/college level or to start working. Figure 3.1 depicts these two alternatives[8]: Earnings steam A represents his/her income following the immediate entrance in the labor force, while curve B shows the earnings associated with obtaining a college degree. It is important to note that before an individual can enjoy the benefits of increased earnings from a college degree, s/he should incur direct (expenses on tuition, materials, transportation, etc) and indirect (forgone earnings) costs[9].

[8] I follow Brojas, 2005 in the given discussion.

[9] Other rather important and significant costs would be psychic costs of education, but since they are hardly measurable, are usually excluded from the analysis.

Figure 3.1: Alternative earnings steams



Source: Ehenbeg and Smith, 1996

The rational choice among these two projects will clearly be in favor of more profitable one. In order to compare and distinguish the best alternative, it is necessary to discount the costs and benefits of both projects, since they are not directly comparable due to differences in time period of earnings and costs. The procedure which allows doing so is called the Net Present Value method and can formally be expressed as:

$$\mathrm{NPV} = \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

Where t is the time of the cash flow, n is the total time of the project (number of years worked), r is the discount rate, C_t - the net cash flow at that point in time. Following the above algorithm, the NPV-s of starting to work at age 18

(NPV_W)[10] or obtaining a college degree (NPV_{COL}) and entering the labor force afterwards will be:

$$NPV_w = W_{W0} + \frac{W_{W1}}{(1+r)} + \frac{W_{W2}}{(1+r)^2} + \cdots + \frac{W_{W47}}{(1+r)^{47}} = \sum_{i=0}^{47} \frac{W_{Wi}}{(1+r)^i}$$

Direct costs of attending college (Tuition fees, material expenses, etc)

Indirect costs of attending college (Earnings forgone)

$$NPV_{COL} = -C_0 - \frac{C_1}{(1+r)} - \frac{C_2}{(1+r)^2} - \frac{C_3}{(1+r)^3} - W_{W0} - \frac{W_{W1}}{(1+r)} - \frac{W_{W2}}{(1+r)^2} - \frac{W_{W3}}{(1+r)^3} +$$

$$+ \frac{W_{COL4}}{(1+r)^4} + \frac{W_{COL5}}{(1+r)^5} + \cdots + \frac{W_{COL47}}{(1+r)^{47}} = -\sum_{i=0}^{3} \frac{C_i}{(1+r)^i} - \sum_{i=0}^{3} \frac{W_{Wi}}{(1+r)^i} + \sum_{i=4}^{47} \frac{W_{COLi}}{(1+r)^i}$$

Post-college earnings steam

Source: Brojas, 2005

where W_{wi} is the i-th period (year) wage of an individual who has chosen to work immediately after high school and W_{COLi} is respectively the i-th period wage of a collage graduate[11].

The decision rule for the individual becomes to choose the projects with positive and higher net present value.

[10] Assuming that legal working age is until 65 and, an individual who chooses to enter the labor force immediately can work for maximum 65-18=47 years.

[11] Since college graduate can start working only at 4th period (assuming duration of the college to be 4 years and no part-time working positions during education), maximum number of years that he/she can work would be 65-18-4=43 years.

From NPV formulation above it could be stated that present oriented individuals, on average, will be less likely to go to college since they discount future earnings heavily. Also, acquiring a college degree during early period of life is more profitable, because individual gets to enjoy its benefits (increased earnings) longer.

Unfortunately, the net present value method is very data intensive technique and it is impossible to apply it to the Georgian Household Survey data[12]. In this context, the most appropriate and convenient method to use would be Mincerian earnings function approach. Mincer's theoretical model initially developed in 1958 treats forgone earnings as only costs to educational projects and seeks to find the internal rate of return, i.e. the rate of return on investments to education which equates the present value of benefits to present value of costs. With the IRR being calculated, the decision rule becomes to choose educational projects whose rate of return (IRR) is greater than the market interest rate. Mincer's structural model resulted in the following econometric specification:

$$lnY_i = \beta_0 + \beta_1 S + e_i$$

Where Y_i is individual earnings, β_0 is the logarithm of earnings of an individual with no schooling[13], S is the number of years studied, and e_i is the error term. β_1 represents the percentage change in income following an increase of schooling by 1 year, i.e. it is marginal (not absolute) rate of return to schooling. As noted by Becker, 1993, it has been hard to distinguish marginal rate of return to schooling (β_1) from the rate of return to schooling leading to the interpretation problem: many researches in the field have compared the marginal rate of

[12] To be able to use this technique, the survey should provide the life-time earnings of the respondents coupled with the individual discount rate for the highest precision.

[13] This can also be thought of a forgone earnings during the time of education;

return to the market interest rate to evaluate the profitability of education with respect to financial investments, when, in fact, the two measures are not comparable. As Curtin and Nelson (1999) state: "the rate of change of profit is not the same entity as the rate of profit". Thus, interpretation of the earnings regression results should be made with caution, especially with respect to public spending on education, because marginal rates of return for higher education may be smaller than market interest rate, not necessarily (conversely in low-income and transition countries[14]) implying that primary and secondary education are more profitable than higher.

Mincer (1974) further elaborated the econometric specification of his model by including experience and its square term to account for on-the-job training - schooling acquired outside the formal educational system.

$$lnY_i = \beta_0 + \beta_1 S + \beta_2 X + \beta_3 X^2 + \varepsilon_i$$

Accordingly, β_2 measures marginal effect of increase in experience[15] (proxy for on-the-job training) on percentage change in earnings. Similarly to β_1, β_2 is expected to be positive since, as human capital theory predicts, schooling (formal and informal) increases productivity which, in turn, results in higher remuneration. β_3, however, is expected to have negative sign because the investment in education, like that in conventional capital, has declining marginal returns and also due to the fact that as age increases (so does the experience), the productivity is being adversely affected by health.

The ease of estimation and interpretation of Mincerian earnings equation comes at a cost. The OLS estimates of the equation are expected to underestimate or

[14] Curtin and Nelson, 1999.

[15] Since few surveys report the length of actual experience of the workers, Mincer proposed to use potential labor market experience measured as Age-6-S.

overestimate the true returns due to the simplifying assumptions like homogeneity of individuals and returns to each schooling year, absence of taxes and problems like heteroskedacticity[16], ability and selection biases associated with the specification.

Individual heterogeneity can be addressed by estimating the extended Mincerian earnings function augmented by educational attainment dummies[17] as strongly advised by Psacharopoulos (1993), additional individual (gender), regional (rural, urban, capital), firm and industry specific characteristics. Also, separate regressions can be estimated for specific groups (man and women, different religions, nationalities, professions, etc.) in order to trace differences and/or similarities among them.

Ability bias is due to the endogeneity of schooling, i.e. individuals with higher unobserved ability tend to choose to acquire more education. Thus, the level of education (years of schooling) is not exogenous or assigned to the individuals at random, but rather determined by their rational, optimizing behavior. As a result, the residuals are correlated with the explicative variable of education (Card, 2000) leading to an upward bias.

The schooling endogeneity can be remedied by either explicitly including the relevant ability measure into the specification or by IV estimation technique. In the later case the variable to be instrumented is education and the instrument,

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[16] It could be shortly mentioned though that robust standard errors estimation technique will be used to account for the unobserved heteroskedasticity as advised by Verbeek, (2000).

[17] The return to j-th educational attainment thus becomes

$$r_j = \frac{\beta_j - \beta_i}{S_j - S_i}$$

where β is the corresponding dummy coefficient and the S is the number of years necessary to acquire the education degree.

while correlated with education, should be orthogonal to the error term of the equation. Unfortunately, the data limitations do not allow tackling the endogeneity problem due to absence of variables that could be used as instruments[18]. However, taking into consideration the evidence from other transition countries[19], the specification is not expected to be flawed with ability bias to large extent since most of the individuals surveyed have received schooling during the soviet period, when access to education was centrally determined and widely available (Arabsheibani and Mussurov, 2005). Also, the absence of proper incentives for education acquisition coupled with compressed wage grid would most likely result in schooling being exogenous.

Another potential flaw is the selection bias. It should be noted that many micro level data suffer the problem when the sample is not randomly drawn from the population. In our case, observations on individuals receiving wages are not randomly drawn from the entire population but rather selected from the employed subpopulation. To handle this issue, Heckman (1979) suggests using two-stage least squares correction method. First stage estimates participation equation as a function of marital status, number of children and standard human capital characteristics. The second stage estimates the earnings equation conditional upon participating. Although the Heckman's correction models is the most frequently used to handle the selection issue, it has some weak points also. As Verbeek (2000) notes "the presence of non-random selection induces a fundamental identification problem and, consequently, the validity of any solution will depend upon the validity of the assumptions that are made..." The strong assumption behind the Heckman's two stage correction model is that the error terms of the equations are uncorrelated. The given assumption can be

[18] Typically, parental education or proximity to college.

[19] Arabsheibani and Mussurov, 2005 and Herasym, 2004 find no evidence of schooling endogeneity in Kazakhstan and Ukraine, respectively.

relaxed in maximum likelihood estimation of selection equation, which obviously becomes superior to the 2 stage procedure.

Further noting the drawbacks of Minceian specification, Heckman, Locher and Todd (2003, 2005) argue that the data of the recent decades is inconsistent with the Mincerian model and stress the need of relaxing some of its assumptions, like absence of income taxes and tuition fees.

Referring to the above mentioned critique and taking into consideration peculiarities of Georgian economy and the data available, I still consider the use of augmented Mincerian earnings function reasonable and most convenient, since until the passage of new tax code (2005) and the education reform (2004) the amount of income taxes and tuition fees paid was negligible[20].

[20] The respondents from the sample have made their educational choices before these changes, thus the reforms were not the determinant factors in their educational decisions.

C h a p t e r 4

EMPIRICAL ANALISIS

4.1 Data Description

The research will be based on the data from Georgian Household Survey conducted between 1997 and 2006 years by the Georgian Department of Statistics, where annually about 5,000 households report their characteristics, expenditures and employment details. Besides the considerable size of the sample (for Georgia which is a small country, it is a sizeable sample), the survey has quite detailed questionnaires, allowing construction of various wage variables[21] and to some extent controlling for differences in the working times. Besides estimating the marginal return to education for the latest period, the 10 year-long duration of the survey also makes studying evolution of returns to education across time possible.

The empirical analysis starts by considering the sample for the year 2006 where 12,292 individuals were interviewed. 9,275 individuals are of legal working age[22] – 5,563 employed and 3,712 without a job. 2,276 employed individuals reported positive earnings[23] that were greater than 30% of minimum wage[24]. The given

[21] Contractual and actually received wages, including/excluding in kind benefits and income from secondary/additional sources; Also, 3 month prior to the interview mean wages can be constructed, again accounting for the fringe benefits and other sources of income.

[22] 16-64 for men and 16-59 for women;

[23] 3087 employed individuals reported zero earnings, which is rather unusual but consistent with the evidence from samples of 1997-2005 years.

subsample consists of 1,357 men and 919 women. Also, in order to isolate educational effects on wages from returns on risk and other determining factors[25] and test whether the returns will be different, the subsample of employed individuals is further restricted to 1,623 contractual workers, consisting of 726 women and 897 men. Table 4.1.1 presents some descriptive statistics of the sample[26].

Table 4.1.1 Means of selected variables, 2006[27]

	Working age sample[28]			Employed sub-sample[29]			Contractual sub-sample[30]		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	37.0	37.5	36.6	41.8	41.6	42.2	41.6	41.2	42.1
Schooling	11.9	11.9	12.0	13.2	12.9	13.6	13.6	13.3	14.0
Full-time				0.9	0.9	0.9	0.9	0.9	0.9
State				0.4	0.3	0.5	0.5	0.4	0.6
Wage				186.6	221.3	135.3	188.5	231.6	135.2
N	**9,275**	**4,513**	**4,762**	**2,276**	**1,357**	**919**	**1,623**	**897**	**726**

[24] The minimum wage of 114 GEL (approx. 70 USD) was introduced in 2006. The minimum wage itself was not chosen as a threshold because it is not rigorously enforced in Georgia and by doing so a significant share of the sample would be excluded from the analysis. Instead, 30% of the minimum wage was used as a cut-off point for full time employees and 15% for the part-time workers.

[25] Self employed – which are included in the employed individuals category may have excess returns on wages over the education level due to entrepreneurial ability and risk. Similarly, a self-employed pheasant may be earning relatively less for his education level than predicted by the models but this may be compensated by reduced expenses on goods produced domestically.

[26] The definitions of the variables are presented in the appendix C;

[27] Refer to the Appendix C for the detailed description of the variables used.

[28] Working age sample consists of all the individuals who reported age eligible for work (16-59 for women, 16-64 for men).

[29] Employed sub-sample consists of employed individuals, both contractual and self-employed;

[30] Contractual sub-sample only consists of individuals from the employed sub-sample who work on the contractual basis.

The mean age across the employed sample is 41.8 years, 41.6 for men and 42.2 for women, respectively. The mean years of schooling is 13.2 years across the given sub-sample, with women being on average more educated than men with mean 13.6 years compared to 12.9 years. Also, employed women are more likely to work at state owned enterprises than men, on average. The mean total monthly earnings are 188.6 GEL across the workers. On average, male employees earn significantly more than females, with the figures of 221.3 GEL and 135.3 GEL respectively. This difference is more pronounced in the contractual sub-sample, where men earn 231.6 GEL while women – 135.2 GEL.

Further consideration of the employed sub-sample by time worked in Table 4.1.2 reveals that, on average, part time workers are older, less educated and earn on average 91.5 GEL less compared to their full time counterparts. Exploring the gender wage differential suggests that, on average, female part-time workers earn significantly less than their male counterparts (127.2 GEL vs. 67.5 GEL) despite the fact that the former are, on average, more educated. A similar relationship is preserved among full time employees, where men have mean wages of 229.7 GEL and women earn 141.5 GEL, on average. A part of this differential can be due to possible differences in actual hours worked[31] and possible discontinuous nature of female participating rates due to maternity leaves. Unfortunately this hypothesis can not be tested due to absence of relevant questions in the survey.

[31] The survey does not ask exact number of hours worked and only enables to construct a dummy for full-time job.

Tables 4.1.2 Means of selected variables by time worked, employed sub-sample, 2006

	Full-time			Part-time		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**
Age	41.7	41.4	42.3	43.0	44.0	41.6
Schooling	13.2	12.9	13.7	12.7	12.5	13.1
State	0.4	0.3	0.5	0.3	0.2	0.4
Wage	194.1	229.7	141.5	102.6	127.2	67.5
N	**2,089**	**1,247**	**842**	**187**	**110**	**77**

Examining the sample by enterprise ownership type (Table 4.1.3) shows that, on average, non-state employees are younger, less educated and more generously remunerated (195.7 GEL vs. 170.2) compared to counterparts from the state sector.

Table 4.1.3 Means of selected variables by enterprise ownership type, employed sub-sample, 2006

	State			Non-state		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**
Age	42.1	41.7	42.5	41.7	41.5	42.0
Schooling	14.3	13.9	14.6	12.6	12.5	12.8
Full-time	0.9	1.0	0.9	0.9	0.9	0.9
Wage	170.2	220.9	126.3	195.7	221.5	143.3
N	**811**	**376**	**435**	**1,465**	**981**	**484**

Table 4.1.4 presents the educational attainment statistics for the working age sample and employed and contractual sub-samples. The figures reinforce the evidence that Georgians place very high emphasis[32] on education with 21% of the working age sample possessing higher education. The share of individuals holding bachelor's or higher degree increases to 40% for employed sub-sample

[32] UNDP Human Development Report, 2000.

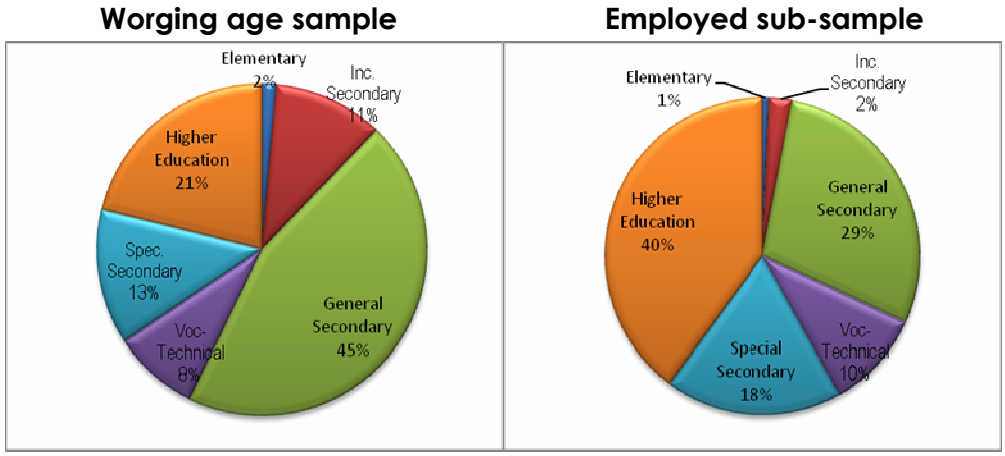
and to 48% for contractual sub-sample. The share of women with higher education is larger in every sample, reaching the peak in contractual sub-sample, where 55% of females posses bachelor's degree of higher. The cumulative share of individuals having incomplete secondary education or lower is under 4% in employed and contractual sub-samples.

Table 4.1.4 Distribution of education shares, 2006

	Working age sample			Employed sub-sample			Contractual sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	1.4	1.2	1.6	0.7	0.7	0.5	0.6	0.8	0.3
Inc. Secondary	10.8	11.0	10.7	2.4	2.9	1.6	1.9	2.2	1.5
General Secondary	45.0	47.1	43.1	28.9	35.7	18.8	22.4	30.4	12.4
Voc-Technical	8.4	9.6	7.2	9.9	12.1	6.8	9.1	10.8	6.9
Special Secondary	13.3	10.4	15.9	18.3	14.4	23.9	17.7	13.4	23.1
Higher Education	21.1	20.8	21.5	39.9	34.2	48.3	48.4	42.4	55.8
N	**9,275**	**4,513**	**4,762**	**2,276**	**1,357**	**919**	**1,623**	**897**	**726**

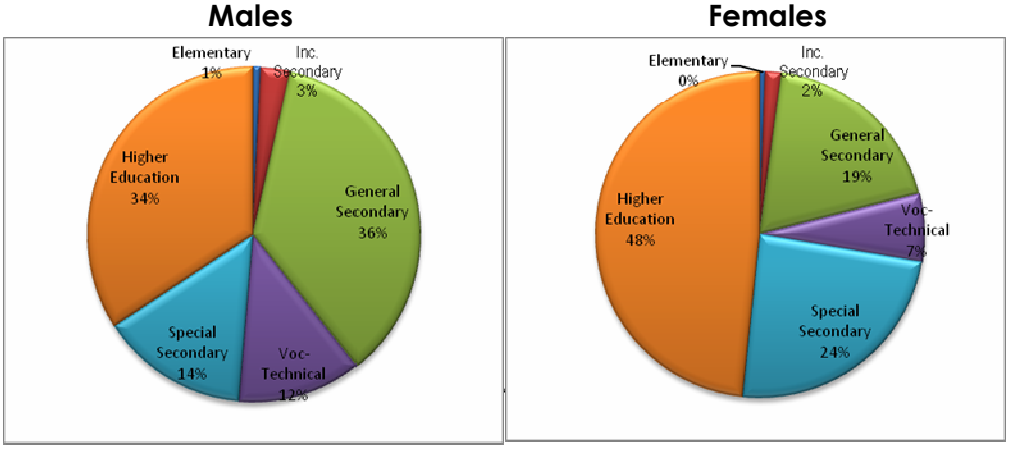
In order to asses how representative the employed sub-sample is for the working age sample in education composition, Figure 4.1.1 presents the pie-charts of education shares for both groups. The share of individuals with incomplete secondary education decreases from 11% to 2 % as the working-age sample is restricted to employed individuals. Similarly, the share of people possessing general secondary education also decreases with more pronounced drop to 29% from 45%. Conversely, the percentage of individuals with vocational technical and special secondary education increases to 10% and 18% respectively. The share of highly educated individuals almost doubles from 21% to 40% suggesting a clear link between education and employment.

Figure 4.1.1 Education shares, working age sample and employed sub-sample, 2006



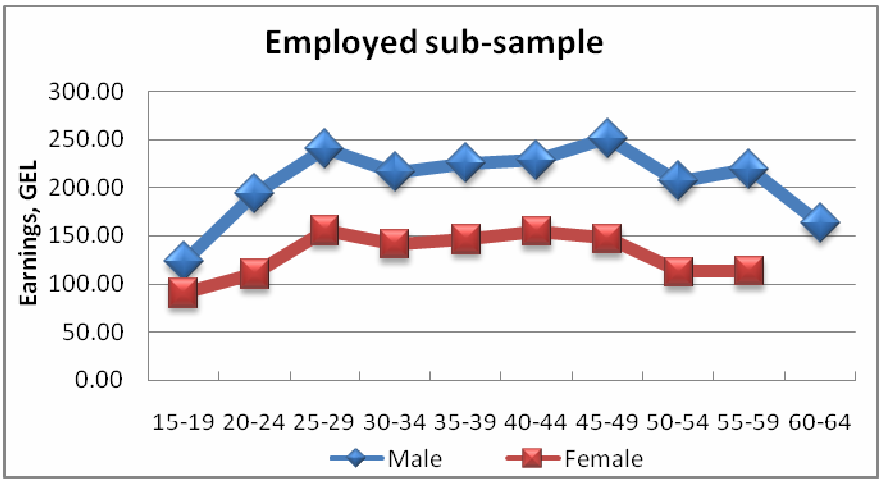
A more detailed consideration of employed-sub sample by gender (Figure 4.1.2) reveals that men have higher share of secondary school graduates and smaller portion of individuals with vocational-technical and special-secondary education. The slight difference in share of university graduates between men and women in the working-age sample is substantially amplified in the employed sub-sample, where share of females holding bachelor's degree or higher is 48% while the corresponding portion of males constitutes to 34%.

Figure 4.1.2 Education shares by gender, employed sub-sample, 2006



Elaborating further on the observed wage-gender differential in Table 3.1.1-3, Figure 3.1.3 presents the age-earnings profiles for male and female employees. The graph suggests that men from the employed sub-sample have higher mean earnings than women in each age category. Other than differences in time worked mentioned above, this fact can be attributed to the self selection by individuals into different professions. i.e. males and females choose different professions (highly remunerated vs. low-paid) which in turn yields differences in earnings. Unfortunately, the GHS questionnaire does not allow controlling for the professions and testing this hypothesis.

Figure 4.1.3 Age-earnings profiles by gender, 2006



The breakdown of age-earnings profiles by educational levels separately for men and women is presented in figures 3 and 4. The patterns coincide with prediction of human capital theory stating that more educated individuals (higher education vs. secondary and vocational) earn more as a result of

improved productivity. The steeper age-earning profiles of more educated individuals are also consistent with the theory, reflecting the compensation for the foregone earnings and implied costs in terms of higher remuneration (slopes).

Figure 4.1.4 Age-earnings profiles by education attainment, 2006

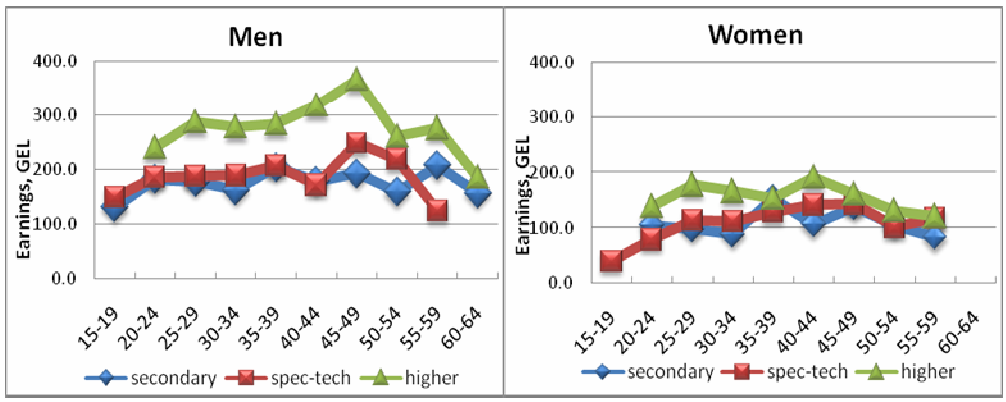
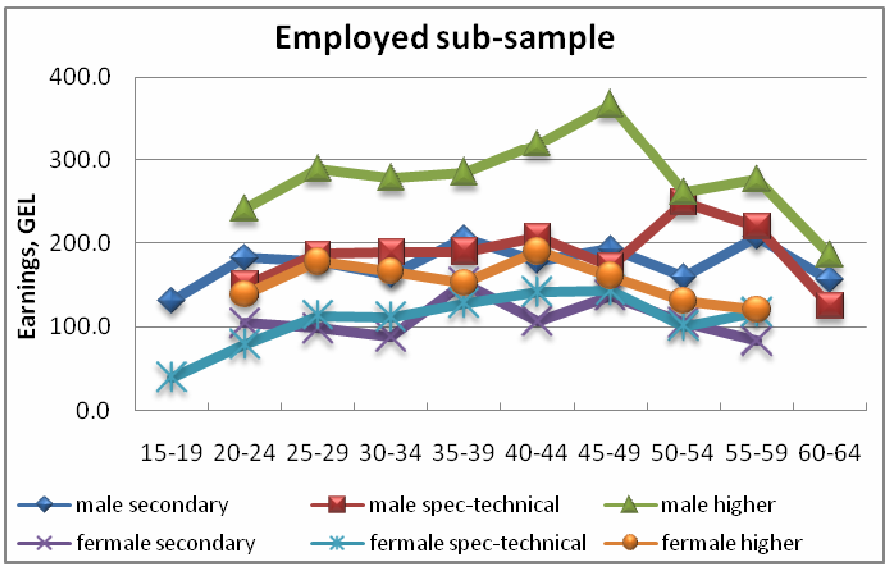


Figure 4.1.5 collates previous two graphs and displays age-earnings profiles by education for both genders. The mean wages for women with higher education are smaller then remuneration received by males with secondary education. This finding is consistent with the evidence from Ukraine (Herasym, 2004) where again females with university degree earned less than males with secondary education. Men with higher education have the highest age-earning profiles, suggesting that transitional Georgia repeats the finding observed in Russia by Nesterova and Sabirianova (1998) rewarding this group the most.

Figure 4.1.5 Age-earnings profiles by gender and education attainment, 2006



4.2 Private returns to education in 2006

Following the common approach used in the literature, econometric analysis of private marginal returns to education starts by estimating the basic Mincerian function, where, as described in the methodology part, logarithm of wages[33] is regressed on years of schooling, age[34], its square term and a gender dummy (Table 4.2.1).

Table 4.2.1 Basic Mincerian Earnings equation, 2006

	Employed sample			Contractual sub-sample		
	Full	Men	Women	Full	Men	Women
e_schooling	0.0694***	0.0819***	0.0509***	0.0753***	0.0822***	0.0652***
	(0.0059)	(0.0077)	(0.0088)	(0.0068)	(0.0090)	(0.010)
age	0.0415***	0.0337***	0.0572***	0.0330***	0.0302**	0.0376*
	(0.0098)	(0.012)	(0.017)	(0.012)	(0.014)	(0.019)
age2	-0.005***	-0.004***	-0.007***	-0.005***	-0.004**	-0.0052**
	(0.0012)	(0.0014)	(0.0021)	(0.0014)	(0.0017)	(0.0023)
female	-0.526***			-0.574***		
	(0.029)			(0.034)		
Constant	3.506***	3.491***	2.945***	3.637***	3.583***	3.143***
	(0.21)	(0.25)	(0.37)	(0.24)	(0.30)	(0.41)
Observations	2276	1357	919	1623	897	726
R-squared	0.16	0.09	0.05	0.19	0.10	0.07

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The basic model explains 16% of the variation in actual wages, a figure which is comparable to other studies in the literature. Substantial part of the explained variation is attributed to the gender dummy, as the R^2 for the separate regressions for men and women is 0.09 and 0.05 respectively. According to the

[33] Refer to the Appendix C for the detailed description of the variables used.

[34] Since the survey does not have an explicit question for the labor market experience, age is used as a proxy.

given specification, on average, an additional year of education is associated with annual 8.2% increase in earnings for men and 5.1% for women, with difference being significant[35] at 1% significance level. The difference in marginal rates of return to schooling is less pronounced in contractual sub-sample, where marginal rate of return increases to 6.5% for women. Women, on average, earn 53% less than men in the employed sub-sample and 55% less in the contractual sub-sample. On average, a year increase in age is associated with 3.4% rise in wages for males, and 5.3% for females. Age-squared has a negative sign as expected, capturing the concavity of age-earnings profiles.

As the given specification is rather parsimonious and even naïve in the sense that it assumes away all other factors influencing wage, the analysis proceeds by augmenting the basic Mincerian model with additional explanatory variables like enterprise ownership, controls for the regions and time worked (Table 4.2.2).

[35] Whether the estimates differed significantly can be tested manually by dividing the difference between the estimates by the square root from the sum of their variances. If the obtained value (t-statistic) is greater than 2 or less then -2, the difference is significant.

Table 4.2.2 Extended Mincerian Earnings equation, 2006

	Employed sample			Contractual sub-sample		
	Full	Men	Women	Full	Men	Women
e_schooling	0.0680***	0.0706***	0.0621***	0.0742***	0.0734***	0.0721***
	(0.0060)	(0.0078)	(0.0094)	(0.0069)	(0.0092)	(0.010)
age	0.0405***	0.0323***	0.0543***	0.0306***	0.0284**	0.0346*
	(0.0094)	(0.012)	(0.016)	(0.011)	(0.014)	(0.018)
age2	-0.005***	-0.004***	-0.007***	-0.004***	-0.004**	-0.0048**
	(0.0011)	(0.0014)	(0.0020)	(0.0014)	(0.0017)	(0.0022)
female	-0.499***			-0.532***		
	(0.027)			(0.032)		
state	-0.174***	-0.154***	-0.205***	-0.161***	-0.159***	-0.171***
	(0.030)	(0.042)	(0.044)	(0.034)	(0.048)	(0.050)
fulltime	0.568***	0.499***	0.662***	0.581***	0.461***	0.718***
	(0.050)	(0.066)	(0.074)	(0.065)	(0.093)	(0.089)
r_kaxeti	-0.168***	-0.200***	-0.114	-0.161***	-0.180**	-0.128
	(0.051)	(0.067)	(0.076)	(0.062)	(0.092)	(0.080)
r_tbilisi	0.261***	0.307***	0.192***	0.269***	0.317***	0.224***
	(0.042)	(0.056)	(0.065)	(0.049)	(0.069)	(0.073)
r_s_qartli	0.0520	0.0521	0.0463	0.0527	0.0923	0.0249
	(0.065)	(0.090)	(0.088)	(0.075)	(0.11)	(0.100)
r_q_qartli	0.0155	-0.0472	0.115	0.0581	0.0120	0.134
	(0.049)	(0.063)	(0.077)	(0.059)	(0.081)	(0.087)
r_samcxe_javxt	-0.0455	-0.149	0.0530	-0.0331	-0.0752	0.00792
	(0.076)	(0.12)	(0.095)	(0.088)	(0.15)	(0.11)
r_adjara	0.0781	0.0741	0.0821	0.100	0.116	0.101
	(0.056)	(0.075)	(0.079)	(0.070)	(0.10)	(0.096)
r_guria	-0.192**	-0.183*	-0.222*	-0.193**	-0.167	-0.224**
	(0.078)	(0.11)	(0.11)	(0.080)	(0.12)	(0.11)
r_samegrelo	-0.0252	-0.110	0.0941	0.00961	-0.0454	0.103
	(0.064)	(0.087)	(0.091)	(0.080)	(0.12)	(0.11)
r_mcxeta_mtiant	0.275***	0.341***	0.190**	0.253***	0.369***	0.128
	(0.063)	(0.086)	(0.091)	(0.073)	(0.10)	(0.099)
Constant	2.965***	3.142***	2.238***	3.085***	3.207***	2.447***
	(0.21)	(0.25)	(0.36)	(0.24)	(0.31)	(0.40)
Observations	2276	1357	919	1623	897	726
R-squared	0.27	0.20	0.19	0.29	0.20	0.21

Robust standard errors in parentheses

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

As the controls for additional factors influencing wage are introduced, the explanatory power of the full model rises to 27%. More precise marginal return to additional year of schooling is estimated to be 7.1% for men and 6.2% for women for the employed sub-sample, with the difference being statistically insignificant. The observation of men and women having insignificantly different marginal returns is inconsistent with international evidence, where women, on average, have higher marginal returns to education compared to men. Relying on evidence from large number of countries, where female marginal rates of return to education are higher than for men, Psacharopoulos (1993) states that educating females is, on the margin, more profitable than males. However the Georgian data suggests that, both genders enjoy similar return to additional year of schooling.

The gender earnings differential decreases slightly to 50% for employed sub-sample and to 53% for contractual sub-sample. State sector employees are likely to receive lower wages (-17%) than non-state workers, with the difference more pronounced in the female sub-sample. Working full-time, on average, is associated with +50% earnings for men and +66% for women in the employed sub-sample. Again, the difference is larger in contractual sub-sample, where the corresponding estimates are +46% and +72% respectively.

The estimates also suggest that, on average, residents of capital receive significantly higher wages than individuals living in the regions. Among those residing in Tbilisi, on average, men earn 10% more than women, with the difference being significant at 5% significance level. The region with highest adverse effects on earnings is found to be Guria, where, on average, individuals receive wages 20% less than residences of Imereti, the region chosen as a base category. The difference is again significant at 5% significance level.

The inclusion of years of schooling as a measure of education into the above specifications assumes homogeneous return to each year of schooling. In order to introduce non-linearity in schooling and explore returns to concrete education levels, Table 4.2.3 presents logarithm of earnings regressed on stream of dummies standing for highest educational attainment together with other explanatory variables.

Table 4.2.3 Extended Mincerian Earnings equation for specific education levels, 2006

	Employed sample			Contractual sub-sample		
	Full	Men	Women	Full	Men	Women
e_voc_technical	0.0512	0.0429	0.0686	0.0407	0.0266	0.0341
	(0.050)	(0.062)	(0.084)	(0.062)	(0.082)	(0.093)
e_spec_secondary	0.0425	0.0422	0.0279	0.0418	0.0441	0.0104
	(0.039)	(0.054)	(0.058)	(0.048)	(0.070)	(0.071)
e_higher	0.376***	0.385***	0.350***	0.405***	0.409***	0.367***
	(0.035)	(0.045)	(0.054)	(0.041)	(0.053)	(0.065)
age	0.0443***	0.0372***	0.0561***	0.0352***	0.0345**	0.0365**
	(0.0094)	(0.012)	(0.016)	(0.011)	(0.014)	(0.018)
age2	-0.005***	-0.004***	-0.007***	-0.004***	-0.004**	-0.005**
	(0.0011)	(0.0014)	(0.0019)	(0.0014)	(0.0017)	(0.0022)
female	-0.499***			-0.531***		
	(0.027)			(0.032)		
state	-0.185***	-0.165***	-0.220***	-0.173***	-0.17***	-0.18***
	(0.031)	(0.043)	(0.045)	(0.035)	(0.049)	(0.050)
fulltime	0.574***	0.505***	0.668***	0.578***	0.456***	0.721***
	(0.050)	(0.067)	(0.073)	(0.065)	(0.093)	(0.088)
Observations	2276	1357	919	1623	897	726
R-squared	0.27	0.21	0.20	0.30	0.21	0.22

Robust standard errors in parentheses

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

Note: Constant and controls for the regions included in the regression but omitted from the table for ease of perception. See Table E.1 in Appendix E for the complete version.

The omitted category in the model is secondary education[36], the return to which is not statistically different from return to vocational-technical and specialized secondary levels. Higher education does have significant wage premium associated with it. Following Clark, 2000[37] the private marginal rate of return to higher education is calculated to be 7.7% for males and 7% for females, with the difference being statistically insignificant. Marginal returns to higher education rise if contractual sub-sample is considered, with male returns of 8.2% and corresponding estimate of 7.3% for women.

Besides increasing wages, education also increases the probability of being employed and decreases the unemployment spells. In this context, the simple OLS procedure is likely to underestimate the true effect of education on earnings, since it does not account for decreased unemployment hazard. The Heckman Selection model is estimated by Maximum Likelihood procedure to remedy the sample selection problem. By the given method, participation and earnings equations are estimated jointly. Marital status and size of the household along with the explanatory variables from the earnings equation are assumed to be determinant factors of individual participation in the labor force. It is expected that being married will most likely affect male labor force participation positively while having opposite effect on female participation due to child bearing. The effect of household size is less clear intuitively: from one consideration the bigger the household, more resources it needs, causing working age members to participate in wage earning activities intensively. From the other point, however, larger household means fewer obligations to each member, decreasing the need for employment.

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[36] Elementary and incomplete secondary education categories where recoded into general secondary due to small variation (elementary – 9 obs, inc. secondary – 36 obs) that would lead to large standard errors and small t-statistics.

[37] See footnote 17 for the description;

Table 4.2.4 Heckman Selection Model for specific educational levels, 2006, ML estimation

	Employed				Contractual			
	Men		Women		Men		Women	
COEFFICIENT	ln_wage	employed	ln_wage	employed	ln_wage	employed	ln_wage	employed
e_voc_technical	-0.00690	0.399***	0.0469	0.272***	-0.0444	0.443***	-0.0027	0.535***
	(0.063)	(0.065)	(0.085)	(0.093)	(0.086)	(0.080)	(0.097)	(0.10)
e_spec_technical	0.00793	0.234***	-0.0256	0.685***	0.00202	0.249***	-0.0479	0.859***
	(0.056)	(0.060)	(0.070)	(0.063)	(0.072)	(0.073)	(0.090)	(0.075)
e_higher	0.329***	0.409***	0.279***	0.912***	0.318***	0.597***	0.289***	1.188***
	(0.050)	(0.046)	(0.077)	(0.056)	(0.066)	(0.054)	(0.10)	(0.066)
age	0.000102	0.201***	0.0398*	0.230***	-0.0026	0.184***	0.0255	0.193***
	(0.019)	(0.0100)	(0.021)	(0.014)	(0.022)	(0.012)	(0.022)	(0.016)
age2	-0.0004	-0.023***	-0.005**	-0.024***	-0.0002	-0.02***	-0.0039	-0.019***
	(0.0022)	(0.0012)	(0.0024)	(0.0018)	(0.0026)	(0.0014)	(0.0025)	(0.0020)
state	-0.158***		-0.22***		-0.17***		-0.18***	
	(0.043)		(0.044)		(0.048)		(0.050)	
fulltime	0.500***		0.669***		0.447***		0.721***	
	(0.066)		(0.073)		(0.090)		(0.087)	
HH_size		-0.0234*		-0.019		-0.0188		-0.00865
		(0.013)		(0.015)		(0.015)		(0.017)
married		0.547***		-0.325***		0.456***		-0.347***
		(0.052)		(0.045)		(0.060)		(0.049)
athrho	-0.385**		-0.197		-0.392**		-0.163	
	(0.16)		(0.17)		(0.19)		(0.17)	
lnsigma	-0.416***		-0.521***		-0.410***		-0.534***	
	(0.035)		(0.031)		(0.046)		(0.032)	
rho	-0.367		-0.194		-0.374		-0.161	
	(0.138)		(0.16)		(0.16)		(0.168)	
sigma	0.660		0.594		0.664		0.586	
	(0.023)		(0.019)		(0.031)		(0.019)	
lambda	-0.242		-0.115		-0.248		-0.095	
	(0.098)		(0.097)		(0.116)		(0.1)	
LR Test	0.0160		0.2364		0.0351		0.3443	
Observations	**1357**	**2826**	**919**	**3162**	**897**	**2366**	**729**	**2969**

Robust standard errors in parentheses

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

Note: Constant and controls for the regions included in the regression but omitted from the table for ease of perception. See Table E.3 in Appendix E for the complete version.

The Table 4.2.4 presents the joint estimation results of earnings and labor force participation equations. As expected, education increases the probability of having a job while being married increases the given probability for men and decreases it for women. Household size has negative effect on the probability of being employed, but the effect is only significant at 10% significance level for

men from employed sub-sample. The chances of being employed also increase with age, on average.

The estimates of arthro (inverse hyperbolic tangent of rho, correlation between the equations) and lnsigma (logarithm of earnings equation's standard error) are presented in the middle section of the table. The lambda coefficient or the summarized selectivity term is the multiple of rho and sigma. The Wald test reported at the bottom of the table is equivalent test of rho=0 and is computationally the comparison of the joint likelihood of an independent probit model for the selection equation and a regression model on the observed wage data against the Heckman selection model likelihood. According to the test, the correlation coefficients are significant at 5% significance level for men what justifies the use of Heckman selection correction model. In contrast, selection bias is not present in female sub-samples, meaning that OLS estimates are more efficient.

The corresponding selection bias removed estimates of annual private marginal returns to higher education for men are 6.6% and 6.4% for the employed and contractual sub-samples. The fact that the given estimates are insignificantly different from the corresponding OLS estimates is inconsistent with the international evidence where the coefficients which account for the selection are systematically higher than what is suggested by OLS.

While the given chapter studied the returns to education in Georgia for the year 2006, the next section will consider the evolution of these returns during the period of 1997-2006.

4.3 Evolution of private returns to education in 1997-2006

The given section extends the analysis presented in the previous chapter by examining the evolution of returns during the last decade. The Tables D.1-5 in Appendix D present the descriptive statistics of the 1997-2006 samples.

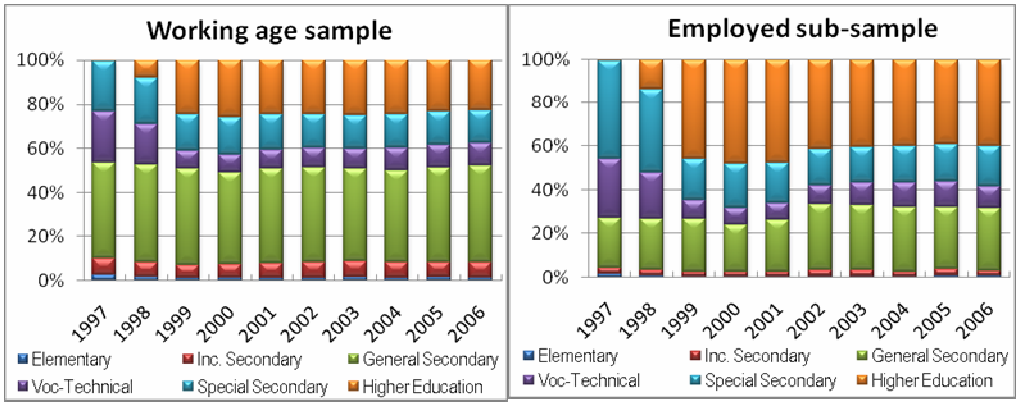
The average age of the individuals in the working age sample and employed sub-sample remained stagnant during the 1997-2006 years (Figure D. 1, Appendix D). It varied slightly around 42 years for working age sample and around 37 for employed sub-sample. The share of employed individuals working full time has increased from 60% to 91% (Figure D.3) reflecting improved work opportunities, while the percentage of labourers employed at state owned enterprises has declined from 77% in 1997 to 36% in 2006 due to privatization of state owned enterprises and job creation in the private sector (Figure D.4). As a result, the mean nominal wages have increased from 66 to 221 GEL for men and from 36 to 135 GEL for women (Figure D.2).

The educational composition of the working age sample and employed sub-samples (Figure 4.3.1) was inert during the previous 10 year period with the exception of 1997-1998 years. The unusually low shares of individuals with higher education (0.5% in 1997, 13.5% in 1998) do not fit in the overall educational composition of the Georgian population, one-third of which posses bachelor's or higher degree.[38] The given low figures are most likely linked to the sampling procedures for the newly initiated Georgian Household Survey at that time[39].

[38] Arabsheibani and Mussurov, 2005.

[39] Georgian Department of Statistics started conducting Household Survey from 3rd quarter of year 1996.

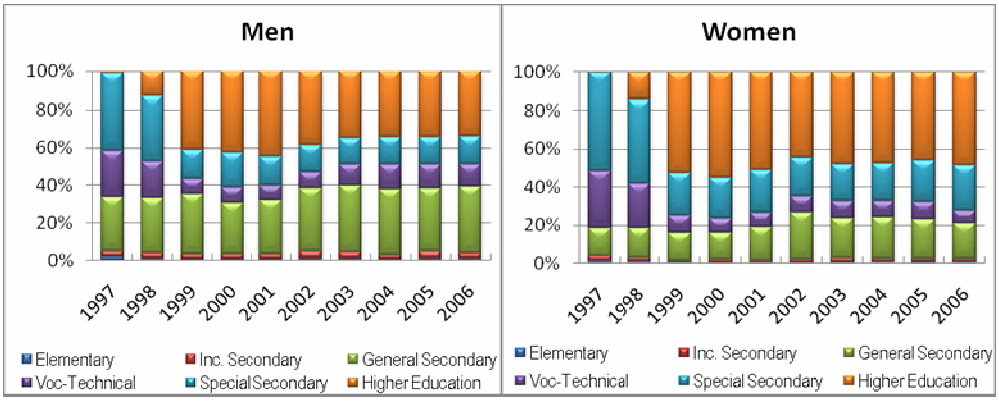
Fgure 4.3.1 Educational composition between 1997-2006



The Figure 4.3.1 also exhibits that educational attainment of the employed sub-sample is systematically higher than that of working age sample, once again indicating the positive correlation between education and employment.

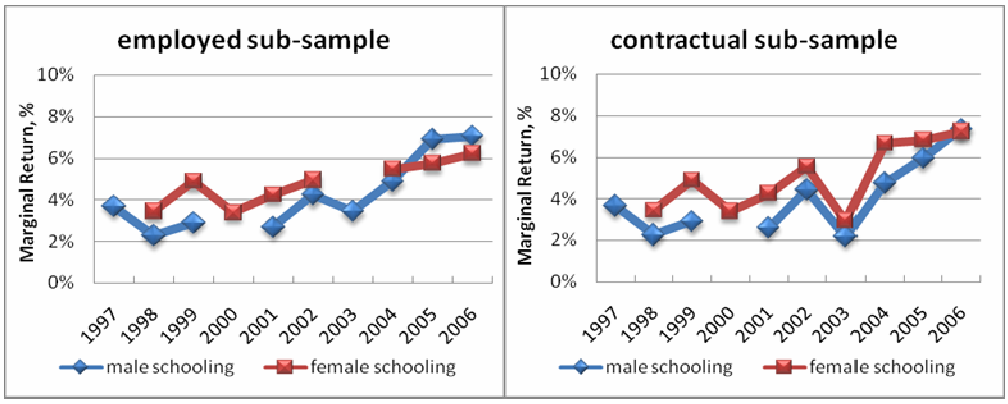
The observed systematic difference in educational attainment is also preserved in the employed sub-sample, where women, on average, are more educated than their male counterparts (Figure 4.3.2). This fact can be partially explained by the findings from the previous chapter, where women were shown to be earning twice as less than men, on average. Smaller remuneration would most likely make education for Georgian women less expensive due to lesser opportunity costs and would result in females being more educated than males.

Figure 4.3.2 Educational composition by gender, employed sub-sample, 1997-2006



Figures 4.3.3-4 plot the estimates of marginal private returns to additional year of schooling for years 1997-2006 for both, employed and contractual sub-samples. The estimates are obtained by, as in previous section, regressing the logarithm of wages on human capital variables and controls like region of residence, time worked and enterprise ownership type. The selection bias was not present in the female sub-samples but was confirmed for men. However, since the estimation for some years did not converge (2004-years of schooling specification, 2000-education attainment dummies specification, both for men) and the difference between the coefficients of OLS and ML estimation was not significant, Figures 4.3.3-4 report OLS estimates. The estimates in the figures are estimated by robust variance estimator procedure and are significantly different from zero at 5% significance level.

Figure 4.3.3 Marginal private returns to additional year of schooling, 1997-2006



The marginal private rate of return to additional year of schooling for employed men, which is estimated to be 3.7% in 1997, decreases slightly in 1998 and exhibits a steady increasing trend afterwards. The difference between the initial value in 1997 and subsequent estimates is not significantly different from zero

until year 2005, where, on average, an additional year of schooling increases male earnings by 7%. The corresponding estimates for women are slightly higher initially, with difference being insignificant and follow the similar tendency, namely, they are also characterized by a clear increasing trend.

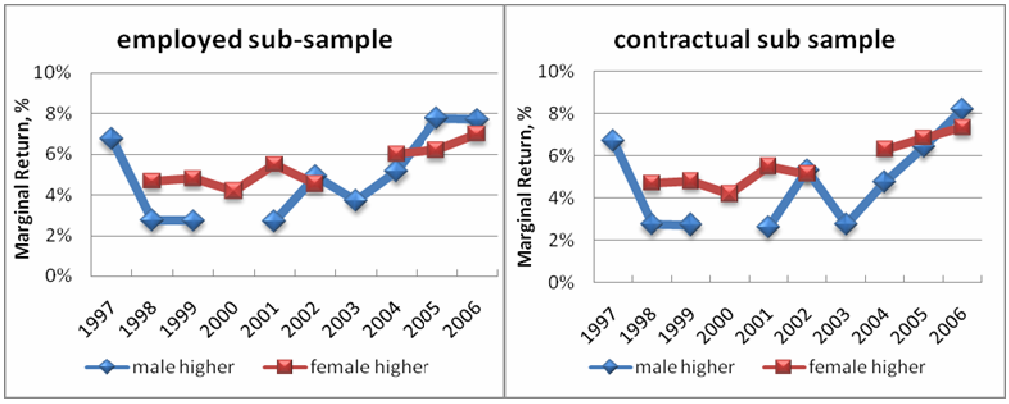
The returns to contractual workers are more volatile: the dips and spikes are pronounced and significantly different from each other. Overall, the increasing tendency is analogous to the one observed in the employed sub-sample. The upward sloping nature of the returns for both sub-samples is most likely due to the improved working opportunities following the transition process.

While the returns to additional years of schooling were considered mainly for purposes of cross-country comparison[40], figure 4.3.4 displays the evolution of annual private marginal returns to higher education for employed and contractual sub-samples. The dip from year 1997 to 1998 observed in figure 3.3.3 is amplified into a significant drop in returns to higher education from 6.7% to 2.7% for men in both sub-samples. The given sharp decline can be partially attributed to the adverse spillovers of Russian financial crisis in 1998 to Georgian economy. The following 3 years (1999-2001) show almost no variation in marginal private returns to higher education for males, followed by a significant spike in 2002 amounting to 5%. Following year 2004, both sub-samples exhibit steady increasing trend in returns to higher education, more pronounced for men. This contrasts evidence from previous years, when women had insignificantly but still higher returns than men. The data suggests that after 2003, other things equal, the

[40] The duration and specifics of education levels may vary across countries, making comparison of the returns to educational attainments difficult. In this context, the years of schooling specification is usually more convenient. In this context it should be noted that returns to education in Georgia were and still are modest compared to CEE and Russia, reflecting the slow pace of transition and poor labor market reforms;

Georgian economy began increasingly rewarding individuals with higher education.

Figure 4.3.4 Marginal private returns to additional year of higher education, 1997-2006



Chapter 5

CONCLUSIONS

The goal of the given thesis was to study the marginal private returns to education in Georgia in 2006 and to consider the evolution of these returns during the last decade using the data from Georgian Household Survey. Selection bias-removed Mincerian rates of return to an additional year of schooling were estimated to be 6.2% both for men and women in the year 2006. When a more precise method was used, specifying education as a string of dummies, the marginal private returns to higher education were the largest compared to other educational levels and constituted 6.6% for men and 7% for women, with the difference being insignificant. The returns to education were found to be similar between employed and contractual sub-samples, suggesting that, other things equal, self-employed individuals do not enjoy excess return over education for their entrepreneurial skills.

In contrast with the evidence from developed countries and in line with the data from other transition economies, marginal private returns to education in Georgia were found to increase with the educational attainment, indicating that incentives to acquire higher education are in place. Despite the fact that the magnitude of these returns is modest compared to other transition states, pointing that labor market reforms in the country are lagging behind, the confirmed hypothesis of increasing marginal returns to education across time supports the presence of incentives to acquire education, suggesting that, other things equal, education in Georgia gets increasingly valued as the transition process progresses.

The given work could not account for the quality of education and possible endogeneity of schooling due to data limitations. These issues clearly deserve a separate study, and this thesis can be considered as a departure point in the given direction. Another interesting topic for further research is the significant gender earnings differentials observed during the analysis. Devoting a separate study to it will shed more light on earnings inequality between men and women in Georgia.

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APPENDIX A

STRUCTURE OF EDUCATION SYSTEM IN GEORGIA[41]

- ***Pre-higher education:***
  - *Duration of compulsory education:*
    - *Age of entry: 6*
    - *Age of exit: 14*
  - *Structure of school system:*
    - *Elementary*
      - *Type of school providing this education: Elementary school*
      - *Length of program in years: 6*
      - *Age level from: 6 to: 12*
    - *Basic*
      - *Type of school providing this education: Basic School*
      - *Length of program in years: 2*
      - *Age level from: 12 to: 14*
    - *Technical Elementary*
      - *Type of school providing this education: Elementary Technical and Vocational School*
      - *Length of program in years: 2*
      - *Age level from: 12 to: 14*
    - *Secondary*
      - *Type of school providing this education: Secondary School*
      - *Length of program in years: 3*
      - *Age level from: 14 to: 17*
    - *Technical Secondary*
      - *Type of school providing this education: Technical and Vocational Secondary School*
      - *Length of program in years: 3*
      - *Age level from: 14 to: 17*
    - *Special Education*

[41] Source: http://www.euroeducation.net/prof/goergco.htm

- *Type of school providing this education: Special Secondary School*
- *Length of program in years: 3*
- *Age level from: 14 to: 17*

- ***University level studies:***

  - *University level first stage: Bakalavris Kharishki:*
    - *The duration of the first stage is usually four years. Students are awarded a Bakalavris Khariskhi (Bachelor's degree). Students with excellent marks are awarded a Diplomi Tsarchinebit (Diploma with Honour).*
  - *University level second stage: Magistris Khariskhi:*
    - *The second stage leads to the award of a Magistris Khariskhi (Master's degree) after two years' study. Students with excellent marks are awarded a Diplomi Tsarchinebit (Diploma with Honour).*
  - *University level third stage: Aspirantura:*
    - *Students who have obtained a Diplomi Tsarchinebit at the second stage may continue to study in Aspirantura. It comprises at least three years' study and ends with the presentation and defence of a thesis and leads to the Metsnierebata Kandidati (equivalent to the PhD).*
  - *University level fourth stage: Metsnierebata Doktori:*
    - *The highest degree is the Metsnierebata Doktori (degree of Doctor of Science) which is conferred after defending a thesis which is the result of independent scientific research in any field. Students may prepare for the degrees of Metsnierabata Kandidati or Doktori in only certain specialized institutions*

School education:

Elementary education lasts for six years. Secondary school education lasts for three years. The document certifying completion of secondary school is the Sashualo Skolis Atestati. Technical and vocational upper secondary education lead, after two to four years, to the Prophesiul-Teknikuri Sastsavleblis Diplomi. Special secondary education leads to the Sashualo Specialuri Sastsavleblis Diplomi. All three diplomas give access to higher education. Candidates, however, must sit for a competitive entrance examination (Misagebi Gamotsdebi).

Higher education:

There are twenty-six public higher education institutions in Georgia - eight universities and fourteen technical and specialized institutes. In addition, 209 private higher education institutions have been established recently. Studies in some 300 different specialities are offered in higher education institutions. They include fields which are highly specific such as the study of Kartvelian languages (related to Georgian) and Caucasian languages, as well as traditional Science and Technology subjects. Technical and specialized institutes offer studies in Metallurgy, Cableway and Railway Transport, Chemical and Food Technology, and Wine Making, Silkworm Breeding, the growing of tea and citrus fruits. Courses in Fine Arts (Theatre, Cinematography, Painting, and Sculpture) are provided by specialized higher education institutions.

Main laws/decrees governing higher education:

Decree: Law on Education of Georgia Year: 1997
Concerns: administrative structure of higher education

Decree: On the Status of State Higher Education Institutions in Georgia
Year: 1991
Concerns: Higher Education Institutions
Decree: Plan of Urgent Measures to be carried out in Field of Education
Year: 1993

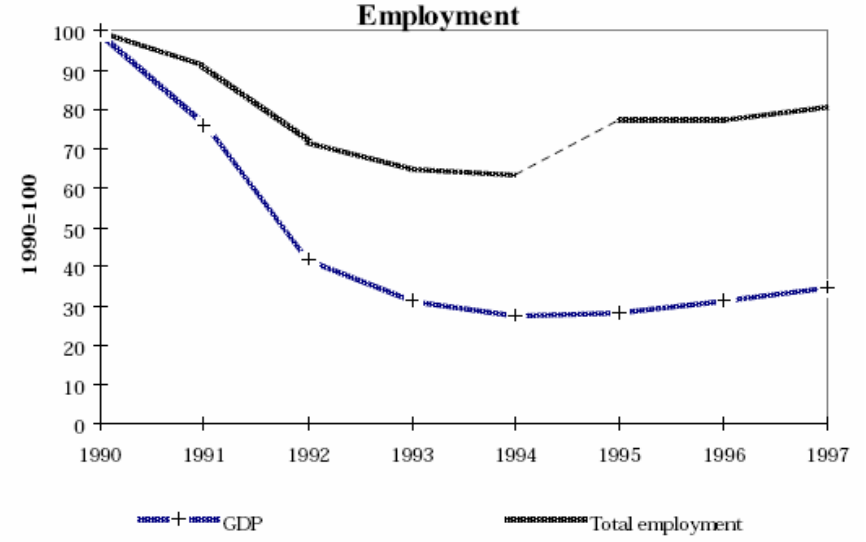
Academic year:
Classes from: Sep to: Jun
Long vacation from: Jul to: Sep

Languages of instruction: *Abkhazian, Azerbaijani, Armenian, Georgian, Russian, English, German*

APPENDIX B

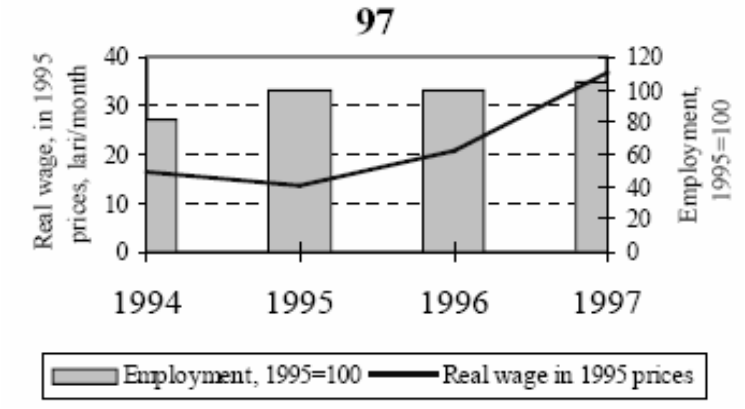
FIGURES FROM OTHER STUDIES

Figure B.1 Georgia: Total Output of the Economy and Employment



Source: Yemtsov, 2001

Figure B.2 Real wages and employment 1994-97



Source: Yemtsov, 2001

APPENDIX C

DEFINITIONS OF THE VARIABLES USED

age	- age of the respondent;
age2	- age-squared;
e_schooling	- number of years of schooling received by the respondent;
e_higher	- dummy variable with value 1 if the respondent's highest educational attainment is higher education, 0 otherwise;
e_secondary	- dummy variable with value 1 if the respondent's highest educational attainment is general secondary education, 0 otherwise;
e_spec_secondary	- dummy variable with value 1 if the respondent's highest educational attainment is special secondary education, 0 otherwise;
e_voc_technical	- dummy variable with value 1 if the respondent's highest educational attainment is vocational-technical education, 0 otherwise;
female	- dummy variable with value 1 if the respondent is female, 0 otherwise;
fulltime	- dummy variable with value 1 if the respondent works fulltime, 0 otherwise;
HH_size	- number of individuals living in the respondent's household;
ln_wage	- logarithm of Wage, which is defined as the total earnings (wage received from primary and secondary workplaces, in-kind benefits and other income from additional wage earning activities) received during the month prior to the interview;

married	- dummy variable with value 1 if the respondent is in registered or non-registered marriage, 0 otherwise;
r_adjara	- dummy variable with value 1 if the respondent is lives in Adjara region, 0 otherwise;
r_guria	- dummy variable with value 1 if the respondent is lives in Guria region, 0 otherwise;
r_imereti	- dummy variable with value 1 if the respondent is lives in Imereti region, 0 otherwise;
r_kaxeti	- dummy variable with value 1 if the respondent is lives in Kahketi region, 0 otherwise;
r_mcxeta_mtiant	- dummy variable with value 1 if the respondent is lives in Mckheta-mtianeti region, 0 otherwise;
r_q_qartli	- dummy variable with value 1 if the respondent is lives in Qvemo Qartli region, 0 otherwise;
r_s_qartli	- dummy variable with value 1 if the respondent is lives in Shida Qartli region, 0 otherwise;
r_samegrelo	- dummy variable with value 1 if the respondent is lives in Samegrelo region, 0 otherwise;
r_samcxe_javxt	- dummy variable with value 1 if the respondent is lives in Samckhe Javakheti region, 0 otherwise;
r_tbilisi	- dummy variable with value 1 if the respondent is lives in Tbilisi (the capital), 0 otherwise;
state	- dummy variable with value 1 if 50% or more of the enterprise where the respondent works in owned by the state, 0 otherwise;

APPENDIX D

DESCRIPTIVE STATISTICS, 1997-2006

Table D.1 Means of selected variables, working age samples and employed sub-samples, 1997-1998

	1997						1998					
	Working-age sample			Employed sub-sample			working-age sample			employed sub-sample		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	37.7	38.6	36.8	41.3	42.3	40.0	37.5	38.4	36.7	40.8	41.3	40.0
Schooling	11.1	11.1	11.2	11.6	11.5	11.7	11.6	11.5	11.6	12.2	12.1	12.3
Full-time				0.6	0.7	0.5				0.7	0.8	0.6
State				0.8	0.7	0.8				0.7	0.7	0.8
Wage				53.4	66.0	36.5				67.2	81.1	48.2
N	**9,470**	**4,745**	**4,725**	**2,066**	**1,180**	**886.0**	**10,265**	**5,207**	**5,058**	**2,416**	**1,396**	**1,020**

Table D.2 Means of selected variables, working age samples and employed sub-samples, 1999-2000

	1999						2000					
	Working-age sample			Employed sub-sample			Working-age sample			Employed sub-sample		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	37.62	38.34	36.88	41.41	41.52	41.25	37.01	38.06	36	41.08	41.67	40.34
Schooling	12.2	12.13	12.27	13.49	13.20	13.88	12.17	12.12	12.22	13.62	13.32	13.99
Full-time				0.73	0.83	0.60				0.68	0.79	0.55
State				0.59	0.50	0.71				0.62	0.56	0.70
Wage				76.97	91.93	56.65				79.58	98.97	55.10
N	**10,724**	**5,418**	**5,306**	**2,151**	**1,239**	**912**	**10,527**	**5,203**	**5,324**	**1,926**	**1,075**	**851**

Table D.3 Means of selected variables, working age samples and employed sub-samples, 2001-2002

	2001						2002					
	Working-age sample			Employed sub-sample			Working-age sample			Employed sub-sample		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	36.9	37.8	36.0	41.3	41.9	40.5	37.2	38.1	36.3	41.4	41.6	41.2
Schooling	12.1	12.1	12.2	13.6	13.4	13.8	12.1	12.0	12.1	13.2	13.0	13.5
Full-time				0.7	0.8	0.5				0.7	0.8	0.6
State				0.6	0.6	0.7				0.5	0.4	0.6
Wage				86.2	107.4	59.5				117.9	143.9	82.6
N	**10,060**	**5,004**	**5,056**	**1,921**	**1,072**	**849.0**	**10,556**	**5,222**	**5,334**	**2,487**	**1,433**	**1,054**

Table D.4 Means of selected variables, working age samples and employed sub-samples, 2003-2004

	2003						2004					
	Working-age sample			Employed sub-sample			Working-age sample			Employed sub-sample		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	37.2	37.9	36.5	41.4	41.2	41.5	37.1	37.5	36.7	41.9	41.6	42.3
Schooling	12.0	12.0	12.1	13.2	12.9	13.6	12.1	12.0	12.1	13.2	12.9	13.6
Full-time				0.9	0.9	0.9				0.9	0.9	0.9
State				0.2	0.1	0.2				0.3	0.2	0.5
Wage				129.0	158.2	87.5				142.2	169.9	102.0
N	**11,312**	**5,552**	**5,760**	**2,881**	**1,691**	**1,190**	**11,195**	**5,467**	**5,728**	**2,952**	**1,749**	**1,203**

Table D.5 Means of selected variables, working age samples and employed sub-samples, 2005-2006

	2005						2006					
	Working-age sample			Employed sub-sample			Working-age sample			Employed sub-sample		
	Full	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Age	37.1	37.5	36.8	41.8	41.5	42.3	37.0	37.5	36.6	41.8	41.6	42.2
Schooling	12.0	12.0	12.0	13.1	12.8	13.5	11.9	11.9	12.0	13.2	12.9	13.6
Full-time				0.9	0.9	0.9				0.9	0.9	0.9
State				0.3	0.3	0.5				0.4	0.3	0.5
Wage				162.9	193.4	117.3				186.6	221.3	135.3
N	**11,017**	**5,412**	**5,605**	**2,937**	**1,762**	**1,175**	**9,275**	**4,513**	**4,762**	**2,276**	**1,357**	**919.0**

Figure D.1 Mean age, 1997-

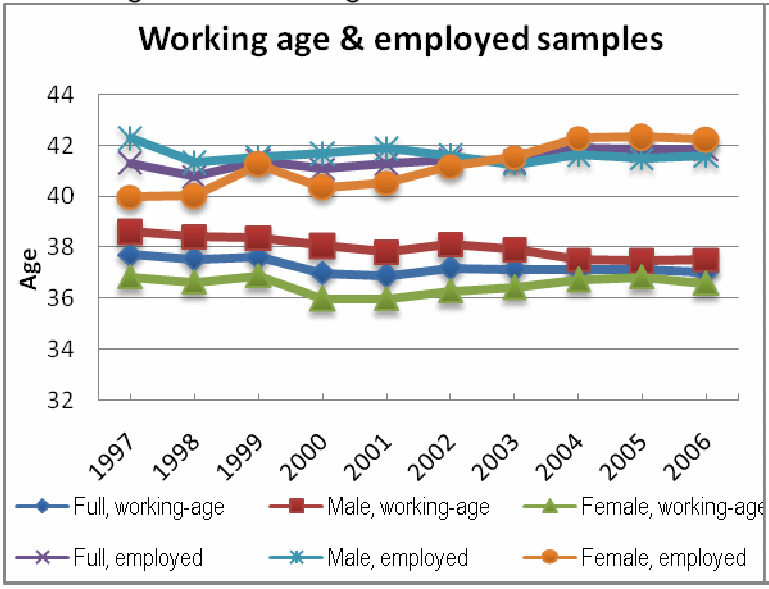


Figure D.2 Average nominal wage, 1997-2006

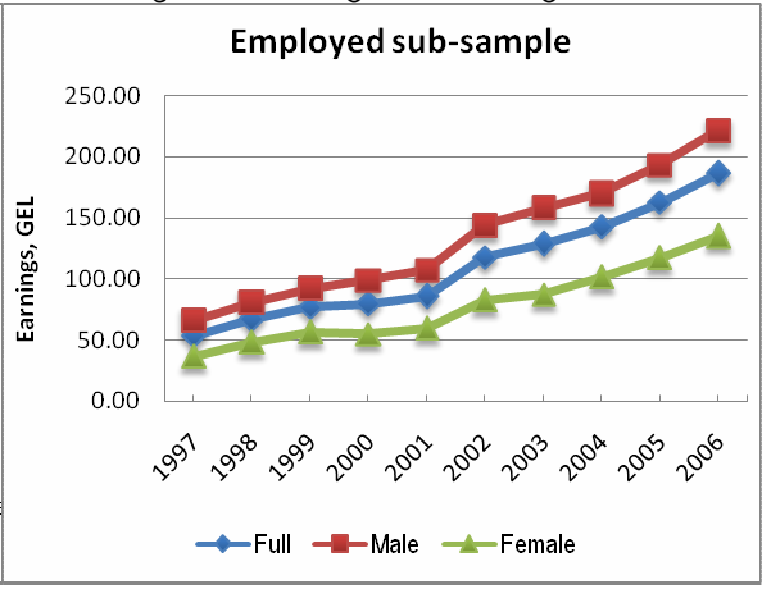


Figure D.3 Share of individuals working full time, 1997-2006

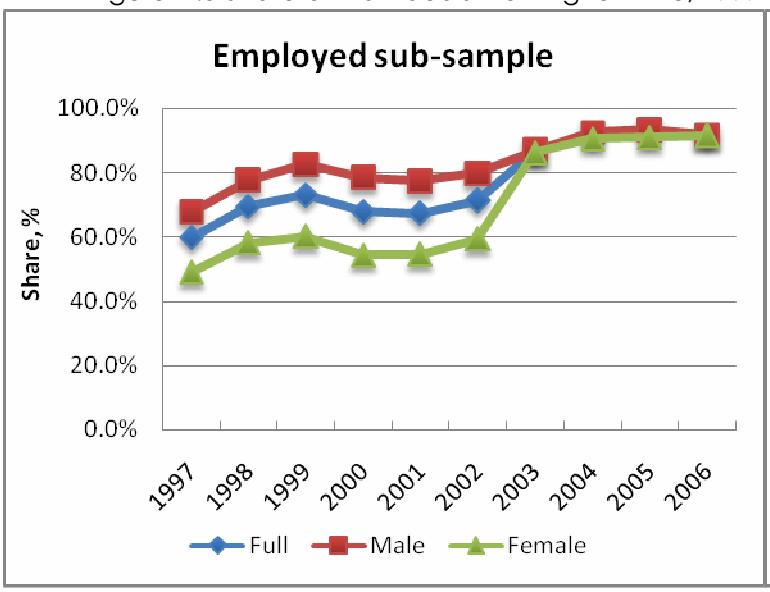


Figure D.4 Share of individuals working at state-owned enterprises

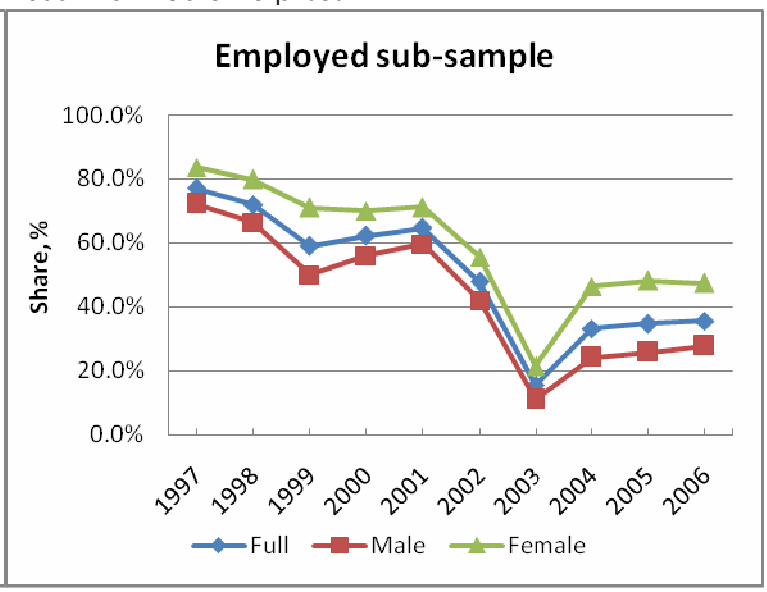


Table D.6 Distribution by education shares, employed sub sample 1997-1998.

	1997						1998					
	Working age sample			Employed sub-sample			Working age sample			Employed sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	2.74	3.41	1.95	1.7	2.0	1.2	1.87	1.82	1.94	0.8	0.6	1.0
Inc. Secondary	7.34	7.19	7.52	3.0	3.1	2.7	6.47	6.42	6.53	2.7	3.2	2.0
General Secondary	43.58	44.89	42.05	22.7	28.7	14.6	44.38	46.57	41.63	23.4	29.2	15.4
Voc-Technical	23.12	21.39	25.17	26.8	24.6	29.8	18.46	17.41	19.78	21.2	19.4	23.5
Special Secondary	22.7	22.51	22.91	45.4	40.9	51.5	20.89	20.03	21.98	38.5	34.6	43.8
Higher Education	0.52	0.62	0.4	0.5	0.8	0.2	7.93	7.75	8.14	13.5	13.0	14.3
N	**6,569**	**3,549**	**3,020**	**2,066**	**1,180**	**886**	**6,989**	**3,895**	**3,094**	**2,416**	**1,396**	**1,020**

Table D.7 Distribution by education shares, employed sub sample 1999-2000.

	1999						2000					
	Working age sample			Employed sub-sample			Working age sample			Employed sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	1.19	1.44	0.88	0.5	0.4	0.6	1.3	1.37	1.21	0.3	0.4	0.2
Inc. Secondary	5.99	6.15	5.8	2.0	2.8	0.9	6.04	6.59	5.39	2.3	3.0	1.4
General Secondary	43.53	45.14	41.57	24.6	32.0	14.5	41.6	42.7	40.2	21.3	27.0	14.2
Voc-Technical	8.45	8.62	8.24	8.5	7.9	9.2	8.42	9.34	7.33	7.9	8.3	7.5
Special Secondary	16.33	14.02	19.14	18.6	15.7	22.5	17	15.5	18.9	19.9	18.6	21.6
Higher Education	24.52	24.64	24.37	45.9	41.1	52.4	25.6	24.5	26.9	48.2	42.8	55.0
N	**7,080**	**3,888**	**3,192**	**2,151**	**1,239**	**912**	**6,853**	**3,716**	**3,137**	**1,926**	**1,075**	**851**

Table D.8 Distribution by education shares, employed sub sample 2001-2002.

	2001						2002					
	Working age sample			Employed sub-sample			Working age sample			Employed sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	1.26	1	1.58	0.4	0.4	0.4	1.27	1.34	1.18	0.5	0.8	0.2
Inc. Secondary	6.63	7.01	6.18	2.1	3.1	0.9	7.3	7.5	7.06	3.0	4.0	1.6
General Secondary	43	43.8	42.1	23.8	28.5	17.9	42.9	45.2	40	30.0	33.7	25.0
Voc-Technical	8.35	9.07	7.49	7.7	8.0	7.3	8.63	9.17	7.96	8.4	8.4	8.4
Special Secondary	16	13.9	18.5	18.3	15.0	22.4	15.6	13.4	18.3	16.9	14.3	20.5
Higher Education	24.7	25.2	24.1	47.7	45.0	51.1	24.4	23.4	25.6	41.2	38.8	44.4
N	**6,562**	**3,583**	**2,979**	**1,921**	**1,072**	**849**	**6,463**	**3,586**	**2,877**	**2,487**	**1,433**	**1,054**

Table D.9 Distribution by education shares, employed sub sample 2002-2003.

	2003						2004					
	Working age sample			Employed sub-sample			Working age sample			Employed sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	1.69	1.57	1.84	0.6	0.7	0.4	1.43	1.28	1.6	0.5	0.5	0.5
Inc. Secondary	7.3	7.66	6.84	3.1	3.7	2.3	7.15	6.91	7.42	2.1	2.3	1.8
General Secondary	41.7	43.7	39.3	29.5	35.5	21.0	41.5	43.5	39.2	29.7	35.2	21.9
Voc-Technical	9.31	10.4	7.98	10.3	11.3	8.8	10.1	11.3	8.78	11.2	12.9	8.7
Special Secondary	15.2	13	18	16.2	13.8	19.7	15.2	13.1	17.7	16.7	14.6	19.6
Higher Education	24.8	23.7	26.1	40.3	35.0	47.8	24.6	23.9	25.4	39.8	34.5	47.6
N	**7,100**	**3,943**	**3,157**	**2,881**	**1,691**	**1,190**	**7,151**	**3,905**	**3,246**	**2,952**	**1,749**	**1,203**

Table D.10 Distribution by education shares, employed sub sample 2003-2004.

	2005						2006					
	Working age sample			Employed sub-sample			Working age sample			Employed sub-sample		
Education	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**	**Full**	**Male**	**Female**
Elementary	1.52	1.15	1.98	0.9	0.8	0.9	1.42	1.12	1.79	0.7	0.7	0.5
Inc. Secondary	6.72	6.66	6.8	3.0	4.0	1.5	6.92	6.83	7.03	2.4	2.9	1.6
General Secondary	43	45	40.5	28.2	33.4	20.5	44	46.5	41.1	28.9	35.7	18.8
Voc-Technical	10.6	11.9	9.07	11.6	13.1	9.5	10.2	11.7	8.34	9.9	12.1	6.8
Special Secondary	14.9	12.2	18.1	17.3	14.4	21.5	14.8	11.8	18.5	18.3	14.4	23.9
Higher Education	23.3	23.1	23.6	39.0	34.3	46.1	22.6	22.1	23.3	39.9	34.2	48.3
N	**6,842**	**3,755**	**3,087**	**2,937**	**1,762**	**1,175**	**5,563**	**3,044**	**2,519**	**2,276**	**1,357**	**919**

APPENDIX E

REGRESSION TABLES

Table E.1 Extended Mincerian Earnings equation for specific education levels, 2006

	Employed sample			Contractual sub-sample		
	Full	Men	Women	Full	Men	Women
e_voc_technical	0.0512	0.0429	0.0686	0.0407	0.0266	0.0341
	(0.050)	(0.062)	(0.084)	(0.062)	(0.082)	(0.093)
e_spec_secondary	0.0425	0.0422	0.0279	0.0418	0.0441	0.0104
	(0.039)	(0.054)	(0.058)	(0.048)	(0.070)	(0.071)
e_higher	0.376***	0.385***	0.350***	0.405***	0.409***	0.367***
	(0.035)	(0.045)	(0.054)	(0.041)	(0.053)	(0.065)
age	0.0443***	0.0372***	0.0561***	0.0352***	0.0345**	0.0365**
	(0.0094)	(0.012)	(0.016)	(0.011)	(0.014)	(0.018)
age2	-0.005***	-0.004***	-0.007***	-0.004***	-0.0043**	-0.005**
	(0.0011)	(0.0014)	(0.0019)	(0.0014)	(0.0017)	(0.0022)
female	-0.499***			-0.531***		
	(0.027)			(0.032)		
state	-0.185***	-0.165***	-0.220***	-0.173***	-0.172***	-0.182***
	(0.031)	(0.043)	(0.045)	(0.035)	(0.049)	(0.050)
fulltime	0.574***	0.505***	0.668***	0.578***	0.456***	0.721***
	(0.050)	(0.067)	(0.073)	(0.065)	(0.093)	(0.088)
r_kaxeti	-0.173***	-0.211***	-0.108	-0.167***	-0.194**	-0.123
	(0.051)	(0.067)	(0.077)	(0.061)	(0.091)	(0.080)
r_tbilisi	0.252***	0.297***	0.188***	0.261***	0.305***	0.219***
	(0.043)	(0.057)	(0.066)	(0.050)	(0.070)	(0.073)
r_s_qartli	0.0539	0.0585	0.0403	0.0578	0.101	0.0225
	(0.064)	(0.091)	(0.088)	(0.075)	(0.11)	(0.099)
r_q_qartli	-0.00291	-0.0647	0.0940	0.0424	0.000680	0.107
	(0.049)	(0.064)	(0.077)	(0.060)	(0.082)	(0.087)
r_samcxe_javxt	-0.0427	-0.149	0.0612	-0.0283	-0.0744	0.0170
	(0.076)	(0.12)	(0.095)	(0.087)	(0.15)	(0.11)
r_adjara	0.0773	0.0698	0.0878	0.102	0.116	0.107
	(0.056)	(0.075)	(0.079)	(0.070)	(0.10)	(0.097)
r_guria	-0.193**	-0.185*	-0.223**	-0.192**	-0.172	-0.218**
	(0.078)	(0.11)	(0.11)	(0.080)	(0.12)	(0.11)
r_samegrelo	-0.0238	-0.111	0.102	0.0147	-0.0437	0.112
	(0.064)	(0.088)	(0.091)	(0.080)	(0.12)	(0.11)
r_mcxeta_mtiant	0.265***	0.339***	0.174*	0.254***	0.369***	0.126
	(0.062)	(0.085)	(0.089)	(0.073)	(0.10)	(0.099)
Constant	3.627***	3.812***	2.876***	3.811***	3.896***	3.217***
	(0.19)	(0.24)	(0.33)	(0.23)	(0.29)	(0.37)
Observations	2276	1357	919	1623	897	726
R-squared	0.27	0.21	0.20	0.30	0.21	0.22

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table E.2 Heckman Selection Model with flat measure of schooling, 2006, ML estimation

	Full				Contractual			
	Men		Women		Men		Women	
COEFFICIENT	ln_wage	employed	ln_wage	employed	ln_wage	employed	ln_wage	employed
e_schooling	0.0616***	0.0685***	0.0548***	0.140***	0.0600***	0.0982***	0.0629***	0.178***
	(0.0086)	(0.0082)	(0.013)	(0.0094)	(0.012)	(0.010)	(0.016)	(0.011)
age	-0.00415	0.203***	0.0425**	0.239***	-0.00555	0.186***	0.0249	0.209***
	(0.018)	(0.010)	(0.021)	(0.014)	(0.024)	(0.012)	(0.022)	(0.015)
age2	0.000111	-0.023***	-0.0056**	-0.0253***	0.000210	-0.021***	-0.00377	-0.022***
	(0.0021)	(0.0012)	(0.0024)	(0.0018)	(0.0027)	(0.0014)	(0.0025)	(0.0019)
state	-0.147***		-0.205***		-0.154***		-0.171***	
	(0.042)		(0.044)		(0.048)		(0.049)	
fulltime	0.493***		0.663***		0.452***		0.718***	
	(0.065)		(0.073)		(0.091)		(0.088)	
r_kaxeti	-0.239***	0.375***	-0.117	0.0764	-0.215**	0.316***	-0.132*	0.119
	(0.070)	(0.080)	(0.076)	(0.083)	(0.094)	(0.10)	(0.079)	(0.093)
r_tbilisi	0.332***	-0.182***	0.200***	-0.19***	0.323***	-0.0360	0.230***	-0.110
	(0.057)	(0.061)	(0.066)	(0.067)	(0.069)	(0.073)	(0.072)	(0.074)
r_s_qartli	0.0789	-0.182**	0.0524	-0.0988	0.107	-0.0942	0.0356	-0.168
	(0.091)	(0.092)	(0.088)	(0.10)	(0.11)	(0.11)	(0.10)	(0.12)
r_q_qartli	-0.0693	0.192***	0.108	0.146*	-0.0122	0.212**	0.126	0.199**
	(0.063)	(0.070)	(0.077)	(0.084)	(0.081)	(0.086)	(0.087)	(0.095)
r_samcxe_javxt	-0.123	-0.163	0.0355	0.401***	-0.0558	-0.0954	-0.0107	0.450***
	(0.12)	(0.11)	(0.097)	(0.10)	(0.15)	(0.13)	(0.11)	(0.12)
r_adjara	0.100	-0.193***	0.0884	-0.0752	0.162	-0.318***	0.109	-0.124
	(0.075)	(0.073)	(0.078)	(0.087)	(0.10)	(0.093)	(0.095)	(0.097)
r_guria	-0.138	-0.333***	-0.238**	0.368***	-0.130	-0.253*	-0.242**	0.398***
	(0.11)	(0.13)	(0.12)	(0.13)	(0.12)	(0.15)	(0.11)	(0.14)
r_samegrelo	-0.0937	-0.0646	0.0878	0.164*	-0.0117	-0.198*	0.102	0.0641
	(0.087)	(0.087)	(0.091)	(0.094)	(0.12)	(0.11)	(0.11)	(0.11)
r_mcxeta_mtiant	0.358***	-0.108	0.174*	0.248**	0.365***	0.0506	0.110	0.295***
	(0.086)	(0.099)	(0.094)	(0.10)	(0.10)	(0.11)	(0.10)	(0.11)
HH_size		-0.0245*		-0.0174		-0.0183		-0.00895
		(0.013)		(0.015)		(0.015)		(0.016)
married		0.552***		-0.34***		0.461***		-0.357***
		(0.052)		(0.044)		(0.059)		(0.049)
Constant	4.168***	-5.002***	2.672***	-7.11***	4.270***	-5.273***	2.871***	-7.220***
	(0.47)	(0.21)	(0.63)	(0.28)	(0.65)	(0.26)	(0.68)	(0.30)
athrho	-0.372**		-0.134		-0.351*		-0.130	
	(0.15)		(0.16)		(0.20)		(0.17)	
lnsigma	-0.417***		-0.522***		-0.414***		-0.531***	
	(0.033)		(0.027)		(0.046)		(0.030)	
rho	-0.356		-0.133		-0.337		-0.129	
	(0.133)		(0.159)		(0.177)		(0.164)	
sigma	0.659		0.593		0.661		0.588	
	(0.022)		(0.016)		(0.03)		(0.017)	
lambda	-0.235		-0.079		-0.223		-0.076	
	(0.094)		(0.095)		(0.126)		(0.098)	
LR Test	0.0141		0.4074		0.0789		0.4358	

Observations	**1357**	**2826**	**919**	**3162**	**897**	**2366**	**729**	**2969**

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table E.3 Heckman Selection Model for specific educational levels, 2006, ML estimation

	Full				Contractual			
	Men		Women		Men		Women	
COEFFICIENT	ln_wage	employed	ln_wage	employed	ln_wage	employed	ln_wage	employed
e_voc_technical	-0.00690	0.399***	0.0469	0.272***	-0.0444	0.443***	-0.0026	0.535***
	(0.063)	(0.065)	(0.085)	(0.093)	(0.086)	(0.080)	(0.097)	(0.10)
e_spec_technical	0.00793	0.234***	-0.0256	0.685***	0.00202	0.249***	-0.0479	0.859***
	(0.056)	(0.060)	(0.070)	(0.063)	(0.072)	(0.073)	(0.090)	(0.075)
e_higher	0.329***	0.409***	0.279***	0.912***	0.318***	0.597***	0.289***	1.188***
	(0.05)	(0.046)	0.077	(0.056)	(0.066)	(0.054)	(0.10)	(0.066)
age	0.000102	0.201***	0.0398*	0.230***	-0.0026	0.184***	0.0255	0.193***
	(0.019)	(0.0100)	(0.021)	(0.014)	(0.022)	(0.012)	(0.022)	(0.016)
age2	-0.0004	-0.023***	-0.005**	-0.024***	-0.0002	-0.02***	-0.0039	-0.019***
	(0.0022)	(0.0012)	(0.0024)	(0.0018)	(0.0026)	(0.0014)	(0.0025)	(0.0020)
state	-0.158***		-0.22***		-0.17***		-0.18***	
	(0.043)		(0.044)		(0.048)		(0.050)	
fulltime	0.500***		0.669***		0.447***		0.721***	
	(0.066)		(0.073)		(0.090)		(0.087)	
r_kaxeti	-0.250***	0.373***	-0.112	0.0717	-0.231**	0.301***	-0.128	0.123
	(0.070)	(0.079)	(0.076)	(0.084)	(0.092)	(0.100)	(0.080)	(0.093)
r_tbilisi	0.320***	-0.166***	0.202***	-0.221***	0.311***	-0.0295	0.227***	-0.133*
	(0.057)	(0.062)	(0.066)	(0.068)	(0.070)	(0.073)	(0.073)	(0.074)
r_s_qartli	0.0894	-0.207**	0.0473	-0.072	0.122	-0.119	0.0351	-0.157
	(0.091)	(0.093)	(0.088)	(0.10)	(0.11)	(0.11)	(0.099)	(0.12)
r_q_qartli	-0.0881	0.192***	0.0825	0.154*	-0.0265	0.206**	0.0959	0.216**
	(0.065)	(0.070)	(0.077)	(0.085)	(0.083)	(0.086)	(0.087)	(0.096)
r_samcxe_javxt	-0.125	-0.136	0.0379	0.372***	-0.0571	-0.0643	-0.0038	0.418***
	(0.12)	(0.11)	(0.098)	(0.10)	(0.15)	(0.13)	(0.11)	(0.11)
r_adjara	0.0953	-0.185**	0.0938	-0.037	0.169	-0.325***	0.114	-0.0856
	(0.075)	(0.073)	(0.079)	(0.087)	(0.10)	(0.093)	(0.096)	(0.097)
r_guria	-0.138	-0.341***	-0.248**	0.367***	-0.128	-0.274*	-0.239**	0.388***
	(0.11)	(0.13)	(0.11)	(0.12)	(0.12)	(0.15)	(0.11)	(0.14)
r_samegrelo	-0.0936	-0.0760	0.0897	0.203**	-0.0064	-0.201*	0.109	0.106
	(0.088)	(0.087)	(0.091)	(0.093)	(0.12)	(0.12)	(0.11)	(0.11)
r_mcxeta_mtiant	0.355***	-0.0975	0.154*	0.215**	0.365***	0.0540	0.106	0.280**
	(0.086)	(0.099)	(0.091)	(0.10)	(0.10)	(0.11)	(0.10)	(0.11)
HH_size		-0.0234*		-0.019		-0.0188		-0.00865
		(0.013)		(0.015)		(0.015)		(0.017)
married		0.547***		-0.325***		0.456***		-0.347***
		(0.052)		(0.045)		(0.060)		(0.049)
Constant	4.769***	-4.280***	3.392***	-5.593***	4.917***	-4.233***	3.619***	-5.266***

	(0.44)	(0.20)	(0.54)	(0.27)	(0.54)	(0.23)	(0.57)	(0.30)
athrho	-0.385**		-0.197		-0.392**		-0.163	
	(0.16)		(0.17)		(0.19)		(0.17)	
lnsigma	-0.416***		-0.521***		-0.410***		-0.534***	
	(0.035)		(0.031)		(0.046)		(0.032)	
rho	-0.367		-0.194		-0.374		-0.161	
	(0.138)		(0.16)		(0.16)		(0.168)	
sigma	0.660		0.594		0.664		0.586	
	(0.023)		(0.019)		(0.031)		(0.019)	
lambda	-0.242		-0.115		-0.248		-0.095	
	(0.098)		(0.097)		(0.116)		(0.1)	
LR Test	0.0160		0.2364		0.0351		0.3443	
Observations	**1357**	**2826**	**919**	**3162**	**897**	**2366**	**729**	**2969**

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1