

Returns to Human Capital in Transitional Russia

Victoria Konstantinova Vernon
Department of Economics
The University of Texas at Austin
Austin, TX 78712-1173
konstant@eco.utexas.edu

April 2002

Abstract

This paper applies parametric and nonparametric techniques to the most recent data from the Russian Longitudinal Monitoring Survey (RLMS) 1992-2000 and shows the returns to schooling increased over the course of transition, overall and for attainment cohorts neither at the top nor bottom of the schooling ladder. The collapse in earnings is focused on people with graduate degrees. Returns to schooling are higher for women; but this gain is more than offset by the large gender wage gap. The gender wage differential increased over the years especially for younger women and women without higher education; there is evidence of increased discrimination. Return to experience increased and remained higher for women than for men. The age-earnings profile for men became more compressed, favoring the young with respect to the old; whereas the opposite took place for women, whose earnings peak became steeper at the middle age. Comparing to the estimates from the U.S. Current Population Survey 1992-2000, the returns to schooling are still lower in Russia; while the returns to experience are higher, especially for women, and the gender wage differential is now more than twice as large in Russia than in the U.S.

1. Introduction.

Transition from centrally planned to a market economy in Russia started with the dissolution of the Soviet Union in December 1991. In the years that followed over 70% of the country's productive capital was privatized; basic legal and institutional infrastructure for the market economy was created. The transformation came at a high price of economic collapse of unprecedented proportions. In 1992-1996, per-capita real GDP in Russia declined by 8.5% per year on average. Unemployment, essentially nonexistent under communism, rose to 11.7%. The rate of poverty at least tripled to 30%; the extent of human suffering is reflected in the simultaneous decline in life expectancy, increase in suicide rates and decrease in birth rates¹. By year 2000, some positive trends emerged: per-capita real GDP was rising at a rate of 8.3% annually, unemployment was declining, poverty rates were stable, inflation had abated, life expectancy was increasing, suicide rates were declining, and birth rates were stable, although the standard of living had not yet returned to the Soviet levels.

Transition affected labor market through changes in wage and employment structure. Several studies (e.g. Brainerd, 1998, Flemming and Micklewright, 1999) documented increase in wage inequality, decline in women's relative wages and in the wages of older workers. Rise in inequality is in part attributable to changes in returns to schooling, age/experience and gender, - the three main components of human capital.

Human capital has long been Russia's greatest resource. The country has a long tradition of top-flight intellectual talent. Rates of educational attainment in the Soviet Union were comparable to those in the western countries. In 1994 statistics, 97% of Russians aged 25 and older had completed secondary or specialized secondary education², compared with 78% in the U.S., and 16% of Russians aged 25 and over had a university degree, compared with 21% in the U.S. But Russia allocated a large amount

¹ The life expectancy at birth for a male in Russia was only 57.6 years, which is as high as it was for a male in the U.S. in 1925, three years before the discovery of penicillin. The rate of suicide in Russian men rose to 72.9 per 100,000 in 1995, compared with 19.8 in the U.S, and was highest among middle-aged men. Birth rates declined by 40% in Russia during the early transition, compared with a decline of 9% in the U.S.

² In Russia, the published data on educational attainment are for age 15 and over. Here, these are interpolated to rates for age 25 and over by use of a life table published by the U.S. Bureau of the Census as the 'International Data Base.'

of capital, both physical and human, to the military as opposed more productive uses. By 1992, over 20% the GDP of Russia was military spending, four times the 5% rate in the U.S, and per-capita GDP in Russia was only 11% of the U.S. value. Russia entered transition lacking productive physical capital and with a highly inefficient portfolio of human capital, awash in scientists and lacking most of the professional skills, - in economics, finance, banking and management, - required by the market-based economy. The reform of the educational system was complicated by the sharp reduction in state subsidies: public expenditure on education decreased on average 9% per year in 1990-96. Increasing tuition costs contributed to the decline in demand for education: university student enrollment declined by 9.3%³ from 1990 to 1996. By 1997, more than 800,000 highly educated Russians left the country⁴ in a “brain drain” westward and to Israel, weakening the quality of the educational institutions.

Most of the work force in Russia in the 1990s was employed in the state sector, an often-uncompetitive and inefficient part of the economy heavily dependent on government subsidies. Decrease in subsidies forced many factories to shut down or work fewer hours. Although official unemployment did not increase proportionately to the fall in production, hidden unemployment in the form of restricted work hours, unpaid leaves and delayed wage payments mirrored the output collapse. Government and companies’ wage arrears were especially high in industry, construction, and education. By 1997, more than \$1.6 billion of educators’ wages were in arrears⁵, exceeding the combined annual salaries of half a million university professors. According to RLMS, in 1996 12% of those households with at least one working-age adult with a university degree had yet no wage earners. Subsistence forced most Russians to cultivate food⁶; in 1998 home food production accounted for 53% of agriculture, 19% of household income, and 4% of GDP⁷.

³ See <http://www.unesco.org/education/information/wer/WEBtables>. Student enrolment grew in the U.S. over the same period by 5.7%.

⁴ See, for instance, Friedberg (1997) for a survey of these immigrants as highly educated on average.

⁵ See <http://www.ilo.org/public/english/dialogue/actrav/papers/russia.htm> or <http://www.indiana.edu/~isre/NEWSLETTER/vol6no1/WAGES.htm>

⁶ In 2000, over 92% of potatoes, 78% of vegetables, 58% of meat, 50% of milk and 28% of eggs were cultivated at home. 66% of households in RLMS 1996 report that they used land last year to grow food.

⁷ Mroz, Henderson and Popkin (2001) p. 5. and Economic Research Service US Department of Agriculture at www.ers.usda.gov/briefing/Russia.

Many doctors and university professors, - virtually the only two occupations, for which graduate degree was required in Russia, - planted potatoes on their patches of land. At the same time, there emerged a class of successful young entrepreneurs in Russia; a lot of them without higher education but with lots of energy to explore profitable opportunities in the new private sector.

The displacement of many highly educated older people and substantial rewards for the young are striking features of the first years of the economic transition in Russia. What are the returns to education in Russia today? How did the link between personal success and human capital change during the reform?

The goals of this study are: 1) to estimate and explain the trends in returns to schooling, experience and gender during transition, comparing present findings to those obtained in earlier studies; 2) to update the existing evidence using more recent data; and, finally 3) to compare returns to human capital in Russia to that in the United States by applying similar analysis to household survey data from both countries.

Previous studies of the Russian labor market found the return to a year of schooling increased following price liberalization of 1992-94, and declined by 1996 before recovering slightly in 1998. This decline in returns was interpreted as a negative trend foreboding dreary prospects for educated Russians. My own study has a rather different conclusion. Its most important result is the returns to schooling and experience increased over the course of transition for the majority of men and women, growing closer to the returns observed in the U.S. The collapse in earnings, compounded by high wage arrears, is focused on relatively few people with graduate degrees. The age distribution of earnings shifted towards the younger cohort for men in Russia, and similar but smaller shift took place in the U.S. Gender wage differential is now at its highest level, and discrimination of women is a growing problem.

Section 2 describes conceptual issues of estimating returns to schooling. Section 3 reviews previous literature on returns to human capital in Russia. Section 4 introduces the data. Section 5 describes the empirical results; section 6 compares findings in the Russian data with those in the U.S. data. Section 7 discusses and concludes.

2. Returns to Human Capital: Concept and Method.

The classical Mincer (1958, 1974) model that has been widely applied in the studies that focus on wage equations⁸, assumes that expenditures on education by individuals are investment flows that build human capital. Optimal schooling decision is reached by balancing benefits and costs of alternative schooling choices. In the simplest form, this model abstracts from the dynamic nature of the schooling and earnings processes and focuses on the relationship between completed schooling and average earning over the lifecycle. People are assumed to have finished formal schooling before entering labor market. The effect of experience on earnings is separable from the effect of schooling. Individuals can lend and borrow at a fixed interest rate, have an infinite planning horizon that starts at the minimum school leaving age, and have no disutility of school versus work. The individual problem is to maximize present discounted value of the stream of earnings net of schooling costs with respect to schooling S

$$\max \int_0^S (p_t - T_t) e^{-Rt} dt + \int_S^\infty w_{tS} e^{-Rt} dt \quad (1)$$

where w_{st} is real earnings at time t of an individual with S years of schooling; p_t is part time earnings while at school; T_t is tuition costs. The first order condition for this problem equates marginal cost and marginal benefit:

$$\int_0^\infty \frac{\partial w_{S,S+\tau}}{\partial S} e^{-R\tau} d\tau = w_{S,S} - p_S + T_S \quad (2)$$

Here the marginal benefit of the S -th year of schooling equals net opportunity cost of schooling, $w_{ss} - p_s$ plus tuition costs T_s . Following Mincer, log earnings are assumed additively separable in education and post schooling experience $w_{st} = f(S)h(t - S)$, with $h(0) = 1$, so that log earnings profiles are parallel in schooling. Then marginal benefit is

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

where $H(R)$ is a decreasing function of the interest rate. Suppose that post-schooling earnings are fixed, $h(t) = 1$ for all t , then $H(R) = 1/R$ and

⁸ See e.g. surveys by Card(1995), Heckman, Lochner and Todd(2000)

$$MB(S) = \frac{w'(S)}{R} \quad (3)$$

Under separability and constant after school earnings, the first order condition becomes:

$$\frac{w'(S)}{w(S)} = R \left(1 + \frac{T(S) - p(S)}{w(S)} \right) \quad (4)$$

The left hand side is the proportional increase in annual earnings from the S -th year of schooling. The right hand side is the annualized marginal cost of the S -th year of schooling as a fraction of foregone earnings. If part time income while at school is just enough to cover tuition cost, then the right hand side becomes simply R , which implies that under perfect information and perfect credit markets individuals invest in schooling until marginal return is equal to interest rate:

$$\frac{w'(S)}{w(S)} = R \quad (5)$$

Equation (5) implies the semi-logarithmic functional model where log of earnings is a function of the years of schooling after other covariates have been accounted for:

$$\ln w(S) = a + bS \quad (6)$$

Traditional form of the earnings equation includes age or labor market experience, its square and other independent factors that may affect individual wage level and contribute to a wedge between marginal return to schooling and the economy-wide interest rate:

$$\ln W = \alpha_0 + \alpha_1 S + \alpha_2 E + \alpha_3 E^2 + \alpha_4 X + \varepsilon \quad (7)$$

Here W is the wage, S is number of years of schooling; E is years of job market experience; X may include individual characteristics such as gender, family composition, regional and firm specific characteristics; ε captures unobserved individual heterogeneity. An alternative specification uses attainment dummies instead of years of schooling:

$$\ln W = \alpha_0 + \alpha_1 NOSEC + \alpha_2 VOC + \alpha_3 TEC + \alpha_4 UNI + \alpha_5 E + \alpha_6 E^2 + \alpha_7 X + \varepsilon \quad (8)$$

In a more realistic model, rate of return to schooling would be affected by other factors, e.g. life expectancy that affects length of time when earnings accrue, or technological changes that affect relative demand for different levels of skills. Different individuals may finish their schooling at a point where marginal return to the last unit

of education is either above or below the average marginal return in the population as a whole, therefore both intercept and coefficient on schooling may be random variables (Card 2000).

Estimations of the semi-log wage equation involve several choices for the investigator. With regards the dependent variable, this is either an hourly wage or calendar earnings which may reflect earnings from primary employment or may include secondary jobs as well. As for the instruments, a decision if hours are included on the right-hand side, if schooling is to be in years or in educational attainment dummies, if years of schooling are taken as reported by the survey respondents or are imputed as-if full-time equivalents based on the highest diploma attained, if age or experience is used and whether to use reported or imputed years of experience, as well as any other instruments to be considered. Because some right-hand side variables in the wage equations may be endogenous, affecting both income and schooling, a decision is required as to any instrumental variables techniques (Card 1998), or a two-stage method as in Heckman (1974), to model participation and the censoring. If hours are freely chosen, then the hourly wage is a better proxy for welfare than is the total earnings as the substitution towards leisure is assumedly welfare enhancing. If, instead, earnings are explained with hours chosen, then the estimate of the returns to schooling will be the sum of elasticity of the hourly wage with respect to schooling plus the elasticity of hours with respect to the wage. In case hours are meaningfully constrained and labor income does not rise proportionate to hourly wages, as is the case in Russia⁹, then monthly earnings may be a better proxy for welfare than is hourly wage, whereas hours may be a regressor that controls for part-time work.

3. Previous Literature.

Since the breakup of communism, there have been a number of studies analyzing labor market in transition. Chase (1998) reports low returns to a marginal year of education of 2.5-4% in Czech Republic and Slovakia in 1984, and an increase to 5-6% by

⁹ In Russia hours negatively covary with hourly wages, the correlation coefficient is -0.11 in the pooled 1994-2000 sample.

1993. The corresponding returns increased for all the levels of education except post graduate, with relatively higher increase for higher levels. Filer et al. (1999) report further increase in both republics to 8-9% by 1997. Rutkowski (1997) reports an increase returns to schooling in Poland from 5% in the late 80s to over 7% in the mid-90s. Orazem and Vodopivec (1995), and Stanovnik (1996) find similar changes in Slovenia; Jones and Ilaypruma (1994) in early transition in Bulgaria; Maurer-Fazio (1999) in reforming China. As for the returns to experience, Rutkowski (1997) observes a decline in Poland, from 3% in 1980s to less than 2% in early 90s. Chase (1998) found similar effect for Czech Republic. Krueger and Pischke (1995) find that return to both education and experience fell slightly in Eastern Germany after unification. A survey by Psacharopoulos (1994) compares returns to human capital from a large number of countries showing that low income countries have the highest return, 11% in Asia and 14% in Latin America, followed by high income countries, 9%, and the intermediate group, 8%. East European transitional economies are usually classified as low-to-medium income; thus the returns to schooling in the former Socialist countries of less than 9% are still low by international standard.

Very few papers study Soviet labor market prior to 1992, mainly due to the lack of good quality micro-level data. The Soviet Family Budget Survey was conducted by the government statistics agency continuously from the 1950s, but the results of the surveys were unavailable for researchers, and were used primarily for the purpose of aggregating the data. The main criticisms of this survey are it does not represent the population and it did not encourage accurate reporting of incomes, especially incomes from unofficial sources; the latter amounted to at least 9% of GDP in the late 80s according to the government statistics (Flemming and Micklewright (1999)).

The foreign studies of Soviet labor market were based on surveys in which individuals did not have an incentive to misreport their income, but the sample characteristics of those surveys most likely differ from those of the overall population. Gregory and Kohlhase (1988) use a sample of over 2,700 immigrants to the United States in 1979-82, and report return to university education in the Soviet Union relative to secondary was around 22%, return to experience was 2-3%. They find returns to secondary, vocational or specialized education were insignificant or very low; returns to

education increased with higher levels of schooling; and women's earnings were 22-29% less than those of men with similar education and personal characteristics.

Several papers have estimated the returns to schooling and gender gap in Russia in the 1990s. Table 1 lists sample selection, dependent variables, controls and most important results of each of those studies, for comparison I also included my own work at the end. Brainerd (1998) uses Russian Center for Public Opinion Research survey data from 1991-94, and finds that wage inequality doubled by 1994, younger people fared better than older people, and men fared well relative to women. She estimates the earnings equation with the logarithm of monthly wages as a dependent variable, and finds the returns to a year of schooling increased from 3.1 to 6.7% for men and 5.4 to 9.6% for women during that period. The return to a university degree over secondary degree also increased from 18.7% to 31.8% for men and from 33.5% to 53% for women; while the return to experience declined from 2.6-3.1% to 1.3% over the same period. In 1991, the earnings of men were 24.8% higher than the earnings of women with similar education, experience and region of residence; this differential increased to 44.6% in 1994. In her later work, Brainerd (2000) applies decomposition of gender wage differential into changes due to changes in the gender-specific factors, such as skills and discrimination, and changes due to widening of the wage structure. She concludes that the overall widening of the lower tail of the wage distribution and low minimum wages, not discrimination, are responsible for the increased inequality for women in the early years of transition.

Using data from RLMS 1992-96, Newell and Reilly (1997) regress the logarithm of monthly earnings from primary employment on educational attainment dummies, occupations, supervisor at the job status and regions. They report a slightly lower return to a year of university education of 4.2% in 1992, higher, 9.7%, in 1994¹⁰ and average, 6.3%, in 1996. Unfortunately, these coefficients on schooling are not directly comparable to other studies since authors used age instead of experience in the regression and the estimates of the returns to age and gender are not reported in their paper. Also, the description of the sample selection criteria supplied in the paper may be incomplete since

¹⁰ The return to a year of schooling for specialized secondary education is lower than for university degree. The authors also report a set of results from a shorter regression without occupational characteristics. The estimates from that specification are higher.

for each year they imply samples some 15% larger than used in the paper; thus selection biases may be present.

Using the same data set, Nesterova and Sabirianova (1998) regress the logarithm of hourly wages from all jobs on a large set of controls that includes supervisory responsibilities, industry, occupations and local labor market conditions. Their estimate of the return to a year of schooling is smaller, 4.2% in 1996; the return to experience and gender differential are also quite modest, 0.9% and 18.9%, respectively. In this specification the coefficient on schooling does not incorporate the effect of schooling in raising occupational level, while the selection of men and women into occupations and industries pick up a part of gender effect. N&S apply a two-step Heckman method to correct for selection bias, with the probit regression at the first stage, and in a very parsimonious model excluding occupational and regional effects they estimate higher return to schooling, 7.8% per year in 1995, higher return to experience at 2.4% per year, and wider gender gap, 31.1%.

Cheidvasser and Benitez-Silva (2000) use RLMS 1992-98, and estimate an earnings equation with the logarithm of monthly earnings from primary employment as a dependent variable in a model excluding hours of work. In a regression with pooled responses from 1995-1998, they report a rather large gender wage differential of 41.8%. Estimated by year in a regression that includes job characteristics, the returns to schooling are low, but the trend is similar, increasing from 1992 to 1994, then decreasing by 1996 and recovering in 1998. The inclusion of job characteristics such as supervisory responsibilities and heavy physical work must be criticized again as outcomes highly correlated with schooling. C&B-S however focus on these estimates in which the returns to a year of schooling in 2000 is 5%, and conclude that ‘these results, present a bleak perspective for educated Russians, with negative implications for investments in education at all levels, auguring the imminent erosion of one the Russia’s few assets not yet completely devalued...’

Analysis of the results in the literature reveals regressions that contain supervisory status or occupation as an effect produce lower returns to schooling due to endogenous nature of occupational outcomes which are highly correlated with schooling

and labor income in Russia¹¹. This inclusion imparts a negative bias in the estimates of the returns to schooling when schooling implies specific training necessary for the promotion to supervisor or even if schooling acts as a mere signal of ability, as schooling contributes independently to the event of promotion and the increase in earnings from the promotion is a positive return to schooling. On the other hand, the most parsimonious model from N&S, with the highest estimate of the return to schooling in the RLMS literature, omits regional cost-of-living effects, imparting a positive bias on the estimated return to schooling since wages are substantially higher in certain regions of Russia where the demand is also greater for highly educated workers¹² or where compensation for severe cold weather conditions is paid. Ignoring the systemic component to this will overstate the role of schooling in these discrepancies. All told, these biases suggest the return to schooling years was higher than 3.4% in 1992; higher than 4.2% and lower than 7.8% in 1996.

The biases affect the estimates of the return to experience and to gender as well. Schooling comes at the expense of experience, and any biases in the estimates of the returns to schooling should impart an opposite bias on the estimates of the returns to experience. Also, among employed Russians, females are over represented in the highest educational attainment groups (Table 2), and any biases in the estimate of the return to schooling should impart an opposite bias on the estimates of the return to gender, as being females compete with diplomas in explaining observed higher earnings. My estimates of the returns to schooling, experience and gender for the same years are within the ranges predicted by the purported biases. For instance, estimates of the returns to schooling on the pooled sample of men and women are 5.2 % per year in 1992 and 6.2% in 1996, of the returns to experience are 2.3% per year in 1992 and 2.7% in 1996, and of the returns to being female are -37.1% in 1992 and -41.2% in 1996. Experiments to replicate the results of other papers also show that when nine occupational dummies are included, the coefficients on the years of schooling are 22-

¹¹ Tests: income vs. 'yes/no' for supervisory responsibilities, $t=7.1$; income vs. 'yes/no' for university degree, $t=6.9$, and supervisory responsibilities vs. degree, $\chi^2=263$.

¹² The chi-square statistic for the 2x2 contingency college degree y/n versus living in Moscow/St. Petersburg y/n is 20.3

44%% lower than reported below, but when regional dummies are omitted, the estimates are 14-31% higher.

The use of only primary employment as in Newell and Reilly (1997) and Cheidvasser and Benitez-Silva (2000) without any incorporation of income from secondary (registered or black market) jobs can result in biased estimates as well. At the beginning of transition many Russians continued to hold their former “Soviet” jobs despite not being paid in full, keeping their “Labor Book” (a version of employee passport) there and calling it primary employment. These persons were often highly educated employees with restricted work hours at the main job¹³ and with meaningful secondary employment (Foley, 1997), such as a dentist at a state hospital working part time in private practice or a university professor of accounting bookkeeping for a firm. In this case ignoring secondary income would underestimate the return to schooling. On the other hand, lack of earning opportunities would often lead individuals to work after-hours for lower wages; subsidiary agriculture is one example of this, although income from home agriculture is not included into labor earnings here and anywhere in the literature. When more educated individuals work extra hours for reduced wages, then using only primary employment will overstate the true returns to schooling; the opposite is true if earnings of people without education doesn’t rise proportionately to hours. At the same time, using only monetary income and ignoring non-monetary compensation introduces a positive bias in the coefficients on schooling since in-kind compensation is negatively related to education. To avoid these biases I consider the broadest available measure labor earnings.

The last remark on the previous literature is that it does not mention the collapse of returns to graduate education in Russia; this important issue deserves attention.

4. The Data.

¹³ An evidence of restricted hours for higher educated workers in Russia is negative correlation of hours with respect to hourly wages. The regression-based elasticity of hours with respect to wages for men is -0.18.

The RLMS 1992-2000 is compiled by the Carolina Population Center of the University of North Carolina at Chappell Hill. It is a first nationally representative household-based sample of Russia designed to measure the effect of Russian reforms on the well being of the population; and it covers a wide range of issues related to health, economics and politics. Data from RLMS was used in numerous other studies on a variety of topics from savings behavior to nutrition, physical activity, abortions, alcohol consumption, and poverty¹⁴. The survey was administered nine times over 1992-2000 in two independent phases; each additional wave improved on the quality of the data. The sample has a two-stage design; geographical sites as primary sampling units, and household addresses are selected within each site. The size of the original sample varies across the rounds of the survey from over 16,000 individuals in the first round to under 9,000 in round eight. The survey has a panel component: each household could be surveyed up to four times in the first phase in 1992-94 and up to five times in the second phase in 1994-2000. Otherwise, they were replaced with new households. The household response rate in all rounds exceeded 80%. The distribution of household size in the sample, within both rural and urban localities, corresponds well to the figures from the 1989 census; the multivariate distribution of the sample by sex, age, and urban-rural location differs from the corresponding multivariate distribution of the census by one percentage point or less. Analysis of the sample attrition offered in the description of the survey suggests that households that move out of their original residences or decline to participate at the next round have higher median incomes and expenditures, more likely to live in the Moscow/St. Petersburg region and be a single-person households than households that remain in their original residences and continue to cooperate in the RLMS. Given that the last three rounds of the survey were taken every other year, corresponding to 1996, 1998, 2000, I select two earlier rounds from 1992 and 1994 to equally space the data.

Each adult within selected households was asked detailed questions on his education, employment status, earnings from primary, secondary and unregistered jobs including the amount of monetary and non-monetary compensations received, hours of

¹⁴ A set of references to papers that used the survey and more information on each of the cross-section can be found on the RLMS website: www.cpc.unc.edu/projects/rlms/papers.htm

work in the last 30 day, characteristics of each job including its description, number of subordinates, amount of physical work, enterprise ownership and size.

There are some data problems specific to the survey: schooling is reported only in terms of educational attainment in the early waves, the respondent's history of military service is not recorded, and there are time-inconsistent answers in some of the responses¹⁵. Also, incomes in the survey are not top-coded, likely contributing to underreporting of income by high-earners. Some records contain errors, for example, as the number of hours of work in the month prior to the survey contains several unrealistically high entries. More importantly, there are major issues with any wage estimations in Russia. A large barter economy arose in Russia in the 1990s, with wages often paid in-kind (Commander and Mumssen, 1998), whereas the value of goods may not be equivalent to the monetary salary since goods need to be sold or exchanged, which imposes extra costs in terms of time, and price may depend on the 'liquidity' of a particular good on the market. Wage arrears were very common until recently with over half of the employed individuals surveyed in 1996 reporting that employer owes them back wages. Lehmann, Wadsworth and Acquisti, (1999) provide evidence that incidence of arrears is higher for individuals with poor outside options such as high migration cost and few local opportunities; and in industries where production was disrupted the most, - agriculture, manufacturing, construction, health and education. Further, most Russians are paid their wages in cash and hold no bank accounts, whereas theft of cash is a growing problem in Russia, and this likely contributes to underreporting of income.

I focus the analysis on the measure of monthly earnings which includes income from all jobs and individual activities as well as the value of in-kind payments, and excludes wage arrears. Individuals are assigned a type of firm ownership based on the main source of labor income; there are four types of ownership: government, self-employment, private and foreign. Schooling is imputed to equal 9 years for incomplete secondary education, 11 years for ordinary secondary, 12 years for vocational, 13 years for specialized secondary, 16 years for college, 19 years for a graduate degree. In the last wave of the survey respondents were asked how long they studied and the year they graduated making it possible to separate people with a two-year university introduced

¹⁵ see N&S p.10

after the educational reform of 1992. Similarly, for the 1996-98 survey rounds, I imputed two years of schooling and a specialized secondary degree if the respondent indicated a university degree, less than 3.5 years of schooling and age under 23. Potential labor market experience is imputed as age less 6, less years of schooling. Potential experience thus defined may overstate true labor market experience for women assuming women are traditionally the ones who take time off for childcare and care for older parents. When included in a regression, potential labor market experience assigns larger portion of the actual male-female wage difference to the 'unexplained' component, and thus may overstate discrimination. To deal with this problem at least in part, I subtract a year for every ten years of work experience from women's potential experience, so that a woman under 25 would have lost a year of experience compared to a man her age, a 25-34 year old woman would have lost 2 years, and a 65 year old woman would have lost 5 years of experience.

5. Wage Determinants: Empirical Evidence.

For the empirical analysis I select individuals ages 16-65¹⁶, excluding disabled people. Disabled are defined as those who report difficulty walking across the room, lifting 5kg, dressing, eating, cooking or showering. Summary mean characteristics of the most recent sample from the year 2000 are presented in Table 2. Positive wage and hours are observed for 63.2% of males and 54.6% of females in this sample¹⁷. The average age of employed is 38.6; women are slightly older than men, and there are more women than men in the sample, which reflects greatly reduced life expectancy of middle aged men in transition. Women are more educated, having on average 12.9 years of schooling, versus 12.2 for men. 22.9% of women and 17.9% of men have a university degree; while 7.2% of women and 14.5% of men did not complete secondary school. Vocational degrees are dominated by men, specialized secondary by women. Graduate degrees are extremely rare, less than 1% of adults have a graduate degree. Most of the employed individuals indicate that the largest share of their earnings comes from work

¹⁶ Compulsory schooling lasts until and often including age 15. Formal retirement age for women is 55 and for men 60 in Russia, but working past retirement age is common.

¹⁷ Unobservable wages do not necessarily imply that the person is unemployed, but may be due

in the state sector, 64.6% of employed females and 50.9% of males. Over 21% of men and 15% of women receive most of their income from self-employment and individual economic activity. Only 3% of adults are employed by companies with foreign ownership. More than 8% of all labor income was received in the form of goods; almost 26% of people report wages arrears. Fewer than 5% of the sample lives in Moscow and St. Petersburg metropolitan area, about 24% come from the rural area, and the rest reside in urban locations in seven other regions of Russia. Average real monthly wages converted to USD at June 1992 exchange rate are very low, just over \$20.

I define several subsamples of adults by gender, attainment and age. There are 6 attainment groups: incomplete secondary, secondary, vocational, specialized secondary, university and graduate degrees. There are 5 groups by age, the youngest is 16-24, and the oldest 55-64.

Table 3 displays the average monthly earnings in USD by gender, age and educational attainment; an index number next to each wage reflects relative earnings with respect to a reference group which is male for gender, secondary education for attainment cohorts and the youngest for age cohorts. According to the table, real wages declined from 1992 to 2000 for all age and gender groups. The ratio of female to male earnings declined unevenly over the years from 66 to 58. Shorter hours of work most likely don't account for this wage differential since an average Russian woman reports having worked only 20 hours less than an average man, 176 versus 196, respectively. Index numbers by attainment and gender show that in 2000 the wage loss from not completing secondary degree increased from 25% to 34% for men and from 17% to 20% for women. Both vocational and specialized secondary degree premium went up over the years. The premium for a university degree increased for men from 22% to 52%; and for women from 23% to 75%. Nonetheless in 2000, a woman with a graduate degree earned less than a man with a high school diploma. Both men and women with graduate degrees experienced a tremendous decline in their relative wages over the years: in 1994, a woman with a graduate degree earned on average 122% more than a woman with a high school diploma, and a man with a graduate degree earned 61% more than a high school graduate man; by 1996, these relative advantages reduced to 16% and 21%. As of 2000,

to wage arrears or missing information on wages or hours.

an average woman with graduate education earned less than a woman with a university degree, and an average man with graduate education earned less than a man with a high school diploma.

The distribution of wages across age cohorts of men shows high relative earnings of 25-34 year old men in early 90s, rather flat earnings profile for 25-54 year olds in the mid 90s, and a shift of the peak earnings age to the 35-44 group by 2000. This pattern suggests that the most successful men were around 30 years old at the start of the reforms. Men 45-54 years old, who would be at the peak earnings age in other countries, earn a little above average for men in Russia. The relative earnings of the oldest cohort were at their lowest point in 1994, when wages of men ages 55-64 were 36% below wages of the youngest men. For women the peak earnings age remained at 35-44 throughout the 90s; and the relative advantage of this group further increased, suggesting that most successful women were around 35 years old at the start of the reforms. By 2000, the relative wages of the oldest workers, especially women, improved; while the relative earnings of the youngest females declined. Figure 1 illustrates mean wages for men and women of different age and attainment groups.

Table 4 shows some correlations in the data shown for 1996 sample. Outcome that wages are observed is positively associated with higher schooling and with living in the Moscow-St.Petersburg metropolitan area, and negatively associated with being a female and living in the rural area. More educated people have higher earnings, are more likely to live in Moscow, be females and work for the government. Schooling is not related to hours of work, wage arrears or presence of additional jobs. People with higher monthly earnings are more likely to work longer hours, be men, live in Moscow, not work for the government and have no wage arrears. Those with wage arrears are more likely to be older, work for the government, and live in rural area.

To control for demographic and work characteristics that also affect earnings, I estimate equation (7). Total monthly wage in this specification is explained in terms of total hours of work, years of schooling, experience and its square, gender, ethnicity, student or retired status, married status, part time work defined as 120 or less hours a month, the ownership structure of the primary employer, the region of residence, and the size and composition of the worker's household. Since wage arrears and payments in-

kind are likely to affect the take-home pay, I include dummy variables for arrears and payment in goods. Standard errors in all regressions are adjusted for geographical clustering using procedure described in Deaton (1997, p.74). There are 20 survey sites used as cluster units in the 1992 data and over 100 sites in later rounds.

Appendix A contains estimates of the earnings equation for each year overall and for men and women. The coefficients of the controls have predictable signs. An extra hour of work earns only 30-50% of regular wages; such low number is most likely an evidence of constrained hours, especially in early transition. The earnings of married people are slightly higher. Individuals who describe their major occupation as students or retired earn substantially less. Non-Russian ethnicity does not affect wages. The earnings of self-employed and the employees of foreign-owned companies are higher than the wage in the government sector. Working for the new private sector was negatively associated with earnings in early transition, and positively in later years. Wage arrears reduce earnings by some 15-43% in the pooled regression for men and women. Individuals whose wages were paid at least in part in goods received substantial positive premium over persons with only monetary earnings in 1992 and negative premium in the later years. This pattern is explained by a change in the nature of in-kind payments in transition: in early 90s, the time of severe shortages and rationing, well-performing enterprises distributed consumer goods to their employees as part of the benefits; whereas later in transition loss making companies distributed their own products to the employees instead of wages. Larger household size and higher share of disabled people have in general negative and only marginally significant effect on wages, while the presence of children has positive effect. Living in all urban locations results in positive premium above rural areas, with the highest premium in Siberia and Northwest where a lot of workers receive bonuses for working in severe weather conditions, as well as in Moscow-St.Petersberg metropolitan areas where the cost of living is higher.

Next subsections are devoted to the discussion of the returns for schooling, experience and gender.

5.1. Returns to schooling.

Appendix A shows that overall returns to an extra year of schooling increased from 5.2% in 1992 to 8.5% in 2000, after a fallback of 1.1% in 1996. The returns are lower for men and higher for women: an extra year of schooling increased from 5% to 7% for men and from 5.4% to 10.3% for women.

Estimates of the categorical equation (8) at the bottom of Appendix A are graphed in Figure 2. According to the results, the returns to a university degree with respect to completed secondary school increased for men from 18.7% to 31.5%, and for women from 25.5% to 56.1%. Returns to specialized secondary education increased by 13% for both men and women, while the return to a vocational degree increased for women and decreased slightly for men. The marginal premium for a graduate degree over university degree decreased dramatically for both men and women, almost disappearing by 2000. The crisis of graduate education was especially severe for men for whom the premium turned negative in the mid-90s. The relative penalty for no secondary education did not increase for men over the years and remained at around 18% throughout the years, while for women it more than doubled from 10.8% to 26.5% in the mid 90s, before it went down to 16.5% in 2000.

In order to find out whether certain age or attainment groups were affected more relative to others, I estimate the earnings equation for each of the five age cohorts and for each of the six attainment cohorts. Tables 5-7 summarize estimates of the coefficients of interest, - returns to schooling, experience/age and gender.

The age distribution of the returns to schooling in Table 6 shows the highest returns for the youngest cohorts of men and women, with the exceptions of women in 1998 and 2000, when the return to an extra year of education for the youngest females fell sharply below all other age groups and below returns to schooling for men in their age group. The smallest returns are in general among cohorts above 45 years of age.

As seen from the results, the decline in returns around 1996 was temporary and did not set forth a negative trend. Why do we observe this wage compression in the mid-90s? Two different explanations are offered in the literature: an increase in real wages and declining inequality in 1996 by N&R¹⁸; and an oversupply of well-educated workers

¹⁸ See Newell and Reilly (1997) p.15.

in an economy where skilled blue-collar workers were in high demand by C&B-S¹⁹. A simple comparison of mean wages in Table 2 shows that the 15% rise in real wages from 1992 to 1994 was followed by a 7% decline by 1996, thus real wages increased very modestly. A simple test can reveal how inequality changed over the same period: a decrease in the ratio of the 90th to 10th deciles of the log wage distribution would correspond to a decrease in inequality. This statistic has values 1.29, 1.39 and 1.41 in the first three RLMS samples from 1992-96, suggesting an increase in inequality rather than a decrease. Given that, the wage compression should be attributed to factors other than shifts in household disposable income and inequality. Relative shift in demand away from higher educated workers may have occurred if the expanding service sector was even more low skill intensive than the shrinking industry²⁰. However the temporary nature of the fall in returns suggests that wage compression could be magnified by large arrears. Arrears are positively associated with government employment, which is in turn positively related to higher schooling. Nonpayment and partial payment of wages peaked in 1996-97 and disproportionately affected people with higher level of education. In RLMS-96, 57% of people with graduate degrees report wage arrears, versus 44% with secondary school diploma.

5.2. Return to Experience.

The full regressions in Appendix A and the summary of the coefficients on experience in Table 6 show that the return to experience increased over the years for men and women from just over 2% to 2.7% for men and to 3.8% for women. The lowest returns to experience, just over 1%, were observed in 1994 and may be due to devalued experience from the planned economy when the new skills for the market economy were not yet accumulated. This is rather similar to the trend in returns to experience in other East European countries. This decline virtually did not affect the highest educational cohort, and was focused on people with less than university education, in particular males. Women had higher returns to experience than men throughout the 90s; Brainerd (1998) suggests this may be a consequence of shorter life horizon for men.

¹⁹ See Cheidvasser and Benitez-Silva, p. 28.

To explore the connection between earnings and age/experience, I construct a non-parametric age-earnings profile using the mean zero residual from regressing log wages on all controls except experience and experience squared. This is a pure relationship between age and earnings, after the effect of schooling, work hours, regional variations, etc had been accounted for. To smooth the graph, I choose interval 16 to 65 years and make a 50 point equally spaced grid over the interval, each point corresponds to one year. For each point a_m along the grid we calculate a weighted regression of the residual on age using all N observation for the particular year, where the i th observation gets weight

$$w_{im} = \frac{1}{h} K\left(\frac{x_i - a_m}{h}\right), \quad i = 1, \dots, N; \quad m = 1, \dots, 51$$

The kernel function is quadratic

$$K(t) = \frac{15}{16}(1-t^2)^2 I(|t| \leq 1),$$

where $I(\cdot)$ is an indicator function that takes values one or zero. The bandwidth h is selected using the optimum bandwidth rule $h = 2.42\sigma n^{-\frac{1}{5}}$ (Deaton, 1997). The results of each weighted regression are used to compute the expected value of the wage residual for each point a_m .

Figure 3 shows the resulting mean zero curves for 1992, 1996, and 2000. Several interesting patterns emerge. The age-earnings profile for men does not look like the classical increasing and hump-shaped graph. Instead it is quite flat reflecting relatively high earnings of the young and low earnings of the old. The peak earnings age for men shifted from 46-47 in 1992 to 30-31 in 1996 and to 31-33 in 2000. The cohort of men who were just under 50 years old at the start of the transition appears to be permanently displaced. Women's age-earnings profile, on the other hand, shows no displacement of the working age older women; the shape of the profile in 2000 became steeper around the middle age. The peak earnings age for women was same as for men in 1992; by 1996 it shifted to age 55-56 with the second hump at 42-43 years old; by 2000 the peak age settled at 45-46.

²⁰ According to Goskomstat, industrial employment in 1998 decreased by 37% from its 1991 level,

5.3. Gender wage gap.

In a regression in which a set of controls takes out all the observable differences between individuals, a coefficient on the dummy variable for a female represents pure effect of gender on wages, everything else being equal. Table 7 shows that the gender wage differential increased from 37.1% to 49.7% during transition, with the largest increase for individuals under age 35 and those without higher education. In 2000, the male/female wage differential was lowest for the post-retirement age cohort and highest for ages 25-34, 63.5%, - the record high differential for all years among all cohorts.

Why have women's wages declined relative to men's wages? Increasing wage gap may be explained in terms of either declining skills of women relative to men or increasing discrimination of women. Assuming observable skills of women did not deteriorate in transition relative to men's, it is possible to test for the presence of discrimination by considering changes in the position of the median female in the male wage distribution. A decline in the median female percentile over time indicates discrimination has increased given the skills of the median female are comparable to the skills of a male in the lower percentile. Brainerd (2000) applied similar method to a different data set though 1994, and did not find evidence of discrimination. The RLMS samples from 1992, 94, 96, 98 and 2000 produce the following values for the position of the median female in the distribution of the male log wages, respectively: 30.1, 32, 34, 30, and 28.3. Indeed the statistic did not decrease through 1996 suggesting no discrimination, but the decline in 1998 and 2000 suggests that increasing wage gap in the later years of transition may be in part explained by growing gender discrimination.

6. Comparison with the U.S.

It is often hard to compare returns to human capital from different studies since returns to schooling and experience are sensitive to the specification of the earnings function. I would like to comment on how returns to human capital in transitional Russia differ from the returns in the West, and in particular in the United States. For this purpose I repeat the analysis and estimate similar equations using data from the Merged

while employment in services increased by over 160%.

Outgoing Rotation Groups of the U.S. Current Population Survey (CPS), matching years to the years of the Russian survey.

CPS is conducted monthly by the Bureau of the Census for the Bureau of Labor Statistics of the U.S. Department of Labor using a scientifically selected sample of around 60,000 households, which are representative of the civilian noninstitutional population of the United States. CPS is the primary sources of information on the employment characteristics of the U.S. population. This survey is widely used for studying the trends in unemployment and labor force participation, occupational distribution, demographic shifts of workers, and earnings differential among groups. Households in the survey are interviewed for 4 consecutive months, leave the sample for the next 8 months, and then come back into the sample for 4 more consecutive months. Usual weekly hours/earning questions are asked only at households in their 4th and 8th interview. These outgoing interviews are the only ones included in the Merged Outgoing Rotation Groups²¹. Since all 12 months of responses are pooled in this data set, the sample is very large; each of the annual files has over 400,000 records. I select records for adults ages 16-65 who report positive income and work hours in the week prior to the interview. The final samples contain over 148,000 records for every other year from 1992-2000. I impute years of schooling based on the highest attainment reported by the individual, and so that the minimum number of the years of schooling is 9, corresponding to no high school diploma and less than 10 years of education, and the maximum number of years are 20, corresponding to a doctorate degree. I assume, as usual, that high school requires 12 years to complete, 'some college' or a two-year college takes 2 more years, college requires a total of 4 years after high school, Masters Degree takes 2 years after college; professional and Doctorate Degree take 3 and 4 years after college, respectively.

The mean characteristics of the sample from the year 2000 are presented in Table 8. A larger percentage of adults ages 16-65 report labor earnings, 65.3% versus 58.5% in Russia. Monthly earnings of the respondents are over \$2,400, more than a hundred times higher than earnings of the Russian workers. Even in case of gross underreporting of labor income by Russian households, it is a stunning difference. Larger share of Americans report positive earnings, 65.3%, versus 58.5% in Russia. 15% of men and 25%

²¹ The data set and more information about the Outgoing Rotation Groups is available at

of women report having worked part time the week prior to the survey, compared to 8% of men and 10% of women in Russia. The average age of the workers in both countries is almost the same, but the number of years of schooling is higher in the U.S., 13.6, compared to 12.6 in Russia. This is most likely because graduate education is much more common in this country: 8.7% of individuals in the U.S. completed a graduate degree, versus less than 1% in Russia.

Appendix B presents estimates of the earnings equations (7) and (8) in the U.S. data. I made several country specific adjustments to the regressions: race and union membership are included among the employee characteristics, while wage arrears and in-kind payments dummies are removed. The U.S. regression also does not include retired or self-employed status since these categories of workers are excluded from the dataset. The U.S. regressions have a much better fit compared to Russian regressions: human capital and other observable factors explain about 60% of earnings variation. An extra hour of work earns 80-93% of regular wage. Part-time employees earn at least 23% less. Being married and having kids are positively associated with earnings, while larger family size and presence of disabled household members have the opposite effect. Individuals from all urban locations have higher labor income compared to their rural counterparts.

The estimated return to a year of schooling increased in the U.S. from 9.5% in 1992 to 10.3%²² in 2000 with a small dip around 1996 for both men and women. Similarly, American women had higher returns to a year of schooling than men, but the difference is very small, less than 1%. Returns to educational attainment at the bottom of Appendix B reveal rather modest changes over the 90s. The premium for a college degree increased by 3% for men and women, while the two-year college degree premium decreased by the same amount. The largest changes that took place over the years were an 8% increase in returns to a Masters Degree for women, from 54.3% to 62.3%, a 4.5% increase in return to a Doctorate degree for men, from 65.7% to 70.2%, and a 5% increase in the penalty for not completing high school, from 16.6% to 21.5%. Interestingly, return to a professional degree has been about 3% higher throughout the years than return to a

www.nber.org/morg

²² These returns are close to the ones reported in e.g. Heckman et al.(2000)

Doctorate Degree for men and women, with an exception of men in the most recent year, for them the return to a professional degree was 67.6%, and to a Ph.D. 70.2%.

The University degree premium in Russia is lower for men and higher for women than that in the U.S., but the graduate degree premium is much larger in the U.S. than in Russia. Estimates of the returns to schooling for Russian women in 2000 are within 2 percentage points close to their U.S. counterparts.

The significance of the first year of experience in the U.S. increased slightly in the mid 90s and returned to the initial values of around 3.4% for men and 2.5% for women, in contrast to a decline and subsequent increase in returns in Russia. Also, returns to experience are larger for men in the U.S. and for women in Russia. The age-earnings profile corrected for differences in education and other factors is presented in Figure 4. The graph has a classical hump shape with earnings of the oldest people higher than earnings of the youngest cohort. Peak earnings age for men shifted from 50-52 in 1992, towards younger age, 42-43, in 2000, while peak earnings age for women remained constant, 38-40.

The gender wage differential in the U.S. increased by 3.6%, from 18.8% in 1992 to 22.4% by 2000, remaining fairly constant throughout the late 90s at a level more than twice as low as it was in Russia. The position of the median female in the male log wage distribution was fairly constant from 1992 to 2000, respectively 28.6, 29.1, 28.5, 29 and 29.7, suggesting a slight decrease in discrimination.

7. Conclusion.

This paper discussed private returns to human capital in Russia during transition from plan to market. Emerging literature uses the RLMS to study schooling and incomes in Russia, often relying on models imparting biases on their estimates of the returns to schooling. Positive biases emerge in the use of only money income and in omitting regional effects, and negative biases emerge in the use of occupational characteristics. While the literature suggests declines in the returns to schooling during the transition, this paper finds returns to schooling actually increased for the majority of Russians. The decline in the returns to schooling in Russia is focused on those with graduate degrees. Two reasons for this phenomenon are relatively high wage arrears and the fact that

skills most highly compensated in transitional Russia do not require graduate degrees. Despite the rarity of graduate degrees in the sample, attained by less than 1% of all employed adults in the RLMS, the estimates of the returns to schooling are sensitive to these; for instance, the estimates of the returns to schooling are ~0.5% higher when a dummy for graduate degrees is included in the regressions.

There are substantial differences in the returns to schooling and experience between men and women in Russia. Women face higher returns than men, but their wages are lower due to the growing gender differential. There is some evidence of increasing discrimination against women; which is most likely not a transient phenomenon, but an issue that is going to persist in the future: women are most likely regarded as higher cost employees in the new private sector, and no systematic anti-discrimination policy is conducted in the Russian labor market. More detailed research is necessary in this area in order to identify the most vulnerable group of women and the corresponding industries/ownership types of employers that are more likely to discriminate.

The measure of earnings used in this study does not take into account large home food production that is taking place in Russia; the home food production income data are available on the household level, and is difficult to apportion to individuals. Including it in income would most likely reduce the estimates of the returns to schooling given that less educated households derive larger share of income from subsidiary agriculture.

The returns to schooling are still lower than they are in the U.S., but they are rising faster. Growing cost of investment in schooling combined with increasing demand for trained specialists in the rapidly developing market economy will ensure higher returns on the investment in education. Thus I expect that returns to education will continue to increase in Russia, in common trend with the returns observed in the West.

References.

Atkinson, A and Micklewright, J.: 1992, *Economic transformation in Eastern Europe and the distribution of Income*. Cambridge: Cambridge University Press.

Becker, G.S.: 1964, *Human capital: a theoretical and empirical analysis, with special reference to education*. Columbia University press, New York.

Becker, G.S.: 1967, Human capital and personal distribution of income. University of Michigan press, Ann Arbor, Michigan.

Brainerd, E.: 1998, Winners and losers in Russian transition. *American Economic review*, 88(5), 1094-1116.

Brainerd, E.: 2000, Women in transition: Changes in gender wage differentials in Eastern Europe and the former Soviet Union. *Industrial and Labor Relations Review*, Vol.54, No.1.

Card, D.: 1998, The casual effect of education on earnings. University of California, Berkeley, Working paper no.2.

Card, D.: 2000, Estimating the return to schooling: progress on some persistent econometric problems. NBER Working paper 7769.

Chase, R.S.: 1998. Markets for communist human capital: returns to education and experience in the Czech republic and Slovakia. *Industrial and labor relations review*, 51(3), 401-423.

Cheidvasser S., Benitez-Silva,H.: 2000. The educated Russian's curse: returns to education in the Russian federation. Yale University Working paper.

Commander,S, Mumssen.C: 1998, Understanding Barter in Russia. EBRD working paper no 37.

Deaton, A.: 1997, The Analysis of Household Surveys. A Microeconometric Approach to Development Policy. The Johns Hopkins University Press.

Earle J., Sabirianova K.: 1999, Understanding Wage arrears in Russia. Working paper no.139. Stockholm Institute of transition economics, Stockholm School of Economics.

Filer,R.K., S.Juraida, J.Planovsky: 1999. Education and wages in the Czech and Slovak republics during transition. *Labor economics*, 6(4), 581-93.

Flemming,J, Micklewright,J,: 1999. Income distribution, economic systems and transition. Innocenti occational paper no 70.

Foley,M. 1997. Labor market dynamics in Russia. Discussion paper 780. Economic Growth center at Yale University.

Gregory, P., Kohlhase,J.: 1988. The earnings of Soviet workers: Evidence from the Soviet Interview Project. *The Review of Economics and Statistics*, 70(1), 23-35 .

Griliches, Z.: 1977, Estimating the returns from schooling: some econometric problems. *Econometrica*, 45(1), 1-22.

Heckman,J., Lochner,L, and Todd,P.: 2000. Fifty years of Mincer earnings regressions.University of Chicago Discussion paper.

Jones,D.C.Ilayperuma,K,: 1994. Wage determination under plan and early transition: evidence from Bulgaria. Hamilton College Department of Economics working paper series. Hamilton, NY, Hamilton College

Krueger,A.: 2000, Education for growth: Why and for whom? NBER working paper no 7591.

Krueger A. Pischke J.: 1995. A comparative analysis of East and West German Labor Market: Before and After Unification, in R.Freedman and L. Katz, eds.,Differences and changes in wage structure. Chicago: University of Chicago Press

Lehmann, H., Wadsworth, J. and Acquisti, A.: 1999, Grime and Punishment: Job Insecurity and Wage Arreas in the Russian Federation. *Journal of Comparative Economics* 27, 595-617.

Maurer-Fazio,M.: 1999. Earnings and education in China's transition to a market economy. Survey evidence from 1989 and 1992. China economic review, 10 17-40.

Micklewright, J.: 2000. Education, Inequality and Transition, UNICEF Innocenti working Paper no 74.

Milanovic, B: 1998. Income, inequality, and poverty during the transition from planned to market economy. IBRD/The World bank.

Mincer, J.: 1958. Investment in human capital and personal income distribution. *Journal of Political Economy*, 70(5), 50-59.

Mincer, J.: 1974. Schooling, experience and earnings. New York: NBER.

Mroz, T.,D., Mancini and B.Popkin: 2001. Monitoring Economic Conditions in the Russian Federation: The Russia Longitudinal Monitoring Survey 1992-2000. Report submitted to the US Agency for International Development. Carolina Population Center, University of North Carolina at Chapel Hill.

Nesterova, D.and Sabirianova,K.: 1998, Invertment in Human Capital under Economic Transformation in Russia. Working paper 99/04, EERC.

Newell,A., Reilly,B.: 1996. The gender wage gap in Russia: Some empirical evidence, *Labor Economics*, 3, 337-356.

Newell,A., Reilly,B: 1997, Rates of return to educational qualifications in the transitional economies. Discussion papers in Economics, 03/97 University of Sussex.

Orazem, P.F.,Vodopivec,M.: 1994. Winners and losers in transition: Returns to

education, experience and gender in Slovenia. World bank policy research working paper no 1342 Washington D.C. World Bank.

Psacharopoulos, G.: 1994. Returns to investment in education: a global update. *World development*, 22(9) 1325-1343.

Puhani, P.: 2000. The Heckman Correction for Sample Selection and its Critique. *Journal of Economic Surveys* 14, 53-68.

Rutkowski, J.: 1997. Low wage employment in transitional economies of Central and Eastern Europe, *MOST:Economic policy in Transitional Economies*, 7(1).

Schultz, T.W.: 1961. Investment in Human Capital. *American Economic Review*, March.

Stanovnik, T.: 1997. The returns to education in Slovenia. *Economics of education review*, 16(4), 443-449.

Table 1. OLS Estimates of the Returns to Schooling, Experience and Gender in the Literature.

Authors	Data, Sample, Dependent Variable	Year	N obs	K reg	Schooling Measure	Earnings Measure	Return Schooling m w	Return Experience m w	Return Gender	Other controls	R-sq
Brainerd (1998)	Russian Center for Public Opinion Research survey, employed men 18-59, women 18-54 with at least one-half the real min wage. Log of monthly wages from primary job	1991 1992 1994	1719 6686 4916	14	imputed years	monthly all jobs	3.1 5.4 6.6 7.4 6.7 7.6	2.6 3.1 0.7 2.2 1.3 1.3	-24.8 -46.4 -44.6	married, state sector region, region*month	0.17 0.18 0.18
Newell and Reilly (1997)	RLMS 92-96, employed individuals 16-60. Log monthly monetary earnings from primary employment	1992 1994 1995 1996	5663 2843 2333 1921	22	imputed attainment dummies	monthly primary	4.2 9.7 5.7 6.3	age n/a n/a n/a n/a	n/a n/a n/a n/a	log work hours occupation supervisor region	0.25 0.22 0.21 0.18
Nesterova and Sabirianova (1998)	RLMS 94-96, employed individuals. Log hourly wages from all jobs	1996	2376	49	reported attainment dummies	hourly all jobs	4.2	0.9	-18.9	occupation, ownership, industry, local unemplmnt, local hiring	0.29
	2-step Heckman selectivity correction with probit on first stage	1995	2836	7	imputed years	hourly primary	7.8	2.4	-31.1	tenure, tenure-sq, married	n/a
Chaidvasser and Benitez-Silva (2000)	RLMS 92-98, employed working age individuals. Log monthly wages from primary job	1995-8 pooled 1992 1993 1994 1995 1996 1998	7343 6000 4000 3000 2500 3000 4000	14 n/a	reported years reported years	monthly primary monthly primary	4.0 3.4 5.7 5.7 3.7 3.5 5.0	2.2 n/a n/a n/a n/a n/a n/a	-41.8 n/a n/a n/a n/a n/a n/a	region, year, rural same and job characteristics	0.24 n/a
Vernon (2002)	RLMS 92-2000, employed age 16-65. Log monthly wages from all jobs, including nonmonetary earnings	1992 1994 1996 1998 2000	6257 3584 3024 3929 4197	29	imputed years	monthly all jobs	5.2 7.3 6.2 8.4 8.5	2.3 1.3 2.7 2.5 3.6	-37.1 -47.1 -41.2 -48.0 -49.7	log hours, region, married, student, retired household composition, ethnicity, arrears, in-kind, employer ownership	0.22 0.33 0.32 0.43 0.41

Table 2. Russia: Sample Means of Earners Ages 16-64, RLMS-2000

	Overall	Males (49%)	Females (51%)
Sample size	4198	2046	2152
Monthly wages, Rubles	2592	3297	1921
Positive earnings	58.5%	63.2%	54.6%
Monthly wages, USD*	\$20.7	\$26.4	\$15.4
Monthly hours of work	186	196	176
Work less than 120 hrs/mo	9.2%	7.9%	10.4%
Age	38.6	38.3	38.8
Schooling years	12.6	12.2	12.9
Experience years	20.0	20.1	19.9
Student	1.3%	1.8%	0.8%
Retired	0.5%	0.4%	0.6%
Married	66.5%	72.9%	60.4%
Non-Russian ethnicity	14.3%	14.5%	14.1%
highest attainment			
Incomplete secondary	10.7%	14.5%	7.2%
Secondary	21.0%	23.8%	18.3%
Vocational	22.0%	26.5%	17.7%
Specialized secondary	25.8%	17.4%	33.9%
University degree	19.7%	17.3%	21.9%
Graduate degree	0.8%	0.6%	1.0%
ownership of employer			
Government	58.0%	50.9%	64.6%
Foreign firm	3.0%	3.6%	2.4%
Private firm	20.8%	24.0%	17.8%
Self-employed	18.3%	21.5%	15.2%
Amount paid in goods	8.6%	10.0%	7.2%
Wage arrears dummy	25.9%	28.7%	23.3%
Household			
Household size	3.5	3.6	3.3
Share of kids ages 1-6	7.0%	7.5%	6.5%
Share of kids ages 7-15	16.2%	15.1%	17.2%
Share of men ages 16-64	32.0%	37.7%	26.7%
Share of women ages 16-64	35.4%	30.2%	40.3%
Share of Seniors 65+	9.4%	9.5%	9.3%
Share of disabled	2.0%	2.1%	1.9%
region of residence			
Moscow-S.P	4.7%	4.4%	4.9%
NorthWest	5.6%	5.5%	5.6%
Central	17.3%	16.7%	17.9%
Volga	15.0%	14.3%	15.7%
Caucasus	5.9%	6.1%	5.7%
Ural	13.4%	13.1%	13.7%
WestSiberia	7.0%	6.9%	7.0%
EastSiberia	7.0%	7.8%	6.2%
Rural	24.2%	25.2%	23.2%
* Using June 1992 exchange rate \$1=Rub125			

Table 3. Russia: Mean Wages by Educational Attainment, by Age Group and by Gender, 1992-2000

	1992		1994		1996		1998		2000	
	mean	index	mean	index	mean	index	mean	index	mean	index
Overall	\$28.85	100	\$32.97	115	\$29.92	108	\$18.26	66	\$20.73	75
Gender - Male	\$34.64	ratio	\$41.72	ratio	\$36.39	ratio	\$22.92	ratio	\$26.38	ratio
Female	\$23.03	66	\$24.18	58	\$23.71	65	\$13.86	60	\$15.37	58
Attainment - Overall										
Incomplete secondary	\$22.99	79	\$24.43	77	\$20.76	68	\$13.38	74	\$13.84	69
Secondary	\$28.89	99	\$29.72	94	\$27.65	90	\$16.16	90	\$18.79	94
Vocational	\$29.19	100	\$31.41	99	\$28.39	93	\$16.93	94	\$20.42	102
Specialized secondary	\$29.20	100	\$31.59	100	\$30.57	100	\$18.00	100	\$20.09	100
University degree	\$34.07	117	\$43.53	138	\$37.93	124	\$24.72	137	\$27.75	138
Graduate degree	\$42.46	145	\$53.86	170	\$32.68	107	\$24.69	137	\$20.73	103
Males										
Incomplete secondary	\$26.36	72	\$30.65	67	\$22.97	54	\$15.52	58	\$16.11	54
Secondary	\$34.96	95	\$37.21	81	\$32.45	77	\$19.53	73	\$24.40	82
Vocational	\$34.93	95	\$37.54	82	\$34.34	81	\$21.13	79	\$24.63	83
Specialized secondary	\$36.80	100	\$45.79	100	\$42.22	100	\$26.86	100	\$29.71	100
University degree	\$42.65	116	\$56.95	124	\$49.36	117	\$32.61	121	\$37.09	125
Graduate degree	\$43.07	117	\$60.02	131	\$39.35	93	\$27.03	101	\$23.95	81
Females										
Incomplete secondary	\$17.97	73	\$15.11	62	\$16.85	69	\$9.35	68	\$9.47	61
Secondary	\$21.72	89	\$20.58	84	\$21.59	88	\$12.07	87	\$11.86	77
Vocational	\$20.66	84	\$21.04	86	\$20.88	85	\$10.96	79	\$14.42	94
Specialized secondary	\$24.49	100	\$24.39	100	\$24.56	100	\$13.85	100	\$15.41	100
University degree	\$26.66	109	\$32.10	132	\$28.84	117	\$18.93	137	\$20.75	135
Graduate degree	\$40.96	167	\$45.74	187	\$24.98	102	\$21.97	159	\$18.98	123
Age group - Overall										
ages 15-24	\$25.34	100	\$33.74	100	\$26.70	100	\$13.97	100	\$15.22	100
ages 25-34	\$31.28	104	\$34.71	101	\$32.24	103	\$19.23	97	\$20.70	87
ages 35-44	\$30.21	100	\$34.24	100	\$31.33	100	\$19.86	100	\$23.93	100
ages 45-54	\$28.32	94	\$33.53	98	\$30.45	97	\$18.90	95	\$21.10	88
ages 55-64	\$23.27	77	\$22.85	67	\$23.11	74	\$14.50	73	\$16.65	70
Males - ages 15-24	\$28.76	100	\$42.18	100	\$29.86	100	\$17.18	100	\$19.71	100
ages 25-34	\$39.15	105	\$44.15	101	\$39.77	102	\$25.14	101	\$27.45	91
ages 35-44	\$37.21	100	\$43.69	100	\$38.97	100	\$24.77	100	\$30.26	100
ages 45-54	\$33.65	90	\$43.32	99	\$38.61	99	\$24.59	99	\$26.91	89
ages 55-64	\$25.93	70	\$26.92	62	\$26.45	68	\$16.77	68	\$19.25	64
Females - ages 15-24	\$21.54	100	\$22.54	100	\$23.20	100	\$10.68	100	\$10.60	100
ages 25-34	\$22.69	94	\$23.91	91	\$23.95	97	\$12.95	83	\$14.00	78
ages 35-44	\$24.09	100	\$26.21	100	\$24.61	100	\$15.62	100	\$17.98	100
ages 45-54	\$23.77	99	\$24.85	95	\$24.49	99	\$14.67	94	\$16.47	92
ages 55-64	\$18.93	79	\$18.44	70	\$18.96	77	\$11.20	72	\$13.24	74

Table 4. Correlations in the RLMS 1996.

Rank Correlation (p-value Spearman)	university degree or +	schooling years	monthly earnings	hours work	arrears	second job	female	expe rience	resides in rural area	Moscow/ St.Pete	employer govt	employer self-empl
labor market participation	0.085	0.223	-	-	-		-0.069	0.001 <i>0.853</i>	-0.103	0.035	-	-
university degree or +		0.843	0.107	-0.029 <i>0.116</i>	-0.022 <i>0.234</i>	-0.023 <i>0.213</i>	0.045 <i>0.013</i>	-0.039 <i>0.030</i>	-0.155	0.125	0.052 <i>0.004</i>	-0.065 <i>0.000</i>
schooling years			0.126	-0.009 <i>0.631</i>	-0.022 <i>0.220</i>	-0.019 <i>0.305</i>	0.124	-0.147	-0.207	0.115	0.050 <i>0.006</i>	-0.059 <i>0.001</i>
monthly earnings				0.184	-0.152	0.007 <i>0.683</i>	-0.164	-0.052 <i>0.004</i>	-0.179	0.137	-0.109	0.023 <i>0.202</i>
hours work					0.097	-0.147	-0.104	0.016 <i>0.367</i>	-0.067 <i>0.000</i>	-0.002 <i>0.899</i>	0.086	-0.166
arrears						-0.059 <i>0.001</i>	-0.038 <i>0.035</i>	0.072	0.170	-0.153	0.051 <i>0.005</i>	-0.009 <i>0.620</i>
second job							-0.093	-0.093	-0.025 <i>0.173</i>	0.050 <i>0.006</i>	-0.293	0.380
female								0.005 <i>0.765</i>	-0.047 <i>0.010</i>	0.015 <i>0.422</i>	0.072	-0.061 <i>0.001</i>
experience									0.025 <i>0.162</i>	-0.035 <i>0.057</i>	0.035 <i>0.056</i>	0.054 <i>0.003</i>
resides in rural area										-0.173	0.041 <i>0.025</i>	0.055 <i>0.003</i>
Moscow/ St.Pete											-0.074	-0.031 <i>0.092</i>
employer govt												-0.690

Table 5. Russia: Returns to Schooling, by Age Group and by Gender, 1992-2000

	1992	1994	1996	1998	2000
	mean	mean	mean	mean	mean
	t-stat	t-stat	t-stat	t-stat	t-stat
Overall	0.052	0.073	0.062	0.084	0.085
	12.4	11.3	7.9	15.3	14.5
Gender - Male	0.050	0.055	0.047	0.064	0.070
Female	0.054	0.091	0.077	0.102	0.103
	8.5	5.7	4.1	7.8	8.1
	8.6	10.4	6.8	13.6	12.6
Age group - Overall					
ages 16-24	0.096	0.110	0.106	0.111	0.090
	4.2	3.7	2.6	4.2	3.1
ages 25-34	0.044	0.070	0.078	0.080	0.091
	3.7	4.0	3.5	5.5	6.2
ages 35-44	0.049	0.082	0.076	0.106	0.101
	5.3	5.4	4.2	8.4	7.1
ages 45-54	0.041	0.061	0.052	0.075	0.081
	4.1	3.7	2.7	5.3	5.8
ages 55-64	0.016	0.075	0.054	0.045	0.090
	1.0	3.1	2.0	2.1	3.9
Male					
ages 16-24	0.098	0.103	0.094	0.147	0.119
	3.0	2.4	1.7	3.4	2.7
ages 25-34	0.041	0.072	0.065	0.033	0.077
	2.4	2.9	2.2	1.5	3.5
ages 35-44	0.036	0.083	0.047	0.097	0.081
	2.6	3.5	1.8	5.0	3.9
ages 45-54	0.037	0.045	0.035	0.031	0.058
	2.5	1.7	1.0	1.4	2.5
ages 55-64	0.024	0.095	0.090	0.044	0.031
	1.0	2.1	2.1	1.4	0.8
Female					
ages 16-24	0.111	0.139	0.153	0.077	0.070
	3.2	3.1	2.3	2.1	1.8
ages 25-34	0.038	0.067	0.076	0.124	0.106
	2.3	2.9	2.3	6.5	5.1
ages 35-44	0.057	0.077	0.103	0.121	0.115
	4.4	3.8	4.1	7.2	5.8
ages 45-54	0.047	0.081	0.059	0.100	0.092
	3.4	4.0	2.5	5.6	5.1
ages 55-64	-0.008	0.085	0.048	0.036	0.155
	-0.3	2.9	1.3	1.1	4.7

Table 7. Russia: Returns to Gender, by Highest Attainment and by Age Group, 1992-2000

	1992	1994	1996	1998	2000
	mean	mean	mean	mean	mean
	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>	<i>t-stat</i>
Overall					
Highest attainment					
Incomplete secondary	-0.371	-0.471	-0.412	-0.480	-0.497
	-18.5	-15.3	-11.6	-19.6	-19.0
Secondary	-0.302	-0.599	-0.570	-0.565	-0.539
	-6.2	-6.8	-4.4	-7.0	-6.0
Vocational	-0.407	-0.459	-0.503	-0.504	-0.546
	-8.6	-6.2	-7.2	-8.6	-8.9
Specialized secondary	-0.423	-0.461	-0.353	-0.582	-0.427
	-7.4	-6.2	-4.1	-11.1	-7.4
University, Graduate	-0.369	-0.445	-0.409	-0.478	-0.567
	-10.1	-6.8	-5.3	-9.2	-10.7
	-0.400	-0.432	-0.381	-0.401	-0.451
	-8.4	-7.0	-5.0	-8.1	-8.2
Age group					
ages 16-24	-0.335	-0.618	-0.308	-0.431	-0.462
	-3.9	-5.2	-2.4	-4.8	-4.7
ages 25-34	-0.431	-0.525	-0.470	-0.587	-0.637
	-9.5	-7.8	-5.6	-10.4	-11.2
ages 35-44	-0.421	-0.413	-0.446	-0.384	-0.426
	-11.0	-6.5	-6.3	-7.9	-8.0
ages 45-54	-0.370	-0.532	-0.359	-0.443	-0.436
	-7.5	-6.6	-3.8	-6.9	-7.0
ages 55-64	-0.439	-0.299	-0.230	-0.488	-0.205
	-4.3	-2.0	-1.4	-3.7	-1.2

Table 8. United States: Sample Means of Earners Ages 16-64, CPS-2000

	Overall	Males (51%)	Females (49%)
Sample size	156,699	80,146	76,553
Positive earnings	65.3%	68.8%	62.0%
Monthly income	\$2,473	\$2,924	\$2,000
Monthly hours of work	159	170	148
Work less than 31 hrs/week	19.6%	14.5%	24.8%
Age	38.4	38.3	38.5
Schooling years	13.6	13.6	13.7
Experience years	17.4	18.7	16.0
Student	5.8%	5.3%	6.4%
Married	57.1%	59.8%	54.3%
Union	13.6%	15.5%	11.6%
White	75.0%	75.1%	75.0%
Hispanic	10.3%	11.6%	8.9%
Black	9.7%	8.4%	11.0%
Asian	4.0%	4.0%	4.0%
Other	1.0%	1.0%	1.1%
highest attainment			
Incomplete secondary	12.4%	14.1%	10.6%
Secondary	31.4%	31.6%	31.1%
Some college	29.1%	27.1%	31.3%
College	18.4%	18.1%	18.7%
Masters degree	6.4%	6.1%	6.6%
Professional degree	1.2%	1.5%	0.9%
Doctorate degree	1.1%	1.5%	0.8%
ownership of employer			
Government	16.5%	13.8%	19.3%
Private for profit	77.4%	82.6%	71.9%
Private non profit	6.2%	3.6%	8.9%
Household			
Household size	3.2	3.2	3.1
Share of kids ages 1-6	4.7%	5.5%	4.0%
Share of kids ages 7-15	8.9%	9.9%	7.8%
Share of men ages 16-64	47.8%	62.0%	33.0%
Share of women ages 16-64	35.2%	18.9%	52.2%
Share of Seniors 65+	3.3%	3.7%	2.9%
Share of disabled	1.1%	1.2%	1.0%
region of residence			
City North East	11.5%	11.4%	11.7%
City Midwest	10.3%	10.3%	10.2%
City South	10.9%	11.1%	10.8%
City West	10.8%	11.3%	10.3%
Town North East	5.9%	5.8%	6.0%
Town Midwest	6.9%	6.9%	6.9%
Town South	11.0%	10.9%	11.1%
Town West	7.2%	7.3%	7.0%
Rural	25.5%	25.1%	25.9%

Figure 1. Mean Wages by Age and Attainment Cohorts, Males and Females, RLMS 1992, 1996, 2000.

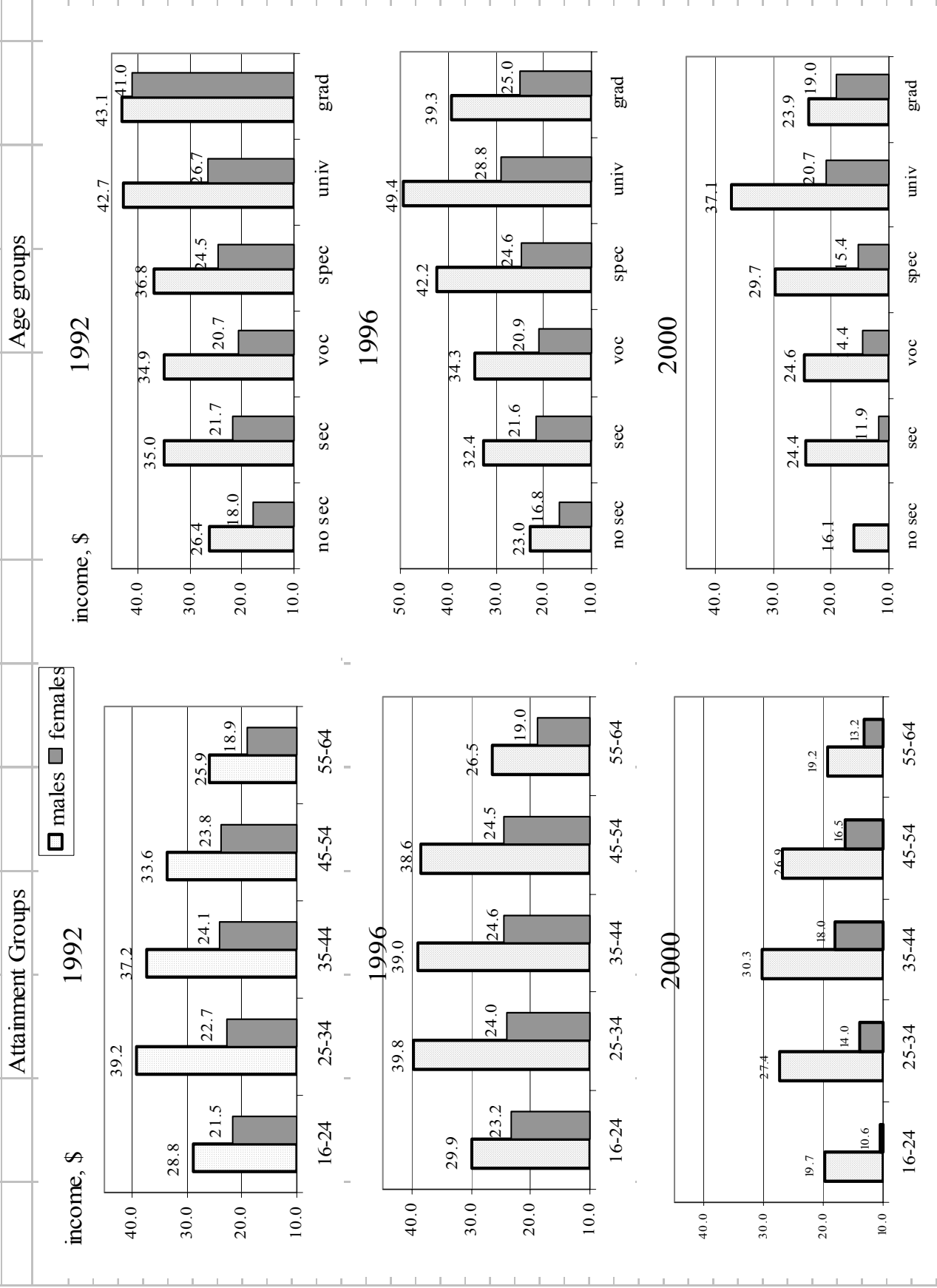


Figure 2. Trend in Returns to Educational Attainment in Russia and Returns to Schooling in Russia and the US.

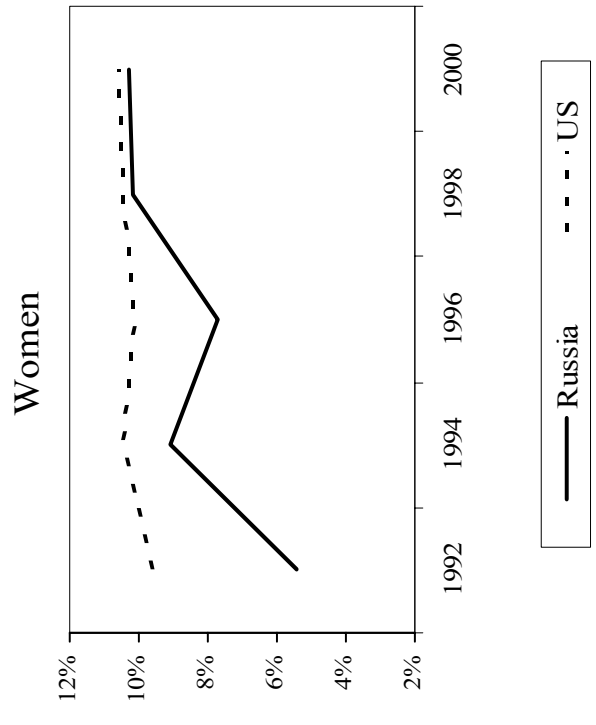
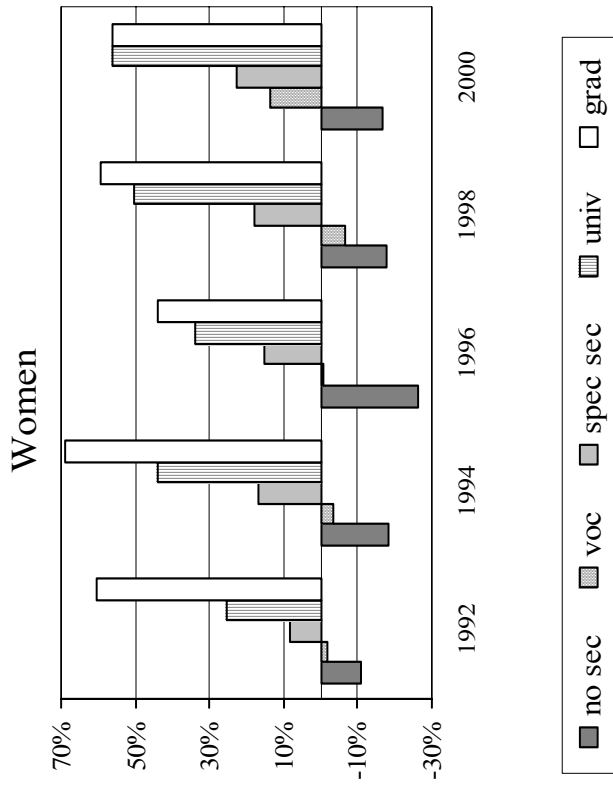
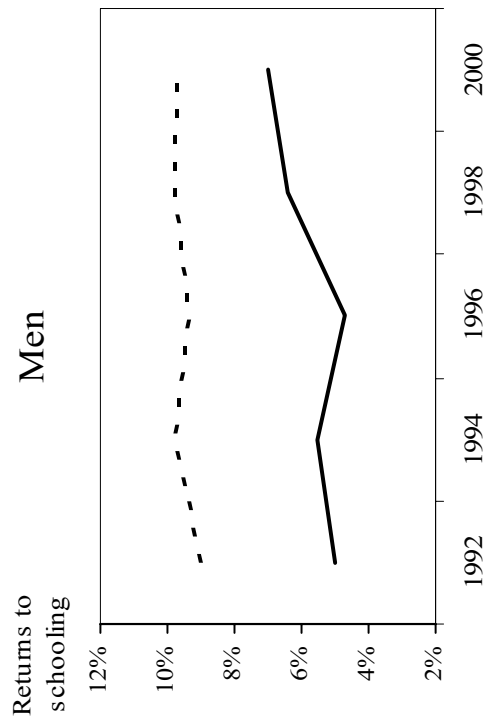
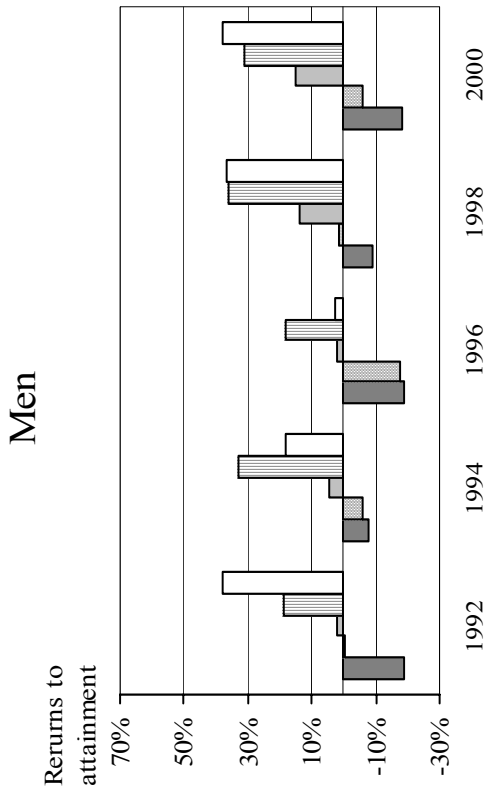


Figure 3. Russia: Non-Parametric Age-Income Profiles,
RLMS 1992, 1996, 2000

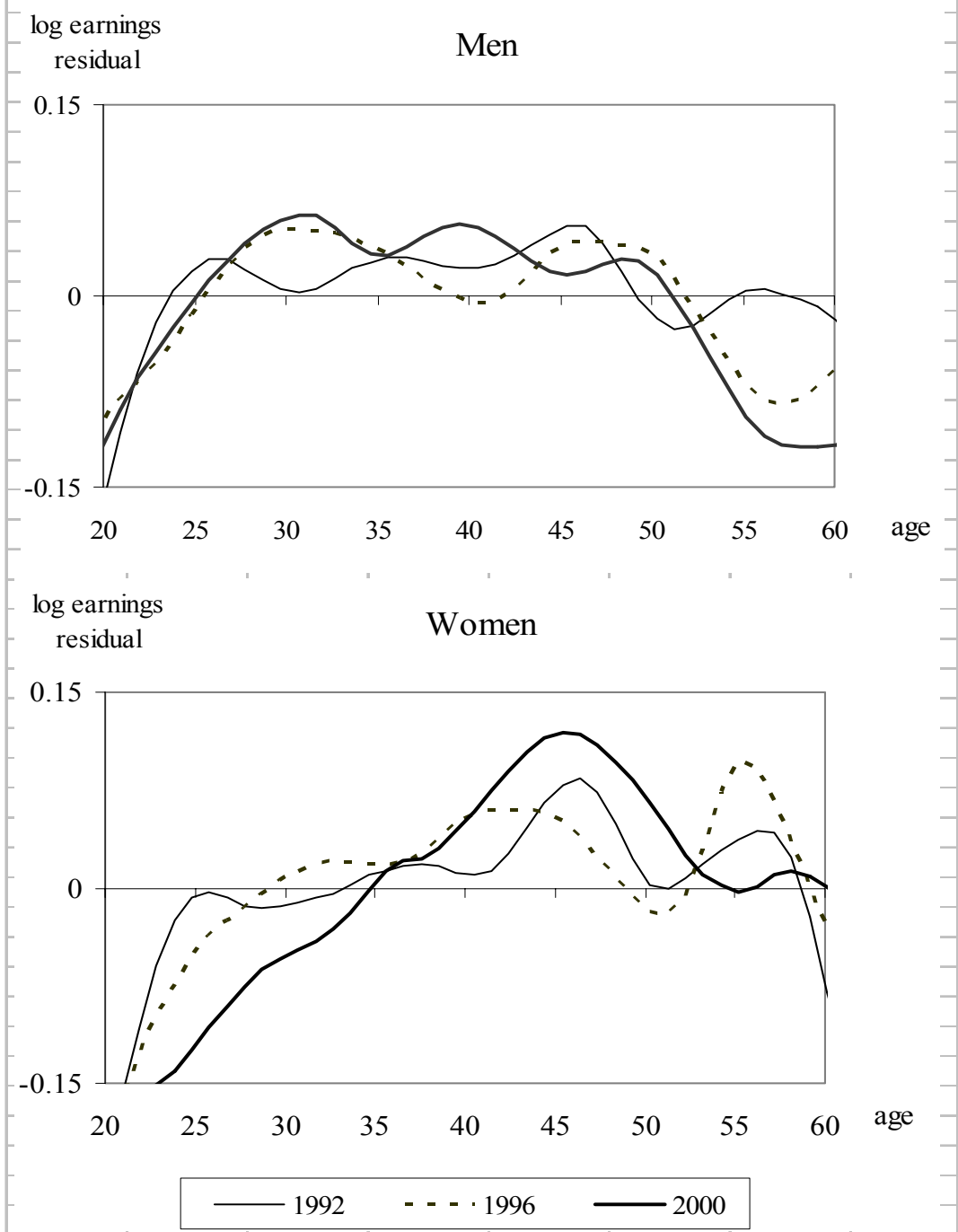
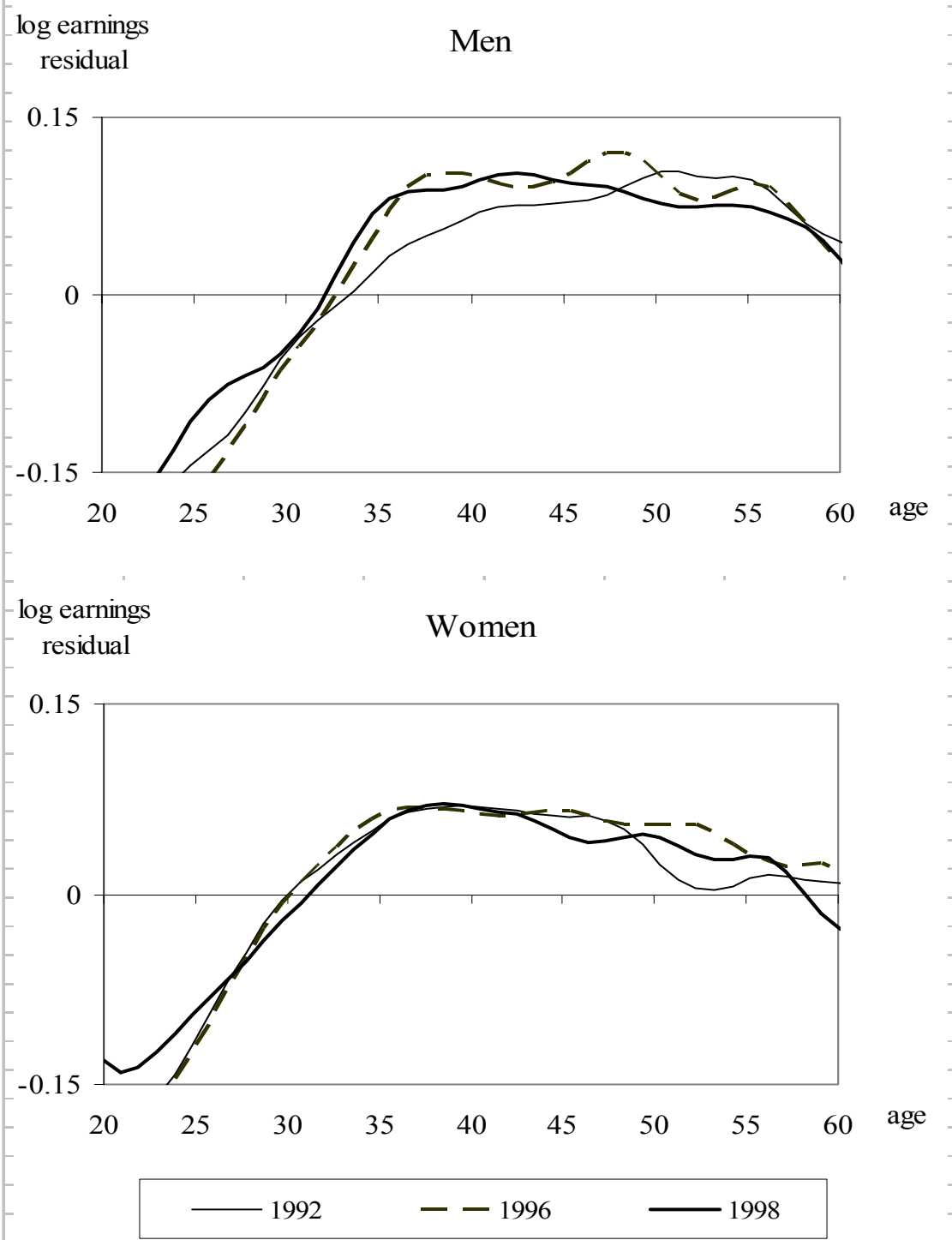


Figure 4. United States: Non-Parametric Age-Income profile,
CPS 1992, 1996, 2000



Appendix A1. Russia: Wage Equation Estimates, All Employed Individuals Ages 16-64

	1992	1994	1996	1998	2000
N=, R-sq	6257	3584	3024	3929	4197
	<i>t-stat</i>	<i>coeff</i>	<i>t-stat</i>	<i>coeff</i>	<i>t-stat</i>
	0.22	0.33	0.32	0.43	0.41
Schooling-years	0.052	0.073	0.062	0.084	0.085
Experience-years	0.023	0.013	0.027	0.025	0.036
Experience-Sq	0.000	0.000	-0.001	-0.001	-0.001
Hours of work	0.295	0.388	0.452	0.504	0.493
Female	-0.371	-0.471	-0.412	-0.480	-0.497
Student	-0.200	-0.622	-0.276	-0.260	-0.249
Married	0.077	0.053	0.050	0.080	0.109
Non-Russian ethnicity		0.077	0.088	-0.025	0.030
Retired	-0.097	-0.775	-0.301	-0.874	-0.481
Foreign employer	0.149	0.292	0.568	0.463	0.491
Russian employer	-0.115	-0.003	0.251	0.163	0.243
Self-employed	0.160	0.119	0.160	0.148	0.199
Wages in arrears		-0.251	-0.427	-0.146	-0.259
Paid in-kind in goods	0.781	-0.108	-0.265	-0.092	-0.351
Share of disabled	-0.165	-0.190	0.057	-0.077	-0.185
Work less than 120 hrs/mo	-0.082	0.172	-0.010	-0.027	-0.093
Log household size	-0.045	-0.042	-0.004	-0.060	-0.054
Share of kids ages 1-6	0.297	0.085	0.152	0.065	0.190
Share of kids ages 7-17	0.203	0.093	0.041	0.285	0.189
Share of women ages 16-64	0.222	0.111	0.184	0.277	0.276
Share of Seniors 65+	0.029	-0.038	-0.086	0.050	-0.036
Region - Moscow-SP	0.206	0.738	0.649	0.765	0.709
Northwest	0.197	0.910	0.735	0.884	0.706
Central	0.184	0.323	0.255	0.409	0.391
Volga	0.017	0.168	0.072	0.250	0.148
Caucasus	0.438	0.272	0.344	0.311	0.370
Ural	-0.024	0.477	0.433	0.538	0.427
West Siberia	0.182	0.903	0.874	0.892	0.723
East Siberia	0.484	0.925	0.741	0.821	0.664
Estimates by Attainment					
Incomplete secondary	-0.149	-0.114	-0.216	-0.125	-0.172
Vocational	0.000	-0.048	-0.099	-0.010	0.026
Specialized	0.057	0.126	0.091	0.171	0.175
University degree	0.227	0.384	0.258	0.448	0.432
Graduate degree	0.455	0.423	0.232	0.476	0.441

Not included: dummies for the month of the survey, intercept, Reference groups: rural for region, government for ownership

Appendix A2. Russia: Wage Equation Estimates, All Employed Males Ages 16-64

	1992	1994	1996	1998	2000
N=, R-sq	3137 0.20	1795 0.29	1481 0.33	1905 0.42	2045 0.41
	<i>coeff</i>	<i>t-stat</i>	<i>coeff</i>	<i>t-stat</i>	<i>coeff</i>
Schooling-years	0.050 8.5	0.055 5.7	0.047 4.1	0.064 7.8	0.070 8.1
Experience-years	0.020 4.2	0.010 1.3	0.018 2.0	0.016 2.5	0.027 4.1
Experience-Sq	0.000 -4.1	0.000 -1.3	0.000 -2.0	0.000 -3.1	-0.001 -4.4
Hours of work	0.276 6.2	0.398 8.5	0.485 8.0	0.498 12.9	0.509 11.7
Student	-0.291 -1.2	-0.445 -2.2	-0.464 -1.9	-0.396 -2.5	-0.260 -1.8
Married	0.072 0.9	-0.040 -0.3	0.136 1.7	0.113 2.4	0.196 4.1
Non-Russian ethnicity	-0.076 -0.6	0.045 0.8	0.051 0.7	-0.020 -0.4	0.054 1.1
Retired	-0.076 -0.6	-0.899 -3.4	-0.651 -1.7	-0.936 -3.4	-0.981 -3.4
Foreign employer*	0.139 1.8	0.152 0.9	0.454 2.8	0.380 3.8	0.390 4.1
Russian employer	-0.129 -2.6	-0.050 -0.7	0.199 2.9	0.094 2.1	0.168 3.9
Self-employed	0.133 2.8	0.090 1.9	0.145 2.6	0.061 1.3	0.133 2.8
Wages in arrears		-0.246 -5.1	-0.394 -7.6	-0.146 -4.0	-0.287 -6.9
Paid in-kind in goods	0.730 3.9	-0.202 -2.8	-0.395 -5.7	-0.086 -1.8	-0.405 -6.5
Share of disabled	-0.307 -1.2	-0.134 -0.5	-0.056 -0.2	-0.156 -0.7	-0.290 -1.2
Work less than 120 hrs/mo	-0.059 -0.8	0.301 3.2	0.048 0.3	0.000 0.0	-0.028 -0.3
Log household size	-0.063 -1.2	-0.011 -0.1	0.064 0.8	-0.123 -2.3	-0.117 -2.1
Share of kids ages 1-6	0.395 3.0	0.490 2.3	0.213 0.9	0.192 1.1	0.418 2.4
Share of kids ages 7-17	0.294 2.7	0.268 1.5	-0.085 -0.4	0.425 3.0	0.197 1.4
Share of women ages 16-64	0.257 1.7	0.400 1.6	-0.183 -0.8	0.422 2.7	0.300 1.8
Share of Seniors 65+	-0.017 -0.2	0.047 0.3	-0.367 -1.8	0.186 1.4	-0.039 -0.3
Region - Moscow-S.P					
Northwest	0.267 5.1	0.883 10.2	0.886 9.1	0.896 11.7	0.751 7.9
Central	0.302 5.1	0.918 8.2	0.737 6.3	1.033 12.3	0.845 10.0
Volga	0.250 4.7	0.456 6.0	0.414 5.0	0.535 9.3	0.461 7.8
Caucasus	0.090 1.8	0.220 2.8	0.189 2.2	0.350 6.0	0.208 3.5
Ural	0.555 11.9	0.293 3.1	0.481 4.4	0.500 6.2	0.428 5.3
West Siberia	0.058 1.2	0.579 7.2	0.354 6.7	0.746 12.3	0.558 9.0
East Siberia	0.230 2.9	1.023 10.9	0.992 9.8	1.009 14.1	0.811 10.5
	0.677 13.2	1.045 10.4	0.685 6.2	1.023 13.5	0.799 10.8
Estimates by Attainment					
Incomplete secondary	-0.190 -4.4	-0.079 -1.1	-0.191 -2.4	-0.088 -1.5	-0.181 -3.0
Vocational	-0.004 -0.1	-0.060 -0.9	-0.178 -2.6	0.014 0.3	-0.062 -1.2
Specialized	0.020 0.5	0.048 0.7	0.019 0.3	0.141 2.6	0.150 2.7
University degree	0.187 4.3	0.328 4.7	0.180 2.5	0.359 6.5	0.313 5.6
Graduate degree	0.381 3.1	0.179 1.0	0.028 0.1	0.369 2.3	0.380 1.6

* Foreign ownership variable is not available for 1992, individual private is used instead.

Appendix A3. Russia: Wage Equation Estimates, All Employed Females Ages 16-64											
	1992		1994		1996		1998		2000		
	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat	
N=, R-sq	3119	0.16	1788	0.33	1542	0.28	2023	0.40	2151	0.36	
Schooling-years	0.054	8.6	0.091	10.4	0.077	6.8	0.102	13.6	0.103	12.6	
Experience-years	0.023	4.8	0.019	2.7	0.033	3.6	0.035	5.8	0.038	5.8	
Experience-Sq	-0.001	-4.0	-0.001	-2.8	-0.001	-3.0	-0.001	-4.9	-0.001	-4.4	
Hours of work	0.340	8.1	0.414	9.9	0.417	7.8	0.521	13.5	0.472	11.0	
Student	-0.142	-0.7	-0.769	-4.3	-0.073	-0.3	-0.085	-0.5	-0.291	-1.5	
Married	0.012	0.2	-0.039	-0.5	0.030	0.5	0.036	1.0	0.039	1.0	
Non-Russian ethnicity			0.099	1.9	0.130	1.6	-0.033	-0.7	0.016	0.3	
Retired	-0.121	-1.2	-0.667	-3.4	-0.186	-0.7	-0.888	-3.9	-0.171	-0.8	
Foreign employer	0.158	2.1	0.398	3.0	0.685	4.1	0.560	5.2	0.608	5.8	
Russian employer	-0.058	-1.0	0.073	1.0	0.278	4.1	0.219	5.2	0.310	7.2	
Self-employed	0.208	4.1	0.167	3.8	0.166	3.0	0.238	5.7	0.269	5.5	
Wages in arrears			-0.265	-6.1	-0.451	-9.3	-0.147	-4.7	-0.221	-5.7	
Paid in-kind in goods	0.856	4.3	0.031	0.4	-0.095	-1.3	-0.088	-1.9	-0.283	-4.4	
Share of disabled	0.025	0.1	-0.264	-1.1	0.015	0.1	-0.005	0.0	-0.051	-0.2	
Work less than 120 hrs/mo	-0.062	-1.1	0.129	1.9	-0.041	-0.4	-0.024	-0.4	-0.144	-1.9	
Log household size	-0.025	-0.6	-0.050	-0.8	-0.014	-0.2	-0.036	-0.8	0.017	0.4	
Share of kids ages 1-6	0.128	0.9	-0.392	-2.0	-0.140	-0.6	-0.035	-0.2	-0.100	-0.6	
Share of kids ages 7-17	0.049	0.4	-0.184	-1.1	-0.039	-0.2	0.192	1.8	0.169	1.5	
Share of women ages 16-64	0.074	0.7	-0.190	-1.1	0.180	0.9	0.197	1.6	0.229	1.8	
Share of Seniors 65+	-0.073	-0.6	-0.273	-1.5	-0.007	0.0	-0.010	-0.1	-0.062	-0.5	
Region - Moscow-S.P	0.126	2.8	0.592	8.2	0.425	4.7	0.642	9.8	0.657	8.0	
Northwest	0.082	1.5	0.897	10.0	0.726	6.7	0.753	10.9	0.577	7.4	
Central	0.104	2.1	0.189	2.9	0.097	1.2	0.279	5.6	0.317	6.0	
Volga	-0.064	-1.4	0.108	1.6	-0.052	-0.6	0.148	2.9	0.088	1.6	
Caucasus	0.304	6.7	0.255	3.0	0.218	2.1	0.135	1.9	0.303	4.0	
Ural	-0.122	-2.7	0.354	5.1	0.289	3.6	0.346	6.7	0.299	5.3	
West Siberia	0.130	1.7	0.777	9.5	0.727	7.3	0.780	11.7	0.641	9.1	
East Siberia	0.266	5.4	0.819	10.1	0.768	7.0	0.644	9.8	0.529	7.2	
Estimates by Attainment											
Incomplete secondary	-0.108	-2.3	-0.181	-2.5	-0.265	-2.7	-0.178	-2.7	-0.165	-2.3	
Vocational	-0.020	-0.4	-0.034	-0.5	-0.005	-0.1	-0.068	-1.4	0.135	2.5	
Specialized	0.081	2.3	0.167	3.0	0.154	2.4	0.180	4.2	0.227	4.9	
University degree	0.255	6.2	0.437	7.2	0.336	4.8	0.501	10.6	0.561	10.7	
Graduate degree	0.604	3.4	0.687	4.0	0.437	1.8	0.596	3.8	0.564	3.5	

Appendix B1. United States: Wage Equation Estimates, All Employed Individuals Ages 16-64

	1992		1994		1996		1998		2000	
	coef	t-stat	coef	t-stat	coef	t-stat	coef	t-stat	coef	t-stat
N=, R-sq	171581	0.69	166211	0.62	148122	0.61	152927	0.59	156698	0.59
Schooling-years	0.095	<i>186.5</i>	0.103	<i>169.6</i>	0.099	<i>153.2</i>	0.102	<i>158.6</i>	0.103	<i>164.2</i>
Experience-years	0.027	<i>78.1</i>	0.030	<i>74.1</i>	0.030	<i>68.0</i>	0.028	<i>63.4</i>	0.026	<i>61.4</i>
Experience-Sq	0.000	<i>-56.7</i>	-0.001	<i>-54.9</i>	-0.001	<i>-51.0</i>	-0.001	<i>-48.2</i>	0.000	<i>-47.3</i>
Hours of work	0.928	<i>214.0</i>	0.798	<i>189.1</i>	0.815	<i>184.1</i>	0.822	<i>183.6</i>	0.836	<i>186.1</i>
Female	-0.188	<i>-76.7</i>	-0.213	<i>-73.0</i>	-0.217	<i>-69.7</i>	-0.223	<i>-71.0</i>	-0.224	<i>-73.0</i>
Student	-0.040	<i>-6.9</i>	-0.123	<i>-18.5</i>	-0.104	<i>-14.6</i>	-0.118	<i>-16.6</i>	-0.111	<i>-16.1</i>
Married	0.125	<i>48.3</i>	0.121	<i>39.7</i>	0.117	<i>35.8</i>	0.116	<i>35.2</i>	0.108	<i>33.8</i>
White	0.040	<i>3.8</i>	0.034	<i>2.9</i>	0.005	<i>0.3</i>	0.045	<i>3.4</i>	0.021	<i>1.6</i>
Hispanic	-0.106	<i>-9.2</i>	-0.099	<i>-8.0</i>	-0.147	<i>-10.2</i>	-0.099	<i>-7.0</i>	-0.122	<i>-9.0</i>
Black	-0.088	<i>-7.8</i>	-0.089	<i>-7.3</i>	-0.145	<i>-10.2</i>	-0.076	<i>-5.5</i>	-0.106	<i>-7.8</i>
Asian	-0.049	<i>-4.0</i>	-0.037	<i>-2.8</i>	-0.080	<i>-5.3</i>	-0.051	<i>-3.5</i>	-0.054	<i>-3.7</i>
Private for profit employer	-0.001	<i>-0.4</i>	0.024	<i>6.8</i>	0.032	<i>8.1</i>	0.053	<i>13.4</i>	0.049	<i>12.6</i>
Private non profit employer			-0.073	<i>-11.7</i>	-0.045	<i>-7.0</i>	-0.038	<i>-6.0</i>	-0.041	<i>-6.6</i>
Log household size	-0.030	<i>-11.4</i>	-0.038	<i>-12.4</i>	-0.034	<i>-10.4</i>	-0.030	<i>-8.9</i>	-0.024	<i>-7.5</i>
Share of kids ages 1-6	0.012	<i>2.7</i>	0.003	<i>0.5</i>	0.003	<i>0.5</i>	-0.007	<i>-1.0</i>	-0.005	<i>-0.7</i>
Share of kids ages 7-15	0.009	<i>1.8</i>	0.011	<i>1.7</i>	0.012	<i>2.0</i>	-0.002	<i>-0.3</i>	0.014	<i>2.4</i>
Share of women ages 16-64	0.052	<i>15.8</i>	0.049	<i>12.1</i>	0.047	<i>11.5</i>	0.049	<i>11.8</i>	0.042	<i>10.4</i>
Share of Seniors 65+	0.022	<i>3.8</i>	-0.015	<i>-2.1</i>	0.019	<i>2.6</i>	0.016	<i>2.2</i>	0.025	<i>3.5</i>
Share of disabled	-0.090	<i>-5.1</i>	-0.064	<i>-4.0</i>	-0.066	<i>-4.2</i>	-0.078	<i>-5.2</i>	-0.087	<i>-6.1</i>
Union membership	0.167	<i>54.4</i>	0.190	<i>52.2</i>	0.177	<i>44.2</i>	0.163	<i>39.6</i>	0.135	<i>33.4</i>
Work less than 31 hrs/week	-0.282	<i>-63.6</i>	-0.279	<i>-66.8</i>	-0.264	<i>-61.5</i>	-0.242	<i>-55.8</i>	-0.233	<i>-54.2</i>
Region - City North East	0.252	<i>74.7</i>	0.267	<i>36.2</i>	0.205	<i>43.5</i>	0.202	<i>42.6</i>	0.195	<i>41.6</i>
City Midwest	0.184	<i>47.9</i>	0.199	<i>23.3</i>	0.189	<i>38.2</i>	0.194	<i>38.8</i>	0.195	<i>40.3</i>
City South	0.191	<i>47.0</i>	0.194	<i>21.5</i>	0.166	<i>33.7</i>	0.177	<i>35.8</i>	0.178	<i>36.9</i>
City West	0.238	<i>59.7</i>	0.233	<i>26.5</i>	0.202	<i>40.1</i>	0.204	<i>40.8</i>	0.206	<i>42.2</i>
Town North East	0.139	<i>26.2</i>	0.188	<i>47.1</i>	0.172	<i>28.6</i>	0.160	<i>26.2</i>	0.144	<i>24.3</i>
Town Midwest	0.066	<i>14.0</i>	0.115	<i>28.2</i>	0.098	<i>17.4</i>	0.095	<i>16.7</i>	0.094	<i>16.8</i>
Town South	0.064	<i>16.7</i>	0.103	<i>26.9</i>	0.084	<i>17.7</i>	0.090	<i>18.6</i>	0.087	<i>18.5</i>
Town West	0.174	<i>33.0</i>	0.168	<i>38.0</i>	0.130	<i>22.4</i>	0.120	<i>20.7</i>	0.122	<i>21.9</i>
Estimates by Attainment										
Incomplete secondary	-0.166	<i>-45.8</i>	-0.203	<i>-46.2</i>	-0.205	<i>-43.6</i>	-0.209	<i>-44.2</i>	-0.215	<i>-46.3</i>
Some College	0.158	<i>57.9</i>	0.149	<i>46.8</i>	0.136	<i>39.8</i>	0.137	<i>39.7</i>	0.137	<i>40.7</i>
College Degree	0.425	<i>129.9</i>	0.445	<i>116.0</i>	0.424	<i>104.0</i>	0.452	<i>110.6</i>	0.456	<i>114.9</i>
Masters Degree	0.544	<i>112.9</i>	0.607	<i>105.5</i>	0.580	<i>94.0</i>	0.592	<i>96.6</i>	0.596	<i>101.5</i>
Professional Degree	0.722	<i>67.8</i>	0.772	<i>65.5</i>	0.738	<i>60.5</i>	0.758	<i>62.0</i>	0.734	<i>60.6</i>
Doctorate Degree	0.703	<i>60.4</i>	0.717	<i>56.5</i>	0.692	<i>51.7</i>	0.723	<i>55.2</i>	0.733	<i>58.9</i>

Not included: dummies for the month of the survey, intercept. Reference groups: rural for region, government for ownership, other for ethnicity

Appendix B2. United States: Wage Equation Estimates, All Employed Males Ages 16-64

	1992		1994		1996		1998		2000	
	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat
N=, R-sq	87788	0.65	84620	0.59	75423	0.57	77982	0.55	80145	0.55
Schooling-years	0.090	130.9	0.098	121.4	0.093	107.3	0.097	110.5	0.097	113.9
Experience-years	0.034	68.3	0.039	66.9	0.037	59.9	0.035	54.3	0.034	54.7
Experience-Sq	-0.001	-50.8	-0.001	-51.1	-0.001	-46.4	-0.001	-42.4	-0.001	-43.3
Hours of work	0.901	130.0	0.760	122.2	0.785	117.8	0.790	114.8	0.829	120.7
Student	-0.014	-1.6	-0.163	-16.5	-0.151	-14.1	-0.182	-17.0	-0.153	-14.7
Married	0.150	37.4	0.157	34.3	0.153	31.1	0.147	29.5	0.144	30.4
White	0.047	3.1	0.075	4.7	0.026	1.4	0.084	4.4	0.047	2.6
Hispanic	-0.142	-8.8	-0.102	-6.0	-0.165	-8.0	-0.103	-5.1	-0.133	-6.9
Black	-0.147	-9.2	-0.099	-5.9	-0.192	-9.4	-0.101	-5.0	-0.142	-7.3
Asian	-0.061	-3.6	-0.041	-2.2	-0.087	-4.0	-0.046	-2.2	-0.054	-2.6
Private for profit employer	0.024	5.5	0.063	12.4	0.064	11.3	0.092	15.8	0.077	13.5
Private non profit employer			-0.178	-16.8	-0.135	-12.1	-0.108	-9.5	-0.124	-11.4
Log household size	-0.028	-8.2	-0.038	-9.5	-0.036	-8.2	-0.026	-5.8	-0.027	-6.4
Share of kids ages 1-6	0.023	3.8	0.016	2.2	0.013	1.6	0.007	0.7	0.005	0.5
Share of kids ages 7-15	0.009	1.5	0.027	3.4	0.017	2.2	0.002	0.3	0.017	2.0
Share of women ages 16-64	0.031	6.5	0.022	4.0	0.023	3.9	0.030	4.8	0.021	3.5
Share of Seniors 65+	0.016	2.0	-0.025	-2.7	0.020	2.0	0.013	1.3	0.031	3.1
Share of disabled	-0.084	-3.6	-0.076	-3.7	-0.080	-3.9	-0.090	-4.5	-0.088	-4.5
Union membership	0.166	41.1	0.184	39.2	0.165	31.6	0.158	29.2	0.133	24.9
Work less than 31 hrs/week	-0.331	-44.0	-0.240	-39.6	-0.222	-35.9	-0.198	-31.1	-0.194	-31.0
Region - City North East	0.226	47.2	0.217	21.0	0.175	26.4	0.184	27.3	0.174	26.2
City Midwest	0.185	34.2	0.188	15.8	0.188	27.1	0.178	25.1	0.190	27.8
City South	0.177	30.6	0.168	13.3	0.144	20.8	0.165	23.5	0.175	25.9
City West	0.222	39.9	0.199	16.6	0.173	24.9	0.180	25.7	0.189	27.9
Town North East	0.117	15.5	0.161	29.0	0.158	18.7	0.146	16.8	0.130	15.5
Town Midwest	0.060	9.0	0.106	18.7	0.109	13.7	0.105	13.0	0.090	11.5
Town South	0.056	10.3	0.086	16.1	0.077	11.4	0.085	12.4	0.078	11.7
Town West	0.159	21.6	0.139	22.9	0.115	14.3	0.110	13.7	0.115	14.8
Estimates by Attainment										
Incomplete secondary	-0.166	-33.8	-0.213	-36.6	-0.217	-34.3	-0.209	-32.6	-0.221	-35.3
Some College	0.131	33.4	0.126	28.1	0.113	23.3	0.125	25.1	0.119	24.8
College Degree	0.411	88.9	0.421	79.5	0.396	69.3	0.435	75.3	0.432	77.3
Masters Degree	0.521	77.0	0.565	71.0	0.522	60.2	0.545	61.9	0.548	65.8
Professional Degree	0.678	50.8	0.722	50.0	0.709	45.4	0.716	45.7	0.677	43.7
Doctorate Degree	0.657	47.1	0.688	45.5	0.668	41.9	0.693	43.3	0.702	45.4

Appendix B3. United States: Wage Equation Estimates, All Employed Females Ages 16-64

	1992		1994		1996		1998		2000	
	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat	coeff	t-stat
N=, R-sq	83792	0.69	81590	0.61	72698	0.60	74944	0.60	76552	0.59
Schooling-years	0.096	127.4	0.105	114.2	0.101	104.8	0.105	109.8	0.105	113.4
Experience-years	0.026	52.4	0.029	47.7	0.029	44.6	0.028	43.1	0.025	40.2
Experience-Sq	-0.001	-43.1	-0.001	-38.9	-0.001	-36.3	-0.001	-35.5	-0.001	-33.7
Hours of work	0.932	170.9	0.796	136.7	0.801	133.0	0.812	135.7	0.809	133.6
Student	-0.061	-7.8	-0.110	-12.2	-0.083	-8.6	-0.082	-8.7	-0.090	-9.7
Married	0.081	23.1	0.075	17.7	0.074	16.5	0.079	17.6	0.063	14.4
White	0.033	2.2	-0.006	-0.4	-0.006	-0.3	0.013	0.7	0.000	0.0
Hispanic	-0.062	-3.9	-0.091	-5.1	-0.114	-5.7	-0.084	-4.3	-0.102	-5.4
Black	-0.044	-2.8	-0.092	-5.3	-0.109	-5.6	-0.064	-3.4	-0.083	-4.5
Asian	-0.022	-1.3	-0.020	-1.0	-0.050	-2.4	-0.034	-1.7	-0.034	-1.7
Private for profit employer	-0.036	-8.8	-0.022	-4.5	-0.006	-1.2	0.011	2.0	0.013	2.5
Private non profit employer			-0.041	-5.2	-0.010	-1.3	-0.019	-2.5	-0.015	-2.0
Log household size	-0.066	-14.9	-0.074	-13.9	-0.067	-11.9	-0.070	-12.3	-0.052	-9.5
Share of kids ages 1-6	-0.006	-0.8	-0.002	-0.3	-0.006	-0.7	-0.011	-1.0	-0.012	-1.2
Share of kids ages 7-15	-0.001	-0.2	-0.018	-1.9	-0.004	-0.4	-0.005	-0.6	0.006	0.7
Share of women ages 16-64	0.033	6.2	0.022	3.2	0.029	4.3	0.023	3.5	0.027	4.1
Share of Seniors 65+	0.019	2.3	-0.001	-0.1	0.010	0.9	0.014	1.4	0.010	1.0
Share of disabled	-0.072	-2.7	-0.011	-0.5	-0.034	-1.4	-0.044	-2.0	-0.072	-3.5
Union membership	0.139	29.2	0.166	29.2	0.166	26.7	0.145	23.0	0.114	18.4
Work less than 31 hrs/week	-0.240	-44.3	-0.293	-50.6	-0.289	-48.3	-0.264	-44.6	-0.259	-43.6
Region - City North East	0.282	60.7	0.327	31.7	0.241	36.6	0.226	34.4	0.223	34.2
City Midwest	0.185	34.5	0.213	17.6	0.197	28.4	0.216	30.9	0.206	30.4
City South	0.203	36.4	0.219	17.3	0.188	27.4	0.192	27.8	0.184	27.1
City West	0.258	46.0	0.273	21.5	0.236	33.0	0.232	33.0	0.227	32.9
Town North East	0.160	21.9	0.220	38.8	0.189	22.3	0.176	20.7	0.162	19.7
Town Midwest	0.073	11.1	0.125	21.6	0.089	11.2	0.089	11.2	0.100	12.9
Town South	0.070	13.2	0.122	22.2	0.093	13.9	0.095	14.2	0.097	14.7
Town West	0.190	25.8	0.201	31.7	0.147	17.8	0.132	16.2	0.130	16.5
Estimates by Attainment										
Incomplete secondary	-0.161	-30.5	-0.188	-28.5	-0.191	-27.3	-0.207	-29.8	-0.204	-29.8
Some College	0.172	46.3	0.159	35.6	0.146	30.9	0.140	29.4	0.143	30.6
College Degree	0.417	91.1	0.447	80.8	0.430	74.1	0.449	78.2	0.459	81.7
Masters Degree	0.543	79.6	0.626	75.8	0.612	70.1	0.614	72.3	0.623	75.4
Professional Degree	0.773	44.0	0.850	42.5	0.755	39.1	0.809	41.4	0.790	40.9
Doctorate Degree	0.759	35.6	0.763	33.2	0.714	29.0	0.775	33.5	0.758	36.0