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INVESTMENT IN HUMAN CAPITAL UNDER ECONOMIC TRANSFORMATION IN RUSSIA

CONTENTS

LIST OF FIGURES AND TABLES

1. GENERAL DESCRIPTION OF THE RESEARCH PROJECT

OBJECTIVES OF THE STUDY

Today the competitive advantages of a country and its potential for modernization are directly related to the size of accumulated human capital. People, with their education, skills and professional experience, determine the opportunities and frontiers of economic change. Investment in human capital gives an individual some sort of power over their own working life and social status, increases their individual freedom through increased mobility and extends the frontiers of their economic choice. Investment in human capital can thus be one of the most important sources of economic dynamics and growth.

Investment in human capital is particularly important for Russia during the period of economic transformation. The previous centralized wage-setting system resulted in a weak correlation between wage and personal success, on the one hand, and education, on the other. It should also be noted that the previous system of education was mostly directed to the training of narrow-skilled specialists for particular industries. As a result workers were less mobile and highly attached to one job and occupation during their life-time horizon. Although the general level of schooling was relatively high, this narrow education did not provide the skills and knowledge now demanded by the market economy. The current situation in the Russian labour market is characterized by a large discrepancy between the available educational capital and the market demand for skills.

All this lends increasing importance to research into human capital formation during the transition period in Russia. In this report the main attention will be given to theoretical and empirical analysis of wage determinants and returns to human capital under the economic transformation. This involves six main steps:

1. Econometric estimation of the basic earnings equations for calculating private rates of return to schooling, returns to labour market experience and returns to specific human capital (tenure).
2. Comparative analysis of rates of returns to human capital across professional and demographic groups, industries and type of enterprises from 1992 to 1996.
3. Tracing how aggregate demands shocks during the transition period affected the returns to human capital.

4. Analyzing how education influences hours at work and employment adjustments, the probability of job loss and the effectiveness of job search.
5. Examining to what extent education affects an individual's transition between the various labour market states such as employment, unemployment and out-of-the-labour force (OLF).

Measuring how taking account of unemployment and selection bias affects the rates of return to schooling and experience.

Achieving these purposes is also important for human capital theory development because it shows a way to apply the main ideas of this theory to the fast-changing economic and social conditions under economic transformation in Russia. It allows us to test various hypotheses on the basis of the first representative population sample in Russia.

REVIEW OF THE LITERATURE

The idea that acquisition and development of skills embodied in human agents of production could be treated as a form of investment originated in the works of W.Petty, A.Smith and A.Marshall, who all stressed how important it is for a national economy to invest in education. At the beginning of the twentieth century, the Russian economist S.Strumilin and the English economists L.Dublin and A.Lotka presented the first empirical results of returns to education by using the discounted earnings procedure.

The idea really came to the professional forefront in the late 1950s and early 1960s with the empirical results of Schultz (1961), Denison (1962) and others showing the importance of education for productivity and economic growth. All these developments were organized into a coherent theoretical structure by Becker (1975), a landmark work which raised virtually all the major questions and which in turn stimulated a vast number of studies in the area of human capital.

Mincer (1958) also developed an important study. He was one of the first to apply human capital concepts directly to the personal distribution of earnings and used the standard earnings function for estimation of rates of return to education and experience. As Willis (1986) says:

> As an empirical tool, the Mincer earnings function has been one of the great success stories of modern labour economics. It has been used in hundreds of studies using data from virtually every historical period and country for which suitable data exist.

Unfortunately, the lack of accessible Soviet micro data did not allow use of this empirical tool for investigating the educational wage differentials and returns to human capital for a long period of the Soviet system. Much of the early work on the Soviet labour market and human capital was done using highly aggregated national or regional data. This situation changed

with interviews of Soviet emigrants to the United States between 1979 and 1982. Gregory and Kohlhase (1988) use these data to study Soviet wage differentials. The results are similar to those found for the United States in some respects, but differ in that they find large returns and penalties to political behaviour external to the firm. Gregory and Collier (1988) use the same data to examine the determinants of unemployment in the Soviet Union. Graeser (1988) uses emigrant data to estimate the human capital model in a centrally planned economy. While these studies were of interest in the 1980s they are unlikely reflect conditions today and can be used only as a basis for comparison with changes during the transition period.

Since the break-up of the Soviet Union there have been a number of studies of the Russian labour market and earnings determinants using individual and household data collected from the first rounds (1992–3) of the Russian Longitudinal Monitoring Survey (RLMS). Foley (1995), for example, uses the RLMS information to analyze patterns of worker transitions between labour market states from 1992 to 1993. Newell and Reilly (1996) present estimates for wage equations and the gender wage gap for Russia using 1992 RLMS data. Mroz and Popkin (1995) use the first round of data from the RLMS to examine the poverty level of Russian households. No published studies to date have used the latest rounds (1994–6) of the RLMS to investigate wage determinants and human capital models. There have also been a number of similar studies of wage structure and earnings determinants in other transitional economies. Vecernik (1995) and Sakova (1996), for example, investigate the change in wage determinants, education and experience in the Czech and Slovak Republics. Rutkowski (1997) analyzes wage determinants in Poland. Orazem and Vodopivec (1995) calculate returns to education and experience for Slovenia. Kollo (1996) provides evidence for wage determinants for Hungary, as do Earle and Oprescu (1993) for Romania. Our estimates of human capital functions in Russia will be analyzed with reference to similar research done by other economists as applied to countries in transition.

THE DATA

The data examined in this study are taken from the Russian Longitudinal Monitoring Survey (RLMS). The RLMS is a household and individual based survey designed to measure systematically the effects of Russian reforms on economic well-being of households and individuals. The first representative sample was therefore drawn in the Russian Federation.[1]

The RLMS data contain results of two longitudinal surveys covering more than 10 000 people during 1992–3 (rounds 1–4) and 1994–6 (rounds 5–7). This information

[1] M. Swafford et al. Sample of the Russian Federation Rounds V, VI, and VII of the Russian Longitudinal Monitoring Survey. Technical Report. March, 1997.

consists of household and individual data on size, sources and structure of income and expenditures, employment, time allocation, level of education, health disabilities and other characteristics (more than 500 variables). It is well suited for the purposes of our project, and allows us to check the main assumptions of the human capital theory related to the economic transformation in modern Russia.

The data employed in this research are restricted to rounds 1 and 5–7. Round 1 is a cross-section of 6500 randomly selected households across Russia conducted from July to November 1992. It contains the data necessary to estimate cross-section wage equations, which can be used as a baseline against which wage equations for subsequent years can be measured. The second phase (1994–6) is more important for us, because it tracks the same set of households over time. These multiple interviews allow us to examine changes over time in labour market earnings and returns to human capital.

Unfortunately the original RLMS data contain little information on firm-specific characteristics that may be important for human capital functions. It has only crude measures of ownership, the size of enterprise and the year when the enterprise was established, and no information on the firm's industry is included in the original data. For the purpose of examining firm-specific earnings, we used information provided by the respondents on their employers that was not part of the original data set to identify individual firms and their industries. An important side-benefit of this was the discovery that respondents working at the same enterprise sometimes provided different answers to questions about the firm. We have cleaned all the original firm variables (size, ownership and founding date) to make them consistent. On this basis, we have coded the industry (5-digit OKONH) for 95 per cent of the employed respondents in 1994–6. This enabled us to analyze returns to human capital controlling for different firm-specific characteristics: industry, ownership, type of enterprise and share of firm employment in the local labour market.

Table A1.1 shows the main differences between RLMS and Goskomstat's distribution of employment across industries. Overall, the percentage distribution of employment in both data sets is approximately the same. but in the RLMS data the share of representatives from food, trade and commerce industries is larger in comparison to Goskomstat data.

DESCRIPTION OF VARIABLES

The RLMS data clearly provide the basis for detailed analysis of the standard human capital model developed by Mincer (1974). The principal variable in this model is earnings in log form. But it should be emphasized that earnings of Russian workers can be measured in many ways, taking into account such phenomena of the transition economy as multiple job-holding, in-kind payments, income from self-employment and arrears of wages.

The RLMS data (rounds 5–7) allow us to use at least three different measures of earnings of Russian workers:[2]

1. Monthly earnings received in the form of wages, bonuses, grants, benefits, revenues and profits at the primary place of work in the reference month.
2. Monthly total earnings in the form of: (a) wages, bonuses, revenues and profits at the primary and secondary places of work; (b) in-kind payments; (c) income from individual economic activity (self-employment) in the reference month.
3. Monthly paid and owed earnings at the primary place of work, including in-kind payments and money, which for various reasons was not paid on time.

Unfortunately, RLMS data does not contain information on contractual wages (permanent labour income), which is a more appropriate measure for estimating the classical earnings function. Owing to the high level of wage arrears and non-regularity of wage payments, actual paid earnings are substantially different from permanent earnings in any particular month.

The high inflation over the interview period may be also a source of earnings measurement error. This error could be serious for 1992–4 in particular, when the average monthly rate of inflation measured through the Consumer Price Index (CPI) was 15 per cent. We adjusted the earnings data for inflation by using monthly CPI for 1992–4.[3] However, we chose not to adjust the monthly earnings data for inflation for 1995–6, for the following reasons. First, most of the respondents (75 per cent) were interviewed during one month. Second, the rate of inflation was relatively low (November 1995 = 4.5 per cent, October 1996 = 1.2 per cent). Third, monthly inflation adjustment can create additional measurement error, because the real earnings of people who were interviewed at the

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[2] It should be noted that the design of questionnaire in round 1 was different from that in rounds 5–7. There was no information on owed earnings in 1992. Two measures of earnings were used. First, a log of monthly earnings from the primary workplace in the reference month (after taxes but not including pensions, bonuses, welfare payments and subsidies). Second, a log of monthly total earnings in the form of: (a) wages and bonuses from the primary workplace; (b) additional earnings from other places of work, including bonuses, subsidies and welfare; (c) income from all individual economic activity (self-employment) in the reference month.

[3] The monthly rate of inflation for the five months of the interview period in 1992 fluctuated from 8.6 per cent in August to 22.9 per cent in October. For the three months of the fifth round interview period, the monthly inflation rate was in range of 14.6–17.8 per cent (Review of the Russian Economy, 1997: 235–6).

beginning of the second month of the survey will be under-estimated in comparison with earnings of those respondents who had an interview at the end of the first month.

Finally, the estimation of the standard earnings equation for Russian condition may be distorted owing to considerable regional differences in price and income levels. In order to eliminate these regional differences we have applied the deflation procedure of individuals' earnings by using the regional CPI for 1992–6.

The other main variables in the standard human capital model include years of schooling (or level of education), labour market experience and tenure or experience with current employer:

1. The variable SCH accounts for years of schooling adjusted for actual level of education. Each educational category corresponds to the average number of years of schooling required to get a certain level of education.
2. The variable EXP denotes potential labour market experience. Since RLMS data did not record a worker's actual labour force experience, a transformation of workers' age was used as a proxy for experience given by EXP = AGE - SCH - 6.
3. The variable TEN denotes years of experience with a current employer at the primary job, computed on the basis of the question: 'Since what year and month have you been working at this place?' This variable is available only for rounds 5–7.

The other variables will be described in the relevant sections of this report.

THE SAMPLE STRUCTURE

The size of the original sample varies across the rounds of the survey. 12 980 individuals responded to the round 1 individual-level adult questionnaire and only 8342 adult individuals participated in round 7. Depending on the purpose of the project, we used several sub-samples.

First, our focus was on employees, and after the elimination of unemployed and OLF individuals, we were left with about 5000 employees. Table A1.2 provides some summary statistics drawn from the RLMS for the employed sample. In order to estimate wage equations, the employed sample was also restricted, excluding those employees on whom all required data on earnings and hours of work were incomplete or inconsistent.[4] As a

[4] The merged file of the three data sets for rounds 5–7 was checked as to whether characteristics of an individual were consistent at three points in time; simple cross–tabulations were used. Respondents with inconsistent values on basic personal characteristics (gender, age and level of education) were also excluded from the employed sample.

result, we were left with three-fifths of the employees. The basic summary statistics displayed in Table A1.2 show that the differences in characteristics between the employed sample and the sample of workers who received earnings at a primary job are not significant, and our samples have roughly the same gender, education, age and occupation composition.

Finally, in the third part of this project our focus was on labour market transitions and flows of individuals between various labour market states from 1995 to 1996. For this purpose, the original sample was restricted to those respondents who participated in both rounds 6 and 7. The results should thus be interpreted bearing in mind that the resulting database is not completely random due to attrition between the interview dates and migration. Of the 8587 individuals answering the adult individual-level questionnaire in round 6 and the 8342 in round 7, only 6666 had valid responses at both times and form the basis for this analysis.[5]

[5] Much of the decrease in sample size is due to non-response by individuals for the questions of interest. A brief comparison of the demographics of people lost due to non-response revealed that the average age, the distribution of educational levels and the gender breakdown were quite similar to the persons remaining in the panel.

2. ESTIMATES OF PRIVATE RATES OF RETURN TO HUMAN CAPITAL

This part of the research analyzes the effects of investment in schooling and experience on the level of earnings during the transition period in Russia. Our research is aimed at determining the the changes in returns to human capital over the period of transformation. We first discuss the initial conditions and returns to human capital in the Soviet period. We then analyze the main changes in the structure and dynamics of returns to schooling. The third section studies returns to experience, and we then decompose the portion of earnings variation attributable to inter-firm and intra-firm factors. Finally, we use the cleaned data with industry coding to investigate a number of hypotheses concerning the firm and regional characteristics associated with the level of earnings. Our final specification of earnings function includes three types of wage determinants: a vector of individual variables (education, gender, experience and tenure), a set of regional dummies and a vector of various firm-specific characteristics such as industry, ownership and share in the local labour market.

THE INITIAL CONDITIONS AND RETURNS TO HUMAN CAPITAL IN THE SOVIET PERIOD

The former socialist system of labour compensation was based on an idea of state ('public') ownership of the labour force and labour effort. In this framework:

1) the labour force is distributed and allocated across industries and regions by central planning
2) the government itself bears all expenses of education and on-the-job training
3) all results of production belong to the government, so labour income should be regulated by the government and it determines the size of nominal and real wages.

This concept gave a theoretical basis for the system of centralized wage-setting, which was realized through various phenomena of the centrally planned economy:

a) a tariff wage scale for each job category
b) 'regional wage coefficients', designed to compensate workers for taking jobs in regions with bad weather and ecological conditions
c) centrally or regionally planned distribution of many important public goods such as housing, kindergartens, medical services and deficient commodities.

Consumer, producer and worker expectations were formed in a world of stable prices, wages, labour demand and labour supply. The 'equalizing principle of the income distribution' became the strongest stereotype of Soviet labour management. Government compensation policy decisions were mostly aimed at attracting a new labour force to the armaments industry or enterprises with poor working conditions. The connection between earnings and labour effort became weaker, which strengthened the role of informal ('shadow') labour incentives and rewards: right of entry to the channels of distribution of deficient commodities, access to the shadow fields of power, hidden social nets, opportunity to obtain unearned incomes, etc.

As a result of the centralized wage-setting system, the earnings of workers were poorly correlated with their education, and the system imposed relatively small or even perverse returns to human capital. This conclusion was bolstered by the empirical studies of Graeser (1988) and Gregory and Kohlhase (1988). They investigated the determinants of Soviet earnings from the Soviet Interview Project (SIP), consisting of almost 2800 interviews with Soviet Jewish emigrants to the United States between 1979 and 1982. The principal findings of the SIP investigations can be generalized in the following statements:

1. The return to education is low for Soviet workers. Gregory and Kohlhase (1988) found that only high-level manpower that had completed higher education yields a positive rate of return. Graeser's (1988) estimates of the returns to added years of schooling vary from 2.3 per cent for secondary education to 5.0 per cent for a university degree.
2. The Soviet gender earnings gap is about 20 per cent, holding other factors including occupation constant; without occupation held constant, Soviet women earn from 22 to 29 per cent less than men.
3. Returns to experience are lower than in market economies. Gregory and Kohlhase estimate the rate of return on one more year of experience as 2–3 per cent.

Empirical evidence that uses RLMS data drawn from the 1992 rounds also suggests relatively modest rates of return to education[6]. As Newell and Reilly (1996) emphasize:

> these low rates may more accurately reflect the consequences of egalitarian policies designed to restrict wage disparity across individuals.

The tariff system and ideological preferences in setting returns to education and skills have now disappeared; workers have been assigned the responsibility for finding a job. Wage and prices have been allowed to adjust to market forces. We would expect unconstrained wage-

[6] Similar research done for several Eastern European countries also shows relatively low returns to schooling under central planning (see Rutkowski, 1997, for Poland; Orazem and Vodopivec, 1995, for Slovenia; Flanagan, 1995, and Vecernik, 1995, for the Czech Republic).

setting and structural change to shift returns in favour of the more educated individuals. At the same time, current changes in labour force composition, devaluation of some skills, a declining supply of skilled jobs and unemployment growth among educated and experienced people are causing a number of opposite tendencies which account for the declining returns to human capital over the transformation period.

RETURNS TO EDUCATION

Traditionally, the rates of return to human capital are measured on the base of the standard Mincer earnings function of log-linear form:

$$\ln W = b_0 + b_1 \times SCH + b_2 \times EXP + b_3 \times EXP^2 + b_4 \times TEN + b_5 \times TEN^2 + e$$

The dependent variable (log of earnings) takes on three forms: a log of hourly real earnings received at the primary place of work in the reference month, a log of hourly real earnings from all jobs and a log of hourly paid and owed earnings at the primary place of work. The schooling coefficient, b_1, provides an estimate of the rate of return to education which is assumed to be constant in this specification. The schooling variable (SCH) is calculated by taking the years needed on average to get the degree reported in the survey. The experience variable (EXP) is calculated as age - schooling - 6 and denotes the potential labour market. The quadratic experience terms, EXP and EXP^2, whose coefficients, b_2 and b_3, are, respectively, positive and negative, capture the concavity of the observed earnings profile. The tenure coefficients, b_4 and b_5, provide an estimate of the returns to specific human capital. The tenure variable (TEN) denotes years of experience with a current employer at a primary job, computed on the basis of the question 'Since what year and month have you been working at this place?'

In order to distinguish returns to various educational levels we use another specification of the earnings equation in the form:

$$\ln W = b_0 + b_1 \times UNIV + b_2 \times TECH + b_3 \times PTU + b_4 \times SEC + b_5 \times EXP + b_6 \times EXP^2 + b_7 \times TEN + b_8 \times TEN^2 + e;$$

where UNIV = the dummy for a university degree, TECH = the dummy for a technical school, PTU = the dummy for a vocational school and SEC = the dummy for a general secondary school, with elementary education as the omitted category.

The estimation of the earnings function enables us to find the rates of return to schooling, experience and specific human capital (or the tenure effect). Tables A2.1– A2.6 present the first empirical results of the regression analysis of factors determining the level of real earnings in Russia for 1992–6.

The estimates of the Mincer earnings equation for 1994–6 RLMS data show that the average rate of return to schooling in Russia (regression coefficient on SCH) is 6–8 per cent of the increase in real earnings for each additional year of schooling, holding other variables except occupation constant. These figures are on average higher than returns to schooling computed at the beginning of the economic reforms (1992) and in the Soviet period. Estimated returns to education support our initial hypothesis that the transition to the market economy shifts returns in favour of more educated individuals.

Table 2.1.

Returns to Schooling in Transition Economies, Selected Countries, 1987-1996

Selected Papers	Variables	Returns to Schooling (OLS Estimates)	
		Socialist period	Post-socialist period
J.Rutkowski (Poland)	Years of schooling	0.05 (1987)	0.07-0.079 (1992) 0.07-0.078 (1995-96)
J.Vecernik (Czech Republic)	Years of schooling	Male 0.040 (1988) Female 0.057 (1988)	Male 0.053 (1992) Female 0.067 (1992)
P. Orazem and M. Vodopivec (Slovenia)	Vocational School Middle School University	0.163 (1987) 0.319 (1987) 0.715 (1987)	0.201 (1991) 0.406 (1991) 0.943 (1991)

Sources: Orazem, Peter, and Milan Vodopivec (1994); Rutkowski Jan (1997); Vecernik J. (1995)

Our conclusion also corresponds with the findings of other researchers in Eastern Europe. Table 2.1 shows the significant increase in returns to education in selected Eastern European countries from the socialist period to the early stage of transition.

Figures 2.1 and 2.2 illustrate age–earnings profiles for 1995–6. We can see that education in Russia results in enlarged flows of earnings and that the average earnings of more educated workers exceed those of less educated workers. The earnings profiles of more educated workers also rise more rapidly than those of less educated workers.

Figure. 2.1: Age-Earnings Profiles by Gender, 1995

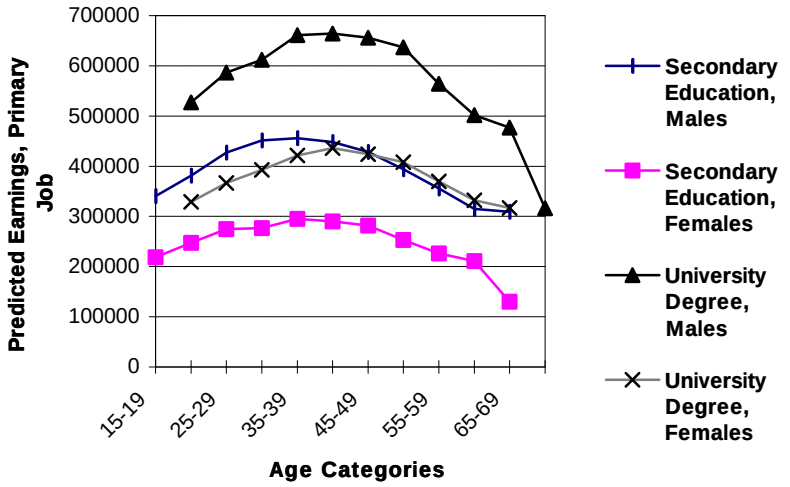
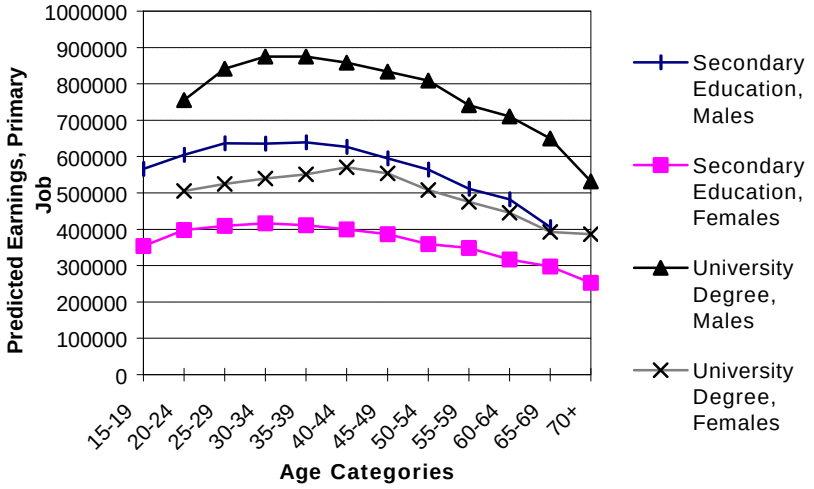
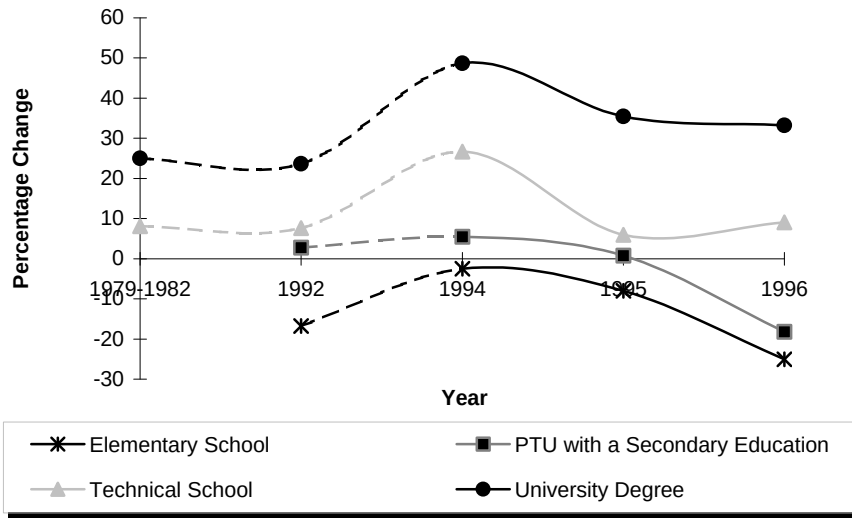


Fig. 2.2: Age-Earnings Profiles by Gender, 1996



The age–earnings profiles of females display similar overall characteristics, but lie significantly below those of men. Figures 2.1, 2.2 and Table 2.7 also indicate that there is a large difference between males and females in rates of return to schooling. Although the female rate of return to schooling was higher than the male at the starting point of the reforms and in the Soviet period[7], during the period of transformation the male rate of return diminished at a more moderate rate. These findings are consonant with the hypothesis of Orazem and Vodopivec (1995) that the transition led to lower differences in the pricing of male and female characteristics. They also find that women have had higher marginal returns to education and steeper returns to experience than men, but that after the transition the male and female earnings structure became much more similar.

Figure 2.3: Percentage Differences in Total Earnings, Men, Russia



At the same time our estimates presented in Table A2.1 and Figure 2.3 show a clear pattern of decreasing rates of return to schooling over the period of transformation, from 7.8 per cent in 1994 to 6.2 per cent in 1996. The main question that ought to be answered is

[7] Graeser (1988) shows that in the Soviet period women had relatively higher returns to schooling. This phenomenon can be explained by the fact that Russian males had more opportunities to receive a high salary without investment to education. For Russian women, investment in education was one of a few factors which assisted in reducing the gender wage differentials.

whether this tendency is long-term or short-term. First of all we should note that our starting hypothesis explaining the difference in returns to schooling between the two periods of the Russian history does not mean that an unconstrained wage-setting system provides rates of return to schooling that increase constantly over time: we are dealing with a jump, not with continuous growth of returns to schooling.

The common explanation of increases in returns to schooling over the 1980s in the United States is a rise of demand for skilled jobs. But do we have any reason to apply this idea to the current situation in the Russian labour market? The answer is 'no'. In modern Russia, the demand for skilled jobs is decreasing relative to the demand for unskilled jobs: there is a significant disproportion between the available supply of skills and the firm demand for skills. As we have already stressed, the previous system of education was mostly directed to the training of narrow-skilled specialists for particular industries, and this narrow education does not develop the skills and knowledge which are now demanded by the market economy.

Table 2.2.

Occupational Structure, by Level of Education

1996	ELEM	SEC	PTU	TECH	UNIV
Officials & Managers	0.17	0.52	0.62	1.06	2.95
Professionals	0.00	4.33	2.15	15.66	59.54
Technicians	7.56	10.55	7.85	30.64	14.96
Clerks	4.81	7.87	7.85	8.36	4.00
Service Workers	4.98	9.52	11.85	8.74	3.48
Skilled Agricultural Workers	1.37	0.78	0.77	0.29	0.32
Craft and Related Trades	22.51	20.24	26.31	14.12	5.06
Operators and Assemblers	29.73	27.77	23.69	12.58	2.95
Unskilled Occupations	28.87	18.08	17.85	6.92	3.48
Army	0.00	0.35	1.08	1.63	3.27

Source: Russian Longitudinal Monitoring Survey.
Notes: The shaded area reflects people whose university degree does not correspond to their occupation.

Table 2.2 shows that almost 20 per cent of people with higher education are employed in occupations with lower educational requirements. These specific features of the labour force structure can cause rates of returns to schooling to decline.

RETURNS TO EXPERIENCE

Experience and tenure effects on earnings are relatively small compared to data from other countries. As we can see from Tables A2.1c A2.6, the average rate of returns to experience, using the Mincer methodology, is 1–2 per cent in Russia. The tenure effect is negligible and statistically insignificant. The small experience effect could be caused by the changing nature of the Russian economy that rewards younger, more mobile, more active and more adaptive people. If this hypothesis is true, we should expect that returns to experience should be positive and relatively high for those who work at state-owned enterprises while the new private sector should demonstrate negligible returns to experience. To test this hypothesis we ran four earnings regressions for different types of firm in our restricted sample:

de novo firms (defined as having a founding date after 1990)

state-owned firms

privatized firms

former collective and state farms.

Table 2.3.

Regression Coefficients on Experience and Education, by Type of Ownership

	De Novo Firms	Privatized Firms	State-Owned Firms	Collective Farms
EXP	0.021 (1.350)	0.031** (2.117)	0.029** (2.206)	0.023 (1.400)
EXP^2	–0.0003 (–0.998)	–0.0004 (–1.46)	–0.0007*** (–2.837)	–0.0005* (–1.685)
SCH	0.084*** (3.579)	0.054*** (2.586)	0.024 (1.327)	0.015 (0.599)

Notes:
*** – significant at the 1 % level
** – significant at the 5% level
* – significant at the 10% level

The results provide support for this hypothesis: there is a positive and significant experience effect in the public and privatized sectors. At the same time in the new private sector we can observe a relatively small experience effect in each year (Table 2.3).

The table shows results of OLS estimates where log of hourly wages at primary job is dependent variable. Other controls included in the regression are gender and years dummies.

It should also be noted that de novo firms are estimated to have returns to education higher than privatized and state-owned firms. Rutkowski (1997) draws a very similar picture for Poland, showing that in the private sector the return on one additional year of schooling is almost one point higher than in the public sector.

Finally, to investigate the experience effect, we again refer to age–earnings profiles. The estimated age–earnings profiles illustrated by Figures 2.1 and 2.2 also support the contention that the new market economy rewards younger people. The peak of earnings shifted from 40–45 in 1992 to 30–35 in 1995–6. In the United States, average earnings increase until age 45–50 and remain constant over the following 10 years while Russian age–earnings profiles show a more rapid decrease in earnings for middle-aged people.

Our results are consistent with the other parallel research in Eastern Europe: the returns to experience tend to decline substantially over the transformation period. Rutkowski (1997), for example, observes the same tendency in Poland:

> Experience lost much of its importance in determining earnings levels. The rate of return on one more year of experience fell from over 3 per cent in the late 1980s to less than 2 per cent in the early 1990s. This probably indicates that experience gained under previous economic conditions is now of lesser value.

As stated by Flanagan (1995), who found a similar effect for the Czech Republic, recent labour market experience is more valuable than experience acquired under central planning.

However, we suspect the tendency of declining returns to experience to be temporary. We would expect that the accumulation of new experience and specific human capital from work in the market economy should raise the returns to experience in the future. The subsequent rounds of the RLMS will allow us to validate this hypothesis.

EARNINGS FUNCTIONS WITH FIRM FIXED-EFFECT

From the estimated earnings functions we can conclude that the explanatory power of our model is low relative to the numerous earnings equations estimated for other countries. The poor performance of the Mincer equations highlights the role of unobservable factors in wage determination in Russia. Moreover, R^2 is declining over the time in each specification

of the model (Table 2.4). This phenomenon corresponds with the findings of Vecernik (1995) and Sakova (1996), who also noticed that demographic characteristics such as gender, age or education are becoming considerably less important in the determination of wages in transition economies.

Table 2.4.

Earnings Functions with Firm Fixed-Effect, Restricted Sample, 1994-1996

Independent Variables	Standard Earnings Equation	Pure Firm Fixed Effect Model	Firm Fixed Effect Estimates of Earnings Function
MALE	0.170*** (3.280)		0.165*** (3.747)
SCH	0.074*** (6.285)		0.039*** (3.912)
EXP	0.018** (2.349)		0.027*** (4.105)
EXP^2	–0.000** (–2.085)		–0.001*** (–3.730)
YEAR95	–0.236*** (–3.939)	–0.264*** (–5.017)	–0.027*** (–5.156)
YEAR96	–0.229*** (–3.624)	–0.295*** (–5.184)	–0.298*** (–5.317)
CONS	1.646*** (10.009)	2.793*** (81.629)	1.965*** (13.931)
FIRM DUMMIES (135 firms)		F(134, 1679) = 9.543	F(134, 1675) = 9.396
N=1816	R^2=0.046	R^2=0.438	R^2=.455

Notes:
*** – significant at the 1 % level
** – significant at the 5% level
* – significant at the 10% level.

We might expect that instead of personal characteristics, firm performance, job features and the peculiarities of local labour markets would determine earnings. To investigate this issue, we focus on the question of the extent to which earnings appear to be a function of firm-specific characteristics. We anticipate that inter-firm variation is much more important in determining the earnings of Russian workers because of the highly diverse firm performance, firm position in the market, local tax policy and other inter-firm differences.

Table 2.5.

Earnings Functions with Region Fixed-Effect, Restricted Sample, 1994-1996

Independent Variables	Standard Earnings Equation	Pure Region Fixed Effect Model	Region Fixed Effect Estimates of Earnings Function
MALE	0.170*** (3.280)		0.193*** (4.389)
SCH	0.074** (6.285)		0.031*** (2.987)
EXP	0.018** (2.349)		0.028*** (4.332)
EXP^2	–0.000** (–2.085)		–0.001*** (–4.291)
YEAR95	–0.236	–0.255*** (–4.861)	–0.255*** (–4.935)

	*** (–3.939)		
YEAR96	–0.229*** (–3.624)	–0.267*** (–4.791)	–0.269*** (–4.880)
CONS	1.646*** (10.009)	2.782*** (80.879)	2.053*** (14.510)
REGION DUMMIES (96 regions)		F(95,1718) = 11.089	F(95,1714) = 10.931
N=1816	R^2=0.046	R^2=.387	R^2=.406

Notes:
*** – significant at the 1 % level
** – significant at the 5% level
* – significant at the 10% level.

To compare inter- and intra-firm variation in earnings, we utilized a special sub-set of respondents employed in a firm with at least four employee-respondents who worked last month and received positive wages at their primary job. Our first step is to regress the log of hourly wages on individual variables (male, years of schooling and experience) and firm dummies, separately and together (see Table A2.2). R^2 shows that firm wage differentials account for 43.8 per cent of wage variation, while the individual characteristics appear to have little significance, taken separately or as a group.

Firm-specific characteristics clearly dominate over individual characteristics in determining the wages of Russian workers. We can also observe changes of coefficients in the standard earnings equation after including firm dummies. Controlling for inter-firm wage differentials, the experience term became statistically more important while education lost much of its significance. This means that highly educated people are more likely to be hired

in the firm with higher average wages, but having been hired in the given firm there is no great variation of wages depending on people's education.

The next step is to run the same fixed-effect regressions on region dummies separately and together with individual characteristics.

Table 2.5 shows that regions also add a substantial portion of explanatory power of the model. From this analysis we can conclude that individual variation contributes the smallest portion of wage variance in Russia and that wage variation is primarily due to two factors: regional and firm differentials.

THE EXTENDED EARNINGS FUNCTION

This section shows the estimates of earnings equations from a closer look at the firm and region characteristics in our sample. In the full sample we were able to use information on firm characteristics available from the RLMS and our industry coding. Of particular interest are industry differences, ownership categories and size of enterprise, share of firm employment in the local labour market and several regional characteristics (set of regional dummies, level of unemployment and hiring rate).

Table 2.6 shows that human capital variables become less important in determining wages after controlling for firm and region characteristics, even though a degree from university and technical school still provides a positive wage gain.

It is interesting to note that the net gender wage gap falls substantially to 18.7–18.9 per cent as a result of extending the standard wage equation. This is due to the fact that gender differences in wages are 'neutralized', to a certain extent, by putting the variables characterizing an individual belonging to a certain industry and occupation into the regression analysis.

Table 2.6.

Extended Earnings Equation, 1996

	Hourly Wages – dependent variable	Primary Job		All Jobs	
		Coeff.	t	Coeff.	t
INDIVID CHARS.	MALE	0.187***	4.268	0.189***	4.231
	Secondary School	0.114	1.579	0.005	0.066
	PTU	-0.010	-0.120	-0.057	-0.710
	Technical School	0.216***	2.922	0.150**	2.021
	University	0.327***	3.963	0.213**	2.533
	EXP	0.004	0.850	0.009*	1.711
	EXP^2	-0.0002	-1.502	-0.000**	-2.527
OCCUPATION DUMMIES	Officials and Managers	0.579***	2.704	0.501**	2.390
	Professionals	0.364***	4.433	0.425***	5.058
	Technicians	0.324***	4.173	0.294***	3.734
	Clerks	0.059	0.667	0.089	0.991
	Service Workers	-0.050	-0.541	-0.002	-0.025
	Agricultural Skilled Workers	0.015	0.059	-0.107	-0.422
	Craft	0.174**	2.306	0.159**	2.115
	Operators	0.227***	3.019	0.194***	2.653
	Army	0.025	0.124	0.085	0.400
REGION DUMMIES	Moscow and St. Petersburg	0.168**	2.007	0.224***	2.601
	North West	-0.048	-0.390	-0.016	-0.131
	Central Region	0.177**	2.431	0.233***	3.121
	Volga	-0.001	-0.014	0.012	0.157
	Ural	-0.206***	-2.624	-0.198**	-2.502
	Western Siberia	-0.453***	-4.254	-0.440***	-4.371
	Eastern Siberia	-0.066	-0.626	-0.092	-0.917

	Hourly Wages – dependent variable	Primary Job		All Jobs	
		Coeff.	t	Coeff.	t
INDUSTRY DUMMIES	Energy	1.031***	6.396	1.162***	7.230
	Fuel	1.112***	7.396	1.317***	9.101
	Metallurgy	0.831***	5.864	0.995***	7.163
	Chemicals	0.581***	3.263	0.820***	4.993
	Machine Building	0.323***	2.798	0.515***	4.882
	Military Complex	0.225*	1.608	0.467***	3.530
	Wood & Building Materials	0.320**	2.210	0.685***	5.109
	Light and Food	0.659***	5.329	0.801***	6.946
	Transport	0.718***	6.450	0.806***	8.023
	Construction	0.749***	6.588	0.889***	8.642
	Trade	0.527***	4.674	0.640***	6.252
	Commerce	0.713***	5.476	0.800***	6.427
	Housing	0.597***	4.906	0.782***	6.849
	Health Services	0.028	0.244	0.192*	1.796
	Social Services	0.048	0.435	0.194**	1.971
	Government	0.588***	5.009	0.720***	6.567
	Other Industries	0.687***	5.052	0.771***	5.903
OWN	Domestic Firms	0.051	0.976	0.124**	2.408
	Foreign Firms	0.220*	1.917	0.177	1.489
	De Novo Firms	0.208***	3.564	0.265***	4.365
LOCAL CHARS	Share 0.1-1%	-0.092*	-1.651	-0.077	-1.347
	1-10%	-0.163**	-2.393	-0.168**	-2.464
	>10%	-0.314**	-2.269	-0.363***	-3.014
	Missing	-0.097**	-1.958	-0.133***	-2.590
	Unemployment	-0.031**	-2.507	-0.032***	-2.584
	Hiring Rate	0.066***	8.305	0.067***	8.436
	CONS	0.678**	2.469	0.533**	1.972
	N	2085		2376	
	R-squared	0.2797		0.2909	

Notes:
*** – significant at the 1 % level; ** – significant at the 5% level; * – significant at the 10% level.
Omitted categories: unskilled occupations, Northern Caucasus among regions, agriculture and forestry among industries, state-owned firms and share of firm employment less than 0.1%.

Among individual factors, occupation dummies play a substantial role in earnings determination. Officials and managers are estimated to have a higher level of hourly wages, while clerks, service and unskilled workers belong to lower-paid group of employees.

Among the measures of firm-specific characteristics, the industry dummies are highly significant, which demonstrates the importance of the addition of these variables to the RLMS data set. We can observe a high differentiation of wages across industries: holding other variables constant the earnings of workers in the fuel industry are 111 per cent higher than the earnings of those employed in forestry and agriculture. Table 2.6 provides evidence that employees in education, culture, science and health services have some of the lowest levels of wages.

The results also show the impact of some categories of ownership, which we have defined on the basis of our questionnaire. The omitted category is state-owned enterprises. Domestic (privatized) firms are insignificantly different from state-owned firms in determining wages. At the same time foreign and de novo private firms (defined as having a founding date after 1990) are estimated to have the strongest positive impact on hourly earnings.

The estimates confirm the importance of these characteristics of the local labour market. The unemployment rate is negatively associated with earnings, but the hiring rate has a positive impact on earnings, suggesting that regions with a lower demand for labour and fewer outside options in the local labour market tend to have lower wages. The variable representing the proportion of firm employment in the local labour market (SHARE) can be considered as a proxy of firm monopsonistic power. The negative and highly significant coefficient is also consistent with outside options' considerations. The results show that firms with a high proportion in the local labour market have a much lower level of wages.

3. HUMAN CAPITAL AND EMPLOYMENT ADJUSTMENTS

INTRODUCTION

In this part of the research, the analysis of Mincer earnings equations will be extended by an examination of the effect of schooling and experience on employment adjustments. Obviously, earnings and employment adjustments tend to be jointly determined. It is important to know whether level of education influences hours at work and employment:

> To what extent does education affect an individual's transition between the various labour market states?
>
> Are schooling and experience related to the probability of being unemployed?
>
> How does taking account of unemployment affect the rate of return to schooling and experience in Russia?

These are the types of questions addressed in this section of the report.

Empirically, labour economists have already proved that the proportional effect of schooling on total earnings is greater than its proportional effect on the hourly wage rate[8]. This indicates that both the hourly wage rate and hours at work increase with the level of education. The Russian labour market is no exception to this rule. Table 3.1 contains the results of regression equations with two kinds of dependent variables: a logarithm of total monthly earnings and a logarithm of hourly wage rate. As can be seen from Table 3.1, the effect of an extra year of schooling on log earnings is 0.011, or 17 per cent (0.007, or 11 per cent in 1996) greater than its effect on log hourly wages. Table 3.1 also indicates similar results for the effect of experience. Again, the effects of experience and its square on earnings are larger (in absolute value) than the effects of these variables on hourly wage rates.

The difference in the proportional effects of schooling and experience on earnings and hourly wage rates may occur either because labour supply (hours at work) increases with accumulation of human capital or unemployment decreases with education and experience. The positive correlation between level of education and hours worked may be caused by the indirect influence of schooling on the labour supply through the wage rate. But there is no strong evidence of a positive effect of wage rates on labour supply in modern labour economics literature. Moreover, Ashenfelter and Ham (1979) suggest that schooling

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[8] See Mincer (1974) for evidence from the United States, and Pscharopoulos and Layard (1977) for Britain.

does not affect the measured labour supply, and the excess of the marginal effects of schooling and experience on earnings over their effects on wage rates is due almost entirely to the effect of schooling and work experience in reducing unemployment.

Table 3.1.

Effects of Schooling and Experience on Total Earnings and Hourly Wage Rates

	1995		1996	
	Log of total monthly earnings	**Log of hourly wage**	**Log of total monthly earnings**	**Log of hourly wage**
MALE	0.422*** (12.888)	0.275*** (7.733)	0.381*** (10.160)	0.276*** (6.908)
SCH	0.075*** (11.097)	0.064*** (8.779)	0.072*** (9.276)	0.065*** (7.821)
EXP	0.037*** (8.601)	0.018*** (3.837)	0.030*** (5.885)	0.001 (0.099)
EXP^2	-0.001*** (-9.900)	-0.000*** (-4.562)	-0.001*** (-6.617)	-0.000 (-1.242)
CONS	11.392*** (120.19)	6.807*** (66.208)	11.775*** (108.50)	7.264*** (62.850)
R-squared	0.124	0.055	0.085	0.046
N	3404	3404	2943	2943

Notes:
*** – significant at the 1 % level
** – significant at the 5% level
* – significant at the 10% level.

Our research here concentrates on the influence of schooling on unemployment. In the first section we will discuss the theoretical reasons for the relationship between education and unemployment. This section focuses on the educational structure of labour market transition probabilities: the probabilities that individuals in a group will move between the various states of the labour market each year. This will be followed by an analysis of the evidence concerning the relationship between education and unemployment incidence. We

will then discuss how taking account of unemployment affects the rate of return to schooling and experience. The final section will be devoted to the correction of the returns to human capital for any sample selection bias.

EDUCATION AND UNEMPLOYMENT: THEORETICAL ISSUES

The relationship between education and unemployment is not clear-cut from the theoretical standpoint. First of all, we need to separate unemployment into an inflow component (the probability of entering unemployment) and a duration component (the duration of unemployment).

With respect to the inflow component, there are good theoretical grounds for expecting a strong association between the level of education and the probability of becoming unemployed. First, the theory of human capital predicts that education leads directly to a rise in labour productivity. In response to the demand shocks firms would therefore prefer to dismiss less educated and less productive than skilled workers. Second, increases in the level of schooling significantly raise the rate of return to future on-the-job training, which leads to the accumulation of firm-specific human capital. It seems that the more specific human capital an individual possesses, the less likely firms are to make them redundant, and the less likely they are to quit. There is thus an obvious link between the probability of an individual becoming unemployed and the level of their education. In the Russian labour market, we will also predict that highly educated individuals will be less subject to the unemployment incidence.

With respect to the duration component, however, there is no strong and direct link between the level of education and the duration of job search. On the one hand, education and the duration of unemployment should be positively related. From a firm viewpoint, the quasi-fixed costs of hiring and training of skilled workers are greater than those of unskilled workers. Unskilled workers will thus be more readily hired if the workers are required for only a short period. From an individual viewpoint, the more human capital they possess, the higher their reservation wage and the better working conditions they demand. These specific job requirements also increase the average period of job search. Furthermore, well educated individuals, as a rule, receive a relatively high level of unemployment benefit because of relatively high pre-unemployment earnings. As the job search theory predicts, these individuals have less incentive to exit from unemployment, all of which implies that unemployment duration is an increasing function of education.

On the other hand, there are a number of offsetting tendencies:

- First, skilled workers have larger choice of jobs because they may take unskilled jobs while looking for more suitable employment, whereas lower educated individuals cannot be hired if a certain level of education is required for skilled occupations.
- Second, if employment decreases, lower educated workers compete for scarce jobs with higher educated people, employers might raise their hiring standards in periods of high unemployment and skilled workers will have more chances to be hired (see Van Ours and Ridder, 1995).
- Third, higher educated individuals are well known to be more mobile and more flexible in the labour market, and are more likely to use more effective ways of job search. The evidence from Nickell (1979) also suggests that the offsetting tendencies dominate in the modern labour market and that the level of education weakly but negatively affects the expected duration of unemployment spells.

To summarize, the theory cannot predict with certainty whether the relationship between the level of education and duration of unemployment is positive or negative. The next sections of the report will be focused on the empirical testing of the hypothesis suggested above as applied to the Russian labour market.

THE EDUCATIONAL STRUCTURE OF LABOUR MARKET TRANSITIONS

It has now been recognized that focusing only on estimation of the unemployment rate masks the highly dynamic nature of labour markets. In order to understand whether the level of human capital determines the level of unemployment we need to focus on the labour market transitions and flows of individuals with different schooling backgrounds between employment, unemployment, and OLF status. The relative unemployment rate in a group of people with a certain level of education and experience might be high because its members have difficulty finding jobs once unemployed, or have difficulty remaining employed once a job is found, or because they frequently enter and exit from the labour force. In terms of our research project it is important to understand how the risk of becoming unemployed and the patterns of job mobility vary across different educational groups.

Table 3.2 presents the estimates of labour market transition probabilities for various educational groups for 1995–6: the probabilities that individuals in an educational group will move between the three labour market categories employed, unemployed and OLF during a one-year period. The category 'employed' consists of those persons who either work at state-owned and private enterprises or engage in the individual economic activity (self–employed).

The category 'unemployed' consists of those respondents who did not work and searched for work in the reference month. The category 'OLF' includes the rest of respondents.

From Table 3.2 we can draw the following conclusions:

1. Across all sectors higher educated individuals are less likely to switch jobs and less likely to become unemployed, perhaps indicative of firms' desire to maintain their more productive employees. As can be seen from the shaded area of Table 3.2, higher education provides more stable employment.
2. There appears to be a sector-specific percentage distribution of individuals across educational groups (see the last row). Those with a university degree are more likely to work in the public sector and less likely to be self-employed. Nevertheless, all types of employment appear to value higher education and try to retain more educated people.
3. Persons with more schooling have a greater attachment to the labour force, whereas the lower educated are more likely to drop out. Across all sectors, the less educated are more likely to leave the labour force, whether from employment or unemployment (see column (6)).
4. Finally, although unemployed people with higher education have relatively high probability of job-finding (0.420 = 0.194 + 0.097 + 0.129), they have difficulties in the search for a well suited job. 29 per cent of unemployed with a university degree remained in their original state; this is slightly above the values for unemployed who graduated from secondary general and technical schools. It can be concluded that one-third of the 'skilled unemployed' are long-term and stagnant.

Ehrenberg (1980) showed that if labour markets are roughly in balance, with the flows into and out of unemployment equal, the unemployment rate for a group (U) is given by

$$u_R = \frac{1}{1 + \left[\frac{(P_{ne} + P_{nu})P_{ue} + P_{ne}P_{un}}{(P_{ne} + P_{nu})P_{eu} + P_{nu}P_{en}} \right]} \qquad (3.1)$$

where P_{ij} represents the probability that an individual in the group will move from labour market state i to labour market state j during the period, and the subscripts n, e, and u represent the states, OLF, employed and unemployed, respectively.

Equation (3.1) makes it clear that to estimate the effect any policy has on the unemployment rate of a group, it is important to know the initial values of all six of the group's labour market transition probabilities and the effect the policy has on each of them. Equation (3.1) and the computed values of the transition probabilities given in Table 3.2

Table 3.2.
Transition Probabilities from Labor Market State i to j By Education Level

i=1995	j=1996				
	Employed			UN	OLF
	State	Private	Self		
State Firms	0.759	0.127	0.031	0.023	0.060
≤8 years	0.694	0.124	0.010	0.039	0.132
9-12 years	0.693	0.169	0.049	0.025	0.064
Technical	0.802	0.102	0.031	0.026	0.039
University	0.878	0.076	0.012	0.007	0.027
Private Firms	0.346	0.482	0.066	0.039	0.067
≤8 years	0.409	0.409	0.045	0.033	0.104
9-12 years	0.333	0.479	0.084	0.043	0.060
Technical	0.389	0.442	0.048	0.043	0.078
University	0.261	0.612	0.061	0.030	0.036
Self-employed	0.184	0.177	0.339	0.104	0.196
≤8 years	0.220	0.203	0.186	0.051	0.339
9-12 years	0.161	0.179	0.351	0.119	0.190
Technical	0.163	0.143	0.408	0.122	0.163
University	0.235	0.177	0.412	0.098	0.078
Unemployed	0.160	0.140	0.096	0.278	0.326
≤8 years	0.075	0.025	0.100	0.325	0.475
9-12 years	0.194	0.150	0.111	0.272	0.272
Technical	0.097	0.210	0.032	0.258	0.403
University	0.194	0.097	0.129	0.290	0.290
OLF	0.040	0.019	0.029	0.051	0.861
≤8 years	0.012	0.005	0.012	0.020	0.951
9-12 years	0.075	0.039	0.066	0.101	0.719
Technical	0.065	0.035	0.015	0.092	0.792
University	0.081	0.023	0.023	0.029	0.843
Total	0.383	0.145	0.054	0.052	0.366

i=1995	j=1996				
	Employed			UN	OLF
	State	Private	Self		
≤8 years	0.189	0.068	0.022	0.032	0.689
9-12 years	0.395	0.190	0.084	0.072	0.259
Technical	0.506	0.159	0.046	0.059	0.230
University	0.580	0.163	0.047	0.028	0.182

allow us to estimate the extent to which a relatively high unemployment rate for a educational group is caused by its values of each of the probabilities.

Column (2) in Table 3.3 presents the estimated average group unemployment rate obtained when we substitute the values of the group's transition probabilities from Table 3.2 into (3.1). The results confirm a general idea of the negative relationship between schooling and unemployment in Russia. The level of unemployment declines rapidly with years of schooling (except males graduated from the technical school). Columns (3)–(8) in Table 3.3 contain calculations of the expected changes of unemployment level when the cohort's values of each transition probability are replaced by the equivalent probability for the reference group that has low relative unemployment rates.

A high unemployment rate among less educated people is seen to be caused primarily by their high probability of leaving employment to move out of the labour force (P_{en}). For people with an elementary education, the low probability of moving from unemployment and OLF force to employment also plays a role (P_{ue}, P_{ne}). For females with a secondary education, the primary cause of high relative unemployment is the large flow from employment to OLF status (P_{en}). The relatively high unemployment rate of males with secondary and vocational education is due primarily to the high probability of leaving employment to become unemployed (P_{eu}).

All the results presented in this section are consistent with general theoretical hypotheses concerning the relationship between the accumulation of human capital and unemployment. Such cross-tabulations, however, could possible be misleading. Workers in different education groups might differ in characteristics other than their education, and these other differences (for example, age or place of work) could account for an univariate association between labour market transition rates and education. Multivariate models of determinants of unemployment incidence and job exit should therefore be estimated.

Table 3.3.

Expected Changes of Unemployment Rates as a Result of Variations in Transitional Probabilities By Gender and Education Level

	u^R (%)	$?u^R$ (P_{en})	$?u^R$ (P_{ne})	$?u^R$ (P_{un})	$?u^R$ (P_{nu})	$?u^R$ (P_{eu})	$?u^R$ (P_{ue})
Males	8.9%						
≤8 years	18.5	-7.7	-7.8	2.3	4.1	-3.5	-7.6
9-12 years	8.7	-0.9	1.7	-0.7	-1.7	-3.7	-0.8
Technical	12.0	-1.5	-2.5	0.5	-3.6	-3.1	-2.6
University	3.0	0	0	0	0	0	0
Females	9.4%						
≤8 years	14.9	-5.7	-7.1	3.7	9.9	-3.6	-5.6
9-12 years	10.7	-3.1	0.9	-0.3	-2.6	-2.7	-2.2
Technical	9.4	-1.0	0.3	0.7	-1.8	-3.2	-2.9
University	4.2	0.2	0.1	-0.4	0.9	-0.9	-1.3
All	9.2%						

EDUCATION AND INCIDENCE OF UNEMPLOYMENT

The results given in this section throw further light on the relation between education and incidence of unemployment in Russia. Here, we present a series of estimates of determinants of the probabilities of being unemployed as well as leaving employment to move out of the labour force and become unemployed.

The determinants of probabilities of being unemployed are computed on the basis of a Probit model estimated by standard maximum-likelihood methods (see Table 3.4). The sample is restricted by labour force participants in a certain year. The dependent variable UN takes on two unique values, 0 and 1. The value 1 denotes unemployed actively seeking a job. The value 0 denotes those respondents who are currently employed, including the self-employed. The independent variables are years of schooling or level of education, potential labour market experience, its square and several demographic dummies such as age categories, gender and marital status.

Table 3.4
Determinants of Probability of being Unemployed, Probit Estimates

	1995		1996	
	1	2	1	2
MALE	-0.149*** (-2.82)	-0.148*** (-2.76)	-0.121*** (-2.38)	-0.117* (-2.27)
SCH	-0.055*** (-4.91)	–	-0.062*** (-5.61)	–
EXP	-0.049*** (-8.29)	–	-0.043*** (-7.17)	–
EXP^2	0.001*** (5.86)	–	0.001*** (4.61)	–
Elementary School	–	0.254*** (2.50)	–	0.340*** (3.58)
Secondary School	–	0.405*** (4.70)	–	0.340*** (4.22)
PTU	–	0.363*** (3.73)	–	0.250*** (2.72)
Technical School	–	0.179* (1.94)	–	0.149* (1.75)
AGE 25-39	–	-0.400*** (-5.63)	–	-0.349*** (-4.91)
40-54	–	-0.531*** (-7.08)	–	-0.465*** (-6.139)
55+	–	-0.253*** (-2.83)	–	-0.439*** (-4.490)
Marital Status	–	-0.254*** (-4.39)	–	-0.272*** (-4.857)
CONS	-0.158 (1.09)	-1.108*** (-11.59)	-0.039 (-0.27)	-0.991*** (-10.85)
R-squared	0.045	0.054	0.039	0.044
N	5290	5281	5124	5111

Notes: Excluded dummy variables: Age 16-24, Higher education, Unmarried

Table 3.5.

Multinomial Logit Model of Employment Transitions. Maximum Likelihood Estimates for Employment, Unemployment and Out of Labor Force Transitions

	Coeff.	Relative Risk Coeff.	z
Unemployment Transitions			
Constant	-5.216***		-10.312
Demographic			
Male	-0.049	0.952	-0.267
Age 16-24	1.308***	3.698	2.742
Age 25-39	1.027**	2.792	2.288
Age 40-54	0.986**	2.682	2.217
Level of Education			
Primary (Elementary)	0.977***	2.657	2.769
General Secondary	0.667**	1.949	2.200
Technical School	0.693**	2.000	2.104
Place of Work			
Private Enterprise	0.497**	1.644	2.397
Self–Employed	1.713***	5.545	7.488
Out of Labor Force Transitions			
Constant	-2.256***		-9.759
Demographic			
Male	-0.300**	0.741	-2.304
Age 16-24	-1.022***	0.360	-4.804
Age 25-39	-1.874***	0.153	-9.823
Age 40-54	-1.417***	0.242	-8.310
Level of Education			
Primary (Elementary)	1.197***	3.312	4.975
General Secondary	1.081***	2.947	4.694
Technical School	0.624**	1.867	2.457
Place of Work			
Private Enterprise	0.175	1.191	1.130
Self–Employed	1.422***	4.144	8.152
Log Likelihood = -1469.4424 chi2(18) = 302.15 N = 3975			

Notes: Comparison group: employed. Excluded dummy variables: Age 55+, Higher education, State enterprise.

The coefficients reveal a U-shaped relationship between unemployment incidence and age. The marital status and male dummies are inversely related to the probability of being unemployed. The estimates also strongly support the main hypothesis that the probability of unemployment incidence declines with years of schooling and experience. Unfortunately, this model does not take into account the transitions from employment to unemployment and OLF states. For the analysis of education influence on job exit and probability of entering unemployment, the multinomial Logit model can be more appropriate.

Table 3.6

Weibull Regression for Duration of Unemployment, 1995

Duration of unemployment – dependent variable	**Coeff.**	**Hazard Ratio**	**t**
Actual Experience	-0.061	1.049	-3.672
SCH	-0.086	1.069	-1.929
Unmarried Women	0.882	0.503	3.091
Unmarried Men	1.208	0.390	3.820
Married Women	1.348	0.350	5.861
Age 16-24	-2.580	7.462	-5.346
Age 25-39	-1.282	2.715	-3.729
Searched for Job	-0.857	1.950	-4.202
Registered in Employment Office	-0.435	1.403	-1.681
CONS	7.446		10.776
N=727; Model chi2(9) = 97.028; Pseudo R^2 = 0.1141; ρ = 0.779.			

Note:The sample was restricted to people aged 16–55.

The estimates of the multinomial Logit model of employment transitions are presented in Table 3.5. For a model of employment transitions, the vector of independent variables includes demographic characteristics of the individual, level of education and variables describing the sector of employment. The dependent variable takes on three outcomes: to remain in employment, to become unemployed or to move out of the labour force. Table 3.5 shows that women are more likely to drop out of the labour force, as are older individuals. Higher educated individuals are less likely to exit employment and low

educated individuals are most likely to become unemployed. The sector coefficients for employment transition suggest that state sector jobs are more stable than non-state jobs.

Table 3.6 shows the results of Weibull estimation of duration of unemployment. The results show the negative impact of human capital variables (years of schooling and actual experience) on the duration of unemployment.

To summarize, the data taken from the RLMS reveal very clearly that increases in the level of an individual's human capital lead to strong reductions in the probability of entering unemployment and having unemployment spells.

UNEMPLOYMENT ADJUSTING THE RATE OF RETURN TO HUMAN CAPITAL

As we have seen, schooling and experience not only raises earnings throughout an individual's life-time but also lowers the probability of becoming unemployed. Consequently, if we take total monthly earnings and use these to compute the rate of return to human capital, we will under-estimate the actual rate of return. We can adjust this rate of return in at least two ways:

1) use the expected monthly total earnings as the dependent variable
2) use the Heckman two-step estimation corrective procedure for any sample selection bias.

The first method is based on the calculation of the expected monthly earnings given by

$$E(w) = Wage \cdot (1 - P) + UNC \cdot P \cdot q,$$

where p is the probability of being unemployed and q is the probability of receiving the unemployment compensation once unemployed.

The level of unemployment compensation is computed in accordance with the Russian Labour Law as equal to three-quarters of monthly earnings from the primary job. The probability of being unemployed is calculated as the predicted value on the base of the Probit estimates given in Table 3.4. The probability of receiving unemployment compensation is computed as the share of unemployed receiving unemployment benefits.

The rate-of-return equations (standard and unemployment-adjusted) are presented in Table 3.7. The log of the earnings variable is regressed on the level of education, male dummy, experience and its square in the traditional fashion. As we can see from Table 3.7, the rate of return to schooling after correcting for unemployment rises by 0.7–0.8 percentage points. This considerable change in the regression coefficients reflects the strong association between unemployment and education. The adjusted rate of return to experience is also increased by 0.6–0.7 percentage points. This is, of course, caused by the fact that experience is inversely related to the probability of becoming unemployed.

Table 3.7.

Earnings Functions, Unemployment Adjusted, 1995-1996

	1995		1996	
	Log of total monthly earnings	Log of total earnings, unemployment adjusted	Log of total monthly earnings	Log of total earnings, unemployment adjusted
MALE	0.422***	0.443***	0.381***	0.405***
	(12.888)	(13.469)	(10.160)	(10.745)
SCH	0.075***	0.081***	0.072***	0.080***
	(11.097)	(12.010)	(9.276)	(10.247)
EXP	0.037***	0.044***	0.030***	0.037***
	(8.601)	(10.011)	(5.885)	(7.266)
EXP^2	-0.001***	-0.001***	-0.001*	-0.001***
	(-9.900)	(-10.984)	(-6.617)	(-7.603)
CONS	11.392***	11.160***	11.775***	11.493***
	(120.19)	(117.98)	(108.50)	(105.31)
R-squared	0.124	0.138	0.085	0.097
N	3404	3397	2943	2933

Notes:
*** – significant at the 1 % level
** – significant at the 5% level
* – significant at the 10% level.

CORRECTING THE RATE OF RETURN TO HUMAN CAPITAL FOR ANY SAMPLE SELECTION BIAS

The second method of employment adjustment of returns to human capital is to use the Heckman selection model. In accordance with this model, omitting the people who did not work and did not receive earnings at the time of the survey causes a sample selection bias that can be corrected by using Heckman's special maximum-likelihood estimation.

The Heckman selection model consists of two equations: a regression equation and a sample selection equation. In our case, the first equation is the standard Mincerian OLS earnings model. The second equation contains a list of variables that determines whether the dependent variable in the first equation (hourly wage) is observed or missing. We assume that the hourly wage is a function of gender, education, experience and tenure whereas the likelihood of working (to be more precise, the likelihood of the wage being observed) is a function of marital status and implicitly the wage (via the inclusion of gender, education, experience and tenure which we think determine the wage).

Table 3.8.

Earnings Functions, Controlling for the Selection Bias, 1995

Dependent Variable – Log of Hourly Wage at Primary Job	OLS Regression Results	Regression Results, Controlling for the Selection Bias
MALE	0.292*** (8.166)	0.311*** (8.690)
SCH	0.067*** (9.017)	0.078*** (9.424)
EXP	0.017*** (3.175)	0.024*** (4.105)
EXP^2	-0.0004*** (-3.599)	-0.0005*** (-4.577)
TEN	-0.004 (-0.667)	0.022* (1.946)
TEN^2	0.0002 (0.909)	-0.0004 (-1.522)
CONS	6.720*** (62.626)	6.176*** (27.914)
N=2836	R^2=0.0608	$chi^2(14)$ = 2766.26 Rho = 0.309 sigma = 0.939

Notes: *** – significant at the 1 % level, ** – significant at the 5% level, * – significant at the 10% level.

Owing to the higher incidence of unemployment among women and individuals with less schooling and experience, we expect the estimated coefficients of the OLS model to be under-estimated. The results of the Heckman selection model computed for the 1995 sample are presented in Table 3.8, which shows that the gender gap, returns to education and experience estimated by the simple OLS model were under-estimated as we predicted.

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Appendices

Table A1.1.
Panel A. Employment distribution: Goskomstat and RLMS data, %

	Goskomstat (firm data)			RLMS (individual data)		
	1993	1994	1995	1994	1995	1996
Total	100.0	100.0	100.0	100.0	100.0	100.0
Industrial Production	29.4	27.2	25.7	26.8	26.7	25.5
Agriculture and Forestry	14.6	15.4	15.7	11.0	10.5	10.6
Transport, Communication	7.6	7.8	7.9	8.0	8.1	7.8
Construction	10.1	9.9	9.7	8.6	8.3	7.2
Trade and Commerce	9.0	9.5	9.7	11.2	11.8	12.5
Housing Services	4.2	4.4	4.9	4.6	4.2	4.8
Health Services	6.0	6.4	6.7	7.1	7.3	7.8
Education, Culture and Arts	10.2	10.8	11.3	11.4	11.3	11.6
Science	3.2	2.7	2.5	2.7	2.6	2.1
Finance and Insurance	0.8	1.1	1.3	1.2	1.3	1.4
Government, Legal Services	2.3	2.4	2.5	2.4	2.5	2.8
Other	2.6	2.5	2.1	5.0	5.4	6.0
Other Industries				0.9	1.1	1.3
Army				2.3	2.1	2.6
Police				1.7	2.0	2.0
Membership Organizations				0.1	0.2	0.1

Table A1.2.

Descriptive Statistics of Basic Variables

Variables	Employed Sampled		Restricted Sample of Workers Received Earnings at Primary Job in Reference Month	
	1995	**1996**	**1995**	**1996**
N (size of sample)	4887	4658	2902	2384
Male (percentage)	49.85%	49.33%	47.83%	46.31%
Age (years)	38.89	39.01	39.54	39.54
EXP (years)	21.29	21.35	21.69	21.57
TEN (years)	8.74	7.71	9.44	8.21
SCH (years)	11.58	11.66	11.84	11.97
EDUCATION LEVEL				
Elementary School	14.57%	13.42%	12.37%	11.41%
Secondary School	27.69%	27.33%	26.08%	24.71%
PTU with a Secondary Education	14.69%	15.01%	14.20%	13.59%
Technical School	22.51%	23.14%	23.98%	25.42%
University Degree	20.54%	21.10%	23.36%	24.87%
OCCUPATION				
Officials & Managers	3.52%	1.07%	4.13%	0.96%
Professionals	13.71%	17.00%	16.30%	20.64%
Technicians	14.45%	14.55%	16.06%	15.98%
Clerks	6.51%	6.35%	7.48%	7.76%
Service Workers	7.80%	7.28%	9.37%	9.52%
Skilled Agricultural Workers	0.37%	0.64%	0.14%	0.54%
Craft	15.72%	15.69%	16.30%	15.86%
Operators	17.43%	17.32%	16.30%	15.86%
Unskilled Workers	12.73%	12.88%	12.44%	11.53%
Army	**1.21%**	**1.27%**	**1.48%**	**1.34%**

EARNINGS FUNCTIONS WITH REGIONAL DEFLATORS

Table A2.1.

Dependent variable – lnWPH (Logarithm of Hourly Earnings from Primary Job)			
	1994	**1995**	**1996**
MALE	0.347*** (10.399)	0.281*** (7.751)	0.278*** (6.987)
LEVEL OF EDUCATION Secondary School	0.012 (0.191)	0.123* (1.815)	0.208*** (2.722)
PTU with a Secondary Education	0.025 (0.381)	0.138* (1.827)	0.080 (0.934)
Technical School	0.244*** (4.038)	0.219*** (3.177)	0.337*** (4.390)
University Degree	0.551*** (9.052)	0.488*** (7.075)	0.510*** (6.691)
EXP	0.008 (1.506)	0.018*** (3.393)	0.003 (0.538)
EXP^2	-0.0003*** (-3.396)	-0.0004*** (-4.048)	-0.0001 (-1.267)
TEN	0.008 (1.456)	-0.003 (-0.555)	-0.000 (-0.004)
TEN^2	-0.0001 (-0.351)	0.0002 (0.976)	-0.0001 (-0.044)
CONS	2.526*** (33.251)	2.341*** (28.795)	2.436*** (26.752)
N R-squared	3365 0.0937	2841 0.0576	2334 0.0542

Excluded dummy-variable: Elementary School.
Note: In all subsequent tables:
t-statistics are reported in parenthesis
*** – significant at the 1% level
** – significant at the 5% level
*– significant at the 10% level

Table A2.2.

Dependent variable - lnWPH (Logarithm of Hourly Earnings from Primary Job)			
	1994	**1995**	**1996**
MALE	0.340*** (10.319)	0.291*** (8.151)	0.276*** (6.987)
SCH	0.078*** (11.620)	0.064*** (8.682)	0.061*** (7.387)
EXP	0.002 (0.462)	0.015*** (2.883)	0.001 (0.123)
EXP^2	-0.0002 (-1.598)	-0.000*** (-3.225)	-0.0001 (-0.633)
TEN	0.009* (1.636)	-0.003 (-0.544)	0.001 (0.197)
TEN^2	-0.0001 (-0.680)	0.0002 (0.899)	-0.0001 (-0.269)
CONS	1.802*** (18.020)	1.795*** (16.827)	1.986*** (16.789)
N R-squared	3365 0.0832	2841 0.0566	2334 0.0466

Table A2.3.

Dependent variable – lnWPH (Logarithm of Hourly Paid and Owed Earnings with In-kind Payments from Primary Job)			
	1994	**1995**	**1996**
MALE	0.322*** (9.444)	0.253*** (6.912)	0.214*** (5.318)
LEVEL OF EDUCATION Secondary School	0.017 (0.271)	0.159** (2.354)	0.163*** (2.157)
PTU with a Secondary Education	0.020 (0.293)	0.145* (1.926)	0.105 (1.234)
Technical School	0.213*** (3.467)	0.262*** (3.802)	0.371*** (4.857)
University Degree	0.533*** (8.594)	0.519*** (7.514)	0.578*** (7.585)
EXP	0.010** (1.993)	0.019*** (3.649)	0.009 (1.509)
EXP^2	-0.000*** (-3.713)	-0.001*** (-4.343)	-0.0003** (-2.243)
TEN	0.007 (1.380)	-0.001 (-0.199)	0.001 (0.114)
TEN^2	-0.000 (-0.176)	0.0001 (0.704)	-0.0001 (-0.374)
CONS	2.384*** (30.857)	2.275*** (27.796)	2.342*** (25.711)
N R-squared	3471 0.0803	2968 0.0545	2559 0.0544

Excluded dummy-variable: Elementary School

Table A2.4.

Dependent variable – lnWPH (Logarithm of Hourly Paid and Owed Earnings with In-kind Payments from Primary Job)			
	1994	**1995**	**1996**
MALE	0.317*** (9.394)	0.260*** (7.204)	0.212*** (5.305)
SCH	0.073*** (10.547)	0.066*** (8.850)	0.065*** (9.012)
EXP	0.005 (1.061)	0.017*** (3.163)	0.005 (0.815)
EXP^2	-0.0002** (-2.087)	-0.000*** (-3.579)	-0.0001 (-1.204)
TEN	0.008 (1.534)	-0.001 (-0.180)	0.002 (0.323)
TEN^2	-0.0001 (-0.451)	0.0001 (0.633)	-0.0001 (-0.616)
CONS	1.712*** (16.783)	1.736*** (16.098)	1.748*** (14.653)
N R-squared	3471 0.0692	2968 0.0534	2559 0.0484

Table A2.5.

Dependent variable – lnWPHTOT (Logarithm of Hourly Total Earnings from All Jobs)			
	1994	**1995**	**1996**
MALE	0.349*** (10.037)	0.266*** (7.285)	0.248*** (6.144)
LEVEL OF EDUCATION Secondary School	0.054 (0.873)	0.165** (2.491)	0.179** (2.371)
PTU with a Secondary Education	-0.014 (-0.198)	0.200*** (2.689)	0.084 (0.985)
Technical School	0.160*** (2.575)	0.269*** (3.939)	0.305*** (3.967)
University Degree	0.522*** (8.298)	0.507*** (7.386)	0.519*** (6.755)
EXP	0.002 (0.398)	0.026*** (5.021)	0.008 (1.350)
EXP^2	-0.000*** (-2.714)	-0.001*** (-5.622)	-0.0002** (-2.296)
TEN	-0.008 (-1.405)	-0.021*** (-3.459)	-0.019*** (-2.882)
TEN^2	0.0003** (1.982)	0.0006*** (3.090)	0.0004** (1.996)
CONS	2.661*** (34.869)	2.352*** (29.510)	2.543*** (28.212)
N R-squared	3826 0.0773	3337 0.0533	2881 0.0494

Excluded dummy-variable: Elementary School

Table A2.6.

Dependent variable – lnWPHTOT (Logarithm of Hourly Total Earnings from All Jobs)			
	1994	**1995**	**1996**
MALE	0.349***	0.272***	0.250***
	(10.112)	(7.535)	(6.240)
SCH	0.066***	0.062***	0.064***
	(9.333)	(8.314)	(7.690)
EXP	-0.002	0.023***	0.004
	(-0.376)	(4.529)	(0.816)
EXP^2	-0.0001	-0.001***	-0.0002
	(-1.249)	(-4.930)	(-1.470)
TEN	-0.007	-0.021***	-0.018***
	(-1.238)	(-3.462)	(-2.678)
TEN^2	0.0003*	0.0006***	0.0004*
	(1.740)	(3.049)	(1.767)
CONS	2.052***	1.879***	2.041***
	(20.242)	(17.844)	(17.436)
N	3826	3337	2881
R-squared	0.0654	0.0526	0.0451

Table A2.7:
Gender Differences in Earnings Determinants.

Dependent variable - lnWAGE (Logarithm of Monthly Earnings from Primary Job)						
	1994		**1995**		**1996**	
	Males	**Fem**	**Males**	**Fem**	**Males**	**Fem**
lnHR	0.288***	0.205***	0.193***	0.160***	0.243***	0.225***
	(6.268)	(5.381)	(3.838)	(3.490)	(3.219)	(3.723)
SCH	0.069***	0.090***	0.054***	0.082***	0.066***	0.054***
	(7.654)	(10.662)	(5.709)	(8.321)	(5.786)	(4.929)
EXP	0.016**	0.006	0.026***	0.030***	0.004	0.014**
	(2.330)	(1.016)	(3.537)	(4.759)	(0.487)	(2.004)
EXP^2	-0.000***	-0.000	-0.001***	-0.001***	-0.000	-0.000***
	(-3.204)	(-1.619)	(-4.408)	(-4.673)	(-0.919)	(-2.770)
TEN	0.009	0.005	-0.008	-0.006	0.016	-0.013
	(1.158)	(0.839)	(-0.958)	(-0.740)	(1.648)	(-1.608)
TEN^2	-0.000***	-0.000	0.000	0.000	-0.001***	0.000*
	(-0.587)	(-0.057)	(1.040)	(0.519)	(-2.101)	(1.735)
CONS	9.803***	9.594***	11.266***	10.566***	11.290***	11.124***
	(38.165)	(43.200)	(39.002)	(40.459)	(27.477)	(32.745)
R–squared	0.093	0.105	0.068	0.093	0.061	0.059
N	1623	1753	1346	1490	1082	1252