Returns to Human Capital under the Communist Wage Grid and During the Transition to a Market Economy

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Abstract

Under communism, workers had their wages set according to a centrally-determined wage grid. In this paper we use new micro data on men to estimate returns to human capital under the communist wage grid and during the transition to a market economy. We use data from the Czech Republic because it is a leading transition economy in which the communist grid remained intact until the very end of the communist regime. We demonstrate that for decades the communist wage grid maintained extremely low rate of return on education, but that the return increased dramatically and equally in all ownership categories of firms during the transition. Our estimates also indicate that men's wage-experience profile was concave in both regimes and on average it did not change from the communist to the transition period. However, the *de novo* private firms display a more concave profile than SOEs and public administration. Contrary to earlier studies, we show that men's inter-industry wage structure changed substantially between 1989 and 1996.

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Non-technical Summary

During a significant part of the twentieth century, over one-third of the world's population lived under the communist system. A large proportion of those who were in the labor force had their wages set according to a centrally-determined wage grid. While the effects of the grid have never been formally analyzed, there has been a general perception that earnings structures in centrally planned economies were very compressed and that one should observe decompression as well as major changes in the wage structure with privatization of state owned enterprises (SOEs) and the emergence of *de novo* private firms during the transition to a market system. In this paper we use new micro data to (a) analyze returns to human capital under the communist wage grid and (b) examine how wages and returns to human capital changed in the emerging market economy as the grid was supplanted by two alternatives: free wage setting in the sector composed of new private firms and a modified wage grid in the public sector and newly privatized firms.

In analyzing the shift from the Communist wage grid, we have selected the Czech Republic because it is one of the leading transition economies and also constitutes an excellent prototype of a sudden change of regimes. In the other leading transition countries, such as Poland and Hungary, central planners started losing control well before the 1989 revolutions and their adherence to the wage grid diminished as bargaining between firms and planners gained in importance. In the Czech Republic the system remained intact until the very end of the communist regime. Moreover, while the Polish and Hungarian economies had significant private sectors already before the transition, the Czech economy was almost 100 percent state owned until 1990 and then underwent one of the most rapid and extensive privatizations in the former Soviet bloc.

The studies carried out to date have examined returns to human capital in a cross-sectional setting using one point in time during the transition and, in some cases, also one point in time under communism. However, no study has (a) analyzed the determinants of wages and

estimated returns to human capital using micro data on the same individuals during a large part of the communist and transition period, and (b) used the ownership of firms in which these individuals work to examine the impact of ownership on return to human capital and wages during the transition.

Our study uses a unique data set and examines these key questions. We analyze the evolution of the returns to education and experience for a sample of male workers in the Czech Republic during most of the communist era (1955-1989) and during the 1991-96 period of transition from plan to market. We have collected a retrospective data set that contains work histories of a panel of 2,284 men, most of whom worked under communism, all of whom worked during at least part of the 1990-96 transition period, and many of whom worked in December 1996, the date of our survey. No other data set currently provides historical information on individuals for such long periods of communism and transition.

Using these micro data, we demonstrate that the functioning communist system succeeded in using the wage grid to set and maintain for decades extremely small wage differentials. Indeed, the estimated rate of return on education is very small and constant for decades during the communist rule. At the level of individual and household incomes, the effects of the wage grid translated into the most egalitarian distribution of income in the world.

The transition from the centrally planned to a market system resulted in a major gradual increase in the rates of return to education, with the rates of return reaching West European levels by 1996. This increase is found in all ownership categories of firms. Hence, in the face of the reduced subsidies to SOEs and the opening of the economy to world competition, the new wage grid used by SOEs, public administration and privatized SOEs did not cause these firms to deviate substantially in terms of returns to education from the *de novo* private firms.

Our cross-sectional and longitudinal estimates of the effects of experience on earnings indicate that men's wage-experience profile was concave in both regimes and did not change from the communist to the transition period. These results imply that the experience-wage grid used by planners to set starting wages was maintained during the entire communist period and

was not substantially altered during the first six years of the transition. However, we find that the *de novo* private firms have a more concave profile than SOEs and public administration and that they pay a higher experience return than SOEs and public administration to the recent entrants in the labor market.

Contrary to earlier studies that found the inter-industry wage structure to be stable and similar in market and centrally planned economies, we show that men's inter-industry wage structure changed substantially between 1989 and 1996 as the economy switched from central planning to a nascent market system. In particular, men working in mining and quarrying lost much of their former wage premium, while those in trade, transport and telecommunications, light manufacturing, and "other" activities gained significantly.

1. Introduction

During a significant part of the twentieth century, over one-third of the world's population lived under the communist system. A large proportion of those who were in the labor force had their wages set according to a centrally-determined wage grid. While the effects of the grid have never been formally analyzed, there has been a general perception that earnings structures in centrally planned economies were very compressed and that one should observe decompression as well as major changes in the wage structure with privatization of state owned enterprises (SOEs) and the emergence of *de novo* private firms during the transition to a market system. In this paper we use new micro data to (a) analyze returns to human capital under the communist wage grid and (b) examine how wages and returns to human capital changed in the emerging market economy as the grid was supplanted by two alternatives: free wage setting in the sector composed of new private firms and a modified wage grid in the public sector and newly privatized firms.

In analyzing the shift from the Communist wage grid, we have selected the Czech Republic because it is one of the leading transition economies and also constitutes an excellent prototype of a sudden change of regimes. In the other leading transition countries, such as Poland and Hungary, central planners started losing control well before the 1989 revolutions and their adherence to the wage grid diminished as bargaining between firms and planners gained in importance (see e.g., Rutkowski, 1994). In the Czech Republic the system remained intact until the very end of the communist regime and evidence from large firm-level data sets indicates that there was no significant rent sharing by workers (Basu, Estrin and Svejnar, 1998). Moreover, while the Polish and Hungarian economies had significant private sectors already before the transition, the Czech economy was almost 100 percent state owned until 1990 and then underwent one of the most rapid and extensive privatizations in the former Soviet bloc.[2]

[2] See e.g., Dyba and Svejnar (1995).

The studies carried out to date have examined returns to human capital in a cross-sectional setting using one point in time during the transition and, in some cases, also one point in time under communism.[3] However, no study has (a) analyzed the determinants of wages and estimated returns to human capital using micro data on the same individuals during a large part of the communist and transition period, and (b) used the ownership of firms in which these individuals work to examine the impact of ownership on return to human capital and wages during the transition.

Our study uses a unique data set and examines these key questions. We analyze the evolution of the returns to education and experience for a sample of male workers in the Czech Republic during most of the communist era (1955-1989) and during the 1991-96 period of transition from plan to market. We have collected a retrospective data set that contains work histories of a panel of 2,284 men, most of whom worked under communism, all of whom worked during at least part of the 1990-96 transition period, and many of whom worked in December 1996, the date of our survey. No other data set currently provides historical information on individuals for such long periods of communism and transition.

Using these micro data, we demonstrate that the communist system used the wage grid to set and maintain for decades extremely low rate of return on education – a finding that was conjectured but never shown empirically before. We also show that the transition resulted in a major increase in the rates of return to education, with the rates of return reaching West European levels by 1996. This increase is found in all ownership categories of firms. Hence, in the face of reduced subsidies and opening of the economy to world competition, the new wage grid used by SOEs, public administration and privatized SOEs did not cause these firms to deviate substantially in terms of returns to education from the market-driven *de novo* private firms. Our estimates of the effects of experience on earnings indicate that men's wage-experience profile

[3] See for example Bird, et al. (1994), Chase (1998), Flanagan (1995), Jones and Illayperuma (1994), Krueger and Pischke (1995), Nesterova and Sabirianova (1999), Orazem and Vodopivec (1997) and Rutkowski (1996).

was concave in both regimes and on average it did not change from the communist to the transition period. However, the *de novo* private firms display a more concave profile than SOEs and public administration and they pay a higher experience return than SOEs and public administration to the recent entrants in the labor market. Contrary to earlier studies that found the inter-industry wage structure to be stable and similar in market and centrally planned economies, we show that men's inter-industry wage structure changed substantially between 1989 and 1996, with men working in mining and quarrying losing much of their former wage premium, while those in trade, transport and telecommunications, light manufacturing, and "other" activities gaining significantly.

The paper is organized as follows: In Section 2 we provide a brief institutional background, while in Section 3 we describe our data and methodology. In Section 4 we present our empirical findings on returns to education under the communist grid and during the transition, while in Section 5 we compare the corresponding returns to experience. In Section 6 we examine the effect of firm ownership on the returns to education and experience and in Section 7 we analyze the shift in inter-industry wage differentials from the communist to the transition period. We conclude the paper in Section 8.

2. The Institutional Background

As in other centrally planned economies, after the 1948 communist takeover of Czechoslovakia the government introduced the wage grid, leaving little discretion for wage setting at the enterprise level by managers or unions. While in principle the trade unions and government jointly determined the grid and the level of wages within the grid, in practice the union and government officials by and large implemented the Communist party policies as set out in the central plan.[4]

[4] See e.g., Windmuller (1970) and Svejnar (1974).

In Tables 1 and 2 we present examples of 1954 and 1984 grids, respectively. As may be seen from the two figures, while the structure of the grid changed somewhat during these thirty years of the Communist regime, the principles underlying the grid remained the same. Wage levels were a function of the individual's education, experience, occupational classification and the industrial sector of the job. Central planners for instance favored the "productive" sectors (industry, construction and agriculture) over the "unproductive" sectors (trade and services) and wages in the productive sectors were hence boosted above the others. Adjustments were also made for the number of hours worked per week, and in earlier years for the difficulty of work (whether or not the job included supervisory activities, larger plots of land, etc). In some years, the location of the job within the government hierarchy (headquarters vs. branch office) mattered. The wage dispersion across the various categories in the grid was modest, given that unskilled workers were the pillar of the regime and the communist ideology dictated that wage differentials between the skilled and unskilled be kept small.[5] Moreover, the planners calibrated the grid in such a way that they created a positive relationship between experience and wages in the first ten (twenty) years of experience in 1954 (1984) and a flat wage-experience profile thereafter. Overall, as may be seen from the 1984 grid, the ratio between the highest and lowest wage was 4.1, which is much smaller than the ratio found in western market economies. Correspondingly, during the communist period income distribution in Czechoslovakia and the other Central and East European (CEE) countries was one of the most egalitarian in the world (see e.g., Atkinson and Micklewright, 1992).

[5] Discussions with officials who used to administer the wage grid indicate that the process was taken very seriously and that administrators from various Soviet bloc countries compared notes and experiences. In this respect, the wage grid was an integral part of the centrally planned system.

In addition to regulating wages, the central planners regulated employment and admissions to higher education. With minor exceptions, all able-bodied adults were obliged to work. Jobs were provided for everyone and employment security was assured. For higher level jobs, assignment was usually based on political loyalty. As was clear after the communist takeover of 1948 and several times later during minor or major political upheavals, many experienced and educated professionals were demoted to unskilled jobs and replaced with loyal communist party members who often had less education. Similarly, in the selection process for admission to senior high schools and universities, weight was given to working class background and communist party membership of the parents.

Since the collapse of communism at the end of 1989, market forces have been increasingly determining wages, employment and even access to education. Access to higher education has been determined primarily by entrance examinations and the supply of and demand for education have risen. From 1989 to 1996, enrolment rates in high schools increased from 83.7 to 95.9 percent of the population 15-18 years of age. During the same period, enrolments for university education rose from 17.1 to 20.0 percent of the population 19-23 years of age. Job matching has become a decentralized exercise between workers and employers, with party affiliation no longer playing a part.[6]

As mentioned earlier, our data permit us to analyze wage setting via the grid versus market in the 1990s. In particular, the public sector and the privatized SOEs continued to use a modified wage grid throughout the 1990s, while the new private firms have relied on market forces since the early 1990s.[7] We are hence able to compare the wage effect of the grid that was

[6] The government now plays an enabling role through 76 District Labor Offices whose function is to improve the operation of the labor market by helping the unemployed to find jobs.

[7] In order to obtain a better understanding of how the wage-experience relationship varies with

imposed on the entire economy under communism to the post-communist effect of (a) the grid that was used by the public sector and privatized SOEs and (b) the market wage setting process of the *de novo* private firms. In Table 3 we present the major elements of the wage grid used in the public sector in 1998. In comparison to its communist predecessor, the transition grid was substantially simplified by the deletion of the industry dimension, but the number of salary classes was increased from nine to twelve, as was the number of wage raises with experience (i.e., number of columns). Moreover, there is evidence of somewhat greater wage dispersion as the ratio between the highest and lowest wage rose to 4.8. The question that naturally arises is whether the rate of return on human capital under the transition grid matched or fell short of the market return provided by the new private firms.

3. Data and Methodology

3.1 Data

We use data from a retrospective questionnaire that was administered in December 1996 to 3,157 randomly selected households in all 76 districts of the Czech Republic. The questionnaire first asks for the wage and other characteristics of the jobs held in January 1989, the first month of the last year of the communist regime.[8] Since the "big bang" of price liberalization and other transition measures occurred in Czechoslovakia on January 1, 1991, the

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ownership, we have examined the internal wage setting practices within several hundred firms with diverse ownership. The enterprise sample comes from Trexima, one of the largest professional research firms in the Czech Republic. We have found that as late as 1998, most state owned and privatized firms still used a modified wage grid that had been carried forward from the communist days. In contrast, the *de novo* private firms have been found to operate without such a grid. Moreover, government intervention in private sector wage setting has been minimal, although some loose wage controls were in effect intermittently from 1991 to 1995.

[8] The January 1989 date was selected as a point in time for which people were likely to remember their labor market characteristics since 1989 was the year of the revolution that toppled the communist regime. See Munich et al. (1997) for a description of the survey and sample design as well as the descriptive statistics of the sample relative to the *Labor Force Survey* data.

questionnaire then traces the characteristics of all the jobs held by the surveyed individuals between January 1991 and December 1996. As a result, we have continuous labor market histories of each individual during the 1991-96 period. In particular, for each job we have the start wage and average hours of work, as well as the industry and ownership of the worker's firm. For the individuals employed in January 1991, the time of the big bang, we have also obtained information on wages and other characteristics at the start of the job held in January 1991. The starting dates of the jobs held in January 1991 span the entire 1948-89 communist period and we have used data from 1955 onward.[9] Finally, for the 1991-96 period we have collected information on each person's household and demographic characteristics, including changes in education and marital status.

The sample is representative of the 1996 population in terms of major demographic characteristics. It yields employment histories of 2,284 men who were employed for a minimum of two weeks during the period between January 1, 1991 and December 31, 1996. For the "mature" communist period of 1955-89, we use data on (a) the starting wages of 1285 men who also held a job in January 1991 and (b) the cross section of wages of 1955 men who were working during January 1989 (the first month of the last year of communism). For the transition period, we use cross section observations on wages and job characteristics of the 1639 men who worked in December 1996, as well as the job start information on 2107 men during the 1991-96 period. The data hence permit us to estimate (a) cross-sectional earnings functions using data

[9] In fact, this question yielded data on jobs that began as early as the 1940s -- 0.3 percent of all the job starts reported occurred before 1951, 2.6 percent occurred during the 1951-60 period, 5.5 percent during 1961-70, 9.2 percent during 1971-80, 18.9 percent during 1981-90, and 63.5 percent during 1991-96. We felt that the very early data points went too far back in time to be reliable and that they might also be confounded with the systemic changes that accompanied the communist takeover of 1948. As a result, we restricted our observations on job starts to those that occurred from 1955 onward since by 1955 the revolutionary period, nationalization and currency reform that followed the communist *coup d'etat* of 1948 were over and the centrally planned system was fully in place. However, in order to test if our results are sensitive to the inclusion of observations from the 1950s, 1960s and 1970s, we have re-estimated our models with sub-samples that dropped observations on jobs that started before the1980s, 1970s and 1960s, respectively. We found only negligible differences in the various results.

from ongoing jobs at one point in time near the end of communism (January 1989) and one point in time in mature transition (December 1996), and (b) earnings functions using a long (1955-96) period of job start data under both regimes.

In appendix Table A.1, we present the 1989 and 1996 means and standard deviations of the variables that we use in estimating the cross-sectional earnings functions. In appendix Table A.2, we report the corresponding information for the job start data during communism and the transition. As may be seen from the tables, the variables display sensible values and considerable variation both cross-sectionally and over time. Since manufacturing was the key part of the communist economy, over one-half of the men have apprenticeship education.

3.2 Estimation Strategy

In order to obtain estimates of the wage structure and returns to human capital at the end of communism (1989) and at a relatively late date during the transition (1996), we first estimate the following augmented human capital earnings function with our 1989 and 1996 cross-sectional data:

$$\ln W_i = \alpha_0 + \alpha_1 E_i + \alpha_2 X_i + \alpha_3 X_i^2 + \alpha_4 P_i + \mathbf{A}_i'\beta + \varepsilon_i, \qquad (1)$$

where lnW_i, the natural logarithm of the monthly earnings of individual i, is taken to be a function of the individual's educational attainment (E_i), number of years of his potential labor market experience X_i, a dummy variable for whether the individual worked in Prague (P_i), and a set of ten industry dummy variables for the industry location of the individual's job ($\boldsymbol{A_i}$).[10] The

[10] The monthly nominal earnings are meant to be net of payroll and income taxes. This is the most common way that the Czechs recall their salary, since both of these taxes are taken out before they receive their pay. However, about 25 percent of the respondents preferred to report their gross rather than net earnings. As a result, we have included as a regressor a dummy variable to control for this discrepancy in reporting. In addition, net earnings in some cases include benefits provided by the state, through the employer, for raising children. We have therefore also included a dummy variable to control for the cases when the reported earnings include children benefits.

dummy variables $\boldsymbol{A}$ and P are included to control for industry wage effects, compensating differentials, and agglomeration effects of the large, central city. We have also estimated the traditional Mincer (1974) equation by omitting $\boldsymbol{A}$ and P from equation (1), but the coefficients on education and experience were virtually the same. In what follows we hence report estimates of the augmented equation (1).[11] We limit our analysis to workers with full-time jobs.

An important stylized fact from the human capital literature is that the effect of education on wages often depends on how the education variable E is measured. We use three different specifications of E: i) the actual self-reported number of years of education, ii) the highest level of attained schooling, and iii) a combination of i) and ii) above.[12]

The "number of years of education" specification yields an estimate of a constant marginal rate of return on an additional year of schooling, at any level, and reflects the approach advocated for instance by Layard and Psacharopoulos (1974). The "highest level of educational attainment" by type of degree obtained allows the rate of return to vary across types of completed education and reflects the criticisms of the assumption of an identical rate of return to each year of education (e.g., Heckman, Layne-Farrar and Todd, 1995).[13] By including both sets of education variables, we are able to test between these competing specifications and see which one is better supported by the data in the communist and transitional contexts. Moreover, since we have data on actual years of schooling reported by the respondent,[14] rather than years imputed by the researchers from the reported school attainment, we can test the validity of the "sheepskin" hypothesis that "wages rise faster with extra years of education when the extra year also conveys a certificate " (Hungerford and Solon, 1987).[15]

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[11] We have also tested for the effect of marital status in equation (1) and found it to be insignificant.

[12] We would like to thank Orley Ashenfelter for suggesting this combined specification to us.

[13] Our data permit us to estimate a specification with six categorical variables reflecting the highest degree attained: 1) junior high school (mandatory education of 9 years), 2) apprentices in 2 year programs, 3) apprentices in 3 year programs, 4) technical high school graduates and apprentices in 4 year programs who received the technical high school diploma, 5) academic high school graduates, and 6) university graduates and above.

[14] The respondents were asked not to report any years of repeated grades.

[15] The "sheep skin effect" hence refers to the fact that wages may not increase steadily with years of education within a given school but may jump up when a degree is received (see Shanahan, 1993 and

As in most studies of human capital, our labor force experience variable X is calculated as the individual's age minus the sum of the individual's years of schooling and basic school enrollment age of six years.[16] In order to provide a good sense of the nature of the experience-earnings profile, we use two alternative specifications of experience: the traditional quadratic one and a spline function that fits the profile to three categories of years of experience.

Equation (1) enables us to compare cross-sectional estimates for late communism (1989) and mature transition (1996). For estimations covering the 1991-1996 period we are able to include additional variables that capture important aspects of the transition and which are not relevant for the communist period. In particular, using our 1996 cross-section data, we estimate an equation that includes ownership dummy variables that capture whether the individual works in public administration or in a state-owned, privatized or *de novo* private firm. Finally, since we have data on wages at the start of jobs, we are also able to estimate continuous changes in the returns to human capital during the communist and transition periods. In order to capture these changes in a simple way, we estimate a time-varying-coefficient model by interacting the education (E) and experience (X and X^2) variables with a monthly time trend. We stratify the data by the pre- and post-January 1991 periods and estimate separate time-varying-coefficient equations for the communist and transition periods.[17]

It has become customary in the literature on earnings functions to correct for coefficient bias that may be brought about by the self-selection of a segment of non-representative

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Heckman et al., 1996). According to this hypothesis, drop-outs get lower returns to schooling than their schoolmates who obtain a degree. Using U.S. data, Hungerford and Solon (1987) for instance find significant discrete jumps in the return to education upon receiving a degree.

[16] The shortcoming of this variable is that it includes periods during which the individual may have been out of the labor market and acquired less labor force experience. This of course tends to be more of a problem in the case of women than men because of the gaps in women's labor market experience during their maternity leaves (Mincer and Polachek, 1974 and Mincer and Ofek, 1982). We have hence not tried to adjust our calculated measure of experience.

[17] Since the dependent variable is in nominal terms, in all the models that use earnings data over time (with variable coefficients) we include annual dummies to control for changes in prices. We have also tested for the validity of a higher than linear time-varying-coefficient model but we have not found strong support for this higher order specification.

individuals (usually women) into the labor market. Since labor force participation rates of both women and men declined dramatically after the fall of communism, we have tested for the presence of a selectivity bias in our sample of men.[18] We have derived Heckman's (1979) λ by estimating a probit equation with the 1996 cross-section data, using as explanatory variables age, age^2, education (in years), a marital status dummy, a dummy variable for the presence of children under 15 years of age in the household, the per capita household income minus the income of the respondent, a dummy variable for Prague and the district level vacancy rates (the number of vacancies per working age population). The estimation yields positive and significant λ but the estimated coefficients on education and experience remain unaffected by the correction procedure (Table A.8). We hence report the uncorrected estimates.

4. Empirical Findings on Returns to Education

We divide our discussion of the returns to education into three parts: In Section 4.1 we present the results on the returns to a year of education, in Section 4.2 the returns to an educational level and in Section 4.3 the returns within the larger encompassing model. All estimates are from specifications that control for heteroskedasticity using the White (1980) method.

4.1 Returns to a Year of Education

In Table 4 we present our 1989 and 1996 cross-sectional estimates of the rates of return to a year of education based on equation (1).[19] For comparative purposes, we also report the corresponding estimates from other studies in the Czech Republic and other selected countries.

Our estimates suggest that in the last year of communism (1989), men's rate of return to a year of education was 2.7% and that by 1996 the rate rose to 5.8%. Our findings are in line with

[18] Paukert (1995) finds that between 1989 and 1994 labor force participation rates of men and women (over 15 years of age) fell between six and eight percentage points in the Czech Republic, Hungary, Poland and Slovakia, and that the absolute decline was about the same for men and women in each country.

[19] The complete set of our estimates of equation (1) using the 1989 and 1996 cross-sectional data is presented in appendix Table A.3.

the cross-sectional estimates obtained for the Czech Republic by Chase (1998), and they display a similar pattern to that found by the cross-sectional studies in other CEE countries, except East Germany. The pattern indicates that the rate of return on education was low under the communist wage grid and that it rose significantly during the transition. The difference in our estimated coefficients over time is significant at 1 percent significance level. Comparing our finding to those from other countries, we show that within a few years after the start of the transition the rates of return on a year of education in CEE and Russia became similar to the rates in Western Europe, but not as high as those in the United States and Latin America (Table 4).

As may be seen from Table 5, the coefficients on the interaction terms of the 1955-90 time-varying-coefficients model are insignificant, indicating that under the communist wage grid the rate of return to a year of schooling was small at 1.7 percent and remained constant over time. Moreover, our statistical comparisons of the point estimates obtained from the longitudinal 1955-90 data in Table 5 and the cross-sectional 1989 data in Table 4 indicate that there was no statistically significant difference between these estimates. We hence document extremely low and astonishingly stagnant wage differentials based on education under the decades of central planning, a finding that was conjectured but never supported with micro data.

In contrast, our time-varying-coefficient estimates in Table 5 show that the estimated rate of return to a year of education rose rapidly during the 1991-96 period of transition, with the monthly rate of increase averaging 0.08 percent.

4.2 Estimates Based on Attained Levels of Education

In Table 6, we report 1989 and 1996 cross-sectional estimates of the returns to several different levels of schooling, relative to the mandatory junior high school. (The full set of estimated parameters is presented in Table A.4.) We use these estimates to calculate the annual returns to a year of education within each completed category of schooling.[20] The time-varying

[20] Each of the four schooling levels below university level represents a direct path from junior high school. Hence, the annual return to a year of education within these levels of schooling relative to junior highs school (r_s) is calculated as the nth root of the rate of return to the schooling level (R_s), where s represents the level of schooling and n represents the number of years of education in each

coefficients for these levels of education over time are presented in Table 7 and the corresponding full set of parameters is reported in appendix Table A.7.

As may be seen from the first column and first five rows of Table 6, at the end of the communist regime the earnings differentials related to different types of schooling were quite small. In particular, in 1989 a university educated man earned on average just 28.3% more than an otherwise identical man with a junior high school education. Similarly, men with a vocational high school degree earned 12.7% more than their counterparts with a junior high school education. Finally, the difference in the earnings of individuals with an apprenticeship background and junior high school graduates was small to negligible.

By 1996 the returns to higher levels of education increased dramatically. A university educated man earned 72% more (coefficient of .544) than his counterpart with junior high school education.[21] The difference between the 1989 and 1996 coefficients on university education is significantly different at the 0.01 confidence level. We also find that the 1996-89 difference in the returns to a vocational high school education is highly significant and that the percentage increase in this return is the largest among all the education levels. On the other hand, the return to an apprenticeship did not change significantly over time.

As may be seen from the calculated annual rates of return for each level of education in 1989 (Table 6), in late communism the marginal return to a year of education was almost the same in all levels of schooling. Yet, by 1996 the marginal return to a year of academic or vocational high school education rose above the return to a year of apprenticeship or university education, thus providing support for the hypothesis of uneven returns to education across educational categories. When we estimate the time-varying-coefficient model using wage data from the 1955-90 period, we find no change in the returns over time (Table 7). We also find that the differences in returns among the various levels of education are analogously small as in the

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level: $r_s = (R_s)^{1/n}$. However, the return to a year of university education represents a return above either academic or vocational high school, and hence it is calculated as $r_u = (R_u - \overline{R}_{hs})^{1/n}$, where bar denotes the average value.

[21] The coefficient is calculated as [exp(0.544)] – 1 = 72%.

estimates based on the 1989 cross section data.[22] The corresponding 1991-96 estimates indicate that during the transition period the rate of return on education rose significantly for men in all educational categories except for academic high school.

Overall, our cross sectional and longitudinal findings indicate that the education-related wage differentials were small and stagnant under communism. The introduction of market forces has resulted in increasing wages in all phases of one's job tenure for those with vocational high school and university education, but the gains were smaller for those with lower education levels.

4.3 Regressions with Years and Levels of Education

In order to assess the relative merits of the specifications with years of education vs. highest level of attained schooling within the communist wage grid and during the transition, we have estimated regressions that include both actual years of education and the highest attained level of education as regressors. The results in Table 8 are based on the 1989 and 1996 cross sectional data and control for the variables listed in equation (1). As may be seen from these estimates, for 1989 we find some statistically significant coefficients on levels of education but the coefficient on years of education is insignificant. By 1996, the differences among the estimated coefficients on educational levels increase and the coefficient on years of education, while still small in absolute terms, becomes statistically significant. However, when we perform F tests on pair-wise differences of the various coefficients between 1989 and 1996, we do not find any of the differences to be statistically significant (Table 8).

The results in Table 8 indicate that the wage setting mechanism of the communist grid is better approximated by the educational attainment specification than by a model based on years of education. Indeed, the complete lack of significance of the coefficient on years of education in 1989, holding the effect of school attainment constant, is consistent with the emphasis that the planners placed through the wage grid on observable and verifiable attainment, supported by

[22] The 1955-90 results also indicate that men with academic high school and university degrees had higher starting wages than others and that the wages of high school and university graduates were not statistically different from each other (p-value of 0.96).

certificates and diplomas. The finding that by 1996 the coefficient on years of education is significant but small, while the coefficients on educational attainment become significantly different from one another, indicates that during the transition both models receive some support in the data.

The estimates reported in Table 8 also point to the presence of sheepskin effects. Controlling for the number of years of education, one finds a significant joint effect associated with completing degrees (i.e., one rejects the hypothesis that the coefficients on the five educational levels are jointly zero), as well as significant individual sheepskin effects for university and both types of high school education.

The estimates reported in Table 8 are based on a specification that constrains all years of education, conditional on attainment, to have the same rate of return. Our data permit us to go beyond this specification and estimate a less restrictive model. Since we know each individual's reported years of education (net of any repeated grades) and the number of years corresponding to degrees in different types of schooling, we can calculate the number of years that each individual attended in a degree program that he did not complete. It turns out that the number of individuals who attended but did not complete the next higher level of education (i.e., number of dropouts) is considerable: 5, 10, 5, and 10 percent, respectively, of those reporting junior high school, vocational program, high school, and university as their highest attained level of education. We can hence identify the sheepskin effect with the rate of return on the incomplete education of these dropouts, controlling for their completed educational attainment. In particular, we have re-estimated the earnings regressions with the addition of interaction terms between the dummy variables for highest attained educational level and the difference between the number of years of actual and imputed education. The results (not reported here in a tabular form) show a zero rate of return on the incomplete education under communism in 1989 and a small rate of return during the transition in 1996. In 1996, the estimated effect shows that the drop-outs earned

more than individuals with only the attained level of the drop-outs, but less than individuals who completed the educational level that was not fully attained by the drop-outs.[23]

Since many other studies have to impute the information on years of education from data on attainment, we have taken advantage of the dual reporting in our data and re-estimated our regressions with the imputed years of education in order to assess the magnitude of the errors-in-variables bias of this indirect measure. Interestingly, rather than generating the expected downward bias in the education coefficient, the imputed education measure yields coefficient estimates that are 1-2 standard errors higher than the estimates based on reported years of education. This is brought about by the fact that educational attainment underestimates the actual number of years of education because a substantial part of the population has attended school beyond the highest attained degree. Our analysis hence indicates that studies that impute years of education from educational attainment and do not control for the drop-out phenomenon may severely overestimate the rate of return on education, as long as there is no extensive grade repetition as is the case in the Czech Republic. Since we do not know which of the studies reported in Table 4 use the imputed vs. actual number of years of schooling, we cannot determine which of these estimates are biased.[24]

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[23] To test the robustness of these results, we ran two more specifications: One with the highest level of educational attainment and a variable measuring the number of years of schooling above the highest level attained (ExYrs) and another one with the number of imputed years of education and ExYrs. The results from both specifications support the above findings. They indicate that the return to the "extra year" of education that does not lead to a degree is significantly lower than the return to an imputed year or to a year of completed degree, and that these returns are lower (not significantly so in the second specification) in 1989 than in 1996.

[24] Our data also permit us to estimate the returns to a field of study for a given level of education. We have carried out this analysis to see whether there was a shift in the returns to fields of study from the communist regime to the market system. As we show in Table A.5, we have found that with one exception, there was no statistically significant change in the returns to the different fields of study from 1989 to 1996 for men who only attained an apprentice education. For men whose highest level of education was vocational high school, most of the coefficients on the fields of study rose by between 15 and 25 percentage points from 1989 to 1996. Men trained in business & trade services gained relatively more over this period, as did men in manufacturing and electrotechnics. Those trained in law, teaching and "other social branches" saw no change in their returns. For the university educated men all the coefficients basically doubled in size between 1989 and 1996. The high outlier was law where returns rose by a factor of almost three. On the low end, the returns of those trained in health, teaching

Finally, we have tested the hypothesis that education obtained under communism is less appropriate for a market economy and hence receives a lower rate of return during the transition period than post-communist education. We have tested two specifications: (a) entering for each man separately his total number of years of communist and post-communist education and (b) entering separately only post-primary education. The resulting estimates do not allow us to reject the hypothesis that the communist and post-communist education generates the same rate of return. The result is consistent with the hypothesis that education obtained under communism was appropriate for a market economy as well as the hypothesis that reforms of the educational system have proceeded slowly during the transition.

5. Returns to Experience

In the first two panels of Table 9 we present the estimated coefficients and standard errors of the experience and experience squared terms from the cross-sectional and job start data, respectively. As may be seen from the various estimates of these two coefficients, men's experience-earnings profiles are concave in both the communist and transition periods and they resemble remarkably the profiles estimated in market economies. In comparing the estimated coefficients from the communist and transition periods, we find that there was virtually no change in the parameter estimates from 1989 to 1996 and 1955-99 to 1991-96, respectively (first two panels in Table 9).[25] Moreover, we find that the wage-experience profile peaked around 26 years of experience in both 1989 and 1996.

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and "other social branches" did not change over time. Our data hence reveal important shifts in the returns to some fields of study. As expected, education in business and trade services has become more highly rewarded. Similarly, the higher rate of return for university educated lawyers is consistent with the increase in demand for legal services during the process of privatization and restructuring.

[25] The F test statistics are F(2, 3547) = 0.07 for the 1989 vs. 1996 comparison based on the specification with years of education, F(2, 3539) = 0.28 for the 1989 vs. 1996 comparison based on the specification

We next tested the extent to which the experience-earnings profile changed over time. F tests performed on the estimates obtained from the time-varying models (Tables A.6 and A.7) indicate that the profile was changing slightly during the 1955-90 period of communism but remained constant during the 1991-96 period of transition. In particular, while the 1955-90 time-varying coefficients on experience and experience squared are individually not statistically significant, at the 5 percent significance test level one cannot reject the hypothesis that they are jointly different from zero. In contrast, the corresponding coefficients for the 1991-96 period are individually as well as jointly insignificant.[26] Finally, the tests of equality of the time-varying coefficients between the 1955-90 and 1991-96 periods indicate that one cannot reject the hypothesis of equality of the experience profile during the two periods.[27]

Overall, the cross-sectional and start wage estimates of the effects of experience on earnings suggest that men's profiles evolved slightly under communism but did not change from the communist period to the period of transition to a market economy**.** These results are provocative because they imply that the experience-earnings profile under communism approximated the Mincerian human capital earnings function and was not substantially altered during the first six years of the transition.

The similarity of the experience-earnings profile generated under the communist wage grid, during the transition and in market economies has led western economists wonder about the principles of wage setting under communism. Robert Flanagan (1993) for instance interpreted his aggregate findings to mean that "communists were good human capitalists," while Walter Oi

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with levels of education, $F(2, 3266) = 0.02$ for the 1955-89 vs. 1991-96 comparison based on the specification with years of education, and $F(2, 3251) = 0.03$ for the 1955-89 vs. 1991-96 comparison based on the specification with levels of education.

[26] The test statistics for the joint significance of the time-varying experience and experience squared coefficients are $F(2, 1230) = 3.31$ under communism and $F(2, 2078) = 0.78$ during the transition.

wondered if communist planners "copied Jacob Mincer."[28] As we have indicated earlier, the communist wage grid predates Jacob Mincer's and Gary Becker's writings. As is evident from Tables 1 and 2, the grid also has a long flat part in its profile, thus making the similarity of communist wage setting and the human capital theory all the more intriguing. After examining several communist wage grids and the institutional information surrounding their determination, we fit the quadratic Mincerian earnings-experience function to the parameters of three communist wage grids dating from 1954, 1979 and 1984. Interestingly, the estimated wage grid coefficients, reported in the third panel of Table 9, are quite similar to those obtained by fitting actual wage data from 1955-89 and 1989. As we show by plotting both actual and fitted wage grid data in Figure 1(a)-(c), the Mincerian experience-earnings profile fits the actual wage grid parameters in each of the three years during communism. Hence, while ideology led the planners to impose narrow education-related wage differentials and cap the experience-earnings profile, they built into the grid enough wage progression with initial years of experience to generate a Mincerian-type quadratic profile in the grid and the actual wage data.

In the last row of Table 9 and in panel (d) of Figure 1 we also present the profile fitted to the wage grid used by the public sector and most privatized SOEs in 1998. As may be seen from the plot and the underlying parameter estimates, the "democratic regime" wage grid may also be approximated very closely by a quadratic experience-earnings function. In fact, the fine gradation of earnings with seniority in the 1998 grid makes the fit very precise.

Finally, as with education, we have tested the hypothesis that experience obtained after 1989 generates higher rates of return in the transitional market economy than experience

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[27] The relevant F statistic is F(4, 3266) = 0.29.

[28] Commentary made at the 1997 Conference on the Handbook of Labor Economics, Princeton University.

accumulated under communism. Since the 1996 cross-sectional data do not have sufficient variation in the values of the post-communist experience variable, we have carried out the test on the 1991-96 job start data. We find that individually and jointly the coefficients on the two types of experience and experience squared are not different from one another.[29] The direct test hence indicates that the communist and transition experience command the same rate of return.

6. Public vs. Private Sector Returns to Human Capital

As we mentioned earlier, the relative behavior of SOEs, privatized SOEs and newly created private firms is one of the fundamental issues in transition economics. In the context of our inquiry, the interesting question is whether the flexibility of new private entrepreneurs leads them to deviate from the communist era wage grid and reward human capital more in line with its productivity than their privatized and non-privatized SOE counterparts. This is an open question since post-communist adjustments in the wage grid, reduction of government subsidies to the SOEs, and the opening up of the economy to international competition may have induced important changes in the pay policies of the SOEs and privatized SOEs as well. Whether the returns to human capital would be higher in the *de novo* private, privatized or public sector firms depends on the relative magnitudes of these effects.

In Table 10 we present the estimated coefficients for education and experience from equation (1), using the 1996 data stratified by three types of ownership: a) SOE and public administration, b) privatized SOEs and cooperatives, and c) *de novo* private firms. In Panel A of the table we report the results using education specified in years, while in the Panel B we present the results using education by highest level attained.

Our basic finding is that while the estimated coefficient on education is higher in privatized SOEs, cooperatives and *de novo* private firms than in SOEs and public administration, one cannot reject the hypothesis that firms of all three ownership types pay the

[29] The F test value on the joint significance is F(2, 2078) = 1.22.

same rate of return to a year of education. Moreover, individual pair-wise tests of differences between the relevant coefficients indicate that there are no significant differences in the rates of return across ownership types when education is measured by the highest level of schooling attained.

With respect to experience we find that the *de novo* private firms pay significantly higher returns than SOEs and public administration on a year of experience to male employees with low experience (i.e., recent entrants into the labor market). Men's wage-experience profiles hence begin steeper in *de novo* firms than in SOEs and public administration, but they are also more concave and have an earlier turning point. It is also the case that men's experience profiles are not significantly different in SOEs and Public Administration than in the privatized enterprise and coops, but they are significantly different in the *de novo* private firms.

In order to provide a deeper understanding of how the wage-experience relationship varies with ownership, we have also estimated spline experience-earnings profiles, where the splines capture three ten-year experience intervals from the start of one's career and one remaining time interval thereafter. As may be seen from Figure 2, the spline estimates for men, based on data from the SOEs and public administration, as well as the privatized firms, reflect the upward sloping and then flat profile that corresponds to the wage grid profile in panel (d) of Figure 1. The only difference lies in the fact that while the grid has a positive concave slope until 30 years of experience, the estimated coefficients yield a positive and significant slope in the first 10 years of one's career, and positive but statistically insignificant slope between 10 and 30 years of experience. The estimated profile from data on men working in the *de novo* private firms is similar but contains a decreasing segment for individuals with more than 30 years of experience. The greater concavity of the wage-experience profile in the *de novo* private firms, detected in the quadratic experience specification of equation (1), is hence also reflected in the estimated spline functions.

Our analysis hence indicates that six years into the transition the rate of return to education is basically the same across the three principal ownership categories of firms. The only

difference among the ownership categories is that *de novo* private firms pay more to younger men with recent work experience.

7. Shifts in Industry Wage Premiums between 1989 and 1996

The literature on inter-industry wage differentials has found that these differentials are relatively persistent and that the ranking of industries by the level of wages they pay was similar in the market and planned economies. These findings were found to hold irrespective of whether one controlled for other factors (e.g., Krueger and Summers, 1987 and Rutkowski, 1994) and they implicitly pointed to a similar set of outcomes in the western labor markets and the communist wage grids at the industry level.

In order to generate new findings that would be comparable to the existing literature, we analyze industry intercepts from the 1989 and 1996 regressions in which we control for years of education and experience. These intercepts are industry wage differentials relative to agriculture, holding constant human capital characteristics of workers.[30]

Analogously to the approach adopted by Krueger and Summers (1987), in Figure 3 we depict a plot of the industry intercepts for 1989 and 1996. The pattern shows a significant shift in men's inter-industry wage structure.[31] In particular, men's 1989 and 1996 relative wage differentials line up close to a downward sloping line and generate a negative correlation coefficient of –0.41. The wage scatter suggests that the relative wages in finance and mining and quarrying have decreased, while those in trade, transport and telecommunications, light manufacturing, and "other" activities gained, between 1989 and 1996. The long-term stability of the inter-industry wage differentials, documented in the earlier literature, hence appears to have been changed as a result of the transition.

[30] These coefficients are reported in full in Table A.3.

[31] The reported pattern is very similar to the one obtained when one does not control for workers' human capital characteristics.

In order to verify the scatter diagram analysis, in Table 11 we report the industry intercepts and tests of significance of their differences between 1989 and 1996. An examination of the 1989-96 differences in these intercepts indicates that five out of eight are statistically significant. Men working in mining and quarrying indeed lost much of their former wage premium, while those in trade, transport and telecommunications, light manufacturing, and "other" activities gained significantly. However, the large decline in men's wage differential in finance, insurance and real estate turns out not to be statistically significant. The interesting question is why we do not find a positive difference in intercepts in this expanding sector that has been hiring employees at very high wages? The answer given by our analysis is that the high wages in the finance sector reflect the high levels of human capital among the new hires. Finally, a more detailed analysis of the differentials in Table 11 indicates that agriculture, the base sector whose share in total output and employment shrank dramatically, lost also in terms of its wage differential relative to the rest of the economy.

8. Conclusions

In this study we have analyzed the returns to human capital under the Communist wage grid (1955-1990) and the changes in wages and returns to human capital that took place during the transition (1991-96) as (a) new private firms started paying market wages and (b) state owned enterprises (SOEs), public administration and privatized firms used a new post-communist grid to set wages. In order to carry out this analysis, we have collected a special retrospective data set in the Czech Republic, a country that, unlike Poland and Hungary, maintained the centrally planned system intact until the very end of the communist era.

Overall, we show that the functioning communist system succeeded in using the wage grid to set and maintain for decades extremely small wage differentials. Indeed, the estimated rate of return on education is very small and constant for decades during the communist rule. At the level of individual and household incomes, the effects of the wage grid translated into the most egalitarian distribution of income in the world.

The transition from the centrally planned to a market system resulted in a major gradual increase in the rates of return to education, with the rates of return reaching West European levels by 1996. This increase is found in all ownership categories of firms. Hence, in the face of the reduced subsidies to SOEs and the opening of the economy to world competition, the new wage grid used by SOEs, public administration and privatized SOEs did not cause these firms to deviate substantially in terms of returns to education from the *de novo* private firms.

Our cross-sectional and longitudinal estimates of the effects of experience on earnings indicate that men's wage-experience profile was concave in both regimes and did not change from the communist to the transition period. These results imply that the experience-wage grid used by planners to set starting wages was maintained during the entire communist period and was not substantially altered during the first six years of the transition. However, we find that the *de novo* private firms have a more concave profile than SOEs and public administration and that they pay a higher experience return than SOEs and public administration to the recent entrants in the labor market.

Contrary to earlier studies that found the inter-industry wage structure to be stable and similar in market and centrally planned economies, we show that men's inter-industry wage structure changed substantially between 1989 and 1996 as the economy switched from central planning to a nascent market system. In particular, men working in mining and quarrying lost much of their former wage premium, while those in trade, transport and telecommunications, light manufacturing, and "other" activities gained significantly.

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Table 1
1954 Czechoslovak Wage Grid

The present grid determined monthly wages in Czechoslovak Crowns for specific occupational categories in agriculture. A grid of this kind existed for each of 20 industries and covered subclasses within 3 occupational classes (managers, blue collar employees and white collar workers). Within the grid, the level of difficulty of each job was determined by various characteristics of each occupation and the number of supervised employees.

		Occupation(Director)				Occupation(Chief accountant)				Occupation(…)
		Level of Difficulty				Level of Difficulty				Level of Difficulty
Education	Experience	I	II	III	IV	I	II	III	IV	…
University+	< 3 years	1681	1867	2092	2428	1264	1436	1607	1867	…
	3-10 years	1868	2074	2324	2697	1404	1595	1786	2074	…
	10+ years	-	-	-	-	1572	1786	2000	2323	…
High School	< 3 years	1604	1782	1997	2317	1148	1305	1462	1697	…
	3-10 years	1782	1980	2218	2574	1276	1450	1624	1885	…
	10+ years	-	-	-	-	1429	1624	1819	2111	…
Less than High School	< 3 years	1528	1690	1901	2206	1033	1175	1316	1527	…
	3-10 years	1697	1886	2112	2451	1148	1305	1462	1697	…
	10+ years	-	-	-	-	1286	1462	1637	1901	…

Note: The salaries were also adjusted for overtime premiums according to a catalog that accompanied each grid.

Table 2
1984 Czechoslovak Wage Grid

By 1982, the planners moved from separate grids defined for each industry and occupation to one grid for the entire economy. The hourly rate was specified for different hours of work per week as follows:

Wage Scale	Hours worked per week	Wage Classes								
		1	2	3	4	5	6	7	8	9
1	42.5	5.3	6	6.7	7.6	8.5	9.6	10.8	12.1	13.6
	41.25	5.5	6.2	6.9	7.8	8.8	9.9	11.1	12.4	13.9
	40	5.6	6.3	7.1	8	9	10.1	11.4	12.8	14.4
	36	6.3	7.1	8	9	10.1	11.3	12.7	14.3	16.1
2	42.5	5.6	6.3	7.1	8	9	10.1	11.4	12.8	14.4
	41.25	5.8	6.5	7.3	8.3	9.3	10.4	11.7	13.1	14.8
	40	6	6.7	7.6	8.5	9.6	10.8	12.1	13.6	15.3
	36	6.6	7.4	8.4	9.5	10.6	11.9	13.4	15.1	17
3	42.5	6	6.7	7.6	8.5	9.6	10.8	12.1	13.6	15.3
	41.25	6.2	6.9	7.8	8.8	9.9	11.1	12.4	13.9	15.7
	40	6.3	7.1	8	9	10.1	11.4	12.8	14.4	16.2
	36	7.1	8	9	10.1	11.3	12.7	14.3	16.1	18.1
4	42.5	6.3	7.1	8	9	10.1	11.4	12.8	14.4	16.2
	41.25	6.5	7.3	8.3	9.3	10.4	11.7	13.1	14.8	16.7
	40	6.7	7.6	8.5	9.6	10.8	12.1	13.6	15.3	17.2
	36	7.4	8.4	9.5	10.6	11.9	13.4	15.1	17	19.2
5	42.5	6.7	7.6	8.5	9.6	10.8	12.1	13.6	15.3	17.2
	41.25	6.9	7.8	8.8	9.9	11.1	12.4	13.9	15.7	17.7
	40	7.1	8	9	10.1	11.4	12.8	14.4	16.2	18.3
	36	8	9	10.1	11.3	12.7	14.3	16.1	18.1	20.4
6	42.5	7.1	8	9	10.1	11.4	12.8	14.4	16.2	18.3
	41.25	7.3	8.3	9.3	10.4	11.7	13.1	14.8	16.7	18.8
	40	7.6	8.5	9.6	10.8	12.1	13.6	15.3	17.2	19.4
	36	8.4	9.5	10.6	11.9	13.4	15.1	17	19.2	21.6
7	42.5	7.6	8.5	9.6	10.8	12.1	13.6	15.3	17.2	19.4
	41.25	7.8	8.8	9.9	11.1	12.4	13.9	15.7	17.7	20
	40	8	9	10.1	11.4	12.8	14.4	16.2	18.3	20.6
	36	9	10.1	11.3	12.7	14.3	16.1	18.1	20.4	22.9
8	42.5	8	9	10.1	11.4	12.8	14.4	16.2	18.3	20.6
	41.25	8.3	9.3	10.4	11.7	13.1	14.8	16.7	18.8	21.2
	40	8.5	9.6	10.8	12.1	13.6	15.3	17.2	19.4	21.8
	36	9.5	10.6	11.9	13.4	15.1	17	19.2	21.6	24.3
9	42.5	8.5	9.6	10.8	12.1	13.6	15.3	17.2	19.4	21.8
	41.25	8.8	9.9	11.1	12.4	13.9	15.7	17.7	20	22.5
	40	9	10.1	11.4	12.8	14.4	16.2	18.3	20.6	23.2
	36	10.1	11.3	12.7	14.3	16.1	18.1	20.4	22.9	25.8

Note: The classification into a wage scale (row) was a function of a person's occupation and difficulty of work. The wage class (column) was determined by a person's level of experience. To determine the appropriate wage for a given person, one had to find the occupation in the accompanying catalog, where these cells were defined. As an example, a machine driver would move from wage classes 4 to 6 over his/her career. In year one, the person would be in wage class 4, and wage scale 3. After X years of experience he/she would move to wage class 5 and after Y more years of experience to wage class 6. The rate at which one crossed the wage classes over time (experience profile) varied for different occupational and qualification levels.

Table 3
1998 Wage Grid for the Public Sector in the Czech Republic

The 1998 wage grid for the public sector resembled in many respects the 1984 communist wage grid. However, the 1998 grid was simpler and the wage experience profile was much finer (12 categories) as well as steeper in 1998 than in the previous years.

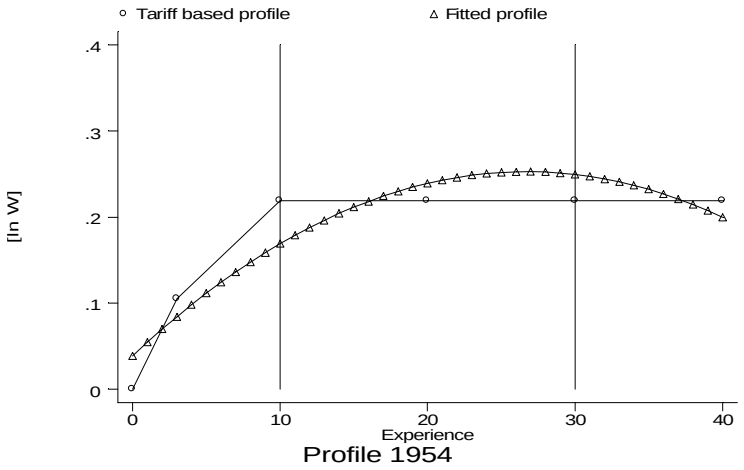
	Years of experience											
Salary Class	< 1 yr.	1-2	3-4	5-6	7-9	10-12	13-15	16-19	20-23	24-27	28-32	>32
1	3,250	3390	3550	3700	3850	4000	4170	4330	4490	4,660	4,820	4,980
2	3560	3720	3880	4050	4210	4380	4540	4720	4900	5080	5250	5430
…	.	.	.	.	.	.	.	.	.	.	.	.
11	8800	9250	9710	10170	10620	11080	11540	11980	12440	12910	13370	13840
12	10,000	10520	11030	11560	12070	12590	13120	13640	14170	14,710	15,230	15,760

Note: Salary classes were defined by occupational and education categories. The slope of the wage-experience profile was the same for all salary classes (rows of the grid). Bonuses of up to 30% of salary were also allowed.

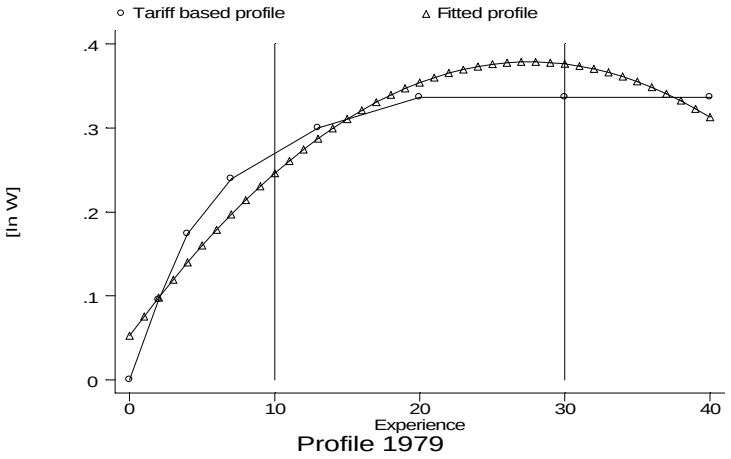
Figure 1

Wage Experience Profiles from the 1954, 1979, 1986 and 1998 Wage Grids (Actual Grid Data Points and Curve Fitted with a Quadratic Wage-Experience Curves Fitted to the Grid)

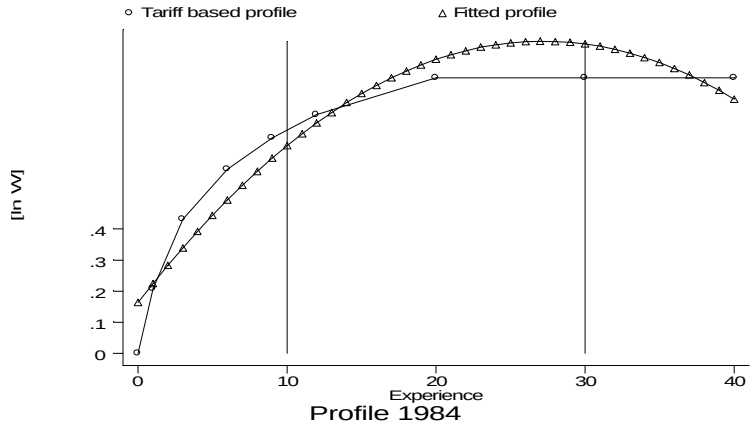
(a)



(b)



(c)



(d)

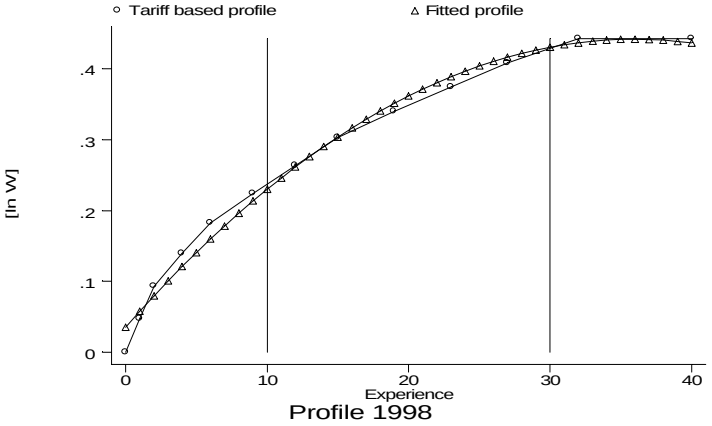


Figure 2
Men's Spline Experience Profiles in 1996 by Enterprise Ownership

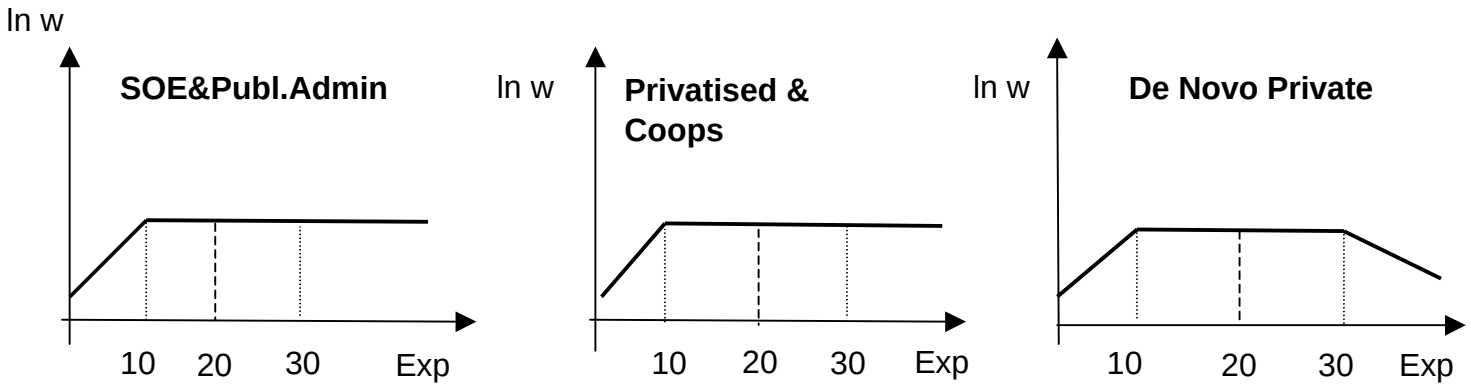
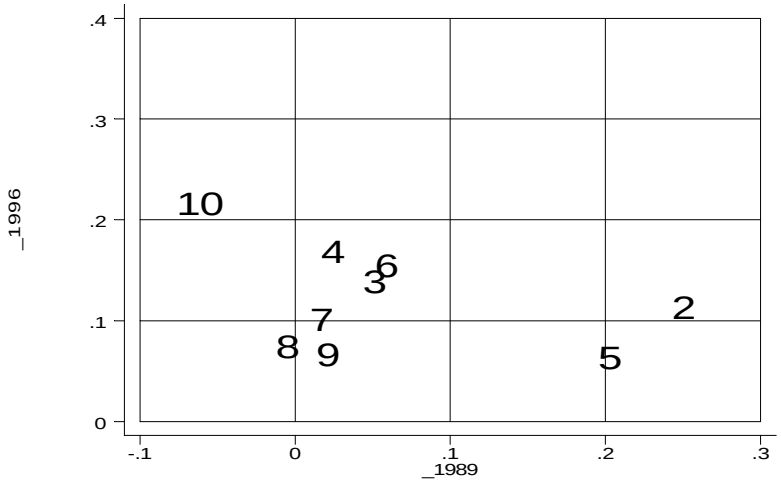


Figure 3

Scatter-plot of Estimated Coefficients on Industry-Specific Dummy Variables (1989 vs. 1996)



Legend

1 Agriculture=base (excluded)
2 Mining, Quarrying, Energy Production and Distribution
3 Construction
4 Wholesale, Retail, and Private Services
5 Finance, Insurance, and Real Estate
6 Transport and Telecommunications
7 Manufacturing-machinery
8 Manufacturing-Other
9 Public Administration, Education, Health, and Army
10 Other

Table 4
Estimated Returns to a Year of Education,
Cross-Sectional Evidence
for the Czech Republic and Other Countries

Country	Reference Years	Communism		Transition	
		Men	Men&Women	Men	Men&Women
CEE					
Czech Republic (1)	1989, 1996	0.027		0.058	
Czech Republic (2)	1984, 1993	0.024		0.052	
East Germany (3)	1989, 1991		0.044		0.041
East Germany (4)	1988, 1991		0.077		0.062
Poland (5)	1987, 1992		0.05		0.07
Slovakia (1)	1984, 1993	0.028		0.049	
CIS					
Russia (6)	1991, 1994	0.031		0.067	
United States (4)	1989			0.085	0.093
Latin America					
Argentina (7)	1989				0.103
Chile (7)	1989				0.120
Mexico (7)	1984				0.141
Venezuela (7)	1989				0.084
Europe					
Germany (7)	1987				0.049
Great Britain (7)	1984				0.068
Switzerland (7)	1987				0.079

Note: Figures are reported coefficients from human capital (Mincer, 1976) earnings functions.
CEE= Central and East Europe.
CIS = Commonwealth of Independent States.

Sources:
(1)Authors' calculations, see Table A.3
(2) Chase, 1998.
(3) Bird et al., 1994.
(4) Krueger & Pischke, 1995.
(5) Rutkowski, 1997.
(6) Brainerd, 1998.
(7) Psacharopoulos, 1994.

Table 5
Estimated Returns to a Year of Education for Men in the Czech Republic[1]
(Time-Varying-Coefficients Model)

	Communism (1955-1990)	**Transition** (1991-1996)
Years of Education	0.017	0.022[a]
	(0.010)	*(0.007)*
*Years of Education*t*	-0.00003	0.0008[a]
	(0.00006)	*(0.0002)*

[1]Taken from Table A.6, standard errors in parentheses.
[a]Significant at the 1% level.

Table 6
Estimated Returns for Men by Level of Educational Attainment, Cross Section Data[1]

A. Level of attainment [1]	**1989**	**1996**
-apprentices (2 years)	0.063	0.094[a]
	(0.051)	*(0.057)*
-apprentices (3 years)	0.077[b]	0.112[a]
	(0.037)	*(0.049)*
-vocational H.S. (4 years)	0.127[a]	0.294[a]
	(0.040)	*(0.050)*
-academic H.S. (4 years)	0.135[c]	0.351[a]
	(0.081)	*(0.107)*
-university	0.283[a]	0.544[a]
	(0.045)	*(0.059)*
Calculated annual returns within attainment level [2]		
-apprentices (2 years)	0.032	0.048
-apprentices (3 years)	0.026	0.038
-vocational H.S. (4 years)	0.032	0.076
-academic H.S. (4 years)	0.034	0.092
-university	0.044	0.076

[1]Taken From Table A.4.

[2]Using the estimated coefficients β on attainment in panel A, and the years of education, annual returns are are computed as $\exp(\beta)-1$.

[a]Significant at the 1% level.

[b]Significant at the 5% level

[c]Significant at the 10% level

Table 7

Estimated Returns for Men by Level of Educational Attainment, Time Varying Coefficients[1]

(Standard Errors in Parentheses)

period	Communism (1955-89)	Transition (1991-96)
Apprentice (2 years)	0.0566	-0.0783
	(0.1007)	*(0.1062)*
Apprentice (2 years)*t	n.a.	0.007
	n.a.	*(0.003)*
Apprentice (3 years)	0.0690	0.0489
	(0.0745)	*(0.0691)*
Apprentice (3 years)*t	-0.00002	0.0044[a]
	(0.0004)	*(0.0017)*
Vocational H.S. (4 years)	0.056	0.051
	(0.082)	*(0.074)*
Vocational H.S.(4 years)*t	-0.0001	0.0064[a]
	(0.0005)	*(0.002)*
Academic H.S.(4 years)	0.3378[b]	0.0896
	(0.1783)	*(0.1126)*
Academic H.S.(4 years)*t	0.0009	0.0028
	(0.0009)	*(0.0028)*
University	0.1789[a]	0.2675[a]
	(0.0888)	*(0.0822)*
University*t	-0.0004	0.0083[a]
	(0.0006)	*(0.0020)*

[1]Taken From Table A.6.

[a]Significant at the 1% level.

[b]Signficant at the 5% level

[c]Significant at the 10% level.

Table 8
Estimated Returns for Men by Level of Educational Attainment
Holding Years of Education Constant

	Communism	Transition	Difference
	1989	1996	1996-89
Years of Education	0.006	0.020 [b]	0.014
	(0.007)	*(0.009)*	*0.17*
Apprentices (1-2 years)	0.052	0.058	0.006
	(0.054)	*(0.061)*	*0.94*
Apprentices (3-4 years)	0.060	0.056	-0.004
	(0.043)	*(0.055)*	*0.95*
Vocational H.S. (4 years)	0.100 [b]	0.209 [a]	0.109
	(0.052)	*(0.062)*	*0.14*
Academic H.S. (4 years)	0.108 [c]	0.271 [b]	0.164
	(0.088)	*(0.112)*	*0.19*
University	0.229 [a]	0.367 [a]	0.137
	(0.078)	*(0.093)*	*0.22*

[a]Significant at the 1% level.

[b]Signficant at the 5% level

[c]Significant at the 10% level.

Note: Standard errors in parentheses and P-values for differences in the coefficients in italics. The regressions also include control dummies for child benefits, taxes and nine industries.

Table 9

Estimated Returns to a Year of Labor Market Experience of Men

(Standard Errors in Parentheses)

Cross-section data	**Experience**	**Experience^2**
1989[1]	0.021	-0.0004
	(0.003)	*(0.0001)*
1989[2]	0.021	-0.0005
	(0.003)	*(0.0001)*
1996[1]	0.021	-0.0004
	(0.005)	*(0.0001)*
1996[2]	0.024	-0.0005
	(0.005)	*(0.0001)*
Job-start data		
1955-1989[3]	0.024	-0.0005
	(0.005)	*(0.0002)*
1955-1989[4]	0.024	-0.0006
	(0.005)	*(0.0002)*
1991-1996[3]	0.028	-0.0006
	(0.005)	*(0.0001)*
1991-1996[4]	0.029	-0.0006
	(0.005)	*(0.0001)*
Wage-Grid data		
Under Communism		
1954	0.016	-0.0003
	(0.005)	*(0.0001)*
1979	0.024	-0.0004
	(0.004)	*(0.0001)*
1984	0.046	-0.0008
	(0.004)	*(0.0001)*
In Transition		
1998	0.023	-0.0003
	(0.001)	*(0.00003)*

Note: All coefficients statistically significant at 1% confidence level.

[1]Table A.3, years of education.

[2]Table A.4, levels of education.

[3]Table A.6, years of education.

[4]Table A.7, levels of education.

Table 10

Estimated Returns to Human Capital of Men in 1996 by Public-Private Ownership[1]

(Standard Errors in Parentheses)

	SOE& Public Administration	Privatized Enterprises&Coop	*De Novo* Private Firms
Panel A:			
Education (years)	0.056[a]	0.065[a]	0.061[a]
	(0.009)	*(0.007)*	*(0.010)*
Experience	0.015[b]	0.022[a]	0.030[a]
	(0.006)	*(0.007)*	*(0.004)*
Experience^2	-0.0003[b]	-0.0004[a]	-0.0007[a]
	(0.0001)	*(0.0002)*	*(0.0001)*
Constant	7.919[a]	7.812[a]	7.845[a]
	(0.140)	*(0.097)*	*(0.155)*
adj.R^2	***0.226***	***0.209***	***0.212***
No. of obs.	***384***	***504***	***604***
Panel B:			
Apprentice with 2 years	0.129	0.114[c]	0.101
	(0.117)	*(0.064)*	*(0.135)*
Aprentice with 3-4 years	0.097	0.156[a]	0.065
	(0.102)	*(0.057)*	*(0.114)*
Vocational High School	0.323[a]	0.327[a]	0.249[b]
	(0.102)	*(0.057)*	*(0.116)*
Academic High School	0.401[a]	0.266[c]	0.342
	(0.138)	*(0.160)*	*(0.303)*
University	0.476[a]	0.673[a]	0.599[a]
	(0.112)	*(0.070)*	*(0.131)*
Experience	0.021[a]	0.027[a]	0.033[a]
	(0.006)	*(0.007)*	*(0.004)*
Experience^2	-0.0004[a]	-0.0005[a]	-0.0008[a]
	(0.0001)	*(0.0002)*	*(0.0001)*
Constant	8.331[a]	8.324[a]	8.401[a]
	(0.133)	*(0.076)*	*(0.140)*
adj.R^2	***0.238***	***0.241***	***0.247***
No. of obs.	***384***	***504***	***604***

[1]The regressions also control for child benefits, gross income, and industry dummies (equation 1).

[a]Significant at the 1% level.

[b]Significant at the 5% level

[c]Significant at the 10% level

Table 11

Changes in Men's Industry Wage Structure from 1989 to 1996[1]

(Standard Errors in Parentheses)

	1989	1996	1996-1989
Mining & Quarrying	0.251 [a]	0.092 [a]	-0.159 [a]
	(0.039)	(0.044)	*0.01*
Construction	0.051	0.131 [a]	0.080
	(0.035)	(0.040)	*0.13*
Wholesale and Retail Trade	0.025	0.163 [a]	0.139 [a]
	(0.037)	(0.041)	*0.01*
Finance, Insur. & Real Estate	0.203	0.052	-0.152
	(0.139)	(0.080)	*0.34*
Transport & Telecommunications	0.059 [c]	0.146 [a]	0.087 [c]
	(0.036)	(0.040)	*0.10*
Manufacturing-Food, Textile,	0.017	0.092 [a]	0.075 [c]
	(0.028)	(0.033)	*0.09*
Manufacturing-Machinery	-0.005	0.066 [a]	0.071
	(0.030)	(0.037)	*0.14*
Public Admin., Education & Healtl	0.021	0.060	0.038
	(0.035)	(0.038)	*0.46*
Not known	-0.062	0.204	0.265 [c]
	(0.079)	(0.115)	*0.06*

NOTES: Base = Agriculture; Standard errors in parentheses; P values from Chi Square test on differences in coefficients are in italics.

[1]Source: Columns 3, 5, 7 and 9 of Table A.3 where education is measured in years.

[a]Significant at the 1% level

[b]Signficant at the 5% level

[c]Signficant at the 10% level

Table A.1
Means and Standard Deviation of Variables in Cross-Sectional Data

	1989		1996	
	mean	st.dev.	mean	st.dev.
Log of monthly wage	8.227	(0.394)	8.961	(0.404)
Experience (years)	18.2	(11.5)	20.4	(12.0)
Experience^2	463.3	(490.4)	559.8	(545.5)
Education in years	12.776	(2.519)	12.626	(2.347)
Highest level of education attained:				
Apprentices w/2 years	0.048	(0.213)	0.035	(0.184)
Apprentices w/3 years	0.484	(0.500)	0.503	(0.500)
Vocational H.S. w/4 years	0.258	(0.438)	0.274	(0.446)
Academic H.S. w/4 years	0.022	(0.147)	0.023	(0.149)
University	0.131	(0.338)	0.119	(0.323)
Field of highest level of education:				
Apprenticeship:				
Machine control	0.028	(0.164)	0.029	(0.168)
Manuf. Machinery and Metalurgy	0.199	(0.399)	0.200	(0.400)
Electrotechnics, transport, telecom.	0.069	(0.254)	0.073	(0.260)
Chemistry, Food processing	0.016	(0.125)	0.018	(0.132)
Textile, Clothing	0.007	(0.084)	0.004	(0.061)
Wood, Shoes manufacturing	0.025	(0.157)	0.031	(0.173)
Construction	0.089	(0.284)	0.089	(0.284)
Agriculture, Forestry	0.040	(0.197)	0.042	(0.202)
Trade, Services	0.029	(0.168)	0.022	(0.145)
Other	0.030	(0.170)	0.031	(0.173)
Academic High School	0.022	(0.147)	0.023	(0.149)
Vocational High School :				
Natural sciences	0.004	(0.060)	0.002	(0.050)
Manufacturing-Machinery	0.091	(0.288)	0.094	(0.292)
Electrotechnics	0.046	(0.209)	0.058	(0.235)
Construction	0.019	(0.136)	0.017	(0.130)
Other technical branches	0.016	(0.127)	0.018	(0.135)
Agriculture	0.023	(0.149)	0.022	(0.147)
Health	0.003	(0.055)	0.006	(0.074)
Business, Trade, Services	0.028	(0.164)	0.027	(0.162)
Law	0.001	(0.032)	0.001	(0.035)
Teaching	0.002	(0.045)	0.002	(0.050)
Other social branches	0.005	(0.071)	0.004	(0.065)
Other	0.021	(0.142)	0.020	(0.141)
University:				
Natural sciences	0.010	(0.098)	0.007	(0.082)
Manufacturing-Machinery	0.023	(0.150)	0.024	(0.153)
Electrotechnics	0.009	(0.096)	0.009	(0.096)
Construction	0.013	(0.112)	0.012	(0.107)

Table A.2
Means and Standard Deviation of Variables for Start Date Data

	Communism		Transition	
Log of earnings	8.049	(0.549)	8.509	(0.484)
Experience	7.009	(9.178)	13.442	(12.653)
Exper. x time	-640	(1185)	381	(535)
Experience ^{2}	135	(303)	341	(512)
Exper. ^{2} x time	-11052	(24646)	9438	(19184)
Years of education	12.843	(2.526)	12.428	(2.261)
Education x time	-1810	(1522)	383	(282)
Apprentice (2 years)	0.037	(0.190)	0.036	(0.185)
Apprentice (2) x time			1.056	(6.863)
Apprentice (3 years)	0.475	(0.500)	0.533	(0.499)
Apprentice (3) x time	-64.5	(101.8)	16.3	(22.0)
Vocational H.S.	0.268	(0.443)	0.243	(0.429)
Vocational H.S. x time	-39.1	(87.6)	7.6	(17.3)
Academic H.S.	0.022	(0.146)	0.036	(0.185)
Academic H.S. x time	-3.5	(30.0)	1.4	(8.0)
University	0.143	(0.350)	0.101	(0.302)
University x time	-17.2	(60.2)	2.8	(10.8)
Prague	0.111	(0.314)	0.121	(0.327)
Child ben. incl,	0.136	(0.343)	0.089	(0.284)
Gross earnings	0.258	(0.437)	0.226	(0.418)
Machine Control	0.093	(0.290)	0.049	(0.216)
Electro., trans., tele.m.	0.098	(0.298)	0.175	(0.380)
Chemistry, Food processing	0.096	(0.295)	0.187	(0.390)
Textile, Clothing	0.125	(0.331)	0.112	(0.315)
Wood, Shoes manufac.	0.007	(0.083)	0.012	(0.108)
Construction	0.075	(0.264)	0.062	(0.241)
Agriculture, Forestry	0.244	(0.429)	0.254	(0.435)
Trade, Services	0.134	(0.341)	0.080	(0.272)
Other	0.007	(0.083)	0.008	(0.089)
26-100 employees			0.245	(0.430)
101-500 employees			0.209	(0.407)
>500 employees			0.172	(0.377)
Not known			0.038	(0.192)
Privatised			0.163	(0.370)
Public administration			0.089	(0.285)
Private established			0.495	(0.500)
Cooperative			0.032	(0.177)
Other & not known			0.081	(0.272)
Employer			0.018	(0.131)
Self-employed			0.061	(0.240)
HH helper + Not known			0.010	(0.102)
No. of Obs.	1285		2107	

Table A.3
Cross-sectional Earnings Functions, 1989 and 1996
(Education by years)

	1989		1996	
	(1)	**(2)**	**(1)**	**(2)**
Education	0.026	0.027	0.058	0.058
	(0.003)	*(0.004)*	*(0.005)*	*(0.005)*
Experience	0.022	0.021	0.020	0.021
	(0.003)	*(0.003)*	*(0.005)*	*(0.005)*
Experience^2	-0.0005	-0.0004	-0.0004	-0.0004
	(0.0001)	*(0.0001)*	*(0.0001)*	*(0.0001)*
Prague	-	0.015	-	0.120
	-	*(0.027)*	-	(0.032)
Child benefits included	-	0.061	-	0.064
	-	*(0.022)*	-	*(0.026)*
Gross earinings	-	0.122	-	0.069
	-	*(0.020)*	-	*(0.022)*
Industry:				
Mining & Quarrying	-	0.251	-	0.092
	-	*(0.039)*	-	*(0.044)*
Construction	-	0.051	-	0.131
	-	*(0.035)*	-	*(0.040)*
Wholesale and Retail Trade	-	0.025	-	0.163
	-	*(0.037)*	-	*(0.041)*
Finance, Insur. & Real Estate	-	0.203	-	0.052
	-	*(0.139)*	-	*(0.080)*
Transport & Telecommunications	-	0.059	-	0.146
	-	*(0.036)*	-	*(0.040)*
Manufacturing-Food, Textile,	-	0.017	-	0.092
	-	*(0.028)*	-	*(0.033)*
Manufacturing-Machinery	-	-0.005	-	0.066
	-	*(0.030)*	-	*(0.037)*
Public Admin., Education & Health			-	0.060
	-	*(0.035)*	-	*(0.038)*
Not known	-	-0.062	-	0.204
	-	*(0.079)*	-	*(0.115)*
Constant	7.704	7.620	8.060	7.916
	(0.050)	*(0.055)*	*(0.063)*	*(0.071)*
adj.R^2	***0.069***	***0.118***	***0.162***	***0.190***
nobs	***1955***	***1951***	***1639***	***1627***

Base = people working outside Prague, whose earnings are net of tax and child benefits, and who work in agriculture.

Table A.4
Cross-sectional Earnings Functions, 1989 and 1996
(Education by levels)

	1989		1996	
	(1)	**(2)**	**(1)**	**(2)**
Apprentice (2 years)	0.0701	0.0635	0.1128	0.0939
	(0.052)	*(0.051)*	*(0.058)*	*(0.057)*
Apprentice (3 years)	0.0923	0.0773	0.1434	0.1122
	(0.038)	*(0.037)*	*(0.049)*	*(0.049)*
Vocational H.S.	0.1374	0.1265	0.3228	0.2943
	(0.040)	*(0.040)*	*(0.050)*	*(0.050)*
Academic H.S.	0.1525	0.1346	0.3822	0.3508
	(0.080)	*(0.081)*	*(0.102)*	*(0.107)*
University	0.2793	0.2826	0.5515	0.5439
	(0.044)	*(0.045)*	*(0.058)*	*(0.059)*
Experience	0.022	0.021	0.024	0.024
	(0.003)	*(0.003)*	*(0.005)*	*(0.005)*
Experience^2	-0.00047	-0.00045	-0.00050	-0.00051
	(0.0001)	*(0.0001)*	*(0.0001)*	*(0.0001)*
Prague	-	0.009	-	0.102
	-	*(0.027)*	-	(0.032)
Child benefits included	-	0.065	-	0.076
	-	*(0.021)*	-	*(0.026)*
Gross earnings	-	0.125	-	0.080
	-	*(0.020)*	-	*(0.021)*
Sector:				
Mining & Quarrying	-	0.250	-	0.095
	-	*(0.039)*	-	*(0.043)*
Construction	-	0.053	-	0.145
	-	*(0.035)*	-	*(0.040)*
Wholesale and Retail Trade	-	0.020	-	0.150
	-	*(0.036)*	-	*(0.040)*
Finance, Insur. & Real Estate	-	0.210	-	0.024
	-	*(0.131)*	-	*(0.076)*
Transport & Telecommunications	-	0.057	-	0.149
	-	*(0.036)*	-	*(0.039)*
Manufacturing-Food, Textile,	-	0.018	-	0.092
	-	*(0.028)*	-	*(0.032)*
Manufacturing-Machinery	-	-0.010	-	0.066
	-	*(0.030)*	-	*(0.036)*
Public Admin., Education & Health	-	0.012	-	0.034
	-	*(0.035)*	-	*(0.038)*
Not known	-	-0.064	-	0.180
	-	*(0.082)*	-	*(0.111)*
Constant	7.910	7.847	8.516	8.404
	(0.043)	*(0.046)*	*(0.054)*	*(0.059)*
adj.R^2	***0.070***	***0.120***	***0.181***	***0.210***
nobs	***1955***	***1951***	***1639***	***1627***

Base = Jr. H.S. graduates working outside Prague in agriculture, whose earnings net of tax and child benefits.

Table A.5
Cross-sectional Earnings Functions, 1989 and 1996
(Education by Levels and Field of Study)

	1989	1996
Apprenticeship Fields of study:		
Machine control	0.123	0.084
	(0.053)	*(0.062)*
Manuf. Machinery and Metalurgy	0.113	0.139
	(0.040)	*(0.051)*
Electrotechnics, transport, telecom.	0.076	0.122
	(0.045)	*(0.056)*
Chemistry, Food processing	0.122	0.031
	(0.068)	*(0.085)*
Textile, Clothing	-0.056	-0.194
	(0.071)	*(0.133)*
Wood, Shoes manufacturing	0.071	0.073
	(0.056)	*(0.061)*
Construction	0.054	0.154
	(0.046)	*(0.060)*
Agriculture, Forestry	-0.040	-0.007
	(0.053)	*(0.064)*
Trade, Services	0.007	0.161
	(0.067)	*(0.071)*
Other	0.093	0.163
	(0.061)	*(0.067)*
Academic High School	0.138	0.352
	(0.081)	*(0.106)*
Fields within vocational high school:		
Natural sciences	0.185	0.745
	(0.127)	*(0.303)*
Manufacturing-Machinery	0.120	0.289
	(0.045)	*(0.052)*
Electrotechnics	0.120	0.361
	(0.052)	*(0.058)*
Construction	0.138	0.309
	(0.077)	*(0.079)*
Other technical branches	0.238	0.265
	(0.070)	*(0.073)*
Agriculture	0.011	0.163
	(0.065)	*(0.063)*

Table A.6
Earnings Regressions with Time Varying Cofficients for Communism and Transition
(Education in Years)

Period	Communism	Transition
Education	0.017	0.022
	(0.010)	*(0.007)*
Education*t	-0.000029	0.000779
	(0.00006)	*(0.00017)*
Experience	0.024	0.028
	(0.005)	*(0.005)*
Experience*t	0.000062	0.000140
	(0.00004)	*(0.00012)*
$Experience^2$	-0.00052	-0.00064
	(0.00016)	*(0.00014)*
$Experience^2$*t	-0.0000004	-0.0000033
	(0.00000)	*(0.00000)*
Prague	-0.126	0.151
	(0.046)	*(0.028)*
Child benefits included	0.228	0.119
	(0.040)	*(0.030)*
Gross Earnings*t	0.133	0.042
	(0.051)	*(0.044)*
Industry:		
Mining & Quarrying	0.276	0.045
	(0.055)	*(0.055)*
Construction	0.134	0.129
	(0.052)	*(0.043)*
Wholesale and Retail Trade	-0.054	0.119
	(0.059)	*(0.045)*
Finance, Insur. & Real Estate	0.116	0.005
	(0.208)	*(0.082)*
Transport & Telecommunications	0.096	0.101
	(0.063)	*(0.055)*
Manufacturing-Food, Textile,	-0.002	0.025
	(0.044)	*(0.041)*
Manufacturing-Machinery	-0.016	0.085
	(0.049)	*(0.048)*
Public Admin., Education & Health	0.094	0.065
	(0.051)	*(0.047)*
Not known	0.064	0.196
	(0.130)	*(0.103)*
Constant	7.930	7.752
	(0.129)	*(0.094)*
adj. R^2	***0.172***	***0.2850***
nobs	***1285***	***2107***

Base = individuals working outside Prague in agriculture, whose earnings are net of tax and child benefits.

Table A.7
Earnings Regressions with Time Varying Cofficients for Communism and Transition
(Education in Levels)

Period	Communism	Transition
Apprentice (2 years)	0.0566	-0.0783
	(0.1007)	*(0.1062)*
Apprentice (2 years)*t	n.a.	0.007
	n.a.	*(0.003)*
Apprentice (3 years)	0.0690	0.0489
	(0.0745)	*(0.0691)*
Apprentice (3 years)*t	0.0000	0.0044
	(0.0004)	*(0.0017)*
Vocational H.S.	0.056	0.051
	(0.082)	*(0.074)*
Vocational H.S.*t	-0.0001	0.0064
	(0.0005)	*(0.002)*
Academic H.S.	0.3378	0.0896
	(0.1783)	*(0.1126)*
Academic H.S.*t	0.0009	0.0028
	(0.0009)	*(0.0028)*
University	0.1789	0.2675
	(0.0888)	*(0.0822)*
University*t	-0.0004	0.0083
	(0.0006)	*(0.0020)*
Experience	0.0244	0.0291
	(0.0054)	*(0.0053)*
Experience*t	0.0001	0.0002
	(0.00004)	*(0.0001)*
$Experience^2$	-0.0006	-0.0006
	(0.0002)	*(0.0001)*
$Experience^2$*t	0.00000	-0.000004
	(0.000002)	*(0.000003)*
Prague	-0.130	0.140
	(0.046)	*(0.028)*
Child benefits included	0.228	0.122
	(0.040)	*(0.029)*
Gross earnings	0.134	0.048
	(0.051)	*(0.044)*
Gross earnings*t	0.000	0.002
	(0.000)	*(0.001)*

Table A.8 Selectivity Bias Correction, 1996 Data

Earnings Function:	
Education	0.05609
	(0.00404)
Experience	0.02075
	(0.00365)
Experience^2	-0.00041
	(0.00009)
Unemployment Rate	-0.06447
	(0.01761)
Prague	0.01481
	(0.04555)
Child benefits included	0.07172
	(0.02756)
Gross earinings	0.00076
	(0.00028)
Industry:	
Mining & Quarrying	0.15295
	(0.04694)
Construction	0.12673
	(0.04251)
Wholesale and Retail Trade	0.14520
	(0.04204)
Finance, Insur. & Real Estate	0.04760
	(0.04261)
Transport & Telecommunications	0.05978
	(0.07874)
Manufacturing-Food, Textile,	0.13913
	(0.04603)
Manufacturing-Machinery	0.08190
	(0.03873)
Public Admin., Education & Health	0.06191
	(0.04311)
Not known	0.13469
	(0.09840)
Constant	8.00367
	(0.06828)
Lnsigma cons	-1.06831
	(0.01727)
Rho	0.61533
Sigma	0.34359
Lamda	0.21142
	(0.04972)

Probit:	
Age	0.58104
	(0.05773)
Age^2	-0.00645
	(0.00061)
Marital status dummy	-0.07363
	(0.42330)
Per capitia HH income net of own income	-0.00053
	(0.00007)
Education in years	0.02883
	(0.08491)
Vacancy rate	7.03700
	(19.70210)
Prague	0.22360
	(0.38912)
Dummy if there is at least one child <15 years	0.94393
of age in the household	(0.41898)
Constant	-7.94086
	(1.66155)
obs.	1670

Table A.7 continued
Earnings Regressions with Time Varying Cofficients for Communism and Transition
(Education in Levels)

Industry:	**Socialism**	**Transition**
Mining & Quarrying	0.272	0.046
	(0.055)	*(0.055)*
Construction	0.132	0.130
	(0.052)	*(0.042)*
Wholesale and Retail Trade	-0.054	0.119
	(0.059)	*(0.044)*
Transport & Telecommunications	0.090	0.095
	(0.063)	*(0.055)*
Manufacturing-Food, Textile,	-0.002	0.025
	(0.044)	*(0.041)*
Manufacturing-Machinery	-0.017	0.087
	(0.049)	*(0.048)*
Public Admin., Education & Health	0.083	0.055
	(0.053)	*(0.047)*
Not known	0.068	0.182
	(0.131)	*(0.099)*
Constant	8.063	7.959
	(0.084)	*(0.078)*
adj.R ^{2}	***0.172***	***0.296***
nobs	***1285***	***2107***

Base = Jr. H.S. graduates working outside Prague in agriculture, whose earnings net of tax and child benefits.

Table A.5 continued
Cross-sectional Earnings Functions, 1989 and 1996
(Education by Levels and Field of Study)

	1989	1996
Health	-0.011	0.084
	(0.118)	*(0.129)*
Business, Trade, Services	0.099	0.280
	(0.068)	*(0.069)*
Law	0.539	0.617
	(0.348)	*(0.119)*
Teaching	0.215	0.223
	(0.172)	*(0.154)*
Other social branches	0.198	0.240
	(0.101)	*(0.198)*
Other	0.210	0.354
	(0.071)	*(0.082)*
Fields within university education:		
Natural sciences	0.135	0.454
	(0.106)	*(0.157)*
Manufacturing-Machinery	0.274	0.571
	(0.074)	*(0.082)*
Electrotechnics	0.300	0.746
	(0.069)	*(0.130)*
Construction	0.275	0.569
	(0.076)	*(0.104)*
Other technical branches	0.488	0.753
	(0.079)	*(0.136)*
Agriculture	0.305	0.496
	(0.077)	*(0.080)*
Health	0.315	0.246
	(0.091)	*(0.166)*
Business, Trade, Services	0.350	0.643
	(0.117)	*(0.144)*
Law	0.394	1.054
	(0.112)	*(0.138)*
Teaching	0.266	0.314
	(0.083)	*(0.091)*
Other social branches	0.129	0.139
	(0.087)	*(0.101)*
Other	-0.007	0.548
	(0.129)	*(0.088)*

Table A.5 continued
Cross-sectional Earnings Functions, 1989 and 1996
(Education by Levels and Field of Study)

	1989	**1996**
Experience	0.021	0.025
	(0.003)	*(0.0049)*
Experience^2	-(0.00044)	-(0.00052)
	(0.00006)	*(0.0001)*
Prague	0.008	0.108
	(0.028)	*(0.031)*
Child Benefits	0.063	0.081
	(0.021)	*(0.026)*
Gross Earnings	0.130	0.085
	(0.020)	*(0.021)*
Industry:		
Mining & Quarrying	0.214	0.046
	(0.040)	*(0.045)*
Construction	0.027	0.086
	(0.039)	*(0.045)*
Wholesale and Retail Trade	-0.005	0.098
	(0.037)	*(0.041)*
Finance, Insur. & Real Estate	0.167	-0.014
	(0.132)	*(0.077)*
Transport & Telecommunications	0.019	0.097
	(0.037)	*(0.042)*
Manufacturing-Food, Textile,	-0.021	0.046
	(0.029)	*(0.034)*
Manufacturing-Machinery	-0.051	0.013
	(0.033)	*(0.039)*
Public Admin., Education & Health	-0.015	0.017
	(0.038)	*(0.041)*
Not known	-0.089	0.135
	(0.082)	*(0.112)*
Constant term	7.877	8.431
	(0.046)	*(0.060)*
adj.R ^{2}	***0.129***	***0.240***
nobs	***1951***	***1627***

Base = Jr. H.S. graduates working outside Prague in agriculture, whose earnings net of tax and child benefits.

Table A.1 continued
Means and Standard Deviation of Variables in Cross-Sectional Data

	1989		1996	
	mean	st.dev.	mean	st.dev.
Other technical branches	0.010	(0.101)	0.008	(0.089)
Agriculture	0.013	(0.115)	0.012	(0.107)
Health	0.008	(0.087)	0.008	(0.089)
Business, Trade, Services	0.012	(0.110)	0.009	(0.096)
Law	0.006	(0.078)	0.005	(0.070)
Teaching	0.016	(0.125)	0.015	(0.123)
Other social branches	0.005	(0.068)	0.004	(0.061)
Other	0.006	(0.078)	0.006	(0.078)
Other variables				
Prague	0.106	(0.307)	0.116	(0.320)
Child benefits included	0.197	(0.398)	0.110	(0.313)
Gross earnings reported	0.247	(0.431)	0.226	(0.418)
Industry:				
Mining & Quarrying	0.088	(0.283)	0.074	(0.261)
Construction	0.116	(0.320)	0.122	(0.327)
Wholesale, Retail,	0.099	(0.299)	0.138	(0.345)
Broad public	0.127	(0.333)	0.136	(0.343)
Finance, Insurance, Renting & Real Estate	0.005	(0.068)	0.015	(0.121)
Transport, Telecommunications	0.082	(0.274)	0.082	(0.274)
Manufacturing-Food, Textile,	0.241	(0.428)	0.252	(0.434)
Manufacturing-Machinery	0.118	(0.323)	0.112	(0.315)
Households + Exteritorial + Not known	0.010	(0.101)	0.009	(0.096)
Firm Size				
1-25 employees			0.211	(0.408)
101-500 employees			0.238	(0.426)
>500 employees			0.256	(0.437)
Not known			0.037	(0.190)
Ownership				
Privatised			0.272	(0.445)
Public Administration			0.135	(0.341)
Private established			0.371	(0.483)
Cooperatives			0.037	(0.190)
Other & not known			0.083	(0.276)
Employment status				
Employer			0.025	(0.157)
Self-employed			0.067	(0.250)
HH Helper + Not known			0.008	(0.089)
Log of district level enemployment rate			0.035	(0.021)
No. of Obs.	1951		1627	