DISCUSSION PAPER SERIES

No. 4215

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LABOUR ECONOMICS and TRANSITION ECONOMICS

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ISSN 0265-8003

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Nauro F Campos, University of Newcastle and CEPR
Dean Jolliffe, William Davidson Institute, University of Michigan

Discussion Paper No. 4215
February 2004

Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

CEPR Discussion Paper No. 4215

February 2004

ABSTRACT

After, Before and During: Returns to Education in Hungary (1986-1998)*

How valuable are the skills acquired under socialism in a market economy? This Paper throws light on this question using unique data covering the years before and during transition (1986-98) for about 3 million Hungarian wage earners. We find that returns to a year of schooling increased by 75% from 6.4% in 1986 to 11.2% in 1998. We also find that the private sector rewards formal education more than the public and, in terms of gender, although in 1986 women had greater returns to schooling than men, by 1998 this difference had been eliminated.

JEL Classification: I20, J20, J24, J31, O15, O52 and P20
Keywords: human capital, Hungary and transition economics

Nauro F Campos
Department of Economics
University of Newcastle
Newcastle-upon-Tyne
NE1 7RU
United Kingdom
Tel: (44 191) 222 6861
Fax: (44 191) 222 6548
Email: n.f.campos@ncl.ac.uk

Dean Jolliffe
William Davidson Institute
Research Fellow
2013 New Hampshire Ave NW #416
Washington, DC 20009
USA
Tel: (1 202) 694 5430
Email: jolliffe@alumni.princeton.edu

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*The authors are grateful to Tim Barmby, Peter Dolton, Štepán Jurajda, two anonymous referees and seminar participants at the University of Newcastle and the World Bank for valuable comments on previous versions. We also thank János Köllo, Gábor Kézdi, Gábor Kõrösi and György Lázar (National Labor Center) for invaluable help with the data, and Dana Žlábková and Ján Plánovský for excellent research assistance. This work benefited in part from financial support from the Phare ACE Grant 97-8085. The usual disclaimer applies.

Submitted 18 November 2003

1. Introduction

This paper estimates returns to years of schooling and types of education before and during the transition from centrally planned to market economy. One objective of the socialist experiment was to provide an egalitarian distribution of income and this goal was pursued by compressing the wage structure deliberately. Returns to education were set centrally and low. One hypothesis is, thus, that the liberalisation of labour markets would result in increased wage dispersion through increasing returns to education. A competing hypothesis is based on the notion that skills acquired under socialism were excessively specialised and useful only for out-dated technology. Out-dated skills would not be rewarded in a market economy and returns to education would decline during the transition. The primary objective of this paper is to investigate which of these two different paths did rates of return to education follow during the transition to a market economy.[1]

The empirical literature investigating these issues in transition economies is very large. Typically, returns to one year of education are estimated to be around 7 percent after the fall of socialism and studies with data for more than one year find that returns to education normally increase during the transition from plan to market.[2] Despite being a large body of literature, only a very small number of studies present results for pre- and post- 1989. The availability of data is the binding constraint as, for example, Labour Force Surveys in transition economies tend to start only after 1991. Data collected before 1989 exist in large quantities, but one of their shortcomings is that most variables need to be re-coded. For this paper, primary data was meticulously re-coded to standard international classifications to

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[1] The emphasis on returns to education can be justified on several grounds. Education is an important policy variable over which governments exert considerable control. Further, schooling is the component of human capital that has received most attention from economists (Card, 1999) and estimates of those rates abound for developed, developing and transition countries at various points in time using rather similar (that is, comparable) estimation methodologies.

[2] See Svejnar (1999), Boeri and Terrell (2002) and Campos and Jolliffe (2002) for reviews of this literature. Psacharopoulos (1994) summarizes this body of research for non-transition countries: returns to education usually range from about 6-7 percent for high-income countries to about 11-12 percent for low-income countries.

allow us to investigate changes in returns before and during the transition from plan to market.

This paper estimates returns to education over a 13-year period between 1986 and 1998 for a transition country that has received surprising little attention in the literature: Hungary. Hungary shows, among all transition economies, the highest score in the EBRD index of market-supporting institutions for 2001 (EBRD, 2002, p. 9). Although among transition economies Hungary stands out for its gradualist approach to reform, it is in many ways representative of the economies chosen for the "first wave" of future members of the European Union. The size of the Hungarian population is between that of Poland and Estonia, and almost identical to that of the Czech Republic. It also has a per capita GDP higher than those of Poland and Estonia, but lower than the Czech and Slovenian figures. Labour market developments also place Hungary far from the more aggressive Estonian laissez-faire and equally far from the more guarded Slovenian approach.[3]

Do we observe a decline or an increase in the rates of return to education during the transition from plan to market in Hungary? We find that returns to a year of schooling increased by 75 percent from 6.4 percent in 1986 to 11.2 percent in 1998, and that returns to experience decline early in the transition but show no overall trend. We also find that the private sector rewards formal education more than the public and, in terms of gender, our results shows that in 1986 women had greater returns to schooling than men, but by 1998 this difference in returns was eliminated and men had slightly higher returns to schooling.

The paper is organised as follows. The next section describes the data and methodology. Section 3 presents our estimates of returns to education in Hungary between 1986 and 1998. Section 4 concludes.

[3] It should be stressed that although Hungary is somewhat representative after the fall of the socialist system (1989), that does not seem the case for the years before 1989. Among others, Flemming and Micklewright (1999) argue that labour market liberalization proceeded at a faster pace in Hungary than in most socialist economies during the 1980s.

2. Data and methodology

The data used in our analysis come from the Wage and Earnings Survey (WES) of the National Labor Center in Hungary, and it contains information on wages, education, type of employment, and other demographic data. Considerable effort was spent in assuring that variables are coded consistently over time. This was carried out with assistance from the National Labor Center and the Hungarian Central Statistical Office and involved substantial recoding of the data on industrial sector, legal form (ownership) and occupation.[4]

We use data from the five years of 1986, 1989, 1992, 1995, and 1998 to cover the communism and transition periods. The sample sizes range from a low of 136,829 in 1992 to a high of 933,282 wage earners in 1989. The sample sizes for the three other years are all above 450,000 observations resulting in a pool of more than 2.9 million wage earners.

2.1 Sample design

For all five years the samples are stratified on the characteristic of whether the wage earner is designated as a manual or non-manual labourer ("blue-" and "white-collar" workers). The sampling units are wage earners and these are selected following a systematic, random selection procedure. The details of the procedures varied across the years in ways that affect the sample weights, but across all years the design is random and the estimates are representative of the sample frame.[5] The sample frame for the years 1986, 1989, and 1992 includes all wage earners in private and public firms with more than 20 employees. The frame was supplemented in 1995 and 1998 to include all wage earners in firms with ten or more employees.

With the exception of the supplementation to the sample frame in 1995 and 1998, the

[4] For details on how consistent definitions of industry, ownership, and occupation codes were obtained for the thirteen-year time frame of our analysis, see Campos and Žlábková (2001).
[5] For more details on the sample design, see Campos and Jolliffe (2002).

sample design is a stratified, single-stage, systematic random draw.[6] The relevant issue is that the comparison across time suffers the slight problem that the frame changed for the last two years, 1995 and 1998. For the years 1986, 1989, and 1992, estimates are representative of all wage labourers who work in firms that have at least 20 employees. For the years 1995 and 1998, the estimates are representative of all wage labourers who work in firms that have at least 10 employees. If it were the case that firms with 10 to 20 employees reward education in a way that is systematically different from firms with 20 or more employees, then it is possible that observed changes in returns to education over time result in part from changing the sample frame in 1995.

One way to correct for this change in the sample frame is to exclude from our analysis those firms with 10 to 20 employees in years 1995 and 1998. This would result in estimates for all years that are representative of a population of labourers employed in firms with 20 or more employees. The analysis loses some information on small firms, but the gain is that all estimates are based on a similar population. Unfortunately, our data does not identify these firms and we can only restrict our analysis by excluding firms with less than 50 employees from all years. Our preferred results are based on this restricted sample since they are representative of the same population across all years, but this analysis then ignores all small firms. In order to check the robustness of our results to this constraint on firm size, we report them for the full samples across all years as well.

2.2 The empirical specification

Wage equations are estimated using a standard Mincer equation, taking the form:

$$\ln(w_i) = \beta_1 S_i + \beta_2 E_i + \beta_3 E_i^2 + \boldsymbol{\beta_4 X_i} + \varepsilon_i \qquad (1)$$

[6] For more details on the properties of a stratified sample see Chapter 3 of Kish (1965) or Chapter 5 of Cochran (1977). For more details on single-stage, systematic random sampling, see Chapter 4 of Kish or Chapter 8 of Cochran. The supplementation to the sample frame in 1995 and 1998 was carried out in two stages. In the first stage, 20 percent of these small firms (10 to 20 employees) were selected and then in the second stage all wage earners in these firms were selected into the sample.

where the i subscript denotes the individual, w is wages, S is years of schooling,[7] E is potential experience, and **X** contains a set of variables to control for institutional and demographic characteristics as well as spatial price differences. Each of these variables is described in more detail below.

The monthly value of wages used in our analysis is the sum of the official base wage received and other payments that the employee receives monthly (rewards given in the reference month, provisions, overtime work, shift work, other special payments, e.g. in mining). In addition, the value of wages includes a pro-rated estimate of irregular payments (1/12 of irregular payments in the previous year).

As a means of assessing the quality of the WES wage data used in this paper, Table 1 compares the monthly value of wages as measured by the WES and data from the International Labour Organization (ILO, 2001) and the Hungarian Central Statistical Office. Standard errors are only available for the WES data, so it is not possible to estimate p-values for the test of whether the differences in means are significant. From examining the ratio of the difference to the standard error for the WES data, though, it appears that the differences in mean values are likely to be statistically significant for all years. Due to the large sample sizes however, even qualitatively small differences in the mean values will be statistically significantly different. It is perhaps more useful to note that for all years except 1989, the difference between the two estimates for mean wages is less than (or equal to) one percent of the mean wage. This suggests that the WES wage data is very similar to the other available estimates of wages for Hungary, and we assert, of reasonable quality.

[Insert Table 1 about here]

Two measures of schooling are examined in this paper. The first measure is a vector of six dummy variables that denote the highest type of completed schooling. The school types

[7] In some specifications S will be a vector of dummy variables representing graduation from different school types, such as primary, secondary, or university.

include primary, three types of secondary (vocational, technical, and gymnasium or general), college, and university.[8] In 1998, 22 percent of wage earners had only primary schooling or less, while 19 percent had college or university education. Of the remaining 59 percent who completed some form of secondary schooling, slightly less than half of these wage earners attended vocational school (28 percent of the total). It should also be noted that over the period of time under consideration, it is the enrolment rates at university and other forms of higher education that have increased the most (UNICEF, 1999).

The second measure of schooling is an estimate of years of school attainment, which is created by converting the data on highest school type completed into years of schooling. The average value of this variable increased from 9.7 in 1986 to 11.3 in 1998.[9] This measure of school attainment is also used to construct a measure of potential experience, which is the wage earner's age less six years and less years of schooling.

The variables designated by **X** include a set of eight dummy variables to control for potential differences across industries.[10] The set of controls also includes dummy variables for the size of the firm. For the sample restricted to only those firms with 50 or more employees, the specification includes a dummy variable for those firms with more than 300 employees. For the full sample, an additional dummy variable is included in the regression that marks those firms with less than 50 employees. To control for the large differences in wages across gender, **X** includes a dummy variable for males.

In addition to the controls for industry, size of firm, and gender; **X** contains a dummy for each of the 19 counties of Hungary and for the capital, Budapest. These spatial-specific, binary variables control for any variation that is specific to Budapest or some particular county. In particular, these dummy variables control for spatial variation in prices, which are

[8] The omitted category is those individuals with less than primary schooling.
[9] The difference between these two means is statistically significant with a p-value of less than 0.0001.
[10] The eight classifications are: industry, construction, transportation and telecommunications, trade, water, services, health and social services, and public services. The excluded classification is agriculture.

likely to be significant with wages and prices in Budapest higher than other regions. The county dummy variables will also control for region specific differences in labour markets, which are also potentially important given that unemployment rates are relatively lower in Budapest, the counties along the Budapest–Vienna highway, and the counties along the Hungarian–Austrian border. Similarly, the county dummies will control for the potential measurement issue that a year of schooling may result in different levels of human capital accumulation over different regions if there are differences in schooling quality across regions.

The controls for firm size and industry, as well the county fixed effects, greatly reduce the potential for omitted variable bias in our estimation of equation (1). Having data that has been collected using the same survey instrument over the years of 1986 to 1998 also significantly improves the credibility of measured changes. Frequently, comparisons over time come from different data sources and one is left with the question of whether the change over time is a consequence of actual changes in the population, or is simply the result of changing the survey instrument.[11] These are important advantages to using the WES data.

One disadvantage of using the WES data is that the choice of variables is limited in that the data contain no credible instruments for schooling (ie. there are no variables that are correlated with schooling that are also reasonably excluded from the wage equation). For this reason, we are unable to control for endogeneity bias when estimating equation (1). Another caveat is that the WES data contain no information on those who are not wage earners, and we therefore do not attempt to control for sample-selection bias.[12] One should keep these two potential sources of bias in mind when interpreting the results. A somewhat mitigating factor is that our analysis is focused on how returns have changed over the pre- and transition years.

[11] For more discussion of this issue, see Jolliffe (2001).
[12] Evidence of the likelihood of sample selection bias presents itself in the form of the changing demographic structure of the sample. In particular, over time the sample has a greater proportion of wage earners with college or university education.

If the magnitude of these potential biases has not changed over time, then their impact on drawing inferences about change over time is limited.

3. Estimation results

The results from Panel A of Table 2 show that the returns to a year of schooling increased by 75 percent from a return of 6.4 percent in 1986 to 11.2 percent in 1998.[13] This dramatic increase in returns to schooling is particularly remarkable given that the average level of schooling has also increased over this time period.

Recall that Panel A restricts our analysis to those firms with 50 or more employees. While this restriction corrects for the change made to the sample frame in 1995, it comes with the disadvantages that a portion of the sample has been dropped, and our analysis excludes wage earners working in smaller firms. By examining the full sample in Panel B of Table 2, it becomes clear that the restriction on the sample does not affect the qualitative nature of the results.

Panel B shows that the return to schooling for wage earners from firms with 20 or more employees increased from 6.2 percent in 1986 to 11.2 percent for wage earners from firms with 10 or more employees in 1998. While there are small differences across the panels from year to year, the overall change from 1986 to 1998 is almost identical over the two panels. For the remainder of the analysis, only those estimates based on the samples of wage earners from firms with 50 or more employees are presented, but the results for the sample of all wage earners continue to be qualitatively very similar.

[Insert Table 2 about here]

As discussed above, there are (at least) two competing hypotheses about the returns to education during transition. One assertion is that the skills acquired from schooling under

[13] This increase in returns is statistically significant.

communism are not well suited for the market economy, and one would expect to see a temporary decline in returns to schooling during transition. Once school curricula adjusted to the changes, one would then expect to see increasing returns. A competing hypothesis is that socialism undervalued education (at least vis-à-vis low income inequality), and one would expect to see immediate increases in returns during transition. The results from Table 2 strongly support the second hypothesis.

It is also important to notice that the rates of return to education reported in Table 2 are rather high in Hungary for the years before the fall of socialism[14] and also that our estimates increased dramatically between 1986 and 1989. These two results are in line with the Flemming and Micklewright (1999) argument that labour market reform proceeded at a faster pace in Hungary than in most socialist economies during the 1980s as a whole.

The decision to model schooling linearly and without interaction terms allows for easier interpretation of the results but is a restrictive assumption. It is frequently asserted that the ability to adjust to the changes brought on by transition vary by age or experience. In order to explore this concern, we relax the restrictions imposed in equation (1) and estimate a model with schooling and experience interacted. To aid in interpreting the results, we write this model as:

$$\ln(w_i)=\delta_1 S_i+\delta_2 E_i+\delta_3 E_i^2+\delta_4 S_i E_i+\delta_5 S_i E_i^2+\delta_6 X_i+\varepsilon_i \qquad (2)$$

where the variables are the same as in equation (1) and the notation for the parameters has changed to stress that this is a different model. The change in log wages from a small change in schooling is then given by:

$$\partial \ln(w)/\partial S=\delta_1+\delta_4 E_i+\delta_5 E_i^2 \qquad (3)$$

[14] These estimates are almost twice as large as those provided, for instance, by Filer et al. (1999) for the Czech and Slovak Republics and by Orazem and Vodopivec (1997) for Slovenia.

which makes it clear that the return to schooling now varies depending on the level of experience. Differentiation of equation (3) by experience shows how the return changes with changes to experience:

$$\partial[\partial \ln(w)/\partial S]/\partial E = \delta_4 + 2\delta_5 E_i \qquad (4)$$

We estimate values for equation (4) using the point estimates reported in table 3 and examining experience at 22 years (which is approximately its average value between 1986 and 1998). In 1986, the value of this partial derivative was –0.17 indicating that returns to schooling declined with more experience. By 1992, this term fell to –0.30 suggesting that the increase in returns to schooling most benefited the youngest wage earners with the least amount of experience. Somewhat surprisingly though, by 1998, this partial derivative was –0.16, essentially returning to its pre-transition level.

[Insert Table 3 about here]

Table 4 compares the change over time of the returns to school years by two important breakdowns. In Panel A, returns are separately estimated for wage earners in private and public firms.[15] The code identifying the legal status of firms is first available for 1992. By 1998, returns were clearly greater in private firms. This result potentially indicates a growing competitiveness of private firms in rewarding more highly skilled workers.

[Insert Table 4 about here]

Panel B examines returns by gender and shows that in 1986 women had significantly (both statistically and qualitatively) greater returns to schooling than men, but by 1998 this difference in returns was eliminated and men had slightly higher returns to schooling. This result is perhaps not so surprising given that in 1986 average female wages were equal to 74 percent of average male wages. Given that returns in Tables 2 – 4 are estimated in percentages of wages, an equivalent change in the level of returns would mean a higher percentage change

in returns for the lower base wage. By 1998 the ratio of female to male wages increased to 86 percent, and by this time the gender gap between (percentage) returns to schooling was eliminated.

By assigning years of schooling to persons who have attended different types of schooling, an implicit assumption is being imposed that a year of vocational schooling, for example, is the same as a year of general secondary schooling. This assumption simplifies interpretation of the results and helps to clearly demonstrate that returns to schooling have been increasing, but it may mask some important information in terms of what types of schooling are being more heavily rewarded in the labour market.

There are several potential explanations for the varying returns to types of schools during transition. One explanation is that different types of school produce different skill sets and these skills may be more or less well suited to the needs of the new market economy. Another related explanation is that the government traditionally steered students into certain types of schools and this planned aspect of the economy no longer provided the correct mix of skills.

Both of these explanations are based on the idea that the changing market environment produced changes in the market value of certain skills. Prior to transition, wage setting was used to favour certain industries and certain types of labour. To this end, labour that had been trained in technical and vocational schools and was involved in the production of physical capital tended to be more highly valued, while labour that had been more academically trained and less likely working in the physical production of goods was less highly valued. Presumably the market economy rewards the value added by labour and is indifferent as to whether the added value is in terms of some physical commodity or, for example, in terms of some service.

[15] Note that in the WES data we use in this paper, public firms include state-owned enterprises, public services as well as public administration.

Figure 1 plots the returns from each of the six school types (ranging from primary to university) rather than years of schooling, and each line is labelled with the percentage change in returns between 1986 and 1998. The estimates are those based on the consistent sample of wage earners in firms with 50 or more employees.[16] One result to note is that the returns to vocational and primary schooling (identified by a dashed line) were virtually unchanged between 1986 and 1998. This result is striking given the dramatic increase in the return to a year of schooling over this time period. Another interesting result is that the largest percentage change in returns is for those wage earners who completed secondary general education. Their returns to schooling increased by 60 percent between 1986 and 1998. The next largest change in returns to schooling is a 48 percent increase for those who completed university.

The result that the returns to general secondary schooling increased the most during transition is consistent with the belief that the planned economy under-valued (relative to the market economy) labour used in the production of non-physical goods and services. It also suggests that human capital resulting from general education is valuable in terms of adjusting to a changing environment, which adds to the discussion of the relative benefits of general education versus training in specific skills. One indication that students are responding to the changing structure of returns by school type is that the share of students in general education increased from 24 percent in 1990 to 28 percent by 1997 (Fretwell and Wheeler, 2001).

Figure 1 also reveals an interesting difference in the pattern of change in returns to school type. During the early years of transition, rates of return to general education (university, college, and secondary) all began to increase while the returns to secondary technical continued to fall. A candidate explanation for this difference is that general

[16] Results for the full samples are available from the authors upon request and are similar in that the percentage change to secondary general education is the greatest of the period from 1986 to 1998. When using the full sample, the rate of change for each school type follows the similar patterns.

education provides people with the skills to more quickly adapt during times of change (Schultz, 1975) and the value of training in specific skills (or the training at technical schools) is more dependent on market fluctuations. When the specific skills are well targeted to the demands of the market, then returns are high, but when market conditions change, there will be a lag before the curricula can adjust to provide the correct mix of skills.

[Insert Figure 1 about here]

4. Conclusions

The objective of this paper is to measure the direction and intensity of changes in the way the labour market rewards formal education in a context close to a laboratory situation, namely, that of the transition from centrally planned to market based economy. We noted two possible paths. On the one hand, if skills acquired under socialism turn out to be of little value in a market environment, then this would translate into a decline of the returns to schooling as the market mechanism takes root (that is, as transition progresses). On the other hand, a if the skills acquired under socialism turn out to be valuable in a market economy that will, of course, be expressed in an increase of the returns to schooling during transition.

This paper uses data for about 2.9 million wage earners from 1986 to 1998 in Hungary to support the following five main conclusions:

(1) returns to a year of schooling increased by 75 percent from 6.4 percent in 1986 to 11.2 percent in 1998;

(2) primary and vocational education show the smallest, and general secondary education and university show the largest changes in returns from 1986 to 1998;

(3) early in transition, more experienced workers appear to have benefited less from the increase in schooling returns, but this effect dissipated by 1998;

(4) returns to education become higher for private sector workers late in the transition (only in 1998); and

(5) while in 1986 women had greater returns to schooling than men, by 1998 this difference was eliminated.

Our core result is that returns to schooling are large throughout the Hungarian transition, at around 10 percent and above since 1992. These returns are also larger than those available for other transition economies and are in line with returns to education in middle-income developing countries. We believe our estimates are more precise than others from the transition literature for at least three reasons: (a) our data was collected using the same survey instrument over the years of 1986 to 1998, covering pre- as well as transition years; (b) our data was painstakingly re-coded to current standard international classifications to minimize errors in comparisons over time; and (c) we favoured an econometric approach that is attentive to the limitations of the data and of the sampling procedures.

We argue that the 75 percent increase in returns to a year of schooling between 1986 and 1998 is evidence that the planned economy under-valued education and that economic liberalization allowed the markets to correct this. By examining returns by type of schooling rather than an aggregated measure of years of schooling, we shed further light on whether the type of schooling received in pre-transition Hungary proved to be appropriate for the liberalized, post-1989 market. The common assumption is that socialist economies under-valued and under-supplied general education. Our analysis supports this view. We note that after 1989, an increasing proportion of students have been choosing to attend general school over vocational and technical schooling. In spite of this increasing supply of students in general schooling, the estimated returns to university and secondary general education increased at a faster rate than returns to vocational and technical training between 1986 and 1998. The empirical evidence in this paper supports the belief that the liberalized economy has responded to market forces and is providing large returns for human capital investments.

The evidence also suggests that wage earners are responding to the changes in the market and making better investment choices.

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Table 1: Comparison of Wage Estimates from WES and ILO Data

	1986	1989	1992	1995	1998
Mean Wage, ILO [a]	6,260	10,461	22,294	39,854	68,718
Mean Wage, WES [b]	6,312	9,761	22,466	40,190	69,415
Standard Error of Mean Wages, WES	4	8	41	77	162
Difference in Wages, ILO-WES	52	-700	172	336	697
Difference/Standard Error	13.9	-86.0	4.2	4.4	4.3
Difference as a percent of ILO Mean	0.8%	-6.7%	0.8%	0.8%	1.0%

[a] LABORSTA data, International Labour Organization (ILO) and the Hungarian Central Statistics Office.
[b] Wage and Employment Survey (WES), National Labor Center, Hungary.

Notes: Wages are monthly figures in nominal Forint (HUF). ILO data on mean wages for 1986 and 1989 are based on ISIC (revision 2) codes 2-9, and the WES estimates are restricted to these same industry codes.

Table 2: Returns to Years of Schooling, 1986-1998
Estimation of Equation (1)

Panel A: Firms with 50 or more employees	**1986**	**1989**	**1992**	**1995**	**1998**
Years of Schooling	0.064	0.085	0.100	0.112	0.112
	(0.0003)	(0.0002)	(0.0007)	(0.0002)	(0.0002)
Dummy: Male=1	0.247	0.255	0.157	0.112	0.106
	(0.0016)	(0.0013)	(0.0040)	(0.0014)	(0.0016)
Potential Experience	0.034	0.032	0.031	0.035	0.033
	(0.0002)	(0.0002)	(0.0006)	(0.0002)	(0.0002)
Experience Squared / 100	-0.047	-0.044	-0.038	-0.044	-0.039
	(0.0005)	(0.0004)	(0.0015)	(0.0005)	(0.0006)
Firm Size: 300+ Employees	-0.008	-0.005	-0.019	-0.054	-0.061
	(0.0033)	(0.0013)	(0.0050)	(0.0012)	(0.0013)
Observations:	149,274	383,720	48,261	371,882	334,207
R-squared:	0.52	0.50	0.45	0.52	0.50
Panel B: All Firms					
Years of Schooling	0.062	0.074	0.095	0.109	0.112
	(0.0001)	(0.0002)	(0.0004)	(0.0002)	(0.0002)
Dummy: Male=1	0.267	0.286	0.175	0.123	0.118
	(0.0007)	(0.0009)	(0.0023)	(0.0012)	(0.0013)
Potential Experience	0.032	0.024	0.031	0.032	0.030
	(0.0001)	(0.0001)	(0.0004)	(0.0002)	(0.0002)
Experience Squared / 100	-0.044	-0.034	-0.038	-0.040	-0.035
	(0.0002)	(0.0003)	(0.0009)	(0.0004)	(0.0005)
Firm Size: 20-50 Employees	0.046	0.014	0.082	0.059	0.144
	(0.0009)	(0.0010)	(0.0026)	(0.0014)	(0.0016)
Firm Size: 300+ Employees	-0.003[a]	-0.013	-0.016	-0.054	-0.071
	(0.0030)	(0.0013)	(0.0050)	(0.0012)	(0.0013)
Observations:	831,407	933,282	136,829	529,928	487,160
R-squared:	0.48	0.39	0.43	0.52	0.50

[a] The only statistically insignificant point estimate—Panel B, 1986, Firm Size: 300+ Employees.

Notes: Dependent variable is the log of monthly wages. Standard errors, in parentheses, are robust to heteroscedasticity of unknown form. The eight industry dummy variables are jointly significant and are excluded from the table. County fixed effects are also jointly significant. All listed point estimates are significant with a p-value of less than 0.01 except for two: The 1986 dummy variable for firm size greater than 300 employees has a p-value of 0.013 in Panel A and 0.28 in Panel B.

Table 3: School-Experience Interaction Effects, 1986-1998
Estimation of Equation (2)

Firms with 50 or more employees	**1986**	**1989**	**1992**	**1995**	**1998**
Years of Schooling	0.039	0.056	0.061	0.064	0.075
	(0.0008)	(0.0007)	(0.0025)	(0.0008)	(0.0010)
Potential Experience	0.009	-0.003	-0.012	-0.016	-0.004
	(0.0008)	(0.0008)	(0.0027)	(0.0010)	(0.0011)
Experience Squared / 100	-0.356	2.555	4.289	4.394	1.577
	(0.1611)	(0.1559)	(0.5404)	(0.1982)	(0.2241)
School interacted with Experience	0.002	0.003	0.004	0.004	0.003
	(0.0001)	(0.0001)	(0.0002)	(0.0001)	(0.0001)
School interacted with Experience Squared /100	-0.387	-0.642	-0.689	-0.686	-0.374
	(0.0160)	(0.0141)	(0.0482)	(0.0168)	(0.0184)
Observations:	149,274	383,720	48,261	371,882	334,207
R-squared:	0.52	0.50	0.45	0.53	0.51

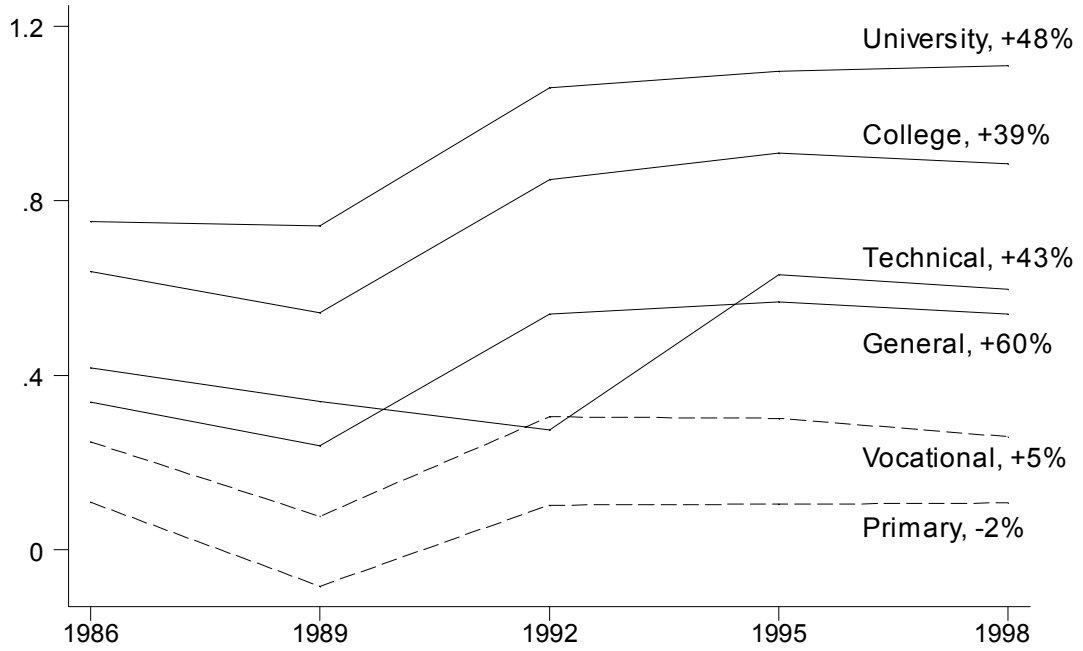
Notes: Dependent variable is the log of monthly wages. Sample consists of wage earners from firms with 50 or more employees. Standard errors, in parentheses, are robust to heteroscedasticity of unknown form. All listed point estimates are significant with a p-value of less than 0.01 except for the 1986 return to experience squared which has a p-value of 0.03.

Table 4: Comparing Private-Public, Male-Female, Estimation of Equation (1)

	1986	1989	1992	1995	1998
Panel A: Returns by Legal Status					
Private Firms	NA	NA	0.096	0.112	0.135
			(0.0006)	(0.0007)	(0.0008)
Public Firms	NA	NA	0.095	0.110	0.109
			(0.0006)	(0.0002)	(0.0002)
Difference (Private-Public)			*0.001* [a]	*0.001*	*0.026*
R^2 (Private / Public)			0.38 / 0.57	0.39 / 0.57	0.43 / 0.57
Panel B: Returns by Gender					
Male Wage Earners	0.060	0.074	0.093	0.104	0.116
	(0.0002)	(0.0003)	(0.0007)	(0.0003)	(0.0004)
Female Wage Earners	0.066	0.075	0.096	0.112	0.109
	(0.0002)	(0.0002)	(0.0006)	(0.0002)	(0.0002)
Difference (Male-Female)	*-0.006*	*-0.002*	*-0.003*	*-0.007*	*0.007*
R^2 (Male / Female)	0.39 / 0.43	0.27 / 0.38	0.38 / 0.43	0.46 / 0.52	0.45 / 0.49

[a] The only statistically insignificant point estimate—Panel A, 1992, Private-Public Difference in returns.

Notes: Dependent variable is the log of monthly wages. Sample consists of wage earners from firms with 50 or more employees. Standard errors, in parentheses, are robust to heteroscedasticity of unknown form. The remaining results from estimation of equation (1) are suppressed for the sake of brevity. All point estimates for the experience and gender variables are statistically significant. The firm-size and industry dummies are jointly significant as well as the county fixed effects. All listed parameters are statistically significant with a p-value less than 0.01 except for one: The 1992 difference between returns private and public firms is not statistically significant. NA indicates that data identifying public and private firms was not available in 1986 and 1989 rounds of the WES.



Note: Vertical axis measures the log wage premium in nominal Forint. Lines plotting returns, or wage premiums, are labelled for each school type and list the percent change from 1986 to 1998.

Figure 1: Returns to School Types, 1986-1998