IN FOCUS

WAGES: NEW DEVELOPMENTS

Edited by
PÉTER GALASI
GÁBOR KÉZDI

INTRODUCTION

PÉTER GALASI & GÁBOR KÉZDI

In the 2002 volume of The Hungarian Labour Market, part I of the "In Focus" section focused on how wages evolved during the post-communist transformation of Hungary. In the initial years of the transition, real wages dropped slightly when compared to other former socialist countries during the "transformational recession", while unit labour costs increased under the influence of a combination of factors. In the second half of the 1990's both real earnings and wage costs dropped significantly. The resulting rise in profits helped to pave the way for re-launching economic growth, which triggered a climb in real wages. Another definitive development of the transformation decade was a steady widening of inequalities in earnings, extremely rapid by international comparison. The gap grew particularly large within industries – between groups with different education levels and between different types of companies.

The 2002 study argues that company level decisions and bargaining gained the dominant role in setting wages. The shape of relative earnings increasingly reflected differences in companies' ability to pay and in the bargaining positions of workers. One decade after the collapse of the socialist system, the Hungarian labour market looks like a well-functioning labour market, in which earnings are related primarily to productivity. From the perspective of the labour market transition is thus over. That of course does not mean the emergence of a frictionless competitive labour market. Some of the problems have their origins deep in the past, like increased regional inequalities or the size of public sector employment. At the same time, new developments and policies produce additional problems that create a more complex labour market picture. The significant rise in the minimum wage and the wages of public sector employees, and the extraordinary expansion of higher education all might have their effect on wages.

Five years after the first In Focus section on the same topic, we take another close look at Hungarian wages. Some studies in the present section analyze how new developments and policies affect wages. Other studies examine whether transition-related trends continued into the 2000's. And yet other studies address questions that were not previously analyzed.

The first study by *Hedvig Horváth, Péter Hudomiet* and *Gábor Kézdi* looks at the role of in-kind benefits in total labour income in Hungary. These benefits include car and cellular phone usage, representation expenses, meals-, clothing- and transport subsidies, etc. The literature has paid less attention to these issues so far in Hungary, in part because of the lack of adequate data. In this study the authors use earnings and in-kind benefits data from a detailed (albeit relatively small) household survey, the Monitor survey of Tárki. They find that both the likelihood of receiving benefits and the amount received is strongly positively related to earnings, which implies that firms do not use benefits for compensating lower earnings but rather treat them as part of total remuneration. As a consequence, inequality in terms of total labour income is larger than in terms of earnings. The results also imply that conclusions drawn from standard earnings regressions hold for the more broadly defined labour income. An important exception is that returns to education are greater if measured in broader income terms than in earnings.

In the second study, *Gábor Kőrösi* analyzes the factors determining inter-firm differences in average wage rates, with an emphasis on firm-level wage dynamics. The study identifies the main determinants shaping inter-firm wage differences in Hungary over the past decade. It also shows the factors that did not seem to play a significant role in spite of their importance in the international literature. The overall picture emerging from the estimates shows that rent sharing (i.e. the split of productivity gains between employers and employees) is present in all Hungarian firms, although the extent varies considerably across industries. Rent sharing is influenced not only by differences in technology but also the market environment that firms face. In the early years of the post-communist transition the degree of rent sharing was significantly higher than in market economies, and has decreased considerably since. The high degree of rent sharing may seem paradoxical at first sight as it is usually accompanied by strong labour unions. Hungarian unions are, on the other hand, relatively weak. It is therefore likely that some transition-specific factors played an important role in the early years.

The third study, by *Álmos Telegdy*, analyzes the wage differences between the public and private sectors during the period of 2000–2004, in the middle of which the wages of public employees were raised significantly and as a result their average wage increased by 36 percent in real value. Consequently, the average wage in the public sector surpassed that of the business sector by 18 percent. Wage differences by education and occupation are significant. The

highest relative wage throughout the period is related to the least educated employees and to the ones who occupy positions requiring unskilled labour. Employees graduated from college or university have the lowest relative wages (–25 percent in 2004). However, after controlling for other observable factors (age and gender being the most important), wages in the public sector in 2004 are found to be higher in virtually all education or occupation categories than in the business sector. The only category for which this is not true is college and university graduates, but the difference here is a mere 3.7 percent. According to these findings the government has not only levelled the wages in the public and business sectors but also pays a wage premium to the majority of its employees. That most likely has major consequences for the whole of the Hungarian labour market.

The fourth study, written by *Péter András Szabó*, looks at whether, and how, regional earnings differences have changed since the turn of the century. Data suggest that regional earnings and labour cost differentials are moderate between 1998 and 2004. The wage gain of the poorest region compared to the most developed part of the country does not exceed 6 per cent by the end of the period. All these results show that labour cost differentials do not play a dominant role in a firms' migration decisions, since a moderate wage gain might not provide enough incentive for a firm to relocate. In the depressed regions, however, the recruiting and screening costs are lower due to the (relatively) abundant labour supply. Thus the less developed regions may have other characteristics that foster formation of companies to a greater extent than the slight gain in earnings (*Köllő* 2003). Hence rural development policy should not concentrate only on "raw" differentials in earnings and labour costs but also on factors that affect the regional distribution of earnings, such as education or unemployment.

The fifth study, written by *Gábor Kertesi* and *János Köllő*, looks at the labour market value of higher education degrees. The economic transformation following the political transition brought about a spectacular increase in returns to higher education. It also brought about a rapid growth of the supply of graduates. As a result, limits to demand will sooner or later put an end to the upward trend in the rising returns. According to conventional wisdom in Hungary, graduate degrees have already entered a steep decline. The authors contrast that with detailed evidence using the data available before May 2005. They conclude that the earnings advantage – very large by international comparison – in the rapidly rejuvenating professions of the business and clerical-administrative sectors has indeed diminished. Meanwhile, the position of the young graduates in the public sector was significantly improved by the pay-rise in 2002. Despite the following decline, their relative earnings are still higher than in the period before the expansion of the higher education. In summary, higher education degrees can still be considered exceptionally

good investments in Hungary taking into account the current earnings, job prospects and individual costs of education.

Julia Varga, in the sixth study, analyzes the composition and earnings of public school teachers. The level of skills in an economy is crucial for its growth, and teachers in state schools play an important role in the production of skills. Hiring and keeping highly skilled schoolteachers has become very difficult in Hungary in the past twenty years as their relative earnings steadily declined. Using large datasets, the author documents the trends in earnings and (measurable) skill composition between 1992 and 2004, a period that includes the significant raising of the salaries of public employees. Relative wage of schoolteachers declined steadily until 2002, especially compared to young college graduates employed in the private sector. At the same time, the average age in the profession rose significantly. As a result of the general raising of public sector wages in 2002, older teachers' wages have become pretty close to wages of older private sector employees. At the same time, young schoolteachers' wages continue to lag behind considerably. This naturally fed back to the career choice of potential teachers. The results suggest that during the entire period, self-selection has led to a declining average quality of the pool of teachers' college entrants and the pool of entrants to the profession itself.

In the seventh study, *Márton Csillag* examines male-female earnings differences between 1986 and 2002 and relates those to occupational and firm-level gender segregation. His analysis shows that while towards the end of communism gender disparities in occupational composition were a major factor in sustaining gender wage gap, following the transition male and female work, however, becomes less strictly defined and that working in a feminized occupation does not, necessarily, entail a wage penalty. The author argues therefore, that the current gender wage gap in Hungary is not due to occupational exclusion coupled with an undervaluation of female work. It is rather a result of women being paid less than their male counterparts in a given occupation and firm. The available evidence is not enough to tell whether that is due to differences in productivity or discriminatory practices, and so further research is needed on the subject.

The last study, by *Péter Galasi*, takes another look at a hotly debated question in post-transition Hungary: the effect of the expansion of higher education on the employment and wages of young graduates. The author makes use of a unique dataset of fresh graduates in order to analyze their earnings mobility at the turn of the century. Most of them obtained other higher-education degrees, participated in training courses, and accumulated additional labour market experience. Some of them could also ameliorate their position in terms of better job/education matching. The author finds, however, that these developments did not necessarily result in higher wages. An

initial 5-year university diploma implies some wage premium over an initial 4-year college diploma even at the time of the second observation, and the premium remains the same whether college-diploma holders obtain another higher-education degree or not. Moreover, the results show that the wage gain attributable to a second higher-education diploma in addition to an initial university diploma is not higher than the one due to a university diploma with no additional higher-education degree. Some types (and combinations of types) of education (business/economics, law, informatics, technical sciences) produce a wage advantage as compared to one degree in agricultural sciences, but these gains seem to be the same for all combinations of types of education. Language courses and short-term courses in business/economics also result in wage gains. Job/education mismatch in itself does not affect earnings, only transition from one state of mismatch to another (from over-education to under-education and from under-education to over-education) implies lower wages. As regards labour market experience, unemployment negatively influences earnings. It seems that, at least in the short run, additional human-capital accumulation might go hand in hand with earnings losses as well as gains.

1. IN-KIND BENEFITS IN HUNGARY

HEDVIG HORVÁTH, PÉTER HUDOMIET & GÁBOR KÉZDI

This study looks at the role of in-kind benefits in total labour income in Hungary. These benefits include car and cellular phone usage, representation expenses, meals-, clothing- and transport subsidies, etc. The literature has paid less attention to these issues so far in Hungary, in part because of the lack of adequate data. In this study we use earnings and in-kind benefits data from a detailed (albeit relatively small) household survey, the Monitor survey of Tárki.

We raise two closely related questions in this study. The first question considers who receives in-kind benefits in Hungary, why, and of what kind. It is possible that, because of compensating differentials, those who earn more might expect less in-kind benefits. In this case, inequality measured solely by earnings would overestimate total labour income inequality. Compensating differentials may occur if, for exogenous reasons, in-kind benefits are higher in some occupations than in others, and employers use other earnings components (wages, bonuses) to compensate for the differential. Of course, a positive correlation is also possible, i.e. higher wages may coincide with higher in-kind benefits. In this latter case, inequality measured solely by earnings would underestimate total labour income inequality. This latter case may occur if the tax cost of in-kind benefits is smaller. Our results support the second case. Although on average the ratio of in-kind benefits to total labour income is small, there is a significant positive relationship between wages and in-kind benefits. Moreover, determinants of in-kind benefits match the determinants of earnings, indicating that overall, the role of in-kind benefits is very similar to that of other earnings components.

Our second question considers how total labour income is affected by the most commonly used covariates in earnings functions (gender, education, etc.). This question is rather technical and tries to examine whether conclusions drawn from those estimates can be extended to total labour incomes as well. Given our answer to the first question, it is not surprising that we find a strong confirmative answer. The estimated parameters of the standard Mincer type regressions are quite similar in both cases, with the notable exception of

the effect of education. Returns to education on total labour income are even larger than on earnings itself.

In-kind benefits

Since 1998, Tárki Social Research Inc.[1] has collected cross-sectional household surveys called Household Monitor, generally every two years. In 2003, 2335 households were successfully interviewed. The main advantage to us of this survey is that, in addition to the usual measures of wages, bonuses and other monetary premiums,[2] it contains detailed data on other sources of labour income: tips, secondary jobs, and in-kind benefits. The survey was carried out on a relatively small sample, and the data collection is based on self-assessment, which could affect reliability.

Table 1.1 contains simple descriptive statistics on the fraction of recipients of the different types of labour income. As far as in-kind benefits are concerned, the relevant information is given in monetary intervals (under 30,000 HUF, 30,000–60,000 HUF, etc.) For the descriptive statistics, we have simply assigned the midpoint of the category, but for the detailed analysis we shall allow for interval-coding.

Table 1.1: Partaking in the different income components (panel A) and the ratio of them to total income (panel B). Tárki Monitor 2003 (N=1752)

	Tips	Payments on invoice	Secondary jobs	In-kind benefits	Monetary earnings
A. What fraction receives it? (Per cent)					
Top managers	0.0	6.3	13.5	79.7	100.0
Middle managers	7.3	10.9	3.9	81.3	100.0
Junior managers	14.8	2.9	8.8	72.6	100.0
White-collar employees	2.8	9.7	7.5	77.9	100.0
Other white-collar workers	6.2	4.8	2.7	74.6	100.0
Skilled workers	6.4	1.6	1.9	61.4	100.0
Agricultural labourers	0.0	0.0	0.0	57.5	100.0
Semi-, unskilled workers	3.8	1.6	0.8	66.4	100.0
TOTAL:	5.5	3.7	3.1	66.4	100.0
B. What is the average fraction of the income component in total labour income? (Per cent)					
Top managers	0.0	0.4	4.3	4.9	90.3
Middle managers	0.1	5.0	2.1	4.4	88.4
Junior managers	0.9	0.1	3.4	4.4	91.2
White-collar employees	0.0	1.2	1.9	3.5	93.4
Other white-collar workers	1.1	4.9	1.0	4.6	88.4
Skilled workers	0.5	0.3	0.6	2.8	95.8
Agricultural labourers	0.0	0.0	0.0	2.0	98.1
Semi-, unskilled workers	0.7	0.6	0.5	2.4	95.9
Total:	0.5	1.6	1.3	3.5	93.1

1 www.tarki.hu/en
2 Earnings include bonuses and premiums. The exact definition is described below.

The most important message of Table 1.1 is that labour income is more than primary job monetary earnings for most Hungarians. Payment on invoice is most frequent for middle managers, junior managers get the most tips, and a non-negligible fraction of managers and other white-collar employees have second jobs. Two-thirds of Hungarian employees receive some in-kind benefits, the higher qualified the job is the more so. At the same time, based on our estimates from the Tárki Monitor survey, the fraction of these to total labour income seems to be quite small. The total income of blue-collar workers is nearly the same as their monetary earnings. It is possible that data on monetary earnings are more reliable than those other components and systematic underestimation is more pronounced there. As we have only self-reported data, we cannot check this potential bias.

The survey also has data, although without monetary equivalent, on different types of in-kind benefits. Table A1.1 (in the appendix) contains these by employment status. Among them, meal benefit is the most frequent one: 50 to 70 per cent of employees in all jobs receive it. Clothing is less frequent but is also *distributed rather homogenously (10–36 percent), and, excluding agricultural workers, the same is true for the transport benefit (11–25 percent). Car usage is mainly given to white-collar and to some extent to skilled workers.

In what follows, we look at the probability of receiving in-kind benefits in a more systematic way, by estimating probit probability models. For each type of benefit, we run two models. In the first model, we control for log wage, job characteristics and job tenure besides the usual Mincer-type explanatory variables (gender, potential experience, education, ownership of the firm, regional location and type of settlement). We address three questions in these models. (a) Is the (partial) correlation between wages and benefits positive or negative? (b) Are the effects of job characteristics and job tenure significant after controlling for wages? (c) Are the effects of the Mincer type variables significant after controlling for wages? The second type of model features the standard Mincer type variables only. We run those models in order to see whether the estimated effects are similar for different types of in-kind benefits. Table 1.2 shows the estimated effects of the most important variables. The table presents the average partial effects (average effect of different explanatory variables on the independent variables).

There is a significant positive link between wages and the probability of receiving in-kind benefits. The narrower models show that the effects of education on any type of in-kind benefits are always significant, positive, and substantial except for company car usage and transport benefits. Nevertheless, this relationship disappears or almost disappears if we control for wages. The complete models (not reported here) also show that while labour market experience is not significant, the gender effect on benefits is similar to the one on wages: women can expect less of both. These results suggest that in-kind

benefits supplement wages and move along with them. Our results therefore support the second possibility in the introduction: benefits are very much like monetary components of earnings and there is no evidence for compensating differentials.

Table 1.2: Probit models for the probability of receiving different kinds of in-kind benefits. Average partial effects on probabilities. Tárki Monitor 2003

	Company car		Cell phone		Mean benefits		Clothing benefits		Transport benefits	
log(wage)	0.053		(0.030)		0.106		0.113		0.104	
Manager	0.038		0.043		(–0.051)		–0.094		(–0.050)	
Blue-collar	–0.039		–0.044		–0.096		–0.114		(–0.048)	
Job tenure (years spent with firm)	(–0.000)		–0.002		0.004		(0.000)		(0.001)	
Education (years)	(0.003)	0.016	0.010	0.021	(0.004)	0.026	(0.003)	0.023	(–0.001)	0.013
Private firm	0.049	0.048	0.057	0.064	–0.227	–0.259	–0.181	–0.207	–0.083	–0.101
Foreign firm	–0.027	(–0.009)	(–0.005)	(0.007)	0.223	0.250	(–0.052)	(–0.024)	0.067	0.096

Note: Parameters in brackets are not significant at 5 percent.

Other results from the models are also interesting. First, the effect of job status and job tenure do not disappear completely even when we control for wages. This can reflect the nature of within-firm incentives, but it can also mean that, besides measured current wages, these variables can also predict long-term (permanent) wages. In the latter case, these variables are significant after controlling for current wages, but they would not be significant if we could control for permanent wages. Second, firm ownership matters. Our models suggest that domestic private firms give less meal and transport benefits to their employees than either foreign or public firms. It seems therefore that domestic private firms do not make use of the legal possibilities of giving such benefits. Furthermore, we can see that public firms give more clothing benefit and less car and cellular phone usage.

Recall from Table 1.1 that the share of in-kind benefits within total labour income is quite small. Therefore, we have estimated models that examine the amount of benefits together. Our main question is that if somebody gets any kind of benefits, what is their monetary equivalent. In addition, we have also examined the factors that can affect the probability of receiving any kind of benefits. Both questions refer to the benefits together, because the survey does not provide information about the amount of the benefits one by one. For the second question we have used probit models. These models estimate the relationship between the explanatory variables and the probability of receiving any kind of benefits. For the first question we have used ordered probit models, because the survey only provides data on the interval in which the monetary equivalents of the benefits are (0–30,000 HUF; 30,000–60,000 HUF; etc.) This latter method is also called interval regression because it is an ordered probit with known thresholds (see *Wooldridge*, 2002, pp. 508.)

For easier interpretations, we have used the logarithms of the category-margins. In this way the estimated parameters of the interval regressions can be directly interpreted: they show the percentage increase of the value of benefits (conditional on having received any) associated with a one unit change in the independent variable.

Just as in the previous case, we estimated two models for both the probability and the magnitude of benefits. The first one contains the standard Mincer type variables; the second one has the job description and job tenure (years spent with the firm) variables. The most important results are shown in Table 1.3 and the complete output is in Table A1.2 in the appendix. We show here models with education measured by completed school years; results from models with degrees of qualification are very similar.

Table 1.3: Probability of receiving any benefits (probit) and value of the benefits if any (interval regression). Tárki Monitor 2003, Hungary

	Probability of any benefits (average partial effects from probits)		Value of the benefits if any (elasticities from interval regressions)	
	(1)	(2)	(1)	(2)
Log(wage)		0.132		1.021
Manager		(–0.023)		(–0.001)
Blue-collar		–0.117		–0.447
Job tenure (years spent at firm)		0.004		(–0.007)
Women	–0.064	–0.062	(–0.131)	(–0.056)
Education (years)	0.037	(0.010)	0.128	(–0.019)
Private firm	–0.187	–0.149	(–0.019)	(0.036)
Foreign firm	0.195	0.162	(0.010)	(–0.178)

Note: Parameters in brackets are not significant at 5 percent.
For complete output see Table A1.2.

Women are 7 per cent less likely to receive in-kind benefits even if we control for job status, tenure and earnings. Domestic private enterprises are less likely to give in-kind benefits, by 20 per cent (16 per cent in model 2), than state-owned ones or foreign private firms (the latter two are about as likely to give). Model 2 implies that 1 per cent higher earnings are associated with 0.15 per cent more likely benefits. Blue-collar workers receive benefits with a 13 percent smaller probability, and each 2.5 years spent at the company increases the chance of benefits by 1 percentage point.

The value of benefits (if positive) does not correlate with ownership. Education matters more for benefits than for earnings: returns to education here are 13 per cent, compared to 9 per cent in the standard Mincer type regressions (see later) but conditional on earnings, it has no effect on benefits. Conditional on earnings and job characteristics, neither gender, nor education seems to matter. One per cent higher earnings are associated with benefits

higher by the very same 1 percent. Blue-collar workers, however, receive half as much even if they receive any.

These results suggest two important conclusions. First, blue-collar jobs are associated with significantly less likely and smaller benefits, even when we control for earnings and education. Second, earnings and benefits move closely together: benefits are related to the marginal product of work the very same way wages do, as a first approximation (that is to say, except that blue-collar jobs seem to have an extra penalty).

Mincer-type regressions for earnings and total labour income including in-kind benefits

Most studies on Hungarian earnings use the wage-tariff data surveys.[3] The first study using the data was *Kertesi and Köllő* (1997a). In the In Focus chapter of the present volume all studies are based on Wage-tariff surveys except for that of Péter Galasi.

Wage-tariff surveys were carried out in 1986, 1989 and yearly from 1992, they contain data on earnings and basic demographical information. The sample covers all public sector workers and a large representative sample of private sector workers at enterprises, together with some data on the plant and the enterprise. Earnings data contain wages and yearly bonuses and premiums. The remarkable value of the wage-tariff surveys is in their size (hundreds of thousands of employees each year) and the possibility to match them with employers' data (e.g. with balance sheets).

All data in the wage-tariff surveys are provided by the employer. Earnings are thus more precise than those gained from household surveys (*Kézdi*, 1998). At the same time, employer provided data have their drawbacks as well. For one thing, families and households are impossible to link. For another, we have the data from one single employer even if a worker has more jobs (or, to be more precise, each record is about one job, and employers are not possible to identify). In addition, wage-tariff does not have information on in-kind benefits.

Below, we compare the most important results of Mincer type regressions from the 2003 wage tariff survey and the 2003 Tárki Monitor survey.[4] First, for a benchmark comparison, we run standard Mincer-type regressions on earnings using variables that are available in both surveys. Average after tax earnings are about 15 percent lower in the self-reported data, which is very similar to the 20 per cent difference in the wage tariff – household survey comparison measured, for the 1980's, by *Kézdi* (1998). Table 1.4 shows the main results of the basic models that can be estimated from both surveys (for complete results, see Table A1.3 in the appendix).

3 The data-owner of the Wage-tariff surveys is the Employment Office (Foglalkoztatási Hivatal), and IE-HAS provided the yearly harmonized data suitable for analysis. The work was lead by János Köllő and the final harmonized version was put together by Mónika Bálint. Original data files can be analyzed according to the agreement with the Employment Office, while the cleared, harmonized, complete and re-weighted database can be analyzed in accordance with agreements with IE-HAS and the consent of the Employment Office. See more details at www.econ.core.hu

4 In the wage tariff survey, after-tax earnings mean the monthly wage in May, 2003 plus one twelfth of 2002 yearly bonuses and premiums, also after tax. In the Monitor survey, respondents report their average after-tax monthly wage between October 2002 and September 2003 and the after-tax value of bonuses and premiums received during the very same period (the latter we divided by twelve).

Table 1.4: Mincer-type earnings regressions, comparable samples of full-time workers. Wage-tariff 2003 and Tárki Monitor 2003

	Wage-tariff	Monitor	Wage-tariff	Monitor
Women	-0.159	-0.162	-0.176	-0.186
Potential experience	(0.006)	0.021	(0.008)	0.022
(Potential experience)^2/100	(0.002)	-0.039	(-0.003)	-0.041
Education (years)	0.086	0.089		
Vocational degree			0.128	0.148
Secondary degree			0.279	0.35
College or more			0.701	0.718

Notes: Linear regression models; the dependent variable is the logarithm of net monthly wage.
Parameters in brackets are not significant at 5 percent. Robust standard errors.
For complete output see Table A1.3.

The explanatory power of the models are of the usual order, though R-squares for Wage-tariff regressions are systematically lower. All coefficients are very close except for potential labour market experience, which is not significant in Wage-tariff-regressions.

If we change the logarithm of net monthly wages to the logarithm of net hourly wages as the dependent variable of the model, gender difference decreases considerably but still remains significant. The most important result for us, however, is that although the return to experience is different, gender wage difference and the return to education are nearly the same in the two samples. This is remarkable, especially if we take into account how different the circumstances of the two surveys are.[5]

After having established comparability, we can analyze what happens if we run regressions of total labour income on the left-hand side instead of monthly earnings. Full labour income consists of the monthly wage, yearly bonuses and premiums projected to one month, and tips, payment for invoice, income from second jobs, and the monetary value of in-kind benefits (recall that the latter include company car, cellular phone, meal, clothing, transport benefits). Table 1.5 shows the main results.

Returns to experience are the same in the two models, gender differences are a little bit greater (men may count on more benefits) but the difference is not significant. On the other hand, returns to education are significantly larger in terms of total labour income than earnings only. The coefficient on education is about 10 percent higher whether it is measured by completed years or degrees – in the latter case, in addition, the difference is nearly 10 percent in all categories. Table A4 also shows that full labour income is lower at Hungarian private companies than at foreign- or state-owned firms.

The results of Mincer type regressions run on the Monitor database are in line with those of the probit models described in the previous part. They report that if the left-hand-side variable contains all the benefits besides mon-

5 Regional differences, however, differ significantly in the two datasets. One important reason for that may be the fact that while Wage-tariff reports the place of employment Monitor reports the place where the individual lives. Henceforth, because of commuters the two variables might show significant deterioration (e.g. in Pest county). Differences between Hungarian and foreign firms are very much alike (they are a bit lower in Monitor), state- and private-owned differences, however, are much lower in Monitor. Ownership is defined differently in the two surveys, and in a household survey it is likely to be much noisier.

etary earnings, the results are basically the same, except for education, the returns of which are about 10 per cent stronger.

Table 1.5: Net monthly wages and net monthly total incomes. Results of Mincer type regressions. Tárki Monitor, 2003.

	Earnings	Total labour income (incl. benefits)	Earnings	Total labour income (incl. benefits)
Women	–0.162	–0.165	–0.186	–0.193
Potential experience	0.021	0.022	0.022	0.023
(Potential experience)^2/100	–0.039	–0.039	–0.041	–0.041
Education (years)	0.089	0.098		
Vocational degree			0.148	0.161
Secondary degree			0.350	0.385
College or more			0.718	0.796

Notes: Linear regression models; the dependent variables are the logarithms of earnings or total labour income.
Parameters in brackets are not significant at 5 percent. Robust standard errors.
For total output see Table A1.4.

Conclusion

Two questions were raised at the beginning of this chapter. The first asked who receives in-kind benefits in Hungary, why and of what type. We answered the question using the Monitor household survey of Tárki. The most important results are the following. The most frequent in-kind benefit is meals and clothing, though other benefits (e.g. company cars and cellular phones) may also be frequent depending on the type of job. Both the likelihood of receiving benefits and the amount received is strongly positively related to earnings, which implies that inequality in terms of total labour income is larger than in terms of earnings. Benefits are related to the marginal product of labour in the same way wages are, implying that firms do not use benefits for compensating lower earnings but rather treat them as similar parts of total remuneration. However we also found that blue-collar workers receive significantly less benefits than their white-collar colleagues with a similar level of earnings.

The second question was whether conclusions drawn from standard earnings regressions hold for more broadly defined labour income. The results here are in line with the ones seen before. Determinants of broad labour income are very similar to determinants of earnings, with one notable exception: returns to education are ten per cent larger if one looks at broad labour income.

Appendix

Table A1.1: Sharing in the different kinds of in-kind benefits. Tárki Monitor 2003, % (N=1752)

Job-status	Car usage	Mileage benefit	Cellular phone usage	Represen-tation expenses	Meal benefit	Clothing benefit	Transport benefit	Other expenses
Top-managers	38.1	21.6	38.8	10.7	60.9	21.7	12.4	8.4
Middle-managers	11.9	10.0	23.2	1.8	65.9	24.6	11.0	4.8
Junior-managers	6.1	3.5	12.5	0.5	66.1	17.8	16.9	1.5
White-collar employees	3.1	3.8	7.1	0.5	70.5	36.2	24.6	6.5
Other white-collar workers	4.5	5.6	6.3	1.3	64.2	28.5	19.0	3.9
Skilled workers	3.8	3.2	4.7	0.2	52.5	15.0	17.1	1.6
Agricultural labourers	0.0	12.2	3.5	0.0	63.0	10.0	0.0	0.0
Semi-, unskilled workers	0.0	0.1	1.3	0.0	53.3	13.3	14.0	2.0
Total:	3.9	3.7	6.3	0.6	58.4	19.9	16.9	2.9

Table A1.2: Models for the probabilities of getting any kinds of benefit and of their amount. Tárki Monitor 2003

	Is any kind of benefit received? (average partial effect on probabilities)				If received, then what is their monetary equivalent (elasticity)			
log(wage)		0.147		0.153		1.021		1.014
Manager		(–0.027)		(–0.026)		(0.001)		(0.015)
Blue-collar		–0.129		–0.145		–0.447		–0.345
Job tenure (Years spent at firm)		0.004		0.004		(–0.007)		(–0.007)
Women	–0.071	–0.069	–0.077	–0.065	(–0.131)	(–0.056)	–0.185	(–0.042)
Potential experience	(0.004)	(–0.002)	(0.004)	(–0.003)	(0.017)	(0.001)	(0.014)	(–0.002)
(Potential experience)^2/100	(0.003)	(0.012)	(0.003)	(0.014)	(–0.040)	(–0.006)	(–0.032)	(0.002)
Years spent in school	0.042	(0.011)			0.128	(–0.019)		
Vocational training school			0.099	(0.059)			(0.239)	(0.061)
Secondary school			0.171	(0.038)			0.850	(0.233)
Higher education			0.262	(0.070)			1.065	(0.018)
Central Hungary	–0.195	–0.241	–0.196	–0.243	0.883	0.577	0.840	0.579
Central Transdanubia	0.172	0.141	0.172	0.138	0.779	0.560	0.751	0.562
Western Transdanubia	0.225	0.198	0.226	0.197	0.558	0.413	0.534	0.416
Southern Transdanubia	(0.008)	(–0.017)	(0.006)	(–0.018)	0.577	0.409	0.544	0.410
Northern Hungary	(–0.003)	(–0.025)	(–0.004)	(–0.026)	0.477	0.419	0.485	0.432
Northern Great-Plain	0.086	(0.055)	0.086	(0.055)	0.470	0.381	0.464	0.390
City	(–0.050)	(–0.053)	(–0.050)	(–0.052)	–0.482	–0.502	–0.509	–0.511
County centre	–0.186	–0.204	–0.187	–0.199	–0.473	–0.561	–0.505	–0.573
Budapest	0.138	0.118	0.140	0.119	–0.756	–0.848	–0.782	–0.860
Private firm	–0.201	–0.163	–0.199	–0.165	(–0.019)	(0.036)	(0.006)	(0.031)
Foreign firm	0.207	0.174	0.206	0.174	(0.010)	(–0.178)	(–0.007)	(–0.181)
Constant					1.408	–7.604	2.423	–7.915
Observations	1652	1626	1652	1626	1135	1128	1135	1128

Notes: Column 2–5: probit models, average partial effects. Column 6–9: parameters of ordered probit models with known category-bounds (interval regressions).
Parameters in brackets are not significant at 5 percent.

Table A1.3: Models for the net monthly wages of full-time workers, and for net hourly wages. Wage-tariff 2003 and Tárki Monitor 2003

	Wage-tariff	Monitor	Wage-tariff	Monitor	Wage-tariff	Monitor	Wage-tariff	Monitor
	Net monthly wages, full-time workers				Net hourly wages			
Women	–0.159	–0.162	–0.176	–0.186	–0.099	–0.110	–0.115	–0.136
Potential experience	(0.006)	0.021	(0.008)	0.022	(0.012)	0.018	0.014	0.019
(Potential experience)^2/100	(0.002)	–0.039	(–0.003)	–0.041	(–0.009)	–0.031	(–0.014)	–0.035
Years spent in school	0.086	0.089			0.092	0.099		
Vocational training school			0.128	0.148			0.141	0.153
Secondary school			0.279	0.350			0.293	0.344
Higher education			0.701	0.718			0.755	0.802
Central Hungary	(0.065)	0.244	(0.065)	0.241	(0.022)	0.190	(0.019)	0.187
Central Transdanubia	(0.09)	0.165	(0.094)	0.164	(0.05)	0.141	(0.051)	0.142
Western Transdanubia	(0.048)	0.131	(0.051)	0.133	(0.096)	0.114	(0.097)	0.118
Southern Transdanubia	(0.021)	0.090	(0.023)	0.086	(–0.016)	0.109	(–0.016)	0.106
Northern Hungary	(–0.048)	(0.039)	(–0.045)	(0.037)	(–0.087)	(0.054)	(–0.087)	(0.052)
Northern Great-Plain	–0.085	0.090	–0.087	0.091	–0.123	0.091	–0.127	0.092
City	0.135	(0.077)	(0.123)	(0.067)	0.168	(0.069)	0.157	(0.066)
County centre	0.08	0.072	0.072	0.066	0.063	(0.016)	0.055	(0.013)
Budapest	(0.037)	(0.008)	(0.035)	(0.005)	(0.077)	(–0.017)	(0.076)	(–0.017)
Private firm	–0.195	–0.079	–0.194	–0.068	–0.189	–0.122	–0.19	–0.107
Foreign firm	0.221	0.200	0.222	0.189	0.173	0.213	0.172	0.201
Constant	10.088	9.823	10.839	10.599	6.301	4.650	7.109	5.518
Observations	121272	1417	121272	1417	129756	1512	129756	1512
R-squared	0.32	0.44	0.33	0.45	0.27	0.40	0.28	0.42

Notes: Linear regression models; the dependent variables are the logarithms of the different types of income. Parameters in brackets are not significant at 5 percent. Robust standard errors.

Table A1.4: Net monthly wages and net monthly total incomes. Results of Mincer-type regressions. Tárki Monitor, 2003

	Net monthly wages, full-time workers				Net hourly wages			
	Monetary earnings	Total income	Monetary earnings	Total income	Monetary earnings	Total income	Monetary earnings	Total income
Women	–0.162	–0.165	–0.186	–0.193	–0.110	–0.113	–0.136	–0.141
Potential experience	0.021	0.022	0.022	0.023	0.018	0.018	0.019	0.019
(Potential experience)2/100	–0.039	–0.039	–0.041	–0.041	–0.031	–0.030	–0.035	–0.034
Years spent in school	0.089	0.098			0.099	0.108		
Vocational training school			0.148	0.161			0.153	0.167
Secondary school			0.350	0.385			0.344	0.378
Higher education			0.718	0.796			0.802	0.879
Central Hungary	0.244	0.242	0.241	0.239	0.190	0.191	0.187	0.187
Central Transdanubia	0.165	0.207	0.164	0.206	0.141	0.178	0.142	0.179
Western Transdanubia	0.131	0.140	0.133	0.142	0.114	0.123	0.118	0.128
Southern Transdanubia	0.090	0.113	0.086	0.109	0.109	0.130	0.106	0.126
Northern Hungary	(0.039)	(0.040)	(0.037)	(0.037)	(0.054)	(0.054)	(0.052)	(0.052)
Northern Great-Plain	0.090	0.093	0.091	0.093	0.091	0.094	0.092	0.095
City	(0.077)	(0.079)	(0.067)	(0.068)	(0.069)	(0.071)	(0.066)	(0.066)
County centre	0.072	(0.041)	0.066	(0.033)	(0.016)	(–0.013)	(0.013)	(–0.017)
Budapest	(0.008)	(–0.001)	(0.005)	(–0.004)	(–0.017)	(–0.026)	(–0.017)	(–0.026)
Private firm	–0.079	–0.076	–0.068	–0.063	–0.122	–0.114	–0.107	–0.098
Foreign firm	0.200	0.209	0.189	0.197	0.213	0.224	0.201	0.212
Constant	9.823	9.757	10.599	10.613	4.650	4.579	5.518	5.527
Observations	1417	1417	1417	1417	1512	1512	1512	1512
R-squared	0.44	0.44	0.45	0.45	0.40	0.41	0.42	0.42

Notes: Linear regression models; the dependent variables are the logarithms of the different types of income. Parameters in brackets are not significant at 5 percent. Robust standard errors.

2. DYNAMICS OF INTER-FIRM WAGE DIFFERENTIALS

GÁBOR KŐRÖSI

Wage dynamics is an obviously important issue both for the employer and the employee. Until now the employee side was emphasized: wage differentials among Hungarian individuals and groups of employees have been extensively studied. This chapter analyses the factors determining inter-firm differences in average wage rates.

Firms react to changes in the corporate environment, and they adjust their behaviour to the new circumstances. A company simultaneously decides on several factors such as changes in the technology, production level, employment and wages, although the implementation of these decisions may have different time horizons. For example, wage rates usually change at predetermined dates, conditional on agreement with trade unions or the company work council. Nevertheless, wage dynamics is inherently linked to other developments at the firm and in its competitive environment.

Company level wage decisions typically concern the average wage and the level of dispersion around it. Thus it is inherently different from a Mincerian human capital model explaining wage differentials among individual employees. The human capital model measures how individual skills are valued in the labour market, relative to a reference group. Obviously, the two levels change consistently: for example, company level average wage may change when the employment structure changes at the firm. Corporate wage decisions influence average wage without shifts in employment structure.

Wage dynamics are analysed from a large panel of annual corporate financial accounts, covering the period between 1992 and 2003.[6] The dataset contains 2356 observations for 1992. The sample size increases year by year, and by 2003 it covered 20076 firms. Sampling probability increases by firm size; thus, 65–77 percent of corporate employment is covered by the sample in each year. Coverage exceeds 80 percent in manufacturing employment in all years, but is more than 60 percent in other sectors, too.[7]

There is a substantial inter-firm dispersion of mean annual wages (per person). An important part of this dispersion shows up as regional wage differences. For example, the mean per capita wage of the corporate sector was

6 The dataset also contains observations from previous years. Those are used for lagged values and as instrumental variables.

7 *Kőrösi* (2005) provides detailed information on the characteristics of the sample.

more than twice as high in Budapest than in Bács-Kiskun county: 1936 vs. 943[8] (wages + premiums). The prominence of Budapest is best reflected by the fact that even the highest county average (1309, Fejér) was below the national average wage (1315) in the corporate sector.

Other classifications show similarly substantial differences in wages at groups of firms. Ownership seems to strongly influence wages: domestic private firms paid 1134, state-owned enterprises 1782, while foreign owned companies 2082 on average. Compared to these differences, sectoral dispersion is much smaller, at least if we look at a high level of the classification. When looking at differences in sectoral wage levels, concentration seems to be the most important factor: the mean wage is much higher in sectors with a very small number of firms. For example, the average wage at the five firms of the *Extraction of crude petroleum and natural gas* (NACE 11) sector was 3184, while the 20 firms of the *Insurance* (NACE 66) sector paid 5436 on average. This suggests that sectoral concentration influences wage determination.

Most of these differences in average wages persisted over time, and they seem to tell an interesting story on their own. Still, we are interested in the dynamic process of corporate wage determination, in the importance of the factors driving the substantial dispersion in wage setting, and in the possible temporal changes in corporate wage policies, rather than in the above raw figures. Several alternative theoretical explanations were suggested in the literature for explaining differences in corporate wage setting. We embedded the driving factors of the alternative theories into a uniform wage model, also allowing for the interactions of various terms.

Literature survey

The *wage curve* hypothesis of *Blanchflower and Oswald* (1994) offers a plausible explanation for the regional dispersion of average wages. They suggest that differences in regional unemployment rates strongly influence wage setting in the corporate sector. *Köllő* showed in the 2002 volume of the *Hungarian Labour Market* the fast growing role of local unemployment in wage setting in the early 1990's. Regional unemployment exerted an increasingly negative effect on wages in the competitive sectors.

Nickell and Wadhani (1990), in a seminal paper on British corporate wage determination, developed a dynamic adjustment model, where firms share the yields of productivity gains with their employees. This *rent sharing* is conditional on the financial position of the firm, as well as outside factors, *e.g.,* the unemployment rate. Thus, the efficiency of corporate activities becomes one important factor in the bargaining process between the management and the employees. Following the *Nickell and Wadhani* (1990) model, many empirical studies analysed the importance of insider power in corporate wage determination. One major explanatory factor of inter-firm wage dispersion is

8 All figures are annual wages, including premia, in HUF 1000 in 2003.

productivity. Trade unions usually can successfully refer to productivity gains at wage negotiations, and management typically is ready to share the yield of efficiency gains with employees.

Nickell et al. (1994) extended the previous model, incorporating the effect of variables describing the intensity of product market competition and market position of the firm into the wage equation. They demonstrated that the favourable market position was also subject to a similar bargaining, and market power had a positive impact on wages in Britain. This positive impact also depended on firm size: trade unions were stronger at large firms, and thus, they had a stronger bargaining power against the management.[9] Dominant firms were less likely to use unemployment pressure for limiting wage growth, thus making the *wage curve* effect conditional on firm size.

A well-known and robust result of Hungarian labour market studies is that the ownership of the employer plays an important role in wage differentials at employee level, and that cannot be attributed to standard explanatory variables of the human capital model. *Kertesi and Köllő* (1997) and (2001) or *Köllő* (2002) also showed that ownership structure changed the effect of other factors determining individual wages: while wages were strongly influenced by *firm size* at foreign-owned companies, productivity differences were more important at domestic firms. Foreign-owned companies paid relatively larger wage premium in low-wage sectors; thus, sectoral wages are less dispersed at foreign-owned employers than at domestic ones. They attributed a substantial part of ownership related sectoral wage differences to this relative advantage of low-wage sectors.

Ownership-related differences were also observed in some other economies. *Dobbelaere* (2001) showed that foreign-owned firms paid higher wages in Bulgaria, but those wages were independent of the efficiency, thus, they did not share rents with their employees. Wages at state-owned enterprises, however, were strongly linked to productivity.[10]

This analysis differs from previous Hungarian wage studies in an important aspect: we look at wage dispersion at the firm, rather than at the employee level. The disadvantage of analysing average company wages is that assuming homogeneous labour we lose the human capital component of wage setting. However, due to the constraints of the available data, that is necessary for analysing the dynamic adjustment process of wage setting, as we cannot identify individuals over time in our sample. The most important deficiency of the human capital based wage models is that they are static, thus unable to handle the adjustment process. One major feature of transition economies is that agents have to cope with much larger shocks than in mature market economies, thus adjustment to changed circumstances is essential.

Several empirical papers, written on corporate wage setting in transition economies, used the above-formulated assumptions. Polish wage determina-

9 Several alternative mechanisms have been suggested for explaining why firm size (*e.g.,* measured by the number of employees) may have a positive influence on corporate wages, *c.f., Bayard and Troske* (1999).

10 Foreign-owned firms seem to have different wage setting strategies in different transitional economies. *Damijan and Kostevc* (2002) analysed whether foreign investment had a positive effect on wage catch-up in transition economies. Their main result was heterogeneity: while they found a strong positive impact for Bulgaria and Hungary, the relationship was reversed in Estonia and Romania, and FDI had no significant effect on wages in Slovenia.

tion was especially extensively analysed. *Grosfeld and Nivet* (1997) and (1999) estimated wage equations for the period 1990–4, using a Polish corporate dataset.[11] They found productivity as the main driving variable of inter-firm wage differentials. Sharing productivity rents varied with ownership structure, and was strongly asymmetric: while productivity losses had no impact on wage setting, productivity gains significantly increased wages.

Christev and Fitzroy (2002) extended the above analysis of Polish wage determination to the period 1994–7, using a similar panel dataset. They paid special attention to the consequences of the privatisation process. Following the logic of the rent-sharing model, they analysed the wage effect of changes in productivity. Their results largely confirmed the previous findings, but they also found a significant wage effect of declining productivity in this later period, although rent-sharing remained asymmetric. However, the rent-sharing rules were different at fully privatised companies and at firms still having substantial state ownership.

Mickiewicz et al. (2005) further extended the scope of analysis. They used data from the period 1998–2001, but the more important extension is substantial: they tested several alternative hypotheses on the wage setting behaviour of Polish enterprises. They refined the analysis of the ownership structure: they not only distinguished majority private or state ownership, but also differentiated private ownership, whether the firm was privatised or *de novo* private enterprise. They also incorporated labour market conditions (*e.g.,* regional unemployment or employment rates) into the model, which had an atypically strong effect on corporate wage setting behaviour, even in the short-run. These coefficients were way higher than any comparable effect estimated for mature market economies. Corporate efficiency had a relatively smaller effect on wages than outside labour market conditions. Private firms were especially unwilling to share the rents from productivity gains with their employees, and that was true for both privatised and *de novo* firms. Except for this minor difference, ownership did not seem to have a measurable effect on corporate wage determination after taking labour market conditions into account. It may thus happen that the previously observed strong ownership effect (*Grosfeld and Nivet* [1997] and [1999], and *Christev and Fitzroy* [2002]) was due to the omission of these labour market conditions. It appears that the probability of *private investment* was strongly influenced by the labour market conditions, and as variables describing external conditions were omitted, ownership variables proxied their effect. The contradicting results of a simpler model in *Bedi and Cieslik* (2002) also suggest the endogeneity of the ownership structure. They interpreted their results supporting efficiency wage hypothesis, but their much stronger rent-sharing most probably is biased by the oversimplified model specification. However, all Polish studies found a strong, sometimes extremely intensive rent sharing. Furthermore

11 All Polish wage studies used very similar corporate datasets, based on financial reports of companies listed at the Warsaw Stock Exchange. This is a highly and very specially selected sample: most firms are large, and all firms started market oriented reorganisation, including at least partial privatisation prior to stock exchange listing. Even though some of these firms initially were in majority state ownership that never meant full state control: these firms already had some important private owners. Thus, this sample is far from being representative of the population of Polish firms, and empirical evidence derived from this information may be subject to strong selection bias.

an important lesson from the Polish empirical work is that corporate wage setting behaviour changed rapidly and substantially over time as transition progressed.

Hypotheses on Hungarian wage determination

The model specification, used for analysing the determinants of inter-firm wage differentials, is based on the surveyed theoretical and empirical literature. The model explains the average real wage (incl. all premia) at the firm with a dynamic adjustment model. Such a dynamic model gives a more realistic description of corporate behaviour: the firm, taking into account developments in the circumstances, re-optimises its activity level, and decides on the necessary changes, thus adjusting its behaviour, including wage setting, to the new situation. We assume that this adjustment cannot be immediate on the labour market: rigidities of labour market regulation, the cost of adjustment, and the institutional framework of inside bargaining jointly hinder the adjustment to the equilibrium wage (which is the marginal product of employed labour).

The first assumption of the model is that the company may share the rent of productivity gains (*Nickell and Wadhani,* 1990).[12] This rent sharing may be influenced by the size of the firm, which is measured by the number of employees (*Bayard and Troske,* 1999). External product and labour market conditions may also influence rent sharing: strong competitive pressure may limit the willingness, indeed the ability of the firm for any bargain, while dominant position may make the firm more pliable[13] (*Nickell et al.,* 1994). Firms in a favourable position on foreign markets, with high export commitments,[14] may react to wage demands with larger flexibility (*Abowd and Lemieux,* 1993). Ownership structure may also impact the wage policy of the firm. Substantial local unemployment may limit the bargaining power of employees, forcing them to accept lower wages (*Blanchflower and Oswald,* 1994). All these factors may interact with each other. For example, in the initial model specification ownership, firm size, market position, or competitive pressure may influence rent sharing, or, indeed, the effect of any other factor. Obviously, the initial specification incorporated factors without real measurable impact on the wage dynamics. Irrelevant factors, interactions were eliminated using standard statistical hypothesis testing. This statistical analysis was used for identifying the most important factors determining wage setting in Hungarian firms.

As output, employment and wage decisions are the consequences of the same optimization process at the firm, wage, employment, output, exports, productivity, and all related variables (for example, market share, or various interactions) were treated as endogenous variables. Differenced lagged vari-

12 Rent sharing may be consistent with efficiency wages: the company may want to attract better (*i.e.,* more productive) labour by paying higher wages. In this case the higher wage may only reflect the market return of the higher human capital of the new employees, which may be the precondition for (further) productivity improvements. Thus, the positive wage effect of productivity growth may just be the consequence of the heterogeneity of labour. This means that productivity must be treated endogeneously even if we disregard the simultaneous nature of corporate decisions.

13 Competitive pressure was measured by two proxies: the market share of the firm within its four digit sector, and market concentration, also within four digit sectors.

14 Foreign exposure is measured by the share of export revenues within total output.

ables and sectoral indicators (related to the detailed sectoral classification) were used as instruments during the GMM estimation.

I also tested the homogeneity of corporate labour market behaviour with respect to differences over ownership, region, sector, size and time.[15] I regularly found significant structural breaks according to sector and time, while wage setting almost always proved to be homogeneous with respect to the other factors. Thus, despite the fact that the statistical analysis was based on a panel dataset, I had to estimate annual sectoral wage equations, *i.e.,* the same model was re-estimated for all sectors and for all years in the sample. The final model specification included the explanatory variables that proved to be significant in at least some of the estimated equations.[16]

Results

The first important result is that the wage setting behaviour of Hungarian firms was homogeneous with respect to the ownership structure and size, unlike in some other transition economies, *e.g.,* in Bulgaria or Poland. That is also an important difference to previous Hungarian results, which were based on an augmented human capital model, using individual employee data. Ownership did influence the returns to human capital, but apparently these effects offset each other, thus they are not discernible at the company level. It is not surprising that corporate wage setting behaviour changed over time: transition is the period of substantial behavioural adjustment. The general picture is that behavioural differences in wage determination in any year are related to the major technological differences, represented by the main sectoral classification.[17] It is interesting to note that sectoral differences in the raw wage data were much smaller than those related to ownership or region, still, the real behavioural differences are related to sector.

The empirical model specification was usually acceptable for the different annual sectoral models, except that they included many insignificant coefficients. The initial model specification consisted of 45 coefficients. Not surprisingly, the estimates were strongly influenced by multicollinearity among the variables: while most coefficients were individually and jointly insignificant, the joint omission of all insignificant explanatory variables substantially changed some of the remaining coefficients. Thus, the final specification still included some coefficients, which were insignificant, but their omission would have changed the results. Also, explanatory variables, which proved to be significant in some cases, were kept in the model estimated for all subsamples, thus ensuring the comparability of the empirical models.

Lagged variables, especially the lagged wage, were essential explanatory factors of the regression models. That indicates the importance of the dynamic adjustment process. Adjustment to the changed conditions was almost immediate in the "golden age" of very rapid growth in the period 1996–2000.

15 Obviously, when testing for a structural break, some corresponding variables had to be omitted. For example, when testing ownership, the ownership related variables were excluded from the model.

16 Occasionally, there were also significant coefficients for the included variables in some estimated equations. As we estimated the same model over various samples (sectoral estimates for each year separately), it is no surprise that some coefficient estimates seemed to be significant. If we use 0.05 significance level, we expect that one in twenty coefficient estimates will seem to be different from 0 even if the true value is exactly 0. Thus, rarely significant explanatory variables were ignored.

17 Sectoral wage negotiations are almost unknown in the Hungarian competitive sector, thus that cannot explain the sectoral heterogeneity of wage setting.

In this period the wage model could be simplified to a differenced equation, where wage changes are a function of changes in productivity and other variables. Adjustment was hindered by the larger and less predictable shocks before 1996 and after 2000, but was still much faster than in developed market economies. (*C.f., Surányi and Kőrösi,* 2003.)

Usually, productivity is the single most important explanatory variable of wage determination. The short-run coefficient is almost always significantly positive. The long-run elasticity is frequently uncertain. Its large standard error is mostly due to the rapid adjustment: in most cases it is the change of productivity rather than its level, which drives the development of inter-firm wage differentials. The short-run productivity coefficient is large by international comparison: a one percent gain in productivity may frequently yield up to half a percent wage increase, *ceteris paribus,* although with significant sectoral and temporal variations. This elasticity is much larger than the values observed for mature market economies (typically not larger than 0.2), although much smaller than some Polish estimates (up to 2). Rent sharing was the largest and the most stable in some labour intensive manufacturing sectors (*e.g.,* textile, clothing and footwear). Firms in more capital intensive manufacturing sectors, such as the engineering and chemical industries, were less willing to share the benefits from the rapid productivity growth: the elasticity was insignificant in some years, and was usually smaller than in the light industries. The willingness to share the rent of productivity growth with their employees declined in all manufacturing sectors except in the light industries, although with a very large variation. This trend is less visible in the non-manufacturing sectors, but those were usually characterised by lower rent sharing, except for services.

Although variables representing the market position of the firm, or competitive pressure were typically insignificant, both individually and jointly, they still frequently had a substantial impact on the value of the rent-sharing coefficient. Figure 2.1 depicts the development of short-run productivity elasticities, *i.e.,* rent-sharing for the major sectors, while Figure 2.2 depicts the same for selected manufacturing sectors. The left-hand graph shows the time path of these coefficients after omitting the insignificant variables in both figures, while the right-hand one shows the same values from the broad model, including all variables describing market position and competitive pressure. The omission of these apparently completely irrelevant variables clearly biases the estimated rent-sharing coefficient downwards in a large part of the sample period. Although market concentration or strong competitive pressure do not directly influence corporate wages, they limit the ability and/or willingness of the company to share the proceeds of productivity growth with its employees. (Still, even these downwards-biased estimates are high compared to the estimates for mature market economies.)

Figure 2.1: Rent sharing in major sectors

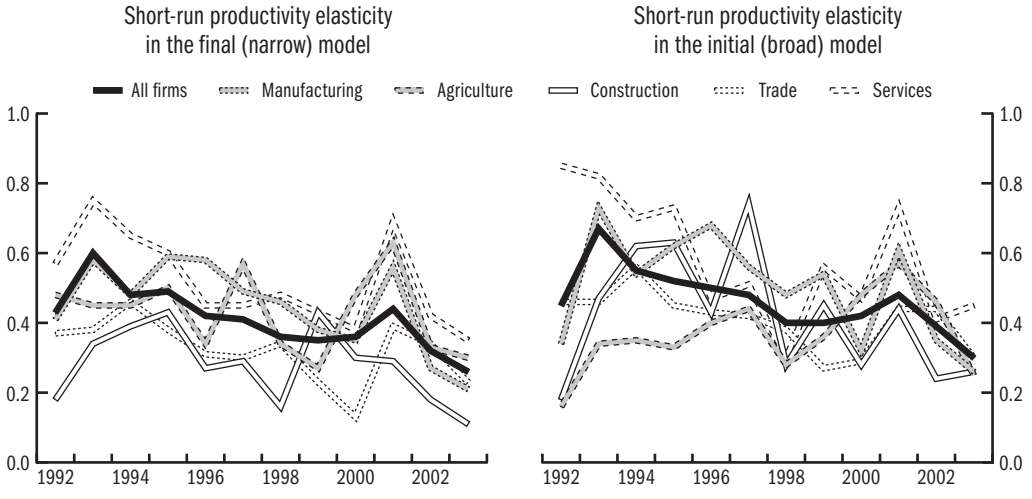
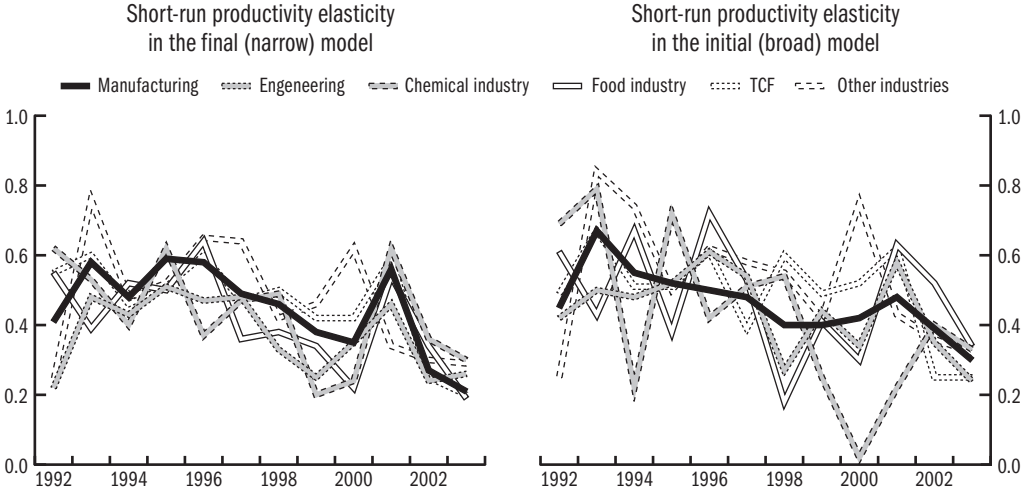


Figure 2.2: Rent sharing in manufacturing



The role of the ownership structure was also extensively studied. Neither ownership variables, nor their interactions with other factors were significant in the initial specification. All ownership related variables could be omitted from the final specification; their omission did not change the statistical properties of the estimated model. Still, I revisited the role of ownership after finalising the specification for empirical analysis. Table 2.1 summarizes the foreign ownership coefficients and their significance (LM-test), when the final specification was augmented by the foreign ownership indicator. Although the foreign ownership almost always has a positive effect on wages, when sig-

nificant, but it rarely matters; it usually gives a negligible premium. And it is insignificant in the majority of the cases, just as all other ownership variables. The only difference is that foreign ownership tends to have a significant wage effect in 1995–6, during the peak of FDI related privatisations, while other ownership variables were mostly significant in 1997. However ownership never had a large impact on wages.

Table 2.1: Foreign ownership premium

Classification	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
All firms	0.06*	0.00	0.01	0.03**	0.04**	0.03**	-0.01	0.01	0.01	0.03**	0.02**	0.02**
Manufacturing	0.10**	-0.04*	0.00	0.02*	0.01	0.01	-0.03*	-0.01	-0.01	0.01	-0.01	0.00
engineering	0.07	-0.02	0.02	0.01	0.03	0.05*	-0.03	-0.02	0.00	0.05**	0.01	0.00
Chemical industry	-0.01	0.01	0.09*	0.09*	-0.01	0.02	-0.01	0.02	-0.01	0.03	0.02	0.03
Food industry	0.08	0.08	0.08	0.07*	0.05	0.01	0.03	0.05	0.03	0.06	0.02	0.05
TCF	0.06	0.00	0.02	0.05**	0.05*	0.00	0.01	0.01	0.03	0.04*	0.00	-0.01
Other industries	-0.06	-0.08*	-0.05	0.05	0.04	0.03	0.01	0.04	-0.04	0.06	0.02	0.01
Agriculture	0.00	-0.08	0.10	0.05	0.08	0.02	0.02	0.04	0.09*	-0.01	0.01	0.09**
Construction	0.12	0.18*	0.04	0.03	0.04	0.10	-0.05	-0.02	0.08**	0.05	0.08	-0.02
Trade	-0.04	0.02	0.00	0.01	0.04*	0.01	0.01	0.03*	-0.01	0.06**	0.04**	0.04**
Services	0.01	0.09	-0.01	0.04	0.02	-0.01	-0.01	0.02	0.01	-0.02	-0.01	0.03
Small firms	0.15*	-0.01	0.01	0.04*	0.02	0.04**	0.00	0.02	0.00	0.02	0.02**	0.04**
Medium-sized firms	0.02	0.00	0.01	0.03*	0.04**	0.02	0.01	-0.01	0.02	0.04**	0.01	-0.02*
Large firms	0.07	0.00	-0.06*	0.02	0.07**	0.00	0.00	0.00	0.00	0.06**	-0.01	0.00

Legend: The value of the coefficient shows the difference between the logarithm of the average wage at foreign and domestic companies, *ceteris paribus* (*i.e.,* assuming identical productivity, employment, etc.). If the coefficient is 0.01, then foreign-owned enterprises pay 1 percent higher wage under identical conditions. One asterisk indicates that the coefficient is significant at the 0.05 probability level, while two asterisks indicate significance at the 0.01 level.

Foreign-owned enterprises paid higher wages on average than domestic ones. But these higher wages are not directly caused by the foreign ownership: they were consistent with the higher productivity of foreign-owned firms. Another important explanation is the dynamic nature of the wage equation. As the past wage level is a very important component of the wage setting model, the model really measures whether the ownership variable causes a difference in the *wage setting strategy of the firm,* rather than in the actual wage level. After privatisation, these firms followed similar wage setting rules as domestic companies. Unlike in some other transition economies such as Poland, foreign-owned firms did not have a distinct wage policy. That probably reflects the much higher penetration of foreign investors into the Hungarian corporate sector: foreign-owned companies set the pace for all firms in the Hungarian economy.

These results apparently contradict to the previously cited results of K*ertesi and Köllő* (2001). They found that foreign ownership and market structure both had a significant impact on individual wages. But there are important

differences between their analysis and this one. First, they used a static model. Thus, they explained the differences in wages. The lagged wage frequently has a coefficient close to 1 in our dynamic model, thus this analysis mostly reflects differences in wage dynamics rather than in levels.

Secondly, they broke up the sample according to ownership categories, assuming that behavioural differences are related to ownership, and not to the sectors. My empirical results do not support that assumption: sectoral differences were substantial, but ownership did not cause changes in behaviour. If I do not differentiate estimation by sector, I also find significant ownership and market structure effects on wages estimated from the entire sample of all firms, or all manufacturing firms, etc, in almost all years. Also, interactions of ownership variables and productivity almost always are significant, if estimated from the entire sample. But those model specifications are always rejected by the diagnostic tests, because they are ridden by structural breaks. Ignoring the technology related heterogeneity of the wage determination would yield strong ownership and market structure impacts, comparable to those in *Kertesi and Köllő* (2001). But the coefficient estimates of these pooled models are biased by the specification errors.

The most likely explanation is that there are substantial sectoral differences in ownership structure. We measure most market structure and competitive pressure variables at a detailed sectoral level, thus their differences are obviously related to the sectoral classification. As wage determination is heterogeneous over the sectors, when ignoring these structural breaks, their impact is largely taken up by variables related to sectoral differences, *i.e.,* by the ownership and market structure variables.

It would theoretically be possible that the omission of the human capital variables, representing the quality of labour, caused a substantial bias in the ownership-related coefficients. But the large sectoral variation of the estimated coefficients (especially the estimates for the short-run productivity elasticity of wages) makes that proposition unlikely. It is difficult to imagine a mechanism, which would always just eliminate the ownership effect in such different estimates. It is much more plausible to assume that a more or less homogeneous wage setting strategy emerged in practically all sectors, and this strategy is only differentiated according to ownership in extreme situations.

The coefficient for the regional unemployment (wage curve effect) has a trend different from the one predicted in *Kertesi and Köllő* (1997b). Local unemployment indeed had a significant negative impact on wages in the early 1990's, but that disappeared after the mid-1990's. Companies most probably quickly adjusted their wage policy to the labour market conditions when mass unemployment became an important characteristic feature of the labour market in the early transition period, creating substantial unemployment-related wage differentials. The distribution of regional unemployment

has remained very stable ever since. Although unemployment levels changed, the relative differences in regional wages reflected differences in labour market conditions. As lagged wages are incorporated into the dynamic model, and these lagged wages already reflected the differences in local labour market conditions after the mid-1990's, there was no need for further differentiation. That explains why the wage curve effect was not observable later in this dynamic setting.

The intensity of import competition is the only variable measuring competitive pressure frequently having a significant coefficient. It is remarkable that when import competition had a significant effect on wages, that typically was positive. *Kramarz* (2003) found an opposite effect for French firms. There is, however, an important difference between the two studies: Kramarz could take the human capital of employees into account. Firms facing stiff foreign competitors are likely to employ better quality labour to improve their competitive position. Thus, the positive coefficient of import competition may reflect the higher wages paid to better and thus more productive employees.

Firm size (measured by the number of employees) usually has a small effect on wages in the sectoral estimates. That is, large firms tend to pay higher wages on average, or to increase wages faster, but this premium is tiny, and sometimes is reversed.

Temporal comparison identifies clear trends in the productivity and the regional unemployment coefficients. The other coefficients rather fluctuated without a clear tendency. These fluctuations, however, seem to be strongly synchronized with each other, and with the fluctuations in rent sharing (short-run productivity elasticity). Corporate wage setting seems to be rather sensitive to the developments in the macroeconomic conditions. The most visible indicator for that sensitivity is the substantial drop in the short-run productivity elasticity in all sectors in 2002–3, reflecting the coincidence of the business and the political cycles.

Conclusions

Sharing the rents of productivity improvements seems to be the single most important factor determining corporate wage strategies in Hungary. That is the only factor having a strong impact on wages in all sectors at most time points. There are substantial sectoral differences in the intensity of rent sharing, which may reflect technology related differences in work practices as well as the varying competitive environment of firms. Rent sharing is much more intensive in Hungary than in any mature market economy however its importance declined over time.

Productivity seems to be the dominant determinant of wage setting, and the only important variable influencing wage determination in the entire period. The impact of all other factors is much smaller. The introduction to

this chapter described large regional wage differences, and similar ones related to ownership. However, these differences seem to be largely consistent with productivity differences, especially after the 1995–6 macroeconomic stabilization.

This intensive rent sharing is somewhat paradoxical. Rent sharing is usually attributed to the bargaining power of trade unions, to organised labour. However, union power is negligible in most of the Hungarian corporate sector. Trade union membership is small and Hungarian trade unions are only combative in the public sector. The strong rent sharing rather reflects a different important characteristic feature of Hungarian transition.

Hungary gives an example for intensive rent sharing without strong trade unions. During the period of large-scale privatisation the (frequently foreign) investors had to realise that few employees were equipped with the skills necessary in a competitive market environment. Transition to the market economy really is a wholesale structural readjustment, which offered huge opportunities to the firms able to exploit them. Successful companies could increase their output by 30–40 percent annually from the mid-1990's. Thus, those companies, which were able to invest into productive capacities, fast productivity improvements, better work practices, and more efficient management, were eager to attract properly qualified labour by paying higher wages. That is reflected in the ever-increasing returns to education in the Mincerian wage equations. (*C.f., Kertesi and Köllő* [2001] or *Galasi* [2003].) Multinational companies were best placed for exploiting these market opportunities, as domestic firms faced strong liquidity constraint during much of the high growth period because of the underdeveloped domestic financial markets. Multinationals not only had a natural access to foreign financial markets, and thus faced no such liquidity constraints, they also had much more modern management and marketing skills. Successful companies could easily pay the wage premium of the well-trained, and thus highly productive young employees. As these well-trained employees were in short supply, expanding firms were forced to attract additional high quality labour by constantly raising their wages. That explains why companies were willing to share the rents of productivity gains even without trade unions. The skill mismatch improved the bargaining position of the well-trained employees in a rapidly expanding market.

Changes in the education system: the expansion of secondary and tertiary education, and a modernisation of the teaching material gradually increased the inflow of better educated employees. As the pool of properly trained people grew, firms faced a less tight labour market, which is reflected in the declining trend of rent sharing.

As the structural adjustment process makes the Hungarian economy increasingly more similar to mature market economies, and labour supply adjusts to demand, the intensive rent sharing is likely to disappear. It may very

well happen that other factors will drive corporate wage determination in the future, factors such as size, market structure, or competitive pressure. Corporate behaviour was still characterised by the transition process in the Hungarian labour market in 2003, but the special effects of transition were gradually losing importance.

3. THE EFFECT OF THE PUBLIC SECTOR WAGE INCREASE ON THE PUBLIC-PRIVATE RELATIVE WAGES

ÁLMOS TELEGDY

One of the most important promises of the election campaign in 2002 was a fifty percent wage increase in the public sector and the winning socialist-liberal coalition government fulfilled its promise. In September, a few months after the elections, the wages of all public sector employees – incorporating roughly 800,000 people – were raised from one day to the other.[18] This can very well be considered as one of the most important labour market measures directly affecting a significant proportion (approximately 20 percent) of the Hungarian labour force. The effect on the labour market can be considerable as the introduced measures altered the relative wages and had a strong influence on both the supply and demand side of the market.

The wage increase had a positive effect on labour supply. The public sector is concentrated in three industries – education, health care and public administration – in which the ratio of the private sector is very low. As the accumulated human capital of public sector employees is worth more in these sectors than elsewhere, higher wages in these industries can induce a higher labour supply among them.

The wage increase is also important as far as fairness in concerned. The wages of public sector employees were lagging far behind the salaries earned in the private sector in all occupation groups and at every educational level (as is shown later in this study). Furthermore, the public sector might favour employees from more disadvantaged groups: new entrants to the labour market, women and the elderly. If the wage increase induces higher participation among these groups, the direct effect can be the higher participation of disadvantaged people as well.

Another positive effect of the wage increase of employees in education and health care is that in the medium or long run this has a positive influence on the human capital of the whole population, as on the one hand it decreases the migration from these occupations, and on the other hand more people

18 In this study only the budgetary institutions are considered as public sector, state owned production units are not included, as the wage increase in 2002 did not cover the latter ones, and this study focuses on the effects related to this increase. For general industrial wage differences see *Kézdi* (2000) and *Kertesi and Köllő* (2003).

might choose professions in these sectors of the economy. In conclusion, the long term effect of the wage increase can reduce negative selection both at entering and leaving these occupations, which had a negative effect on the quality of professions tied to the public sector.

These measures, however, also have disadvantages, which lead to a shrinking number of jobs. Public sector wage increase is a heavy strain on the budget, and as a result it is very likely that public sector employment should be cut.[19] The increased wages may have a direct effect on the labour demand of the private sector, too. As in certain fields mobility does exist between the public and private sectors, the wage increase might also raise the salaries in the private sector: if the wage premium in the private sector decreases or vanishes, enterprises should increase the salaries in order to keep the more able employees. Increased wages, however, have a negative impact on employment.

In this paper I present the extent of wage increase and its effect on the relative wages between the public and private sectors.[20]

Wage changes in the public sector: average wage increase

We start our analysis by showing the level and changes of average wages during the period of 2000–2004 in the public and private sectors. As seen in Table 3.1, at the beginning of the period studied real wages of public sector employees lagged well behind those of the employees in the corporate sector.[21] The average wage in the public sector was 74 thousand HUF, while in the corporate sector it reached up to 95 thousand HUF, which represents a 21.6 percent difference. However, the wages of employees in public institutions in the coming years rose more significantly than in the corporate sector. Average wages in the public sector increased by 8.9 percent in 2001, and by 10.7 percent in 2002, while in the corporate sector this increase was 3.1 and 8.6 percent, respectively. As a result, the average wage difference shrank to 15.6 percent by 2002.

As shown by the data, the salary increase in 2002 raised real wages in the public sector by 36.2 percent, thus the relative average wage rose by 31 percent. As the public wage increase in comparison to the corporate sector was again more significant in the following year, the difference between the average wages increased to 18 percent in 2004. (That year the average wage in the public sector was close to 127 thousand HUF, while in the corporate sector it reached only 105 thousand HUF.) According to our calculations the promised "50 percent" raise materialized as a 35 percent increase only. This is partly the consequence of the fact that in Table 3.1 we calculated real wage differences (the consumer price index rose by 4.7 percent from 2002 to 2003), but the promised wage increase considered nominal wages. However, the nominal wage increase proved to be only 41 percent, 9 percent less than the promised 50 percent, at least according to the sample used in this analysis.

19 The enactment of the 122/2004 law, which is aimed at helping people laid off from the public sector in finding a job, and the measures taken after the parliamentary elections in 2006 resulting in a decreasing number of public employees show that the government is indeed planning layoffs from the public sector.

20 A deficiency of the analysis derives from the fact that after 2002 data are available for 2 years only, therefore longer tendencies cannot be identified. Furthermore, mobility data would also be needed to estimate how the wage increase affected the number of people entering and leaving their job in the public sector.

21 Data on wages are calculated from the Wage Survey database (the wages of public sector employees are gained using a 10 percent random sample taken from this database). Small enterprises are under-represented, and as the employees of large companies usually earn more than the employees of smaller entities, the results are somewhat distorted in favour of the competitive sector.

Table 3.1: Public and private sector wages

	Public				Private				Public/
Year	Average	SD	Change	N	Average	SD	Change	N	Private
2000	74.2	52.1	n.a.	53,038	94.8	114.0	n.a.	125,145	0.78
2001	80.8	57.3	8.9	53,995	97.7	105.7	3.1	127,995	0.83
2002	89.5	58.8	10.7	66,252	106.1	118.9	8.6	126,520	0.84
2003	121.9	64.1	36.2	39,958	106.2	116.6	0.1	149,395	1.15
2004	126.6	77.1	3.9	43,918	107.3	122.9	1.0	165,923	1.18

Source: Hungarian Wage Survey database.
Notes: Average wage refers to May, deflated by CPI (base year: 2000). Changes in percentage. n.a. = not applicable.

As the average wage is also influenced by the employment composition of the sector, it is possible that the measured 41 percent was due to changes in the public sector employment composition: in the event that the government – in parallel with the wage increase – initiates the restructuring of the public sector resulting in a decreasing ratio of higher ranked and more educated officials, then the average wage increases less, as the proportion of high-wage earners is smaller following the wage increase. Table 3.2 shows the composition of public sector employees by gender, age, education and occupation in 2002 and 2003. I created four categories of education: employees with 8 grades of schooling or less, vocational education, high school diploma or a university degree. I categorized the employees into five groups by occupation: unskilled, skilled manual, skilled non-manual, professionals and managers. Compared to 2002, the following year saw the ratio of women among public sector employees 3.9 percent higher and the average age rose by two years. In 2002, 16.4 percent of public sector employees had no more than 8 years of education, 15.5 percent had graduated from vocational schools, 28.9 percent had a high school diploma and 39.1 percent had graduated from college. In 2003 the number of graduates from vocational schools was nearly 5 percent less, while that of college or university graduates rose by 4.4 percent. The composition by occupation supports this fact showing that in 2003 5.5 percent less employees with a vocational education worked in the public sector than a year before, and the number of skilled white collar workers and professionals grew by 2.7–3.0 percent.

All the above confirm the fact that, following the wage increase, the number of public sector employees with higher than average wages did not drop, but in fact increased. Thus the data do not support the assumption that the lower than 50 percent wage increase is due to the changes in the composition by occupation and education. However, the higher ratio of women could possibly lower the rate of average wage increase, as it is apparent from the data that women in the public sector on average earn 23 percent less than men.[22]

22 There is a possible distortion in the data as the sample size was very different in 2002 compared to 2003. For verification I compared 2002 and 2004 data; the results are very similar to those shown in the Table, which proves that differences in the composition are not likely to derive from the error in sampling.

Table 3.2: Public sector composition, 2002–2003

Year	2002	2003	Percent change
Gender			
Female	72.9	76.8	3.9
Age			
Average age	42.5	44.7	2.2
Education			
8 or less	16.4	16.5	0.1
Vocational	15.5	10.8	–4.7
High school	28.9	29.2	0.3
University	39.1	43.5	4.4
Occupation			
Unskilled	15.4	15.2	–0.2
Skilled, manual	10.9	5.4	–5.5
Skilled, office	34.0	36.7	2.7
Professional, non managerial	31.3	34.3	3.0
Manager	8.3	8.4	0.1
N66,252	39,958		

Source: Hungarian Wage Survey database.

So far this study has surveyed general trends in wage changes. Now we break down these changes by education and occupation. Figures 3.1 and 3.2 show the trends in average wages by education and occupation. During the period observed the lowest wage increase affected vocational school graduates, their earnings being 54 percent higher in 2004 than four years previously. (Employees in this category even suffered a 2 percent drop in their wages in 2004 while the average wage in other categories never decreased.) The earnings of employees with no more than 8 grades of education and with a high school diploma grew at the same rate (by 64 and 66 percent). Employees with a higher educational degree benefited from the largest increase, the rate in this case being 71 percent. The nominal wage raise in 2002–2003 reached 50 percent only in the case of vocational school graduates.

Figure 3.1: Public sector wages by education

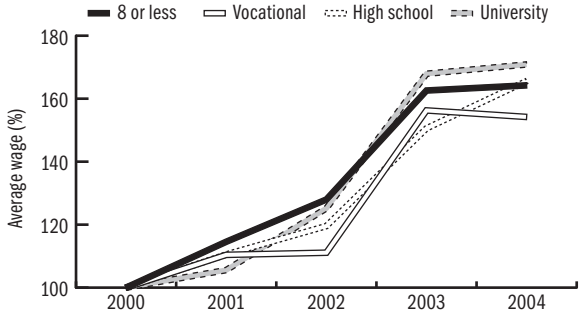
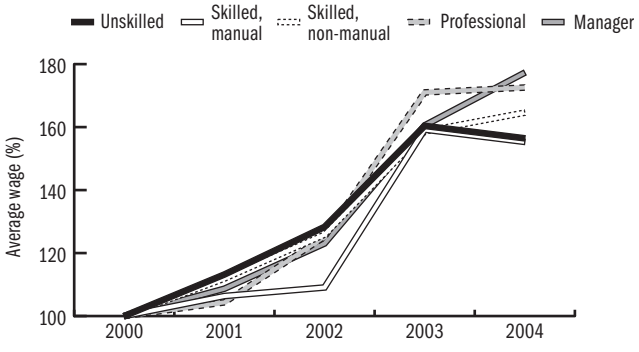


Figure 3.2 shows wage changes by occupation. The results are very similar to the ones concluded from Figure 3.1. The lowest wage increase affected vocational school graduates (55 percent), while the highest was received by people with professions for which a higher educational degree is necessary (73 percent) and by managers (77 percent). It is worth mentioning that the wages grew in almost all education and occupation groups even before the significant raise in 2002 and in certain groups in 2004, as well.

Figure 3.2: Public sector wages by occupation



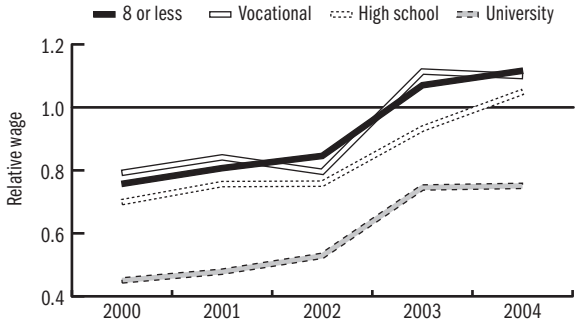
Public and private relative wages

Having examined the evolution of average wages, we now turn to the relative wages by occupation and education. The political aspects of this are interesting because employees in the public sector do not take into account the average relative wages. Instead they consider the wages paid within their occupation and education category. From economic aspect it is also important because the average relative wage within a given educational and occupational category will be the driving force behind selecting between the public and private sectors.

Figure 3.3 shows the relative average wages by education groups. As *Kézdi* (2000) shows, relative wages significantly differ by the level of education. In 2000, at the beginning of the period observed, the wages of vocational graduates total up to 79 percent of the wages in the corporate sector; those of elementary school graduates are very similar (76 percent); the relative wages of high school graduates are somewhat lower (70 percent); those who lose most on being employed in the public sector are the employees with a higher education diploma, as their wage was only 45 percent of the wages earned in by people with a similar educational background in the corporate sector. The government must have been aware of this fact as until 2002 the relative wages of higher educational graduates increased faster than those of other employees – thus the wage premium of higher educational graduates in the private sector diminished by 8 percent in two years. In the same year the average wage

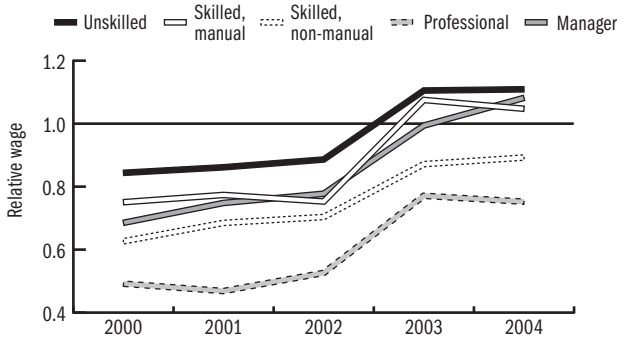
of people with a high school diploma lagged behind by 24 percent compared to workers with a similar education in the corporate sector, that of vocational school graduates was behind by 20 percent, the highest relative wages were paid to people with the lowest education – their earnings were only 15 percent less in the public than in the private sector.

Figure 3.3: Relative wage by education



As was expected, the high wage raise abruptly changed the relative wages between the two sectors. The wages in the public sector approached those of the private sector, and even surpassed them in the lower education groups: for elementary and vocational school graduates the public sector paid a 13–15 percent wage premium. The relative wage of employees with a high school diploma remained below the wages paid in the private sector by 7 percent, and in the higher education group the lag was still significant –25 percent. Relative wages stagnated during the year following the considerable increase, except for the salaries of high school graduates, which went through an additional raise, and in the last year of the period in question they already surpassed the wages in the competitive sector by 5 percent.

Figure 3.4: Relative wage by occupation



The relative wages of the different occupation groups show a similar picture to the wage differences by education. Unskilled workers had the highest relative

wage (84 percent in 2000), this was followed by the relative wages of skilled manual workers (75 percent), and managers (69 percent). The relative wage of skilled white collar workers was 63 percent, and that of highly educated professionals a mere 49 percent. At the end of the period the ranking was the same with the exception that the wage of managers was the second best. This year the public sector already pays a premium to three occupational groups. These are the unskilled workers whose average wage is 10 percent higher in the public than in the competitive sector, the managers (8 percent) and the skilled manual workers (5 percent). The relative wage of skilled non-manual workers is 90 percent, and that of professionals is 75 percent.

There are several possible explanations for relative wage differences. One of them is that fringe benefits are higher in the public than in the competitive sector and they compensate for, or at least diminish, sectoral wage differences. However, it is contradictory that managers are the most significant recipients of fringe benefits and yet are paid similarly in both sectors. It is also possible that there is less stress in the public sector, working hours are shorter, and this compensates the employees for the lower wages. For example, if people work shorter hours in the public sector then they have more time for additional work activities, which makes up for lower wages. However, this is in contradiction to the fact that wage differences are high for professional employees only, and it is also very unlikely that pleasant jobs were so strongly selected by occupation. The third possibility is that the government is well aware of the phenomenon that employees with a higher education degree are tied to the public sector, as doctors or teachers have their human capital valued much more in the public sector. The officials may also know that among managers and less educated occupation groups the mobility between the public and private sectors is higher. Finally, it is also possible that employers choose their employees according to certain criteria, not measurable for the researcher and on average they hire less efficient employees in the public sector. Unfortunately, these hypotheses cannot be tested due to lack of relevant data, but using regression techniques we can take into account all the observable characteristics of employees at the same time, i.e. we appraise the wage differences in the public and private sectors by comparing the wages of employees with the same observable characteristics. In this case we compare the wages of employees of the same sex, educational background, work experience and occupation in the public and private sectors.[23]

The nature of changes in the relative wages over time (Table 3.3) is the same as shown in the last row of Table 3.1: compared to the competitive sector the average wage in the public sector is lower in the first three years of the period and higher in the last two. However, the differences between the two sectors are much bigger where we control for human capital differences: this time the wages in the first year observed are 27 percent lower in the public sector

23 We determine the effect of a certain characteristic on the relative wage by creating an interaction between this variable and the dummy variable of the public sector.

compared to the 21.6 percent we calculated without using control variables. And at the end of the period the wages are only 8.4 percent higher in the public sector (set against the 18 percent).

Table 3.3: Change of the relative wage over time

Year	Effect	
2000	-0.270	(0.003)
2001	-0.257	(0.003)
2002	-0.205	(0.002)
2003	0.070	(0.003)
2004	0.084	(0.003)
N	951,831	

Notes: The coefficients represent year effects from Mincerian equations. Standard errors in parentheses. The coefficients are significant at the one percent level.

Table 3.4: Change of the relative wage by education and occupation

	2000		2004	
Education				
8 classes or less	-0.134	(0.007)	0.147	(0.007)
Vocational	-0.133	(0.007)	0.137	(0.008)
High school	-0.220	(0.005)	0.098	(0.005)
University	-0.432	(0.006)	-0.037	(0.005)
Occupation				
Unskilled	-0.061	(0.007)	0.175	(0.007)
Skilled, manual	-0.242	(0.009)	0.091	(0.010)
Skilled, office	-0.266	(0.005)	0.041	(0.005)
Professional, non-managerial	-0.479	(0.008)	-0.085	(0.006)
Manager	-0.199	(0.009)	0.248	(0.009)
N	178,046		209,827	

Notes:. The coefficients come from Mincerian equations augmented with occupation. and year effects. Standard errors in parentheses. The coefficients are significant at the one-percent level.

In Table 3.4 we ran regressions separately for 2000 and 2004, and we study wage differences by education and occupation.[24] In the first year of the period observed the regression results do not differ from simple averages. However, in 2004 the public-private sector relative wage increases significantly if we take into account all the observable characteristics at the same time. According to the estimated coefficients both low educated groups earned 14 percent more in the public sector in contrast to people with a similar educational background in the corporate sector; in case of high school graduates this difference is 10 percent, and for employees with a higher educational qualification the relative wage difference drops to 3.7 percent from the 25 percent we measured in Table 3.3! We also attain the same results by occupation groups. Highly qualified employees constitute the only category where the wages are lower

24 Similarly to observing changes over time, now we interacted educational and occupational category variables with the dummy variables of the public sector.

in the public than in the private sector, but the difference is less than 10 percent. Employees of other occupation groups receive a premium in the public sector. The premium is the highest among managers at almost 25 percent, the second highest premium is paid to the unskilled workers (17.5 percent), but the wage of skilled employees in the public sector also surpasses the respective wage in the corporate sector.

Summary

In this study I analyzed the wage differences between the public and private sectors during the period of 2000–2004, in the middle of which (in 2002) the wages of public employees were raised significantly and as a result their average wage increased by 36 percent in real value. Consequently, the average wage in the public sector surpassed that of the corporate sector by 18 percent. If we analyze the wages by education and occupation groups, the differences we find are quite significant. The highest relative wage throughout the period is related to the least educated employees and to the ones who occupied positions requiring unskilled labour. Workers pertaining to these groups earned 15 percent more in 2004 than their counterparts with a similar education or in similar positions in the corporate sector. Employees who graduated from college or university had the lowest relative wages (–25 percent in 2004). However, if we estimate the relative wages with the help of regression techniques and thus we consider all the observable characteristics of the employees at the same time then the wages of the public sector in 2004 are higher in almost all education or occupation categories than in the corporate sector. The only category it is not true for is college and university graduates, but the difference here is a mere 3.7 percent. According to our findings the government has not only levelled the wages in the public and corporate sectors but also pays a wage premium to the majority of its employees.

Some beneficial factors of employment can even raise this public wage premium. We measured only salaries while the employees also receive fringe benefits. Where the extent of the latter is more significant in the public sector then we underestimated the volume of the premium. It is also possible that other, non-wage type dimensions of jobs are not the same in the two sectors. If working in the public sector is less demanding, or the psychological satisfaction is higher, and job security is greater then, beside similar wages, the overall work conditions are better in the public sector. Finally, we would like to point out that if public sector employees differ from the employees of the corporate sector based on some characteristics, which are not measured by the data available to us, and these characteristics influence their productivity, then the results might be biased.

4. REGIONAL DIFFERENTIALS IN EARNINGS AND LABOUR COSTS

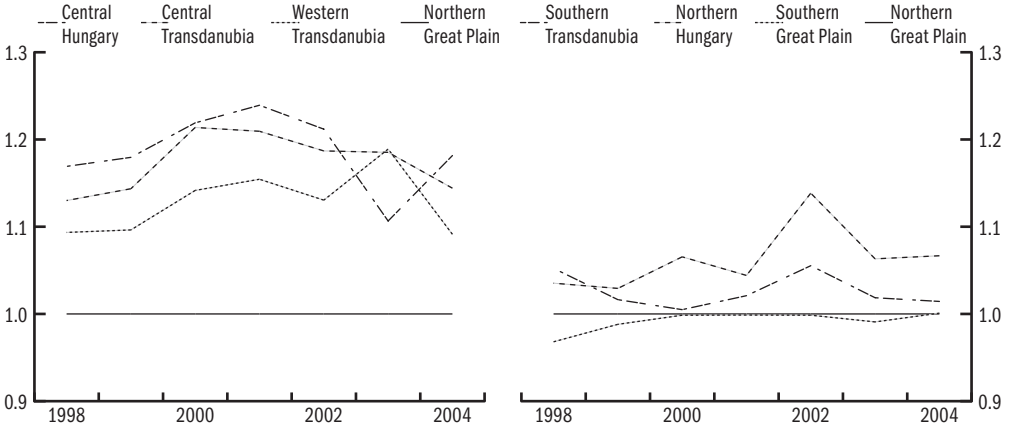
PÉTER ANDRÁS SZABÓ

Data suggests that wage differentials between Hungary's NUTS-II level regions are substantial. Figures 4.1 and 4.2 clearly show the three most developed macro-regions: Central Hungary, Central Transdanubia and Western Transdanubia. In the last 15 years the regional differentials – which are even greater in point of gross earnings – followed an increasing trend. However earlier studies (*Köllő* [2000], [2004]) showed that over the period of transition (1986–2001) these differences decreased significantly if we control for personal characteristics and productivity.[25]

In this chapter we analyse the dynamics of wage and earnings differentials between 1998–2003. We try to answer whether the tendencies of the last ten years have been continued or not. We also investigate the differences between the types of municipalities.

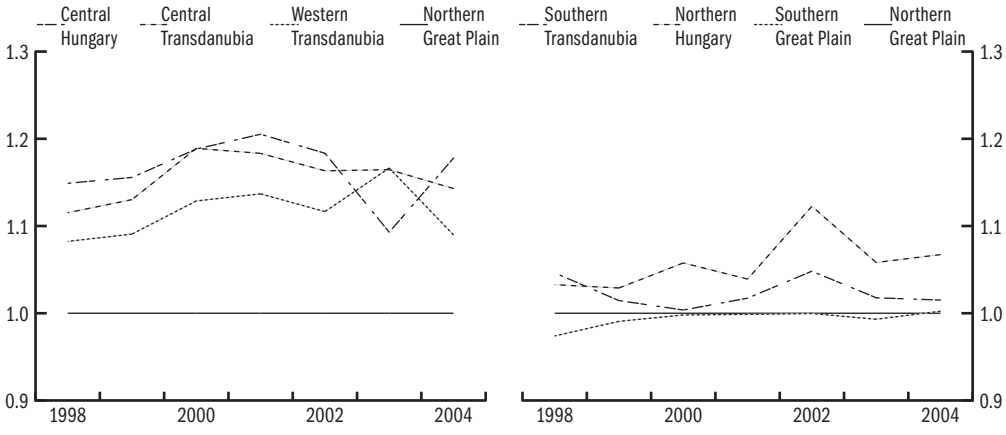
25 The calculations published here follow the method used by *Köllő* (2004), there is some difference, however, in the definition of the macro-regions. To make the comparison with the official statistical data easier, I used the definitions of the Central Statistical Office throughout the analysis. I am indebted to János Köllő for his help.

Figure 4.1: Gross wage differentials across regions (relative to the Northern Great Plain), 1998–2004



Source: Wage Survey.

Figure 4.2: Net wage differentials across regions (relative to the Northern Great Plain), 1998–2004



Source: Wage Survey.

According to neoclassical economics the mobility of labour and capital tends to equalise prices across markets. In connection with regional earnings it means that wage rates should have a tendency toward convergence across regions. However in Hungary growing wage differentials could be observed in the transition period.

Eberts and Schweitzer (1994) distinguish the following causes of regional wage differentials.

First, it should be recognized that *not all factors are mobile across regions*. Workers and firms may respond quickly to changes in market conditions, yet there are factors unique to a region, which influence wage rates and change only slowly.

Second, the convergence can be hampered by the *regions' diverse adjustment to various shocks*. Examining U.S. regional data *Blanchard and Katz* (1992) suggest that the adjustment to a local labour-market shock can take as long as 10 years.

Third, if we are to measure regional wage differentials precisely it is important to compare "identical" workers. The so-called "unconditional" wage differentials may not measure the real differences accurately. Therefore individual characteristics that affect productivity and wage cost (for example age or education) should be controlled for in any analysis of regional wage convergence.

Several studies analysed the Hungarian situation (e.g. *Fazekas* 2005, *Hahn* 2004). Their main findings are that the causes of regional differences are to be found on the demand side of the labour market. After the change of the regime the creation of new workplaces were related to the region's infrastructural position and the workforce's educational standard, therefore the new workplaces were concentrated mostly in the central and western part of the

country (*Fazekas* 2005). On the other hand differences in wages between the low and high unemployment regions can promote wage convergence through the potential gains of migration. Thus the substantial wage differences denote low regional mobility. Till 2003 the Hungarian employment policy did not treat the reduction of regional differentials as a priority, only at that time there originated a separate employment policy directive (*Fazekas and Németh* 2005).

After 1989 the most important factor influencing wage differentials was unemployment, thus we look at the relationship between wages and unemployment first. Then we analyse the differentials among types of municipalities and macro-regions. *Köllő* (2004) shows that wage differentials in the public sector are negligible among macro regions and smaller across types of settlements than in the private sector,[26] so throughout the analysis we deal only with the private sector.

Unemployment elasticity of earnings and labour costs

One of the most influential factors determining wage differentials is unemployment (*Köllő* 2000). The unemployment elasticity of earnings and labour costs[27] can be seen on Figure 4.3. The graphs show that if the regional (NUTS-IV) unemployment rate is one percentage point higher, how much lower – controlled for any other factors[28] that effect wages – the net and gross earnings are.

As shown in Figure 4.3, the unemployment elasticity of wages continued to decline after 2000. The peak in 2000 may be attributable to single factors (e.g. 57% minimum-wage increase) that caused the relationship between unemployment and earnings to loosen.

Figure 4.3: Unemployment elasticity of earnings and labour costs, 1998–2003

Source: Wage Survey.

The calculated elasticities are smaller in absolute value if the effect of firm's productivity is taken into account. It can be explained by the fact that in high unemployment regions the productivity is lower. After 1998 the elasticities

26 This is due to the bureaucratic rules of wage setting that allows no adjustment to (regional) labour market conditions. The observed weak negative correlations across types of settlements "reflect compositional differences – the fact that the depressed areas, most of them rural, have smaller schools, basic health institutions, and only low-ranked offices of public administration." (*Köllő* 2004, pp. 70.)

27 In the following labour cost means earnings at the given level of firm productivity controlled for individual characteristics, industry etc. The detailed description of the model can be found in the Appendix.

28 In the regression we controlled for gender, age, education, experience, industry, firm size, firm ownership, firm's capital-labour ratio and NUTS-II dummies.

of earnings and labour costs changed differently: till 2001 the difference between the two increased, which means that in high productivity regions there was a greater decline in the unemployment related labour cost differentials. In 2002–2003 this trend has been reversed, the gap between the unemployment elasticities of earnings and labour costs reduced. At the end of the period one percentage rise in the unemployment rate resulted in a 5 percentage decline in earnings and 6 percentage decline in labour costs.

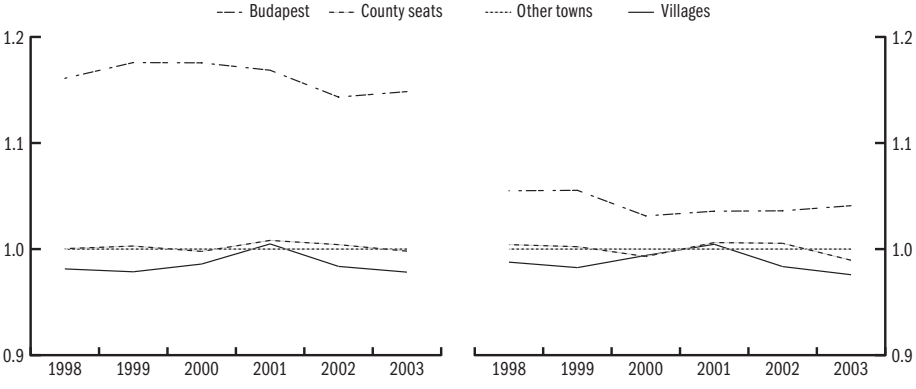
Examining 16 countries *Blanchflower and Oswald* (1994) found that wages have – not controlling for firm's productivity – an unemployment elasticity of approximately –0.1. This result was also confirmed by the authors' new calculations (*Blanchflower and Oswald* 2005). In Hungary the unemployment elasticity of earnings diverged from this 'benchmark' level, which is in line with *Köllő's* (2004) earlier calculations. The reason for this divergence may be the concentration of long-term unemployment and inactivity in specific regions. That being the case labour cost differentials can be persistent due to the lower competition for workplaces.

Nevertheless unemployment is not the only factor that affects wage differentials, therefore we use wage equations in our analysis of regional differences. For further details of the model see the Appendix.

Earnings and labour cost differentials across types of settlements

Figures 4.4 and 4.5 show the net and gross earnings differentials of Budapest, county seats and villages relative to other towns. In the calculations we controlled for individual and environmental characteristics (this is shown on the left graph) and also for firm's productivity and local unemployment (right graph).

Figure 4.4: Net wage differentials across types of settlements, 1998–2003

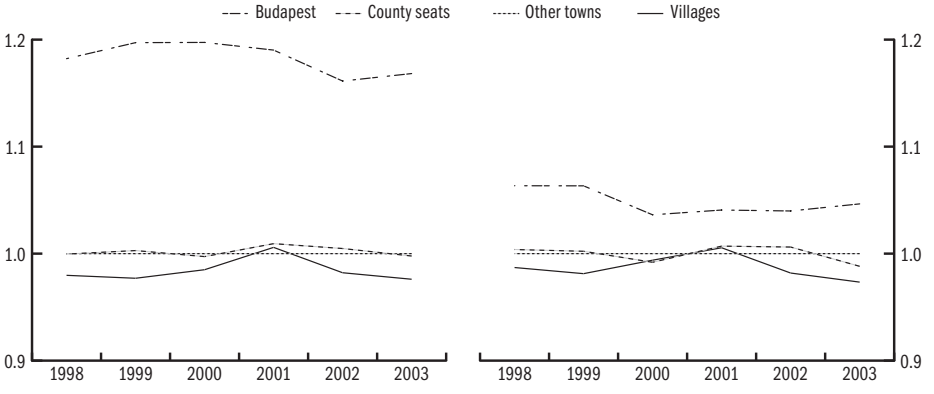


Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

Ignoring the effect of unemployment and firm's productivity the net earnings differentials are negligible through the whole period among county seats, other towns and villages, even the greatest difference does not exceed 3 per cent. The earnings differentials for Budapest versus other settlements are substantial, around 15–17%, though they have a decreasing trend.

If we control for unemployment and productivity, the differentials remain at the same level for county seats and villages. In the case of Budapest, however, there is a remarkable change: the productivity adjusted differentials drop below 5 per cent. Thus a firm holding its productivity level fixed and moving from the capital to a small town with the same level of unemployment realises only a modest, 4–5 per cent wage gain.

Figure 4.5: Gross wage differentials across types of settlements, 1998–2003



Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

The estimated labour cost differentials (Figure 4.5) follow a similar pattern. In order to realise the 17–20% labour cost differentials which a small town possesses relative to Budapest, the firm has to accept a higher unemployment rate and lower productivity resulting from the loss of the benefits of a prosperous, metropolitan area. If the firm wants these two factors to be held constant, the potential gain is 10 percentage point lower, about 5 per cent in 2003. The difference between county seats, other towns and villages has almost completely disappeared by the end of the period.

We can conclude that the earnings and labour cost differentials followed the same trend presented in *Köllő* (2004).

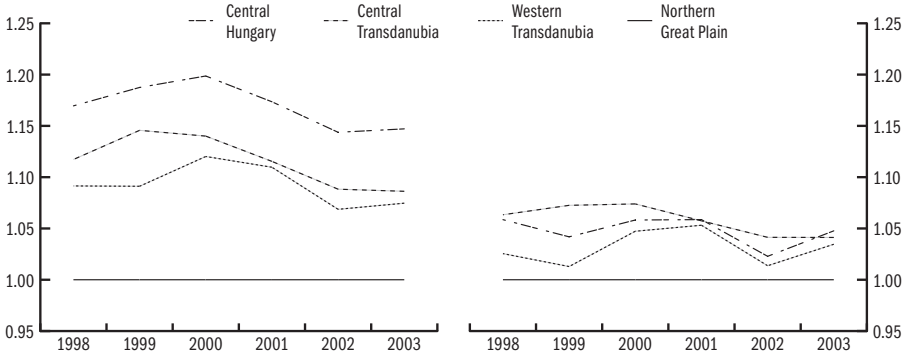
Regional differences

Regional differences – like those between types of settlements – are much smaller than the unconditional differences if we allow for individual and

employer attributes. On Figures 4.6–4.9 – similarly to Figures 4.4 and 4.5 – the left panel shows the earnings differentials controlling for individual and environmental characteristics, while on the right side we depict differences holding also unemployment and firm's productivity level constant. In the estimates the poorest region, the Northern Great Plain was treated as the reference category.

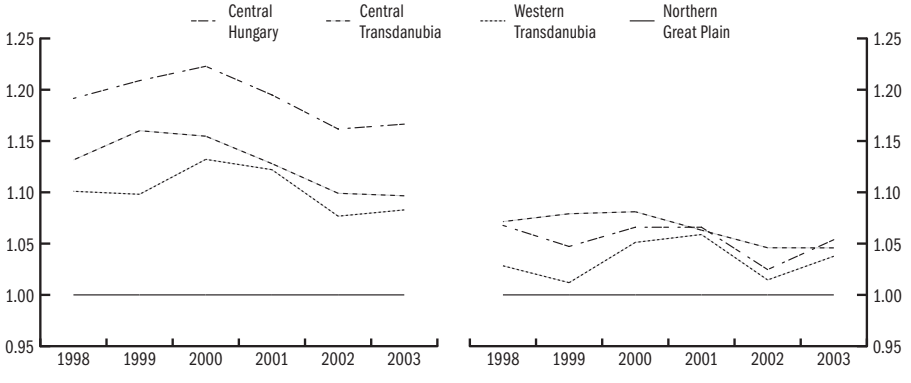
Figures 4.6 and 4.7 show the trend of the net and gross wages in the most developed three regions (Central Hungary, Central and Western Transdanubia) relative to the Northern Great Plain.

Figure 4.6: Regional net wage differentials, 1998–2003



Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

Figure 4.7: Regional gross wage differentials, 1998–2003



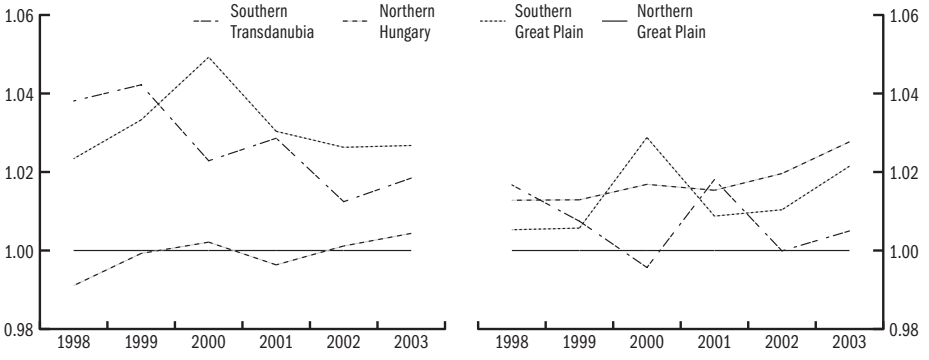
Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

The wage advantage of developed regions decreased over the period, from 9–20 to 7–15 per cent by 2003. It is clear from the comparison of the two panels

that this gap is mainly attributable to the growing relative productivity and the decreasing relative unemployment of the central and western regions. If we adjust for these factors the difference is around 3–5 per cent.

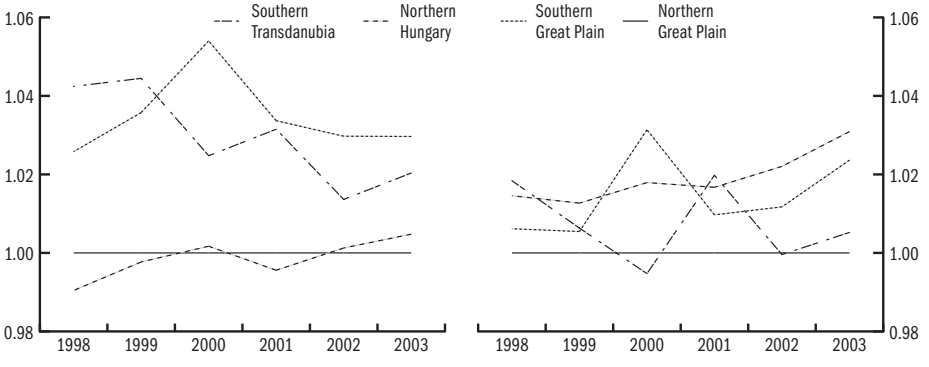
The estimates of the gross wage differentials yield similar results. The remaining difference between the poorest and the most developed regions of Hungary is around 8–17 per cent after controlling for individual characteristics, which decreases further (below 5 per cent) if the level of unemployment and firm's productivity is held fixed. The results presented here are consistent with those of *Köllő* (2004).

Figure 4.8: Regional net wage differentials, 1998–2003



Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

Figure 4.9: Regional gross wage differentials, 1998–2003



Note: The left panel shows the earnings differentials adjusting for individual and environmental characteristics, while on the right side we also control for unemployment and firm's productivity.
Source: Wage Survey.

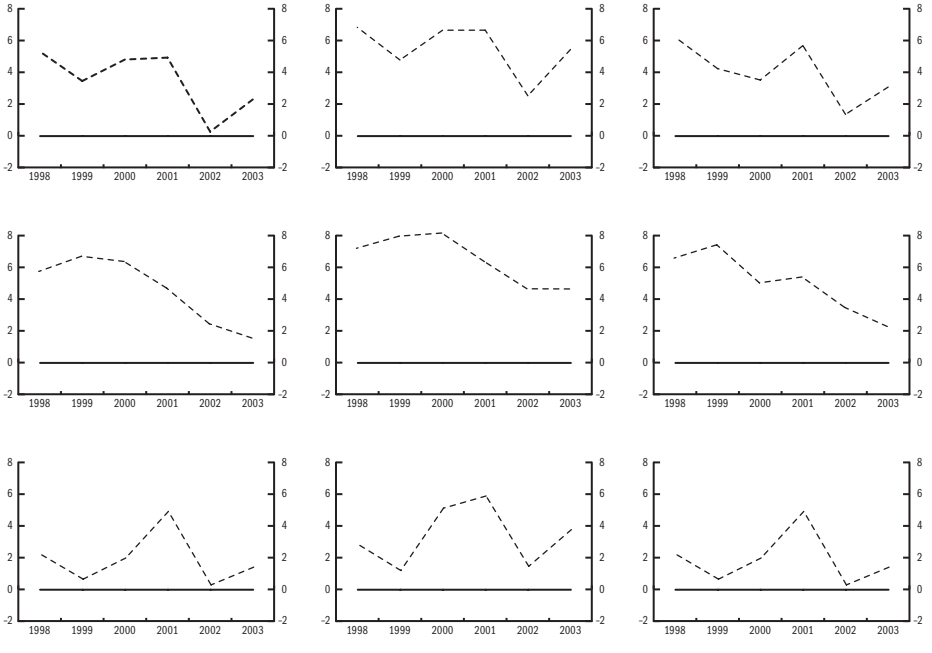
As shown in Figures 4.1 and 4.2 the raw earnings differentials between the less developed regions are modest and become negligible if individual and

employer attributes are controlled for. Whichever estimation is considered the differences remain below 3 per cent. These results are confirmed by estimates of the gross wage differentials whether they are controlled for productivity or not.

Summary

Data suggests that regional earnings and labour cost differentials were moderate between 1998–2004. Across types of settlements only the capital has a substantial 15–20 per cent wage advantage, but it is reduced below 5 per cent if differentials are adjusted for firm's productivity and unemployment. As for regional differences, the wage gain of the poorest region compared to the most developed part of the country does not exceed 6 per cent by the end of the period (Figure 4.10).

Figure 4.10: Estimated gross labour cost differentials for a firm relocating from region i to region j while holding its productivity fixed, 1998–2003



Source: Wage Survey.

All these results show that labour cost differentials do not play a dominant role in the firms' migration decisions, since some percentage wage gain does not provide enough incentive for a firm to relocate. In the depressed regions, however, the recruiting and screening costs are lower due to the (relative) abundant labour supply. Thus the less developed regions may have other characteristics that foster formation of companies to a greater extent than the

slight gain in earnings (*Köllő* 2003). Hence rural development policy may not concentrate only on "raw" differentials in earnings and labour costs but also on factors that affect the regional distribution of earnings, such as education or unemployment.

Appendix

The Wage Survey (WS) is an annual survey conducted by the National Labour Centre in 1986, 1989 and each May since 1992. Since 2000 the sampling procedure is the following (i) the firm census provided by the CSO serves as the sampling frame (ii) it is a legal obligation of each firm employing more than 5 workers (1986–1993: 20 workers, 1994–1999: 10 workers) to fill in a firm-level questionnaire and provide individual data on a 10 per cent random sample of the employees. (iii) public sector institutions irrespective of size have to fill in the institution-level questionnaire and provide individual data on all employees (iv) Firms employing between 5–20 (1995–1999: 11–20) workers according to the census are sampled in a procedure stratified by four-digit industries. The firms contacted are obliged to fill in the firm-level questionnaire and provide individual demographic and wage data on all employees. The observations are weighted to ensure that they are representative. About 180 thousand individuals employed in 20,000 firms and public sector institutions were observed in 1999–2004.

The regressions quoted in this section had log monthly gross or net earnings on the left hand side. The right hand variables were as follows:

- Male
- Labour experience in years and its squared value
- Education: vocational school, secondary school and college/university degree (reference category: elementary school)
- Log micro-level (NUTS-IV) unemployment rate
- Types of settlements: Budapest, county seats and villages (reference category: other towns)
- Six regional (NUTS-II) dummies (reference category: the Northern Great Plain)
- 50 industry dummies
- Productivity: Log of sales net of material costs divided by the number of workers in the respondent's firm
- Dummy taking 1 if the firm's value added is negative, otherwise 0
- Firm's capital-labour ratio
- Firm ownership: private majority, foreign majority or mixed (reference category: state, local government or cooperative majority)

The coefficients were estimated on private sector data with ordinary least squares adjusting for heteroscedasticity and without using weights. The charts display approximations of the percentage differentials by $\exp(b)$.

5. GRADUATE EARNINGS IN 1992–2005

GÁBOR KERTESI & JÁNOS KÖLLŐ

The economic transformation following the political transition brought about an increase in the value of higher education degrees. According to surveys around 2000, this trend continued in the later years of transition as well. According to the standard Mincer regression returns to education in Romania (only 0.034 in 1985–1989) increased from 0.069 to 0.085 between 1997 and 2000 (*Andren, Earle and Sapatoru* [2004] p. 23.).[29] In the Czech Republic, the relative earnings advantage of university graduates to people with secondary education rose from 0.409 logarithm points in 1998 to 0.482 logarithm points in 2002. (*Jurajda* [2004], data from companies with more than 10 employees in the business sector.)[30] *In Hungary* with the data of the wage-tariff surveys the standard Mincer equations suggest that the returns to education increased from 0.106 to 0.127 for women and from 0.118 to 0.147 for men, and the log premium of graduates to people with a high school degree grew from 0.363 to 0.535 for women and from 0.550 to 0.693 for men in the period between 1998 and 2005.

The rapid growth in the supply of graduates and limits to demand will sooner or later put an end to the upward trend in the value of higher educations degrees. In this chapter we consider whether there are signs of the devaluation of degrees using the data available before May 2005.

Earlier studies by *Galasi* (2004a), (2004b) examine the potential signs of the devaluation of degrees. One potential indication is when graduates are forced to fill jobs which require secondary education. Galasi finds that there were no trends in this direction before 2002. On the contrary an increasing share of the graduates were working in "graduate jobs", where employers reward the degrees with a high wage premium (*Galasi* [2004b]). At the same time, the number of "graduate" professions (in which the wage premium for a university degree exceeded a certain threshold, 44% in the given study) doubled.[31]

29 In the standard Mincer equation ($\ln w = b_0 + b_1 S + b_2 X + b_3 X^2$, where S indicates the number of years spent in school and X the number of years spent in employment) the parameter b_1 measures the returns to education with infinite time-horizon, zero direct costs of education and a stable experience-earning profile.

30 Using the standard Mincer equation, the return of one year in education was 0.089 for women and 0.111 for men in 2002, which by-and-large should correspond to the Romanian values, considering that the Czech study does not include the public sector where wage differentials are usually smaller.

31 As newer and newer professions were included in these categories, the wage premium of the average worker in a "graduate job" diminished (after 1998). This however does *not* contradict the significant overall increase in the earnings advantage of graduates to workers with secondary education. On the one hand the overall earnings advantage depends on the earnings premium of the graduates in these jobs, and on the other hand a number of new jobs among the "graduate professions" have just passed (closely) the 44% threshold of returns in the studied period.

Another possible sign of the devaluation of degrees is discussed in another study by *Galasi* (2004a) that analyses the returns to education according to whether the individual is in a job corresponding to the level of their education, or higher or lower than that. The level of necessary education is defined by the modal educational attainment of workers filling the job, those who are above that are considered "overqualified" and the number of years spent in education over the mode are the "extra years". (The proportion of overqualified workers increased from 10 to 20% between 1994 and 2002, while that of underqualified dropped from one third to one fifth.) A remarkable finding is that between 1995 and 2001 the market valued the "extra years" slightly more than the educational attainment corresponding to the job. The rank returned only in 2002 when a "necessary" year increased the individual's logarithm of earning by 0.108, while the "extra" year increased it by "only" 0.094. The absolute value of the wage premium of the "extra" years nevertheless has been declining since 1999, after it had nearly doubled between 1994 and 1998. This together with the increase in the number of overqualified workers can be interpreted as the first sign of the excessive output of higher education with a negative impact on the returns. Below we will argue that there are further trends in 2003–2004 that lead to similar conclusions.

Before addressing the change of the value of new degrees, we should put their level into an international perspective. Relatively accurate comparisons can be made using the data from *Brunello, Comi and Lucifora* (2000), and *Jurajda* (2004). *Brunello et al.* calculate the logarithmic differentials of hourly wage for men with secondary and higher education aged between 45–51 years. Their measured values ranged between 0.28 (Italy) and 0.57 (Portugal). The value for Austria and Germany that have similar educational systems to Hungary are 0.37 and 0.41 respectively. In the Czech business sector the wage differential was significantly higher, 0.6 in 2002; in Hungary it was 0.64 in the public sector and 0.87 in the business sector in 2004. All in all, taking into account that the differences in working hours in the public sector are marginal, we can estimate that the logarithmic differential of hourly wage is at the level of 0.71 in the Hungarian economy. This means that while a middle-aged male graduate in Austria earns 45% more than his peer with secondary education ($e^{0.37}$=1.448), the advantage of the graduate worker in Hungary is 103%; more than double that of the Austrian figure![32]

Expansion of higher education and employment prospects

The earnings advantage of graduates can be expected to decrease as a result of a sharp increase in supply. After the change of regime, higher education expanded rapidly in Hungary. The number of full time students has been on the rise since 1986 and the number of part-time students has been increasing since 1992. The number of college and university students has grown from

32 A new generation of studies on the returns to the human capital supports the claim that the exceptionally high wage premium of graduates in Hungary cannot be explained by their exceptionally high relative skills, using the data from the International Adult Literacy Survey (IALS). Models that include both scores and educational attainment (*OECD* [2002], *Danny, Harmon and O'Sullivan* [2004], *Carbonaro* [2002]) equally find that in the transition countries, including Hungary, the effect of education on wages is strong even at identical skill-levels. See especially *Carbonaro* (2002), pp. 21–22.

100,000 before the political transition to 350,000 today. The number of new graduates began to increase in 1995, however it did not grow as rapidly as the number of students because students spend a longer time in education and second degrees are becoming increasingly widespread. Nowadays each year more than 50 thousand fresh graduates leave the higher education system, approximately twice as many as in the early years of transition. Table 5.1 shows the extent of the supply shock. Some 120 thousand fresh graduates entered the labour market in the five years before and after the political transition. In the following 5-year period this figure was nearly 200 thousand and since 2000 – based on our estimates – more than 250 thousand. The total number of graduates is 150% of the pre-transition level and nearly one third of them are new graduates.

Table 5.1: Extent of the supply-shock

Period	Number of new graduates (thousand)	Total number of graduates (thousand)	Ratio of new graduates as % of the total number of graduates
1986–1990	121	1988: 572[a]	21.2
1991–1995	120	1993: 640[b]	18.8
1996–2000	196	1998: 694[b]	28.2
2001–2005[c]	257	2003: 850[b]	30.1

[a] Source: Central Statistical Office (CSO) Income Survey 1987/88.
[b] Source: The autumn wave of the CSO Labour Force Survey in the given year.
[c] The number of new graduates in 2004 and 2005 is based on estimates.

The expansion did not cause significant unemployment among graduates, including fresh graduates until 2003.[33] Unemployment was 1–3% of the cohorts except for the brief period (up to the age of 27) after graduation in the case of men and after child birth for women. (The same figure was 5.5–6 times higher for people with primary education.) The number of jobless persons looking for paid employment was steadily falling among young graduates, their job prospects were improving even in 2001–2003. A slight decrease could be observed only in the 21 to 23-year-old age group after 2000. However most of this group had a college degree and they represented only 17–18% of the 21–26-year-old age group of young persons. In the typical cohorts of new entrants (24–26 years), the share of unemployed people was steadily falling by the end of 2003.

The trends after 2003 can only be studied using the data of the unemployment register, which is hardly adequate for our purposes. While one in four persons who completed primary or vocational training school and one in six persons with secondary education is registered as unemployed by the Public Employment Service, the same figure is only one in eight for graduates.[34] Between 1995 and 2005 the yearly average number of registered graduate unemployed increased from 11,973 to 19,433, the number of fresh graduates from

33 See also *Kertesi and Köllő* (2006), pp. 205–207.
34 Figures are calculated from the data of CSO Labour Force Survey, third quarter of 2001.

1,800 to 4,561 with most of the growth taking place in 2004–2005. (Data from the Employment Office). When interpreting these changes, it should be taken into account that the total graduate population grew rapidly, by 40% in the above period, and the number of fresh graduates nearly doubled. Taking these into account, it still seems that registered unemployment grew rapidly among fresh graduates in 2005.

A further question is to what extent decisions to extend the time spent in education are based on the difficulties of finding work. The study by *Varga* (2006) on the career path of fresh graduates addresses this question and finds that the labour market status had no significant impact on decisions to continue studies in the years around 2000. Decisions to get a second degree were based on the potential earnings premium on the one hand, and on returning to the original career choice (returning to the original choice of programme after getting a first degree in another field free of charge) on the other.

Available data thus suggest that difficulties emerged after 2003, the 8th year of rapid growth of supply. The budgetary restrictions put forward in the summer of 2006 are likely to have a negative impact on the situation of young graduates, which will have a strong effect on graduate earnings.

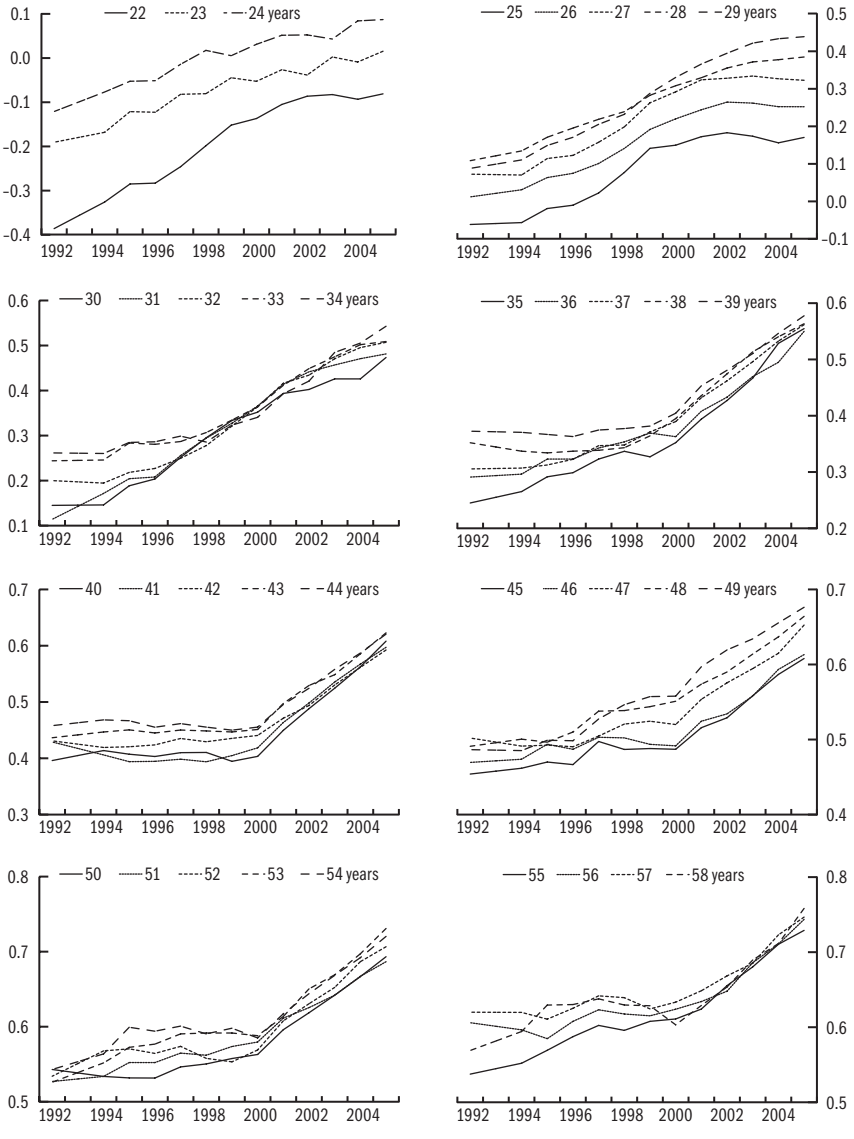
Graduate earnings

The trends of graduate earnings can be followed more accurately than unemployment thanks to the Wage-tariff surveys, which include the data of more than 1,000 graduate employers for all ages. First we examine the aggregate data without making a distinction betweens professions and sectors. The earnings advantage of each graduate cohort is measured by the b_4 coefficient of the following cross-sectional regressions:

$$\ln w_i = b_0 + b_1 \text{GEND}_i + b_2 \text{PRIM}_i + b_3 \text{VOC}_i + \sum_i b_4^i \text{AGE}_i \times \text{GRAD}_i + b_5 \text{BUDAPEST}_i + u_i, \quad (1)$$

where GEND, PRIM, VOC and GRAD stand for gender and educational attainment (primary, vocational, and graduate degree), respectively, and AGE *stands* for age. The parameters measure the relative earnings advantage of graduate cohorts to the average-aged employees with a secondary education, controlling for the significant difference between Budapest and the rest of the country on the graduate job market which we consider an equalizing differential. The regressions use the data of companies with more than 20 employees in 1992–94 and companies with more than 10 employees and the public sector between 1995 and 2005. The possible distortions of this are discussed later. The results are shown in Graph 1. The graphs plot the trend of measured earnings premium for each age-year. (The trends are estimated from time series with data from 1986, 1989 and 1992–2005 using moving average smoothing.)

Figure 5.1: Trends of earnings premiums by age, 1992–2005



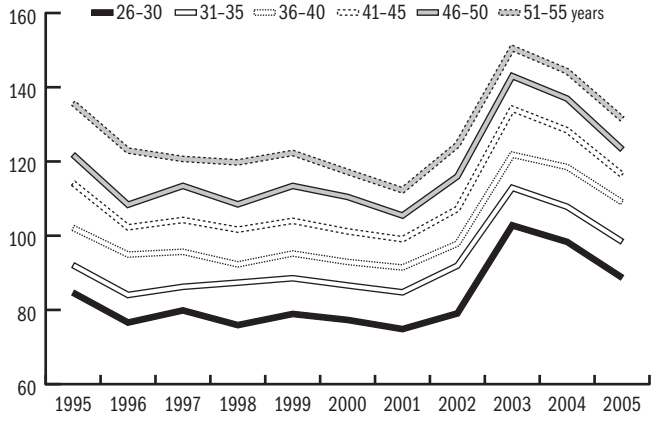
Source: Wage-tariff surveys.

The graphs clearly show that after 2000 the earnings advantage of graduates aged 30 years and over has increased even more than before. (In the 1990s the earnings of graduates aged less than 33 years grew much faster than those of older graduates.) The upward earnings trend of new entrants (see charts 1 and 2) however was interrupted in 2003–2004, and the earnings advantage levelled off for the 22–27-year-old age group. The 28–29-year-olds – similarly to older age groups – increased their earnings premium in these years as well.

For a more accurate exploration of trends we categorise the professions into five groups based on the proportion of graduates and whether the share of young persons among them increased, decreased or remained the same between 1995 and 2003. This way we distinguish three groups (ageing, stable age composition, rejuvenating), clerical professions and a residual category.[35] The average earnings for each group are given as a percentage of the national average earning.

Three major professions (medical doctors, primary school teachers and teaching staff in child care homes) are in the group of *ageing graduate professions*. Their earning position improved significantly, nearly by 20 percentage points in the period of generous redistribution before and after the elections of 2002, and deteriorated in 2004–2005. In this group the relative wages are not determined by the market forces but by statutory public sector salary scales, the earnings of the different age groups followed a similar development. This is clearly shown by the parallel graphs indicating the relative wage of each cohort throughout the period. (Graph 2)[36]

Figure 5.2: The relative earnings of graduates in the ageing group of professions between 1995 and 2005



Source: Wage-tariff surveys.

The majority of the professions in the stable age composition group are also in the public sector (secondary school teachers, academic staff in higher education, in the cultural sector, management in health care, education and government sectors) but it also includes unit managers from agriculture, construction, retailing, catering and services. The relative earnings of graduates in the graduate professions of the stable age composition group have risen notably over recent years. (See Graph 3)

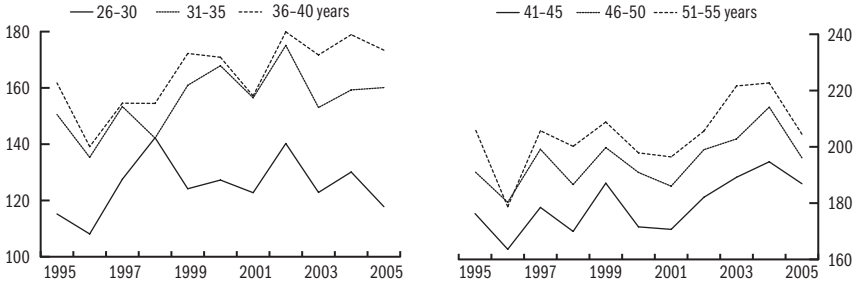
Among the rejuvenating graduate professions we find the engineers, economists, lawyers, IT professionals, highly qualified administrators and the man-

35 The exact definition of the groups of professions can be found on pages 210–213 and in the appendix of the article by *Kertesi and Köllő* (2006).

36 The graphs clearly plot the effects of the general pay-rise in the public sector in 2002.

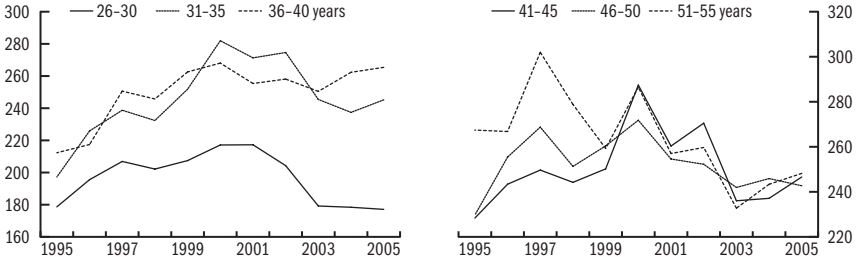
agers in the industrial, business, finance and marketing sectors. Although these jobs are the 'number one' targets of young graduates, the demand seemed more than sufficient to absorb the increasing supply: employment rates are continually high and unemployment rates fell both among younger and older graduates.[37] Nevertheless, after 2000 the expansion of employment took place with declining relative wages in each cohort. Thus in the rejuvenating graduate professions the excess demand clearly ended. However this was not manifested in difficulties in finding work but in changing prices. (see Graph 4)

Figure 5.3: The relative earnings of graduates in the professional groups with stable age composition between 1995 and 2005



Source: Wage-tariff surveys.

Figure 5.4: The relative earnings of graduates in the rejuvenating group of professions between 1995 and 2005



Source: Wage-tariff surveys.

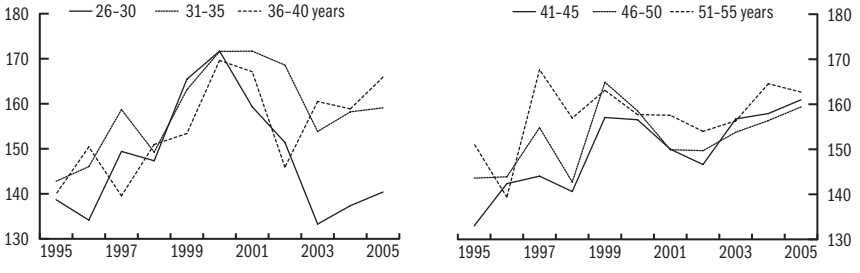
Administrative-clerical professions are the fourth group where the share of graduates increased – from 7.5% to 12.5% between 1995 and 2003. According to our estimates, one in seven new graduate jobs was created in this category, and nearly two thirds of the new jobs here were filled by graduates. The employment rate increased and unemployment decreased steadily and significantly among people with an administrative-clerical background regardless of the level of their educational attainment and age. The relative wage of fresh graduates entering these jobs grew sharply before 2000, however it fell between 2001–2003 (see graph 5). This decline affected the 31–35-year-old age group as well, while the earnings of older age groups continued to rise.[38]

37 On the employment and unemployment rates of the groups of professions see Graphs 4 and 5 in *Kertesi and Köllő* (2006).

38 It is likely that this is influenced by the access to management positions which linked to age.

In 2004 and 2005 the decline of the earnings disadvantage of the business sector increased the relative earnings of fresh graduates in clerical jobs, which now stands at approximately the 1997–98 level and is not lower than in the period preceding the expansion of higher education. The price-adjustment process, which was observed in the graduate professions of the business and clerical-administrative sectors and re-shaped the distribution among the age groups, did not take place in the public sector.

Figure 5.5: The relative earnings of graduates in the clerical-administrative positions between 1995 and 2005



Source: Wage-tariff surveys.

In conclusion, it can be argued that the earnings advantage – clearly enormous by international comparison – in the rapidly rejuvenating professions of the business and clerical-administrative sectors has diminished. The position of the fresh graduates in the public sector was significantly improved by the pay-rise in 2002. Despite the following decline, their relative earnings are still higher than in the period before the expansion of the higher education.

Higher education degrees can still be considered exceptionally good investments in Hungary taking into account the current earnings, job prospects and individual costs of education. The shrinking of the public sector, which currently employs nearly 60% of graduates, and the introduction of tuition fees are however expected to change the situation and diminish the still outstandingly high earnings advantage of graduates.

6. CHANGES OF RELATIVE WAGES AND THE COMPOSITION OF THOSE EMPLOYED IN PUBLIC EDUCATION

JÚLIA VARGA

In this section we focus on recent trends in wages in the public education sector and on the effect of relative earnings on the composition of the teaching force. Trends in wages in public education might be interesting for different reasons. First, public education has a large share in employment. During the 2000's 8 per cent of the employed and 14 per cent of the female employed worked in the public education sector.[39] Public education has a large share in public sector employment – more than a third of the public sector employed are working in public education.[40] The effect of the increase of civil servants' salaries on the composition of the teaching force might also be interesting. Finally the analysis of teachers' relative wages may contribute to the understanding of teachers' quality and of students' performance. During recent years the results of the internationally comparable students' assessments show that the performance of the Hungarian students is unfavourable[41] and the results of most of the empirical analysis show that the key determinants of students' performance are teachers' qualifications, their skills and motivation.[42] Relative wages in teaching compared to comparably qualified graduates may contribute to the decision to teach, the exit decisions of teachers and to teacher quality.

Average salaries, relative salaries

Figure 6.1 shows average wages in the public education sector between 1992 and 2004 as a percentage of average salaries. In 1992 there was a large increase in civil servants' salaries and as a consequence relative wages in public education have changed during recent years. In 1992 relative earnings in public education were 8 per cent down on average earnings. In primary and lower secondary education average earnings were 15 per cent lower while in upper secondary education relative earnings were 15 per cent higher than average earnings. Between 1992 and 1996 relative earnings in public education decreased by 10 percentage points, relative wages of those working in

39 In 2000 the share of public education in employment was 8.4 per cent; in 2001 8.1; in 2002 8.2; in 2003 8.4; in 2004 8.5; in 2005 8.3 per cent. In female employment the share of public education was 14.4 per cent in 2000, in 2001 13.9; in 2002 14.1; in 2003 14.3; in 2004 14.6; in 2005 14 per cent (Central Statistical Office LFS data).

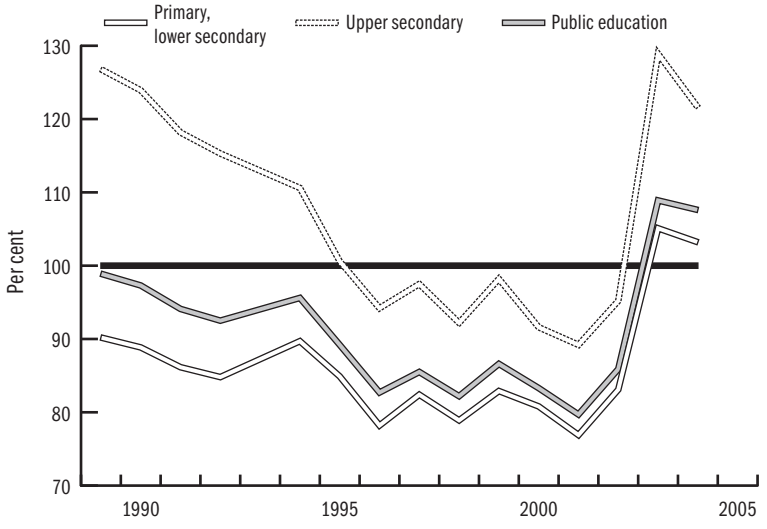
40 In 2005 36.5% (Central Statistical Office LFS data).

41 See for example*: Horváth-Környei* (2003).

42 See for example: *Rivkin-Hanusek-Kain, 2000; Darling-Hammod,* 1999.

upper secondary education by 21 percentage points and of those who were working in primary and lower secondary education by 7 percentage points. In 1997 and 1999 the relative position of public education was recovering by 1–2 percentage points but in 2001 it reached its lowest level when relative earnings in public education were less than 80 per cent of the national average. After the increase of civil servants' salaries in 2002 the average wages in public education exceeded the national average in 2003, but in 2004 the advantage moderated and by 2004 the relative position of public education was close to that of 1989. Nevertheless the relative position of those working in primary and lower secondary education in 2004 was still better than in any other year since 1989.

Figure 6.1: Relative earnings in public education, 1989–2004, %



Source: Based on data of National Employment Service Wage Tariff Surveys.

Table 6.1: Real average earnings in public education, public and business sector 2000–2004 (thousands HUF)

Year	Public education	Public sector	Business sector
2000	72.9	74.2	94.7
2001	75.4	80.3	97.2
2002	91.0	85.9	101.8
2003	122.3	115.9	100.9
2004	119.8	123.6	104.7
Change between 2000 and 2004 %	+ 64.3	+ 66.5	+ 10.5

Source: National Employment Service Wage Tariff Surveys.

Table 6.1 shows changes of real wages in public education and in the public and business sector. Between 2000 and 2002 real wages in public education

rose by more than 64 per cent which is a somewhat lower than the increase of real wages in the public sector but much higher than the increase of real wages in the business sector. It's worthwhile to note that real wages had already increased in public education by 25 per cent between 2000 and 2002, that is before the increase of civil servants' salaries, while in the business sector real wages rose by 7.5 per cent during the same period.

The composition of public education employment differs by gender, age and qualification from employment in the business sector. In public education there is a far higher ratio of female employed and there is a much higher ratio of highly qualified and older workers. Table 6.2 shows employment in public education by gender, age, educational attainment and the percentage of teaching staff among the employed. (Four educational categories are distinguished: less than upper secondary education with the maturation[43] exam, upper secondary education with the maturation exam, college and university.) Table 6.3 shows average age of the teaching force in public education by gender and qualification.

Table 6.2: Distribution of employed in public education by gender and educational attainment and their average age, 1998–2004

	1998	2001	2002	2003	2004
Female %	75.1	77.9	80.8	81.2	80.5
Average age	41.4	43.1	43.7	44.9	44.4
Highest educational attainment (%)					
Lower than upper secondary education with maturation exam (at most 11 years of education)	24.8	23.3	23.1	23.1	22.4
Upper secondary with maturation exam	19.1	11.9	11.6	11.6	11.9
College	42.2	53.0	53.5	52.5	53.1
University	13.9	11.8	11.8	12.8	12.6
Total	100.0	100.0	100.0	100.0	100.0
Proportion of teaching force among employed (%)	58.3	59.3	59.4	59.5	59.8

Source: National Employment Service Wage Tariff Surveys.

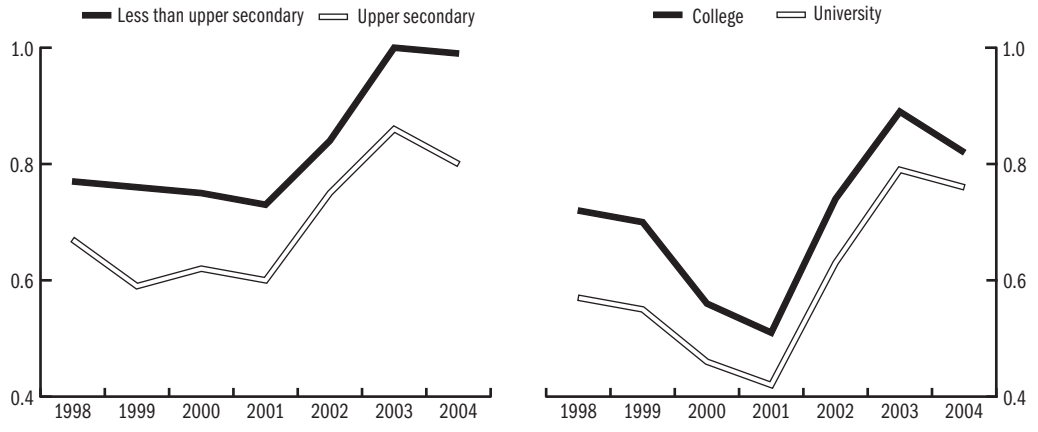
Table 6.3: Average age and highest educational attainment of the teaching force in public education, 1998–2004

	1998	2001	2002	2003	2004
Female %	79.7	81.9	82.0	82.3	80.8
Average age	39.6	41.3	41.9	42.9	42.6
Educational attainment					
Less than college	5.2	6.0	4.8	4.0	4.9
College	74.9	77.3	78.2	77.2	77.0
University	15.4	16.7	17.0	18.8	18.1
Total	100.0	100.0	100.0	100.0	100.0

Source: National Employment Service Wage Tariff Surveys.

43 Maturation exam (érettségi vizsga) is the secondary school leaving examination which is required for higher education studies.

Figure 6.2: Relative earnings in public education by educational attainment controlling for gender and experience (national average = 1), 1998–2004



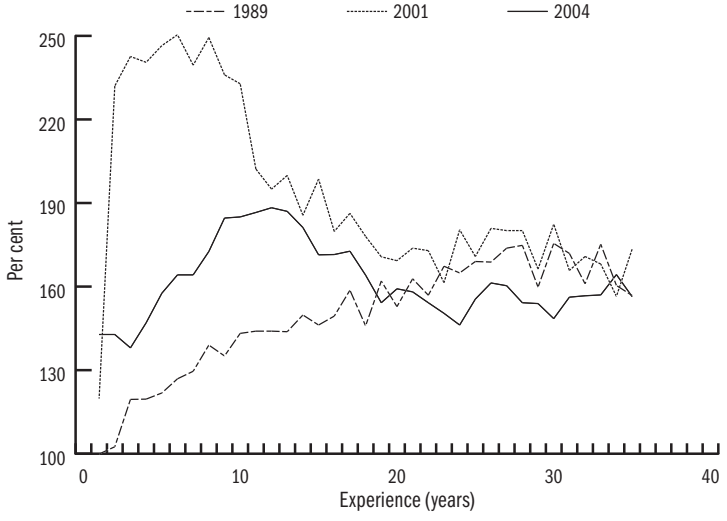
Source: Based on data of National Employment Service Wage Tariff Surveys.

Figure 6.2 displays relative earnings of employees in public education by educational categories between 1998 and 2004 controlling for gender and experience, that is it gives a picture of how the earnings of employees in the different educational categories in public education relate to similar (same gender and experience) employees in the same educational category in the whole economy. The figure shows that the low-level educated group (with less than upper secondary education with the maturation exam) had already had the best position in public education before the increase of civil servants' salaries, and after the salary increase the earnings of this group even exceeded the average earnings of employees with the same educational attainment, gender and experience. The figure also shows that between 1998 and 2002, before the increase of civil servants' salaries, the higher the educational category was the worse was the relative earnings position of those employed in the public education sector. After the salary increase the relative earnings position has improved the most of those whose highest educational attainment is college, and the relative position of those whose educational attainment is university has still been the worst. About 60 per cent of those employed in public education are working as teachers and from these less than 20 per cent have a university education, and more than three-quarters have a college education (Table 6.3). This means that the relative position of the teaching force has improved the most in public education after the salary increase for civil servants.

Figure 6.3 shows the average salary of an employee with a tertiary level qualification as a proportion of the salary of qualified teachers by years of experience in 1989, 2001 and 2004. During the transition the relative returns to higher educational qualifications increased across all experience groups, but the returns to education increased at substantially higher rates in the young

cohorts. People who graduated after the beginning of the transition were suddenly very highly valued. From 1992 and even more so from 1995 onwards the rise in returns to higher education was the highest in cohorts with 0–5 years of experience, and by the end of the 1990's, the group with 6–10 years of experience had also caught up.[44] The rise in return to formal education was accompanied by the devaluation of experience acquired under socialism – the returns to experience have declined for the older age cohorts and have increased only for the youngest cohorts. For the youngest cohorts the returns to formal education and to experience have increased as well.

Figure 6.3: Average earnings of employed with higher education qualification as a proportion of earnings of teachers by years of experience, 1989, 2001, 2004 (%)



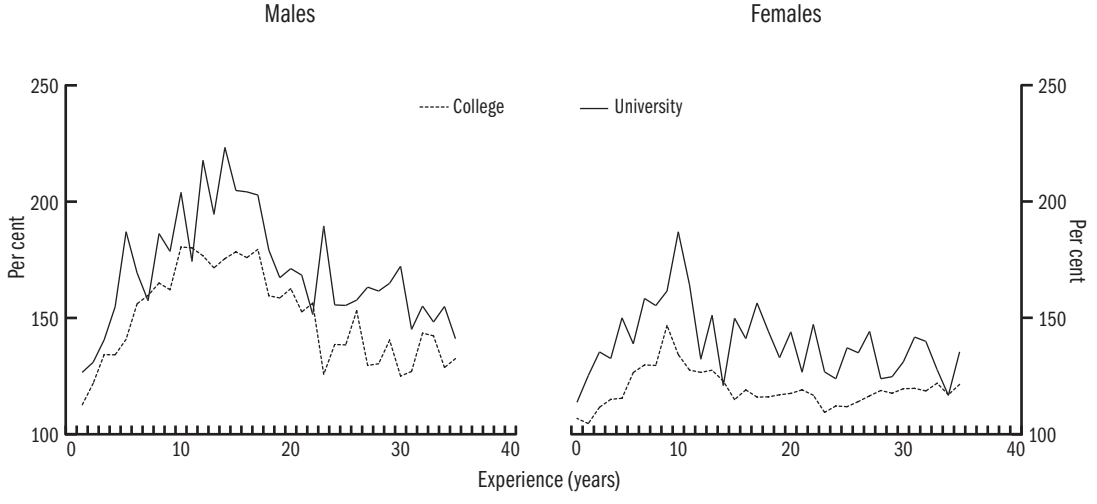
Source: Based on data of the National Employment Office Wage Tariff Surveys.

For employees working as teachers this was not the case. As a consequence of the civil servants remuneration system teachers' wages grow with experience. The figure shows that in 1989, before the transition the wage advantage of the average employee with a higher education qualification compared with teachers was the smallest at the start of their career, and was the biggest among those who had served for 25–30 years. After the transition this pattern has changed. In 2001, the difference between the average earnings of an employee with a tertiary level qualification and that of a person working as a teacher was the biggest in the groups with 5–10 years of experience; not only was the difference between teachers and non-teachers having worked for over 20 years much smaller but its increase between 1989 and 2001 was also significantly smaller than in the case of younger cohorts. Following the salary increase of civil servants earnings differences have become smaller, but they were still the biggest for the younger cohorts. Following the salary in-

44 See for example: *Köllő* (2002), *Kézdi* (2005).

crease the relative position of the older cohorts with more than 20 years of experience has improved the most and has become more favourable than before the transition. Figure 6.4 shows the average salary of an employee with a tertiary level qualification as a proportion of the salary of qualified teachers by years of experience by gender and level of higher education qualification (college/university).

Figure 6.4: Average earnings of employed with a college education as a proportion of earnings of teachers with college education and average earnings of employed with university education as a proportion of earnings of teachers with university education by gender and years of experience, 2004 (%)



Source: Based on data of the National Employment Office Wage Tariff Surveys.

Earnings differences have declined between teachers and the average but the average male employee with a university degree and 10–12 years of experience still earns twice as much as a teacher with the same characteristics and the average female employee with a university degree and 10–12 years of experience earns 1.5 as much. The salary increase has improved much more the relative position of teachers with a college degree, and even more so in the relative position of female teachers with a college degree. The difference between the wages of female teachers with a college degree and having 15–20 years of experience has practically diminished if we take account of the longer vacation for teachers. The changes seems to have little effect on attracting and retaining young graduates with a university degree in public education, but it might have an effect on retaining female teachers with a college level degree and more than 20 years of experience. In the next section we summarize basic facts regarding changes in the statistical profile of teachers. These changes also support the assumption that, due to changes in the relative position of teachers, individuals with different qualifications and ability have chosen teaching than earlier.

Changes in the statistical profile of teachers

The percentage of women among teachers continued to rise between 1989 and 2005 from 75 to 83 per cent. At primary and lower secondary level the proportion of female teachers rose from 78.5 to 88 per cent, at upper secondary level from 46.9 to 63 per cent. The increase was more substantial at upper secondary level, where, during the same period, the number of teachers also rose because of the expansion of the longer upper secondary programs which are finalised with a maturation exam. The rise in the proportion of female teachers in a period of growing demand may reflect the fact that teaching is less attractive for young male graduates just starting out on their careers. The proportion of female teachers is even higher among young cohorts. In 2004, among teachers younger than age 30, less than one third of upper secondary school teachers were men and, in the same category about 10 per cent at primary and lower secondary education.[45]

During the same period the average age of teachers also rose from 38.1 to 42.6 per cent. Another characteristic of career beginner teachers is that in upper secondary education the proportion of teachers with a college degree is growing and is higher than the proportion of teachers with a university degree. In 2001 in general upper secondary schools 52 per cent of career beginner teachers had a college degree and in 2004 71 per cent of them had a college qualification. At vocational secondary schools the proportion of teachers with a college degree rose from 58 to 70 per cent among career beginner teachers. An element of the young teachers with a college degree probably obtain a university level degree later on in their career, but these changes also support the assumption that teaching is not attractive for young graduates with a university degree even following the salary increase of civil servants. These changes may also reflect the fact that schools attempt to adjust for the increase in civil servants salaries by employing less educated and less expensive labour.

Determinants of the choice of teaching

The sharp drop in teachers' relative wages took place simultaneously with the expansion in higher education. The number of applicants and those admitted to higher education has increased steadily during the last fifteen years. It means that for prospective students the alternative possibilities for higher education studies have increased. These changes might have an effect on the composition of students who choose teacher training. Changes in the statistical profile of teachers suggest that unfavourable self-selection processes have started in the course of becoming qualified for the teaching profession. In the following we analyse these processes, with the help of two data-bases,[46] at two decision points: (1) the choice of teacher training (2) choice of teaching after graduation.

45 Based on data of ÁFSZ (National Employment Service).

46 The analysis of the decision on choosing teacher training is based on a survey of secondary school students carried out in 2000. The survey asked students about their personal and family background, their results in secondary schools, their labour market expectations and plans about further studies. For a detailed description of the survey see *Varga* (2002). The analysis of the choice of teaching after graduation is based on the follow-up of the Hungarian Higher Education Graduates Survey (FIDÉV) conducted in 2004 which requested information on the labour market success of graduates 5 or 6 years after graduation. The sample consisted of graduates who graduated in 1998 and 1999 from full time higher education We also had information on the labour market success of the graduates 1 year after graduation.

The first decision is choosing teacher training in higher education studies. The questions to be considered are – if there is a difference between students who choose teacher training and who choose other orientations in their abilities and labour market expectations and how these differences affect the probability of choosing teacher training. The second choice is to enter teaching after graduation. The question to be answered here is – if the ability of graduates' earnings that could-be earned in non-teaching occupations have an effect on the probability of a graduate working as a teacher 5 or 6 years after graduation.

The results of the first model, which describes the choice of teacher-training, are reported in Table 6.4. As for university level teacher training the results show that the ability of students has no significant effect on teacher training, that is the results do not support the assumption that less able students are more likely to choose university level teacher training. On the contrary less able students (whose "accumulated score" is less) are significantly more likely to choose college level teacher training. The results seem to support the conclusion that, through a self-selection process, for college level teacher training less able students are selected. Students who have a lower accumulated score, whose earnings-foregone are smaller, who think their probability of getting an appropriate job after finishing secondary school to be less and who expect a smaller wage-gain from higher educational studies are more likely to choose college level teacher training.

Table 6.4: Determinants of the choice of teacher training[1]

	Marginal effect dy/dx
Male	
College level teacher training	–0.052
University level teacher training	–0.072
Expected earnings gain	
College level teacher training	–0.009
University level teacher training	–0.021
Expected probability of finding a job with secondary school degree	
College level teacher training	–0.001
University level teacher training	–0.001*
Ability (accumulated score)	
College level teacher training	–0.003
University level teacher training	0.001*

1 Multinomial logit estimation with robust standard errors.
Base category: choosing university level non-teacher training programme.
The model included the following further explanatory variables: type of secondary school, educational attainment of father and mother, type of settlement where the individual is living, per capita family income, applying for cost-priced education.
Number of observations: 1477. Pseudo R^2: 0.2011
* Significant at 1 % level.

Table 6.5: Determinants of choice of teaching[1]

	Specification 1	Specification 2
	Marginal effect dy/dx	
Field specialization of diploma		
Humanities	0.0052	0.0629**
Foreign languages	0.0795	0.2012
Elementary school teacher training	0.0981	0.3224*
Natural sciences	0.0439	0.0698**
Technical, informatics	0.0138	0.0356
Law, economics	-0.0222	-0.0316**
Ability		
Admitted as a percentage of applicants at home institution in the year of application	0.2457**	0.3876*
Hours of work	-0.0003*	-0.0004*
Mother worked as teacher	-0.0213*	-0.0251*
Exp($W(T=0)-W(T=1)$)	-0.0852	-0.1548**
Prob. working as teacher at 1st observation	0.1321*	-

1 For detailed description of the model see Annex.
* Significant at 1 % level, ** significant at 5 % level.
Exp($W(T=0)-W(T=1)$is the expected wage differential for the individual between teaching and non-teaching occupation.

Table 6.5 summarizes the results of the model describing the choice of teaching following graduation.[47] Two different specifications were used. In the first a dummy variable was included indicating if the graduate was working as a teacher at the 1st observation (one year after graduation) or not. In the second specification this variable was omitted. The results show that the ability of graduates has a significant effect on the probability of an individual working as a teacher 5 or 6 years after graduation. The (in all likelihood) less able individuals, those who have graduated from a less selective institution/field specialization are more likely to work as a teacher at the 2nd observation. Using the 1st specification which included the variable indicating if the individual was working as a teacher at the 1st observation the difference between the wage that the individual could be earned in an alternative job as a non-teacher and the wages that could be earned as a teacher had no significant effect on the probability that the individual was working as a teacher at the 2nd observation. Nevertheless in estimation results of the other specification (when this variable was omitted from the model) the effect of the wage difference was significant. The aim of the estimations with the 2nd specification was to decide if the wage difference has an effect through the probability of being in a teaching position at the 1st observation and the results supported this assumption. Using the 2nd specification the wage difference also had a significant effect on the probability of an individual working as a teacher at the 2nd observation.

47 For detailed description of the model see Annex.

In summary, the results supported that there are self-selection processes in the course of less able students choosing college level teacher training and then less able graduates choosing teaching.

Appendix

Using data of the Follow-up Survey of Higher Education Graduates' Survey (FIDÉV) the decision to enter and continue teaching was analysed.

The key equation is the following which describes if the graduate is in the teaching profession at the 2nd observation or not:

$$T_t = \beta_0 + \beta_1 (\ln W_t^N - \ln W_t^T) + \beta_2 T_1 + \beta_3 \underline{X} + \mu_1, \qquad (1)$$

T_t is a dummy variable taking the value of 1 if the individual is working as a teacher at the 2nd observation, and 0 otherwise.

One of the most important explanatory variables is the difference between the wage that the individual could earn in an alternative job as a non-teacher W_t^N and the wages that could be earned as a teacher W_t^T.

T_1 is a dummy variable indicating if the individual's job at 1st observation (1 year after graduation) was as a teacher or not. (Working as a teacher – 1; 0 – otherwise.)

$\underline{X}$ vector includes the qualification of graduates (university or college level, field of study, obtaining a 2nd degree), gender, type of settlement where the individual is living, monthly hours of work, and "ability" of graduates.

We have no direct observations for ability of graduates. As a proxy for the ability problem the admission rate (admitted as a percentage of total applicants) of the home institution and field specialisation for each individual in the year of admission was used. The lower the admission rate the more selective the institution/field specialisation proved to be and applicants with "better ability" were able to gain admission, and, in contrast, the higher the admission rate the less selective the institution/field specialization proved to be and "less able" applicants were also able to gain admission.

The variable indicating if the individual was working as a teacher at first observation is clearly endogenous, so a reduced form probit equation for choice of teaching as first job was estimated and predicted values were used in estimation of equation (1) as T_1 values.

To obtain wage variables two wage equations were estimated, one using data for all current teachers and one using data for all non-teachers in the sample and the predicted values of these were taken as the wages that individuals could earn in teaching and the non-teaching state. Of course, we only observe teachers' wages for those who are working as teachers and we only observe non-teachers' wages for those who are working in other professions not as teachers. As it seems very unlikely that individuals choose teaching by accident we can not assume that wages of non-teachers are unbiased pre-

dictors for teachers' wages if they were working as non-teachers and wages of teachers are unbiased predictors of non-teachers if they were working as teachers. To allow for this selectivity a reduced form version of equation (1) was estimated omitting from the equation the wage and first job choice variable and then the inverse Mills ratios (λ) from these equations were put in the estimated wage equations, in equations (2) and (3).

$$T_t = \beta_0 + \beta_1 \underline{X} + \mu_1 \quad (2)$$

$$\ln W_t^T = \delta_0{}^T + \delta_1{}^T \underline{X}' + \sigma\rho^T\lambda + \mu_2 \quad (3)$$

$$\ln W_t^N = \delta_0{}^N + \delta_1{}^N \underline{X}' + \sigma\rho^N\lambda + \mu_3 \quad (4)$$

$\underline{X}$ includes variables indicating parent's education (two dummy variables: father worked as teacher yes=1, no=0; mother worked as teacher yes=1, no=0). These variables may influence the choice of becoming a teacher (the individual has better knowledge of a teaching career and is more or less likely to choose teaching) but have no direct effect on teachers' wages.

$\underline{X}$' also includes some variables, which are not included in the selection equation but which may have effect on wages. These variables are: experience, experience squared, type of job contract if the individual has permanent, open ended employment contract=1 or not=0).

For analysing if wage difference has an effect through the probability of the individual working as a teacher at the 1st observation estimations were repeated omitting the variable indicating that the individual was working as a teacher at 1st observation.

7. "FEMALE WORK" AND THE GENDER WAGE GAP FROM LATE SOCIALISM TO TODAY

MÁRTON CSILLAG

In spite of the equal pay for equal work guarantees inscribed in the constitutions of the socialist period and the rhetoric of emancipation for women practiced by communist governments, the gender wage gap was of a similar magnitude in socialist countries as in western societies. At the same time, gender differences in occupational distribution were even more pronounced in socialist countries than in western ones. This was due to the official encouragement of women entering the labour force in occupational categories that were considered/deemed suitable for them. Given that the "productive sphere" and physical work was given priority over services, and that this preference was translated into the centrally set wage tariff system, "women's jobs" were characterized by low wages. In essence, the gender wage gap was mostly due to institutionalized discrimination that took the form of occupational gender segregation. (For more on this see, for example, *McAuley* [1981].)

In this chapter we first take a look at changes in occupational segregation from late socialist times until today, then we examine the returns to "women's jobs", finally we document how the two above factors affected the evolution of the gender wage gap. In our analysis using the Wage Surveys of the National Employment Office, we limit the investigation to employees of medium and large companies of the business sector, and we examine two subperiods separately: 1986–1993, and 1995–2002.[48]

An analysis of the relationship between the gender composition of occupations and occupational wage differentials is not only useful for examining how patterns inherited from socialist times might still be effective. We might also look at whether the substantial rise in women's relative wages after the collapse of the socialist system was due to a shift in the occupational structure of labour demand as a result of the transition to a market economy, and in this sense was a one-time adjustment. By contrast, examining whether women have started to enter occupations previously considered as "men's" we might be able to predict whether there are trends pointing towards greater gender

48 We do not analyze the public sector as there wages are still centrally set; while based on the business sector we are able to examine the effect of the liberalization of wage setting on the gender wage gap. We excluded smaller firms, as in our analysis of gender (and occupational) wage differentials we would like to control for the fact that women and men work in different types of firms. We are only able to control for firm effects if there are at least two employees in our sample from a given firm, which we can guarantee by only including firms with at least 100 employees. Finally, we examine the two above periods separately due to a major change in the occupational coding system that occurred in 1994.

equality in the longer run. Finally, this analysis is also useful from a policy viewpoint in the sense that it will give hints as to whether public intervention is more needed in countering gender discrimination in recruitment and promotion practices or rather direct wage discrimination (meaning gender wage differentials within a given occupation and firm).

Explanations and methods

As our goal is not only to document the role of gender disparities in the occupational distribution in shaping male-female wage differentials, but also to make an attempt at figuring out whether these gender differences result from gender discrimination, we will now take a look at the three main explanations of the relationship between the gender composition of occupations and occupational wage differentials, so that these give us guidance in interpreting our econometric evidence.

The leading explanation of gender differences in the occupational distribution is the crowding theory. According to this theory women are excluded from certain occupations for which they are deemed less able, and as a consequence, there is excess supply of labour to the remaining occupations that drives wages down in these occupations. So both occupational segregation and the negative wage differential to working in "female occupations" results from employers' discriminative behaviour. The second explanation builds on gender differences in tastes and on the theory of compensating wage differentials. According to this women typically prefer some job characteristics that employers can only provide by incurring additional costs (say more flexible work schedules), and wages in female occupations are lower to compensate for this. Third, the non-random sorting of workers across occupations based on skills might also explain occupational wage differentials. If "female occupations" require lower skills, then there will be a negative payoff to working in these occupations. Providing evidence on which of these explanations might prevail is important from a public policy viewpoint: if gender differences result from differences in skills, or from differences in tastes, then we cannot firmly speak about current discrimination in the labour market, and there is no clear reason for state intervention in the labour market.

The above-discussed theories explaining the link between the gender composition of occupations and occupational wage differentials also call our attention to the problems inherent in trying to empirically measure whether female jobs are "undervalued". This is due to the omitted variables problem: if we are not able to properly measure either job characteristics or the skills of workers in different occupations, and "female occupations" systematically differ in either of these, then we will measure the link between the gender composition of jobs and their relative wages in a biased manner. To mitigate these problems, we will use a two-step procedure in which we will measure

how much of the difference in the wages of two employees who are working in different occupations, but are otherwise comparable, is due to differences in the gender composition of their jobs. (See Appendix 1 for details on the estimation procedure.)

We will look at two results of the above empirical procedure in detail. First of all, we will examine how much of the gender wage gap can be explained by gender differences in occupational composition, which we will consider as a measure of the discrimination against women that takes the form of occupational segregation. Second, we will look at the adjusted gender wage gap, that is the wage gap that remains after controlling for all observable differences between women and men, which is considered as the simplest measure of direct wage discrimination. We will calculate these two elements of the wage differences for each year analyzed, and we will also consider how changes in these two possible forms of discrimination contributed to changes in the gender wage gap between 1986–1993 and 1995–2002. (The details of decomposing the gender wage gap can be found in Appendix 2.)

Women's work and wages in late socialism

Gender segregation along occupational lines in Hungary was higher than in Western economies during late socialism, similar to that which has been documented for other post-socialist economies.[49] We found a negative relationship between the "feminization" of an occupation and its relative wages that was significant both in the statistical and economic sense. This meant that an employee in a typically female occupation earned 8 percent less than if she had worked in a male occupation. As a result, in late socialism roughly one-fourth of the gender wage gap could be attributed to occupational segregation. At the same time, a female employee earned 18 percent less than her male counterpart having the same age, schooling and occupation and working at the same firm as her.

The early period of the transition: the revaluation of "female work"

The relative wages of women increased substantially after the collapse of socialism and roughly half of this increase was due to an appreciation of female work. More precisely, even though female occupations paid slightly less than male occupations in 1993, this difference was not statistically significant. This change came about with the growth of relative wages in administrative/economic/financial jobs which were typically done by women under socialism, and this revaluation led to a 6 percentage point increase in the relative wages of women.

During this period, the proportion of female employees in the business sector increased slightly, with all of this change coming from a shift in the occupational structure of employment, as male-dominated occupations lost

49 *Blau et al.* (1998) report an index of segregation of 0.53 based on US data from the late eighties, which is lower than our results, even though they calculated this index at a much finer level of disaggregation, with more than 400 different occupations. *Jurajda* (2003) uses Czech and Slovak data, while *Ogloblin* (1999) using Russian data gets results similar to ours.

their importance to be replaced by female-dominated occupations. At the same time, gender segregation also increased slightly, which was partly due to the occupational structure tilting towards more segregated occupations, and partly to women losing ground in traditionally male occupations. All of the above evidence suggests that the improvement in the relative position of women during early transition was due to a very pronounced decrease in the demand for "male work", and not to an alleviation of the exclusion of women from certain occupations.

Table 7.1: Basic results, 1986–2002

Year	Observed female-male wage ratio	Proportion female	Occupational segregation	Female-male difference in proportion female in occupation
1986	0.738	0.401	0.595	0.441
1993	0.833	0.431	0.627	0.450
1995	0.805	0.438	0.589	0.431
2002	0.798	0.408	0.541	0.369

Note: The observed female to male wage ratio is based on monthly earnings. In order to measure occupational segregation, we use the standard dissimilarity indices:

$$D = \sum_{i}^{T} \frac{1}{2} |f_i - m_i|$$

where f_i and m_i represent the share of female and male employees in occupation (firm) i, respectively, which ranges from 0 to 1, with 1 meaning maximum unevenness. We also provide a second measure: mean differences between women and men in proportion female in occupation.

Table 7.2: Distribution of workers by gender composition of occupation (%)

Sex composition of occupation	Women	Men	All	Women	Men	All
		1995			2002	
Male	6.9	61.7	39.6	5.4	57.2	35.6
Integrated	21.8	24.2	23.2	16.5	26.0	22.1
Female	71.3	14.1	37.2	78.1	16.8	42.3
		1995			2002	
Male	8.4	59.6	38.2	11.0	58.8	40.0
Integrated	25.8	29.9	28.2	27.8	29.4	28.8
Female	65.8	10.5	33.6	61.2	11.9	31.2

Note: Occupations with up to 25% female share in employment were classified as "male", those with over 55% female share as "female", and the rest as "integrated".

The late transition period

The second half of the nineties brought substantial positive change in terms of gender differences in the occupational distribution, even though there was no further improvement in the relative wages of women. First of all, occupational segregation decreased with women starting to find pathways into professions formerly considered as male. This was not only due to the entry of

new generations with new skills and preferences into the labour market after transition, as the decrease in occupational segregation was a general phenomenon, happening within given cohorts (see Table 6.4 for evidence). Second, the negative payoffs to working in a female occupation also decreased in the second half of the nineties. Both these changes contributed to the fact that gender disparities in the occupational distribution have become a minor factor in sustaining the gender wage gap.

Table 7.3: The gender wage gap and the effect of gender composition on wages

Year	Total gender wage gap	Adjusted gender wage gap	Wage effect of occupational femaleness	Occupational composition effect
1986	–0.304	–0.205	–0.176	–0.078
1993	–0.183	–0.182	–0.033	–0.015
1995	–0.216	–0.138	–0.107	–0.046
2002	–0.227	–0.147	–0.083	–0.030

Note: The total gender gap here is the mean logarithmic difference in the monthly earnings of women and men. For a definition of the other measures, see Appendix 2.

Table 7.4: Mean difference between women and men in proportion female in occupation, by cohort

Years of experience	2002	1995	1995 cohort in 2002
0–10	0.315	0.419	0.353
11–20	0.365	0.447	0.383
21–30	0.392	0.446	0.410
31–40	0.410	0.415	0.386

Note: We used data from 1995 to calculate the proportion female in a given occupation, and calculated the gender differences within given experience cohorts. By fixing the gender composition of each occupation, we look at the effects of pure changes in occupational composition. The results presented in the fourth column are calculated by sliding the upper and lower bounds of the cohorts in time, this means for example that in the row 11–20 years of experience, we actually used 18 and 27 years of experience to define this cohort.

Female work before the introduction of anti-discrimination legislation

Finally we will use data from 2002, the last year before the introduction of anti-discrimination legislation, to examine more thoroughly whether we find evidence that might support the crowding hypothesis. To do that, we will modify the analysis in two respects. First, we will use hourly wages instead of monthly earnings as our dependent variable, which might have an effect on our results if the negative correlation between monthly earnings and the femaleness of occupations is due to women working shorter hours. Second, we will use additional occupation characteristics,[50] in order to control for equalizing differences that are related to these. These more detailed and thus

50 Additional occupational characteristics were calculated from the 2001 and 2002 waves of the Labour Force Survey. These characteristics were the following ones: usual weekly hours worked, proportion of those working with variable work schedules, proportion of those working in multiple shifts, average years of schooling, average number of years of experience, proportion of those working with a contract of limited length.

more reliable analyses could not be done for earlier years due to a lack of appropriate data.

The first step of this analysis shows that controlling for the number of hours worked does not modify results: based on monthly earnings the coefficient on the proportion female in an occupation is –0.083 (with a standard error of 0.069), while using hourly wages as a dependent variable it is –0.082 (standard error: 0.085).[51] Our second result is more substantial: we do not find evidence that occupational segregation and the negative payoff to working in feminized occupations would be the result of labour market discrimination. Our evidence shows that occupational wage differentials are more due to occupational characteristics other than feminization; after controlling for these the coefficient on the proportion female in an occupation changes to 0.027 (standard error: 0.056). Relative earnings in female occupations are low because these jobs require both lower general and specific knowledge, as well as because working hours are shorter[52] and work schedules are more flexible in these occupations.

Our analysis shows that while in late socialist times gender disparities in occupational composition were a major factor in sustaining the gender wage gap, following the transition male and female work has become less strictly defined and that working in a feminized occupation does not entail a wage penalty. In other words, currently the gender wage gap in Hungary is not due to occupational exclusion coupled with an undervaluation of female work. The gender wage gap is rather a result of women being paid less than their male colleagues in a given occupation and firm. Further research is needed in order to find out whether this is due to employers' discriminative behaviour or rather to gender differences in productivity.

Appendix

1: The estimation procedure

In order to model the relationship between the gender composition of occupations and occupation wage differentials we use a two-step procedure. In the first stage we estimate individual-level wage equations of the form:

$$w_{ijk} = G_{ijk}\alpha + X_{ijk}\beta + O_j\,\eta_j + F_k\gamma_k + v_{ijk}\,.$$

This means that we model individual wages (more precisely their natural logarithms) as a function of an individual's gender (G_{ijk}, female=1, male=0), other individual level observables (X_{ijk}: schooling, experience and its square), the firm where she is employed (F_k), and her occupation (O_j) (and v_{ijk} is an individual-specific error term). This means that we use occupation-specific dummies (O_j= 1 if the individual works in the jth occupation and O_j = 0 otherwise) to estimate occupation wage effects. We used a modified version of the three-digit occupational codes (FEOR), which results in 125 differ-

51 This is due to the fact that women in our sample work only roughly 2 hours per month less than men.

52 The fact that in our sample the number of hours worked for women is not substantially lower than for men even though the usual hours worked in female occupations is lower is probably due to this latter measure being calculated from a different sample.

ent occupations for 1986–1993 period, and 120 occupations for the 1995–2002 period.

Then, in a second stage, we regress these occupation wage effects on the proportion female (PF_j) and other occupation characteristics (Z_j):

$\eta_j = PF_j\phi + Z_j\delta + \varepsilon_j$.

Thus we estimate how much of the wage differences between two otherwise comparable individuals working in different occupations can be explained by differences in the feminization of their occupations, thus the coefficient will measure the payoff (or penalty) to "female work".

2: Decomposing the gender wage gap

Using the results of the above two-step estimation procedure we can decompose the raw gender wage gap in the following way (using m to denote males and f for females, and over bar for averages):

$$\bar{w}_m - \bar{w}_f = \alpha + (\bar{X}_m - \bar{X}_f)\beta + (\bar{F}_m - \bar{F}_n)\gamma + (\overline{PF}_m - \overline{PF}_f)\phi + (\bar{Z}_m - \bar{Z}_f)\delta.$$

In our discussion, we analyze the first and the fourth elements of this decomposition. The first element (α) is the adjusted gender gap, the difference between women and men that remains after having controlled for all observable characteristics, and which is considered as the simplest measure of wage discrimination. The fourth element is the occupational composition effect $[(\overline{PF}_m - \overline{PF}_f)\phi]$ that shows the effect of women working in larger proportions than men in feminized occupations.

We also examined how the above factors contributed to the changes in the gender wage gap in the periods 1986–1993 and 1995–2002: we shortly describe this dynamic decomposition here. Let us denote by t_2 and t_1 the ending and starting date of a given period, respectively. For simplicity, we will now assume that the vector (X) contains all observable individual characteristics (except for gender) and firm dummies, and we will forget about all characteristics of occupations except for the proportion female. Then we can decompose the change in gender wage differentials in the following way:

$$(\bar{w}_f^{t_2} - \bar{w}_n^{t_2}) - (\bar{w}_f^{t_1} - \bar{w}_n^{t_1}) = (\alpha^{t_2} - \alpha^{t_1}) + \left[(\overline{PF}_f^{t_2} - \overline{PF}_n^{t_2}) - (\overline{PF}_f^{t_1} - \overline{PF}_n^{t_1})\right]\phi^{t_2} +$$
$$+ (\overline{PF}_{\cdot}^{t_1} - \overline{PF}_{\cdot}^{t_1})(\phi^{t_2} - \phi^{t_2}) + \left[(\bar{X}_{\cdot}^{t_2} - \bar{X}_{\cdot}^{t_2})\beta^{t_2} - (\bar{X}_{\cdot}^{t_1} - \bar{X}_{\cdot}^{t_1})\beta^{t_1}\right].$$

In this decomposition, the first term is the change in the adjusted gender wage gap, the second reflects the effect of changes in the gender differences in occupational composition. The third term measures the effect of the change in returns to femaleness of an occupation, while the last term captures all additional changes.

8. EARNINGS OF HIGHER-EDUCATION GRADUATES: THE ROLE OF EDUCATION, TYPE OF EDUCATION AND UNDER/OVER-EDUCATION

PÉTER GALASI

Nowadays the labour market situation of higher-education graduates has attracted much attention. This is partly due to higher-education expansion resulting in a fast-growing higher-education output, and, thus raising the question of the devaluation of higher-education diplomas in terms of relative earnings and also the deterioration of the labour market situation of the young graduates from higher-education institutions.

Although these concerns (*Polónyi and Timár* 2001) have not been justified as yet (*Kertesi and Köllő* 2005, *Galasi and Varga* 2005), there have recently been some signs that the labour market entry of young graduates has been becoming more difficult. The number of the registered unemployed among young people with a higher-education diploma has been increasing dynamically.[53] At the same time the (ILO/OECD) rate of unemployment of the young with tertiary education attainment is low by European standards, though it has been slightly increasing,[54] and the wage premium for a higher-education diploma is quite high and increasing.[55]

Though we have information on the labour market position of young persons with the higher-education diploma, data are only available from cross-sections, therefore nothing has been known to date about their labour-market mobility. Below we will try to identify some characteristics of their earnings' mobility by using data from three surveys conducted on samples representative of the former full-time higher-education students. The first contains information on the September 1999 labour-market situation of young career-beginners who graduated from higher education as full-time students in 1998, the second one describes the September 2000 labour-market situation of persons graduated from higher education as full-time students in 1999, the third is a follow-up survey on the February 2004 labour market situation of the two cohorts graduated in 1998 and 1999. Here we will use the sample of persons employed and having non-zero observed earnings[56] at the time of both the first (September 1999 or 2000) and the second (February 2004) observation.

53 For example the proportion of young persons registered unemployed with a higher-education diploma among the young registered unemployed increased from 4.4 per cent to 11.7 per cent between 1998 and 2004 (Employment Office's data).

54 Out of 11 European countries (Denmark, Finland, Germany, Great Britain, Hungary, Italy, Norway, Poland, Slovenia, Spain, Sweden) the Hungarian unemployment rate of the 15–39 years old with tertiary education is the lowest one between 1998 and 2003 (EUROSTAT).

55 The wage premium of the employees aged 15–39 with tertiary education attainment as compared to those with high-school diploma is 72 per cent in 1998 and 86 per cent in 2004 (Employment Office's wage surveys).

56 The terms earnings, wages, pay, salary and income are used interchangeably. All these refer to monthly net (after-tax) real earnings an employee obtains on the labour market.

The sample size is relatively modest (N: 1582), and it is weighted by types of education and higher-education institutions.[57]

We focus on changes in earnings as a result of investment in human capital and education/occupation mismatch. Due to the uniqueness of the data, our analysis might produce new insights into the changing situation of the young graduates, and, consequently, usefully complement the results of the literature on the subject (especially *Galasi* [2005b], [2005c], *Kertesi and Köllő* [2005]).

At the time of the first observation (1999 and 2000) a strong and growing demand for higher-education graduates was witnessed, coupled with a quite inelastic supply, and no negative side-effect of higher-education expansion was detected. The strong demand was reflected in very high wage premia for some types of education: business/economics, informatics, and technical education. By the time of the second observation the supply of the higher education has become more elastic, the demand for young graduates might have diminished, and this might have resulted in a deteriorating labour market position of those graduates who entered the labour market with the types of education which exhibited a rapid increase in terms of the number of students during the period of transition (i. e. business/economics, law).

Earnings, education, type of education and under/over-education: the raw data

Three factors affecting earnings are considered below: education (highest degree: college and university), type of education and over/under-education. Simple two-dimensional tables will be presented. Before we proceed it is worth mentioning two problems related to the interpretation of our results. First, the two cohorts (1998's and 1999's graduates) entered the labour market in different calendar years, and their labour market position was first observed in the 15th-16th months after graduation, whereas the second observation was made in the same calendar year and month. Therefore the length of their potential labour market experience differs at the time of the second observation, thus it would be better to analyse their earnings mobility separately. The relative small sample-size however does not allow us to do so, consequently the results might contain a labour-market career-path (or life-cycle) bias. Second, a quite considerable (about 50 per cent high) one-time wage rise occurred in the public sector between the first and the second observation. About a half of the sample are employed in the public sector, thus this pay rise strongly affects the earnings mobility of the young graduates. In order to control for this measure it would be appropriate to limit our analysis to the business sector, but then – again – half of the sample would be lost, thus the effect of this one-time wage rise would not be separated from other processes affecting earnings mobility.

57 Some earlier results from these surveys are summarised in: *Galasi* 2003a, 2003b, 2005a, *Galasi and Varga* 2002, 2005.

Information about average net (after-tax) monthly wage and its standard deviation at the time of the first and second observation are reported in Table 8.1. First-observation wages are converted to 2003 prices thus the table says something about real-wage changes.

Table 8.1: First- and second-observation earnings, Gini (N: 1582)

	Mean	Standard deviation	95 % confidence interval	
First-observation earnings (in thousand forint)	68	44.3	65	70
Second-observation earnings (in thousand forint)	120	70.1	117	123
Gini coefficient				
First-observation earnings (in thousand forint)	0.287			
Second-observation earnings (in thousand forint)	0.256			

Note: first-observation earnings are converted to 2003 prices

We can detect a quite considerable increase in the average real wage – from HUF 68 to 120 thousand coupled with a lessening wage dispersion (see the values of the Gini index). The latter might be due to the one-time pay rise in the public sector since the average wage in the public sector was much lower than that of the business sector at the time of the first observation.

Not all of the employed young graduates could, however, gain in terms of real wages during the period in consideration, some of them even suffered from wage losses between the first and the second observation. This is shown in Table 8.2 where changes in the relative earnings position of young graduates are presented with the help of wage quintiles. In order to interpret the results properly, it is worth mentioning that the precision of wage estimates are relatively low because of the small sample-size and that some of the wage (im)mobility might be due to measurement error.

Table 8.2: Earnings quintile mobility (row per cent) (N: 1582)

First-observation quintiles	Second-observation quintiles					
	1st	2nd	3rd	4th	5th	Together
1st	35.1	29.0	15.3	10.0	10.6	100.0
2nd	26.3	30.3	25.9	10.9	6.6	100.0
3rd	19.3	21.0	29.6	19.4	10.8	100.0
4th	10.0	16.3	20.3	35.7	17.8	100.0
5th	7.2	9.3	9.5	23.2	50.8	100.0
Together	19.9	21.5	20.5	19.5	18.6	100.0

A quite intensive earnings mobility took place between the two observations. By inspecting the main diagonal of the table we can conclude that about one third of our graduates stayed in the same quintile, except for the fifth quintile where some half of the persons are stayers. Two thirds of persons being in the first quintile at the time of the first observation could ameliorate their earnings position, and the same holds true of 43, 31 and 18 per cent of those

residing in the second, third and fourth initial quintiles, respectively. Similarly, the proportion of downwardly mobile persons is quite high: about one fourth of those initially being in the second quintile face a deteriorating position, and this is also true for 40, 46 and 49 per cent of employees being initially in the third, fourth and fifth quintile, respectively.

The effect of education on earnings is reported in Table 8.3, where means, standard deviations and 95 per-cent confidence intervals are presented. At the time of the first observation our respondents had one college or university diploma, and university-diploma holders could then realise a quite considerable and significant wage premium (see the first panel of the table). As regards their additional educational attainment, about half of the young graduates obtained another higher education degree between the two observations. Our main question might be whether additional diplomas might have resulted or not in additional wage gains.

Table 8.3: Earnings and a higher-education degree

Higher-education degree	Mean	Standard deviation	95 % confidence interval		N	N (%)
First observation						
University	78	57.7	73	82	565	35.7
College	62	33.4	60	64	1017	64.3
Mean	68	44.3	65	70	1582	100.0
Second observation						
One university	140	91.1	130	151	282	18.0
University and AHD	143	94.7	113	174	38	2.4
University and college	111	40.7	102	119	85	5.5
Two universities	130	74.2	118	143	134	8.6
University and PhD	118	55.2	95	142	22	1.4
One college	115	73.8	109	122	483	30.9
College and AHD	102	37.7	91	112	48	3.1
Two colleges	111	49.8	105	117	267	17.1
University and college	112	52.5	105	119	205	13.1
Mean	120	70.1	117	123	1564	100.0

Note: cells with less than twenty observations are omitted (second-observation earnings)

18 and 31 per-cent of our respondents have still one college or university diploma, respectively, and the remaining half have an additional higher-education degree at the time of the second observation. The first column of the second panel of the table (wages at the time of the second observation) shows the degrees obtained and their sequence. For example the row "college – university" contains information about the wages of those having obtained first a college, and then a university diploma. The average wage of those having one or two university diplomas or a university plus a PhD degree or a university degree combined with an AHD[58] might not differ at the time of the second

58 AHDs are short (one-year-long) higher-education programmes.

observation. Moreover one university diploma produces significantly higher average wages than one college diploma, and we can arrive at the same conclusion when a college degree is combined with any other one (university plus college, college plus university, college plus AHD, two college diplomas). The results are instructive since they suggest that additional diplomas do not necessarily imply wage gains. This problem will be analysed later with the help of multivariate techniques.

We also take a look at the relationship between earnings and type of education. Due to sample-size limits we cannot distinguish here between college and university education, and we use a one-digit variant of the type of education variable (see Table 8.4).

Table 8.4: Earnings and types of education of the higher-education degree

Type of education	Mean	Standard deviation	95 % confidence interval		N	N (%)
First-observation earnings (thousand forint)						
Agricultural	66	31.3	61	70	194	12.3
Humanities	50	23.0	48	52	464	29.3
Technical	81	41.5	77	85	368	23.3
Arts	50	32.8	38	63	25	1.6
Medical	56	28.5	51	61	126	8.0
Social science	91	68.0	83	99	310	19.6
Natural science	50	23.8	45	55	96	6.0
Mean	68	44.3	65	70	1582	100.0
First-observation earnings (thousand forint)						
One degree						
Agricultural	125	59.7	112	137	85	6.3
Humanities	101	81.0	91	112	215	15.9
Technical	132	70.7	122	141	221	16.3
Arts	117	69.4	100	133	70	5.2
Medical	152	87.3	138	166	147	10.8
Social science	91	27.5	82	100	38	2.8
Natural science	110	47.1	91	128	25	1.9
Two degrees						
Humanities	88	21.1	84	91	129	9.5
Technical	125	51.9	112	137	68	5.0
Social science	149	77.9	134	163	109	8.0
Social science and humanities	104	46.0	84	123	21	1.5
Social science and technical	139	59.8	113	165	20	1.5
Agricultural and social science	121	49.4	108	134	54	4.0
Arts and social sciences	118	50.5	107	130	74	5.5
Technical and social science	131	44.2	120	143	54	4.0
Medical and social science	156	97.6	116	197	22	1.7
Mean	120	70.1	117	123	1352	100.0

Note: cells with less than twenty observations are omitted (second-observation earnings).

In Panel 1 and 2 first- and second-observation earnings are presented, respectively. As regards first-observation wages, respondents with diplomas in social sciences and technical education appear to realise the highest earnings, agricultural education does produce the second-third highest earnings, whereas the remaining types of education do not seem to differ in terms of average wages.

Panel 2 provides information on second-observation average earnings by types of education. Since several respondents obtained a second higher-education degree between the second and the first observation, many of them have two diplomas at the time of the second observation, and these degrees might be different in terms of type of education. A considerable segment of those having two degrees have an additional degree in social sciences, several of them entered the labour market with diplomas in agriculture, arts and humanities, and technical sciences. A brief inspection of the confidence intervals shows that one or two degrees with almost any type of education, and any combination of types of education might result in the same wage level. Only those with one degree in natural sciences and two degrees in arts and humanities face lower wages than the other groups.

Finally, we consider the role under/over-education might play in wage determination. Models of under/over-education assume that any job represents a schooling requirement, but employers might hire persons with different levels of schooling for any job, if they do not find the necessary number of potential employees with the required education at the going market wages. If this is the case then an employee might be under/over-educated because s/he will have more or less education than the level of education required, and this might affect his/her wage (*Chevalier* 2003, *Rubb* 2000).[59] It is worth noting that over/under-education is an everyday phenomenon on the labour market, especially among young workers who have just started their career, sometimes in low-level jobs. The distribution of the sample by over/under-education is shown in Table 8.5.

From Panel 1 we can conclude that almost half of our sample possess the required education, more than forty and less than ten per cent of them are over- and under-educated, respectively, at the time of the first observation. As for the second observation, they have, on average, a higher level of schooling, and, as a consequence, more of them are over-educated, and the number of properly and under-educated persons is lower. This change went hand in hand with a quite intensive matching mobility (see Panel 2 of the table). Some 30, and 27 per cent of the young are over- and properly educated at the time of both the first and second observation, for some 40 per cent occupation/schooling matching changed. 18 per cent of our respondents become over-educated from being at the properly educated level, and about every tenth can ameliorate their school/education matching (from over- to properly educated).

59 Over/under-education can be measured in several ways. We use *Kiker–Santos–Oliveira's* (1997) method. We assume that the recent occupation of the respondent is a good proxy for her/his job, and that modal years of education observed in a given occupation correctly represent the education requirement of that occupation. Modal years of education are then computed from the sample for each occupation, and these modal values are assigned to each respondent as years of required education. With observed and required education at hand, years of over- and under-education can also be computed.

Table 8.5: Occupation/education matching

	First observation	Second observation
Distribution (per cent)		
Properly educated	47.6	41.1
Over-educated	42.7	52.1
Under-educated	9.7	6.8
Together	100.0	100.0
Matching mobility (from first to second observation)		
Stayers		
Properly educated	27.4	
Over-educated	30.8	
Under-educated	2.4	
Movers		
Properly and over-educated	17.9	
Properly and under-educated	2.3	
Over - and properly educated	9.8	
Over- and under-educated	2.1	
Under- and properly educated	3.9	
Under- and overeducated	3.4	
Together	100.0	

Let us see now whether matching has an effect on earnings or not. We consider first matching and earnings at the time of the first observation, then we take a look at the effect of matching mobility on second-observation earnings. Results are shown in Table 8.6.

Table 8.6: Earnings and occupation/education matching

Matching	Mean	Standard deviation	95 % confidence interval		N	N (%)
First observation	**First-observation earnings**					
Properly educated	60	34.1	58	63	762	47.6
Under-educated	64	32.3	59	69	152	9.7
Over-educated	79	55.3	74	83	668	42.7
Mean	68	44.3	65	70	1582	100.0
First and second observations	**Second-observation earnings**					
Stayers						
Properly educated	108	55.4	103	114	433	27.4
Under-educated	107	55.4	89	125	38	2.4
Over-educated	133	79.1	126	140	487	30.8
Movers						
Properly and over-educated	120	63.5	113	128	283	17.9
Properly and under-educated	140	180.5	82	199	37	2.3
Over- and properly educated	122	71.9	111	133	156	9.8
Over- and under-educated	106	59.1	86	126	34	2.1
Under- and properly educated	114	48.0	102	126	61	3.9
Under- and overeducated	122	63.0	105	138	54	3.4
Mean	120	70.1	117	123	1582	100.0

Regarding first-observation earnings (Panel 1) it seems that over-education produces wage advantages, whereas the under- and properly educated might have the same level of earnings. The results of matching mobility in terms of earnings might be summarised as follows. Those who are over-educated at the time of both the first and the second observation have a significant wage advantage over those who are properly and under-educated at the time of both observations. In general, we can conclude that over-education does not result in any wage disadvantage.

Determinants of second-observation wages[60]

The second section focuses on the determinants of second-observation earnings with the help of a five-equation structural model.[61] We consider human capital (education, training, labour-market experience) and schooling/occupation matching as potentially important factors influencing wages. The key dependent variable is the natural logarithm of after-tax wage rate (hourly wage). As human capital variables, education (one- or two higher-education degrees, and their level – college, university diploma, PhD degree), type of education, non-higher-education degrees obtained and training courses completed between the two observations, and labour market experience are available.

Higher education degrees are included as a series of dummies representing the number, the level and the sequence of higher education diplomas (one college, one university degree, two college, two university degrees, university-college, college-university, university-PhD, college-AHD, university-AHD diplomas). Type of education is inserted as the possible combination of the following types: agricultural education, humanities, foreign language, minor languages, teacher training, physical education, informatics, technical education, arts, medical education, law and public administration, business and economics, natural sciences. Non-higher-education and training courses completed between the two observations are also inserted as dummies (technical education, informatics, business-economics, agricultural, medical education, teacher training, law and public administration, foreign language).

Labour market experience is represented by three dummy variables: the length of time (in months) of being unemployed, full-time student and on child-care allowance.

Both first- and second-observation occupation/education matching is measured (properly educated, over- and under-educated), and a series of dummies captures the possible combinations of the first- and second-observation states (properly, over-, under-educated at the time of both observations, properly educated – under-educated, over-educated – under-educated, etc.).

Estimation results are shown in Table 8.7. The figures are point-estimate values significant at the p=0.05 level of the regression parameters expressed in percentage from the first equation of the structural model.[62]

60 *Varga* (2006) analysing similar problems using the same samples but a different formulation and econometric techniques arrives at a similar conclusion.

61 A skeletal description of the model and its estimates appear in the appendix. Estimation results of Table 7 are from the first equation of the structural model.

62 The whole set of estimation results is presented in Table A1 in the appendix.

Table 8.7: Second-observation wage premium or penalty due to higher-education degree, types of education, matching and labour-market-career interruption (per cent)

A. Second-observation higher-education degree	
One university	32.1
University and PhD	30.0
University and AHD	29.4
Two universities	28.5
University and college	16.1
B. Matching mobility	
Over- and under-educated	–12.0
Under- and overeducated	–9.8
C. Type of education of the higher-education degree	
One degree	
Law	19.1
Informatics	17.5
Business/economics	14.4
Two degrees	
Law and humanities	43.1
Business/economics and law	42.1
Informatics	41.3
Law and business/economics	37.2
Business/economics	35.0
Business/economics and technical	29.5
Agricultural and technical	28.8
Technical	18.4
Humanities and technical	–34.4
D. Types of education of the non-higher-education degree	
Technical	–4.9
Language	152.7
E. Type of education of courses not providing any degree	
Business/economics	27.2
F. Labour-market-career interruption	
Unemployment (in months)	–1.0

Notes: Iterated 3SLS.
Dependent variable: natural log of the second-observation (after-tax) wage rate.
Only parameter estimates significant at the p=0.05 level are shown.
Reference categories:
Second-observation higher-education degree: one college degree.
Matching mobility: properly educated at the time of both observations.
Type of education of the higher-education degree: one degree in agricultural sciences.
Types of education of the non-higher-education degree: non-participation.
Type of education of courses not providing any degree: non-participation.

Panel A of the table contains information about the impact of higher-education degrees on wages. Our respondents have either one or two higher-education diplomas, the reference category is one college diploma. The cells in the Table then show the relative wage premium/penalty in percentage terms which an average young worker with given degree(s) realises as compared to those having only one college diploma. A university degree produces wage

advantages, and any higher-education degree in addition to an initial university degree (two university, university and college, university and AHD, university and PhD diplomas) results in a significant wage premium. No extra wage is detected (and for this reason these combination of degrees are not presented in the Table) for those young workers who initially had a college diploma and obtained another degree between the two observations (college and university, two college, college and AHD diplomas).

Another important question is whether the significant point-estimates differ one from another. The joint test of significance[63] suggests that this might not be the case, that is, we cannot exclude that the estimated wage premia are the same for all groups of workers. A pair wise testing of coefficients, however, reveals that two university diplomas produce higher wages than one university diploma combined with a college diploma.

We can conclude that workers having entered the labour market with a university diploma have wage advantages even at the time of the second observation over those who initially had a college degree – whether they obtained a second degree or not. Secondly, although an initial university diploma combined with any other higher-education degree implies some wage premium as compared with a college diploma with no additional degree, in most cases it does not produce higher wages than a university degree with no additional degree. All these suggest that additional higher-education degrees do not necessarily result in extra wages at least in the short term.

In Panel B of the table the impact of matching mobility on wages is shown. The reference category is the group of workers having the required education at the time of both observations. Here we have only two significant and negative parameter estimates. Matching mobility negatively affects wages in the case of workers who are first over-educated and then become under-educated, and this is so for those initially under- and then over-educated. This suggests that matching mobility influences wages only if the initial state of mismatch is replaced by another state of mismatch, a worker with the same state of mismatch at the time of both observations (over-educated – over-educated, under-educated – under-educated) does not experience any wage loss.

Significant parameter estimates for types of education are presented in Panel C of the table. Since the reference type of education is one degree in agricultural sciences, the figures show the relative wage premium/penalty in percentage terms which an average young worker with given types of education realises as compared to those having only one degree in agricultural sciences. The workers in the sample might have a maximum of two higher-education diplomas, that is, at most two different types of education, and also they might possess two diplomas with the same type of education. It seems that either one diploma with a given type of education, or two diplomas with different types of education, or two diplomas with the same type of education

63 Results of pair wise and joint parameter testing are available from the author upon request.

might produce wage advantages. For those having one diploma at the time of the second observation, law, informatics or business/economics provide a statistically significant wage premium. Respondents with two diplomas might face higher wages if they acquired their degrees in law and arts/humanities, business/economics and law, business/economics and technical sciences, agricultural and technical sciences, and also if they obtained two degrees in informatics, business/economics, and technical sciences. The only one negative parameter estimate is for the combination of arts/humanities and technical sciences. It might be worth mentioning that most of the parameter estimates are non-significant, and therefore they are not included in Table 8.7.

Here, it might also be instructive to test for the joint and pair wise equality of the significant parameter estimates. In the light of the joint test the hypothesis of equality of the parameter estimates cannot be rejected, that is, that the wage premia of all combinations of types of education do not differ. The pair wise tests of significance, however, show that respondents holding two diplomas in business/economics earn more than those with one diploma in business/economics and with two diplomas in technical sciences.

Among the courses that do not provide a higher-education degree (Panel D), or any degree at all (Panel E), we can find very few significant parameter estimates. In both cases the reference group is non-participation in such courses. If a worker participates in a program in technical sciences, they can expect a wage penalty that amounts to about five per cent, a completed language course, however, produces a huge (some 150 per cent high) wage premium (Panel D). Training courses in business/economics also provide some wage advantage (Panel E).

Out of the three dummies representing labour market experience (length of time of being unemployed, full-time student and on child-care allowance), only unemployment seems to affect earnings (Panel F). Each month of unemployment implies about a one per cent decrease in wages.

Our results can be summarised as follows. The young workers in the sample invested heavily in their human capital between the two observations by obtaining other higher-education degrees, participating in training courses, and by accumulating additional labour market experience. Some of them could ameliorate their position in terms of better job/education matching as well. All these developments, however, did not necessarily result in higher wages. An initial university diploma implies some wage premium over an initial college diploma even at the time of the second observation, and the premium remains the same whether college-diploma holders obtain another higher-education degree or not. Moreover, the second-observation wage gain attributable to a second higher-education diploma in addition to a(n initial) university diploma is not higher than the one due to a university diploma with no additional higher-education degree. Some types of and combinations of

types of education (business/economics, law, informatics, technical sciences) produce a wage advantage as compared to one degree in agricultural sciences, but these gains seem to be the same for all combinations of types of education, except for two diplomas in business/economics that result in higher earnings than one diploma in business/economics and two diplomas in technical sciences. Language courses and short-term courses in business/economics also result in wage gains. Job/education mismatch in itself does not affect earnings, only transition from one state of mismatch to another one (from over-education to under-education and from under-education to over-education) implies lower wages. As regards labour market experience, unemployment negatively influences earnings.

Appendix
A structural model for determinants of first- and second-observation earnings.

We have two observations regarding the wages of career-beginners with the higher-education diploma. Two wage equations can then be estimated. We assume that when choosing a job, our respondents consider wage rate – hours of work packages, that is, the problem of simultaneity arises regarding the estimation of the two earnings functions. In order to handle simultaneity we have to run two hours-of-work equations in addition to the two wage-rate equations, and we have to insert the wage variable into the hours-of-work equations and the hours-of-work variable into the earnings equations. We also assume that the two wages are not independent, that is initial wages have an impact on second-observation wages, therefore first-observation wages have to be inserted into the first-observation earnings equation. The working time variable is the natural log of monthly hours of work, the wage rate variable is the natural log of net (after-tax) wage rate constructed by having divided the monthly after-tax wage by the monthly hours of work.

We assume that the human capital an individual accumulated over their labour-market career might have an impact on their wages. We distinguish five elements of human capital: higher-education degree, field of studies of the higher-education diploma, types of non-higher-education degrees, types of courses not providing any diploma, labour market experience. As regards the first element, we have a dummy for the first observation (university =1, college=0), and a series of combination of higher education diplomas obtained at the time of the first and the second observation. The second one is a series of dummies representing first-observation types of education, and a series of combination of first- and second-observation types of education. Non-higher education fields of studies contain also a series of dummies covering the non-higher-education courses completed between the first and the second obser-

vation. The fourth variable comprises a series of fields of courses (in general short-term training programs) the individual attended and finished between the two observations. Finally, labour market experience is a represented by three variables capturing the length of labour-market-career interruptions (unemployment, full-time student, being on child-care leave) detected between the first and the second observations.[64] Wages might be influenced by occupation/education matching, and also changes in occupation/education matching. Therefore we have inserted dummy variables showing the first-observation (mis)match into the first-observation wage equation (over-, under-, and properly educated), and also dummy variables capturing matching mobility between the two observations into the second-observation wage equation (over-, under-, properly educated at the time of both observations, over-educated – under-educated, under-educated – over-educated, etc.). Finally, we assume that the higher-education variable in the first-observation wage equation is endogenous due to ability bias, and for this reason we estimate a fifth equation, where the dependent variable is the first-observation higher-education degree (university=1, college=0), and the explanatory variables are two proxies for ability: mother's and father's education (years of schooling).

We estimate a structural model of five equations. Most of the equations contain endogenous explanatory variables, therefore the error terms and these variables are correlated. Plus explanatory variables of some equations are at the same time dependent variables of other equations, implying that the error terms of the individual equations are also correlated. We make use of the 3SLS estimator that applies an instrumental-variable approach to consistently estimate the parameters, and uses the GLS estimator so as to handle the correlation between the error terms of the individual equations (see *Greene*, 1993, p.611).

The equations and their key variables are as follows:

1. $\log w_{t1} = f(\log h_{t1}, \log w_{t0}, S_{t1}, TE_{t1}, SP_{t1}, TR_{t1}, MM_{t1}, EXP_{t1}...)$
2. $\log h_{t1} = g(\log w_{t1}...)$
3. $\log w_{t0} = h(\log h_{t0}, S_{t0}, TE_{t0}, SP_{t0}, TR_{t0}, M_{t0}...)$
4. $\log h_{t0} = k(\log w_{t0}...)$
5. $S_{t0} = z(S_p, S_m)$,

where t_0 and t_1 indicate the first and the second observations. log*w* and log*h* stand for wage-rate and monthly working time. *S*, *TE*, *SP*, *TR*, *EXP* denote higher-education degree, type of education of the higher-education degree, type of education for a non-higher-education degree, training courses not providing any degree, and labour-market experience, respectively.

The *p* and *m* are for the father and mother of the respondent. *M* and *MM* indicate first-observation matching, and matching mobility between the

64 Labour market experience at the time of the first observation seems to be irrelevant because every single worker had then practically the same labour-market-experience length.

first and second observations. The dependent variable of the fifth equation is dummy, therefore a linear-probability model is estimated. The most important objection to this, that the predicted value of the model does not fall into the interval 0–1, is not justified in the case of our sample.

Estimation results are summarised in Table A8.1.

Table A8.1: Determinants of wages

	Dependent variable	Second-observation wage rate (log)	
Equation 1	Coefficient	z	P>|z|
Second-observation hours of work (log)	–0.9863	–10.15	0.000
First-observation wage rate (log)	–0.0170	–0.97	0.334
Female	-0.1150	–5.80	0.000
Second-observation higher-education degree			
One college	0.0000	0.00	0.000
One university	0.2782	10.01	0.000
College and university	0.0235	0.32	0.751
Two colleges	–0.0556	–0.77	0.443
College and AHD	–0.0905	–1.13	0.260
College and university	–0.0519	–0.40	0.686
Two universities	0.2506	3.25	0.001
University and college	0.1492	2.64	0.008
University and AHD	0.2575	2.88	0.004
University and PhD	0.2626	2.47	0.014
Matching mobility			
Stayers			
Properly educated	0.0000	0.00	0.000
Over-educated	0.0245	0.98	0.329
Under-educated	0.0229	0.40	0.692
Movers			
Properly and over-educated	–0.0117	–0.42	0.671
Properly and under-educated	–0.0153	–0.27	0.784
Over- and properly educated	0.0204	0.67	0.504
Over- and under-educated	–0.1276	–2.09	0.037
Under- and properly educated	–0.0255	–0.55	0.585
Under- and over-educated	–0.1030	–2.13	0.033
Type of education of the second-observation higher-education degrees			
One degree			
Agricultural	0.0000	0.00	0.000
Humanities	–0.0514	–1.03	0.303
Foreign languages	0.0260	0.39	0.693
Teacher	–0.0245	–0.44	0.658
Informatics	0.1611	2.90	0.004
Technical	0.0219	0.49	0.625
Health care	0.0403	0.62	0.538
Law	0.1751	2.34	0.019
Business/economics	0.1344	2.79	0.005
Natural sciences	–0.0590	–0.86	0.392

	Dependent variable	Second-observation wage rate (log)	
Equation 1	Coefficient	z	P>|z|
Two degrees			
Agricultural	–0.0659	–0.63	0.526
Humanities and agricultural	–0.1326	–0.49	0.623
Teacher and agricultural	–0.0894	–0.47	0.637
Technical and agricultural	–0.0576	–0.42	0.677
Health care and agricultural	–0.1421	–0.79	0.428
Business/economics and agricultural	0.3012	0.94	0.346
Natural sciences and agricultural	–0.2737	–1.31	0.190
Agricultural and humanities	0.0166	0.09	0.927
Informatics and humanities	0.0150	0.17	0.867
Humanities	–0.0363	–0.34	0.736
Foreign languages and humanities	0.0350	0.36	0.720
Teacher and humanities	0.3994	1.89	0.058
Technical and humanities	–0.0712	–0.46	0.643
Health care and humanities	–0.0045	–0.03	0.979
Law and humanities	0.3581	2.33	0.020
Business/economics and humanities	0.1765	1.36	0.175
Natural sciences and humanities	–0.0028	–0.02	0.984
Agricultural and foreign languages	–0.0595	–0.26	0.792
Humanities and foreign languages	0.0391	0.28	0.779
Foreign languages	–0.0056	–0.04	0.970
Teacher and foreign language	–0.1315	–1.00	0.316
Health care and foreign languages	0.0280	0.12	0.902
Business/economics and foreign languages	–0.0048	–0.03	0.978
Natural sciences and foreign languages	–0.0893	–0.28	0.776
Agricultural and teacher	–0.1053	–0.34	0.734
Humanities and teacher	0.0114	0.11	0.914
Foreign languages and teacher	0.0325	0.20	0.843
Teacher	–0.0075	–0.08	0.940
Technical and teacher	0.0210	0.15	0.882
Health care and teacher	0.0904	0.48	0.634
Law and teacher	0.2904	0.88	0.381
Business/economics and teacher	0.0484	0.26	0.798
Natural sciences and teacher	–0.1501	–1.19	0.234
Agricultural and informatics	0.0237	0.16	0.876
Humanities and informatics	0.0902	0.34	0.733
Foreign language and informatics	–0.1372	–0.66	0.510
Informatics	0.3454	2.25	0.025
Technical and informatics	0.0753	0.48	0.634
Health care and informatics	0.2499	1.19	0.234
Business/economics and informatics	0.0168	0.11	0.909
Natural sciences and informatics	0.0844	0.53	0.598
Agricultural and technical	0.2529	2.40	0.016
Humanities and technical	–0.4213	–2.14	0.032
Foreign language and technical	–0.1351	–0.64	0.521
Informatics and technical	0.1782	1.02	0.308

	Dependent variable	Second-observation wage rate (log)	
Equation 1	Coefficient	z	P>|z|
Technical	0.1691	1.98	0.047
Health care and technical	0.0158	0.08	0.935
Business/economics and technical	0.2584	2.27	0.023
Natural sciences and technical	0.0980	0.49	0.628
Humanities and technical	–0.0759	–0.38	0.702
Foreign language and health care	0.0417	0.13	0.896
Health care	–0.0668	–0.66	0.512
Business/economics and health care	0.0443	0.23	0.814
Agricultural and law	0.1122	0.82	0.411
Humanities and law	–0.0125	–0.12	0.907
Foreign language and law	0.0818	0.37	0.715
Informatics and law	0.2922	0.93	0.353
Technical and law	0.2611	1.65	0.098
Law	0.1307	1.35	0.175
Business/economics and law	0.3516	3.01	0.003
Natural sciences and law	–0.0256	–0.22	0.826
Agricultural and business/economics	0.1039	1.21	0.228
Humanities and business/economics	0.1366	1.36	0.175
Foreign language and business/economics	0.1565	1.43	0.153
Informatics and business/economics	0.0818	0.73	0.467
Technical and business/economics	0.1750	1.89	0.058
Health care and business/economics	0.2012	1.89	0.058
Law and business/economics	0.3160	2.62	0.009
Business/economics	0.3000	3.64	0.000
Natural sciences and business/economics	0.0795	0.68	0.494
Agricultural and natural sciences	0.1271	0.74	0.459
Humanities and natural sciences	–0.0796	–0.54	0.592
Foreign languages and natural sciences	0.0572	0.21	0.832
Teacher and natural sciences	–0.0930	–0.49	0.623
Informatics and natural sciences	0.2539	0.81	0.419
Technical and natural sciences	0.0426	0.22	0.827
Health care and natural sciences	0.1089	0.47	0.635
Law and natural sciences	–0.4133	–1.31	0.192
Business/economics and natural sciences	0.0964	0.30	0.762
Natural sciences	0.0419	0.35	0.723
Date of obtaining a second higher-education degree	0.0112	1.13	0.260
Non-higher-education degree (obtained between the two observations)			
No degree	0.0000	0.00	0.000
Technical	–0.0506	–2.33	0.020
Informatics	–0.0042	–0.11	0.912
Agricultural	–0.0013	–0.03	0.979
Business/economics	–0.0032	–0.03	0.976
Health care	0.2779	1.73	0.084
Teacher	0.0882	0.55	0.582
Law	0.4013	1.53	0.125
Foreign language	0.9272	3.10	0.002

Equation 1	Dependent variable Coefficient	Second-observation wage rate (log) z	P>|z|
Other courses attended between the two observations			
No course attended	0.0000	0.00	0.000
Technical	0.0078	0.12	0.901
Informatics	–0.0538	–0.85	0.395
Agricultural	0.1695	1.05	0.295
Business/economics	0.2410	4.37	0.000
Health care	0.0213	0.31	0.760
Teacher	0.0236	0.46	0.649
Law	–0.0098	–0.12	0.904
Foreign language	–0.0053	–0.15	0.877
Other	–0.0074	–0.12	0.902
Labour market characteristics			
Manager	0.1358	6.72	0.000
At least half a year of labour market experience abroad after having completed the first degree	0.1356	3.40	0.001
Attending a higher-education institute at the time of the second observation	0.0312	0.89	0.373
Full-time student and employee at the time of the second observation	0.0280	0.36	0.720
Length of time of being full-time student in a higher-education institute between the two observations	–0.0003	–0.13	0.897
Working with his/her first employer at the time of the second observation	–0.0102	–0.59	0.553
Number of months of unemployment between the two observations	–0.0101	–3.92	0.000
Number of months of being on child-care leave between the two observations	–0.0019	–0.79	0.429
Ownership of the firm at the time of the second observation			
State-owned and Hungarian private owner	0.0000	0.00	0.000
Non-Hungarian private owner	0.2915	12.18	0.000
Hungarian and non-Hungarian private	0.2565	7.12	0.000
Wave	0.0308	1.52	0.129
Constant	8.9202	4.46	0.000

Equation 2	Dependent variable Coefficient	Second-observation wage rate (log) z	P>|z|
Second-observation hours of work (log)	–0.9863	–10.15	0.000
Second-observation wage (log)	0.0022	0.69	0.489
Female	–0.0840	–5.08	0.000
Working as a teacher at the time of the second observation	–0.2623	–13.86	0.000
Number of months of being on child-care leave between the two observations	0.0000	–0.18	0.855
Number of months of unemployment between the two observations	0.0000	0.22	0.825

Attending a higher-education institute at the time of the second observation	–0.0009	–0.70	0.486
Full-time student and employee at the time of the second observation	–0.0017	–0.40	0.693
Ownership of the firm at the time of the second observation			
State-owned	0.0000	0.00	0.000
Hungarian private owner	–0.0018	–1.39	0.165
Non-Hungarian private owner	–0.0013	–0.80	0.426
State-owned and Hungarian private owner	–0.0018	–0.25	0.804
Hungarian and non-Hungarian private	–0.0016	–0.74	0.459
Constant	5.1378	210.59	0.000

	Dependent variable	First-observation wage rate (log)	
Equation 3	Coefficient	z	P>|z|
Second-observation hours of work (log)	–0.9863	–10.15	0.000
First-observation hours of work (log)	–0.8705	–45.11	0.000
Female	–0.0816	–3.45	0.001
Higher-education degree: university	0.2382	9.29	0.000
First-observation matching			
Properly educated	0.0000	0.00	0.000
Under-educated	0.0140	0.34	0.733
Over-educated	0.0666	2.66	0.008
Type of education of the first higher education degree			
Agricultural	0.0000	0.00	0.000
Humanities	–0.2054	–4.15	0.000
Foreign languages	–0.0474	–0.82	0.412
Teacher	–0.1618	–3.31	0.001
Physical education	–0.2651	–2.25	0.025
Informatics	0.3293	5.75	0.000
Technical	0.2011	4.80	0.000
Arts	–0.2379	–2.42	0.016
Health care	–0.0816	–1.39	0.166
Law	–0.1229	–1.77	0.077
Business/economics	0.4039	9.33	0.000
Social	–0.0631	–0.77	0.444
Natural sciences	–0.2505	–4.44	0.000
Wave	0.0575	2.39	0.017
Constant	4.5699	1.92	0.055

	Dependent variable	First-observation wage rate (log)	
Equation 4	Coefficient	z	P>|z|
Second-observation hours of work (log)	–0.9863	–10.15	0.000
First-observation wage rate (log)	0.0011	1.17	0.243
Female	–0.0822	–5.01	0.000
Working as a teacher at the time of the second observation	–0.2620	–13.96	0.000
First-observation training courses			
No course	0.0009	0.34	0.734
Technical	0.0005	0.23	0.820
Informatics	0.0000	0.00	0.000
Agricultural	–0.0003	–0.17	0.861
Business/economics	–0.0204	–7.63	0.000
Health care	0.0002	0.07	0.944
Humanities	–0.0003	–0.14	0.887
Teacher	0.0005	0.15	0.882
Law	0.0001	0.04	0.967
Foreign language	–0.0011	–0.68	0.500
Other	5.1212	48.83	0.000

	Dependent variable	First-observation higher education degree: university	
Equation 5	Coefficient	z	P>|z|
Second-observation hours of work (log)	–0.9863	–10.15	0.000
Mother's education (years of schooling)	0.0242	4.40	0.000
Father's education (years of schooling)	0.0182	2.91	0.004
Constant	–0.1841	–2.71	0.007

Equation	chi^2	P
1st	914.10	0.000
2nd	259.11	0.000
3rd	2402.25	0.000
4th	321.58	0.000
5th	64.55	0.000

N = 1324
Estimator: iterated 3SLS.

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