4. OCCUPATIONAL LABOUR MARKETS

4.1 Teacher salaries, teachers' selection and turnover
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Becoming a teacher is not a result of a single decision, but of a series of subsequent ones. Prospective teachers first have to choose teacher training as a field specialization in their higher education studies, and then, after graduating (or later) they have to decide on entering the teaching profession and continuing therein. The composition of teachers is the result of this series of self-selection processes.

How do wages affect a teacher's decision to enter and remain in the teaching role? Can teacher attrition be reduced by means of wage increases? How does an overall wage increase affects teacher attrition for different groups of teachers? The answer to these questions is of central policy importance. As teachers constitute a large proportion of public servants and as the salary costs of teachers, and other school employees make up around 80 per cent of current educational expenditures a wage increase for teachers also has importance from a budgetary respect. This chapter investigates how teachers' salaries affect the composition of teachers, more specifically, how the 2002 year public servants' wage increase effected attrition of the different groups of teachers.

Earlier research has found that teacher salaries have an effect on who chooses the teaching profession (*Dolton,* 1990, *Chevalier et al.,* 2002, *Wolter and Denzler*, 2003). For Hungary *Varga* (2007) found that the decisive factor in the choice of the teaching profession is the difference of attainable earnings between non-teaching and teaching jobs. The same study also found that there are self-selection processes at every point in the process of becoming a teacher – applying for teacher training, finding employment as a teacher after finishing higher education, and continuing teaching in the fifth and sixth years after qualifying. Those who apply for college-level teacher training have less advanced abilities than those who apply for other specialisations. The less talented graduates are more likely to take teaching jobs, and they are more likely to be found among those in their fifth or sixth year of a teaching career.

Nevertheless concerning the role of the attractiveness of higher-paying alternative occupations in teacher attrition research findings are mixed. A part of the studies found that there is a connection between teacher attrition and teachers' relative wages. *Murnane and Olsen* (1989) show that higher wages have an important influence on how long teachers stay in teaching. Similar results were presented by *Podgursky et al.* (2004); *Imazeki* (2005); *Krieg* (2006); *Ondrich et al.* (2008); *Dolton and van der Klaauw* (1995), (1999); and

Chevalier et al. (2002). Other studies found that very few teachers who leave teaching take jobs that pay more than their prior salaries as teachers. *Scafidi et al.* (2006); *Frijters et al,* (2004); and *Vandenberghe* (2000) found that a large share of teachers who leave teaching relinquish employment entirely or earn less pay in other occupations within the public sector. Other studies show that working conditions are as important in teachers' leaving decisions as relative salaries (*Hanushek et al.* (2001). *Stinebrickner* (1998) found that the role of family circumstances, such as maternity and marriage is decisive in teachers' leaving decisions. *Gilpin* (2011) found that the wage differential between a teaching and a non-teaching occupation matters only for inexperienced teachers – teachers with less than six years of teaching experience – while the work environment affects the leaving decisions of both experienced and inexperienced teachers.

This chapter is based on a study which investigated the role of wages in teacher attrition in Hungary; the differences in the effect of wages between differently aged teachers and the effect of the 2002 year salary increase on teacher attrition (*Varga,* 2013).

Data

The base data-set used in the study was a merged dataset collecting information from the Pension Directorate (ONYF), the Health Insurance Fund (OEP), the Treasury (MÁK) and the Public Employment Service (ÁFSZ). The sample was created by a fifty per cent random draw from the Hungarian population aged 5–74 in January 2002. Each individual in the sample is followed from January 2002 until December 2008 or exit from the social security system (for reasons of death or permanent emigration). Out of the base dataset a "teacher" subsample was created. All individuals who were in a teaching job for at least one month between January 2002 and December 2008 were included in the teacher subsample. We have data for 57,546 individuals. The unit of observation is the monthly status of individuals and the maximum number of observations for an individual is 84 months.

Our data contains information on demographics (age, gender), educational attainment (for those with at least one unemployment spell), employment status, occupation code, wages for the occupation codes, and transfer receipt.

Methods

For analysing, the effect of the 2002 wage increase on teacher decision to leave the profession duration models were used. Duration models estimate the conditional probability that a teacher leaves the profession given that she/he has not left it prior to the month of investigation.

First, we used *binary choice Cox proportional hazard models* (leaving the teaching profession or not), then *competing risk models*[1] that distinguish exits

1 In the Cox model the base hazard is non-parametric, no form is pre-specified for the baseline hazard, the hazards are proportional to each other, and do not depend on time, but time-dependent covariates also can be incorporated to the analysis. Censored data are handled in the Cox model: both left truncated data, that for those who work as teachers in the first observation there is no information as to how long have they worked as a teacher and the model also handles the right censored data, that we only know that the event of interest had not happened for an individual during the time that was the subject of the study, but we do not have information if it happened later.

to another occupation and exits to a non-working state. In the Cox-model, the risk given covariates are the product of the baseline hazard and a relative risk:

$$\lambda[t, x(t)] = \lambda_0(t)e^{x(t)'B(t)},$$

Where λ_0 stands for the base hazard; t for time; x for the observable characteristics of the individual. The Cox-model can allow for time-varying covariates $x(t)$. The model also handles time-dependent effects, where the coefficients are a parametric function of time $\beta(t)$, so the effects of covariates are not proportional.

A number of those who leave teaching do not go on to another job, but intentionally or non-intentionally arrive at a non-employment state: become inactive, go on to child-care pension, retire, become unemployed, etc. As the determinants of these decisions might be different from the determinants of going to a non-teaching job teacher attrition was also analysed with the help of a competing risk model (*Fine and Gray,* 1999) which distinguishes exits to a non-teaching job (NT), and exits out of active status (NF). Competing risks are present when those who are working as teachers are at risk of more than one mutually exclusive event, and the occurrence of one of these will prevent any other event from happening. In our case the individual either goes on to a non-teaching job or becomes inactive or unemployed. Competing risk models define a separate hazard function for each event: going to a non-teaching job $\lambda_{NT(t)}$ and becoming inactive or unemployed $\lambda_{NF(t)}$. The total hazard of leaving teaching is the sum of the sub-hazards.

The effect of the single, high level wage increase of public servants was analysed with the help of models where the independent variables contained dummy variables which indicated the year of the observation using 2002, on the one hand, as the reference category. On the other hand as the Cox-model makes it possible to split the data by episodes and check whether the effect of the covariates differs by episodes this method was used as well. The effect of the wage increase was also investigated using episode splitting. The public servants' wage increase came into force in September 2002. The data from January to August 2002 describe the state before the wage increase and the data from September 2002 the state after the wage increase. Thus, the data were split into two episodes and checked to determine if the effect of given covariates differed before and after September 2002

Independent variables in the analysis were: gender, age-group dummies in the models that used the whole sample, and region of residence. Regional effect may reflect different effects: the differences in local labour markets, differences in the work environment, and differences in the quality of education caused by, for instance, differences in pupils' composition or other factors. Further independent variables in the models were if the individual had worked as a teacher in primary or secondary education. The effect of wages was measured

by the (log) wages of the individual at January 2002 constant prices.[2] In addition, the monthly unemployment rate of the region of the individual's residence was also included. Finally, a dummy variable indicated if the month was September. School years begin in September and prior to that there is a long summer holiday, so it might be worthwhile to delay an exit from teaching until September and use the full the summer holiday.

Teacher attrition

Figure 4.1.1 shows the empirical Kaplan and Meier survival functions by gender and age-group.[3] The figure shows in the months observed the proportion of teachers who are still working as teachers. The figure for the whole sample shows that for those teachers who began teaching between January 2002 and December 2008 the unconditional exit rate was quite steady between 2002 and 2008. Exit rates of men and women were similar between January 2002 and September 2002, but thereafter the exit rates of men were higher than the exit rates of women.

2 We estimated also three further specifications using different measures for teachers' relative wages. The detailed estimations results are reported in *Varga* (2013).

3 Censored cases are not regarded as exits.

Figure 4.1.1: Kaplan–Meier empirical survival (remaining in the teaching profession) functions by gender and age-groups
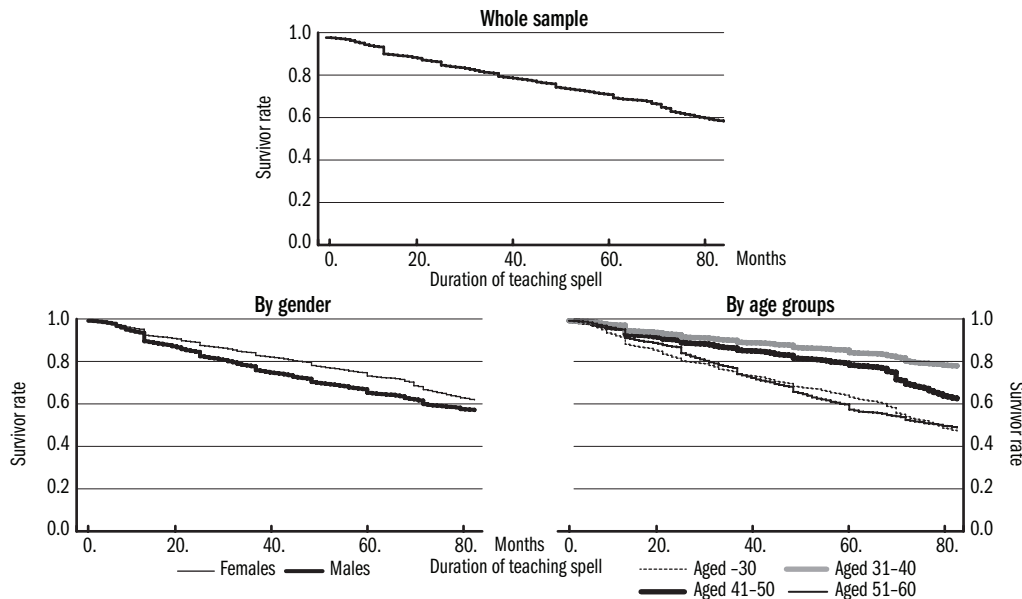
There are marked differences after September 2002. Only half of the teachers who were younger than 30 years of age and older than 51–60 remained in teaching by December 2008. Survival was the greatest among teachers who were 41–51 years of age. Exit rates of the younger and older teachers were slightly higher by January 2008 than for middle-aged teachers, but thereafter

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exit rates of the younger and older teachers accelerated. The smallest survival can be observed among young teachers.

How much do teachers earn after leaving the profession?

Table 4.1.1 shows average monthly earnings of current and former teachers one month after former teachers had left teaching at constant prices. Average earnings of former teachers are smaller one month after leaving teaching than the average earnings of those who remain in teaching posts because a large proportion of former teachers become inactive, go on to childcare pension or retire. Average earnings of former teachers who remain active and are working in a non-teaching job is higher than earnings of current teachers

Table 4.1.1: Average monthly earnings of current and former teachers
(in constant prices – 2002 January, HUF)

	All	–30 years old	31–40 years old	41–50 years old	51–60 years old	61– years old
Current teachers	149,818	106,531	130,229	169,783	192,820	159,807
All former teachers	123,480	84,294	104,286	151,043	172,909	107,529
Former teachers who remain working	152,031	113,220	138,516	170,804	181,320	104,384
Former teachers who are on child-care pension	47,348	47,030	46,858	37,013	–	–
Former teachers who are non-employed for other reasons	48,977	49,931	46,900	39.003	39,4712	43,890

There are differences *by age groups*. Inexperienced, young, former teachers, those who are younger than 30 and those who are 31–40 years of age earn more on average than those who remain in teaching. Average earning gain of former teachers is not too high at 6–7 per cent. Older teachers do not achieve any earnings gain from attrition. There is no difference between the earnings of former and current teachers for those who are 41–50 years of age. Earnings of former teachers who are older than 50 are even lower than the earnings of their counterparts who remain in teaching.

The effect of salaries and the effect of the public servants' wage increase

In September 2002 the base salary of public servants was increased uniformly by 50 per cent and, as a consequence, average real salaries of teachers increased by 20.5 per cent. Nevertheless in the subsequent years the wage increase of teachers slowed down, and then stopped, and the relative earnings of teachers began to deteriorate. (See "Teacher salaries in the public sector"; in Box 4.1.1).

Table 4.1.2 reports the results of the binary choice Cox-model split for two episodes. The table shows the sub-hazard rates. The first part of the table reports the results of the base model. The second part of the table shows the

results of the estimations where the variables in the equation were split into two episodes (months 0–9 and months 10–84), to check if there was a difference in the probability of attrition before and after the public servants' wage increase. That is, it was checked to see if the probability of attrition differed during the first eight months of the observations and during the subsequent months for teachers with certain characteristics (belonging to different age-groups; teachers teaching in secondary education as compared to teachers teaching in primary schools; male teachers as compared to female teachers). A hazard ratio greater than one implies an increased probability of attrition while a ratio less than one implies a decreased probability.[4]

Table 4.1.2: Binary choice Cox proportional hazard models
(leaving teaching profession or not) split to episodes

	Hazard rate
Base model	
Gender (Male)	1.142***
Teaching in secondary school	1.043*
Monthly unemployment rate in the region	0.926***
(log) real salary	0.693***
September	0.096***
–30 years old	2.282***
31–40 years old	1.599***
51–60 years old	3.373***
Older than 60 years	12.438***
tvc (variables in tvc equation interacted with $t < 9$)	
Gender (Male)	1.219**
Teaching in secondary school	1.219**
–30 years old	1.255***
31–40 years old	n. s.
51–60 years old	0.433***

*** Significant at the 1 per cent level. ** Significant at the 5 per cent level. * Significant at the 10 per cent level. n.s. not significant.
Other controls: Regions Reference category: Female, teaching in primary or lower secondary education, region Southern Transdanubia, another month than September, 41–50 years old.

Results of the base model show that the lower the salary of the teacher the higher the probability of attrition. Teachers who are younger than 30 leave the profession with more than twice the probability as that of teachers who are 41–50 years of age. Teachers who are 41–50 years of age remain in teaching with the highest probability compared to the other age groups. The high probability of attrition for the 51–60 years of age group and teachers who are older than 60 is due to retirement.

The results of the interactions with duration show that the effect of gender is different in months 0–9 and 10–84. The estimate shows a 21.9 per cent

4 For instance in the base model the hazard ratio of men is 1.142 indicating that the probability of leaving for men is 14.2 per cent higher than for women. Similarly a one percentage point increase in the regional unemployment rate will decrease attrition by 7.4 per cent (the hazard rate is 0.926).

larger effect in the second, post wage increase period for men and a 21.9 per cent larger effect for teachers teaching in secondary schools. There is no evidence that the effect is different for the 31–40 year old teachers in the two periods. Young, inexperienced teachers left teaching with 25.5 per cent larger probability after September 2002 than before compared to teachers belonging to the reference group – those in the 41–50 years of age group. The probability of attrition of older, 51–60 years of age teachers decreased by 56 per cent after the wage increase.

Table 4.1.3 summarizes the results of the separate competing risk models for age-groups that analysed the effect of the 2002 year wage increase with the help of dummy variables which indicated in which year was the month under observation. The reference year was 2002. The competing risk models which consider the effect of wages on multiple causes of attrition were going to a non-teaching job and becoming inactive or unemployed.

Table 4.1.3: The effect of wage increase – Competing risk models (subhazard rates).
Risks: Working in a non-teaching job/ Inactive or unemployed

	–30 years old		31–40 years old		41–50 years old		51–60 years old	
	Working in non-teaching job	Inactive or unemployed	Working in non-teaching job	Inactive or unemployed	Working in non-teaching job	Inactive or unemployed	Working in non-teaching job	Inactive or unemployed
Gender (Male)	1.511***	0.700***	2.031***	0.397***	1.707***	n. s.	1.241***	0.734***
Log real salaries	0.745***	0.670***	0.847***	0.660***	0.597***	0.464***	0.773***	0.788***
2003	0.777**	n. s.	0.760**	n. s.	0.561***	1.674***	0.920	0.864
2004	n. s.	2.355***	n. s.	n. s.	0.594***	1.769***	0.711***	0.682***
2005	n. s.	3.739***	n. s.	1.736***	0.591***	2.171***	0.676***	0.595***
2006	n. s.	3.581***	n. s.	1.884***	0.728**	2.256***	0.681***	0.234***
2007	1.667***	7.157***	1.518***	6.791***	n. s.	5.271***	n. s.	0.182***
2008	1.392***	8.258***		10.060***	n. s.	4.532***	n. s.	0.229***

*** Significant at the 1 per cent level. ** Significant at the 5 per cent level. * Significant at the 10 per cent level. n.s. Not significant.

Other control variables in the model: teaching in secondary school, monthly unemployment rate in the region, September.

Reference category: female, teaching in primary school, region Southern Transdanubia, another month than September, year 2002.

Low salaries increase the probability of moving to another job or becoming inactive. As for the effect of the public servants' wage increase: in 2003 young teachers (younger than 30), and those teachers in the 31–40 years of age group left teaching for a non-teaching job with a lower probability than in 2002. The results show no difference in the probability of attrition after 2004, compared to 2002. After 2007 young teachers left teaching with a greater probability than in 2002. The probability of becoming inactive increased after 2004 both for teachers under 30 and teachers between 31–40 years of age. Teachers who are younger than 30 became, with twice as much prob-

ability, inactive or unemployed in 2004 than in 2002, and with an eightfold larger probability in 2008. For the 31–40-year-old teachers, the probability of becoming unemployed is tenfold greater in 2008 than in 2002.

The effect of the wage increase lasted longer for older teachers and was stronger than for the young. The probability of going to a non-teaching job decreased for older teachers after the wage increase. Both the 41–50 year old teachers and the 51–60 year old teachers exited teaching for another job with lower probability from 2003 to 2006 than in 2002. The effect was the strongest for the 41–50 year old teachers. They exited teaching with a 40–45 per cent smaller probability than in 2002. The probability of becoming inactive had been decreasing for the 41–50 year old teachers from 2003. The older, 51–60 year old teachers had become inactive with a much lower probability after 2002 than in 2002.

The public sector wage increase had reduced the probability of going to a non-teaching job for young teachers only for one year. The effect lasted longer for older teachers. After the wage increase young teachers for some years went to another job and became inactive with larger probability than before the wage increase. On the contrary, older, 51–60 year old teachers had not only gone to another job with smaller probability, but they had also become inactive with a smaller probability after the wage increase. Older teachers were the group of teachers that were retained in teaching by the wage increase.

Where do teachers work after having left the profession?

To get a fuller picture of the determinants of teachers attrition it is worthwhile to summarize where teachers work after having left teaching. According to the results of earlier research (*Gilpin*, 2011) a large part of the teachers who leave teaching stay in the education sector in an administrative or non-teaching job. Our data contains information on the occupation codes of former teachers, and it is also possible from the data to identify the sector of employment of former teachers. *Table 4.1.4* shows by age-group if former teachers are working in the education sector or outside the education sector. *Table 4.1.5* shows the distribution of former teachers who are working outside the education sector by occupation group.

The majority of teachers who leave teaching remain in the education sector in Hungary too, but there are large differences between age-groups. More than 70 per cent of former teachers who are younger than 30 years of age leave the education sector and more than half of the 31–40 year old group who exit teaching go to work outside the education sector. On the contrary more than 60 per cent of older teachers remain in the education sector in non-teaching jobs. That is older teachers leave teaching for other possibilities within the education sector – administrative or management jobs. Only one-third of former teachers who are older than 41 find a job outside the education sector.

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Table 4.1.4: Distribution of former teachers
by sector of employment after attrition (per cent)

	Whole sample	–30 years old	31–40 years old	41–50 years old	51–60 years old
Working outside the education sector in non-teaching job	51.77	70.57	51.24	37.52	39.89
Working in the education sector in non-teaching job	48.23	29.43	48.76	62.48	60.11
All	100.00	100.00	100.00	100.00	100.00

Table 4.1.5: Distribution of former teachers who left education sector
by occupation group (per cent)

	Whole sample	–30 years old	31–40 years old	41–50 years old	51–60 years old
Managers	33.1	11.6	32.0	50.6	47.9
Other professionals	29.7	31.9	32.3	25.5	28.6
Clerical support workers	29.9	43.9	25.4	15.8	17.1
Service and sales workers	3.9	7.9	5.5	3.7	1.1
Elementary occupations	3.4	4.7	4.8	4.4	5.3
All	100.0	100.0	100.0	100.0	100.0

The table indicates that inexperienced former teachers who exited the education sector work not only in other professional jobs, but they also go to other employment for higher earnings. 44 per cent of former teachers who are younger than 30 years of age work as office or administrative support and about 8 per cent as service and sales workers. The majority of 31–40 year old former teachers work as managers or professionals, a quarter of them become clerical support workers, and 5 per cent of them go to service and sales jobs. More than half of the former teachers who are older than 41 become managers, a quarter of them go to other professional jobs, and 16–17 per cent of them obtain employment as clerical support. About 5 per cent of former teachers work in elementary occupations in all age groups of former teachers.

Conclusions

This chapter investigated the effect of salaries on teachers attrition. Results show that earnings matter. The lower the salary of a teacher the larger is the probability that the teacher will go to another job or becomes inactive in all age-groups of teachers, but the effect is stronger for young teachers. The majority of exiting young teachers leave the education sector and find a job outside the education sector. Teachers aged 41–50 remain in teaching with the highest probability, all other age groups find another job or become inactive with a larger probability. The public sector wage increase in 2002 did reduce attrition rates of young teachers' temporarily, but the effect disappeared as the relative earnings of young teachers began to deteriorate again thereafter.

Attrition rates of young teachers who are younger than 30 or the 31–40 year old group returned to the level where it had been before the salary increase or even worsened. Attrition rates of older teachers decreased after September 2002. In 2013, the so-called "teacher career model" was introduced in Hungary, and the base salary of teachers was increased in certain parts of the pay scale. At the same time, a number of earlier bonuses and supplements were abolished. So, we do not know yet if the total salary of teachers or certain groups of teachers has increased or decreased and how relative salaries of teachers have changed. Further analysis will be needed, when micro-level data on teacher salaries for 2013 and for the subsequent years will be available, to evaluate how the new conditioning of teacher salaries has affected the relative wages of teachers and the attractiveness of the teaching profession.

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