

# Appearing ethnic wage gap: Estonia during political and economic transition<sup>\*</sup>

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## Abstract

We analyse the ethnic wage gap in Estonia, a former Soviet republic and current EU member, which hosts a substantial Russian-speaking minority. The analysis covers a lengthy period from the final years of the Soviet Union until the first years of EU membership. We document the rise of a substantial wage gap among males in favour of the Estonian-speaking population. This result is robust with respect to controls for language skills, education, industry and occupation. The main factors causing the unexplained wage gap include different ethnicity-specific returns to education and working in the capital city. The gap for young and established workers is of equal size.

We argue that the most plausible explanations are establishment-level segregation, possibly related to sorting and screening discrimination. Unobserved human capital, related to the segregated school system, may also play a certain role.

**Jel codes:** J15, J31, J71, P36

*Key words:* wage decomposition, ethnicity, Estonia, former Soviet Union

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## 1 Introduction

Ethnic minorities have lower wages. This almost seems to be a universal fact in Europe and to a lesser extent in the US. Much of this wage differential can be explained by lower qualifications – education and language proficiency (Dustmann and Fabbri, 2003), or family background (Black et al., 2006). As an alternative explanation, macroeconomic shocks may have an asymmetric effect on different ethnic groups, for instance, in the case of restructuring and ethnic segregation across industries (Bound and Freeman, 1992) or a surge in immigration and different skill distributions across ethnic groups (Borjas et al., 1996).

However, even if we control for all the available information we have, minorities are still paid considerably less in many cases. The examples include blacks and middle eastern workers in Europe (Clark and Drinkwater, 2005; Blackaby et al., 2005; Rooth, 2007), or blacks in the southern US (Altonji and Blank, 1999; Black et al., 2006). Although lower salaries may, in principle, be compensated by lower unemployment and higher fringe benefits, the bulk of evidence suggests that the case is the opposite.

Despite a large number of studies over recent decades, the mechanisms behind the unexplained wage gap are still largely unknown. In most cases, the gap may be related to unobservable characteristics, such as ability and motivation (recent results controlling for test scores point in this direction, see Altonji and Blank (1999) for a survey). Another possible explanation is discrimination, evidence of which is found in a number of studies (Altonji and Blank, 1999; Bertrand and Mullainathan, 2004; Rooth, 2007).

Most of the previous studies use data for advanced market economies. Although these countries excel in terms of data quality and research skills, the economic environment lacks major shocks, which could be used as instruments. These analyses should be supplemented with evidence from countries that have experienced major structural changes, completely altering the roles of ethnic groups. Examples include the collapse of the former Soviet Union (where the Russian-speaking population became a minority in the new national states), and the fall of apartheid in South Africa, where the whites lost their privileged status. To a certain extent, rapidly changing roles in ethnic groups serve as a natural experiment, allowing us to shed some new light on the association between status and wages in such ethnic groups.

The limited existing evidence from former communist countries suggests that the unexplained wage gap is indeed related to problems with ethnic relations. The countries with a problematic record of ethnic relations tend to show a significant wage gap in favour of the majority (see Noorkõiv et al. (1998);

Kroncke and Smith (1999); Orazem and Vodopivec (2000) for Estonia; Bhumaiik et al. (2006) for Kosovo and Giddings (2002) for Bulgaria, Hazans (2007) for Latvia, Kahanec and Zaiceva (2008) for Estonia and Latvia). The difference is negligible in Slovenia (Orazem and Vodopivec, 2000). In the Ukraine, where ethnicity has not been an issue, the Russian-speaking minority enjoys a small wage advantage (Constant et al., 2006). However, this is not a universal outcome of a shift in power between ethnic groups. The evidence from South Africa (Allanson et al., 2002; Leibbrandt et al., 2005) suggests the opposite – the first post-apartheid decade is associated with an increasing white-black wage gap.

The current paper complements this literature. We look at ethnic wage differences in Estonia, a former Soviet republic and current member of the EU. The case of Estonia is particularly interesting because it hosts a considerable Russian-speaking minority (around 30% of the population), whose situation changed completely after the collapse of the Soviet Union. Unlike most previous studies about the transition countries, we look at the development of the wage differential during the whole transition period from the late 1980s until 2005.

We analyse the wage gap between ethnic Estonian- and minority males using the Estonian Labour Force Survey and Paths-of-a-Generation datasets. We document the rise of a substantial unexplained wage gap in favour of Estonian-speaking men around 1994. Later, the gap slightly increased to around 20% in 2003. Most of the gap is related to two components: etno-specific differences in returns to working in the capital city, and different returns to education. The gap is roughly equal for the younger (born 1975 and later) and for the older men (born before 1960). These results point toward discrimination and entry barriers for the Russian-speaking minority in the Estonian labour market, although explanations, related to education- and unobserved characteristics cannot be completely excluded.

The rest of the paper is structured as follows: in the next section we will describe Estonian institutions before- and after the transition to a market economy, and provide some background to the roles of ethnic groups. Section 3 is devoted to a description of the datasets, variables and summary statistics. Section 4 describes the empirical strategy and section 5 presents the wage gap using different subsamples and estimation techniques. In the section 6 we shed some light on a few possible explanations, including discrimination, differences in school quality, and segregation. The last two sections are devoted to discussions and a brief conclusion.

## 2 Background: Estonia since World War II

The economy in the Soviet Union was in many ways very different from the advanced market economies. Wages were set by central institutions and were not directly related to the supply and demand of skills. As a result of wage setting based on an ideology of equality, there were virtually no returns to education and other types of qualifications.

During the last years of the Soviet era, private enterprises were allowed in the form of “cooperatives”, and a major wave of privatisation began in 1992, soon after the collapse of Soviet Union. Two years later, around 50% of the former state enterprises were sold, and in 1995 the large-scale privatisation had essentially been completed with the government still controlling infrastructure-related firms (such as power plants, railways and telecoms). In 1995, Estonia experienced the first year of economic growth after a long downturn following the collapse of the planned economy. The increasingly market-oriented economy led to rapidly increasing returns to human capital.

Before the Second World War, Estonia was ethnically relatively homogenous. By far the largest group of the population of about 1 million were Ethnic Estonians (around 94%). After the War, the Soviet leadership started a forceful industrialisation campaign. A side effect of industrialisation was a steady inflow of workers, mainly Russian-speaking, from other parts of the Soviet Union. The net inflow averaged around 10 000 people annually and resulted in the population increasing to 1.57 million by 1989, about 40% of which were recent immigrants. Most of the immigrants settled in the capital Tallinn, and to the northeastern part of the country.

The large inflow of Russian-speaking workers combined with the push from Moscow led to increasing importance of the Russian language in the country. Since the 1970s, the country had two *de facto* official languages. Certain areas in the economic and public sphere, such as the army, railways and the merchant fleet were completely dominated by Russian-speaking workers. In most of the enterprises which were directly controlled from Moscow, Russian was the internal language.

Although Estonian was used in a decreasing number of fields, the language was not directly endangered in short term. Most of the curriculum at the colleges was available in Estonian, there were Estonian newspapers and magazines, Estonian radio programs and a TV channel, a large number of books was published in Estonian each year. However, the widening use of Russian caused increasing concerns about the future of the Estonian people and the language. One particular outcome of these concerns was an unwillingness to participate in the mainstream Soviet society. Estonians never felt themselves as a part

of the Soviet nation and distinguished clearly between their own, “Estonians” and the others, “Russians”. In this way these language groupings managed to co-exist in a fairly segregated country.

The tide turned during the last years of *perestroika*. The Estonian-speaking population became organized relatively quickly and grasped the opportunity to fight for more autonomy, and ultimately for independence. The Russian-speaking minority was slower and less efficient in defending their interests. The country re-gained it’s independence on 20 August 1991, during the August Coup in the USSR.

Estonian legislation prohibits discrimination on hiring and in compensation, in particular discrimination based on gender, ethnicity, race, language and religion. These principles were introduced already in the early 1990s. During the EU accession process, the country adopted the respective EU directives. However, those did not add any qualitative changes in terms of discrimination.

Segregated school system continues to exist in Estonia. However, now the political interest in teaching Estonian to Russian-speaking children has increased a lot while Estonian schools can opt out of teaching Russian altogether. In this way, knowledge of Estonian among the Russian-speaking population has vastly improved while the younger Estonian generation has more and more difficulties understanding Russian.

The relationship between the two main ethnic groups has mostly been “normal” though somewhat tense in periods. Most notably, the tensions exploded to large-scale riots in Tallinn in spring 2007. In everyday life, the ethnic groups are largely living on their own with a limited inter-ethnic contact. The separate worlds are also reflected in media which may present quite different viewpoints depending on the language (Korts and Kõuts, 2002).

### **3 Data**

#### *3.1 Data sources*

We exploit two different data sets, one of which excels in terms of sample size while the other allows us to observe income back as far as 1987 and to verify the results using an independent data source.

### *Estonian Labour Force Survey*

The Estonian Labour Force Survey (ELFS) was first conducted in 1995. The first wave includes a retrospective part where labour market history as far back as 1989 is also observed. The next survey was conducted in 1997 and thereafter the survey was conducted as an annual cross-section until 2000. Since that year, the survey was shifted to a rotating panel sampling scheme conducted quarterly. The different waves include mostly similar information, although the details may vary. The number of annually sampled individuals varies between around 5,000 (1997 wave) and 16,000 (from 2000 onwards), resulting to around 3,000 males annually with a positive income.

The ELFS sample includes permanent residents aged between 15 and 74. The 1995 sample of the ELFS was based on the 1989 nationwide census database. Hence, it does not include people, who arrived in, or left Estonia between 1989 and 1994. For the latter years, the sample is based on the data from the Population Register.

### *Paths of a Generation*

(PG) is a panel study of high school graduates from 1982 (Titma and Tuma, 1995). We exploit the data from three waves – 1987, 1992 and 1997. The sample size is around 2,100 for the individual waves and around 600 males have current wage information. The 1987 wave has issues with sample selection. The respondents are around 22 years old, and hence most of those who went to college do not yet have a regular job. Income for that year is based on individuals without a completed college degree.

In this paper we focus on the ELFS results. The PG based results are briefly discussed in section 5.

### *3.2 Sample selection and Variables*

We limit ourselves to males in order to avoid complications, related to modelling intra-family labour supply decisions. In the case of ELFS, we choose individuals between 20 and 60 years old. In the case of PG, we do not impose any additional age restrictions as the sample is already age-homogenous.

Both datasets allow us to control for personal characteristics and human capital variables, such as age, education and family status, which are commonly used in similar studies. Below, we discuss the most important variables of this study; the complete list of the variables is given in Appendix A.

Information on ethnicity is based on a question about the respondents' *ethnic nationality*, present in all the waves of the ELFS and PG. In most cases, this means which ethnic group the individuals identify themselves with. Usually, the identification is language based, although it may differ in certain circumstances, as for individuals born in multi-lingual families. This variable only allows us to distinguish between Estonian and non-Estonian workers. However, as by far most of those who are not Estonian-speakers use Russian as their first language, we call them "Russian-speaking" or "minority" below.

We use the monthly salary on the main job as the income variable. The way this information is collected is changed several times during the period of observation. For 1989 and 1992-1994, "salary in autumn" is reported. In 1989, it was paid in Soviet roubles, later in Estonian kroons. During the next wave, "salary" in January 1995, October 1995, October 1996 and January 1997 was reported. Thereafter, the net salary in the previous January, October and current January is reported. As the survey was changed from an annual to quarterly event in 2000, and the "last net salary of the main job" is reported from 2000 on. The switch from gross to net income in 1997 decreases the income gap estimate somewhat, as the Estonian tax system is slightly progressive<sup>1</sup>. We expect the possible bias from these structural breaks not to be of major concern as they supposedly affect the data in the same way for both Estonian-speaking and minority workers.

Both datasets include self-reported information on language skills. In ELFS, it is reported whether the respondent is able to write and speak (coded as 1), speak (code 2), or simply understand (code 3) the language. We denote the corresponding variables *langEE1–langEE3* for Estonian- and *langENG* (all 3 levels combined) for English skills. PG has analogous 5-level coding. Language information is extremely relevant while controlling for the ability of Russian-speaking individuals to work in an Estonian-speaking environment. We admit that self-reported information on language skills may be biased, however, we still argue that such a multi-level descriptive information is not too far from the truth.

We include a dummy for *immigrant status*, which we define as moving to the country at age 8 or above. Hence we call "immigrants" those individuals who started their schooling outside the country.

PG allows to use a few less common controls for family- and individual-specific human capital. It includes math grades at the end of primary school<sup>2</sup>, fathers'

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<sup>1</sup> Estonia introduced a flat tax rate of 26% in early 1990s. The rate has later been lowered to 24% and further to 23%. However, due to tax exemption (which has been increased several times), the tax system is in fact slightly progressive.

<sup>2</sup> Unfortunately, the grades are not calibrated at the national level and hence it is rather a measure of relative performance at the corresponding school.

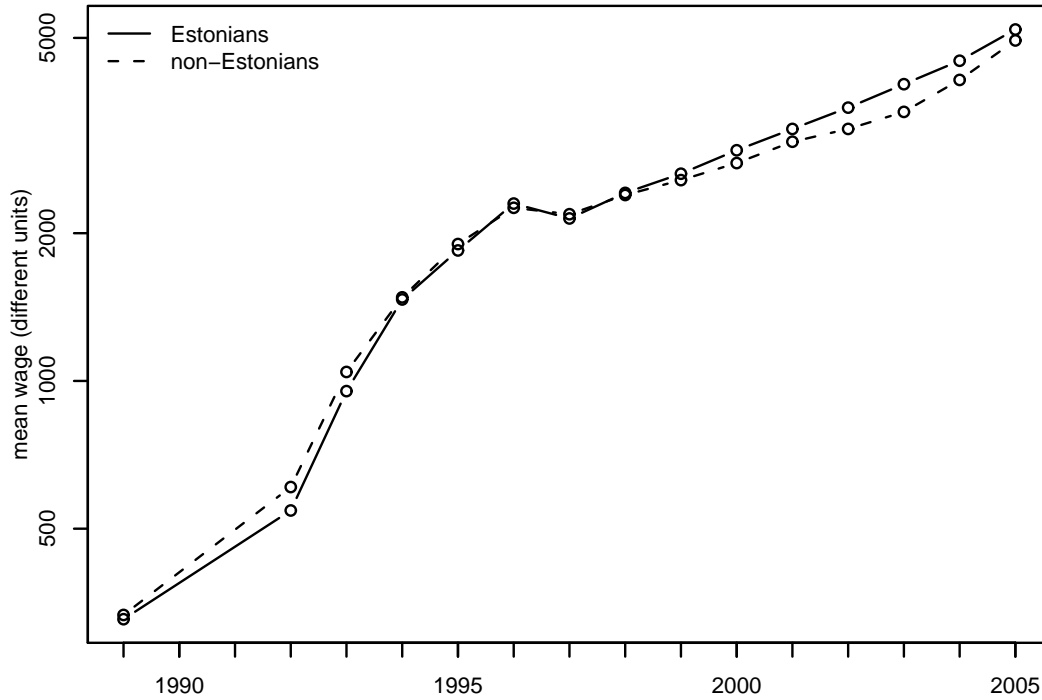


Fig. 1. Mean wage across ethnic groups. ELFS data. 1989 wage is measured in Soviet roubles, later Estonian kroons. Gross wage until 1996, net wage since 1997.

education and the exposition at Estonian and Russian languages at work.

### 3.3 Descriptive statistics

Sample averages, based on ELFS data, reveal that the mean wage for non-Estonians was slightly above that of Estonians during the time of the most rapid transition 1992-1994 (Figure 1). After that period, the advantage turned increasingly in favour of ethnic Estonians. However, the difference seems to be contracting toward the end of the period.

Averages of the selected explanatory variables are presented in Table 1. The full table can be seen in the Appendix (Table B.1).

These tables reveal several interesting facts. The age distribution seems to be virtually equal for both ethnic groups, although the Russian-speaking population consists largely of immigrants. The proportion of workers with a college degree is fairly close. However, there are more Estonian-speaking individuals without a high-school degree. Males of the majority group are clearly better at speaking English while the trend is upwards for both ethnic groups. Knowledge of Estonian is also improving among the Russian-speaking population, although at a slower pace than that of English. Around 10% of the

Table 1  
Means of the selected variables

	1989	1994	1999	2001	2003	2005
<i>college degree E</i>	0.16	0.17	0.15	0.14	0.14	0.15
<i>college degree R</i>	0.15	0.16	0.13	0.12	0.12	0.16
<i>Capital E</i>	0.30	0.34	0.23	0.23	0.23	0.27
<i>Capital R</i>	0.49	0.51	0.36	0.38	0.36	0.43
<i>langEE1 R</i>	0.07	0.08	0.11	0.11	0.11	0.16
<i>langEE2 R</i>	0.11	0.11	0.15	0.13	0.15	0.16
<i>langEE3 R</i>	0.16	0.17	0.16	0.16	0.21	0.24
<i>langEE Home R</i>	0.10	0.09	0.13	0.10	0.10	0.09
<i>langENG E</i>	0.22	0.28	0.30	0.37	0.41	0.45
<i>langENG R</i>	0.10	0.13	0.14	0.19	0.16	0.24
<i>immigrant R</i>	0.57	0.49	0.38	0.36	0.32	0.27
<i>manufacturing E</i>	0.19	0.18	0.24	0.24	0.32	0.27
<i>manufacturing R</i>	0.37	0.26	0.29	0.37	0.32	0.31
<i>publadm E</i>	0.04	0.06	0.08	0.10	0.10	0.09
<i>publadm R</i>	0.04	0.04	0.03	0.04	0.04	0.04
<i>manager E</i>	0.14	0.18	0.14	0.14	0.12	0.13
<i>manager R</i>	0.12	0.11	0.09	0.06	0.06	0.08
<i>professional E</i>	0.10	0.08	0.08	0.08	0.10	0.08
<i>professional R</i>	0.07	0.06	0.04	0.04	0.05	0.05
<i>craft E</i>	0.28	0.24	0.25	0.25	0.24	0.25
<i>craft R</i>	0.42	0.39	0.39	0.40	0.40	0.37

Notes: ELFS data. *E* stands for Estonian-speaking, *R* for Russians-speaking workers.

non-Estonians speak Estonian at home, here no trend is visible. The regional variables depict a well-known pattern – there are virtually no Russian-speaking people in the south-eastern part of the country, while almost the opposite is true for industrial northeast. The capital Tallinn contains roughly 25% of the Estonian-speaking and slightly above a third of the Russian-speaking workforce. Russian-speaking males are over-represented in mining, manufacturing, energy and logistics sectors, while Estonians dominate in agriculture, trade, public administration (since mid 1990s) and education. There are more professionals and managers among Estonians; Russians dominate craft- and related occupations.

## 4 Wage decomposition model

We decompose the average wage differential between ethnic Estonians and non-Estonians using Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973). We ignore selection into wage employment (look at the discussion in Section 6).

Assume the log wage of individual  $i$  can be written as

$$\log w_i^g = \beta^{g'} \mathbf{X}_i + \gamma^{g'} \mathbf{Z}_i + \varepsilon_i \quad (1)$$

where  $w$  is the wage.  $\mathbf{X}$  and  $\mathbf{Z}$  are vectors of individual characteristics where we distinguish between the explanatory variables, common for both groups ( $\mathbf{X}$ ) and group-specific variables ( $\mathbf{Z}$ ). The leading examples of  $\mathbf{Z}$  include Estonian language skills as virtually all ethnic Estonians are fluent in Estonian.  $\beta$  and  $\gamma$  are corresponding parameter vectors and  $\varepsilon$  is a random error, distributed independently of  $\mathbf{X}$ . Index  $g$  indicates the ethnic group. We denote the groups by  $E$  (Estonian) and  $R$  (Russian).

Let the upper bar denote the sample average of the corresponding variable and hat the parameter estimate. The difference between group specific average wages can be decomposed as follows:

$$\begin{aligned} \overline{\log w^R} - \overline{\log w^E} &= \hat{\beta}^{E'}(\bar{\mathbf{X}}^R - \bar{\mathbf{X}}^E) + (\hat{\beta}^{R'} - \hat{\beta}^{E'})\bar{\mathbf{X}}^R + \\ &\quad + (\hat{\gamma}^{R'}\bar{\mathbf{Z}}^R - \hat{\gamma}^{E'}\bar{\mathbf{Z}}^E) \quad (2) \\ &\equiv \Delta_X + \Delta_\beta + \Delta_Z. \quad (3) \end{aligned}$$

The first component,  $\Delta_X$ , captures the mean wage difference caused by differences in common individual characteristics, such as age or education;  $\Delta_Z$  are the differences caused by explanatory variables not present for the other group and  $\Delta_\beta$  are differences, caused by different valuations of common skills. The standard errors for each of the components can be calculated by the delta method. Although the decomposition can be performed using the  $\bar{\mathbf{X}}^E$  instead of  $\bar{\mathbf{X}}^R$  in the term  $\Delta_\beta$  as well, in this study we use the minority-specific explanatory variables  $\bar{\mathbf{X}}^R$  for the reference. This specification answers the question – what would the wage of the minority workers be, given their current characteristics, if these were valued in the same way as for Estonian-speaking workers.

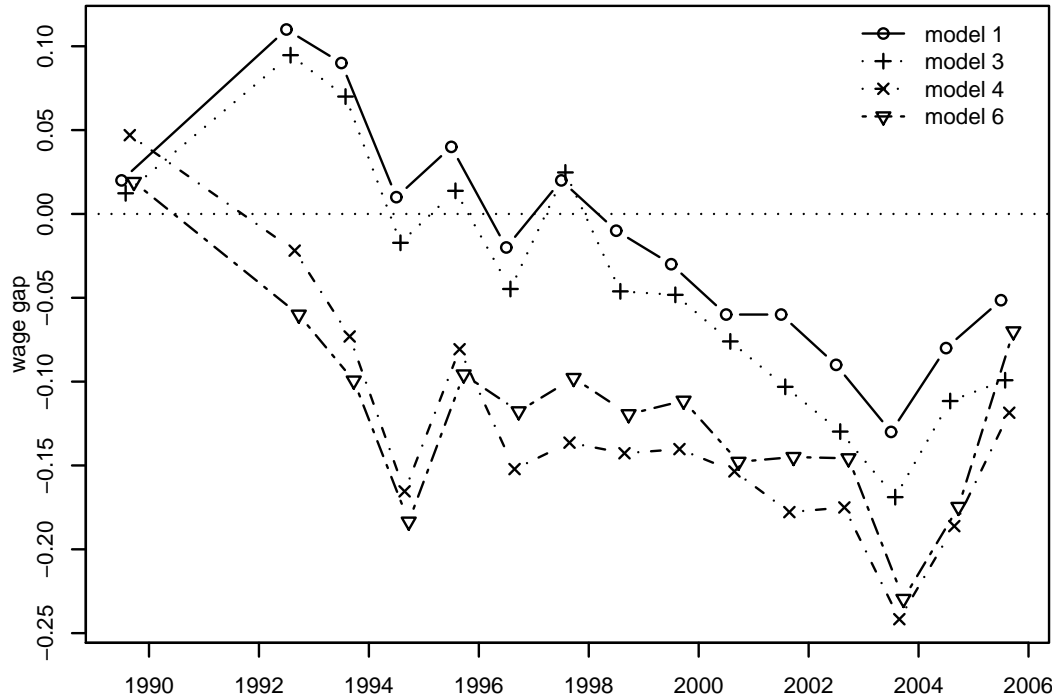


Fig. 2. Unexplained wage differential in favour of ethnic Russians ( $\Delta_\beta$ ). Selected models.

## 5 Results

### 5.1 The general trend

We estimate the models independently for each year we have wage data for, and for various sets of control variables. We present the resulting unexplained differences ( $\Delta_\beta$ ) for selected years in Table 2.

We also depict the behaviour of  $\Delta_\beta$  in Figure 2. The figure reveals a steady negative trend in the wage gap since the early period of transition. This development seems to reverse in 2003. The trend is similar for most of the period for all models; however, the initial development during the early 1990s differs. The difference between the models decreases over time, but remains visible until the end of the period of observation.

The Russian-speaking workers earned somewhat more on average in the early 1990s (Model 1). The initial advantage turned into a disadvantage 6–8 years later. Controlling for age and education (Model 2) makes the wage differential look slightly more negative (this effect is almost solely related to education, see below). Adding controls for immigrant status and family structure (Model 3) further decreases the unexplained wage gap. The most important explanatory

Table 2  
Unexplained wage differential in favour of ethnic Russians ( $\Delta_\beta$ ).

year	Models					
	1	2	3	4	5	6
1989	0.020	0.018	0.055	0.090	0.094	0.043
	<i>0.030</i>	<i>0.027</i>	<i>0.054</i>	<i>0.057</i>	<i>0.058</i>	<i>0.067</i>
1993	0.090*	0.087*	0.037	-0.069	-0.035	-0.108
	<i>0.030</i>	<i>0.030</i>	<i>0.055</i>	<i>0.056</i>	<i>0.056</i>	<i>0.058</i>
1994	0.010	-0.000	-0.072	-0.189*	-0.155*	-0.199*
	<i>0.030</i>	<i>0.029</i>	<i>0.053</i>	<i>0.056</i>	<i>0.056</i>	<i>0.057</i>
1997	0.020	0.020	-0.073*	-0.180*	-0.140*	-0.141*
	<i>0.020</i>	<i>0.016</i>	<i>0.026</i>	<i>0.029</i>	<i>0.029</i>	<i>0.027</i>
2000	-0.060*	-0.055*	-0.113*	-0.204*	-0.158*	-0.197*
	<i>0.030</i>	<i>0.025</i>	<i>0.037</i>	<i>0.050</i>	<i>0.050</i>	<i>0.048</i>
2002	-0.090*	-0.099*	-0.165*	-0.207*	-0.166*	-0.171*
	<i>0.030</i>	<i>0.028</i>	<i>0.037</i>	<i>0.044</i>	<i>0.045</i>	<i>0.045</i>
2003	-0.130*	-0.132*	-0.213*	-0.272*	-0.225*	-0.258*
	<i>0.020</i>	<i>0.022</i>	<i>0.029</i>	<i>0.038</i>	<i>0.038</i>	<i>0.037</i>
2004	-0.080*	-0.075*	-0.174*	-0.242*	-0.198*	-0.206*
	<i>0.020</i>	<i>0.023</i>	<i>0.029</i>	<i>0.040</i>	<i>0.040</i>	<i>0.039</i>
2005	-0.051*	-0.052*	-0.150*	-0.167*	-0.126*	-0.108*
	<i>0.024</i>	<i>0.021</i>	<i>0.027</i>	<i>0.035</i>	<i>0.035</i>	<i>0.035</i>
	Controls					
constant	✓	✓	✓	✓	✓	✓
age		✓	✓	✓	✓	✓
education		✓	✓	✓	✓	✓
family			✓	✓	✓	✓
immigrant			✓	✓	✓	✓
region				✓	✓	✓
language					✓	✓
industry						✓
occupation						✓

Notes: \* – statistically different from 0 at the 5% level. Standard errors in italics.

variables are regional controls (model 4), making the wage gap between 5 and 10 percentage points more negative for most years. This fact is mostly related to wage rates in the capital, Tallinn, where Estonian-speaking workers enjoy much larger wage premiums than minority workers. However, the importance of regional controls is fading – in 2005 these explained only 1.7 percentage points of the differential. Part of the wage gap is explained by language skills (model 5), making the unexplained part by 2-4 percentage points less negative. The last set of controls we add – industry and occupation – shows the situation in a slightly paler light; however, the difference is tiny.

We can conclude that Russian-speaking workers are apparently earning less. However, this is not because they are employed in worse industries and located in worse regions, but rather the other way around. Unfortunately, their gain from more favourable characteristics remains smaller than that for the ethnic majority. The only significant disadvantage in the characteristics of the minority population we are able to identify from Figure 2, is their poorer language skills.

The PG dataset basically confirms the main message (Table C.1 in the Appendix). We see an unexplained wage advantage in favour of men in the minority in 1987. This advantage turns insignificant in 1992 and negative in 1997. As the PG is a panel dataset, the results confirm that the observed trends are not related to sample selection but to different development of the income for different ethnic groups. The estimates are rather imprecise, though, because of the small sample size.

## 5.2 What determines the differential?

In this subsection we analyse which of the explanatory variables determine the unexplained wage differentials. We focus on Model 5 as it includes most of the variables of interest and does not include industry and occupation, the variables most probably affected by possible discrimination. We present the estimates for selected years and selected variables (Table 3); the results for all variables are given in Appendix D (the other models were qualitatively similar).

In most cases, the coefficients have expected sign and size. The most important determinants of wages are education, marriage, part-time work, regional dummies and language skills. In 1989, most of the coefficients were small and insignificant. However, because of the rapid development in the early 1990s, the returns became close to the new stable values already in 1994.

What coefficients determine the unexplained wage gap? The most consistent of these variables is *Capital* – working in the capital region. While Estonian-

Table 3

Selected coefficients for the Model 5.

	1989	1994	2001	2003	2005
<i>E college degree</i>	-0.026	0.408 <sup>◆</sup>	0.570 <sup>◆◊</sup>	0.454 <sup>◆•</sup>	0.470 <sup>◆•</sup>
<i>R college degree</i>	-0.075	0.285 <sup>◆</sup>	0.394 <sup>◆</sup>	0.240 <sup>◆</sup>	0.259 <sup>◆</sup>
<i>E Capital</i>	0.108 <sup>◆</sup>	0.476 <sup>◆•</sup>	0.403 <sup>◆•</sup>	0.277 <sup>◆•</sup>	0.216 <sup>◆•</sup>
<i>R Capital</i>	-0.016	0.195 <sup>◆</sup>	0.137 <sup>◇</sup>	0.035	0.038
<i>E langENG</i>	0.028	0.169 <sup>◆</sup>	0.130 <sup>◆</sup>	0.205 <sup>◆◊</sup>	0.171 <sup>◆</sup>
<i>R langENG</i>	0.179 <sup>◇</sup>	0.100	0.172 <sup>◆</sup>	0.089	0.137 <sup>◆</sup>
<i>R langEE1</i>	0.030	-0.065	0.013	-0.001	0.019
<i>R langEE2</i>	-0.062	-0.093	0.007	-0.063	0.056
<i>R langEE3</i>	0.010	-0.029	0.064	-0.032	0.060
<i>R langEE home</i>	-0.020	-0.028	0.034	-0.098 <sup>◇</sup>	0.052
<i>E intercept</i>	5.603 <sup>◆</sup>	6.922 <sup>◆</sup>	7.670 <sup>◆</sup>	7.972 <sup>◆</sup>	8.157 <sup>◆</sup>
<i>R intercept</i>	5.781 <sup>◆</sup>	7.003 <sup>◆</sup>	7.768 <sup>◆</sup>	7.986 <sup>◆</sup>	8.283 <sup>◆</sup>

Notes: <sup>◇</sup>, <sup>◆</sup> – coefficients are statistically significant at 5% and 1% level; <sup>◊</sup>, <sup>•</sup> – coefficients' difference between the ethnic groups is statistically significant at 5% and 1% level.

speaking workers can expect around 30% higher salaries in that area compared to the rest of the country, the wage premium for minority workers is small or non-existent. Another important variable is returns to university-level education – *college degree* – where the difference was significantly in favour of Estonian-speaking workers during the period 1995–2001. Different returns to education for different ethnic groups have been documented earlier by, for example, Arias et al. (2004) for Brazil, Chiswick and Miller (2006) for the US, and Noorkõiv et al. (1998) for Estonia. Another regional dummy, *North-East*, has favoured Estonian-speaking workers in recent years.

The estimated returns to language skills<sup>3</sup> reveal an interesting picture. While knowledge of English (*langENG*) has been related to at least 10% of the wage advantage through almost the entire observed period, we are unable to document any similar effect for the Estonian language (*langEE1*–*langEE3* and *langEE home*). Although most of the coefficients are positive, they are substantially smaller and only a few of them are statistically significant.

<sup>3</sup> We admit that we do not estimate *returns* in the narrow meaning of this term. For instance, acquiring language skills may be related to unobserved ability and to occupation (and hence to wage).

## 6 Possible explanations of the wage difference

**Discrimination** There is a lot of evidence of racial and ethnic discrimination in Europe (see Riach and Rich (2002) for a review). In Estonia, the relationship between ethnic Estonians and Russians has been tense in periods. The mainstream media has almost never expressed extreme opinions, though web-based forums and news-sites often reflect highly biased and negative images of “the others”. In this context it seems possible that at least part of the unexplained wage gap is related to ethnic discrimination. Unfortunately, there are very few studies focused on the question of discrimination in Estonia. According to Pettai (2002), 37% of the minorities find discrimination common (while only 6% of Estonian-speaking people find this to be the case).

The results above are consistent with Beckerian discrimination. However, as in other similar analyses, Beckerian discrimination cannot be proven. Even more, there is no evidence about lower pay for similar work (though this may be the case for negotiated salaries). A more plausible type of discrimination are entry barriers; there is some anecdotal evidence on attempts to avoid Russian-speaking workers in mainly Estonian work-teams. Our results suggest that similar entry barriers may play a substantial role in the Estonian labour market.

**Selection effects** Our models include only individuals who receive a positive salary. Could such a selection bias the estimates in favour of Estonian-speaking workers? We estimate the probability of being employed, unemployed and non-participant by separate logit models using the personal characteristics and minority dummy as the explanatory variables. Table 4 presents the estimated impact of the dummy for selected years. Minority males are less employed, more unemployed and rather less non-participants (although the latter coefficients, though mostly negative, are not statistically significant for a number of the years).

These figures are easy to interpret. Since early 1990s, Estonian-speaking males have enjoyed a higher employment rate and lower unemployment rate compared to minority men. This is a common outcome in Europe, see for instance, Arai and Vilhelmsson (2004) and Blackaby et al. (2005). However, despite the less-favourable situation, the non-participation rate in the minority population has been rather smaller than that among Estonian-speaking men. This fact suggests that the minority wage earners are *more* favourably selected from the unobserved distribution of ability: lower non-participation rate indicates that the working motivation is at least as big for the minority- as for the majority men, while lower employment rate suggests we are observing the wage further right in the ability distribution. Hence accounting for selectivity should rather

Table 4

Logit estimates for the probability of being employed, unemployed and non-participant. Only coefficient for the minority dummy is reported.

year	Employment	Unemployment	Non-participation
1989	0.206	1.142*	-0.336*
	<i>0.162</i>	<i>0.542</i>	<i>0.171</i>
1994	-0.072	0.415*	-0.206
	<i>0.102</i>	<i>0.145</i>	<i>0.131</i>
1997	-0.294*	0.510*	0.033
	<i>0.058</i>	<i>0.077</i>	<i>0.072</i>
2000	-0.140	0.323*	-0.105
	<i>0.077</i>	<i>0.095</i>	<i>0.098</i>
2003	-0.406*	0.845*	-0.049
	<i>0.082</i>	<i>0.111</i>	<i>0.100</i>
2005	-0.123	0.640*	-0.201*
	<i>0.087</i>	<i>0.127</i>	<i>0.102</i>

Notes: Standard errors in italics. \* – statistically significant at 5% level.

enlarge the unexplained wage gap.

**Migration** The break-up of the Soviet Union was accompanied by substantial demographic changes. According to estimates, around 150,000 mainly Russian-speaking residents left the country during the early transition period, resulting in a significant fall in the total population. Since 1994, the relative proportion of different ethnic groups have remained roughly stable.

Immigration to Estonia has been virtually zero since around 1990. According to the census in 2000, around 8,300 men in the age group 20-59 were temporarily residing abroad<sup>4</sup>. This is around 3% of the male working population in the same age group. Hence we do not expect temporary migration to bias our results seriously in the 1990s. However, those statistics do not include information on individuals who left the country permanently.

Could the estimated wage differential be an artifact of selective emigration in early 1990s? Theoretical analysis suggests that the return migrants may either be the “worst of the best” or “the best of the worst”, depending the relative return to skills in the host and destination country (Borjas and Bratsberg, 1996). The empirical analyses have confirmed the presence of both positive

<sup>4</sup> Statistics Estonia, online-database

and negative selection of return-migrants (Borjas and Bratsberg, 1996; Rooth and Saarela, 2007). It is not immediately clear, whether the decision to leave Estonia for another region in the newly collapsed Soviet Union is directly comparable the migrants' decision to emigrate.

Our data for the period 1989-1994 is covered by the retrospective part of the first wave of the LFS, conducted in 1995, after the main wave of emigration. The gap, non-existent in 1989, clearly appeared during those years (see Figure 2) even with exactly the same sample for all these years. Although imprecise, the PG panel dataset supports this conclusion. However, as the return to qualifications was small in early 1990s, the gap would appear small at that time even if the emigrants were mostly high-skilled workers.

We compare the education data based on census of 1989 (conducted *before* the emigration wave) and 2000. The share of Estonian-speaking males above age 10 with a college degree has risen from 0.096 to 0.110 while that for the others has fallen from 0.124 to 0.119. These opposite, although small, trends suggest that selective emigration may have played a certain role. Note also that the variable *college degree* show essentially no trend for neither of the ethnic groups in Table 1. The rapid fall of the share of immigrants (variable *immigrant*) is related to retirement of older cohorts, mostly consisting of immigrants. The changing age structure may have a certain influence on the education figures too. More research is needed to clarify these issues.

As emigration has increased a lot since the EU accession in 2004 we cannot exclude a certain bias to the estimates for the most recent years.

**Language skills** According to a common perception in the Estonian-speaking community, by far the most important determinant of inter-ethnic communication is knowledge of the Estonian language (Vihalemm, 2002). Current results, where language skills determine only a minor part of the wage gap, are not in concordance with this view. There are two possible explanations: first, self-reported language skills are severely biased; and second, the level, that Estonian-speaking individuals consider “fluency in the language”, is far above what the minority finds reasonable.

The first explanation is not particularly convincing. First, self-assessed measures are common in the literature (see, for instance, Chiswick and Miller (1995)). Second, as the language skills are positively correlated to ability and expected returns to the language fluency, one expects skill levels to be endogenous, and hence the returns (in the narrow sense) to language skill to be rather overestimated. It is hard to believe, that an objective measure would change the current picture completely. Even more, if the knowledge of Estonian language were the main factor behind the unexplained wage gap, one

should expect the gap narrowing over the period as all the evidence (see Table 1) points to improving Estonian skills of the minority workers. However, we do not observe the gap getting any smaller<sup>5</sup>. Last, the finding that the language skills have no measurable outcome on minority earnings is not without parallels in the literature. Adsera and Chiswick (2007) find the returns to language skills being highly heterogenous among male European immigrants, with the estimates ranging between 0 and 50% in different countries.

Unfortunately, there is no information about what is considered “sufficient fluency”. The use of Estonian by the minority may not automatically provide easier access to jobs. For example, Ponarin (2000) argues that using the titular language is in fact associated with *a loss of respect* for the native Estonians.

**Segregation** In this subsection we look at the role of ethnic segregation by industries. Although our estimates include controls for industry (model 6), we believe that a closer look at the industry-wise distribution of ethnic groups may help us to better understand the wage gap.

First, we compare the average wage rate and the ethnic composition of the workforce by industries (Table 5). The table reveals that almost one third of Estonians were employed in low-wage agriculture, whereas only 5% of minorities were working in that sector in 1989. Estonians were also overrepresented in trade and education. Minorities earned better salaries in mining, fishing, electricity and logistics; in minority-dominated manufacturing the salary for Estonian males was better. During the following years, employment in agriculture dropped sharply and most of the agricultural employees moved to other, better paid industries (or to non-employment). This process has mostly contributed to the income of Estonian-speaking workers. Increasingly a larger number of Estonian males has moved to above-the average paying public administration while Russian employment in that sector is stagnated.

Next, we follow the methodology of Jurajda (2003), and calculate the share of minority employees for different industries (Table 6). One can see that the share has fallen substantially in public administration and manufacturing, while it has not increased considerably in any industry.

In order to analyse the relationship between the minority percentage and the average wage across industries, we calculate the minority share  $S_i$  in the industry where the individual  $i$  is working, and estimate the following wage regressions independently for both ethnic groups and for each year:

$$\ln w_i = \beta' \mathbf{X}_i + \gamma S_i + \varepsilon_i, \quad (4)$$

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<sup>5</sup> We are grateful to a referee for this insight.

Table 5

Percentage of workers of both ethnic groups, employed in selected industries

	% Estonians		% Russians		Relative wage			
					1989		2004	
	1989	2004	1989	2004	<i>overall</i>	<i>R/E</i>	<i>overall</i>	<i>R/E</i>
agriculture	0.320	0.089	0.054	0.020	0.84	0.99	0.73	0.75
fishing	0.041	0.011	0.060	0.008	1.77	1.99*	0.93	1.59*
mining	0.009	0.016	0.050	0.072	1.21	2.09	0.94	1.16
manufacturing	0.186	0.289	0.374	0.330	0.97	0.74*	0.91	0.93
electricity	0.024	0.026	0.036	0.073	0.93	1.11*	1.00	0.80*
construction	0.135	0.134	0.129	0.141	1.18	0.89	1.10	0.85*
trade	0.040	0.098	0.032	0.070	1.23	0.68	1.07	0.67*
hotelrest	0.013	0.011	0.010	0.011	1.52	0.30	0.75	1.20
logistics	0.088	0.096	0.154	0.127	0.97	1.39*	1.12	0.98
business	0.040	0.041	0.031	0.058	0.82	0.95	1.03	0.70
publadm	0.038	0.091	0.037	0.030	0.79	0.66	1.04	0.95
education	0.039	0.043	0.013	0.023	0.77	2.99*	1.07	0.77
health	0.028	0.031	0.020	0.025	0.83	0.64	0.85	0.76

*Notes:**overall: relative wage in the industry relative to the national average, males**R/E: average wage of Russian workers relative to Estonian workers in the industry, males (\* – averages differ at 5% level)**Source: ELFS*

where  $w_i$  denotes the individual wage, the vector  $\mathbf{X}_i$  includes the individual- and job-specific characteristics (we control for age, education, family, immigrant status and occupation).

The estimated effect of segregation (parameter  $\gamma$  in (4)) is presented in Figure 3. The higher share of minority employees in industry is associated with better pay for both Estonian-speaking and minority workers for the entire period. The effect seems to be increasing during the early 1990s, reaching a peak around 1994, and falling slightly thereafter.

This exercise suggests that the wage gap is not related to minority workers, employed in worse-paid industries. Although our measure of industries is quite crude (we are only able to control for 14 aggregated industries), it is hard to believe that a finer control would lead to a completely different picture – *all* of our estimates so far suggest that minorities are, on average, working in better

Table 6  
 Minority shares in selected industries.

	1989	1994	1999	2001	2003	2005
agriculture	0.08	0.09	0.11	0.07	0.07	0.07
fishing	0.43	0.58	0.45	0.27	0.00	0.29
mining	0.75	0.71	0.78	0.77	0.64	0.61
manufacturing	0.51	0.41	0.32	0.40	0.29	0.29
electricity	0.44	0.44	0.44	0.69	0.60	0.46
construction	0.33	0.31	0.29	0.25	0.36	0.28
trade	0.29	0.29	0.22	0.18	0.23	0.18
hotelrest	0.28	0.19	0.19	0.17	0.15	0.24
logistics	0.47	0.51	0.42	0.38	0.35	0.41
financial	1.00	0.26	0.06	0.15	0.00	0.00
business	0.28	0.31	0.23	0.35	0.39	0.29
publadm	0.34	0.23	0.13	0.13	0.14	0.12
education	0.14	0.16	0.23	0.17	0.16	0.12
health	0.27	0.23	0.14	0.12	0.21	0.22

paid industries.

**Obsolete skills** Could the results be related to different expectations about the development of the labour market? It is possible that the Estonian-speaking population was better prepared for the changes in the economy through different educational and occupational choices. The Estonian-speaking tier of the segregated school system was more closely oriented to the local labour market and this may have been led to better education and occupations (often in agriculture, though). The Russian-speaking tier produced primarily blue-collar workers for the local Russian-speaking industrial segment, while the leaders were hired from elsewhere in the Soviet Union (Helemäe et al., 2000).

We perform a wage decomposition for two groups – old (born before 1960) and young workers (born after 1975). Men, born before 1960 were already established workers, 30 or more years old during the most radical changes in society in the early 1990s. Those, born 1975 and later, were less than 17 years old during these years. Most of them had not yet started their working career and hence they should have had better information about the requirements of the new economy while choosing their education and profession.

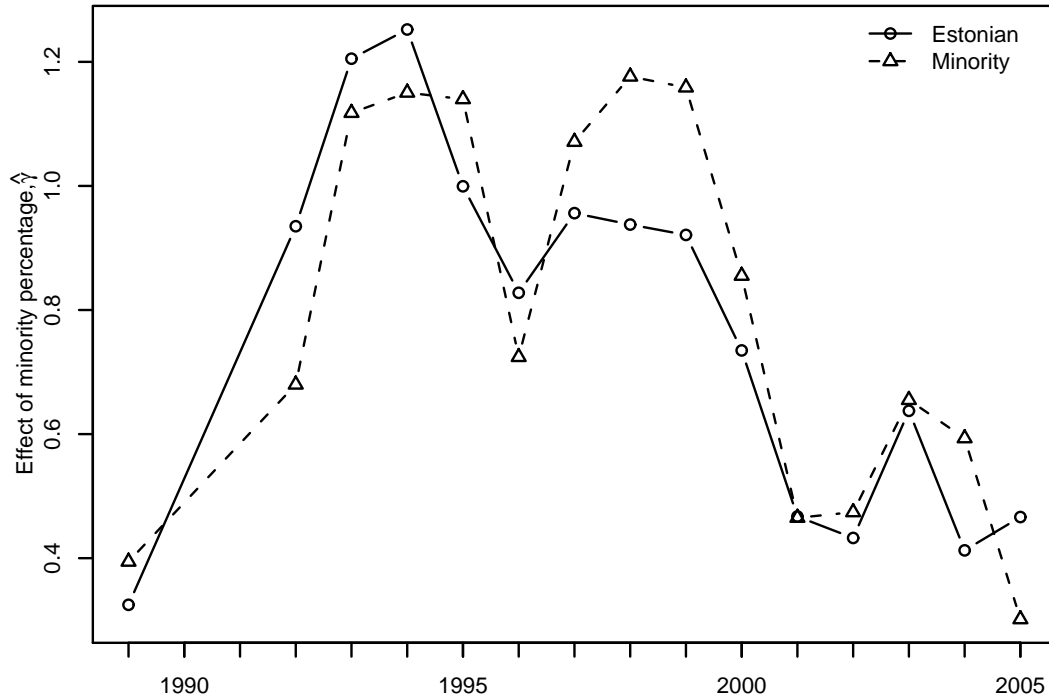


Fig. 3. Effect of the minority percentage in industries on wages for Estonian and minority workers.

The results are presented in Table 7. Due to the low number of observations (and selection issues), we pool the years, adding year dummies into the model specifications. We can see that the young cohort is rather worse than better off. The younger Russian-speaking workers earn around 10% less than the Estonian-speaking workers regardless of the model specification. The negative differential for the older workers only appears after inserting regional controls into the model, however, the controls have no impact on the differential for the young cohort. In their case the different returns to family characteristics and immigrant status seem to play a certain role (the unexplained differential for model 3 is much more negative than for model 2). Part of the disadvantage for young Russians is explained by worse language abilities and by industry and occupation. It suggests that Estonian-language schools may be better in adapting to the needs of market economy (see below). The choice of worse industry and occupation may be related to the entry barriers<sup>6</sup>.

In conclusion, our analysis of the two cohorts does not support the idea that the unexplained wage gap is related to the obsolete human capital of the older generation. The youth seems to be doing no better than the middle-aged workers.

<sup>6</sup> We are grateful to a referee for this insight.

Table 7

Unexplained wage differential in favour of ethnic Russians ( $\Delta_\beta$ ).

	Models					
	1	2	3	4	5	6
Born before 1960						
1997-2005	0.035*	-0.001	-0.016	-0.125*	-0.103*	-0.110*
	<i>0.011</i>	<i>0.009</i>	<i>0.009</i>	<i>0.013</i>	<i>0.013</i>	<i>0.013</i>
Born 1975 and later						
1997-2005	-0.102*	-0.113*	-0.150*	-0.158*	-0.117*	-0.097*
	<i>0.022</i>	<i>0.018</i>	<i>0.017</i>	<i>0.027</i>	<i>0.028</i>	<i>0.028</i>
Controls						
constant	✓	✓	✓	✓	✓	✓
age		✓	✓	✓	✓	✓
education		✓	✓	✓	✓	✓
family			✓	✓	✓	✓
immigrant			✓	✓	✓	✓
region				✓	✓	✓
language					✓	✓
industry						✓
occupation						✓

Notes: Results for males born before 1960 and after 1974. Standard errors in italics. \* – statistically significant at 5% level.

**School quality** As the Estonian education system is almost completely segregated by language, it is possible that bad labour market performance among ethnic minorities is related to the lower quality of Russian schools. There is some evidence that already in the early 1980s, the graduates of Russian schools had a lower starting position in their careers than those who graduated from Estonian schools (Helemäe et al., 2000). The programs have always been slightly different. Until the early 1990s, the Russian schools lasted 10 years while Estonian schools lasted 11 years. The program was mostly similar, the additional year was justified by a different curriculum as Estonian language, literature and history were virtually absent in Russian schools. Since the mid-1990s, the length of the program is unified (12 years) and the program is virtually the same. The main difference lies in language studies – while the Russian schools have to teach Estonian language since the first year, the Estonian schools start the first foreign language at year 3. Hence the Russian kids have to learn one additional subject during the first two years at school, com-

pared to their Estonian mates. The literature offers a little evidence that such a more intensive program years later hurts the labour market performance, however a few weaker students may be put into a more disadvantaged position (Pischke, 2007). A potentially more serious issue is related to the choice of languages: as the Estonian children start learning a foreign language (usually English) at year 3, the Russians do the same as the second foreign language 3 years later<sup>7</sup>. This may be one of the reasons behind the weaker English skills and hence part of the (explained) wage gap (see Section 5.2).

Below, we present the results of the state exams for 2006 by school language in order to shed some light on school performance. The state exams are a unified set of exams performed when graduating from high school, and which are evaluated using a nation-wide scale. This allows us to directly compare schools<sup>8</sup>. Although the high school graduates of 2006 are not included in the current study, the data from earlier years<sup>9</sup> suggest that school performance did not vary much during the last decade.

Most of the exam results are slightly better for Estonian-speaking schools (Table 8). However, for a few important subjects this is not the case. In sciences, the Russian schools do slightly better, while in mathematics the difference (in favour of Estonian schools) is less than 10% of the standard deviation. The bulk of the literature, devoted to the relationship between high school performance and later labour market outcomes, indicates a negligible effect of taking individual subjects on future earnings, with math as a possible exception (Altonji, 1995; Dolton and Vignoles, 2002; Rose and Betts, 2004)<sup>10</sup>. Whether these results are informative in this context – the effect of high school grades on later earnings – is not quite clear. However, based on the favourable outcomes for sciences and mathematics, we don't expect school quality to be the main explanation for worse labour-market outcomes among Russian-speaking men.

**Regional effects: The capital county** In this subsection we analyse whether the wage differential may be related to imperfect regional controls. We look at the residents of the capital county. It forms essentially a single labour market, whereby most jobs are concentrated in Tallinn and its suburbs.

Table 9 presents the unexplained wage gap for different years and models.

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<sup>7</sup> Many Russian schools voluntarily choose to start teaching English earlier.

<sup>8</sup> Note that such a comparison is a subject to endogenous selection as there are only a few exams, compulsory to all the graduates.

<sup>9</sup> Before 2006, the results are presented according to the *examination language*, not according to the school language.

<sup>10</sup> Johnes (2005) finds that different subjects have important complementarities and synergy. There are substantial differences in returns to various sets of subjects.

Table 8

The average results of state exams according school language, 2006.

Subject	lang	N	average	std	difference
History	E	1907	68.28	17.29	
	R	232	58.61	21.24	-0.46
Biology	E	3000	63.35	17.13	
	R	708	59.49	20.38	-0.19
Physics	E	490	69.09	20.95	
	R	79	71.97	22.55	0.13
Geography	E	6263	60.94	13.25	
	R	605	51.45	14.47	-0.66
English	E	7158	66.71	15.54	
	R	2051	58.38	15.33	-0.54
Chemistry	E	1721	64.82	19.62	
	R	553	68.42	19.57	0.18
Mathematics	E	4493	52.08	23.05	
	R	1524	50.35	22.45	-0.08
Society	E	3626	59.96	14.21	
	R	481	46.45	16.17	-0.84
Total	E	39439	61.14	18.86	
	R	13607	59.2	20.78	-0.09

*Notes: Both males and females. Bilingual schools are excluded. N – number of examinees; lang – schools language. Difference is the difference in mean scores as the percentage of the standard deviation. Source: National Centre of Examination and Qualification*

We construct the table in the same way as the Table 2 above. We remove Model 4 as it is equivalent to Model 3 in this case. Figure 4 (analogous to Figure 2 above) represents a graphical view of the table. At first look, it is not too different from Figure 2. Here, too, one can see a falling trend, which stabilises around 1995, and a positive development after 2000. However, the initial positive effect of Figure 2 is missing. Arguably, the former was related to the geographic location as a large share of Russian-speaking men work in Tallinn.

The point estimates are rather more negative than for the full sample (Table 2). The absolute values of the estimates tend to decrease while adding additional explanatory variables. The most important variables, explaining

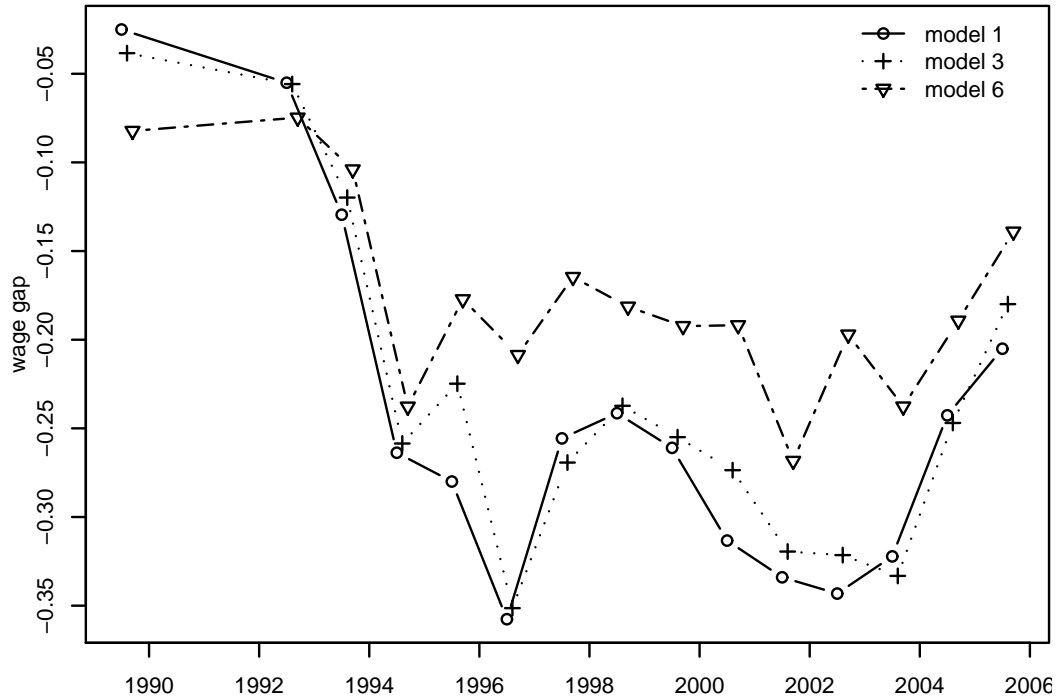


Fig. 4. Unexplained wage differential in favour of ethnic Russians ( $\Delta\beta$ ). Residents of the capital county. Selected models.

the wage gap, are the controls for language skills. The lower wages of Russian-speaking men are also related to slightly worse occupations, industries and education (until mid 1990s only). However, even controlling for all these characteristics, we are still left with a very large unexplained component, around 20% of the mean wage.

**Measurement errors** Could our results be related to measurement errors? If there is a systematic misreporting bias (e.g. due to more distrust among the Russian-speaking workers), a spurious wage differential may arise. In order to get an idea of the extent of the problem, we report the proportion of employed individuals in both ethnic groups without a reported wage in Table 10. The table reveals that such a mis-report was probably not an issue until the mid-1990s. However, since the late-1990s, up to 37% of Estonian-speaking workers do not report their wage while the figures for the minority remain below 20% in most cases. Substantial non-reporting in agriculture will probably increase the perceived wages of Estonian-speaking workers. However, the effect should be negligible in the capital area. Underreporting in the relatively well paid financial services sector should bias the wage gap downward, although employment in the financial sector is not large.

The only study we are aware of, devoted to tax-evasion in Estonia, does not find any difference between the ethnic groups in terms of tax-evasion behaviour

Table 9  
Unexplained wage differential in favour of ethnic Russians ( $\Delta_\beta$ ). Capital county

	Models				
	1	2	3	5	6
1989	-0.025 <i>0.043</i>	-0.035 <i>0.045</i>	-0.038 <i>0.045</i>	-0.036 <i>0.047</i>	-0.082 <i>0.055</i>
1993	-0.130* <i>0.043</i>	-0.122* <i>0.043</i>	-0.120* <i>0.043</i>	-0.072 <i>0.044</i>	-0.104* <i>0.051</i>
1994	-0.264* <i>0.041</i>	-0.245* <i>0.043</i>	-0.259* <i>0.041</i>	-0.211* <i>0.043</i>	-0.238* <i>0.048</i>
1997	-0.256* <i>0.032</i>	-0.256* <i>0.032</i>	-0.269* <i>0.031</i>	-0.221* <i>0.032</i>	-0.165* <i>0.035</i>
2000	-0.313* <i>0.054</i>	-0.285* <i>0.053</i>	-0.274* <i>0.050</i>	-0.224* <i>0.053</i>	-0.192* <i>0.055</i>
2002	-0.343* <i>0.058</i>	-0.291* <i>0.052</i>	-0.321* <i>0.051</i>	-0.226* <i>0.055</i>	-0.197* <i>0.062</i>
2003	-0.322* <i>0.042</i>	-0.299* <i>0.041</i>	-0.333* <i>0.039</i>	-0.251* <i>0.043</i>	-0.238* <i>0.047</i>
2004	-0.243* <i>0.046</i>	-0.204* <i>0.045</i>	-0.247* <i>0.042</i>	-0.190* <i>0.045</i>	-0.189* <i>0.049</i>
2005	-0.205* <i>0.037</i>	-0.168* <i>0.036</i>	-0.180* <i>0.035</i>	-0.148* <i>0.036</i>	-0.139* <i>0.038</i>
	Controls				
constant	✓	✓	✓	✓	✓
age		✓	✓	✓	✓
education		✓	✓	✓	✓
family			✓	✓	✓
immigrant			✓	✓	✓
language				✓	✓
industry					✓
occupation					✓

Notes: Standard errors in italics. \* – statistically significant at 5% level.

Table 10

Proportion of employed individuals with missing wage according to year (left panel) and industry (right panel).

Year	Estonian	Minority	Industry	
1989	0.029	0.028	agriculture	0.29
1992	0.053	0.036	fishing	0.23
1993	0.053	0.036	mining	0.06
1994	0.045	0.026	manufacturing	0.12
1995	0.044	0.031	electricity	0.08
1996	0.038	0.026	construction	0.19
1997	0.152	0.083	trade	0.25
1998	0.197	0.119	hotelrest	0.20
1999	0.240	0.137	logistics	0.18
2000	0.310	0.199	financial	0.26
2001	0.296	0.124	business	0.22
2002	0.325	0.150	publadm	0.12
2003	0.371	0.189	education	0.08
2004	0.347	0.215	health	0.18
2005	0.320	0.230		

(Kriz et al., 2007).

In conclusion, although we are not able to explain the observed wage gap as a result of misreporting, the problem seems to be of substantial magnitude. Better data sources and different methodology are needed for future analysis.

## 7 Discussion

What can we conclude from our analysis of the unexplained wage gap? We have excluded a number of explanations: selection effects, language skills, segregation, schooling choice based on different expectations, and regional segregation. The most plausible remaining explanations are discrimination and human capital accumulation, related to schools and cultural background, and, to a certain extent, measurement errors.

What type of discrimination might be present in a former Soviet republic? Although our results are in concordance with Beckerian discrimination – lower

pay for equal work – we do not believe this is a common situation in the Estonian labour market. Other possible candidates are sorting (Blanchard and Diamond, 1994); entry barriers, perhaps in the form of screening discrimination (Cornell and Welch, 1996); and segregated social networks (Seidel et al., 2000; Calvo-Armengol and Jackson, 2004) combined with establishment-level segregation as in Sattinger (1996). Unfortunately, we cannot test these hypotheses on our datasets. However, there is some anecdotal evidence on an unwillingness to accept workers with different ethnic background in an ethnically homogenous environment.

The increasing wage gap during the early 1990s fits well with the fact that this was the time of building up the political and economic institutions of the new nation-state. These institutions hired mostly Estonian-speaking workers (look at the falling minority share in public administration in Table 6). Our results suggest that the politically dominating Estonian-speaking majority avoided recruitment of “the others” during the early stages of the political reforms already. This gap may have been persisting because of small number of contacts between the language groups.

This explanation is closely related to social networks and job referrals (Montgomery, 1991; Kugler, 2003). There is a lot of anecdotal evidence that the social networks of the ethnic groups are largely separated. Such a separation may be related to prejudices and mutual mistrust; it may be both the reason and the result of segregation.

The falling unexplained wage gap during the increasingly tight labour markets of 2004 and 2005 provides some support for sorting – preferences for Estonian-speaking workers if there is any choice; and for screening discrimination. These processes should lead to a counter-cyclical wage differential. However, our analysis does not reveal any distinct feature around the substantial economic downturn 1998–1999. Here, analysis of the job market mobility may be relevant.

What type of unmeasured human capital might be related to the wage gap? The general ability does not seem to be a plausible explanation, although selective emigration in early 1990s or after 2000 may play a certain role. It would be interesting to include standard test scores, such as AFQT, to our analysis. Unfortunately, such tests are not conducted regularly in Estonia.

Other plausible explanations include language skills and cultural background. Our outcome – the titular language has only a minor effect on the minority earnings – is in a striking contrast with the bulk of the literature. It would be interesting to measure what the expected level of “fluency” is for Estonian-speaking individuals. As Estonian, unlike English, is not a widely used second language, Estonians may simply lack the experience to hear their native tongue

spoken with an accent.

A different approach would be to estimate the wage gap separately for fluent and non-fluent speakers of the titular language. As the language skills have been shown to be complementary to the other skills (Chiswick and Miller, 2003), one may expect the returns to education be more similar for the fluent speakers of Estonian. However, it is hard to imagine that this would make the return to language skills comparable to what is found in the literature. This question is left for future research. Another relevant point here is the degree of exogeneity of language skills. As language fluency needs practice, one needs either mixed social networks or workplaces in order to achieve the desired fluency.

What does our analysis tell us about the other labour markets?

The current results support the idea of a distinct relationship between the political and economic roles of the ethnic groups. The group which is leading at the political arena seems also to achieve economic advantages – at least in the presence of ethnic tensions. In light of analogous results from Kosovo (Bhumaik et al., 2006) and the Ukraine (Constant et al., 2006), the role of political leadership seems even more plausible.

We argue that one possible mechanism behind the unexplained wage gap could be network segregation. More research would be necessary here. Segregated networks may play a much broader role being related to both immigrant labour market outcomes in Europe or the black-white wage gap in the US. Unfortunately, the literature concerning association between network segregation and labour market outcomes is not well developed.

## 8 Conclusions

We have analysed the unexplained wage gap between ethnic Estonians and minority males in the Estonian labour market during the transition period 1989–2005. We use Estonian Labour Force Survey data and restrict the sample to males only. We decompose the mean wage differential using the Oaxaca-Blinder technique.

We document a substantial rise in the unexplained wage gap over this period. Whereas there was virtually no unexplained differential around 1990, the gap appeared in early 1990s and reached to around 10-15% of the mean wage in favour of Estonian-speaking workers. The gap is mainly related to different wage premiums for a job in the capital region, and different returns to education. We show that the unexplained difference is even greater in the largest

regional labour market – the capital city – and that there is no substantial difference between the size of the gap for young and old workers.

We analyse a number of possible explanations and exclude selection effects, language skills, segregation, schooling choice based on different expectations, and regional effects, as the main reasons for the unexplained gap. The two most plausible candidates for explaining the differential are discrimination in the form of entry barriers combined with low-level segregation, and explanations related to segregated social networks.

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Table A.1  
Explanatory variables, used for the ELFS data.

<i>variable</i>	description
Education and family	
<i>less than HS</i>	less than high school degree
<i>high school</i>	high school degree, some college
<i>college degree</i>	college degree
<i>married</i>	married or co-habiting
Age groups	
<i>20-24, 25-34, 35-49, 50-60</i>	
Region	
<i>South-East, North-East, Capital</i>	
Language (EE – Estonian, only for the minority; ENG – English)	
<i>langEE1</i>	understanding, speaking and writing skills
<i>langEE2</i>	understanding and speaking
<i>langEE3</i>	understanding
<i>langEE Home</i>	uses Estonian at home
<i>langENG</i>	understanding and speaking skills (both Estonian- and Russian speaking workers)
Other individual characteristics	
<i>immigrant</i>	moved to Estonia at age 8 or later
<i>parttime</i>	working less than 35 hours a week
Industry	
<i>agriculture</i> (reference group), <i>fishing</i> , <i>mining</i> , <i>manufacturing</i> , <i>electricity</i> , <i>construction</i> , <i>trade</i> , <i>hotelrest</i> , <i>logistics</i> , <i>financial</i> , <i>business</i> , <i>publadm</i> , <i>education</i> , <i>health</i>	
Occupation	
<i>manager</i> , <i>professional</i> , <i>technican</i> , <i>clerk</i> , <i>serviceworker</i> , <i>skillagri</i> , <i>craft</i> , <i>operator</i> , <i>elementary</i> (reference group), <i>publsect</i>	

## A List of variables

In Table A.1 and A.2 we list and describe all the explanatory variables used in the analysis. A more in-depth discussion of the most crucial variables is provided in section 3.2.

Table A.2  
 Explanatory variables used for PG data.

<i>variable</i>	description
Education and family	
<i>high school</i>	reference group
<i>some college</i>	up to 3 years college
<i>college degree</i>	at least 5 years college
<i>g8Math</i>	math score in 8th grade (3, 4, 5, 5 is the best)
<i>father edu</i>	father's education (less than HS, HS, college)
<i>married</i>	married or cohabiting
<i>kids</i>	children in the household
<i>siblings</i>	grown up with siblings in the household
Age control	
<i>birthYear</i>	year of birth
Region	
<i>South-East, North-East, Capital</i>	
Language	
<i>langEE1</i>	good knowledge of Estonian
<i>langEN1</i>	English
Other individual characteristics	
<i>ill</i>	health problems hamper working
<i>immigrant</i>	born outside Estonia
Industry	
<i>agriculture and fishing</i> (reference group), <i>mining, manufacturing, electricity, construction, trade, hotelrest, logistics, financial, business, publadm, education, health</i>	
Occupation	
<i>manager, professional, technican, clerk, serviceworker, skillagri, craft, operator, elementary</i> (reference group), <i>publsect</i>	

## B Variable averages

Table B.1: Means of selected variables. ELFS data

	1989	1994	1999	2001	2003	2005
Education and family						
<i>less than HS E</i>	0.23	0.18	0.29	0.27	0.25	0.24
<i>less than HS R</i>	0.18	0.13	0.19	0.17	0.18	0.20
<i>high school E</i>	0.61	0.65	0.56	0.59	0.60	0.61
<i>high school R</i>	0.67	0.71	0.68	0.71	0.70	0.65
<i>college degree E</i>	0.16	0.17	0.15	0.14	0.14	0.15
<i>college degree R</i>	0.15	0.16	0.13	0.12	0.12	0.16
<i>married E</i>	0.78	0.75	0.75	0.73	0.70	0.72
<i>married R</i>	0.80	0.78	0.80	0.77	0.80	0.77
Age groups						
<i>age2024 E</i>	0.10	0.14	0.11	0.10	0.12	0.12
<i>age2024 R</i>	0.09	0.10	0.10	0.12	0.11	0.10
<i>age2534 E</i>	0.29	0.27	0.27	0.27	0.26	0.24
<i>age2534 R</i>	0.30	0.25	0.25	0.26	0.24	0.24
<i>age3549 E</i>	0.39	0.38	0.40	0.39	0.41	0.42
<i>age3549 R</i>	0.40	0.45	0.47	0.41	0.42	0.41
<i>age5060 E</i>	0.21	0.22	0.22	0.24	0.22	0.22
<i>age5060 R</i>	0.20	0.20	0.18	0.20	0.24	0.24
Region						
<i>South-East E</i>	0.11	0.09	0.14	0.13	0.12	0.13
<i>South-East R</i>	0.03	0.02	0.03	0.02	0.03	0.03
<i>North-East E</i>	0.05	0.04	0.03	0.04	0.04	0.02
<i>North-East R</i>	0.32	0.33	0.38	0.43	0.43	0.36
<i>Capital E</i>	0.30	0.34	0.23	0.23	0.23	0.27
<i>Capital R</i>	0.49	0.51	0.36	0.38	0.36	0.43

Table B.1 – continues...

Table B.1 – continued

	1989	1994	1999	2001	2003	2005
Language						
<i>langEE1 R</i>	0.07	0.08	0.11	0.11	0.11	0.16
<i>langEE2 R</i>	0.11	0.11	0.15	0.13	0.15	0.16
<i>langEE3 R</i>	0.16	0.17	0.16	0.16	0.21	0.24
<i>langEE Home R</i>	0.10	0.09	0.13	0.10	0.10	0.09
<i>langENG E</i>	0.22	0.28	0.30	0.37	0.41	0.45
<i>langENG R</i>	0.10	0.13	0.14	0.19	0.16	0.24
Other individual characteristics						
<i>immigrant R</i>	0.57	0.49	0.38	0.36	0.32	0.27
<i>partime E</i>	0.02	0.05	0.05	0.05	0.05	0.05
<i>partime R</i>	0.02	0.04	0.06	0.03	0.02	0.01
Industry						
<i>agriculture E</i>	0.32	0.19	0.13	0.12	0.07	0.10
<i>agriculture R</i>	0.05	0.04	0.04	0.02	0.01	0.02
<i>fishing E</i>	0.04	0.02	0.01	0.01	0.00	0.01
<i>fishing R</i>	0.06	0.05	0.01	0.00	0.00	0.01
<i>mining E</i>	0.01	0.01	0.01	0.01	0.01	0.01
<i>mining R</i>	0.05	0.05	0.07	0.05	0.06	0.05
<i>manufacturing E</i>	0.19	0.18	0.24	0.24	0.32	0.27
<i>manufacturing R</i>	0.37	0.26	0.29	0.37	0.32	0.31
<i>electricity E</i>	0.02	0.04	0.03	0.02	0.02	0.02
<i>electricity R</i>	0.04	0.06	0.07	0.09	0.08	0.06
<i>construction E</i>	0.14	0.13	0.12	0.13	0.10	0.15
<i>construction R</i>	0.13	0.12	0.12	0.10	0.15	0.16
<i>trade E</i>	0.04	0.12	0.11	0.12	0.12	0.10
<i>trade R</i>	0.03	0.10	0.08	0.06	0.08	0.06
<i>hotelrest E</i>	0.01	0.02	0.01	0.01	0.01	0.01

Table B.1 – continues...

Table B.1 – continued

	1989	1994	1999	2001	2003	2005
<i>hotelrest E</i>	0.01	0.01	0.01	0.00	0.01	0.01
<i>logistics E</i>	0.09	0.09	0.10	0.10	0.09	0.09
<i>logistics R</i>	0.15	0.19	0.18	0.15	0.12	0.18
<i>financial E</i>	0.00	0.01	0.01	0.01	0.01	0.00
<i>financial R</i>	0.00	0.01	0.00	0.00	0.00	0.00
<i>business E</i>	0.04	0.05	0.05	0.05	0.05	0.06
<i>business R</i>	0.03	0.05	0.04	0.06	0.07	0.06
<i>publadm E</i>	0.04	0.06	0.08	0.10	0.10	0.09
<i>publadm R</i>	0.04	0.04	0.03	0.04	0.04	0.04
<i>education E</i>	0.04	0.04	0.04	0.04	0.04	0.04
<i>education R</i>	0.01	0.02	0.03	0.02	0.02	0.01
<i>health E</i>	0.03	0.04	0.04	0.03	0.03	0.03
<i>health R</i>	0.02	0.02	0.02	0.01	0.02	0.02
Occupation						
<i>manager E</i>	0.14	0.18	0.14	0.14	0.12	0.13
<i>manager R</i>	0.12	0.11	0.09	0.06	0.06	0.08
<i>professional E</i>	0.10	0.08	0.08	0.08	0.10	0.08
<i>professional R</i>	0.07	0.06	0.04	0.04	0.05	0.05
<i>technican E</i>	0.05	0.07	0.08	0.08	0.08	0.07
<i>technican R</i>	0.04	0.06	0.06	0.05	0.04	0.05
<i>clerk E</i>	0.01	0.01	0.02	0.02	0.03	0.03
<i>clerk R</i>	0.01	0.02	0.02	0.03	0.03	0.04
<i>serviceworker E</i>	0.02	0.05	0.05	0.05	0.07	0.05
<i>serviceworker R</i>	0.03	0.04	0.03	0.04	0.07	0.04
<i>skillagri E</i>	0.04	0.06	0.03	0.02	0.02	0.02
<i>skillagri R</i>	0.02	0.01	0.01	0.01	0.01	0.01
<i>craft E</i>	0.28	0.24	0.25	0.25	0.24	0.25

Table B.1 – continues...

Table B.1 – continued

	1989	1994	1999	2001	2003	2005
<i>craft R</i>	0.42	0.39	0.39	0.40	0.40	0.37
<i>operator E</i>	0.33	0.24	0.26	0.24	0.24	0.26
<i>operator R</i>	0.25	0.24	0.25	0.25	0.26	0.27
<i>elementary E</i>	0.04	0.05	0.09	0.12	0.12	0.11
<i>elementary R</i>	0.04	0.07	0.11	0.11	0.10	0.09
<i>publsect E</i>	0.93	0.47	0.25	0.25	0.21	0.19
<i>publsect R</i>	0.94	0.64	0.31	0.28	0.18	0.17

Notes: *E* stands for Estonians, *R* for Russians.

Table C.1  
 Unexplained wage gap for estimated models, PG data

	Models					
	1	2	3	4	5	6
1987	0.142*	0.113*	0.096	0.184*	0.178*	0.117
	<i>0.052</i>	<i>0.058</i>	<i>0.076</i>	<i>0.083</i>	<i>0.086</i>	<i>0.091</i>
1992	0.172	0.128	0.140	0.055	0.053	-0.113
	<i>0.103</i>	<i>0.113</i>	<i>0.146</i>	<i>0.173</i>	<i>0.176</i>	<i>0.189</i>
1997	-0.170*	-0.186*	-0.167	-0.313*	-0.405*	-0.457*
	<i>0.081</i>	<i>0.086</i>	<i>0.101</i>	<i>0.141</i>	<i>0.150</i>	<i>0.173</i>
	Controls					
constant	✓	✓	✓	✓	✓	✓
age		✓	✓	✓	✓	✓
education		✓	✓	✓	✓	✓
family			✓	✓	✓	✓
immigrant			✓	✓	✓	✓
region				✓	✓	✓
language					✓	✓
industry						✓
occupation						✓

## C Results based on PG data

Estimated unexplained wage gap ( $\Delta_\beta$ ) is given in the table C.1.

## D Coefficients

Here we list all the coefficients for the Model 5 for selected years.

Table D.1: Estimation results (Model 5).

	1989	1993	1996	1997	1998	1999
E age2534	0.033	-0.120 <sup>◇</sup>	0.038	-0.047	-0.066 <sup>◆</sup>	0.008
R age2534	0.151	0.145	0.056	0.063	0.000	0.030
E age3549	0.033	-0.112 <sup>◇</sup>	-0.138 <sup>●</sup>	-0.084 <sup>◆●</sup>	-0.108 <sup>◆●</sup>	-0.075 <sup>◇</sup>
R age3549	0.056	0.101	0.281 <sup>◆</sup>	0.114 <sup>◇</sup>	0.028	0.077
E age5060	0.019	-0.171 <sup>◆●</sup>	-0.130	-0.155 <sup>◆</sup>	-0.173 <sup>◇</sup>	-0.167 <sup>◆</sup>
R age5060	0.005	0.143	0.043	-0.045	-0.056	-0.001
E college degree	-0.026	0.363 <sup>◆</sup>	0.464 <sup>◆●</sup>	0.513 <sup>◆●</sup>	0.568 <sup>◆●</sup>	0.598 <sup>◆●</sup>
R college degree	-0.075	0.218 <sup>◇</sup>	0.108	0.237 <sup>◆</sup>	0.365 <sup>◆</sup>	0.333 <sup>◆</sup>
E high school	0.048	0.135 <sup>◆</sup>	0.098 <sup>◇</sup>	0.135 <sup>◆●</sup>	0.178 <sup>◆</sup>	0.199 <sup>◆</sup>
R high school	-0.085	0.143 <sup>◇</sup>	-0.048	0.038	0.178 <sup>◆</sup>	0.200 <sup>◆</sup>
E married	0.153 <sup>◆</sup>	0.121 <sup>◆</sup>	0.164 <sup>◆</sup>	0.189 <sup>◆</sup>	0.183 <sup>◆</sup>	0.176 <sup>◆</sup>
R married	0.119 <sup>◇</sup>	0.110	0.258 <sup>◆</sup>	0.209 <sup>◆</sup>	0.198 <sup>◆</sup>	0.130 <sup>◆</sup>
E parttime	-0.519 <sup>◆</sup>	-0.672 <sup>◆</sup>	-0.679 <sup>◆</sup>	-0.759 <sup>◆●</sup>	-0.649 <sup>◆●</sup>	-0.685 <sup>◆●</sup>
R parttime	-0.302	-0.591 <sup>◆</sup>	-0.413 <sup>◆</sup>	-0.282 <sup>◆</sup>	-0.047	-0.190 <sup>◆</sup>
E South-East	-0.047	-0.186 <sup>◆</sup>	-0.186 <sup>◆</sup>	-0.106 <sup>◆</sup>	-0.089 <sup>◆</sup>	-0.063 <sup>◇</sup>
R South-East	-0.051	-0.513 <sup>◆</sup>	-0.213	-0.103	-0.071	-0.060
E North-East	-0.218 <sup>◆</sup>	0.146	0.034	0.140 <sup>◇</sup>	0.125 <sup>◆</sup>	0.103
R North-East	-0.167 <sup>◇</sup>	-0.053	0.013	0.017	0.061	0.078
E Capital	0.108 <sup>◆</sup>	0.448 <sup>◆</sup>	0.484 <sup>◆●</sup>	0.389 <sup>◆●</sup>	0.333 <sup>◆●</sup>	0.374 <sup>◆●</sup>
R Capital	-0.016	0.248 <sup>◆</sup>	0.036	0.153 <sup>◆</sup>	0.181 <sup>◆</sup>	0.174 <sup>◆</sup>
E langENG	0.028	0.186 <sup>◆</sup>	0.105 <sup>◇</sup>	0.182 <sup>◆</sup>	0.160 <sup>◆</sup>	0.153 <sup>◆</sup>
R langENG	0.179 <sup>◇</sup>	0.127	0.238 <sup>◇</sup>	0.133 <sup>◆</sup>	0.165 <sup>◆</sup>	0.144 <sup>◆</sup>
R langEE1	0.030	-0.074	0.052	-0.070	-0.017	0.034

Table D.1 – continues...

Table D.1 – continued

	1989	1993	1996	1997	1998	1999
R langEE2	-0.062	-0.034	0.042	0.009	0.094 <sup>◇</sup>	0.154 <sup>◆</sup>
R langEE3	0.010	-0.002	0.136	0.046	-0.014	0.105 <sup>◇</sup>
R immigrant	-0.058	-0.122	-0.119	-0.029	0.038	0.055
R langEE home	-0.020	-0.058	-0.058	0.007	0.013	0.060
E intercept	5.603 <sup>◆</sup>	6.581 <sup>◆</sup>	7.437 <sup>◆</sup>	7.405 <sup>◆</sup>	7.515 <sup>◆•</sup>	7.516 <sup>◆◊</sup>
R intercept	5.781 <sup>◆</sup>	6.562 <sup>◆</sup>	7.350 <sup>◆</sup>	7.351 <sup>◆</sup>	7.338 <sup>◆</sup>	7.350 <sup>◆</sup>
E $R^2$	0.038	0.231	0.307	0.299	0.291	0.299
R $R^2$	0.037	0.121	0.152	0.105	0.116	0.111
E adj $R^2$	0.032	0.226	0.298	0.298	0.289	0.297
R adj $R^2$	0.020	0.104	0.117	0.097	0.109	0.101
E $F$	6.62	46.94	34.10	198.37	220.66	142.16
R $F$	2.25	7.04	4.41	12.94	16.81	11.28
E # obs	1857	1728	860	5119	5937	3673
R # obs	957	834	411	1787	2061	1460

Notes: <sup>◇</sup>, <sup>◆</sup> – coefficients significant at 5% and 1% level; <sup>◊</sup>, <sup>•</sup> – coefficients' difference between the ethnic groups significant at 5% and 1% level.

The degrees of freedom for the  $F$  test are 16 and number of observations – 17 for Russians; 11 and number of observations – 12 for Estonians.

Table D.2: Estimation results (Model 5).

	2000	2001	2002	2003	2004	2005
E age2534	0.138 <sup>◆</sup>	0.036	0.020	0.040	0.104 <sup>◇</sup>	0.135 <sup>◆</sup>
R age2534	0.008	-0.043	0.068	0.079	0.129	0.034
E age3549	0.063	-0.072	-0.062	0.008	0.014	0.078 <sup>◇</sup>
R age3549	0.073	-0.080	0.084	0.097	0.081	0.059
E age5060	-0.052	-0.079	-0.120 <sup>◇</sup>	-0.094 <sup>◇</sup>	-0.094 <sup>◇</sup>	-0.066

Table D.2 – continues...

Table D.2 – continued

	2000	2001	2002	2003	2004	2005
R age5060	-0.022	-0.093	0.023	0.071	0.040	-0.050
E college degree	0.545 $\diamond$ <sub>o</sub>	0.570 $\diamond$ <sub>o</sub>	0.582 $\diamond$	0.454 $\diamond$ <sub>.</sub>	0.418 $\diamond$	0.470 $\diamond$ <sub>.</sub>
R college degree	0.344 $\diamond$	0.394 $\diamond$	0.451 $\diamond$	0.240 $\diamond$	0.319 $\diamond$	0.259 $\diamond$
E high school	0.187 $\diamond$	0.261 $\diamond$ <sub>o</sub>	0.187 $\diamond$	0.098 $\diamond$	0.118 $\diamond$	0.135 $\diamond$
R high school	0.203 $\diamond$	0.153 $\diamond$	0.115 $\diamond$	0.051	0.086	0.081
E married	0.124 $\diamond$	0.185 $\diamond$	0.210 $\diamond$	0.163 $\diamond$	0.231 $\diamond$	0.161 $\diamond$
R married	0.073	0.131 $\diamond$	0.131 $\diamond$	0.189 $\diamond$	0.239 $\diamond$	0.118 $\diamond$
E parttime	-0.908 $\diamond$ <sub>o</sub>	-0.739 $\diamond$	-0.744 $\diamond$ <sub>o</sub>	-0.914 $\diamond$	-0.754 $\diamond$	-0.824 $\diamond$
R parttime	-0.656 $\diamond$	-0.782 $\diamond$	-1.022 $\diamond$	-1.142 $\diamond$	-0.586 $\diamond$	-0.916 $\diamond$
E South-East	-0.009	-0.150 $\diamond$	-0.085 $\diamond$	-0.092 $\diamond$	-0.135 $\diamond$	-0.116 $\diamond$
R South-East	-0.007	-0.176	-0.183	-0.160	-0.035	-0.240 $\diamond$
E North-East	0.106	0.014	-0.024	0.097 <sub>.</sub>	0.125 <sub>.</sub>	-0.051
R North-East	0.022	-0.043	-0.126 $\diamond$	-0.148 $\diamond$	-0.118 $\diamond$	-0.163 $\diamond$
E Capital	0.357 $\diamond$ <sub>.</sub>	0.403 $\diamond$ <sub>.</sub>	0.334 $\diamond$ <sub>.</sub>	0.277 $\diamond$ <sub>.</sub>	0.237 $\diamond$ <sub>.</sub>	0.216 $\diamond$ <sub>.</sub>
R Capital	0.099	0.137 $\diamond$	0.041	0.035	0.058	0.038
E langENG	0.183 $\diamond$	0.130 $\diamond$	0.162 $\diamond$	0.205 $\diamond$ <sub>o</sub>	0.175 $\diamond$	0.171 $\diamond$
R langENG	0.101	0.172 $\diamond$	0.192 $\diamond$	0.089	0.100	0.137 $\diamond$
R langEE1	0.010	0.013	0.053	-0.001	0.053	0.019
R langEE2	-0.012	0.007	-0.074	-0.063	0.038	0.056
R langEE3	0.177 $\diamond$	0.064	-0.044	-0.032	0.093	0.060
R immigrant	-0.001	0.061	0.037	0.011	0.064	0.064
R langEE home	0.048	0.034	-0.042	-0.098 $\diamond$	0.037	0.052
E intercept	7.552 $\diamond$	7.670 $\diamond$	7.799 $\diamond$	7.972 $\diamond$	8.017 $\diamond$	8.157 $\diamond$
R intercept	7.587 $\diamond$	7.768 $\diamond$	7.862 $\diamond$	7.986 $\diamond$	7.938 $\diamond$	8.283 $\diamond$
E $R^2$	0.325	0.360	0.281	0.325	0.316	0.358
R $R^2$	0.145	0.171	0.167	0.207	0.194	0.200
E adj $R^2$	0.321	0.357	0.277	0.321	0.312	0.354

Table D.2 – continues...

Table D.2 – continued

	2000	2001	2002	2003	2004	2005
R adj $R^2$	0.127	0.156	0.150	0.190	0.174	0.181
E $F$	76.21	103.44	67.73	78.99	73.53	93.07
R $F$	8.01	10.95	9.76	11.77	9.39	10.23
E # obs	1754	2032	1914	1814	1762	1851
R # obs	774	866	794	736	640	671

Notes:  $\diamond$ ,  $\blacklozenge$  – coefficients significant at 5% and 1% level;  $\circ$ ,  $\bullet$  – coefficients' difference between the ethnic groups significant at 5% and 1% level.

The degrees of freedom for the  $F$  test are 16 and number of observations – 17 for Russians; 11 and number of observations – 12 for Estonians.