Immediate Returns to Internal Migration: Estimates using Estonian Data

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Abstract

Current paper analyses the wage immediately after internal migration in Estonia using Estonian LFS from 1992-1995, where the immediate wage data is present. Only migration of work-places is considered, data about the places of residence is not taken into account. Two models are constructed: an additive shift type model of wage change associated with job change; and a model with endogenous migration decision, describing the first wage in the particular job. The wage change model is estimated using OLS, the first wage model using two-part- and sample selection methods. The models support the idea that part of the wage gain is received immediately after the migration. The wage of migrants exceeds the wage of the stayers in the same region by approximately 15-20%. The results of the endogenous models are partially unstable, the problem is to find a good set of descriptive variables for migration decision.

Key words: Internal Migration, Transition Economics, Estonia

JEL-codes: J61, R23

1 Introduction

Economists have looked at migration as a way to invest in human capital since the classical article by Sjaastad (1962). Migration is connected with both revenues and expenditures. Expenditures are related with the direct moving costs, with time necessary for searching for and learning the new job, and with the adjustment into a new environment. The revenues are higher real wage and better living conditions in the future. The theory predicts that the migration should be directed toward regions with higher wages and lower unemployment, the individual migrants should gain in wages, at least in long run.

The results, based on aggregated migration data show generally that the workers are moving towards higher wages, confirming the idea of investments, while results for the connection between unemployment and migration are more complicated (Marr, 1977; McCormick, 1997; Fidrmuc, 2000).

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The empirical studies, based on individual data, have typically tried to explain the particular migration decisions while controlling for personal-, family-, job-related- and regional characteristics.

Generally, the results based on micro data confirm the idea of viewing migration as an investment. There is evidence the that wage gain is an important reason for migration (Nakosteen and Zimmer, 1980). It has been found that the wages of the migrants rise more rapidly after the migration than those of natives (Borjas *et al.*, 1992; Yankow, 1999; Hu, 2000), Tunali (2000) has found support for the rationality of the decision to migrate using more indicators than just wage increase. Bartel (1979) has found that the gains depend on way of leaving the previous job. Generally, job quitters achieve wage gains while this needs not to be true for laid-off migrants. As the unemployed individuals do not have opportunity costs associated with leaving the previous job, they should be more mobile. This is confirmed by Pissarides and Wadsworth (1989).

It has been stressed that the presence of social network in the region of destination increases the immigration considerably (see e.g. Carrington *et al.*, 1996; Neto and Mullet, 1998). The presence of friends and relatives makes it less risky and more easy to cope in the new environment, the friends can help in finding job and lodging. Neto and Mullet (1998) have found evidence that the income level and possibilities to find the job affect migration incentive more strongly when the social network is present. In the absence of network, the migration is less depending on economic reasons.

According to the theory of migration as an investment, the movers will gain in wages in long run. In short run, the wage of movers can be lower or higher than that of stayers. The immediate wage increase or decrease gives information about the motivation of migration, size of the moving costs and the length of the planning horizon. The wage behaviour is not clear, Borjas *et al.* (1992) have found (based on U.S. data) that the wage of the migrant decreases initially, while Yankow (1999) does not confirm the result (using U.S. data, too). According to him, the migration is followed by an immediate wage increase by 2-3% above of the wage of the natives.

According to my knowledge, all the previous studies have used an indirect method for estimating the wage before and immediately after the migration. In the current paper, the Estonian Labour Force Survey from 1995 is used, where the data about the the wages immediately before and after the migration are directly available, no approximation is needed. Following Bartel (1979), job mobility reasons are included into the model.

Two models are constructed in the current analysis. The first model describes wage change during job change, it focuses on a possible extra gain of movers, in additive shift (AS) form. Second model describes the wage immediately after the migration, introducing endogenous migration decision using the idea of investment. Both models support the idea that part of the wage gains are received immediately after migration. Wage increase is about 15-20% larger among movers. In this way current analysis supports the results of Yankow (1999) in contrary to Borjas *et al.* (1992).

The paper is divided as follows: section 2 presents briefly the Estonian labour market, section 3 describes the data set and the variables, section 4 describes wage and migration decision modelling, section 5 presents the results and section 6 gives a short discussion of the results and suggestions for the future improvements.

2 Labour Market Development in Estonia

The step-by-step price liberalisation in Estonia began in 1989 when the country was still part of the Soviet Union. Estonia gained independence during the Soviet collapse in august 1991. The most important economic reforms were conducted in 1992, including liberalisation of prices and establishing a convertible national currency. In 1993 the privatisation of major state enterprises began.

Table 1: development of Estonian Labour market

	1989	1992	1993	1994	1995	1998
employment (in thousands)	837,9	765,7	708,1	692,6	656,1	636,2
unemployment rate (%)	0,6	3,7	6,5	7,6	9,7	9,9
share of primary sector (%)	21,2	19,0	16,6	14,6	10,5	9,1
share of tertiary sector (%)	41,7	45,5	50,4	53,1	55,4	57,5
wages in Tallinn relative to the country's average			1,24	1,21	1,19	1,21

Source: Country Report on Labour Market Flexibility and Social Security: Estonia. ILO 2000; Estonian Statistical Office

During the Soviet period, there was virtually no unemployment (Table 1), unemployment started to increase at the time of restructuring. The prices of raw materials increased dramatically and the domestic firms had to start competing with foreign products while the subsidies to the domestic firms were eliminated. These large changes resulted a steady rise of unemployment to around 10% by 1995.

The economic reforms have hit the different industries and regions differently. The primary sector, previously dominated by large state-owned farms, was depending on cheap raw materials and big markets in Soviet Union. These markets vanished during the transition, the share of foreign food products grew rapidly while the possible markets in Western Europe remained closed. As a result, employment in regions, previously dominated by agriculture, has decreased significantly. The situation in mining and heavy industry was similar. At the same time, several new industries such as finance, trade, transportation and public administration, developed rapidly. These new industries are located mainly in cities. In addition, foreign direct investments are highly concentrated in the Tallinn area and have accelerated the job creation process there.

The labour market institutions are weakly developed in Estonia. The trade unions are covering only a minor part of employees, the bargaining power of the unions is not sufficient to affect wage setting in most industries. The unemployment benefits are extremely low, around 7% of the average wage (in fact, social security transfers are more important for the unemployed than the unemployment benefits) and the unemployment legislation quite restrictive. There are several regional support programs, but virtually no regional tax differences nor regional subsidies. From the viewpoint of institutions, the labour market should be quite flexible, but due to the low mobility of the work-force, the big regional differences persist (Eamets and Toomet, 2000).

The country's southern parts, previously depending on agriculture, suffer from high unemployment, the wages are significantly lower and the share of inactive population is higher there. In North-Eastern Estonia, a region dominated by heavy industry, the decline of the active population has been smaller, the decrease of jobs has caused much higher unemployment. In contrary, Estonian big cities Tallinn, Tartu and Pärnu are doing relatively well. The unemployment in these cities is moderate and the wage levels are above that in the other regions. Kulikov (1999) has shown that the regional difference in the duration of unemployment spells is even bigger than the difference in unemployment levels.

As a result migration from countryside to big cities has increased considerably (Tammaru and Sjöberg, 1999).

3 Data

3.1 Estonian Labour Force Survey 1995

The first labour force survey in Estonia was conducted early in 1995. In all 9608 individuals between age 15-75 were questioned. The retrospective part of the questionnaire (years 1989-1994) includes information about all the individual jobs, side-jobs, wages, vacancies, labour market transitions etc. The data about first and last wage on a particular job, geographic location of the job and the reasons of job separation is included into the database, too. The spatial resolution in the database is limited with local community, time resolution is one month. Job transfers are not included.

This data set allows to deduce directly when an individual has changed job, what has been the reason and how the wage has been changed. According to my knowledge, all the previous authors have used some kind of approximation.

The survey covers six years in all, but due to the rapid changes in economic environment in Estonia, only a 2,5 years sub-period (starting from the currency reform, June 1992) was actually used. All the job-to-job movements were extracted for that time, non-employment spells up to three months between jobs were allowed. Only the mobility of work-places was considered, the data about the place of residence was not taken into account. As one person could change job several times, there are repeated observations present in the sample. Only migration between Tallinn and the rest of Estonia is considered.

3.2 Variables used

The definitions of the variables are given in the Table 2. The personal data, which can change in accordance with job mobility (as age and education), is taken at the time when leaving the previous job. The dependent variable is difference in the logarithm of wage in the wage change model (model describing the change of wage when changing job), and logarithm of the first wage, relative to the Estonian average in the case of first wage model, a model which describes the first wage on the new job.

Two type of explanatory variables are used: status variables, describing individual's personal and job related characteristics, and job-search related variables, controlling the reason and way of job-search. Status variables include education, age, working sector etc, in current work only dummy variables are used in this context where value „1" means the corresponding condition is true. Index f following a status variable name means the corresponding status on the new job, l on the previous job. This notation is used only for variables which can be different across the jobs. A version of status variables are status change variables, denoted as $A \to B$. These can have value -1, 0 or 1, meaning correspondingly shift from status B to status A, staying in status A or B, and shift from status A to B. Three job-search variables are used describing migration, unemployment and displacement. These variables describe the different sorting of jobs, in the case of model with endogeneous migration decision, the sorting associated with migration is modelled explicitly and the variable *migration* is not used.

Two regions are considered: Tallinn (T) and rest of the Estonia (E). Variable T is a dummy which' value is 1 for Tallinn and $T \to E$ can have values -1, 0 and 1 depending on the migration.

Table 2: Explanatory variables used in the model.

last wage	last wage on the particular work-place, relative to the Estonian average
first wage	first wage on the particular work-place, relative to the Estonian average
	job search variables
migration	new job in another region
displaced	leaved the job involuntarily
unemployed	unemployed between the jobs
	status variables
private	new job in private sector
I	new job in primary sector
II	new job in secondary sector
professional	new occupation as senior official, professional (ISCO groups 1-3)
tenure > 2	tenure at last job longer than two years
young	age < 35
higher education	individual has higher education
non-Estonian	not ethnic Estonians
woman	female
married	a couple, whether married or not
depending	depending person in the family
Tallinn	job in Tallinn
	status change variables
→private	movement to private sector
I→II	movement from primary to secondary sector
II→III	
III→I	
→professional	status change to professional
$E \to T$	moving to Tallinn

Note: Search and status variables are dummy variables.
The status change variables have value „1" when the individual moved to particular status, „-1" when moved out from the status, and „0" means no status change.
„1" following a status variable name means the corresponding variable on the new job.

3.3 Descriptive statistics

The sub-sample, used in this work, contains 2384 job-to-job movements. The statistical overview of the data is given in the Table 3. The main facts in the table are the following:

Table 3: Summary statistics

	Stayers		Movers	
	Estonia	Tallinn	$E \to T$	$T \to E$
log last wage	-0.53	-0.11	-0.35	-0.03
log first wage	-0.29	0.09	0.30	0.04
displaced	0.49	0.39	0.31	0.33
unemployed	0.06	0.06	0.11	0.13
private1	0.69	0.68	0.69	0.75
state1	0.31	0.32	0.31	0.25
I1	0.16	0.01	0.03	0.09
II1	0.33	0.29	0.33	0.47
professional1	0.30	0.39	0.26	0.30
tenure (years)	6.56	5.18	5.36	2.87
young	0.49	0.48	0.58	0.62
higher education	0.12	0.24	0.14	0.09
non-Estonian	0.20	0.46	0.19	0.39
woman	0.38	0.41	0.25	0.18
married	0.69	0.63	0.71	0.61
depending	0.70	0.66	0.72	0.74
No. observations	1338	841	118	87

Note: average values of the variables. *wage* is measured relative to the Estonian average. All but *wage* and *tenure* are dummy variables.

- The average difference between the last and the first wage is 20-30% in both regions. The wage gain is significantly higher for individuals, migrating to Tallinn. In the case of opposite migration, the gain is small but positive.
- There are more displaced persons outside of Tallinn. Displaced persons are less mobile.
- Unemployment in the sample is similar for both regions. Unemployed individuals are more mobile.
- Comparing the employment across the sectors, one sees that migration to Tallinn goes mainly to the tertiary sector, whereas the opposite migration goes to secondary and tertiary sectors. Very few migrants start working in the primary sector.
- Younger individuals are more mobile. The $T \to E$ migrants have lower tenure.
- The share of migrants with higher education is similar to the distribution in the donor region in the case of $E \to T$ migration. In opposite direction, the share of higher education is much lower.

- Women are less mobile.
- Family variables show no clear pattern.

4 Models

The idea of the models is to describe the (log of) wage as a function of two types of variables – status variables, describing the particular job, location and personal characteristics; and search variables, describing the way the particular job was obtained. Eventual unemployment, migration and displacement belong here. The variable of interest in current context is migration.

Two types of wage are observed: last wage w_l and first wage w_f. The notions *first* and *last* are associated with the particular job – these are the individual's first and last wage on a particular job. Investigating job changes, one observes first *last wage on the previous job*, and thereafter *first wage on the next job*. So, in current context the last wage is followed by the first one.

Two models are constructed. The first, wage change model, is a simple description of wage change associated with migration. It's advantage is simplicity and easy estimation but it do not explain causal relationship between migration and wage increase. The second model is an attempt to describe the first wage using endogenous migration decision from the viewpoint of investment into location (Sjaastad, 1962). Migration decision is connected with expected gains and modelled by selection model in Heckman (1976) style.

4.1 Modelling the last and first wage

Assume that the wage in region $R \in \{E, T\}$ can be expressed as

$$\log w_{ti}^R = \alpha_{0t}^R + \boldsymbol{X}_{ti}' \boldsymbol{\alpha}_t^R + \boldsymbol{Y}_{ti}' \boldsymbol{\beta}_t^R + u_i^R. \tag{1}$$

The vector $\boldsymbol{X}_t$ contains status' variables on corresponding job and $\boldsymbol{Y}_t$ search variables, $t \in \{f, l\}$ denotes wage type, $\boldsymbol{X}_l$ and X_f are the status variables on previous and next job correspondingly. Neither $\boldsymbol{X}_t$ nor $\boldsymbol{Y}_t$ contains constant term, the only constant is α_{0t}^R.

Assume further that $\boldsymbol{\alpha}_t^R \equiv \boldsymbol{\alpha}$ do not depend on the region and wage type. It means the slope parameters are equal for both regions and wages, or, the status' variables do not affect the difference between the regional wages and wage types. The difference is fully described by the constant term, by search variables, by the difference between X_f and X_l and by the error terms.

Analogously, assume that $\boldsymbol{\beta}_t^R \equiv \boldsymbol{\beta}_t$ do not depend on region. It means the slope of search parameters is the same (search variables are affecting wage in the same way) in both regions. However, the different affect on the different wage types is allowed.

Assume further that the first wage is depending both on $\boldsymbol{X}_f$ and $\boldsymbol{Y}_f$ while the last wage is depending on $\boldsymbol{X}_l$ only ($\boldsymbol{\beta}_l = 0$). This means that the first wage is depending on the way the job was searched while the last wage is not. This assumption is mainly motivated by the availability of data. The data for job searching is present only if job was started after the beginning of 1989. Second, the unemployment and the number of displaced workers was low in the beginning of transition (the number of migrants has always been low), and concludingly there is not much variation in the data. Additional motivation comes from the fact that the last wage is more depending on the on-the-job training and general ability and less on the job search. However, it is a possible source of bias. The way of job search may affect the last wage through the chosen industry or occupation, for example. This issue is further discussed in the section 6.

Write α_{0t}^R as sum of type specific and region specific component:

$$\alpha_{0t}^R = \alpha_{0t} + \alpha_0^R. \tag{2}$$

I normalize $\alpha_0^E = 0$.

Assume the error term u_i contains individual-specific and true random component:

$$u_i^R = u_i^I + u_{it}^R, \tag{3}$$

where the individual-specific component u_i^I has the same value for last and first wage and in both regions. The true random component u_{it}^R differs across wage types and regions, it includes unobserved job-specific effects and individual, job and region mixed effects. The individual can gain in wages, if the job-specific or personal characteristics or random component between previous and next job differ.

There are different views in the literature whether one should control for observable job characteristics in order to estimate the return from migration. Borjas *et al.* (1992) argue that changing the (observable) job characteristics is one way to gain from migration, so those variables should not be included into regression. Yankow (1999), in contrary, controls for the observable characteristics, he argues that ignoring the observed variables can bias the results. In current work both the methods are applied, controls for industry and occupations are included in the case of *long form* while in the case of *short form* they are dropped. Main results do not differ significantly between the two forms.

In principle equation (1) can be estimated directly. However, due to high wage inflation in Estonia during transition period, the intercept α_0 would depend on time (the wage increase model, discussed below, is less sensitive to that problem). In this case it is difficult to separate the intercept and the coefficient of migration, which is the aim of current paper. In order to eliminate inflation effects in the first wage model, the nominal wage was deflated with a proxy for the mean wage in Estonia. In fact the wage level is estimated, comparing the actual nominal wage with the approximated average.

4.2 Wage increase model

The advantage of wage increase model is the fact that it uses more information than just the first wage. It is more robust against selection effects in the form of unobserved parameters and against trend in the variables. In contrast with the first wage model, the actual nominal wage is used. One disadvantage, as mentioned before, is the lack of the search data for previous job. Second, it needs an assumption about the association between endogenous migration decision and wage. In the current model the common additive shift (AS) is used where $\log w$ is assumed to be higher for the migrants by a constant.

Making the assumptions described above, one can write:[1]

$$\log w_{fi}^{R_{fi}} - \log w_{li}^{R_{li}} = \left(\boldsymbol{X}_{1i}' - \boldsymbol{X}_{0i}'\right)\boldsymbol{\alpha} + \boldsymbol{Y}_i'\boldsymbol{\beta} + \\ + \left(\alpha_0^{R_{fi}} - \alpha_0^{R_{li}}\right) + (\alpha_{0f} - \alpha_{0l}) + v_i. \quad (4)$$

R_{li} and R_{fi} describe regions of previous and next job correspondingly. Here the assumption is made that the distribution of error terms in equation (1) has similar distribution in both regions. The individual-specific component of the error term drops out.

Equation (4) shows that the wage change expression can be described containing four parts: the first part depends on the change of characteristics, the second describes the job-search, the third controls for the regional wage level and the fourth for different type wage level.

Using direction variable $E \to T$ for migration to Tallinn, equation (4) can be written as

$$\begin{aligned}\log w_{fi}^{R_{fi}} - \log w_{li}^{R_{li}} &= (\boldsymbol{X}_{fi}' - \boldsymbol{X}_{li}')\boldsymbol{\alpha_l} + \boldsymbol{Y}_{fi}\boldsymbol{\beta} + (\alpha_{0f} - \alpha_{0l}) + \\ &+ \alpha_0^T \cdot (E \to T) + v_i. \end{aligned} \quad (5)$$

If the movers are receiving higher wages thanks to unobserved variables (it is described by u_{it}^R), then $Ev^M > Ev^S$. This effect is captured by the dummy variable *migration*.

All the parameters can be estimated with OLS.

4.3 Endogenous migration model

The purpose of this model is to construct an independent way of estimating immediate wage effect associated with migration. Here I use only the first wage data, the last wage is not used. In order to include selection effects, the endogenous migration decision is introduced using first wage as a proxy for expected long-run income.

Assume that the decision to change the job is exogenous. Given that decision, the individuals choose between offers in the home and the distant region. If the wage offer in the distant region is enough better than in the home region, the individual migrates, otherwise takes the job in the home region. Such a behaviour is perhaps not far from truth for displaced persons, for the others, the decision to change the job is probably endogenous. However, the decision of job change is not investigated in the current paper in order to avoid modelling on-the-job search. Possible biases are discussed in the section 6.

Assume an individual, living in the region R, considers whether to accept an offer in the local or distant region. The distant offer is accepted if the expected long-run income is bigger than in the local case plus some mobility cost. Assume the expected discounted long-term income in region R is related with the first wage as:

$$EY_i^R = a \log w_{fi}^R + a\nu_i^R, \quad (6)$$

[1] Note that this particular expression allows the last wage to be associated with the following job-search behaviour. In that case the coefficient $\boldsymbol{\beta}$ must be interpreted as affecting not wage but wage increase.

where $a > 0$ is a proportionality factor. Note that the following is not modelling the first wage any more, but modelling the expected long-term income using proxy in the form of first wage.

The individual will move if (s)he expects a gain from it:

$$y_i^* = EY_i^{\bar{R}} - EY_i^R - C_i > 0. \tag{7}$$

Here $\bar{R}$ means the other region, and C is mobility cost. Assume the mobility cost can be expressed as

$$C_i = \boldsymbol{Z}_i'\boldsymbol{\gamma} + \varepsilon_i. \tag{8}$$

Here $\boldsymbol{Z}$ describes the personal and region-related characteristics. Note that the distribution of error term ε is assumed not to depend on the region. According to the assumptions in section 4.1 we can write

$$\begin{aligned}\frac{EY_i^{\bar{R}} - EY_i^R}{a} &= \log w_{fi}^{\bar{R}} - \log w_{fi}^R + \nu_i^{\bar{R}} - \nu_i^R = \\ &= \alpha_0^{\bar{R}} - \alpha_0^R + \left(u_{if}^{\bar{R}} - u_{if}^R\right) + \left(\nu_i^{\bar{R}} - \nu_i^R\right),\end{aligned} \tag{9}$$

Where u is error term from the wage equation (1) and the individual-specific component u^I drops out. The difference depends only on the difference between regional wage levels $(\alpha_0^{\bar{R}} - \alpha_0^R)$ and on error terms, not on the personal characteristics. Using (6), (8) and (9) it follows from (7):

$$y_i^* = a\left(\alpha_0^{\bar{R}_{li}} - \alpha_0^{R_{li}}\right) - \boldsymbol{Z}_i'\boldsymbol{\gamma} + e_i, \tag{10}$$

where

$$e_i = a\left(u_i^{\bar{R}} - u_{if}^R\right) + a\left(\nu_i^{\bar{R}} - \nu_i^R\right) - \varepsilon_i. \tag{11}$$

The first term in parenthesis describes the differences in stochastic component in wages, and the second term is differences in stochastic component in long-run incomes. Note that α_0^R can be interpreted not as regional wage level but as a general region-specific effect. It is natural to suggest that $\operatorname{Corr}(e, u^{\bar{R}}) > 0$ and $\operatorname{Corr}(e, u^R) < 0$.

The variance of the error term e is

$$\begin{aligned}\operatorname{Var} e &= a^2\operatorname{Var}\left(u_f^R + \nu_i^R\right) + a^2\operatorname{Var}\left(u_f^{\bar{R}} + \nu_i^{\bar{R}}\right) + \operatorname{Var}\varepsilon - \\ & a^2 2\operatorname{Cov}\left[\left(u_f^R + \nu_i^R\right), \left(u^{\bar{R}} + \nu_i^{\bar{R}}\right)\right] + \\ & 2a\left\{\operatorname{Cov}\left[\left(u_f^{\bar{R}} + \nu_i^{\bar{R}}\right), \varepsilon\right] - \operatorname{Cov}\left[\left(u^R + \nu_i^R\right), \varepsilon\right]\right\}\end{aligned} \tag{12}$$

A similar expression can be written for an individual, initially in the region $\bar{R}$.

So long $\boldsymbol{\gamma}$ and $\boldsymbol{Z}$ are unspecified, we can redefine them and write (10) in a shorter form:

$$y_i^* = \boldsymbol{Z}_i'\boldsymbol{\gamma} + e_i. \tag{13}$$

Note that $\boldsymbol{Z}$ now includes regional wage level difference (term $\alpha_0^{\bar{R}_{li}} - \alpha_0^{R_{li}}$ in (10)) for both, movers and stayers.

Now it is possible to combine stayers in both regions and movers in both regions. Here, it is necessary that $\operatorname{Var} e$ is equal in both regions, i.e.

$$\operatorname{Cov}\left[\left(u^{\bar{R}}+\nu_i^{\bar{R}}\right),\varepsilon\right]=\operatorname{Cov}\left[\left(u^{R}+\nu_i^{R}\right),\varepsilon\right], \tag{14}$$

i.e. the correlation between expected income and moving cost is equal in both regions. Note that variables in the vectors $\boldsymbol{X}$ and $\boldsymbol{Y}$ are not necessarily included in $\boldsymbol{Z}$.

Using (1) we can write equation for first wage for stayers and movers as

$$\log w_{fi}^{SR} = \alpha_{0f}+\alpha_0^R+\boldsymbol{X}'_{fi}\boldsymbol{\alpha}+\boldsymbol{Y}'_{fi}\boldsymbol{\beta}_f+u_i^R. \tag{15}$$

$$\log w_{fi}^{M\bar{R}} = \alpha_{0f}+\alpha_0^{\bar{R}}+\boldsymbol{X}'_{fi}\boldsymbol{\alpha}+\boldsymbol{Y}'_{fi}\boldsymbol{\beta}_f+u_i^{\bar{R}}. \tag{16}$$

Here it is assumed that the error terms, u^S and u^M have equal distribution in both regions. Both equations can be written in shorter form as

$$\log w_{fi}^{SR} = \boldsymbol{K}'_{fi}\boldsymbol{\delta}+u_i^R. \tag{17}$$

$$\log w_{fi}^{M\bar{R}} = \bar{\boldsymbol{K}}'_{fi}\boldsymbol{\delta}+u_i^{\bar{R}}. \tag{18}$$

Here $\boldsymbol{K}$ includes both personal, job-search related and regional variables. Note that in addition to the difference in the error terms, the expressions for movers and stayers have different regional variables. The variable *migration* is *not* included in the case of selection model.

We can observe only the sign of y_i^* and one of the variables, w_{fi}^{SR} or $w_{fi}^{M\bar{R}}$, depending on the sign. In this case we can normalize $\boldsymbol{\gamma}$ so that $\sigma_e=1$. Assuming e_i, u_i^S and u_i^M have a common three-dimensional distribution, the equations (13), (17) and (18) together form a version of type 5 Tobit model, following Amemiya (1985) notation.

Writing the distribution of the error terms as

$$\begin{pmatrix} e_i \\ u_i^S \\ u_i^M \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix},\begin{pmatrix} 1 & \varrho_S\sigma_S & \varrho_M\sigma_M \\ \varrho_S\sigma_S & \sigma_S^2 & \sigma_{SM} \\ \varrho_M\sigma_M & \sigma_{SM} & \sigma_M^2 \end{pmatrix}\right), \tag{19}$$

the log-likelihood of the model will be:

$$\begin{aligned}
l = -\frac{N}{2}\log 2\pi + & \\
&+\sum_S\Bigg\{-\log\sigma_S-\frac{1}{2}\left(\frac{w_{fi}^{SR}-\boldsymbol{K}'_{fi}\boldsymbol{\delta}}{\sigma_S}\right)^2+ \\
&\qquad +\log\Phi\left[-\frac{\boldsymbol{Z}'\boldsymbol{\gamma}+\frac{\varrho_S}{\sigma_S}\left(w_{fi}^{SR}-\boldsymbol{K}'_{fi}\boldsymbol{\delta}\right)}{\sqrt{1-\varrho_S^2}}\right]\Bigg\} \\
&+\sum_M\Bigg\{-\log\sigma_M-\frac{1}{2}\left(\frac{w_{fi}^{M\bar{R}}-\bar{\boldsymbol{K}}'_{fi}\boldsymbol{\delta}}{\sigma_M}\right)^2+ \\
&\qquad +\log\Phi\left[\frac{\boldsymbol{Z}'\boldsymbol{\gamma}+\frac{\varrho_M}{\sigma_M}\left(w_{fi}^{M\bar{R}}-\bar{\boldsymbol{K}}'_{fi}\boldsymbol{\delta}\right)}{\sqrt{1-\varrho_M^2}}\right]\Bigg\}.
\end{aligned} \tag{20}$$

Consistent initial values for the likelihood maximisation can be found using Heckman two-step procedure.

The equations (13), (17) and (18) can be estimated separately as a two-part model (TPM). It has been found that in some situations TPM does better than selection model, specially in the cases where exclusion condition cannot be specified (Puhani, 2000).

The expected observed wage for the movers and stayers is (the indices i, f and R are dropped):

$$\begin{aligned} E \log w^S &= \boldsymbol{K}'\boldsymbol{\delta} - \varrho_S \sigma_S \lambda(-\boldsymbol{Z}'\boldsymbol{\gamma}) && (21) \\ E \log w^M &= \bar{\boldsymbol{K}}'\boldsymbol{\delta} + \varrho_M \sigma_M \lambda(\boldsymbol{Z}'\boldsymbol{\gamma}) && (22) \end{aligned}$$

and the expected difference between the wages of movers and stayers, not explained by the observable variables, is consequently

$$D = \varrho_M \sigma_M \lambda(\boldsymbol{Z}'\boldsymbol{\gamma}) + \varrho_S \sigma_S \lambda(-\boldsymbol{Z}'\boldsymbol{\gamma}). \qquad (23)$$

If the model is estimated with TPM, $D = 0$ because $\varrho \equiv 0$. In that case the unexplained difference can be captured by AS using the dummy variable *migration*.

5 Empirical Results

Due to methodology, all the results must be interpreted conditional to job change.

5.1 Wage change model

The results for the wage change model in the form (5) are given in the Table 4. The status' variables, used in the model were $tenure > 2$, *professional*, *I*, *II*, *III* and *private*. The results for long and short model are similar. Note that $tenure > 2$ must be interpreted with minus sign: it is tenure on the *previous job*, tenure on the first job is always zero, and the corresponding term in equation (5) is $(0 - tenure_i)\alpha_{tenure}$.

The intercept term (term $\alpha_{0f} - \alpha_{0l}$ in equation (5)) describes the different wage setting processes for first and last wage. First wage on the new job has typically been around 30% higher than the last wage on previous job.

The main parameter of interest, *migration*, is positive and significant (however, only on 10% level in the case of short model). It suggests that persons who migrate will earn relatively more than those who change the job only.

Displaced persons tend to get lower wage rise, the result for the unemployed is not significant. The negative values suggest that both types of employees have motivation to accept job with low wages. This is probably connected with the fact that job-change is usually exogenous for the displaced persons while a voluntary job-change takes place only if the new wage is better.

Surprising is the tenure-coefficient (negative value means that individuals with higher tenure will get higher wage rise, as explained before).

The status change coefficients have expected sign. They express the fact that professionals, individuals with higher education and worker in secondary

Table 4: Wage change model

	long form		short form	
	value	t	value	t
constant	0.2969	11.54*	0.2967	11.66*
migration	0.1282	1.97*	0.1249	1.92
displaced	-0.1845	-5.82*	-0.1917	-6.06*
unemployed	-0.0303	-0.46	-0.0217	-0.32
tenure > 2	-0.0828	-2.57*	-0.0785	-2.48*
$\to$professional	0.0905	2.37*		
I$\to$II	0.1512	2.31*		
II$\to$III	-0.1344	-4.19*		
III$\to$I	-0.0031	-0.05		
$\to$private	-0.0142	-0.53		
$E \to T$	0.2879	4.59*	0.2826	4.51*
	$R^2 = 0.045$		$R^2 = 0.033$	
	$F(10, 2373) = 11.16^*$		$F(5, 2378) = 16, 22^*$	

Notes:
heteroscedasticity consistent t-values are given.
* - significant on 95% level.
Coefficient for *tenure* must be interpreted with minus sign (explained in text).

sector have higher wages. There seems to be no significant difference between wages in state- and private sector.

The last variable, $E \to T$ („1" for $E \to T$ migrants, 0 for stayers and „-1" for $T \to E$ migrants), captures the wage level difference between Tallinn and the rest of Estonia ($\alpha_0^T - \alpha_0^E$ in (5)). The wages in Tallinn are around 30% higher than elsewhere.

5.2 First wage model

The first wage model was estimated in two ways – as a two part model and as a selection model. TPM consisted of equations (13), (17) and (18) estimated independently, selection model was estimated using likelihood function in the form (20) where common normal distribution of error terms (19) was assumed. The results are given in the Table 5 for the short form first wage model (long form is not shown); and in the Table 6 for migration decision part.

First wage models give mostly similar results when estimated in TPM or sample selection form, the difference between long and short form is not big as well. Most of the coefficients are in the same order as in wage increase model. The sign and significance for most of the coefficients are similar but *unemployment*, *higher education* and correlation coefficients differ significantly.

The main parameter of interest, the gain of migration, is around 0,20. The result is significantly higher than in the case of wage change model, but here all the four methods are giving similar result.

The displaced and unemployed individuals seem to accept 15 and 20% lower wage respectively at the next job (discussed in section 6).

Table 5: First wage model (short form)

	two-part model		selection model	
	value	t	value	t
constant	-0.0746	-2.46*	-0.1093	-2.79*
migration	0.2071	3.99*		
D			0.2099	2.99*
displaced	-0.1596	-5.80*	-0.1509	-5.19*
unemployed	-0.2036	-4.02*	-0.2166	-3.75*
young	0.0167	0.61	0.0108	0.38
higher education	0.3175	7.80*	0.3232	8.53*
non-Estonian	-0.1319	-4.35*	-0.1295	-4.16*
woman	-0.3659	-13.22*	-0.3536	-11.80*
Tallinn	0.3538	12.16*	0.3514	11.84*
ϱ_S			-0.2774	-1.60
ϱ_M			0.1810	4.05*

Notes:
Asymptotic t-values given
* - significant on 95% level.

There seem to be no significant difference between wages in the state and private sector. Wages in primary sector seem to be insignificantly lower than in the reference group (tertiary sector). The wages in secondary sector are around 20% higher, professionals earn about 25% more. The wage premium of higher education is of similar order but here the long and short model differ notably.

The wage of younger individuals do not differ from that of the older ones. Non-Estonians earn around 10% less than Estonians and women 30% less than men. The wage level in Tallinn is 40% higher than in rest of Estonia.

The correlation coefficient between wage- and selection error terms are of reasonable value for the short form but the value for the long form – $\varrho_S = 0.64$ – is clearly unrealistic. The decomposition of error term in selection equation (equation (11)) suggests that the correlation is negative.

Migration probability model gives generally few significant parameters (Table 6).

Displaced workers migrate less, unemployed individuals more. It may be explained by the idea that displaced workers are those who are generally less active to search job. The unemployed persons are more active, both on the local and distant labour market. This is probably associated with the fact that they have no alternate costs associated with leaving the previous job. Working in private sector and in secondary sector is associated with more mobility. However, the results are hardly significant.

The result for young individuals is positive but surprisingly not significant on 5% level.

Individuals with higher education are less mobile. Both of these models give insignificant results, but from the Table 3 it seems reasonable to conclude that this effect is due to lower tendency to migrate out from Tallinn, probably due to different returns of education in different regions.

None of the family related variables appears to be significant.

Table 6: Probit model for migration

	two-part model		Selection model			
			long form		short form	
	value	t	value	t	value	t
constant	-1.4026	-10.75*	-1.3301	-10.55*	-1.4195	-10.94*
displaced	-0.2778	-3.45*	-0.2868	-3.63*	-0.2768	-3.45*
unemployed	0.4396	3.30*	0.4223	3.24*	0.4554	3.45*
professional$_l$	0.0204	0.22	-0.1022	-1.11	0.0899	0.89
private$_l$	0.1138	1.46	0.1452	1.97*	0.0855	1.10
I$_l$	-0.0014	-0.01	0.0241	0.22	-0.0186	-0.16
II$_l$	0.1607	1.89	0.1414	1.77	0.1884	2.20*
young	0.1471	1.82	0.1104	1.39	0.1465	1.82
higher education	-0.1774	-1.45	-0.1424	-1.18	-0.1935	-1.56
non-Estonian	-0.1017	-1.13	-0.0727	-0.83	-0.1008	-1.12
woman	-0.3471	-4.02*	-0.2764	-3.17*	-0.3463	-4.05*
cohabiting	0.0251	0.29	-0.0904	-1.06	0.0584	0.66
depending	0.0840	0.96	0.1191	1.45	0.0573	0.66
$\alpha_0^{\bar{R}} - \alpha_0^R$	-0.0526	-1.25	-0.0235	-0.57	-0.0476	-1.13
	$\chi^2(13) = 65.9^*$					

Notes:
* - significant on 95% level.

Surprising is the coefficient for wage difference, $\alpha_0^{\bar{R}} - \alpha_0^R$. This term describes the anticipated difference in wage levels (in equation (10)). Negative value of the coefficient means that moving toward higher wages in Tallinn is actually less probable than the opposite migration. Probably the other regional characteristics, not only wages, are affecting migration.

6 Discussion

Both the models support the idea that part of the gain of migration is received immediately with the first wage. The coefficient for the first wage model is significantly higher than in the case of the wage change model. This fact is probably caused by the unobservable characteristics, the movers tend to receive higher wage in general. This view is confirmed by the table 3, where it is shown that the last wage of movers is higher than the average. The selection model should take into account the unobserved characteristics by the migration decision equation (7), but due to low significance of estimation, notable effects may persist. The unstable values for the correlation coefficients suggest that the selection model do not work efficiently on current data. The results, given by selection models do not differ significantly from those, given by corresponding TPM-s.

The result may be interpreted as an extra wage increase due to job sorting, the movers get immediately on their first job, relative to the wage increase of the natives. This means the movers have found better wage (better job) instantly after the migration than the local inhabitants who are changing the job. Although the current approach is not directly associated with any theoretical model, it supports the idea of continuous job search with mobility costs. In that case a job in distant region is accepted only if the wage offer is high enough. It should be stressed here that in this case job is found *before* the actual movement takes place. If an individual would migrate before the job is found, it would be difficult to explain his/her relatively high wage.

The immediate wage gain suggests that the migration costs are relatively high and the planning horizon is short. From these conclusions two policy implications are possible:

- The migration risk and in this way the migration cost too, can be lowered and mobility increased if the government makes information about jobs in other regions more easily available.
- The short planning horizon can be used to affect migration in a certain direction by limited-time wage or tax subsidies.

The negative effect of expected wage increase (variable $\alpha_0^{\bar{R}} - \alpha_0^R$ in the table 6) on the migration probability can result from several reasons. One explanation is that different region-specific variables, not just the wage, play an important role. It would be easy to take into account living costs but those are unfortunately not measured in Estonia. The housing prices vary hugely across Estonia, making it difficult to migrate to Tallinn despite of much higher wages there. It is not possible just to sell one's old flat in countryside and buy a new in Tallinn, a flat price in poorer regions is comparable to monthly rental prices in Tallinn.

As mentioned above, the result for wage change model may be biased because I do not control for job search behaviour on the previous job. Search behaviour on the previous job, associated with lower last wage (presumably unemployment and displacement) may result higher wage increase associated with the next job. If these persons are more mobile, this would bias the value of $migration$ coefficient upward. In this case, the migrants should have low last wage. This outcome seems improbable, table 3 shows that the migrants have higher last wages. If the individuals, receiving lower last wage, have lower tendency to migrate, then the last wage of migrants should be above the average. Because the tendency for the unemployed is lower and for the displaced higher, the sign of the bias is ambiguous.

Assumption that the job change is exogenous should show higher first wage for the voluntary (endogenous) job-changers. One will voluntarily change the job only if one has found a better offer, presumably with higher wage. This fact may explain partly the low first wage for unemployed and displaced individuals. The presence of migration costs should affect the voluntary and involuntary job-changers in the same way, leaving extra wage increase, which is associated with migration, unaffected.

The fact that individuals with longer tenure receive higher wage increase is presumably associated with the high inflation in Estonia during the transition time. Assuming the wage is increasing with job-specific human capital, one would expect that the wage change, associated with job change, will decrease with tenure. The current result suggests that this need not to be the case in transition economies. There are two possible explanations:

- During the years of transition, the rise of wages of existing jobs systematically lay behind the average wage inflation. New jobs were created with the wages significantly above the average.

- Costs, associated with the job change, are different across the individuals. Generally, those who have worked longer time by a certain employer have higher mobility costs, and in conclusion, they must get higher wage offer in order to choose to change the employer.

This outcome needs further investigation.

In the future work it is necessary to introduce the modelling of on-the-job search. A possible improvement may be to allow the slope parameters to differ across the regions. And third – a better variable set should be designed for describing migration decision.

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