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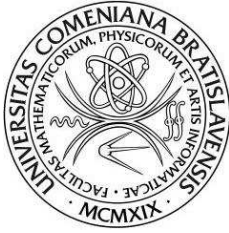
Fakulta matematiky, fyziky a informatiky

Katedra aplikovanej matematiky a štatistiky

Diplomová práca

Bratislava 2010   Vladimír Oravec

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JOB FLOWS AND FIRM GROWTH: THE CASE OF SLOVAK REPUBLIC 2000-2007

Diplomová práca

Vladimír Oravec

9.1.9 Aplikovaná matematika

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Poďakovanie

Chcel by som využiť tento priestor a vysloviť úprimné poďakovanie svojmu vedúcemu záverečnej práce, Mgr. Matúšovi Senajovi za odborné rady a mnohé podnetné pripomienky k práci. Taktiež by som rád poďakoval rodine a najbližším za ich trpezlivosť a podporu.

Čestné prehlásenie

Prehlasujem, že som prácu vypracoval samostatne s využitím svojich poznatkov a s použitím uvedenej literatúry.

Abstrakt

ORAVEC, Vladimír: Job flows and firm growth: the case of Slovak Republic 2000-2007. [Diplomová práca]-Univerzita Komenského v Bratislave. Fakulta matematiky, fyziky a informatiky; Katedra aplikovanej matematiky a štatistiky.-Vedúci diplomovej práce: Mgr. Matúš Senaj-Bratislava: NBS, 2010 /61 s./

Diplomová práca sa zaoberá tokmi pracovných miest na trhu práce v Slovenskej Republike v rokoch 2000 až 2007. Pri svojom výskume využíva databázu informácii o firmách Štatistického úradu SR. Výsledok pre celkový tok pracovných miest na trhu práce je veľmi podobný ostatným krajinám prechádzajúcim z centrálne plánovanej ekonomiky na trhovú. Zánik pracovných miest výrazne prevyšuje ich vznik. Tento rozdiel sa však ku koncu pozorovaného obdobia zmenšuje až napokon v roku 2007 vznik mierne dominuje nad zánikom. Ďaľšou podobnou črtou týchto krajín je inverzná zívislosť medzi veľkosťou firmy a jej flexibilitou na trhu. Výsledky dokazujú, že čím má firma menej zamestnancov tým je flexibilnejšia. Odvetvia priemyslu, ktoré kedysi boli v popredí záujmov dnes upadajú (poľnohospodárstvo, baníctvo), zatiaľ čo kedysi podceňované a nevyvinuté odvetvia napredujú (Veľkoobchod a maloobchod). Regióny Slovenskej Republiky do roku 2005 vykazovali veľké rozdiely, ale odvtedy zaznamenali veľký rast a rozdiely sa začali zmenšovať. Firmy bez podielu zahraničného kapitálu na začiatku výrazne zaostávali, výrazne prevyšoval zánik pracovných pozícii, ale postupom času sa produktivita ich pracovníkov zvýšila a od roku 2004 sa vznik a zánik pracovných miest v týchto firmách takmer vyrovnali. V poslednej časti sa táto práca zaoberá modelovaním pravdepodobnosti rastu firmy. Vplyv na túto pravdepodonosť nepreukázali regióny, čo je veľmi zaujímavé zistenie. Všetky ostatné parametre (veľkosť firmy, produktivita pracovníkov, hodinová mzda...) vplyv preukázali.

Kľúčové slová: Vznik pracovných miest, Zánik pracovných miest, Čistá zmena zamestnanosti, Fluktuácia pracovníkov, Rast firmy, Slovenská republika

Abstract

In this work job flows in Slovak labor market over period 2000-2007 are analyzed. Based on the database containing information about firms compiled by Statistical Office of the Slovak Republic. This thesis shows that job destruction almost over whole period dominates the job creation (except of 2007), what is a common feature of the transition economies. Traditional industries like agriculture experienced the big decline, net employment change and job reallocation rate had the worst values among all of the industries. On the other hand, industries like wholesale, retail trade and business services remarked boom. Another similar feature with transition economies is reverse trend of relationship between job reallocation and enterprise size. The most flexible firms are the smallest, whereas the biggest vice versa. The study of regions of Slovak Republic demonstrates sizeable differences between Slovak regions till 2005 and decreasing of these differences since then. Results in ownership type examination show that restructuring process in the Slovak labor market achieved positive results. The consolidation of job flows in firms not sharing of foreign capital started in 2004 and productivity of employees markedly raised. The last part of this work is the view on probability of firm growth. Using probit model we found out that this probability depends positively on enterprise size, productivity of workers and foreign capital, and negatively on wages paid to workers. Regions were found to be not significant, which is very interesting finding.

Contents

Chapter 1

Introduction

Slovak Republic belongs to the group of countries located in central and eastern Europe, that are transforming from centrally planned economy to the market system. This transition process, after which have these countries their name (transition countries), started in the early 1990s. In Slovakia it began approximately in 1991, when the Soviet Union, under which influence Slovakia was, dissolved. This process is usually characterized by the changing and creating of institutions, especially private firms. The role of the state is changing, thereby, the creation of fundamentally different governmental institutions and the promotion of private-owned firms, markets and independent financial institutions (Falke (2002)).

The main ingredients of the transition process (IMF) are *liberalization* (allowing most prices to be determined in free market and lowering trade barriers), *macroeconomic stabilization* (bringing inflation under control and lowering it over time), *restructuring and privatization* (reforming the firms to render them capable of producing goods that could be sold in free markets and transferring their ownership into private hands) and *legal and institutional reforms* (redefining the role of the state).

In 2000, the International Monetary Fund listed the following European countries as transition economies: Albania, Belarus, Bulgaria, Croatia, *Czech Republic*, *Estonia*, *Hungary*, *Latvia*, *Lithuania*, Republic of Macedonia, Moldova, *Poland*, Romania, Russia, *Slovak Republic*, *Slovenia*, Ukraine. According to European Bank for Re-

construction and Development, eight countries, which joined the European Union in 2004 (italic in the list of countries) have completed the transition process.

Many empirical studies on job flows and their determinants in CEE transition countries emerged over the last decade. These studies are considered as suitable indicators of labor market flexibility and restructuring processes and their main findings were summarized and discussed by Haltiwanger, Lehmann, Terrell (2003).

First of all, the patterns of job flows differ during transition. While in the early 1990s practically all of the transition countries observed predominance of job destruction over job creation, which led to high values of unemployment (Konings, Bilsen (1997)), in later stages of transition the equalization of the job creation and destruction rates came. Flexibility of labor market became comparable to economies of western Europe (Faggio, Konings (2003)). Second, very important feature of these works is that the majority of job creation took place in self-employment and small and private firms, while job destruction was concentrated mostly in the state enterprises.

The most recent paper about the Slovak labor market flows during the period 2000-2004 Siebertova, Senaj (2007) shows that these two features were typical also for the Slovak transition. Previous empirical analysis about job dynamics in the Slovak Republic covers period 1994-1998 and can be found in the World Bank Country Study (2002). During this period the net employment growth was low. Process of restructuring was slowed-down by the low values of the turnover rate (lower than in OECD countries, and also Poland) and the job creation fell below the neighboring transition countries. The second paper about Slovakia, Studena (2004), analyzed the relationship between firm size and its growth based on the sample of medium and large firms covering period 1993-1996. There was no proven relation between these two parameters. The novelty of this diploma thesis lies in employing hopefully more suitable data source comparing to previously mentioned papers.

The first goal of this thesis is to analyze the period of late transition in Slovakia 2000-2007 and searching for the possible end of the transition process, which was completed according to EBRD. Using the firm-level database from Statistical Office of SR, we calculate the job creation and destruction measures and compare with

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other transition countries and countries from western Europe. We also analyze net job flows by the firm characteristics: industry, firm size, region, ownership type. The second aim is the analysis of firm growth where the probit models are employed.

The following chapters are organized as follows. Literature overview is in the second chapter, while data description in the third. The methods of our work are presented in the fourth chapter. All of the sections of the chapter 5 are dedicated to particular results of our job flows analysis and estimation of firm growth model respectively. In the sixth chapter are presented summaries and conclusion of this thesis and finally the last two chapters belong to References and Appendix.

Chapter 2

Literature overview

In this first section we will introduce some of the books and papers that were helpful mostly.

DAVIS, S.J.-HALTIWANGER, J.C.-SCHUCH S. - Job creation and Destruction(1998)

The book is the outcome of the research program at the Center for Economic Studies. It focuses on the U.S. manufacturing sector from 1972 to 1988 using the most complete plant-level source currently available, the Longitudinal Research Data constructed by the Census Bureau. The authors describe the characteristics that create and destroy job positions over time (including industry of origin, wage payments, international trade exposure, factor intensity, size, age and productivity performance). This paper was very useful in the chapter where we have introduced methodology of our observations.

SIEBERTOVA Z.-SENAJ M.- Job creation and Job destruction: Evidence form the Slovak Republic 2000-2004 (2007)

This paper is the only one existing work about job flows in Slovak Republic. Authors in this work analyzed job flows in Slovak labor market during period 2000-2004. They found out that job flows in Slovak Republic are comparable to other transition countries. Job destruction dominates the job creation which leads to the negative net

employment change, compensated with sharp raise in the amount of self-employed persons. Job reallocation expands in sectors that were undeveloped in the past, and in traditional sectors of industry, like agriculture and mining, diminishes. In job creation are leading foreign owned enterprises, dominating over the state and the domestic private firms. Together with foreign owned firms are the most dynamic smaller firms. In analysis of the enterprise size was found typical feature for transition economies, inverse relation between firm size and job reallocation rate. Authors also investigate the enterprise growth and their results show that the probability of enterprise growth depends on ownership type and negatively on the initial size. In this thesis we have made several comparisons with this work recalculating our results into period till year 2004.

FAGGIO G.-KONINGS J. - Job Creation, Job Destruction and employment growth in transition countries in the 90´s.(2003)

This paper is covering job flows studies in five transition countries, Poland, Estonia, Slovenia, Bulgaria and Romania (period 1993-97). The first important finding is the domination of job destruction over creation in all transition countries, but this dominance has decreasing tendency. According to this paper job reallocation rate in more developed transition countries is comparable to those of western economies. The next interesting conclusion is that foreign enterprises have higher excess job reallocation rates and small businesses are the most dynamic in terms of job reallocation.

RUTKOWSKI J. - Job creation and job destruction in Poland 1993-1999 (2002)

We mention this work as an example of transition countries that neighbor with Slovakia. Following this work, labor market in Poland is very flexible and dynamic, job reallocation rate is comparable to the OECD countries with flexible labor markets. Job destruction rate is during observed period above creation rate and sum of these rates (job reallocation rate) has varied. Job reallocation in the smallest enterprises reaches higher values than in the bigger firms. Also the best net employment change

results are in the smallest enterprises.

BROWN D.J.-EARLE S.J. - Job reallocation and Productivity Growth in the Ukrainian Transition (2004)
As the second example of neighboring country we introduce Ukraine. This work targets the reallocation rate and covers period 1992-2000. The increase of the job reallocation enhances the productivity, but this affect is a little bit slower than in "Mother Russia".

RUTKOWSKI J. - Firms, Jobs And Employment In Moldova (2004)
Low employment and scary job opportunities are main conclusions of this work. Lack of firms that entries labor market and low rate of job creation of existing firms. Combination with high destruction rate, which is typical for transition countries, generates difficult situation. Only small and novo private enterprises have positive results in the net employment change rate, but unfortunately for Moldova, this sector is on labor market represented very lightly.

BOJNEC S.-KONINGS J. (1998) - Job Creation, Job Destruction and Labor Demand in Slovenia
In early years of transition the job destruction rate dominates the job creation, later diminishes. The excess job reallocation is low. The newly established firms participate on job creation rate mostly and have higher employment growth than traditional enterprises.

EAMETS R.-PHILLIPS K.-MASSO J.(2004) - Where have all the jobs gone? Gross job flows in Estonia
This paper analysis gross job flows in Estonia over period 1995-2001 covering almost 52000 firms. The creation and destruction rates are extremely high and comparable to US flows. Estimation of the amount of job flows over and above the amount needed to accommodate net employment changes is 23 percent-excess job reallocation in US

was 18 percent, in UK 9 percent and 6 percent in Germany. The job flows was keeping in high values the favorable institutional environment, low start-up costs and a large representation of the smallest firms.

CENTENO M.-MACHADO C.-NOVO A. A.(2007) - Job creation and destruction in Portugal

For comparison with countries from western Europe we use Portugal labor market during years 2000-2007. The job creation rate fluctuates at around 14 percent and job destruction at around 12 percent which induces positive net employment change. Small firms play significant role in job flows survey but the biggest enterprises contribute mostly to job creation of Portugal.

DENG H.-McGUCKIN R.(2005):The Dynamics of China's Labor Market: Job Creation and Destruction in the Industrial Sector

According to the authors China has made substantial progress in its transition to a market-driven economy. This work provides the job flows study in chinese labor market during period 1995-2003. In the center of transition were state administrated and government controlled firms. The annual rate of productivity growth of chinese large and medium firms was marvelous 20.4 percent. Private firms still outperformed government controlled firms.

SCHIFERAW A.-BEDI A.(2009) - The Dynamics of Job Creation and Job Destruction: Is Sub-Saharan Africa Different?

To make an interesting comparison we choose work about Ethiopian labor market during period 1996-2007. The rates of job creation and destruction are comparable to the findings from developed and emerging economies. Job reallocation is higher in smaller and younger firms, but small firms create jobs mainly in order to market-entry.

Chapter 3

Data

In following analysis, we use annual surveys conducted by the Statistical Office of the SR. The three annual surveys were merged together: Annual questionnaire on business statistics, Annual questionnaire in banking and non-banking financial institutions, Annual questionnaire in insurance.

The object of statistical survey Annual questionnaire in banking and non-banking financial institutions and Annual questionnaire in insurance is to obtain information for system of national accounting, needs of financial statistics and needs of international organizations. Purpose of Annual questionnaire on business statistics is to obtain information about development and structure of employment and salaries. The objective group of these surveys are all of firms from register of Statistical Office of SR, only Annual questionnaire on business statistics is working with firms with more than 20 employees. Enterprises are surveyed exhaustively (firms with less than 20 employees are represented only if they remarked sales over 100 million Slovak crowns), based on collecting all necessary information concerning all the enterprises from the database.

The database covers period 2000-2007 and each year includes more than 5000 companies. We focus on continuing firms, the newly opened and closed firms are excluded from this database. The database offers two different numbers of employees. First number does not distinguish between part-time and full time employees and

takes these two groups as a single job, whereas the second number decomposes these two groups and two employees employed for a part-time job counts as one employed for a full-time equivalent job. Since the amount of workers employed for a part-time job is quite small number, our surveys are oriented only into first group. Several results of the second survey are presented in Appendix.

In order to find out particular representations of the firms in the database, we can follow up with Figure 3.1. (firms on the left side, employees on the right), the representation by firm size.
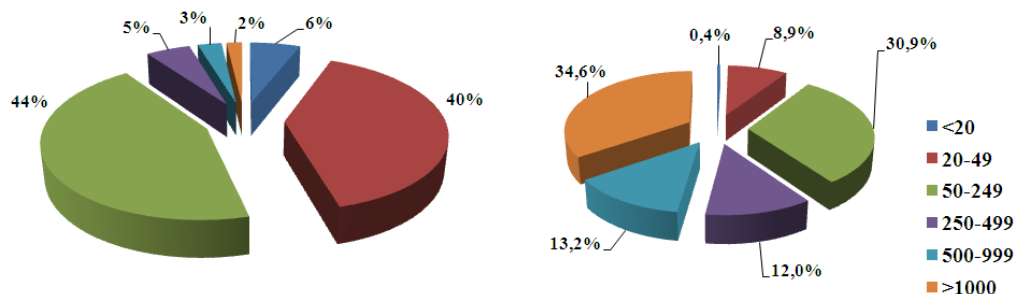

Figure 3.1: Number of firms/employees by firm size

Major sample in this diploma thesis are companies with 20-250 employees but most employees in this database are employed in companies employing more than 1000 employees which is the least presented group. The under-represented group are the firms with less than 20 workers. The already mentioned reason is representation of these firms only if they remarked sales over 100 million Slovak crowns.

Except of the numbers of employees database contains several additional information about companies (such as type of business company is doing, region of Slovakia company is located, amount of foreign capital in company business, hourly wages payed to employees...), that will help us to make comparison between enterprises.

There are 13 types of business represented by database enterprises. The representation of particular firms and employees is illustrated in Figure 3.2.
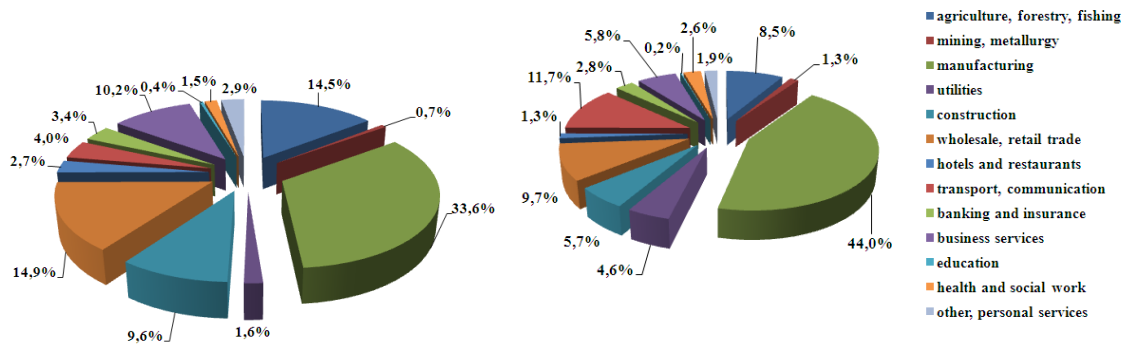
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Figure 3.2: Number of firms/employees by industry

The highest number of firms from our database belongs to the manufacturing industry followed by wholesale, retail and agriculture groups. The most employees work in manufacturing, transport, communication and wholesale & retail.

Enterprises and employees are mostly situated in Bratislava region. Values of the other 7 regions are approximately in the same level (Figure 3.3.).
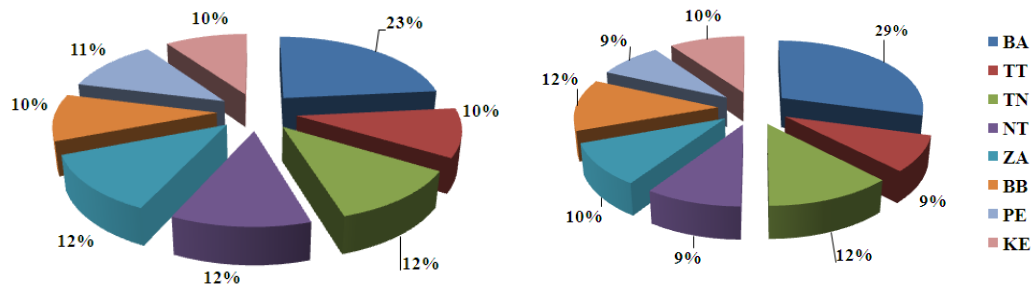

Figure 3.3: Number of firms/employees by region

Since the database included some outliers (e.g. unrealistic annual growth or decrease, which could be caused by mistake in some numbers or by incorrect position of comma..), it was necessary to make several " cleaning " commands, that eliminated meaningless observations.

Table 3.1. contains numbers of firms and employees in original database, and also these numbers after depriving of mistakes. According to his table the number of employees covered by our database is approximately 40 percent of all employees in

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Table 3.1: Number of firms/employees in database compared to number of all workers in SR

Year	Enterprises before "cleaning"	Enterprises after "cleaning"	Employees before "cleaning"	Employees after "cleaning"	Employees(*) in SR
2000-2001	5 355	5 303	775 886	797 108	1 943 400
2001-2002	5 362	5 134	830 005	747 230	1 940 900
2002-2003	5 362	5 327	788 948	801 190	1 947 600
2003-2004	5 331	5 229	790 205	764 493	1 904 200
2004-2005	5 331	5 297	846 488	762 885	1 929 000
2005-2006	5 824	5 773	843 296	826 067	2 002 600
2006-2007	5 824	5 787	852 275	842 761	2 043 000

Source:Authors calculations,

(*)Statistical Office of the SR.

the Slovak Republic. That quite high number enables to consider the results of this thesis very interesting and credible.

Chapter 4

Methodology

In this chapter we introduce the methods we have used in our analyses. Definitions in the part of the flows, we have drawn from Davis, Haltiwanger, Schuch (1998) and for econometric part we are thankful to Gujarati (2003).

4.1 Job flows

In our analysis, the primary concept is job, which can be introduced as an employment position filled by a worker. The basic unit underlying our job creation and job destruction measures is the enterprise, the place where production takes place. We calculate our measures over twelve-month periods.

The two basic definition are job creation and destruction. *Job creation* at time t equals employment gains summed over plants that expand or start up between *t-1* and t

$$JCR_{st} = \frac{\sum_{i \in S^+} \triangle EMP_{is,t}}{EMP_{s,t-1}}.$$

and *job destruction* at time t equals employment losses summed over all plants contract or shut down between *t-1* and *t*.

$$JDR_{st} = \frac{\sum_{i \in S^-} |\triangle EMP_{is,t}|}{EMP_{s,t-1}}.$$

where $\triangle EMP_{is,t} = EMP_{is,t} - EMP_{is,t-1}$ (difference between number of employees at time *t-1* and *t*.), S^+ marks the set of enterprises with $\triangle EMP_{is,t} > 0$ and S^- enterprises with $\triangle EMP_{is,t} < 0$

We can observe the employment dynamics at time t from NEC (Net Employment Change), which we can define as difference between employment at time t and employment at time *t-1*. We can compute it as a difference between job creation and job destruction rates:

$$NEC_{st} = JCR_{st} - JDR_{st}$$

Hence, job creation and job destruction values decompose the net employment change into two components, first associated with growing plants and second with sinking plants. The job creation and destruction components offer information about employment dynamics. For example, the net growth 5 percent could mean job creation 7 percent and the destruction rate 2 percent, but also 25 percent creation and 20 percent destruction rate. The performance of the economy varies with these rates. Higher rates of job creation mean better possibilities for unemployed people. On the other hand higher job destruction rates mean danger for employed people, that means higher probability to loose their job.

The following indicator, called job reallocation denotes the reordering jobs across locations and equals as the sum of job creation and job destruction rates. Job-losing employees find new job opportunities in the another firms, become unemployed and look for a new job, or leave the labor force. Newly opened jobs are filled with jobless or previously hired workers. But we have to add that workers often change their employment status for reasons unrelated to the reallocation of firms.

$$JTR_{st} = JCR_{st} + JDR_{st}$$

Exact definition according to [1] is that job reallocation at time t is the sum of all

plant-level employment gains and losses that occur between *t-1* and *t*.

Finally, the measure of job reallocation above the amount that is needed to accommodate net employment changes, Excess Job Reallocation, equals the difference between job reallocation and the absolute value of net employment change.

$$EJR_{st} = JTR_{st} - |NEC_{st}| = 2\min\{JCR_{st}, JDR_{st}\}$$

This rate can be decomposed in two components.

$$EJR_t = \sum_{s=1}^{S}\big(|NEC_{st}| - |NEC_t|\big) + \sum_{s=1}^{S}\big(|JTR_{st}| - |NEC_{st}|\big)$$

First captures between-sector employment shifts and is computed as the difference between the absolute net employment change for each sector and absolute value of net employment change for the overall economy. The second one measures excess job reallocation within sectors, the difference between the absolute turnover rate and the absolute net employment change for each sector.

4.2   Short introduction to the probability models

The framework of basic probability model starts with the definition of experiment with random outcomes and continues with calculating the probabilities for each outcome. There are two basic types of random variable X, *discrete* and *continuous*. *Discrete variable* is variable that takes values from a finite or countable set $\{x = x_1, x_2, ...\}$ and *continuous* variables can have an infinite number of different values between two given points $\{x_1 < x < x_2\}$. *Probability density function $f(x)$* determines probabilities for all possible values of X. For discrete random variables $f(x) = P(X = x)$ and for continuous $F(x) = \int_{-\infty}^{x} f(x)dx = P(X \leq x)$. Density for discrete variables must sum to 1 and for continuous must integrate to 1.

Before the following subsection we have to introduce some other definitions. *Dummy variable* is one that takes a values 0 or 1 to indicate the presence or absence of some ef-

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fect that may be expected to shift the outcome. *Dependent variable* is variable whose value depends on one or more variables in the equation. For example in equation $z = x^2 + y$ is dependent variable z. The dependent variables are *qualitative variables*, variables that express a qualitative attribute, while the explanatory variables (x and y in the example) can be qualitative and *quantitative* (variables that are measured in terms of numbers). The examples (binary variable):

- Is that a player of the national team? (yes/no)

- Does the family own the house? (yes/no)

- Does the country belong to European Union? (yes/no)

With more options:

- Highest achieved education level (basic school/high school/college)

4.2.1   The linear probability model

Suppose the binary outcome Y (does enterprise grow? (yes/no)) and regressor vector X. Consider the following model:

$$Y = \beta_1 + \beta_2 X_i + u_i$$

where X is number of employees in the firm and dummy variable Y (probability of enterprises growth) takes a value Y=1 if enterprise grows and Y=0 if does not.

This regression model is called a *linear probability model*. Some problems can occur by the estimation of this model. The most important shortcoming is that the estimated values of Y can exceed the interval (0,1).
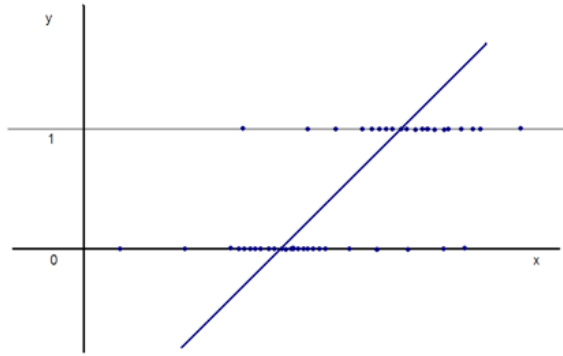
Figure 4.1: Linear probability model

4.2.2 The logit model

In order to overcome the shortcomings of the linear probability models the probit and logit models, with the nonlinear regression curve (Figure 4.2), were proposed. The logit model has the following form:

$$P_i = E(Y = 1|X_i) = F(\beta_1 + \beta_2 X_i)$$

Natural choice for the function $F()$ is cumulative distribution function. Conditional expectation of Y_i given X_i, $E(Y_i|X_i)$, can be interpreted as the conditional probability that the event will occur given X. That means $P(Y_i = 1|X_i) = F(\beta_1 + \beta_2 X_i)$. ($E(Y_i|X_i)$ gives the probability of the growth of the enterprise with explanatory variables X_i).
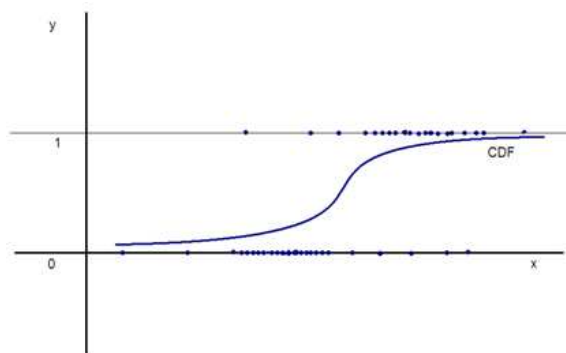

Figure 4.2: Cumulative distribution function

Now consider the following form of this problem:

$$P_i = E(Y = 1|X_i) = \frac{1}{1 + e^{-(\beta_1 + \beta_2 X_i)}}$$

$$P_i = \frac{1}{1 + e^{-Z_i}} = \frac{e^z}{1 + e^z}$$

where $Z_i = \beta_1 + \beta_2 X_i$. The form of the logistic (cumulative) distribution function is following:

$$F(\beta_1 + \beta_2 X_i) = \frac{e^{\beta_1 + \beta_2 X_i}}{1 + e^{\beta_1 + \beta_2 X_i}}$$

4.2.3   The probit model

The difference between logit and probit model is in the choice of the cumulative distribution function. As was mentioned, logit model uses logistic distribution function. On the other hand, probit makes use of cumulative distribution function of normal distribution. It can be written:

$$P_i = E(Y = 1|X_i) = F(\beta_1 + \beta_2 X_i)$$

where $F(\beta_1 + \beta_2 X_i) = \frac{1}{\sqrt{2\Pi}} \int_{-\infty}^{\beta_1 + \beta_2 X_i} e^{-z^2/2} dz$

In general there are only small differences between probit and logit models (Figure 4.3) and there is no clearly answer which one to choose. The choice of the proper model depends on the problem we are solving.

The parameters of probit and logit model are estimated through maximum likelihood method and and likelihood function is global concave function. Coefficients by the parameters could not be interpreted as an elasticities (for each value of X_i is gradient of regression curve different), but it is possible to calculate these elasticities through following equations (they are working with mean value of gradients).
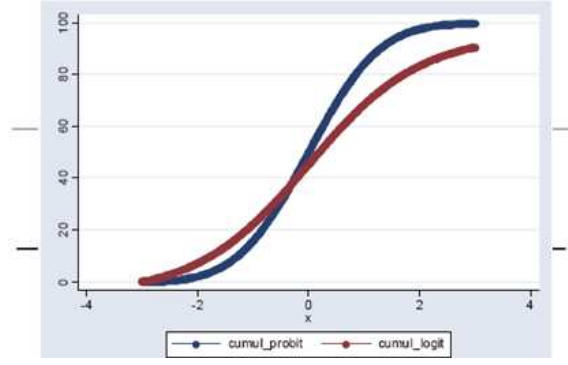
Figure 4.3: Comparison of probit and logit model

For probit model

$$\frac{\partial E(y)}{\partial (x_i)} = \phi(\beta^T x)\beta_i$$

where $\phi(z) = \frac{1}{\sqrt{2\Pi}}e^{-\frac{z^2}{2}}$ and for logit model

$$\frac{\partial E(y)}{\partial (x_i)} = p(1-p)\beta_i$$

where $p = \frac{e^{\beta^T x}}{1+e^{\beta^T x}}$

4.2.4   Our specification of the firm growth model

We have chosen the probit model because of its better comparison in the literature. Our binary dependent variable is called NEC (Net Employment Creator), which is dummy variable taking value 1 if difference between number of employees of enterprise i at t-1 and t is at least $+1\%$ and value 0 otherwise.

$$\triangle NEC_{i,t} = \beta_0 + \beta_1 \ln(EMP_{i,t-1}) + \beta_2 FOR_{i,t-1} + \beta_3 \ln(SAL_{i,t-1}) +$$

$$+\beta_4 \ln(PROD_{i,t-1}) + \sum_j \beta_j X_{i,j} + \epsilon_{i,t}$$

The explanatory variables $\ln(EMP_{i,t-1})$, $\ln(SAL_{i,t-1})$ and $\ln(PROD_{i,t-1})$ are natural logarithms of enterprise size (number of employees), salary paid to employees and productivity of labor respectively.

$FOR_{i,t-1}$ is amount of foreign capital in enterprise business and $X_{i,j}$ is a vector of characteristics of enterprise i, which consists of dummy variables for geographical regions and four aggregate sectors of economic activities, which are *agriculture, industries* (mining, manufacturing, utilities and construction), *business services* (wholesale and retail, hotels and restaurants, transport, communication, banking and insurance, business services) and *public services* (public administration, education, health and social work, personal services).

Vector $\beta = (\beta_0, \beta_1), ..., \beta_j)^T$ is a vector of unknown parameters and $\epsilon_{i,t}$ is a random disturbance term.

Our model has been tested with the Omitted Variables Likelihood Ratio Test, which tests the hypothesis that listed variables were incorrectly omitted from the estimated equation.

Chapter 5

Results

This chapter is dedicated to the results of our analysis. In the first section we report our findings of the job flows observations and compare them with the other transition countries and also with the countries from western Europe. The results of our probit model estimation are grouped in the second section of this chapter.

5.1 Job flows

The outcomes of our job flows analysis take part in this first section. They are decomposed into aggregate flows results, then results for job flows by particular sector of industry, enterprise size, region, and ownership type.

5.1.1 Aggregate job flows

Average job creation rate is 4.94% and the average job destruction rate is 6.84%, which implies the average negative net employment change -1.90%. The average values of the job reallocation and excess job reallocation are more than 12% and almost 10% respectively (Table 5.1. and in Figure 5.1.).

Looking into Figure 5.1, the negative net employment change started with relatively moderate number but in the following year markedly raised and from that moment had a decreasing tendency till the last year of our study when turned into
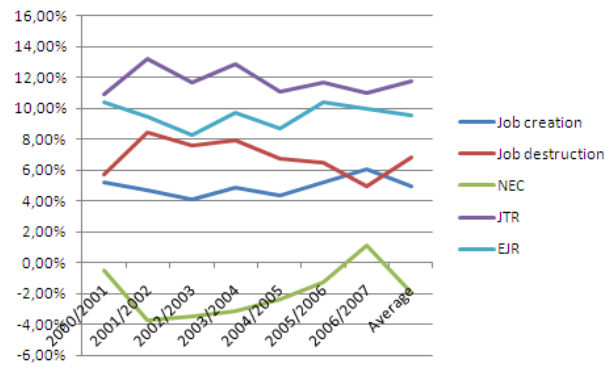
Figure 5.1: Job Creation, Job Destruction, NEC

Table 5.1: **Job flows for employees 2000-2007**

Year	Job creation	Job destruction	NEC	JTR	EJR
2000/2001	5.22%	5.71%	-0.49%	10.94%	10.44%
2001/2002	4.74%	8.44%	-3.69%	13.18%	9.49%
2002/2003	4.12%	7.60%	-3.47%	11.72%	8.25%
2003/2004	4.87%	7.97%	-3.10%	12.84%	9.74%
2004/2005	4.35%	6.75%	-2.40%	11.10%	8.71%
2005/2006	5.22%	6.46%	-1.24%	11.68%	10.44%
2006/2007	6.06%	4.97%	1.09%	11.04%	9.94%
Average	**4.94%**	**6.84%**	**-1.90%**	**11.78%**	**9.57%**

Source: Author´s calculations.

the positive number. The similar result have observed Faggio and Konings (2003) in the labor market of different transition countries.

This negative result for net employment change is out of accord with positive result of change in number of employed person in the Slovak Republic in these years (see Table 5.2). Main reason might be (Siebertova, Senaj (2007)), that number of employed persons in SR is decomposed into reduction or very small increase of employees and big increase of self employed persons. Self employed persons are not part of our database and small enterprises (with less than 20 employees) take place very lightly (see Figure 3.1). Ergo, positive trends of these two groups are excluded of our analysis. This thesis is working only with continuing firms, thus many of the

newly established foreign investments, which during period 2000-2007 appeared, and their positive trend in job creation are also excluded.

Table 5.2: **Number of employed persons in SR 2000-2007 (in thousands of persons)**

year	total	change (%)	employees	change (%)	self empl.	change (%)
2000	2101.7		1931.0		167.4	
2001	2123.7	1.0	1943.4	0.6	177.9	6.3
2002	2127.0	0.2	1940.9	-0.1	183.1	2.9
2003	2164.0	1.7	1947.6	0.3	210.9	15.2
2004	2170.4	0.3	1904.2	-2.2	259.9	23.2
2005	2216.2	2.1	1929.0	1.3	279.3	7.5
2006	2301.4	3.8	2002.6	3.8	289.2	3.5
2007	2357.3	2.4	2043.6	2.0	303.6	5.0
Average	**2195.2**	**1.5**	**1955.3**	**0.7**	**233.9**	**8.0**

Source: Statistical Office of the SR.

In order to create an interesting comparison we have looked into the results of the paper Siebertova, Senaj (2007). Table 5.3 presents their results together with results of this diploma thesis over period 2000-2004.

We can observe the most important feature, the similarity of the net employment change values. It has to be added that the data source used in Siebertova, Senaj (2007) was private firm Trexima, while this thesis is working with Statistical Office of the SR. The fact that these papers are working with two different databases obtained from two different sources makes their results more trustworthy. The Slovak Republic was in the phase of restructuring during period 2000-2004, which both of these works confirm. The surveys show the domination of job destruction over creation during whole period and the high values of the labor market flexibility.

Table 5.3: **Comparison over 2000-2004**

Year	Job creation	Job destruction	NEC	JTR	EJR
2000/2001	5.22%	5.71%	-0.49%	10.94%	10.44%
2001/2002	4.74%	8.44%	-3.69%	13.18%	9.49%
2002/2003	4.12%	7.60%	-3.47%	11.72%	8.25%
2003/2004	4.87%	7.97%	-3.10%	12.84%	9.74%
Source: Author´s calculations.					
2000/2001	6.30%	9.60%	-3.30%	15.80%	12.50%
2001/2002	8.10%	12.10%	-4.00%	20.20%	16.30%
2002/2003	6.90%	11.00%	-4.10%	17.80%	13.80%
2003/2004	7.60%	11.00%	-3.40%	18.50%	15.20%

Source: Siebertova, Senaj (2007).

5.1.2 International comparison with selected countries

Let us introduce an interesting comparison of job flows rates among selected countries. Firstly, we focused on comparison with some of transition countries, where we expect predominance of job destruction over job creation rate, whereas at later stages roughly equality of these rates. Also higher rates of reallocation in order to get higher efficiency and productivity of workers could be expected.

Poland is the example of a successful transition country in terms of job flows. 2003 is the year when Polish employment change, decomposed into the creation rate which is approximately 3 percent for the whole period and the decreasing destruction rate, turned into positive value. The values of reallocation were descending, transition in Poland apparently ended.

For Ukraine data are available only to year 2000 and till then transition had achieved only a light change in creation and destruction rates, but not a bigger success (at the end of period destruction rate lightly decreased and creation raised, reallocation also raised, which induced possible consolidation in the near future).

The example of a specific transition country is Estonia. Results of Masso, Eamets,
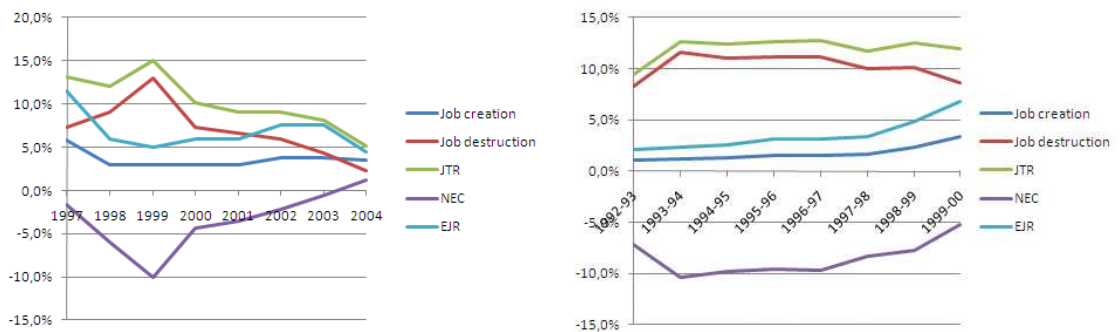
Figure 5.2: Poland, Ukraine
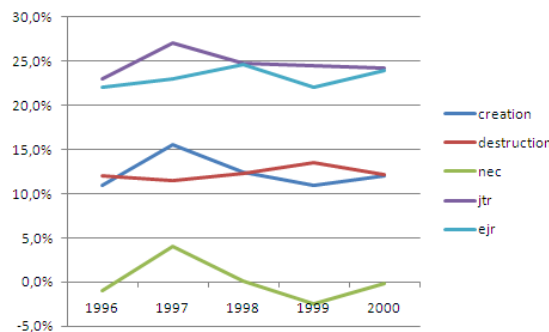
Figure 5.3: Estonia

Philips (2004) show that job creation and destruction rates in Estonia were very high in international comparison, higher than in any other European country, and comparable to the levels documented for the United States. In contrast of the other transition countries the net employment change did not have increasing tendency from negative values to positive, but it looked like it was oscillating around zero.

The figure 5.4 we avail from Rutkowski (2004) paper about Moldova job flows. Countries Poland, Moldova and Bulgaria show the best view into the trend how job flows in transition countries look like. If Slovakia was in this Figure, it would be between Poland and France with reallocation almost 11 percent and creation and destruction rates less than 6 percent (results 2000-2001).

Paper Salvador, Messina, Vallanti (2004) (Figure 5.5 and Table 5.4) allows us to make comparison also with other European countries. All of the average job flows
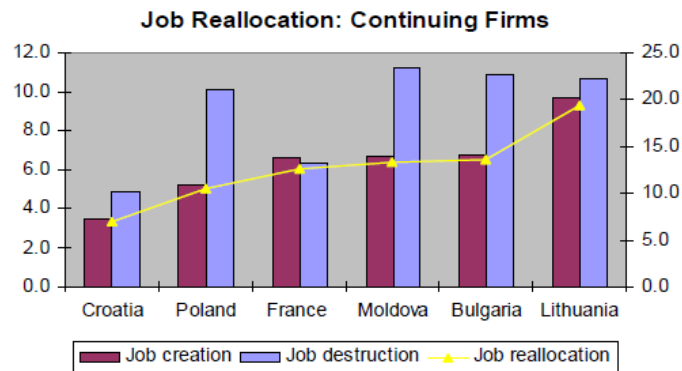
Figure 5.4: Moldova against selected countries

Source: Rutkowski J. (2004)

Moldova(2001), Croatia(2001), Bulgaria(2000), Lithuania(1998-99), Poland(1999), France(1984-91)

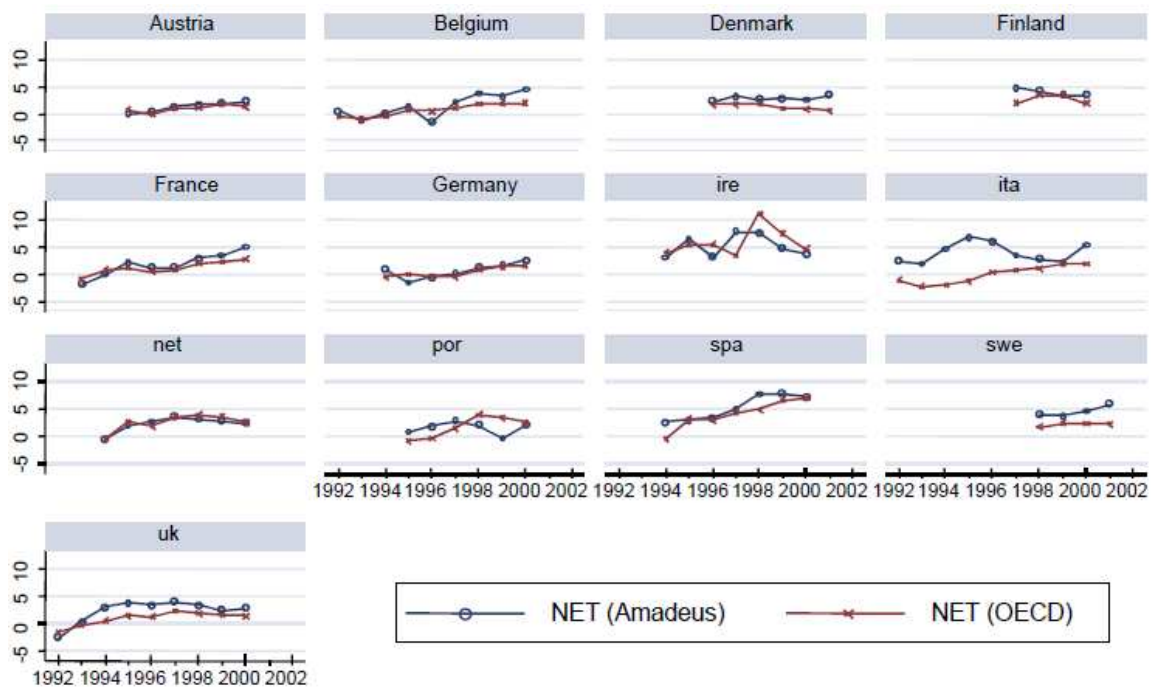Figure 5.5: Net Employment Change Comparing Amadeus with Official Statistics (OECD)

are positive, but some countries (France, Italy, UK, ...) show a negative beginning in order to make their economic system more effective. It is the similar process as in the transition countries but it came sooner.

We also present some examples of job flows of non-European world countries (Figure 5.6 and Figure 5.7).

Table 5.4: **Average job flows rate - Europe 90s**

Contry	Job creation	Job destruction	NEC	JTR	EJR
Austria	4.6%	3.4%	1.2%	7.9%	6.8%
Belgium	5.2%	3.8%	1.3%	9.0%	7.6%
Denmark	6.2%	3.3%	2.8%	9.5%	6.6%
Finland	7.0%	3.0%	4.0%	9.9%	6.0%
France	5.1%	3.2%	1.8%	8.3%	6.4%
Germany	4.4%	3.7%	0.7%	8.1%	7.4%
Ireland	8.5%	3.1%	5.4%	11.5%	6.2%
Italy	8.2%	4.1%	4.1%	12.3%	8.2%
Netherlands	6.5%	4.3%	2.2%	10.8%	8.6%
Portugal	4.9%	3.5%	1.5%	8.4%	7.0%
*Portugal	13.3%	11.8%	1.6%	25.1%	23.7%
Spain	8.6%	3.4%	5.2%	12.1%	6.8%
Sweden	8.1%	3.6%	4.5%	11.7%	7.2%
UK	6.6%	4.4%	2.3%	11.0%	8.8%
*UK 1998-2005	15.2%	14.5%	0.7%	29.7%	29.0%
Euro area	5.6%	3.7%	1.9%	9.3%	7.4%

Sources :Salvador G.R.-Messina J.-Vallanti G.(2004), ∗Centano M.-Machado C.-Novo A.A.(2007).
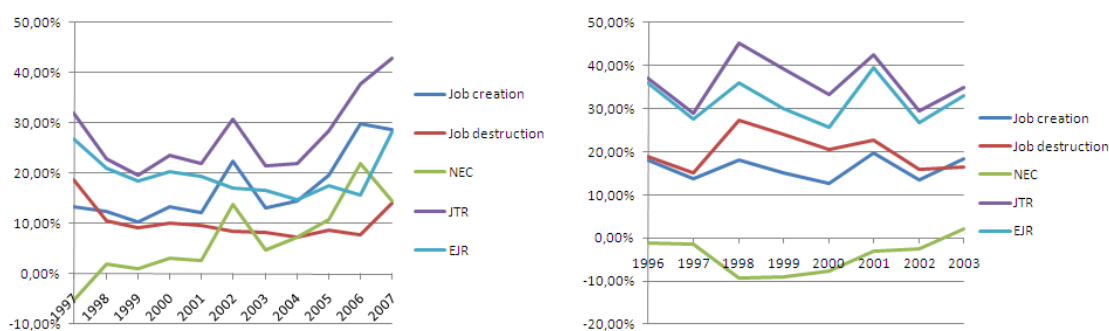

Figure 5.6: Ethiopia, China

Sources: Schiferaw A. - Bedi A. (2009), Deng H. - McGuckin R. (2005)

The last comparison in this section is about job reallocation and the excess job reallocation rates (Figure 5.8). According to our observation during period 2000-2004
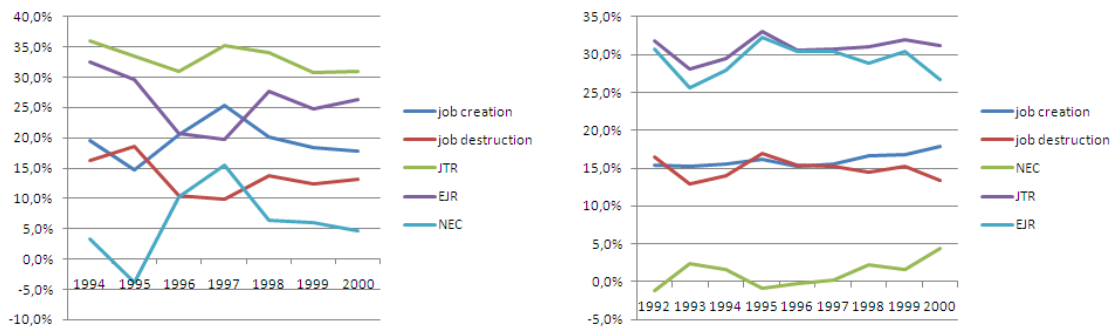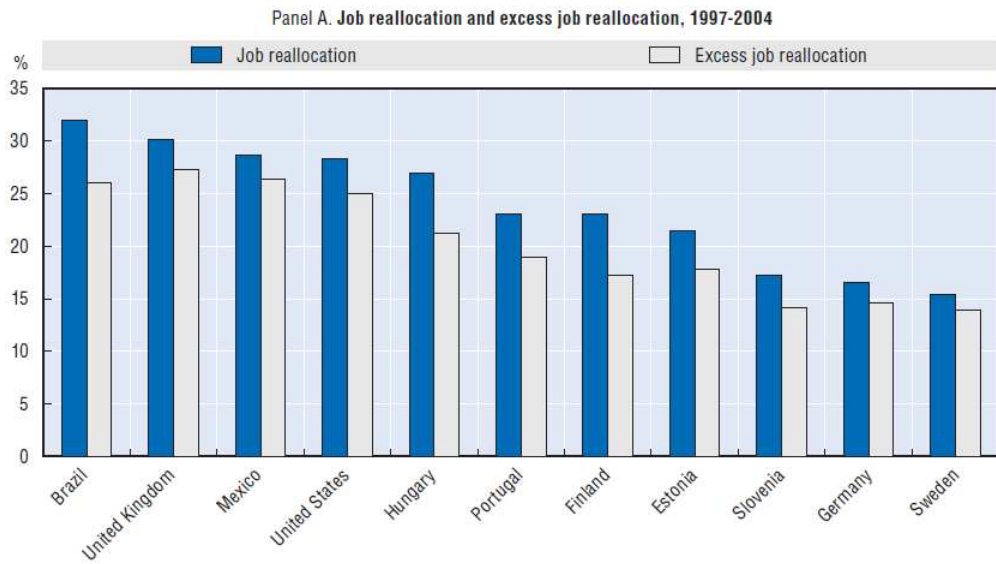
Figure 5.7: Mexico, Brazil

Figure 5.8: Source: www.oecd.org

job reallocation rate is more than 12 percent and excess job reallocation almost 10 percent.

5.1.3   Job flows by type of industry

In this section we will compare job flows by character of business enterprise is doing. We distinguish between 13 different sectors of industry. As was mentioned in Figure 3.2. in Chapter 3 the most enterprises are from manufacturing group followed by wholesale, retail and agriculture groups.

Job flows results are grouped in the Table 5.5. The highest job creation rate achieved sectors business services with 81 percent above average and wholesale & retail trade with 69 percent above the average. The bottom belongs to agriculture (21 percent of the average), which has also the highest destruction rate (32 percent above average). This fact leads to the worst net employment change rate.

Table 5.5: Job flows by sectors of industries over 2000-2007

Industry	Job Creation	Job Destruction	NEC	JTR	EJR
agriculture, forestry, fishing	1.02%	9.00%	-7.97%	10.02%	2.05%
mining, metallurgy	2.64%	7.55%	-4.91%	10.20%	5.29%
manufacturing	5.97%	6.50%	-0.53%	12.47%	10.84%
utilities	1.08%	7.19%	-6.11%	8.26%	2.15%
construction	5.20%	8.51%	-3.31%	13.70%	10.39%
wholesale, retail trade	8.34%	4.39%	3.95%	12.73%	8.78%
hotels and restaurants	4.53%	5.87%	-1.33%	10.40%	8.72%
transport, communication	1.80%	8.37%	-6.57%	10.16%	3.60%
banking and insurance	3.75%	4.07%	-0.32%	7.82%	6.50%
business services	8.95%	7.67%	1.27%	16.62%	13.47%
education	2.50%	4.73%	-2.24%	7.23%	4.88%
health and social work	2.31%	4.70%	-2.40%	7.01%	4.06%
other, personal services	5.68%	6.82%	-1.14%	12.50%	9.53%

Source: Author´s calculations.

Lowest destruction rates were registered in wholesale & retail trade (64 percent of the average) and banking & insurance (59 percent of the average). The high creation

rate of wholesale combined with low destruction rate empty into the highest net employment change rate among all the sectors. The second place in net growth belongs to sector business services (in contrast with wholesale, business services noticed rising tendency over observed period, while wholesale decreasing, also higher excess job reallocation rates, which makes business services very promising sector to the future (Figure 5.9.)).

Sectors with the highest average excess job reallocation rate are business services (41 percent above average) and manufacturing (13 percent above average). On the bottom are traditional sectors agriculture (21 percent of the average), utilities (22 percent of the average) and mining together with education and health & social work.
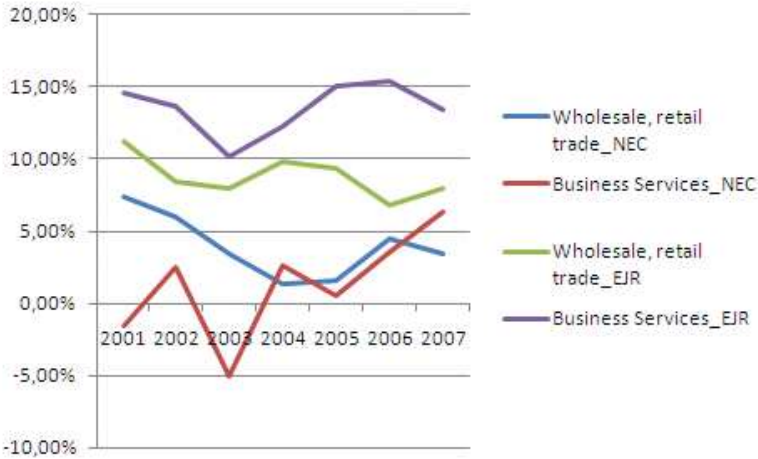

Figure 5.9: Comparison of wholesale and business services

Some interesting findings were observed in this study. In 2004 in sector of mining observed a big jump of the job creation rate (9.60 percent, without this year is the average only 1.48 percent). The second big change was recorded in the destruction rate of transport and communication sector (2002), 25.65 percent. Excluding this year, the average would change into the value of 5.48 percent.

These two shocks could be explained as an attempt to improve efficiency of these sectors, which was realized successfully in both cases. The net growth in both of these sectors after year of the observed shock had the raising tendency (Figure 5.10).

For the most interesting and important finding we consider that net employment
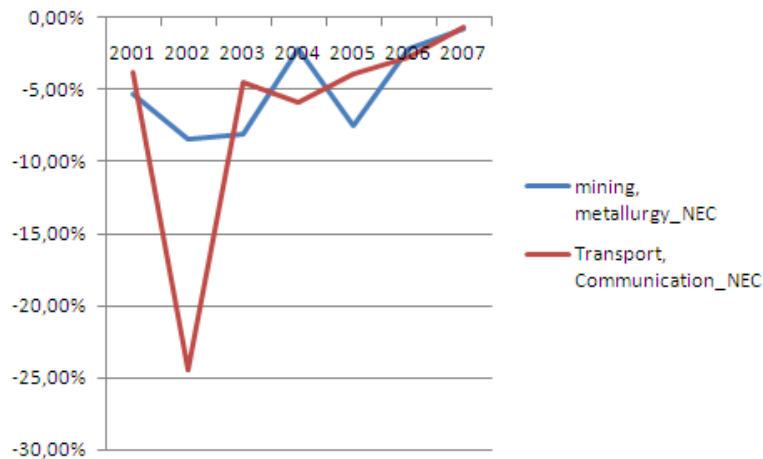
Figure 5.10: NEC in sectors of mining and transport

growth in the last year of our study had positive sign in 7 sectors of industry. Preceding years only sectors wholesale and business services had positive results (a few exceptions can be noticed in the other sectors). In 2007 also manufacturing, hotels & restaurants, banking and insurance, health & social work and personal services joined to group of the "positive sectors". It seems to be the successful outcome of transforming in these sectors.

Now let us introduce two interesting findings and join several thoughts. The relation between type of industry and the gross wage per hour in the Figure 5.11, and with productivity of workers in the Figure 5.12.
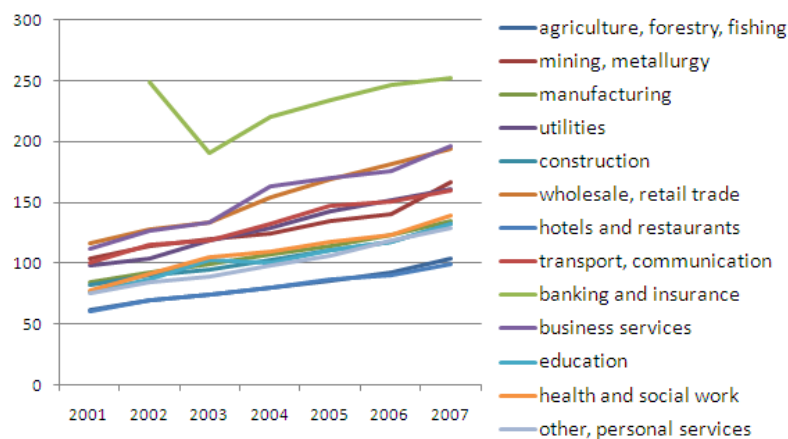
Figure 5.11: Gross wage per hour

Markedly highest hourly wages were in banking and insurance group followed by wholesale, retail and business services. The lowest were in agriculture and hotels & restaurants group.
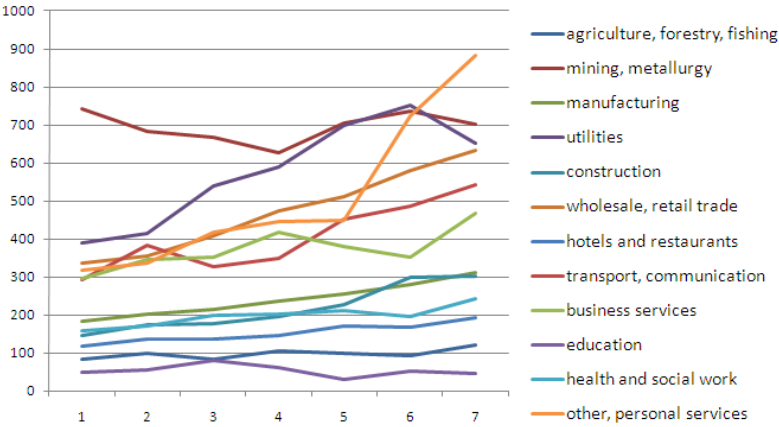
Figure 5.12: Productivity per hour

The top ranking in productivity of workers belongs surprisingly to the sectors not in the best condition in last years. Mining and utilities together with personal services beat wholesale and retail. We have to add that banking and insurance sector did not report productivity of workers in the database.

Figure 5.13 shows the problems concerning the education and health care sectors.
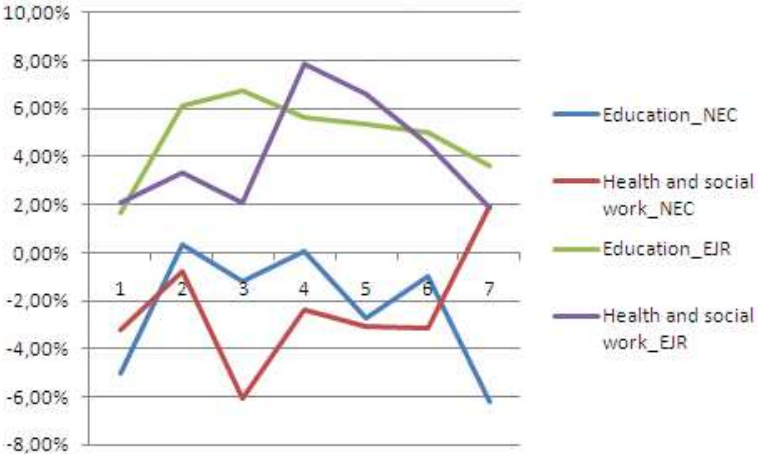
Figure 5.13: Education and health care

Negative employment change (tendency, excluding year 2007, was in both cases

decreasing) together with decreasing excess job reallocation do not give the big chance for change in the near future. The hourly wages belong to the lower among the sectors so it is not a big surprise that productivity is also backward the others.

To obtain the best comparison of our results with the paper Siebertova, Senaj (2007) (Table 5.7) we calculated the average over period 2000-2004 (Table 5.6).

Table 5.6: Job flows by sectors of industries over 2000-2004

| Industry	Job Creation	Job Destruction	NEC	JTR	EJR
agriculture, forestry, fishing	0.93%	9.87%	-8.94%	10.80%	1.86%
mining, metallurgy	2.81%	8.81%	-6.00%	11.63%	5.63%
manufacturing	5.95%	6.47%	-0.52%	12.42%	11.01%
utilities	1.04%	6.12%	-5.08%	7.16%	2.08%
construction	4.97%	10.07%	-5.10%	15.04%	9.94%
wholesale, retail trade	9.21%	4.67%	4.54%	13.88%	9.33%
hotels and restaurants	3.87%	6.24%	-2.37%	10.11%	7.74%
transport, Communication	1.23%	10.89%	-9.66%	12.12%	2.45%
banking and Insurance	3.89%	4.78%	-0.89%	8.67%	7.29%
business Services	7.57%	7.95%	-0.38%	15.53%	12.63%
education	2.63%	4.08%	-1.45%	6.70%	5.06%
health and social work	1.92%	5.05%	-3.12%	6.97%	3.84%
other, personal services	4.56%	7.74%	-3.18%	12.30%	8.82%

Source: Author´s calculations.

Whereas in the paper Siebertova, Senaj (2007) the leaders in job creation rate are wholesale & retail, banking & insurance and construction (all above 20 percent) in this diploma thesis are these leaders sectors wholesale & retail together with business services. Both of these papers underwrite the downgrade of the sector of agriculture. The difference is in the height of the job creation rate and resulting reallocation rates. The sector of mining is the only one having worse destruction rate than agriculture (Siebertova, Senaj (2007)). In our results, two sectors, construction and transport &

Table 5.7: Job flows by sectors of industries over 2000-2004

Industry	Job Creation	Job Destruction	NEC	JTR	EJR
agriculture, forestry, fishing	7.7%	16.3%	-8.6%	24.0%	15.4%
mining, metallurgy	1.8%	19.2%	-17.3%	21.0%	3.7%
manufacturing	6.4%	9.8%	-3.4%	16.1%	12.6%
utilities	4.9%	5.8%	-0.8%	10.7%	9.8%
construction	11.4%	13.9%	-2.5%	25.3%	22.8%
wholesale, retail trade	14.9%	11.7%	3.2%	26.6%	23.5%
hotels and restaurants	10.8%	13.3%	-2.5%	24.1%	21.6%
transport, communication	7.7%	13.5%	-5.8%	21.3%	14.5%
banking and insurance	11.4%	8.3%	3.2%	19.7%	16.7%
business services	10.4%	10.4%	0.0%	20.8%	20.8%
education	5.8%	8.3%	-2.5%	13.4%	10.7%
health and social work	5.1%	6.2%	-1.1%	11.3%	10.2%
other, personal services	10.1%	10.7%	-0.6%	20.8%	20.3%

Source: Siebertova, Senaj (2007).

communication, got worse destruction than mining.

5.1.4 Job flows by enterprise size

Second characteristic which we will analyze is a firm size, defined by the number of employees in every enterprise.

At the beginning we can analyze the tendency of job turnover rate. There is an inverse relation between this rate and enterprise size (see Table 5.8). Job turnover in the smallest firms it is 65 percent above average, whereas in the biggest firms is only 89 percent of the average. This inverse relationship is a common conclusion in the CEE countries analysis (Faggio-Konings(2003)).

Table 5.8: Job flows by enterprise size

Enterprise size	Job Creation	Job Destruction	NEC	JTR	EJR
<20	12.38%	7.08%	5.30%	19.45%	14.16%
20-49	6.79%	7.14%	-0.34%	13.93%	12.87%
50-249	6.01%	6.72%	-0.71%	12.73%	11.16%
250-499	6.08%	6.26%	-0.18%	12.34%	10.51%
500-999	5.05%	5.72%	-0.67%	10.77%	8.50%
>1000	2.99%	7.49%	-4.50%	10.49%	5.99%

Source: Author´s calculations.

In Figure 5.14 the relationship between job turnover and firm size of some transition countries is depicted. Distribution and borders of a firm size of these five countries are different (category of the smallest firms in Croatia contains firms with less than 50 employees, while in other three countries less than 10, the biggest in Poland and Estonia more than 500 and in Croatia with Moldova more than 250).

The net growth was positive over full period 2000-2007 only in the smallest enterprises. Job creation rate of these firms was high over the whole period, while the job destruction was high only till 2003 when began to decrease. All of the other categories (excluded firms with more than 1000 employees) turned into positive values of NEC (2005-2007).

Net employment change in category of the biggest enterprises (more than 1000
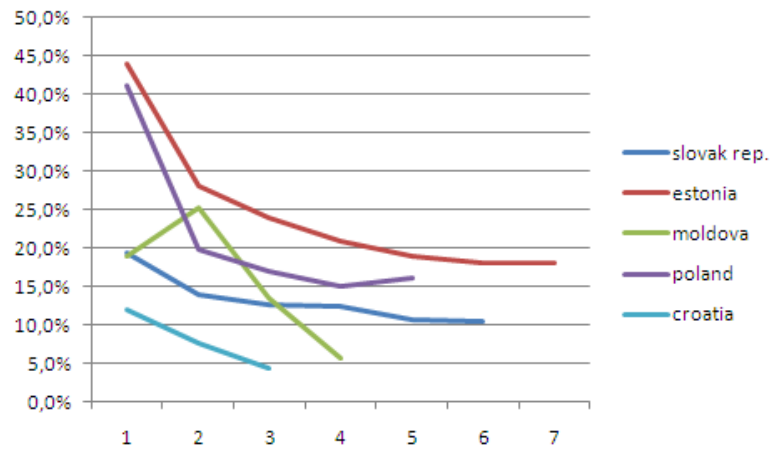
Figure 5.14: Relation between firm size and job turnover rate in some transition countries
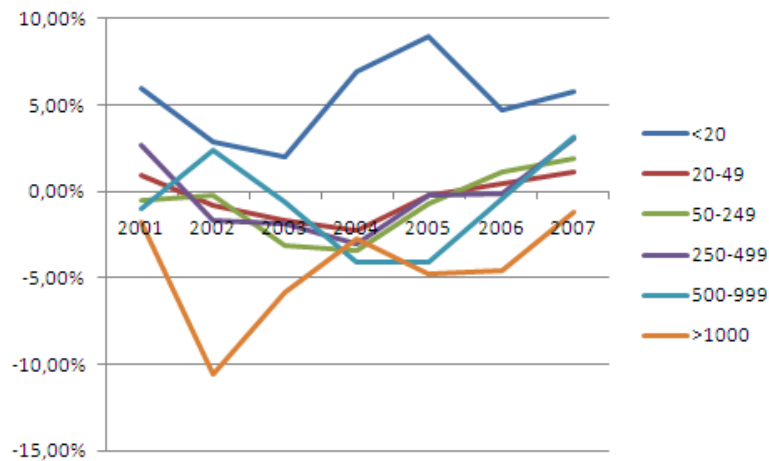
Figure 5.15: NEC by enterprise size

employees) was negative in every year of this study. This rate was decomposed into job creation approximately 3 percent over entire period and job destruction, which was high till year 2003, then began to decrease as well as negative value of the net employment change.

The result of restructuring in the biggest (category of more than 1000 employees) enterprises we can see in Figure 5.16. Productivity of these firms was raising during
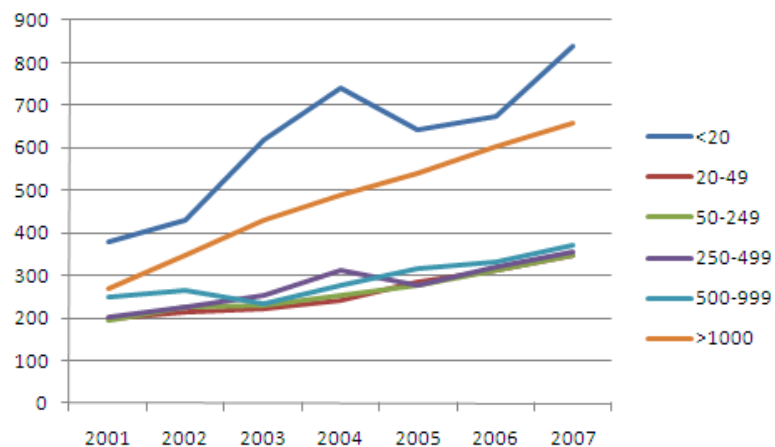
Figure 5.16: Productivity of workers by enterprise size

whole period. Only the smallest enterprises had better values.

To compare these results with results of Siebertova, Senaj (2007) we have recalculated our values to period 2000-2004.

Both works show the same tendency of job turnover rate. In Siebertova, Senaj (2007) absents the category of enterprises with less than 20 workers so we can not conclude the positive result of it. On the contrary with this thesis, category of the biggest firms in Siebertova, Senaj (2007) achieved the positive result.

Table 5.9: Comparison over 2000-2004

Enterprise size	Job Creation	Job Destruction	NEC	JTR	EJR
<20	12,53%	8,10%	4,43%	20,62%	16,20%
20-49	6,73%	7,67%	-0,94%	14,40%	12,98%
50-249	5,50%	7,32%	-1,82%	12,82%	10,99%
250-499	5,57%	6,55%	-0,99%	12,12%	9,79%
500-999	5,31%	6,14%	-0,83%	11,44%	9,40%
>1000	3,00%	8,23%	-5,23%	11,23%	6,00%
Source: Author´s calculations.					
20-49	4.2%	22.1%	-17.9%	26.3%	8.4%
50-249	5.4%	17.6%	-12.2%	22.9%	10.8%
250-499	6.1%	14.5%	-8.4%	20.6%	12.2%
500-999	8.5%	11.8%	-3.3%	20.3%	14.8%
>1000	7.8%	7.1%	0.7%	14.9%	11.1%

Source: Siebertova, Senaj (2007).

5.1.5 Job flows by region

To see the job flows results in particular regions of Slovakia, take a look into Table 5.10.

Region of Trnava achieved the highest creation rate and the lowest destruction rate, which indicated the highest net employment change among all of the Slovak regions. The most negative net employment change belonged to region of Banska Bystrica. This rate was caused by the lowest creation rate (61 percent of the average) and high destruction rate (the highest destruction rate in Bratislava region, 15 percent above the average). This region showed also the lowest flexibility, whereas the other seven regions achieved higher and very similar values (only region Kosice was under the average).

Detailed view into individual regions, especially eastern regions such as Kosice

Table 5.10: Job flows by region of SR 2000-2007

Slovak Region	Job Creation	Job Destruction	NEC	JTR	EJR
BA	5.03%	7.67%	-2.65%	12.70%	9.63%
TT	6.46%	5.77%	0.69%	12.23%	10.61%
TN	5.06%	6.21%	-1.15%	11.27%	9.49%
NT	5.70%	6.36%	-0.66%	12.06%	10.44%
ZA	5.24%	7.40%	-2.17%	12.64%	9.53%
BB	3.06%	6.92%	-3.86%	9.98%	6.11%
PE	5.07%	7.14%	-2.08%	12.21%	9.75%
KE	4.34%	6.03%	-1.69%	10.37%	8.20%

Source: Author´s calculations.

and Presov, depicts the Figure 5.17. The fall in net employment change in 2003, and one year later respectively, was a start of the improvement. Last year of this study brought to both of these regions positive net growth. This stabilization of job flows went hand in hand with decreasing job reallocation.
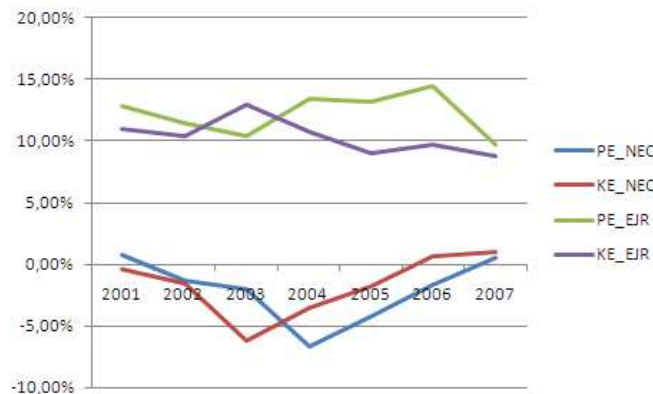

Figure 5.17: Eastern part of Slovakia

Very similar tendencies were observed in the central region involving regions Zilina and Banska Bystrica. The same years started the change in the net growth. While region of Banska Bystrica had negative growth values over whole period, Zilina noted more than 3 percent growth in the last year (better only in region Trnava 5.69 per-

cent). In Banska Bystrica the job reallocation had decreasing tendency since 2004, but in Zilina this rate stayed in higher values (around 12 percent).
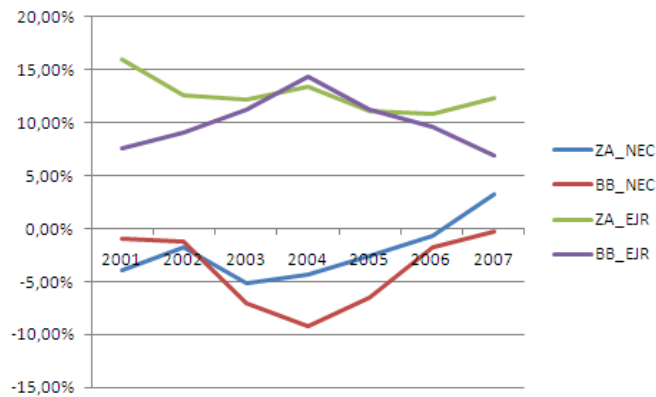
Figure 5.18: Central part of Slovakia

The highest net growth in western region (the highest overall) was observed in region of Trnava. Over whole period this rate was near the zero value but since 2005 raised to 5.69 percent in 2007. Except of years 2003 and 2004 region Nitra had positive growth rates and region Trencin was the only one region ending in the negative value of this rate. The big amount of job closures in the region of Bratislava in 2002 influenced the employment change, since this year had experienced this region several fluctuations (in 2007 1.49 percent).

Figure 5.19: Western part of Slovakia

The following analysis we present, comprises the comparison of the hourly wages in every region of the Slovak Republic. The big difference between Bratislava region

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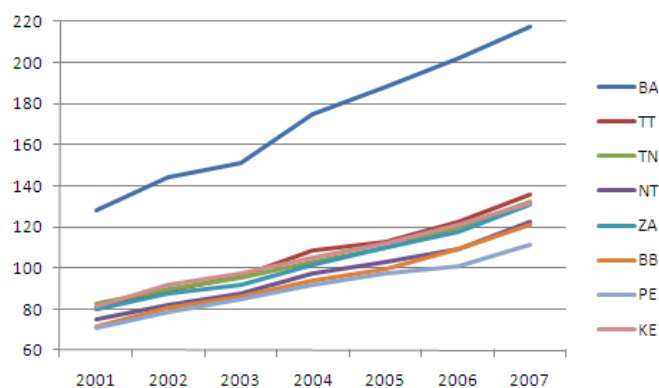
Figure 5.20: Hourly wages by region of SR

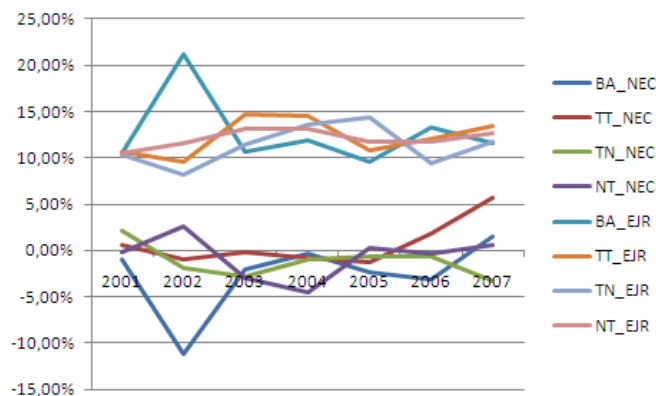and the other seven regions is shown in Figure 5.20. Nominal hourly wages increased in all eight regions, but the raise of Bratislava region was markedly the sharpest. The worst paying regions of Presov and Banska Bytrica payed approximately the half of Bratislava wages.
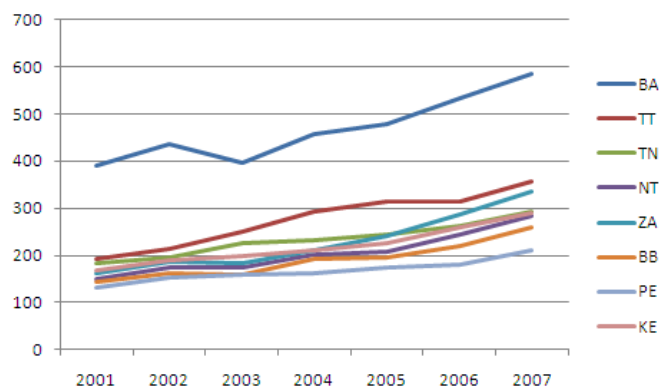
Figure 5.21: Productivity per hour by region of SR

In observation of productivity per hour by regions, we obtained very similar results. There was a big gap between Bratislava region and the rest of Slovak regions. Regions of Presov and Banska Bystrica were also the worst in the productivity of their workers.

The fall of the net employment change rate in region of Bratislava in 2002, caused slowdown of the sharp growth of hourly wages and the small decrease in productivity per hour. The following year 2003, as the net growth increased, the wages and productivity noticeably increased.

5.1.6 Job flows by ownership type

This section is a bit different because approximately 80% of all firms did not report amount of foreign capital so we could not use them. In spite of this fact, the survey without these firms offers interesting results.

In the first step we excluded these firms. After this elimination, the database contained approximately 1000 firms, which reported the share of foreign capital.
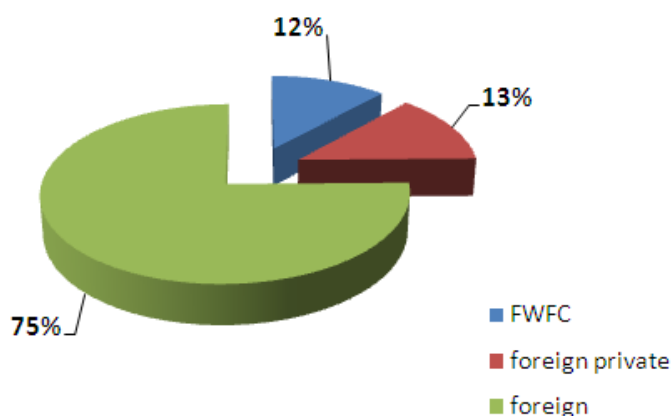
Figure 5.22: Number of firms in every group

In the second step we classified three groups according to the amount of foreign capital. *Firms without share of foreign capital (FWFC)*, *Domestic private firms* sharing of foreign capital less than a half of basic capital and *Foreign enterprises* with more than a half.

Our first observation appertains to productivity of workers in each group.

Productivity of employees in FWFC enterprises conspicuously kept behind the productivity of workers in Domestic private and Foreign enterprises respectively (see Figure 5.23). During the period 2000-2007 productivity of all three groups was raising but in FWFC enterprises the ratio of increase was the highest (almost 200 percent). Cause of the continuing restructuring process of the Slovak economy, this result is not a big surprise and it can be said that it is the confirmation of the successful process.

Another view on relation between foreign capital and productivity of employees
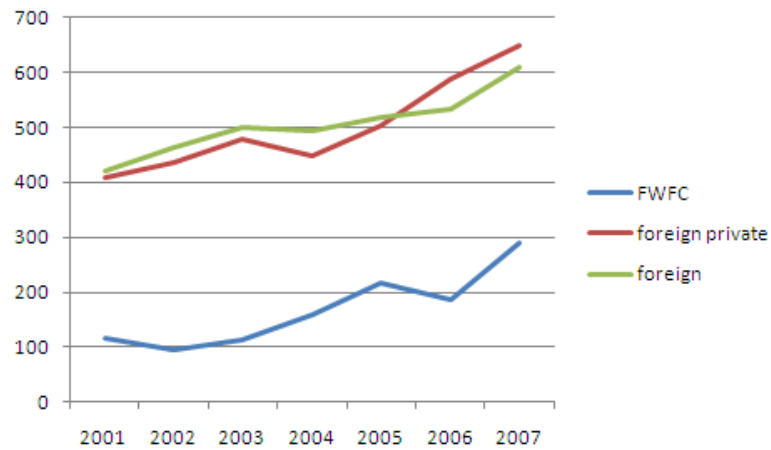
Figure 5.23: Productivity of workers according to ownership type

depicts the Figure 5.24.
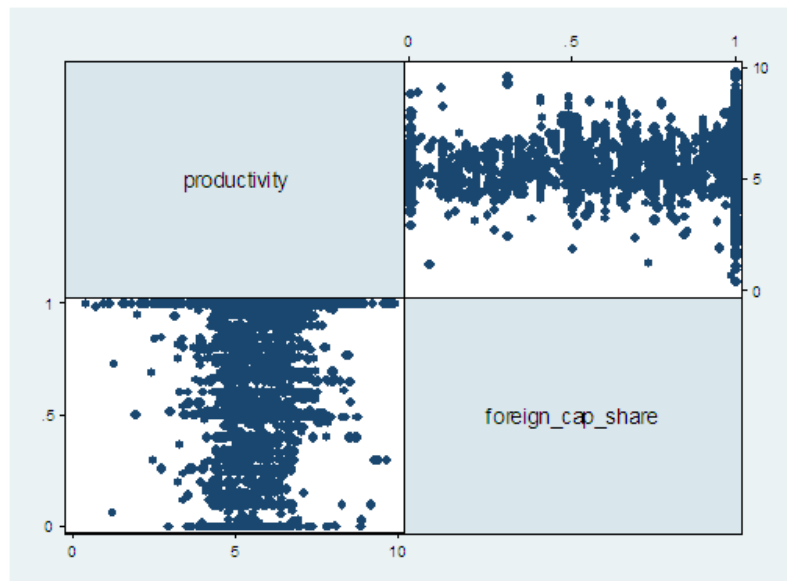
Figure 5.24: Relation between share of foreign capital and productivity

There is a positive relation, that means with raising share of foreign capital raises the productivity of workers.

Table 5.11. shows the average job flows for every group.

The group of our interests are FWFC firms (Figure 5.25.). Job destruction rate in this group was high until 2004, when it fell under 5 percent. In 2007 this rate dropped below 3 percent and net employment growth changed into positive value.

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Table 5.11: Average job flows by ownership type

Ownership Type	Job Creation	Job Destruction	NEC	JTR	EJR
FWFC	2,50%	10,74%	-8,24%	13,24%	4,96%
foreign private	4,37%	7,51%	-3,14%	11,88%	8,74%
foreign	9,19%	4,93%	4,25%	14,12%	9,86%

Source: Author´s calculations.
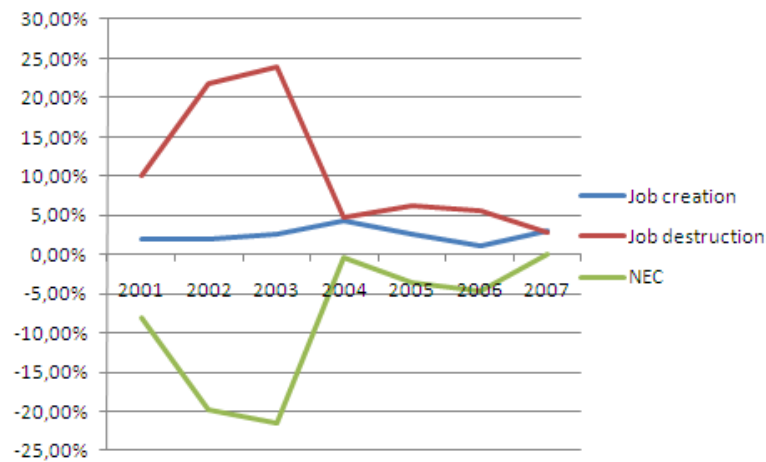
Figure 5.25: Job Creation, Job Destruction and NEC in FWFC

In the next two groups values of job flows were around the average. The best result of net growth for domestic private enterprises was almost zero in 2007 (negative values over whole period) and 8 percent in 2001 of foreign enterprises (during whole period positive net growth values).

5.2 Probit model of firm growth

In this section we will estimate the probability of enterprise growth using the probit model in two ways. As was said before, plenty of firms did not report the amount of foreign capital. Thus, in one subsection we will include foreign capital in our observation and in the second one not.

5.2.1 Estimate of probit model

Merging almost 35 000 observations and using the probit model we have obtained the following results (Table 5.12.).

Now look at all significant parameters one by one. Only one parameter has significant negative impact on probability of growth. It is natural logarithm of salaries payed to employees and means that with increasing amount of the average wages in the company the probability of hiring new employees is decreasing.

Special parameter is enterprise size. In the economic literature is well known so called Gibrat´s law, relationship between number of employees and enterprise growth. This rule, defined by Robert Gibrat (1904-1980), states that the size of a firm and its growth rate are independent. Many of the empirical studies do not agree that the foundation and the outcome of Gibrat´s law are correct, and show negative relation between these two parameters. In our work we have observed the positive relation which is not in line with these empirical studies, thus we can not negate trueness of this law.

The average hourly productivity has positive impact on probability of growth. As was mentioned in chapter 5.1.6., the relation between productivity of employees and amount of foreign capital is positive. In order to improve workers productivity firms with no, or minor share of the foreign capital eventually, closed many of the job positions. On the other hand, firms with major share of the foreign capital opened a lot of new positions so the positive result of relation between productivity of workers and probability of firm growth is not a surprise.

Table 5.12: Probit model

Y	Coef.	Elasticity	Std.Err	P>|z|
enterprise size	0.135	0.051	0.006	0.000
salaries	-0.104	-0.039	0.021	0.000
productivity of workers	0.231	0.087	0.011	0.000
industries (agriculture omitted)				
industries	0.516	0.194	0.024	0.000
business services	0.591	0.226	0.026	0.000
public services	0.505	0.198	0.039	0.000
regions (bratislava omitted)				
trnava	-0.041	-0.015	0.027	0.132
trencin	0.030	0.011	0.026	0.241
zilina	0.009	0.003	0.026	0.718
nitra	-0.010	-0.003	0.025	0.686
banska bystrica	-0.012	-0.004	0.028	0.670
presov	-0.003	-0.001	0.027	0.906
kosice	-0.032	-0.012	0.027	0.241
constant	-2.083		0.083	0.000

Source: Author´s calculations.

If the enterprise belongs to other business than agriculture, probability of its growth is high and positive in all three aggregate groups of industry which is the common result in all transition countries. The net change in agriculture is the worst among all the sectors (see Chapter 5.1.3) and in each of the three aggregate groups takes place at least one sector which achieved almost equality of creation and destruction rates (the best net growth results are in the group *business services*), with highest coefficient in our estimation).

Probably the most interesting finding of this regression is disproving the expectations about significance of the dummy variables representing Slovak regions. Together with previous significant parameters and the fact we are working with continuing firms

we can summarize these findings as follows. Wherever is the existing firm located, it does not influence its growth. The only important characteristics are its size, hourly wages and productivity of its employees together with type of business the firm is doing.

5.2.2   Estimate of probit model with foreign capital

For the sake of complexity we present also the probit model where the share of foreign capital is analyzed (Table 5.13). It is worth nothing that only 7000 firms have reported their share of foreign capital, therefore the exercise of this survey is presented only for the illustration and its accuracy could be impugnable.

Relation between the new parameter representing foreign capital and the probability of growth is positive which is expected result. We can appeal to chapter 5.1.6 again. Firms without, or with minor share of foreign capital eventually, show negative net employment change, while firms with major share have net change positive.

5.2.3   Comparisons

The paper Siebertova, Senaj (2007) proposes three probability models to test the determinants of the probability of employment growth in individual firms. The method used to test these models is the same as in our thesis, Omitted Variables Likelihood Ratio Test (described in the section 4.2.3).

In the first model (Table 5.14) they have presented, only the impact of the ownership type on the probability of firm growth is studied. The significant parameter of foreign owned enterprises has the positive sign. It has the positive impact on the probability of firm growth compared to state owned firms (the same result is obtained also in (2) and (3)). This thesis does not offer the estimation containing ownership groups, and also results in section 5.1.6 do not contain firms owned by state, thus this conclusion we can not compare.

The second model adds the natural logarithm of enterprise size. Coefficient of this variable is significant and negative, the impact of initial firm size on the probability

Table 5.13: Probit model

Y	Coef.	Elasticity	Std.Err	P>|z|
foreign capital	0.471	0.187	0.054	0.000
enterprise size	0.116	0.046	0.013	0.000
salaries	-0.135	-0.054	0.046	0.004
productivity of workers	0.106	0.042	0.024	0.000
industries (agriculture omitted)				
industries	0.202	0.080	0.165	0.221
business services	0.327	0.129	0.166	0.049
public services	0.276	0.108	0.184	0.134
regions (bratislava omitted)				
trnava	-0.084	-0.033	0.056	0.135
trencin	0.063	0.025	0.056	0.265
zilina	0.026	0.010	0.058	0.653
nitra	-0.062	-0.025	0.060	0.297
banska bystrica	-0.033	-0.013	0.069	0.630
presov	0.025	0.010	0.068	0.711
kosice	-0.165	-0.065	0.067	0.014
constant	-1.036		0.243	0.000

Source: Author´s calculations.

of its growth is negative. According to Studena (2004), there is no systematic relationship between firm size and its growth. On contrary, our results show the positive relationship.

The regional and industrial dummy variables were used in the third model. All estimated industrial coefficients have the positive sign and regional estimations negative. Majority of these coefficients remained statistically significant which is a difference compared to our thesis, in which coefficients of regional dummies are all non-significant.

Table 5.14: Probit model

Model	(1)	(2)	(3)
Variable	coefficient	coefficient	coefficient
Constant	-0.216	0.398	0.275
Ownership (state omitted)			
Domestic private	-0.053	-0.080	-0.006
Foreign	0.214	0.267	0.276
Firm size		-0.121	-0.114
Industries (Agriculture omitted)			
Industries			0.178
Business Services			0.181
Public Services			0,297
Regions (Bratislava omitted)			
Banska Bystrica			-0.160
Kosice			-0.065
Nitra			-0.198
Presov			-0.186
Trencin			-0.165
Trnava			-0.124
Zilina			-0.323

Source: Siebertova, Senaj (2007)

Why is there so big difference? Of course, the main reason is two different data sources. We can also decompose our results in two periods (2000-2004 and 2004-2007) and estimate separate regressions for both. In the Figure 5.26 the trend of the net growth rate over period 2000-2004 is shown (period used in paper Siebertova, Senaj (2007)).

During period 2000-2004 the regions had mostly the decreasing tendency of net employment change. The region of Bratislava remarked the curious period, big fall in 2002 and increase since then.
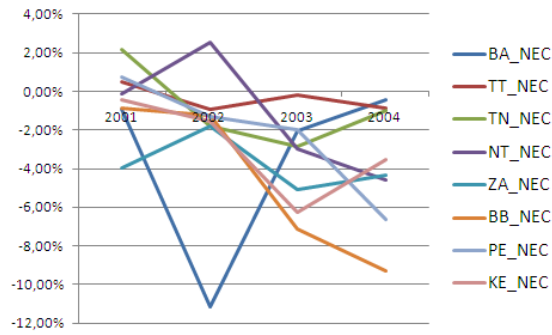
Figure 5.26: NEC by region 2000-2004

The observation for period 2004-2007 is shown in Figure 5.27.
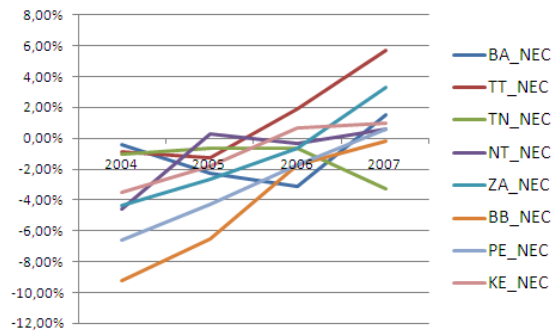
Figure 5.27: NEC by region 2004-2007

Almost all of the regions have the same tendency, raising and ending in positive net employment change values. Differences are markedly smaller than during the first period so it would not be surprise if the parameters of Slovak regions will be nonsignificant.

For both of these periods we have estimated the probit model and report its results in the first two columns of Table 5.15. The period 2000-2004 brings two significant regions, Kosice and Banska Bystrica, both with negative sign. The regional coefficients are as we expected non-significant over period 2004-2007. All of the other parameters for both of the periods (and also for whole period 2000-2007) are found to be significant and their values are very similar, what confirms the robustness of these regressions.

To sum up, period 2000-2007 consists of two relatively different periods, period

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Table 5.15: Probit model

Variable	2000-2004		2004-2007		2000-2007	
	coefficient	p-value	coefficient	p-value	coefficient	p-value
firm size	0.129	0.000	0.147	0.000	0.135	0.000
wages per hour	-0.203	0.000	-0.068	0.016	-0.104	0.000
productivity	0.240	0.000	0.208	0.000	0.231	0.000
Industries	0.550	0.000	0.514	0.000	0.516	0.000
Business Services	0.624	0.000	0.589	0.000	0.591	0.000
Public Services	0.514	0.000	0.516	0.000	0.505	0.000
Trnava	-0.05	0.124	-0.066	0.066	-0.041	0.132
Trencin	0.023	0.508	0.013	0.700	0.030	0.241
Zilina	-0.010	0.762	-0.019	0.595	0.009	0.718
Nitra	0.049	0.151	-0.037	0.274	-0.010	0.686
Banska Bystrica	-0.08	0.028	-0.003	0.935	-0.012	0.670
Presov	-0.037	0.306	-0.019	0.604	-0.003	0.906
Kosice	-0.076	0.041	-0.055	0.146	-0.032	0.241
Constant	-1.66	0.000	-2.117	0.000	-2.083	0.000

Source: Author´s calculations.

2000-2004 could be explained like ongoing transition process (what was also one of the conclusions of paper Siebertova, Senaj (2007)) typical with the domination of destruction rate. Differences between regions and their impact on the probability of firm growth were high. The probable end of transition occurred somewhere between 2004 and 2005 and till 2007 appeared many of positive and promising outcomes, like the equalization of differences among regions proven by non-significance of the regional parameters in probit estimation.

Chapter 6

Summary and Conclusions

This thesis has two main parts. The first part analyses job flows in the labor market in Slovak Republic since 2000 till 2007. Our observations are based on the exhaustive databases obtained from the Statistical Office of SR. The databases contain information mainly about companies with more than 20 employees (firms with less than 20 employees are presented only if they remarked sales over 100 million Slovak crowns). Now we can come up to the particular outcomes of our observations.

Results of aggregate job flows are very similar to other transition countries. The job destruction rate predominates over job creation rate, which generates the negative net employment change. This domination declines slowly and the last year of our survey is the first year when net growth turns into positive value.

The most job creating sectors are wholesale, retail trade and business services. Both of these sectors, that were underdeveloped in the past, have positive average employment growth during 2000-2007. Together with construction and manufacturing they belong to the most flexible sectors of industry in Slovakia. The worst sectors in terms of net growth rate are, not surprisingly, agriculture and mining, together with transport and utilities.

Another typical feature of the transition countries is inverse relation between the enterprise size and its flexibility. The job turnover rate in the smallest firms is almost 20 percent, while the firms with more than 1000 employees have this rate approxi-

mately half of it. The smallest firms are the only, in which job creation predominates over job destruction. The other groups, excepted firms with more than 1000 employees, achieved positive result at the end of analyzed period (2006-2007).

Majority of job creation is situated in the region of Trnava, the only region that achieved positive average value of the net growth. On the other hand, the most destructive region is Bratislava. Net employment change gains the worst value in the region of Banska Bystrica.

Probably one of two most important findings of the ownership type analysis is the year 2004 when the improvement of the net growth in the firms without share of foreign capital occurred. The second one is the raising tendency of productivity of workers employed in these firms.

In the second part of this thesis we present estimates of the probability model of enterprise growth in two ways. In the first we observe the relation with firm size, productivity of workers, hourly wages, dummies of aggregate industries and regions respectively, while in the second we add to explanatory variables the share of foreign capital.

Both of these two approaches bring very interesting outcomes. Significant variables enterprise size, share of foreign capital and productivity of workers have positive sign, therefore the relation between these parameters and probability of growth is positive. While the positive signs by the coefficients of productivity and foreign capital are expectable, the firm size is quite different case. Many empirical works, including paper about Slovakia Siebertova, Senaj (2007), show the negative relation between the probability of growth and number of its employees. On the contrary, Studena (2004) showed nonexisting relation and together with our positive result confirmed Gibrat´s law according to which there is no relation between these two parameters. The main reasons for three different conclusions of these empirical papers based on Slovak data are probably three different time periods and data sources. The coefficient on hourly wages payed to employees has negative sign, so the relation of this variable with the probability of firm growth is negative. The probability of firm growth is higher when firm does not belong to agricultural sector, the highest probability have

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companies operating in business services sector. Very surprising and crucial outcome of probit analysis is non-significance of the regional dummies. Thus, for the continuing firms their location is not the determining factor in their growth. Factors influencing growth probability are already mentioned size, productivity, share of foreign capital and hourly wages together with sector of industry the enterprise belongs to. This result does not correspond with significance of almost all regions in paper Siebertova, Senaj (2007). To make a better approach we have decomposed the period 2000-2007 in two periods. The first is 2000-2004 (the same as in paper Siebertova, Senaj (2007)) and this period brings significance to some regions. The difference in the number of significant regions between these papers is caused by the different data sources.

Chapter 7

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Chapter 8

Appendix

Table 8.1: **Job flows for computed employees 2000-2007**

Year	Job creation	Job destruction	NEC	JTR	EJR
2000/2001	5.31%	5.83%	-0.52%	11.14%	10.62%
2001/2002	4.66%	8.39%	-3.73%	13.05%	9.32%
002/2003	4.13%	7.56%	-3.43%	11.68%	8.26%
2003/2004	4.98%	7.88%	-2.90%	12.87%	9.97%
2004/2005	4.39%	6.72%	-2.32%	11.11%	8.78%
005/2006	5.16%	6.44%	-1.28%	11.60%	10.33%
2006/2007	5.99%	4.93%	1.06%	10.92%	9.85%
Average	**4.95%**	**6.82%**	**-1.87%**	**11.77%**	**9.59%**

Table 8.2: **Job flows by industry for computed employees 2000-2007**

Industry	Job Creation	Job Destruction	NEC	JTR	EJR
agriculture, forestry, fishing	0.97%	9.07%	-8.10%	10.04%	1.93%
mining, metallurgy	2.67%	7.53%	-4.86%	10.21%	5.35%
manufacturing	5.96%	6.50%	-0.53%	12.46%	10.84%
Utilities	1.09%	7.17%	-6.08%	8.26%	2.18%
Construction	5.14%	8.37%	-3.23%	13.50%	10.27%
Wholesale, retail trade	8.40%	4.34%	4.06%	12.73%	8.68%
Hotels and restaurants	4.68%	5.93%	-1.24%	10.61%	8.96%
Transport, Communication	1.78%	8.32%	-6.54%	10.10%	3.56%
Banking and Insurance	3.72%	4.13%	-0.42%	7.85%	6.60%
Business Services	8.95%	7.59%	1.37%	16.54%	13.43%
Education	2.46%	4.63%	-2.16%	7.09%	3.61%
Health and social work	2.52%	4.57%	-2.05%	7.09%	4.32%
Other, Personal Services	5.90%	7.02%	-1.12%	12.92%	10.01%

Table 8.3: **Job flows by firm size for computed employees 2000-2007**

Enteprise size	Job Creation	Job Destruction	NEC	JTR	EJR
<20	12.43%	7.15%	5.28%	19.58%	14.30%
20-49	6.80%	7.09%	-0.29%	13.89%	13.00%
50-249	6.02%	6.73%	-0.71%	12.74%	11.19%
250-499	6.04%	6.19%	-0.15%	12.23%	10.30%
500-999	5.21%	5.80%	-0.59%	11.01%	8.65%
>1000	2.97%	7.43%	-4.46%	10.40%	5.94%