*Chapter 2*

# How Mobile are Central and Eastern Europeans? Evidence from Inter-Regional Migration in the Czech Republic[♣]

*by*

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**Abstract:** In this chapter, I analyze the determinants of interregional migration between 74 districts in the Czech Republic over the years 1993–2003. The results of my analyses show that migrants respond strongly to the interregional differences in wages. On the other hand, the districts' unemployment rates do not seem to play an important role. Further, on average Czechs prefer to move to regions near by and the migration propensity decreases with larger distance between two districts. Overall, the scale of interregional migration in the Czech Republic is very low given the large interregional disparities, indicating relatively low migration propensity of Czechs.

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## 2.1. INTRODUCTION

Central and Eastern Europe (CEE) became a relatively new and large source of immigration after the fall of the Iron Curtain. The CEE migration issue gained a remarkable attention in connection with the recent European Union (EU) enlargement. Politicians, academic and the public have argued about the size and speed of potential East-West migration flows. The main difficulty reaching any straightforward conclusions about the CEE migration lays in the fact that the migration behavior of Central and Eastern Europeans is relatively unknown. There is a lack of migration experience from those countries as there was a virtual migration stop during the entire 40 years of communistic regime. The period after the communistic breakdown brought fundamental changes in institutional, political and societal structures of the CEE countries, which have strongly influenced the migration behavior in the nineties. At the same time, the emigration has been limited by immigration policies from the Western world.[2] But the migration within unrestricted EU labor markets is likely to be different.

One possibility to study the migration behavior of Central and Eastern Europeans in an environment with no obstacles such as restrictive immigration policies is to analyze determinants of interregional migration in those countries. This paper deals with the determinants of interregional migration in the Czech Republic. The Czech Republic presents a suitable country for this kind of analysis as it is a typical Central European source country with considerable regional differences in economic, social and demographic conditions.

Until now there is relatively little empirical evidence on the determinants of internal migration in the CEE countries. A majority of the existing studies finds that the interregional migration responds to the economic characteristics, although the interregional migration is lower than expected, see e.g. Fidrmuc (2004). Most of the studies base their analyses on the overall inflows to and outflows from particular districts without distinguishing the regions of origin and destination. The purpose of the paper is to add additional evidence on the interregional migration from one of the CEE countries, the Czech Republic. As I use data on the migration flows between pairs of regions, it makes it possible to control for unobservable factors of

[2] Moreover, the immigration policies have changed over time towards getting more restrictive.

both regions of origin and destination. In this way, I add some new factors into the existing empirical evidence from the CEE countries. The paper deals with the following interesting questions: What are the main determinants of interregional migration in the Czech Republic? Is the migration driven mostly by "pure" economic factors such as wages and employment opportunities or do non-economic factors such as studies, family reasons, housing or environment play a role as well? In order to answer the questions, I analyze gross migration flows between 74 Czech districts annually over the period 1993-2003.

The paper proceeds as follows. Section 2.2 gives an overview of the theory and the previous empirical evidence on the determinants of interregional migration. Section 2.3 provides some stylized facts about economic and regional labor market conditions in the Czech Republic and the role of migration. Section 2.4 presents the data set used in the analysis. Section 2.5 presents an empirical model and discusses the results of my analysis. Finally, Section 2.6 concludes.

## 2.2. THEORY AND PREVIOUS RESEARCH

The classical economic theories on migration have focused on differences in income opportunities as the main determinant of migration, see Hicks (1932). This traditional view is further reflected in the empirical literature on migration of workers as the "human capital investment" theoretical framework (Sjaastad, 1962) that indicates that a person decides to move if the discounted future expected benefit is higher than the costs of migration. However, in reality the incentives to migrate measured only by differentials in expected earnings have failed to explain why so few people move given huge differences in wages across the geographical space. The Harris and Todaro (1970) model[3] goes a step further and indicates that migration is motivated by expected earnings differentials adjusted for the probability of being employed at the destination region.

Some studies argue that migration flows are determined by the number of job opportunities in different regions, perhaps even more so than by the wage differences. For instance in the empirical findings of Jackman and Savouri (1992), the wage differential was not significant although higher migration rates were found

[3] Harris and Todaro (1970) analyze rural-urban migration.

from high-wage to low-wage regions. On the other hand, the study shows that unemployment and vacancy rates have significant and well-defined effects. They have created the well-known "matching function", which expresses the number of total hirings as a function of the number of unemployed workers (job seekers) and the number of vacancies. If a job-seeker and a vacancy are matched, this will lead to migration whenever the two are in different regions, see Jackman and Savouri (1992).

Unemployment rate variables, on the other hand, have yielded insignificant coefficients in a number of studies, see e.g. Bentolila (1997), Pissarides and Wadsworth (1989). One possible explanation could be that existence of welfare systems may create poverty traps for unemployed. Another explanation of the difficulties with finding any significant employment /unemployment effects may be explained by the existence of the so-called "wage curve", see Blanchflower and Oswald (1994). This might be the case for CEE countries as confirmed by some empirical evidence, see e.g. Blanchflower (2001) for evidence on CEE transition countries and Huitfeld (2001), Jurajda (2002) and Galuscak and Munich (2003) for evidence from the Czech Republic.

Some studies have also analyzed the decision to migrate as e.g. a family or household decision. A move takes place only if the net gain of a family will be positive, see Mincer (1978), Holmlund (1984). Labor migration can be taken also as the risk-sharing behavior of families. In contrast to individuals, households may diversify their resources such as labor, in order to minimize risks to the family income (Stark, 1991).

Looking at migration, the other way round, as a mechanism for resolving labor market disequilibria, there is a growing number of empirical studies. The study by Blanchard and Katz (1992) confirms a strong position of interregional migration as a labor market adjustment mechanism in the United States. They find that labor migration plays a major role in reducing interregional unemployment differentials. Decrisin and Fatas (1995) found that labor mobility plays a considerably smaller role as a mechanism for diminishing labor market differentials in the European labor markets. Bentolila (1997) finds that in Spain, there is evidence even of in-migration to the depressed regions, rather than out-migration. This may be due to the return migration or compensating differentials such as quality of life and housing prices.

He also finds that the level of migration is negatively related to the national level of unemployment. This suggests that the workers perceptions of the probability of employment in other regions are significantly correlated with the national unemployment level.

Until now, there are only few papers on the migration flows in the Central and Eastern European countries. All authors agree that although most labor markets in the transition countries are rather flexible, the geographical mobility is lower than expected given the relatively big and growing regional differences. The study by Boeri and Scarpetta (1996) show that the direction of migration flows is consistent with underlying labor market imbalances, but the magnitude of interregional migration is decreasing over time in spite of increasing unemployment differentials. They show that commuting has become a substitute for migration and estimate that a distance up to 30 km makes it worth to commute rather than to move. Erbenova (1994) suggests that interregional mobility in the Czechoslovakia has been low because of the underdevelopment of the housing market. She also claims that commuting is likely to play a dominant role in regional labor market mobility. Burda and Profit (1996) estimate a matching function and find the importance of labor mobility as a determinant of adjustment dynamics between the local labor markets in the Czech Republic, despite growing regional disparities in unemployment rates during the 1992-1994 period of economic transition. The most recent and relevant study is the one by Fidrmuc (2004). The author focuses on interregional migration as an effective channel of regional adjustment to idiosyncratic shocks in CEE transitional and South European economies over the years 1992-1998. He found out that even though net migration responds to regional economic characteristics, the effects are economically small, and thus migration plays a poor role in equalizing regional disparities in transitional economies. On the basis of his results, he also mentions that it seems unlikely that there will be a massive East-West migration after the enlargement as Eastern Europeans do not move readily even within their own countries. However, the author looks at the overall gross population inflows to and outflows from particular districts without distinguishing the regions of origin and destination, respectively (the same data were used in the study by Erbenova, 1994). The purpose of this paper is to add new empirical evidence on interregional migration in the Czech Republic. My study differs from the previous research by considering flows between two particular

districts and identifying push and pull factors in both source and destination regions. Moreover, I carry out my analysis on a longer panel of data, namely for the period 1993-2003.

## 2.3. ECONOMIC AND REGIONAL LABOR MARKET CONDITIONS IN THE CZECH REPUBLIC

At the beginning of the transition process, the Czech labor market was characterized by relatively small wage differentials across the regions and highly specialized regional economic structures.[4] This was the result of a strong equalization policy pursued during the forty years of communistic regime.[5] The regional disparities started to grow together with price liberalizations, changes in geographical orientation of trade and a boom of the tertiary sector, which took place especially in the largest urban areas and major tourist resorts, see Erbenova (1994). The regional disparities became even more significant with the restructuring of large, inefficient enterprises in old industrial regions and with a concentration of foreign investments especially into the area of Prague and other large cities. Moreover, during the first years of the transformation the Czech government was focusing mainly on macro-economic issues and the regional needs hardly received any attention. Thus, this was mirrored in a deepening of the interregional differences on the Czech labor market.

### *2.3.1. Unemployment and Wages*

Beginning with the development in unemployment rates, the Czech labor market was characterized as a "miracle" prior to 1997 as the Czech unemployment rate stayed below 4 per cent, see Table 2.1. However, this situation changed with the exchange rate crisis in 1997 and the following economic recession characterized by a decline in the real GDP level and a quick slowdown of inflation, see the

[4] Such structural rigidity was maintained at the beginning of the 1990's through state subsidies to selected large enterprises. The enterprises have been established under the previous regime and in majority they suffered from huge debts and inefficiency. The goal was to give them a "chance to stand on their own" and to make them more attractive for strategic investors, see Blazek (1999). The government's help often came in the form of writing off the debt from the communistic period and/or financial subsidies. By this support, sudden serious labour market problems were avoided, but at the same time the structural rigidity was kept artificially.

[5] The former Czechoslovakia was probably the country with the strongest equalization policy in the Central and Eastern European region, see Balchin et al. (1999), Blazek (1999).

development of main economic indicators in the Appendix, Table 2.A. Consequently the unemployment rate, which at the beginning of the transformation process was extremely low compared with the development of other Central and Eastern European transition countries, started to increase significantly after 1997.

Moreover, there have been enormous regional differences in the level of unemployment, see Table 2.1. At the end of 1993, the lowest unemployment rate was 0.3% (Prague) and the highest 8.7% (Bruntal). In 2003, one can observe a much higher overall unemployment rate with the lowest unemployment rate at 3.04% (Prague) and the highest at 23.51% (Most). As the overall national unemployment grew over time, the regional unemployment rates have come closer to each other over time as shown by the coefficient of variation[6] in Table 2.1. The regional unemployment structure is fairly stable during the period 1993-2003. Unemployment is highest in the typical heavy industry and coal-mining areas in North Moravia and North-East Bohemia.[7] Unemployment is also high in some typical agricultural regions of South Moravia. The lowest unemployment rates are mostly found in the areas characterized by the predominance of modern manufacturing and service sectors as well as in tourist boom areas.

The number of unemployed per vacancy, which is a broad indicator of "tightness" of local labor markets, has been growing relatively steeply over time, see Table 2.1. As regards the regional differences, the areas with a high unemployment level also appear to be those with lower vacancy rates.[8] There are almost 100 unemployed per one vacancy in the district of Ostrava whereas in Prague the ratio is 2.15 in 2003. For instance, Prague district could be characterized as "overheated" as the number of vacancies exceeded the number of unemployed for most of the period under consideration. Although there was such a substantial increase in number of unemployed per vacancy, the relative differences between the regions didn't widen as the coefficient of variation after the initial rise in 1996 and 1997 again decreased slowly over time.

[6] The coefficient of variation is widely used as a measure of interregional inequality. The coefficient is simply a dispersion measure standardized by mean.

[7] These are regions, which have experienced large-scale restructuring of the inefficient communist enterprises.

[8] Nevertheless, it also might be due to a lower number of job announcements going through the local labour offices.

*Table 2.1: Regional differences in Czech unemployment rate, labor market "tightness" and wages; districts 1993-2003.*

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unemployment rate** | | | | | | | | | | | |
| **Mean** | 3,89 | 3,38 | 3,12 | 3,75 | 5,58 | 7,77 | 9,60 | 8,89 | 9,00 | 9,94 | 10,47 |
| **Standard deviation** | 1,94 | 1,73 | 1,67 | 1,88 | 2,51 | 3,06 | 3,69 | 4,07 | 3,96 | 4,12 | 4,23 |
| **Minimum** | 0,30 | 0,28 | 0,29 | 0,43 | 0,65 | 1,59 | 2,53 | 2,82 | 2,51 | 2,75 | 3,04 |
| **Maximum** | 8,70 | 7,54 | 7,34 | 9,40 | 12,37 | 15,62 | 19,95 | 21,47 | 21,25 | 21,71 | 23,51 |
| **Coeff. of variation** | 0,50 | 0,51 | 0,54 | 0,50 | 0,45 | 0,39 | 0,38 | 0,46 | 0,44 | 0,41 | 0,40 |
| **Number of unemployed per vacancy** | | | | | | | | | | | |
| **Mean** | 5,89 | 3,06 | 2,19 | 2,81 | 5,51 | 12,84 | 17,31 | 12,08 | 12,48 | 18,32 | 20,15 |
| **Standard deviation** | 5,61 | 2,67 | 1,61 | 3,67 | 7,27 | 10,70 | 14,52 | 11,25 | 10,93 | 17,71 | 17,11 |
| **Minimum** | 0,17 | 0,12 | 0,13 | 0,23 | 0,51 | 0,88 | 1,15 | 0,82 | 1,08 | 2,06 | 2,15 |
| **Maximum** | 31,07 | 16,80 | 8,94 | 31,05 | 60,88 | 53,34 | 79,90 | 56,59 | 50,98 | 106,88 | 96,04 |
| **Coeff. of variation** | 0,95 | 0,87 | 0,74 | 1,31 | 1,32 | 0,83 | 0,84 | 0,93 | 0,88 | 0,97 | 0,85 |
| **Nominal wages** | | | | | | | | | | | |
| **Mean** | 5551 | 6500 | 7661 | 9043 | 9969 | 10819 | 11645 | 12360 | 13082 | 13944 | 14903 |
| **Standard deviation** | 445,6 | 556,8 | 656,2 | 789,2 | 876,0 | 1055,3 | 1177,9 | 1267,7 | 1301,1 | 1356,1 | 1399,9 |
| **Minimum** | 4837 | 5729 | 6840 | 8110 | 8834 | 9460 | 10042 | 10530 | 10990 | 11910 | 12913 |
| **Maximum** | 7145 | 8731 | 10520 | 12541 | 14073 | 15874 | 17437 | 18865 | 18404 | 19897 | 21093 |
| **Coeff. of variation** | 0,08 | 0,09 | 0,09 | 0,09 | 0,09 | 0,10 | 0,10 | 0,10 | 0,10 | 0,10 | 0,09 |

*Source:* Czech Statistical Office, own calculations.

Regarding the wages, there was a rather low degree of regional wage variation in all transition countries at the beginning of transformation, and the Czech Republic was not an exception. As far as nominal wages are concerned, the coefficient of variation increased just slightly and was relatively stable over time, fluctuating around 0.1, see Table 2.1.

### *2.3.2. Migration*

Given such enormous economic differences between the districts and knowing what the economic theory predicts, one could expect that there will be strong incentives for individuals to move in the Czech Republic. Let us take a closer look at the development of migration flows.

Table 2.2 shows the development in the gross out- and in-migration rates[9] over the period 1993-2003. From the first quick look at the migration rates, it is clear that they are on a very low level, moving around 1% with minima and maxima from 0.5% to 1.9% and from 0.4% to 4.1% for out- and in-migration, respectively. Hence, the current level of migration is about the same level as the migration magnitude in the Western European countries, see e.g. Jackman and Savouri, (1992), Eriksson (1987), Decrisin and Fatas (1995) or Bentolila (1997), and far from the level of geographical mobility in the US (3-4%), see e.g. Blanchard and Katz (1992).[10]

As regards the out-migration flows, the magnitude was decreasing somewhat till 1996 and became relatively stable around the level of 0.88% of the district's population. After 2000, the overall gross out-migration rate grows. As regards the interregional differences in the migration behavior as shown by the coefficient of variation, there was no change in the regional differences. The coefficient of variation of the gross out-migration rate was quite low, fluctuating steadily around the value of 0.2 over time. This suggests that the out-migration rates and the regional differences in out-migration are relatively stable.

However, the picture is fairly different when looking at the gross in-migration rates and their development across districts, see Table 2.2. Although the mean value of gross in-migration rates is stable around the 0.9-1%, its standard deviation was increasing steeply over the time period 1993-2000 and so did the coefficient of variation. This shows that certain districts are more popular as destinations than others and this tendency has become more pronounced over time.

[9] The migration rates are defined in the following way: *gross out-migration rate* as migration flow from the particular district *i* to all other districts per population in the district *i; gross in-migration rate* as migration flow from all districts into the particular district *j* per population in the district *j*.
[10] Blanchard and Katz (1992) found that labour migration plays a strong/major role in reducing the interregional unemployment differentials.

*Table 2.2: Migration rates across districts during the period 1993-1999.*

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gross out-migration rate (from a district *i* per population in the *i* district)** | | | | | | | | | | | |
| Mean | 1,09 | 0,96 | 0,92 | 0,86 | 0,86 | 0,88 | 0,88 | 0,87 | 0,93 | 1,05 | 1,00 |
| Standard deviation | 0,246 | 0,219 | 0,204 | 0,200 | 0,184 | 0,185 | 0,179 | 0,175 | 0,217 | 0,258 | 0,244 |
| Minimum | 0,652 | 0,56 | 0,53 | 0,52 | 0,53 | 0,51 | 0,53 | 0,54 | 0,57 | 0, 63 | 0,60 |
| Maximum | 1,97 | 1,72 | 1,65 | 1,59 | 1,52 | 1,44 | 1,48 | 1,28 | 1,56 | 1,85 | 1,70 |
| Coeff. of variation | 0,23 | 0,23 | 0,22 | 0,23 | 0,21 | 0,21 | 0,20 | 0,20 | 0,23 | 0,25 | 0,24 |
| **Gross in-migration .ate (to a district *j* per population in the *j* district)** | | | | | | | | | | | |
| Mean | 1,08 | 0,97 | 0,95 | 0,90 | 0,93 | 0,96 | 0,95 | 0,95 | 1,00 | 1,09 | 1,04 |
| Standard deviation | 0,272 | 0,270 | 0,273 | 0,274 | 0,328 | 0,404 | 0,434 | 0,457 | 0,487 | 0,530 | 0,496 |
| Minimum | 0,62 | 0,58 | 0,51 | 0,53 | 0,50 | 0,51 | 0,46 | 0,49 | 0,52 | 0,55 | 0,44 |
| Maximum | 2,18 | 2,18 | 2,21 | 2,33 | 2,53 | 3,28 | 3,60 | 3,76 | 3,87 | 4,07 | 3,62 |
| Coeff. of variation | 0,25 | 0,28 | 0,29 | 0,30 | 0,35 | 0,42 | 0,46 | 0,48 | 0,49 | 0,49 | 0,48 |

*Source:* Czech Statistical Office, own calculations.

What drives the interregional migration? Are those interregional differences in unemployment and wages the main factors explaining the migration or do other factors play a role? The next sections look at those questions and provide analyses of the determinants of the interregional migration.

## 2.4. DATA

The data used for the analysis have been collected from publications by the Czech Statistical Office and cover a period of eleven years, 1993 to 2003. The migration statistics come from a migration register, which provides the annual information on migration flows between the 8-macro regions or/and between 77 districts.[11] My preferred unit of analysis is a district that makes it possible to capture migration patterns in a greater detail. For a complete list of Czech districts, see Appendix, Table 2.B.

[11] There were changes in the regional structure, both on macro-region and district levels in 1996. Specifically, there were 8 macro-regions (NUTS 3) prior to 1996. As regards districts, the number changed from 76 to 77 (NUTS-4 level), namely, the district Jesenik has been created out of parts of two other districts, Bruntal and Sumperk. In order not to bias the estimations, I exclude these 3 districts from my analyses.

The Czech Statistical Office defines migration as a change of the place of living connected with moving and registration of the permanent residence in a different district. International migration is not taken into account. It is obvious from the definition of migration that people moving without registration are not included in the statistics. But, people tend to register because non-registration creates difficulties, for instance when enrolling children on schools, receiving health care etc. Thus, in the case of long-term migration, movements are always registered. On the other hand, some people may migrate and register more than once a year and thus migration statistics may underestimate actual migration.[12]

In my empirical analyses of determinants of migration, I use information on wages and employment push/pull variables, such as unemployment rates and vacancies. The information on unemployment rates and vacancies is based on the administrative records of the districts' labor offices and is obtained from the Czech Statistical Office. Although employers are obliged to inform the districts' labor offices about job openings, vacancy data are, however, likely to be underestimated. The data on wages come from the Czech Statistical Office, as well. Further, for purposes of my analyses I have used a distance variable between main districts' cities. I obtained this information from the online Czech railway's information service.

For a full list of variables and their summary statistics, see Appendix, Table 2.C.

## 2.5. MODEL AND EMPIRICAL ANALYSES

In this paper, I estimate the determinants of the gross migration flows between 74 Czech districts. I build on the framework of gravity-type models, which is a standard and useful approach in describing choice behavior between two points in space. Its attractiveness stems partly from its simplicity and partly from the fact that it is suitable for the sort of data that I collected from the Czech Statistical Office sources.

[12] Once the migrants register, they are required to fill in questionnaires about their motives for migrating and their economic and demographic characteristics. Consequently, it is possible to identify the characteristics of internal migrants and their reasons for migration. But, as the Czech Statistical Office does not permit usage of individual data, the information is aggregated. Nevertheless, it might be useful to present the characteristics of migrants in the Czech Republic, which I'm going to do in the future.

The gravity-type models borrow the idea from Newton's law of gravitation:

$$G_{ij} = c\frac{Ww}{dist_{ij}^{\ 2}} \tag{2.1}$$

where $G_{ij}$ is the gravity between two objects, *W* and *w* are the weights of objects, $dist_{ij}$ is a distance between *i* and *j* and *c* is a constant. The theory basically indicates that the attracting force between two objects decreases in proportion to the squared distance between the objects.

This simple relationship performs well in modeling general patterns of migration, see e.g. Karemera et al. (2000). The most simple gravity model relates the migration flow from area *i* to area *j*, $m_{ij}$, to an attractiveness of the origin and an attractiveness of the destination, $O_i$ and $D_j$ respectively, and to the distance between the areas $dist_{ij}$. The model could be rewritten in the following form:

$$m_{ij} = O_i^{\alpha} D_j^{\beta} dist_{ij}^{\gamma} \tag{2.2}$$

where $\alpha, \beta, \gamma$ denote constant parameters.

Following the Harris/Todaro study, I employ relative wages and variables reflecting employment opportunities such as unemployment and vacancy rates as main push/pull factors.

The modified gravity model can be rewritten in the following form:

$$\ln m_{ijt} = c + \alpha_1 \ln A_{ijt} + \alpha_2 dist_{ij} + \varepsilon_{ijt} \tag{2.3}$$

where $m_{ijt}$ is a gross migration flow from a sending district *i* to a receiving district *j* in the period *t* expressed per thousand of the *i* sending district's population, where *j* = 1,…,74[13], *i* = 1,…,74 and *t* = 1,…,11. $A_{ijt}$ is a matrix of explanatory variables of source and receiving districts that may change over time. $dist_{ij}$ denotes distance between districts in km. It might be expected that people prefer to move to districts rather close by compared to moving into districts far away. The explanation is that migration to more distant districts is connected with both higher direct, but also

[13] Three districts are excluded from my analyses: Jesenik, Bruntal and Sumperk, due to changes in regional structures in 1996.

psychological costs of migration.[14] Thus, I expect the coefficient to the distance variable to be positive. $\alpha_1$ and $\alpha_2$ are parameters to be estimated, $\varepsilon_{ijt}$ is an error term. All variables are in logs in order to express impact elasticities.

The matrix of time-variant explanatory variables, $A_{ij}$, is given in a Harris/Todaro's model fashion as:

$$\ln A_{ijt} = \beta_1 \ln w_{ijt} + \beta_2 \ln U_{jt} + \beta_3 \ln U_{it} + \beta_4 \ln V_{jt} + \beta_5 \ln V_{it} + \upsilon_{ijt} \qquad (2.4)$$

where $\ln w_{ij}$ denotes *Log wage ratio*, defined as $\ln w_{ij} = \ln(W_j / W_i)$, where $W_j, W_i$ stands for an average nominal wage in a receiving district *j* and a sending district *i*, respectively; $\ln U_j$ and $\ln U_i$ denote *Log unemployment rate* in a receiving district *j* and a sending district *i*, respectively. $\ln V_{jt}$ and $\ln V_{it}$ denote *Log vacancy rate* in *j* and *i*, respectively. The vacancy rate is defined as vacancies per population of the particular district, $v_j = (V_j / P_j) * 100$ for receiving district *j* and $v_i = (V_i / P_i) * 100$ for sending district *i*. According to the theory, I expect a positive effect of the wage ratio meaning that migration flows should go on average from low-wage to high-wage districts. Further, I expect that $\beta_2 < 0; \beta_3 > 0; \beta_4 > 0;$ and $\beta_5 < 0$.

Table 2.3 reports pooled OLS-estimates[15] of the simple gravity-type model for the 74 administrative districts in the Czech Republic. First, I considered the model without the distance variable. Comparing the explanatory power of the regression without the distance variable, column (1), to the explanatory power of the regression with the distance variable, column (2), the R-squared increased significantly from 4% to 52%. This shows that the distance between two districts plays an important role in explaining the migration flows.

The coefficients of the economic explanatory variables are all significant. Beginning with the wage ratio estimates, the coefficient is large and positive as expected. Thus, migrants tend to go from low-wage districts to high-wage districts. The unemployment rate coefficient for a destination and an origin has the expected negative and positive sign, respectively, but the effect is small, see Table 2.3 column

[14] This is even more true for couples, where both spouses participate in the labour market. They may find it difficult to find employment for both spouses if moving to districts far away. Such a situation is typical in the Czech Republic, where both spouses are breadwinners in most families.
[15] with the "robust" Hubert/White/sandwich variances.

2. However, the coefficients to the districts' vacancy rates both for destinations and origins have exactly the opposite signs than what the theory would predict. Thus, the employment opportunities as represented by vacancy rates provide unclear results.

Regarding the econometric specification, there might be some complications with a certain degree of endogeneity/reverse causality of explanatory variables in the model. Specifically, the migration flows might affect wages, unemployment and vacancy rates in both destination and source districts in the given period *t*.[16] In order to avoid the problem, I instrument wage ratio, unemployment and vacancy rates with their first lags. Hence, the matrix of time-variant explanatory variables, $A_{ijt}$, is specified as follows:

$$\ln A_{ijt-1} = \beta_1 \ln w_{ijt-1} + \beta_2 \ln U_{jt-1} + \beta_3 \ln U_{it-1} + \beta_4 \ln V_{jt-1} + \beta_5 \ln V_{it-1} + \upsilon_{ijt} \qquad (2.5)$$

I also account for a spatial autocorrelation by applying a logical spatial arrangement of the districts into the regressions. A very useful tool for bringing the notion of space into the econometric model might be a so-called spatial weight matrix, see Anselin (1988). There are many different procedures in selecting the weight matrix, see Anselin (1988) for an overview. In the simplest case, which I use in my analysis, a symmetric matrix is defined as a dummy with a value equal to one if two districts are neighbors, and zero otherwise. The *neighboring dummy* variable is denoted as $prox_{ij}$.

Finally, I include the lagged dependent variable – lagged migration rate – on the right-hand side to add dynamics into the model, see Anselin (1988). The model with spatial components and lagged dependent variable has the following form:

$$\ln m_{ijt} = c + \alpha_0 \ln m_{ijt-1} + \alpha_1 \ln A_{ijt-1} + \alpha_2 \ln dist_{ij} + \alpha_3 prox_{ij} + \varepsilon_{ijt} \qquad (2.6)$$

Table 2.3 shows the results of the model with lagged explanatory variables. In columns 4 and 5, I gradually add a neighboring dummy, $prox_{ij}$, and a lagged dependent variable, respectively. In both cases, the explanatory power of the model increased, especially by adding the lagged dependent variable.

[16] As mentioned in the previous literature/theory section, an entire stream of literature exists that focuses on migration as a mechanism for diminishing labour market equilibrium, see e.g. Blanchard and Katz (1992), Decrisin and Fatas (1995).

*Table 2.3. Determinants of gross migration flows, OLS, 1993–2003*

| *Dependent variable:* Gross flows per 1000 inhab., $\ln m_{ijt}$ | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| *Independent variables:* | | | | | |
| *Gross flows lag,* $\ln m_{ijt-1}$ | - | - | - | - | 0.510 [0.004]*** |
| *Wage ratio,* $\ln w_{ijt}$ | 1.599 [0.044]*** | 1.610 [0.032]*** | - | - | - |
| Wage ratio lag, $\ln w_{ijt-1}$ | - | - | 1.599 [0.034]*** | 1.600 [0.035]*** | 0.792 [0.025]*** |
| Unemployment rate *j*, $\ln U_{jt}$ | -0.096 [0.010]*** | -0.043 [0.007]*** | - | - | - |
| Unemployment rate *j* lag, $\ln U_{jt-1}$ | - | - | -0.037 [0.007]*** | -0.045 [0.007]*** | -0.013 [0.006]** |
| Vacancy rate *j*, $\ln V_{jt}$ | -0.083 [0.010]*** | -0.112 [0.007]*** | - | - | - |
| Vacancy rate *j* lag, $\ln V_{jt-1}$ | - | - | -0.113 [0.007]*** | -0.109 [0.007]*** | -0.045 [0.006]*** |
| Unemployment rate *i*, $\ln U_{it}$ | -0.019 [0.009]** | 0.030 [0.006]*** | - | - | - |
| Unemployment rate *i* lag, $\ln U_{it-1}$ | - | - | 0.057 [0.006]*** | 0.049 [0.006]*** | 0.039 [0.005]*** |
| Vacancy rate *i*, $\ln V_{it}$ | 0.111 [0.010]*** | 0.080 [0.007]*** | - | - | - |
| Vacancy rate *i* lag, $\ln V_{it-1}$ | - | - | 0.106 [0.008]*** | 0.109 [0.007]*** | 0.064 [0.006]*** |
| Distance in km, $\ln dist_{ij}$ | - | -1.214 [0.006]*** | -1.216 [0.006]*** | -1.011 [0.007]*** | -0.499 [0.007]*** |
| Neighbour (0/1), $prox_{ij}$ | - | - | - | 1.034 [0.018]*** | 0.502 [0.012]*** |
| Constant term | -2.717 [0.015]*** | 3.514 [0.031]*** | 3.476 [0.033]*** | 2.353 [0.040]*** | 1.141 [0.030]*** |
| No of observations | 59421 | 59421 | 54019 | 54019 | 54016 |
| No of districts | 74 | 74 | 74 | 74 | 74 |
| Adjusted R-squared | 0.04 | 0.51 | 0.52 | 0.55 | 0.67 |

Notes: 10, 5 and 1% levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

The results show that the coefficient to the lagged dependent variable is positive, highly significant and large, see Table 2.3 column (5). The coefficients of other explanatory variables changed and became much smaller by adding the lagged dependent variable on the right-hand side, but the directions of the effects stayed the same. The coefficient to the neighboring dummy, $prox_{ij}$, shows that people indeed tend to migrate to neighboring districts.

Aside the variables considered in the model, there are other unobservable push/pull factors that play a role in a migrant's decision. For instance, people migrate because of "division of labor" between districts. Some districts are characterized by certain

industrial structures and by certain institutions such as educational institutions, i.e. universities and high schools. These and other unobservable characteristics of the districts might be important in explaining interregional migration. In the presence of the unobserved district-specific heterogeneity, the pooled OLS-estimator is biased and inconsistent, see Baltagi (2005). In order to control for the unobserved heterogeneity, I apply one of the frequently used panel data techniques such as a fixed-effect (within) panel data estimator. I account for both destination and source district's specific effects, $\mu_j$ and $\mu_i$ respectively. Finally, I control for aggregate shocks that influenced all regions in the same way in a given year by inclusion of year dummies. The model with the fixed district- and year-specific effects is given as:

$$\ln m_{ijt} = c + \alpha_0 \ln m_{ijt-1} + \alpha_1 \ln A_{ijt-1} + \alpha_2 \ln dist_{ij} + \alpha_3 prox_{ij} + \mu_j + \mu_i + year + \varepsilon_{ijt} \qquad (2.7)$$

The results of the model using fixed effects panel data estimator are presented in Table 2.4, columns (2) and (3). There are a couple of interesting differences to observe. First, the coefficients to the lagged dependent variable and the lagged wage ratio became much smaller in size. But still one can notice that the wage ratio is strongly positive and robust over all regressions. Hence, wages are one important determinant of Czech interregional migration.

Interestingly, the coefficients to the unemployment and vacancy rate in destinations switched their signs and became both positive.[17] The coefficients to the unemployment and vacancy rate in origins became insignificant and much smaller in size. Aside the wrong signs of some of the variables that capture employment opportunities, the coefficients to the variables are all very small. Similar weak or non-existent unemployment/employment effects on migration were found in other previous studies, e.g. in Fidrmuc (2004) for CEE transition economies or in Bentolila (1997) for Spain.

The positive sign of the coefficient to the destination district's unemployment rate in the fixed effect panel data regressions might be due to the existing skills heterogeneity in the unemployment structures and heterogeneity in migration

[17] The coefficient to the vacancy rate is just marginally significant in the regression with the year dummies.

flows.[18] Further, it may reflect the migration for family reasons such as marriage, partnership or divorce.

*Table 2.4. Determinants of gross migration flows, Fixed effects estimator, 1993–2003*

| *Dependent variable:* $m_{ijt}$ = Gross Flows per 1000 inhab., $\ln m_{ijt}$ | (1) | (2) | (3) |
|---|---|---|---|
| *Independent variables:* | | | |
| *Gross flows lag,* $\ln m_{ijt-1}$ | 0.510 [0.004]*** | 0.269 [0.004]*** | 0.266 [0.004]*** |
| Wage ratio lag, $\ln w_{ijt-1}$ | 0.792 [0.025]*** | 0.394 [0.076]*** | 0.395 [0.076]*** |
| Unemployment rate *j* lag, $\ln U_{jt-1}$ | -0.013 [0.006]** | 0.037 [0.011]*** | 0.065 [0.015]*** |
| Vacancy rate *j* lag, $\ln V_{jt-1}$ | -0.045 [0.006]*** | 0.020 [0.008]*** | 0.016 [0.009]* |
| Unemployment rate *i* lag, $\ln U_{it-1}$ | 0.039 [0.005]*** | 0.006 [0.011] | 0.034 [0.015]** |
| Vacancy rate *i* lag, $\ln V_{it-1}$ | 0.064 [0.006]*** | 0.007 [0.008] | 0.003 [0.009] |
| Distance in km, $\ln dist_{ij}$ | -0.499 [0.007]*** | -0.805 [0.007]*** | -0.808 [0.007]*** |
| Neighbour (0/1), $prox_{ij}$ | 0.502 [0.012]*** | 0.732 [0.014]*** | 0.735 [0.014]*** |
| Fixed effects of destination | - | Yes | Yes |
| Fixed effects of source | - | Yes | Yes |
| Year dummies | - | - | Yes |
| Constant term | 1.141 [0.030]*** | 3.948 [0.046]*** | 3.933 [0.049]*** |
| No of observations | 54016 | 54016 | 54016 |
| No of districts | 74 | 74 | 74 |
| Adjusted R-squared | 0.67 | 0.72 | 0.72 |

Notes: 10, 5 and 1% levels of confidence are indicated by *, ** and ***, respectively. Standard errors are in parentheses.

Another explanation of the difficulties with finding clear employment/unemployment push pull effects may be the fact that the overall national unemployment rate has increased so steeply during the observed period that the actual differences in unemployment have decreased slightly. Further, the Czech Republic has a generous nation-wide level of social security that likely constitutes a

[18] For instance, the districts characterized by a concentration of the large non-efficient enterprises from the communist regime have experienced growing unemployment rates after the destructuralization, especially for the low-skilled workers. At the same time, the demand for highly skilled might have increased in those districts.

welfare trap for unemployed, see e.g. Eriksson and Pytlikova (2004) for an overview of the social security system in the Czech Republic. Such a situation may not stimulate the unemployed to move in order to find a job, which might explain the results as well. It might be also due to the existence of the so-called "wage curve", i.e. wages in the districts with low unemployment tend to be higher, ceteris paribus, than in the districts with high unemployment, see Blanchflower and Oswald (1994), Galuscak and Munich (2003). Last but not least, one should be careful with the underreporting error in vacancy rates.

The coefficients to the last two variables, distance in kilometers and neighboring dummy, have both expected signs and are large and highly significant. The effects are robust over all regressions. The positive coefficient to the distance variable shows that the migration decreases with a growing distance between two districts. One explanation is that the costs of migration play a role even within one country.

## 2.6. CONCLUDING REMARKS

In this paper, I have analyzed the determinants of interregional migration in the Czech Republic over the years 1993-2003. It is useful to understand migration patterns within one country, where there are no barriers to migration like those considered in the international migration literature such as language, cultural barriers and immigration policies. Especially, it is of a great importance to identify the migration behavior in the Central and Eastern European countries, which have recently joined the European Union. The reason is that the behavior of the CEE migrants is relatively unknown especially in the case of free movement of labor in the enlarged Europe.

I look at the interregional migration determinants in one typical Central European country, the Czech Republic. The results of my analyses show that migrants respond strongly to the interregional differences in wages. Thus, wages are the key driving force in the inter-regional migration. On the other hand, the districts' unemployment rates do not seem to play an important role. It might be because the overall national unemployment rate has gone up so steeply during the observed period that the actual differences in unemployment have decreased. Another explanation could be the existence of the generous nation-wide level of social security benefits, which does not stimulate unemployed workers enough to migrate in order to get a job. Further,

it might also be due to the existence of the so-called “wage curve”. Finally, the distance between two districts plays an important role in the inter-regional migration in the Czech Republic.

Overall, considering the low degree of interregional migration in the presence of the considerable interregional disparities, one may conclude that Czechs have a fairly low migration propensity. But the behavior is driven strongly by wages, hence once having much larger wage differences in the enlarged Europe and no formal barriers to migration, the migration propensity might be higher.

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# APPENDIX:

*Table 2.A: The development of basic macroeconomic indicators in the Czech Republic during the period 1993-2003.*

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **GDP annual growth at 95 const. prices** | 0,1 | 2,2 | 5,9 | 4,3 | -0,8 | -2,2 | -0,4 | 3,9 | 2,6 | 1,5 | 3,1 |
| **Inflation rate** | 20,8 | 10,0 | 9,1 | 8,8 | 8,5 | 10,7 | 2,1 | 3,9 | 4,7 | 1,8 | 0,1 |
| **Labour productivity growth** | 1,7 | 1,0 | 4,2 | 3,2 | 0,0 | 0,9 | 3,3 | 4,1 | 2,6 | 2,1 | 3,9 |
| **The growth of gross average earnings** | 18,6 | 18,3 | 9,9 | 9,2 | 8,4 | 9,3 | 8,4 | 6,5 | 8,7 | 7,3 | 6,8 |
| **Subsistence wage in CZK** | 1 960 | 2 160 | 2 440 | 2 890 | 3 040 | 3 430 | 3 430 | 3 770 | 4 100 | 4 100 | 4 100 |

Source: Czech Statistical Office.

*Table 2.B: List of districts in the Czech Republic:*

| cod | | districts |
|---|---|---|
| 1 | PHA | Hl. m. Praha |
| 201 | BN | Benešov |
| 202 | BE | Beroun |
| 203 | KD | Kladno |
| 204 | KO | Kolín |
| 205 | KH | Kutná Hora |
| 206 | ME | Mělník |
| 207 | MB | Mladá Boleslav |
| 208 | NB | Nymburk |
| 209 | PY | Praha-východ |
| 210 | PZ | Praha-západ |
| 211 | PB | Příbram |
| 212 | RA | Rakovník |
| | | |
| 301 | CB | České Budějovice |
| 302 | CK | Český Krumlov |
| 303 | JH | Jindřichův Hradec |
| 304 | PE | Pelhřimov |
| 305 | PI | Písek |
| 306 | PT | Prachatice |
| 307 | ST | Strakonice |
| 308 | TA | Tábor |
| | | |
| 401 | DO | Domažlice |
| 402 | CH | Cheb |
| 403 | KV | Karlovy Vary |
| 404 | KT | Klatovy |
| 405 | PM | Plzeň-město |
| 406 | PJ | Plzeň-jih |
| 407 | PS | Plzeň-sever |
| 408 | RO | Rokycany |
| 409 | SO | Sokolov |
| 410 | TC | Tachov |
| | | |
| 501 | CL | Česká Lípa |
| 502 | DC | Děčín |
| 503 | CV | Chomutov |
| 504 | JN | Jablonec n.N. |
| 505 | LI | Liberec |
| 506 | LT | Litoměřice |
| 507 | LN | Louny |
| 508 | MO | Most |
| 509 | TP | Teplice |
| 510 | UL | Ústí nad Labem |
| | | |
| 601 | HB | Havlíčkův Brod |
| 602 | HK | Hradec Králové |
| 603 | CR | Chrudim |
| 604 | JC | Jičín |
| 605 | NA | Náchod |
| 606 | PU | Pardubice |
| 607 | RK | Rychnov nad Kněžnou |
| 608 | SM | Semily |
| 609 | SY | Svitavy |
| 610 | TU | Trutnov |
| 611 | UO | Ústí nad Orlicí |
| 701 | BK | Blansko |
| 702 | BM | Brno - město |
| 703 | BI | Brno - venkov |
| 704 | BV | Břeclav |
| 705 | HO | Hodonín |
| 706 | JI | Jihlava |
| 707 | KM | Kroměříž |
| 708 | PV | Prostějov |
| 709 | TR | Třebíč |
| 710 | UH | Uherské Hradiště |
| 711 | VY | Vyškov |
| 712 | ZL | Zlín |
| 713 | ZN | Znojmo |
| 714 | ZR | Žďár nad Sázavou |
| | | |
| 801 | BR | Bruntál |
| 802 | FM | Frýdek - Místek |
| 811 | JE | Jeseník |
| 803 | KI | Karviná |
| 804 | NJ | Nový Jičín |
| 805 | OC | Olomouc |
| 806 | OP | Opava |
| 807 | OV | Ostrava - město |
| 808 | PR | Přerov |
| 809 | SU | Šumperk |
| 810 | VS | Vsetín |

*Table 2.C: Summary statistics of variables used in the study:*

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| mij | 63915 | 16.33923 | 59.3124 | 0 | 2616 |
| uj | 64760 | 4438.721 | 4287.162 | 180 | 29470 |
| vj | 64760 | 736.863 | 1124.147 | 44 | 14587 |
| urj | 64760 | 6.891842 | 4.210143 | .28 | 23.50997 |
| wj | 64760 | 10519.75 | 3090.864 | 4837 | 21093 |
| pj | 64760 | 133940.1 | 134443.9 | 42148 | 1217023 |
| urban_j | 64760 | 63.34251 | 15.82277 | 33.8 | 100 |
| ui | 64760 | 4438.721 | 4287.162 | 180 | 29470 |
| vi | 64760 | 736.863 | 1124.147 | 44 | 14587 |
| uri | 64760 | 6.891842 | 4.210143 | .28 | 23.50997 |
| wi | 64760 | 10519.75 | 3090.864 | 4837 | 21093 |
| pi | 64760 | 133940.1 | 134443.9 | 42148 | 1217023 |
| urban_i | 64760 | 63.34251 | 15.82277 | 33.8 | 100 |
| d_ij | 64760 | 241.4536 | 134.169 | 0 | 642 |
| prox | 64760 | .0615658 | .2403671 | 0 | 1 |