REGIONAL MIGRATION AND THE EVOLUTION OF REGIONAL UNEMPLOYMENT PATTERN IN UKRAINE

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

Master of Arts in Economics

National University "Kyiv-Mohyla Academy"
Economics Education and Research Consortium
Master's Program in Economics

2004

Approved by _____
Ms.Svitlana Budagovska (Head of the State Examination Committee)

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Program Authorized
to Offer Degree Master's Program in Economics, NaUKMA

Date _____

National University "Kyiv-Mohyla Academy"

Abstract

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Interregional labor migration is traditionally considered as one of the main mechanism in equilibrating regional labor market disparities in the developed countries. This paper examines regional mobility as a possible solution for the problem of structure inefficiency in Ukraine economy.

Theory traditionally explains migration by regional disparities in main indicators of economic performance (wages and unemployment rate). However, as empirical results show, this is not the case for Ukraine. I try to find possible explanation for regional labor mobility adding some social, public goods/servives and infrastructure factors.

On the basis of the constructed model the conclusion is made that for the early period of transition wage and unemployment differences between Ukrainian regions can be considered as a plausible explanation for regional labor mobility, while for the recent years these variables are not reliable. Possible causes of this phenomenon are presented.

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ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to her thesis advisor, Dr. Hartmut Lehmann, without whom producing this thesis would be impossible. His encouragement, invaluable comments and guidance contributed considerably to my graduate experience.

Special thanks go to Dr. Tom Coupe for his assistance and constructive critics without which this work would not have been completed.

I am also grateful to my fellow students at EERC for their moral support, numerical advises and useful suggestions, especially to Olha Buinitska, Ganna Cherednichenko and Yulia Tereshchenko.

GLOSSARY

CIS – Commonwealth of Independent States.

Liquidity constraint - a contradiction to theory (that suggests negative relationship between income and outgoing migration) due to poverty trap.

Regional Migration - the movement of persons from one country region to another.

RLM – Regional Labor Markets

Chapter 1

INTRODUCTION

Ukraine as one of the CIS transition countries goes through many specific processes and faces a great number of economic problems. The biggest one, however, is inefficiency in resources reallocation and their usage.

Traditionally economies are hit by such massive shocks as trade liberalization, economic integration, a collapse in terms of war or the fall of communism. A common feature of all these processes is the fact that their influence on the productivity of the capital in different sectors is often dramatic. Formerly profitable enterprises and industries decline, while others grow. When industries are localized, we can expect the reallocation of the sources across the regions.

There are two key issues in Ukraine's transition to market economy: capital and labor mobility [1] that reallocate resources from inefficient enterprises to efficient ones. Since the creation of capital market institutions that will correspond to the world standards is a long-term process in our country, capital mobility is low and a leading role in successful transition in the nearest future belongs to labor mobility. In a perfect world, reallocation of the labor force should be swift and quite smooth, but such important obstacles as administrative barriers, social norms or underdeveloped housing market are slowing this process down. Moreover, a geographically concentrated industrial structure is an additional distinguishing feature inherited by Ukraine from its history. Therefore, interregional labor mobility as one of the possible way for resources reallocation

[1] In the present paper migration and labor mobility are used as equivalent terms

that is used to solve the problem of structure inefficiency in the developed countries may have some specifics for Ukraine.

To the integrated analysis of the process (assuming free movement between the regions), an understanding of key factors that influence on the internal migration is needed. The main idea of my thesis is to examine the so called Tiebout competition between the regions, i.e. to test whether internal migration in Ukraine can be explained by difference in some key factors among the regions (unemployment rate, wage disparities, income and poverty levels, education, life expectancy etc.), controlling for fixed effects and macroeconomic shocks, and to estimate the importance of each above-mentioned factors.

Traditionally migration has been regarded as a major adjustment mechanism of equilibrating the disparities in regional labor markets. Providing that the workers are willing to move from a region with high unemployment rate and low income to a region with lower unemployment rate and higher income, migration contributes to more efficient resource allocation (Hamalainen, 2002). Because of some specifics in the economy processes and historical development of our country, the situation with interregional migration in Ukraine may be different. Particularly, some surveys of transition economies conclude that because of administrative barriers, underdeveloped housing markets, low monetary returns to job changes and market segmentation of job offers worker mobility in these countries is lower than expected [Filer et al.(2001), Boeri and Flinn (1999)]. Therefore, despite the fact that regional disparities in wages and unemployment are large and not decreasing over time, we may expect lower degree of interregional migration mobility in Ukraine than in other European countries. Hence, in my thesis I am going to test whether unemployment and wage regional differences and other mobility determinants have a significant influence on the internal migration in Ukraine. In other words, is there a geographic labor market puzzle in Ukraine, in the sense that there is little

interregional mobility despite a large variation in job market conditions and unemployment rates?

The other reason why the analysis of internal migration can be interesting to examine is because of its implications for economic and regional policy. In many countries active labor market policy is assigned the explicit aim of reducing regional unemployment gaps. Some selective measures are targeted with the aim to implement this goal. But while analysing and predicting the policy-makers should keep in mind the possible consequences of their actions. For example, the theory predicts the negative relationship between the income and outgoing migration. Contrary to this fact, because of liquidity constraint the effect of income on outgoing migration for poor regions is positive. If this is the case, the extensive use of selective employment measures may have just opposite results and prolong regional unemployment disparities.

Therefore, interregional (internal) migration concerns not only to demographic but first of all to economic processes. Taking into account the important role of the interregional labor mobility in the performance of the Ukrainian economy and the fact that this problem in its economic aspect is paid little attention in empirical research it should be investigated more in details. Moreover, the implications of migration process in Ukraine may be taken into account when regional policy will be elaborated or changed.

The paper is structured as follows. The current theory in migration field and econometrics approaches in modelling regional labor mobility is briefly reviewed in Chapter 2. Chapter 3 presents my own methodology along with determinants of migration behaviour and data description. Empirical results for two different time periods are reported in Chapter 4. Finally, I compare obtained results and conclude. Appendixes provide further information on data used.

Chapter 2

OVERVIEW

2.1. Literature Review

Taking into account the fact that in the macroeconomic theory migration is traditionally considered as a key factor in equilibrating RLM and in efficient resource allocation, it is logically to presume that this phenomenon is paid much attention both in theoretical papers and empirical research. As Greenwood (1997) demonstrated the literature on this subject has grown noticeable when the process of migration has become relatively commonplace and has given a rise to numerous policy concerns. Generally speaking, the migration literature can be classified in a number of ways.

First of all, one can distinguish theoretical from empirical papers. In the majority of theoretical researches main migration determinants (the factors that affect the migration) are classified in some groups.

At least three ways of classification (theories) should be mentioned. The first is the human capital theory [Becker (1962) and Sjaastad (1962)] that considers migration as an investment in human capital. Within this framework an individual's migration decision is determined by the comparison of the returns and the costs of migration, which can also involve such non-financial factors as psychological costs of moving etc.

The second is a job search theory [Rogerson (1982), Meier (1985) and Armstrong and Taylor (1993)]. It relates the migration decision to the reservation

wage and models this decision as part of the search process of an unemployed person.

In contrast to all above-mentioned theoretical works, the most used way of migration determinants examination in empirical research is the third (neo-classical) theory. Its basics are laid in Harris and Todaro well-known framework "Migration, Unemployment and Development: A Two Sector Analysis" (1970). Migration is caused by the geographic difference in labor demand and supply between the areas and is motivated by expected earnings differentials (wages differentials adjusted for the probability of employment). Accordingly, relatively higher wage (or lower unemployment rate) in the destination region will attract higher labor inflows mirrored also by capital outflows. The segregation of aforementioned and some other migration determinants on qualitative and quantitative terms is prevalent among the researchers. It was Pissarides and Wadsworth (1989), who first summarized the effect of the main factors (unemployment and relative wage in the region of origin) on the interregional migration at three levels (personal, regional and national). They argued that at the personal level unemployment status would increase the likelihood of migration (controlling such personal characteristics as access to the capital market and job information network), at second level regional unemployment differentials encourage labor mobility and at national level higher aggregate unemployment rate will reduce the probability of migration. Empirical estimation of the suggested theory revealed that unemployment has a strong effect on migration likelihood but contrary to the theory regional differentials in unemployment do not exert an influence on migration. In contrast, the regional differentials in wages have much stronger effect on migration.

Secondly, all empirical researches can be also presented in different ways. One of them, for example, is segregation by the used data. However, while most

studies used regional data, some of them have been carried out at the individual level. For example, Hamalainen (2002) uses Finnish individual level data to explore the migration incentives of the unemployed. He picks out four groups of migration decision determinants: individual characteristics (gender, age, education etc.), labor market characteristics (regional unemployment rate, size of the origin region), information about income (aggregate non-labor income, wealth, and debts), and information about spouse and shows the impact of selective employment measures on the migration likelihood of the unemployed. The obtained results are also confirmed by the other researches - Pekkala and Tervo (2002) who used the same data set for Finland combined with longitudinal employment file. They consider migration behaviour of the unemployed in terms of the casual effect of moving on individual employment status or, in other words, migration as a method of spatial job search. The conclusion was similar: "quality" of migrants (e.g. age, education, human capital etc.) also increases probability to find a good job significantly.

Comparing individual and regional data approaches, one should clearly understand that the former one might be regarded as better way of modelling that gives more accurate estimations. In this case the utility of each migrant and the additional factors which affecting migration decision are taken into account. However, the problems with such data sets do exist. It is not only the selection bias but also the technical difficulties with individual data collection. That's why the similar internal migration researches for developing countries are not yet carried.

In spite of the numerous mobility literature classification schemes perhaps the most reasonable and convenient is the one that distinguishes the level of country development. Two groups of segregation can be distinguished: developed countries and transition economies.

For the first group (developed countries) labor mobility is high and plays an important role in smoothing wage and unemployment region disparities. Economic theory suggests that differences in the cost of living and employment prospects have significant effect on regional labor mobility. Hence, in the majority papers there are three variables that are designed to capture movements - wages, unemployment and house prices. Fry, Fry and Peter (1999) used an applied economic analysis to model internal migration in Australia. The main problem concerned with so-called "size effect" (the increase in migration that results purely from an increase in the population) and was solved by taking the ratio of migration to population number. The authors obtained the following results: for three small regions no evidence that above-mentioned economic variables have any direct impact on net migration was found. Quite the contrary, for each of the big states wages, unemployment and house prices variables perform quite well.

Devillanova and Garcia-Fontes (1998) looks for the answer on the question how do migration flows respond to local economic conditions for Spanish Provinces during 1978-1992. They explain that the answer is supreme and relevant in view of European integration. Particularly, because internal migration is one of the main vehicles for labor market adjustment in European Monetary Union, the understanding and explaining effects of observed migration flows on regional imbalances is crucial. In spite of using new data source for extended gravity model (a Generalized Negative Binominal regression) that includes only job-seeking migrants and allows to identify temporary migration, the obtained results remains ambiguous. Firstly, the effect of employment opportunities have changed in 1984: before neither the unemployment rate differentials nor the growth of employment affect interregional migration, since this year both variables became significant and exhibited the expected sign, although the elasticity to the unemployment rate regional differences remained

low. Finally, migrants seem to be more responsive to the economic conditions than the other ones, but their response to the wage regional imbalances and housing price is wrongly signed.

Although traditional predictions of Hicks-Sjaastad framework (that persons migrate from low-income to high-income regions and that increases in mobility costs deter migration) are broadly supported by empirical results Borjas , Bronars and Trejo (1992) argues that there are many other interesting and important question left unaddressed. Hence, they reject regional income differentials as a suggested by Hicks and Sjaastad variable that generate unidirectional migrational flows Hicks-Sjaastad and use Roy approach that stresses regional differences in the returns to skills. The authors believe that this issue is as important as those dominated in traditional literature because the economic impact of migration depends most of all on which people move as well as on how many people move (regions with higher returns to skills attract more workers than regions those returns are lower). The robustness of suggested returns to skills variable is confirmed by empirical results of the paper.

The general processes in labor mobility for the countries with fundamental structural change have mainly the same tendencies as for developed economies because this change occurred in the countries quite a long time ago. It should be stressed that economic structural change is one of the major factors suggested in the literature as an explanation of the existence of the counter-urbanization tendency in European countries during the 1970s and 1980s. Bierence (2002) evaluates the importance of the economic structural change hypothesis, by determining the degree to which the internal migration flows in Western Germany can be related to employment growth differences. Parikh and Van Leuvensteijn (2002) also examine the well-known determinants of labor migration between regions of Germany after reunification and whether such

determinants have radically changed between pre-unification and post-unification period under the influence of wage convergence between East and West Germany.

However, the greatest difference in the significance of labor migration exists not between developed countries and countries with structural change, but above all between developed and transition economies. As Fidrmuc (2002) states, "in hypothetical economy with perfect labor mobility, regions would adjust to asymmetric shocks (such as an idiosyncratic fall in demand for the region's products, technological progress that renders productive facilities in the region obsolete) instantaneously. When factor mobility is limited and prices and wages are rigid, however, the effects of asymmetric shocks persist and regional economies have to rely on other mechanisms to deal with". It is the main reason why he compares the migration mechanism for developed (on the USA, Italy, Spain, Portugal example) and transition economies (Czech Republic, Hungary, Poland and Slovakia), where persistent economic differences between the regions of the countries are exhibited, and labor mobility contributes little in smoothing those differentials away.

The pattern of labor mobility in the third group of countries of the classification (transition economies) has some distinguishing features in comparison with the first group (developed countries), but also some common ones for all developing countries [Fidrmuc (2002)]. First of all, it's economic insignificance of wage and unemployment effects on labor mobility (it is expected from the theory that the net immigration is positively related to the average wage and negatively to the unemployment rate in the region). The main reason of this phenomenon consists in the fact that wages and unemployment affect on the gross inflows and outflows similarly. Thus, regions with high wages tend to experience high immigration as well as emigration (rather than high immigration

and low emigration). Second, another contradiction between the theory and the real-life situation does exist. The theory states that, in the case of substantial regional disparities, workers aspire at moving from the depressed to regions with higher wages and better employment opportunities. Nevertheless, despite sizeable and growing gap between prosperous and depressed regions, migration in transition economies in fact has been declining in the course of reforms. The different reasons are suggested to explain the fact of low geographical and labor mobility: rising costs of out-of-district job search and moving (low monetary returns to job changes), worsening situation at the housing market, rising aggregate unemployment level at the country, administrative barriers, and market segmentation of job offers.

The majority of researches done in migration field for CIS countries are related to Russia because of its size and impact on the world economy. Therefore, many specific points of labor migration in transition countries are examined for Russia case. For example, Andrienko and Guriev (2003) found out that so-called liquidity constraint is an important barrier to mobility: while the effect of income on outgoing migration is negative on average, it is positive for poor regions. The population of these regions cannot move because the high moving costs, and when the income begins to grow people become able to overcome liquidity constraint. Thus, income growth increases rather than decreases outgoing migration. While about a third of Russian regions is locked in such poverty traps, the liquidity constraint may have a crucial effect on mobility tendency in developing countries.

"Attachment" strategy, that is another specific feature of many transition economies is investigated by Friebel and Guriev (2002). They examine it as an additional, endogenous, obstacle that has not been considered before and claim that firms often devise this strategy to keep workers from moving out of a local labor market. Obviously, that providing or substituting wages by non-monetary compensation, firms make it more difficult for employees to raise some cash

amount needed for covering migration costs. The authors investigate how does the concentration of labor market affect on migration flows and make some final conclusions. Firstly, the feasibility of attachment depends on the inherited structure of labor market in the region. In other words, "attachment" strategy works only for few firms presented in the local labor market and collapses beyond a certain number of firms. Secondly, despite the fact that attachment is beneficial for both employers and employees, it is harmful for unemployed people.

Brown (1997) also analyzes the pattern of migration in Russia with the goal to find out whether labor mobility is mitigating or equilibrating regional labor market differentials. She improves previous studies by using gross flows rather than net flows in order to properly distinguish the effects of traditional economic, amenity factors and housing market reform on the direction of migration flows. Several checks confirm the robustness of the obtained results: even early in transition, migration responds to average prices and wages, amenity and demographic factors, and housing market reform also significantly matters.

2.2. Model Overview

For general idea about how interregional labor mobility is traditionally modeled some basic researches in this field are examined in the following section. I present key gravity model, its versions/specifications and the set of determinant variables used by different researchers. Such overview gives the understanding of the main steps and procedures needed for adequate model building and is taking as a base for my own specification of regional labor mobility model that is presented in the underlying sections.

Hence, one of the basic general specifications of the interregional labor mobility model[2] is

$$M_{it} = \mathrm{f}(W_{it},\ U_{it},\ H_{it},\ Z_{it})$$

where M_{it} - net migration;

W_{it}, U_{it}, H_{it} - real wages, unemployment, house prices respectively;

Z_{it} - a vector of other variables that may influence net regional migration.

Internal migration can be also described by means of square matrix, whose rows and columns are locations within a country. In this case M_{ij} is an element of intersection that represents the number of migrants from area i to j. The main advantage of such approach is the fact that some regularities and common tendencies may be observed. For example, the matrix has larger values for migration between large places and/or in correspondence of locations that are geographically closer. Thus, the creation of internal migration matrix is a useful tool for describing the situation in a general way with displaying the main trends. But it is obviously not enough for detailed examination. Hence, more complex well-known models of mobility will be examined below as a base for my own empirical work.

The fundamental empirical analysis of the internal migration determinants is based on the "gravity model" which is very common in the migration literature. It follows Newton's law of universal gravity and in the econometric form can be written as

$$M_{ij} = G \cdot \frac{P_i^{\alpha} \cdot P_j^{\beta}}{D_{ij}^{\gamma}}$$

M_{ij} - number of people attracted by region i from region j;

P_i - size of region i, P_j - size of region j;

[2] Fry, Fry and Peter (XXXX)

D_{ij} - distance between these regions;

G - is a universal constant;

α, β, γ - the parameters are to be estimated

or in a logarithmic form for reducing the impact of heteroscedasticity:

$$ln M_{ij} = \phi + \alpha \ ln P_i + \beta \ ln P_j - \gamma D_{ij}$$

This specification is widely taken as an initial point in the process of interregional migration modeling by majority of researchers. Then they often disprove one of basic assumption and add new assumptions to own model specification. Hence, while Newton's law assumes $\alpha=1, \ \beta=1, \gamma=1$, Andrienko and Guriev (2003) prove that this gravity model is certainly unrealistic for simulation of integrated economical processes. They claim that there is no reason to believe the estimated parameters would be the same in case of migration. Not only the fact that different region size has different effect on the number of migrated people (thus, α and β are not the same or equal 1), but also the distance influence on migration decision (γ) should be taken into account. The authors also stress that Greenwood also showed that it is mainly costs of moving that affect the choice of migration distance and include the following parts: transportation costs, cost of information searching and acquisitioning, psychological costs of leaving family and friends. Despite the increasing last part of costs over the distance, transportation and information costs are not expected to be very large with modern technologies existing. Hence, these expenditures increase slower than linearly and it is obviously that assumption about γ=1 is violated.

Thus, Andrienko and Guriev expanded gravity model due to change in the basic assumption taking into account paramount fact that the areas differ in terms of economic development and public provision. Because a potential migrant compares his current residence and new place utilities some additional characteristics of origin and destination areas are paid attention in the modified

model, where G is no more a constant but a term that depends on these characteristics. Moreover, obtained model allows also controlling both for long-term trends in migration, inertia and legacy (including fixed effect η_{ij}) and macroeconomic and global shocks (presenting dummies δ_t):

$$ln M_{ij} = b + \gamma\, ln D_{ij} + \kappa' Y_i + \lambda' Y_j + \mu' X_i + \nu' X_j + \zeta_{ij}$$

Y_i, Y_j - characteristics of the regions that may vary over time (real income, unemployment rate, poverty level, crime level, development of housing market, provision of public good etc.)

X_i, X_j - matrixes of regional variables that change very slowly or do not change at all (population, education, climate, urbanization level etc.)

More advanced and structured extension of gravity model can be found in Brown's article. To treat the problem of distinguishing effects of variables on in- and outcome migration (that are vital not only for economic relationships but also informing policy related to labor mobility) this model was modified for gross migration flows (i.e. both in- and outmigration equations are estimated).

The rate of inmigration into oblast depends on the following variables:

$$\frac{M_j}{\sum_{i \neq j} E_i} = \alpha \frac{P_j}{\frac{\sum_i P_i}{N}} + \beta_1 \sum_{i \neq j} \frac{E_i}{d_{ij}} + \beta_2 \sum_{i \neq j} \frac{E_i}{d_{ij}^2} + \sum_c \gamma_c \frac{X_{cj}}{\frac{\sum_i X_{ci}}{N}} + \varepsilon$$

M_j - number of inmigrants;

$\sum_{i \neq j} E_i$ - number of outmigrants from other oblast;

$P_{i,}P_j$ - population of the regions;

d_{ij} - distance from i to j;

X_c - oblast characteristics;

N - total number of oblasts;

$\alpha,\ \beta_{1,}\ \beta_{2,}\ \gamma_c$ - parameters to be estimated.

By the analogy the equation for outmigration flows is constructed:

$$\frac{E_i}{P_i} = \alpha \frac{P_i}{\frac{\sum_j P_j}{N}} + \beta_1 \sum_{j \neq i} \frac{1}{d_{ji}} + \beta_2 \sum_{j \neq i} \frac{1}{d_{ji}^2} + \sum_c \delta_c \frac{X_{ci}}{\frac{\sum_j X_{cj}}{N}} + \varepsilon$$

Chapter 3

METHODOLOGY

3.1. Model Specification

Because of some restrictions mentioned in Data Description paragraph it is impossible to reproduce gravity model in the case of Ukraine. Particularly, data presents just aggregate number of inmigrants in the region but doesn't specify from which region did people come. The situation with outmigration flows is the same. Hence, we cannot observe bilateral relations between each pair of the regions.

My solution of this problem is the following. As we can see from the methodology review, there are some groups of variables (e.g. economical and social factors), which affect migration flows for each pair of region significantly. Thus, I expect that the same variable set also has an impact on aggregated level of gross incoming, outcoming and net migration flows for each Ukrainian region. With the help of linear regression for different years and regions this hypothesis is checked and as the result general conclusions about the main causes, character and structure of regional labor mobility in Ukraine are presented in the next sections.

Hence, the general specification of my model looks like

$$Y_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \xi_{it} \quad (1)$$

Y_{it} - migration variable (gross in-, out or net flows)

X_{it} - matrix of variables that change over time

Z_{it} - matrix of variables that do not change or change insignificantly

α, β, γ - parameters to be estimated

ξ_{it} - error term

$i = 1,...,26$ - number of the region

t - year of estimation

It should be stressed that for the countries with large territory a ratio of migration to population is modeled traditionally instead of simple migration variable. Usual reason of such approach is treating of "size effect", defined as the increase in migration that results purely from an increase in the population. Greenwold (1993) shows that one way of accounting this effect is to impose some parameter restrictions (that are complex and data dependent). The easier but equally good method of treating "size effect" problem is just to use a ratio of migration to population. This would ensure that the parameter restrictions are less complex and able to be imposed at all points in the sample.

As it can be seen on the example of Russia, this method works and is actively used by researchers. Just in contrast, I do not use such approach. The main reason is the fact that territory of Ukraine is not as large as Russia territory. Moreover, because Ukrainian regions are quite homogeneous in size, amount of population, economic and political conditions the gap in their development is expected to be not considerable. Thus, I assume no "size-effect" for Ukraine and do not use ratio of migrants to population as a dependent variable.

Another reason widely used by Russian researchers in explanation low mobility level is liquidity constraint. People with higher income are less likely to be willing to leave (because other regions are less attractive to them) despite the fact that their ability to leave is higher. The more income do people have in the region, the weaker is liquidity constraint that disappears once the income level becomes sufficiently high. To test the hypothesis that it is an important barrier to migration, they include both income and squared income in regression. I also checked this hypothesis for the case of Ukraine. For both models obtained

positive coefficient at income variable is evidence that liquidity constraints do not exist in our country. The most common explanation of this fact is relative homogeneity in incomes and wages for Ukraine in comparison to Russia

Due to data limitation (migration flows are presented not annually) on the base of above specified regression [(1)] two models are done. The first one is for 1990-1995 time period and describes the trends of net regional migration flows:

$$net_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \xi_{it} \quad (2)$$

Second model is constructed for years 1999, 2000 and 2002 (because of Ukrainian population census in 2001 migration data was not observed) and is more detailed than model, which estimates net regional labor mobility. Brown (1997) claims that the latter model cannot clearly distinguish which of two (in- or outmigration) flows is offered by certain local labor market condition. Furthermore, the situation when some variable influences on both in- and outmigration is possible. In this case net flows estimation will conclude this factor has no effect on interregional mobility, which is obviously false.

Hence, the best solution of these problems (which is used in the second model) is gross instead of net labor mobility variables. The model includes two equations that examine how the same set of independent variables influences on gross in- and outmigration flows:

$$\begin{cases} inc_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \xi_{it} & (3) \\ outc_{it} = \alpha + \beta X_{it} + \gamma Z_{it} + \xi_{it} & (4) \end{cases}$$

Despite the fact that such detailed specification is more adequate to real situation and thus is obviously more preferable, an equation for net flows is done in additional. This fact gives an opportunity to compare correctly the causes of regional mobility, the size of influence for each factor, the main tendencies in Ukrainian migration process for two different time periods.

3.2. Determinants of Migration Bbehavior

On the basis of strong theoretical background in regional migration field and following the common approach in identifying prior causes of labor mobility in the country I supposed three groups do matter most of all: economic, social factors and the variable that describes situation with the housing market of Ukraine. But I also keep in mind classification used in Andrienko and Guriev paper (2003), where the groups of variables that change over time and do not change (or change insignificantly) exist.

It is economic factors and indexes (wage and unemployment rate) that play dominant role in decision migrate or not. First of all, we can expect that wages are primary interest of a potential migrant who compares them among the regions. Higher expected wage gives person two kinds of benefits: he/she not only increases own utility because of rise in incomes, but also has additional opportunity to cover migration costs. Thus, it is expected a positive correlation between wage and number of inmigrants in the region and a negative correlation for outmigration flows (the higher wage is, the less number of people are willing to left this job and this region). Since net mobility flows are just a difference between in- and outcoming gross migration, the relations between wage and net migration are forecasted to have a positive sign.

Following the same intuition, conclusion about the influence of unemployment rate on migration can be made. As the rate of unemployment in the region increases, the outmigration flows also grow, while the number of potential inmigrants automatically decreases. Hence, there is a negative correlation between unemployment rate and net labor mobility.

The second group of variables concerns goods provision, social factors and infrastructure of the region. I consider number of doctors, beds in hospitals per 10.000 of population and life expectancy as the indicators of the situation with healthcare system, while paid services provided in the region present infrastructure development. Such variables as phones per 100 households or cars

per 10.000 of population are implicit pointers of average income level in oblast (with higher income the number of privately owned phones and cars grows). Number of institutes and colleges describes how well high-education is developed. Obviously, when all above-mentioned factors have a tendency to increase, the general well being of population also improves. Thus, the impact of each of them on inmigration flows is strongly positive. Just the opposite is the situation for outmigration (correlation has negative sign). As a result, number of net migrants increases if the change of all these variables is positive.

Such factors as rate of urbanization and crimes are related. Indeed, with high urbanization rate we can expect huge number of crimes because the majority of them are committed in the cities. Distance of migration is also taken into account. This variable (called remoteness index) is calculated as an average distance from the center of oblast to the other regions' centers. I suppose that the larger is this variable the less is the number of outcomers from home region and incomers to quest region.

It is especially interesting to examine situation with housing market in Ukraine. On the one hand, possession of housing by population may be considered as primary interest factor that influences on decision to migrate or not. But just on the contrary, we can observe that in big cities majority of migrants are renting their apartments. Hence, it is interesting to see which of these two forces is dominated and how does it influence on the obtained results.

Finally, if some reclassification of above mentioned factors is needed for correct comparison with other researches (e.g. Andrienko and Guriev, [2003]), it can be easily done. Groups of variables are not social and economic in this case; factors are divided into category that change over time and those who do not change (or change insignificantly). The former group includes wage, unemployment rate, paid services, hospital beds, doctors, cars, phones, crime rate and housing market situation, while the latter category embraces life expectancy, level of urbanization, number of institutes in the region and remoteness index.

3.3 Data Description

For the purpose of my research and understanding the nature of labor mobility I use panel data of migration flows among 24 regions of Ukraine, Crimea and Kyiv, presented by Derzhkomstat. Using panel data we follow the same subject over time that allows us to control for (time-invariant) unobservable variables that influences migration. Moreover, Kennedy (1998)[1] argues that panel data estimation allows not only to control for such problems as individual heterogeneity, alleviate aggregation bias, but also examine adjustment dynamics and improve efficiency by using data with more variability and less collinearity.

Traditionally, the majority of authors of the papers in this field use the gross region-to-region flows that for each pair of regions and years show how many people migrate from one area to the other. Such methodology allows distinguishing between migrations induced by current living standard differential and the long-term trends in migration (inertia or legacy) that are controlled for by using fixed effects.

Unfortunately, the situation with labor mobility statistics in Ukraine has two main negative specifics that defined the methodology of my work. The biggest one is the fact that for the earliest 90-s Derzhkomstat reports only net migration flows between Ukraine regions, starting to give full information (both gross in-, outcome and net migration flows) only since 1999. Besides, for each region only aggregate number of incomers is given, not specifying from which areas do people move. The same situation is with outmigration flows, where direction of outmigrants moving is not known. Hence, bilateral relations for each pair of Ukrainian regions cannot be observed.

Because of such specifics of migration data for our country, the traditional approaches to the mechanism of labor mobility modeling are taking

[1] Peter Kennedy, "A guide to Econometrics", - 4th edition, 1998 – p. 231

into account but transformed for Ukraine case. Due to availability of different forms of migration flows (gross or net) I examine what impact does the same set of economic and social variables have on labor mobility process for two time periods: for 1990-1995 when only net data flows is available, and for years 1999, 2000 and 2001 when both gross in- and outmigration series exist. After simulation of labor mobility for two different periods and obtaining results I compare the significance of each factor and conclude whether the situation changed dramatically or the common tendencies in migration inhere in both models.

Some possible drawbacks of used data should be mentioned, constantly kept in mind and paid particular attention during the process of modeling for heterogeneity or bias problems avoiding. Only in this case, when some additional assumptions about the migration data set are made, the obtained results from regression would be adequate and correct.

First, I assume that the goal of all migrating people is job search or, in other words, that population migration data actually is labor migration data. Obviously there are some retirees, children, students and other people migrating because of any reason other than the search for employment. But, unfortunately, there is no way in distinguishing between population and labor migration information. The data set even for population migrants is not full for all years, so it is naïve to believe that labor mobility data (which needs much higher level of detail elaboration) does exist separately.

Theoretically, a major consequence of using population instead of labor migration data is possible overestimation of labor mobility. But I do not think that it is a case in Ukraine. Since informal migration does also exist and is sometimes as high as formal one, number of people who migrates with no employment search reason and those who moves informally would most likely be balanced. Despite this fact, possible overestimation problem is kept in mind during the process of modeling.

Parikh (2002) claims that the use of these data may also underestimate the role of economic variables because most of the discrepancy between labor migration and population is not necessarily related to economic factors (like wages and unemployment). In contrast to his research, I use not only economic variables but also social factors that describe healthcare system, infrastructure and goods/services provision in the oblast to explain the main causes of regional labor mobility in Ukraine. Hence, the problem of underestimation in this meaning is not actual for my paper.

Secondly, I use regional instead of individual data. Despite the fact that the estimates obtained from individual information are obviously more accurate, it is very difficult to find any research with similar data even for developed countries with a great number of deep particularized official surveys. Hence, almost all researchers use regional instead of individual data and I follow them. Such approach implies implicit assumption that migrants are representative of their regions. In other words, they know all area specifics well, possess full information about own region and use it for own profits.

Finally, in the process of obtaining results and making conclusions about the causes of regional labor mobility in Ukraine special attention should be paid to the fact that informal migration for some regions may be as high as the formal. Striking example of such areas may be Kyiv and some other mega policies, where incomers often are working and living without any registration. As a result, the possibility of bias may exist. The only way to treat all these problems is a national representative survey of potential and actual migrants that (to the best of my knowledge) so far does not exist for Ukraine.

Chapter 4

EMPIRICAL RESULTS

4.1 Model for 1990-1995 time period

After correct specification of general model, the choice of appropriate functional form is also very important. In the first model for years 1990-1995 I try to explain how different factors from the chosen set of variables influence net labor migration flows.

Traditionally for convenience in showing the tendencies of the process a logarithm form of dependent and independent variables is taken. Then we have an ability to say how many percentages does dependent variable change due to 1% change in some regressor. But since net flows that are just a difference between in- and outcome labor mobility in the region may have negative sign, I use logs only for such variables as wage and unemployment rate but not for net flows (they are presented in natural form).

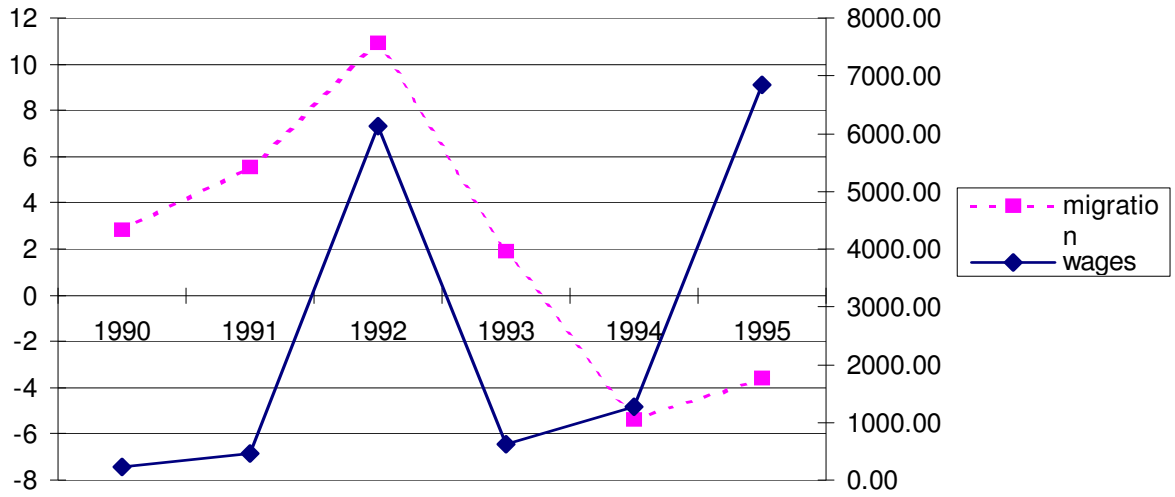
The process of choosing appropriate functional (OLS, RE or FE) form of regression is following. First of all, pooled and random effects regressions are compared with the help of Breusch and Pagan Lagrangian multiplier test (Appendix 2). On the basis of obtained statistics we can say that H_0 ($\alpha_1 = \alpha_2 = ... = \alpha_j = 0$) is accepted at 6% significance level (0.6447).

Hence, pooled OLS is more appropriate form for the model of early 90-s and is chosen as a final version where economic, social factors and situation at housing market explain about 37% of net labor mobility flows (R-sq. = 0.3693). The left variation in dependent variable can be explained as I surmise by costs of

moving (that varies for each family and therefore is difficulty calculated) and some unobserved external factors.

Before formal conclusions about the significance of economic variables that I am interested first of all are made, some intuitions about their role in explaining net migration can be presented. For the purpose of conclusion about the character of correlation between migration and wages, and migration and unemployment rate the graphs are constructed. In this way it can be easily shown the simultaneous tendencies in the change of all variables during different time periods. For example, from the Figure 1 we can easily see that the behavior of net migration and wages trends is almost the same: from 1990 till 1992 both series have a tendency to grow, in 1992 there is a rapid fall and then gradual increase in migration and wages can be observed again. Thus, we can expect that wages variable is one of the factors that may influence on the net migration flows; and if this correlation between them is significant it will have a positive sign.

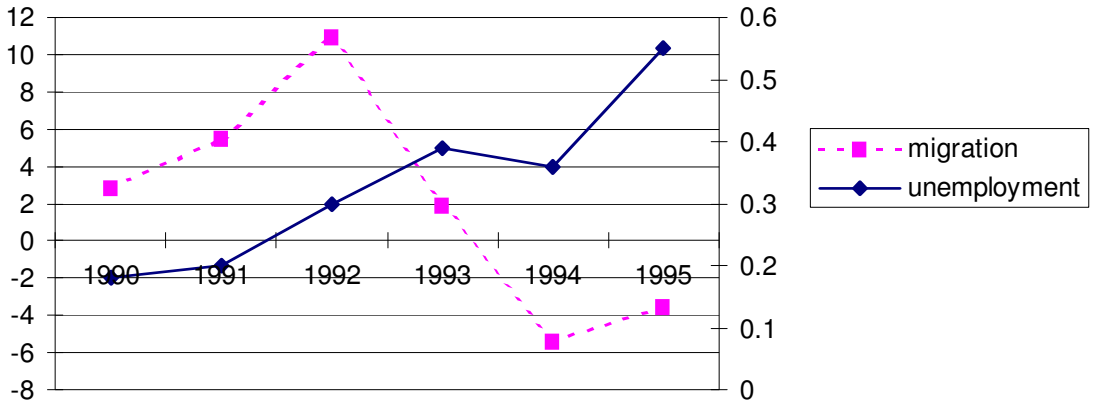
Figure 1. **Net migration and wages in Ukraine, 1990-1995**



The same approach is applied to unemployment rate variable. Comparison of the trends in net migration and unemployment series (presented

on Figure 2) shows that correlation between this factors is also possible, but the probability of this event is a little less than in previous case: while tendencies in

Figure 2. **Net migration and unemployment in Ukraine, 1990-1995**



increase and fall are enough similar, the ratio of changes decreases.

Obviously that simple intuition cannot be considered as a solid argument in explaining nature of regional migration. Only statistical results (Table 2, Appendix 2) obtained for pooled 1990-1995 regression can confirm or reject intuitive hypothesis. For this purpose they should be examined carefully. First of all, I am especially interested in economic region labor market disparities.

Table 2 (Appendix 2) shows that both wage and unemployment rate are significant (at 1% and 5% significance levels accordingly) and have predicted signs in correlation with net mobility flows. Thus, 1% of wage positive difference between the regions causes increase of incoming and, therefore, rise of net migration by about 2 thousand persons (1.979013) for this area. The situation with unemployment rate disparities is diametrically opposite: the higher unemployment rate is, the lower net migration for this region. If the rate rises by 1%, the migration decreases by about 3 thousand of people (3.00146). Hence, the general conclusion is the following: for 1990-1995 years net regional migration in

Ukraine can be partially explained by differences in economic regional labor markets (wages and unemployment rate).

What about the role of social factors (first of all number of doctors/ bends in hospitals and life expectancy that indicate the development of healthcare system in region) in explaining the nature of mobility? 1-person increase in number of doctors per 10.000 population raises net migration flow by about 356 persons (0.3558786), while additional hospital bed increases number of net migrants by 268 persons (0.267662). On the basis of significance level we can assume that it is number of doctors in the region instead of hospital beds that influence on decision to migrate or not (at 1% significance level doctors variable is significant while number of hospital beds is not). Positive difference in life expectancy by 1 year causes 175 person (0.1747269) raise in net migration flow. But level of significance is not confiding.

122 person decrease in net migration due to additional thousand of crime has a logical explanation: people are less interested in moving into high criminal region. Statistics also shows that level of urbanization is not significant for decision to migrate or not. What is really important to migrants is a distance of moving. From the fact that every additional thousand km decreases net migration by 26 thousand persons we can conclude that distance of migration is one of the leading causes of labor mobility.

The results obtained for education and paid service variables have double meaning. On the one hand, I expected that additional institute or college might attract those families that have children of proper age. On the other hand, it conversely decreases net migration by 924 persons. The logical explanation of this fact may be the following: as additional institute appears it automatically increases number of high-educated people in the oblast. Hence, the competition on the regional labor market also rises that scares potential migrants (specially those without high education). For paid services provided in the region, intuitively we could say that variety of such services would attract potential entrants and,

therefore, increase net migration. A negative sigh in obtained results shows that the relation between migration and service variables is absolutely different: an increase in paid services means that there is a decrease in unpaid services provided in the region. Hence, number of people willing in migrate into this region fall while number of outmigrants rises, and net migration also decreases.

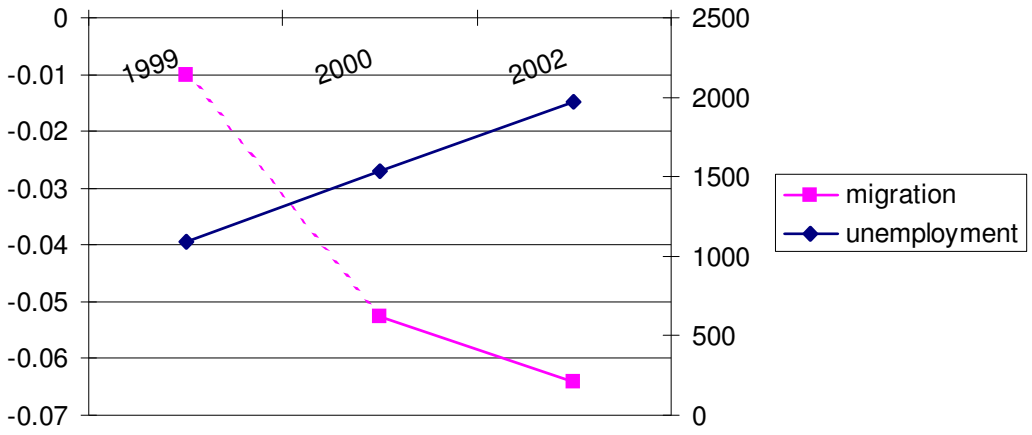
Finally, special attention should be paid to situation at housing market (possession of housing by population). As statistics shows, this variable is very important for migration decision (1% significance level). The only problem is unexpected sigh of correlation. It is logically to assume that the greater is the number of housing possession by 10.000 population more people are willing to in migrate and less persons are willing to out migrate from this region. Just the opposite, the sign is negative. The only possible explanation of this fact that I can find is the bias because apartment renting. When newly arrived begin to work they mainly rent the housing instead of buying it. Hence, housing market variable influence first of all on those people who are lived in the region for a long time period but not on newly arrived persons.

4.2. Model for 1999, 2000 and 2002 years

This model is more complex and structured than previous one. Inclusion not only equation for net migration flows in this model but also in- and outmigration regressions gives an opportunity to examine direction of the influence of each factor on in- and outmigration as well as the nature of net migration in general. Therefore, the structure of this section is following: at first the steps of modeling are identical with the previous model, then two additional regressions are build for showing the nature of influence for each variable. In conclusion section results of both models for different time periods are compared and general conclusions about the change in tendencies and causes of regional labor mobility in Ukraine are made.

First, intuition about the relationships between net migration flows and basic economic variables is made with the help of graphical construction. As it can be easily see from the Figure 3 the trends in migration and unemployment rate series are not identical: while unemployment is increasing constantly, the number of net migrants keeps falling. Hence, without any statistical results it is impossible to predict whether regional unemployment rate disparities can explain variation in net migration flows or not.

Figure 3. **Net migration and unemployment in Ukraine, 1999, 2000 & 2002**



The same situation is observed for net migration and wages. Figure 4 clearly shows that there is no synchronism in both data series. Again, any conclusion about the character and sign of the correlation between these variables as well as about the significance of each factor cannot be made without statistical estimation.

In this model I have an opportunity to add one more economic factor (income of population in the region) for increasing the probability to explain net migration by regional economic variables differences (for early 90-s such data is not available). The intuition of such behavior is following: since official wage reported in documentation often differs from that which is given "in pockets" for

last years, it may be income that reflects truth situation. Unfortunately, even with inclusion additional economic factor situation does not change: the graphs for

Figure 4. **Net migration and wages in Ukraine, 1999, 2000 & 2002**

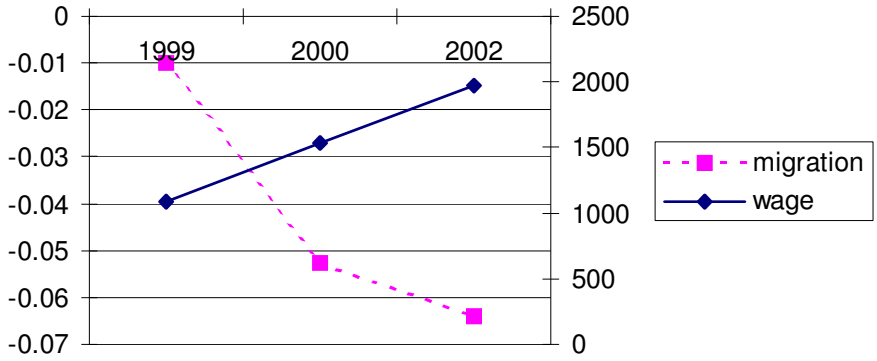
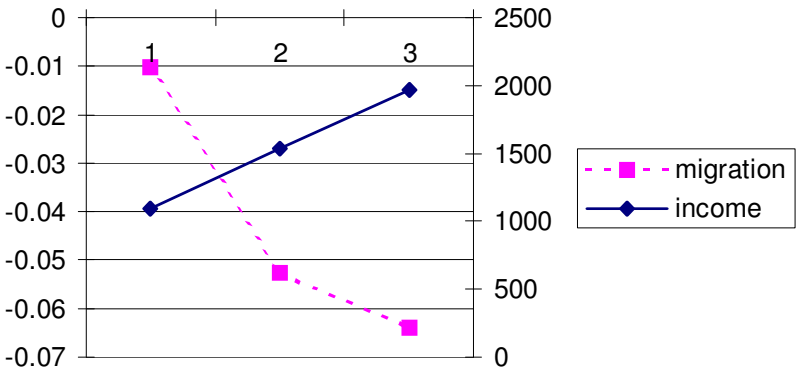


Figure 5. **Net migration and income in Ukraine, 1999, 2000 & 2002**



migration and wages, and migration and incomes are identical in the trends. The conclusion from this fact is not that wages are reported honestly and that they are the main source of population income. Most likely that incomes also do not present a complete picture of situation with receipts of the households.

Statistical results obtained for net migration equation of this model are obviously more substantial evidence of variable significance than economic intuition. As we can see from Table 2 (Appendix 3) above specified set of economic and social variables explains about 83% of variation in net labor mobility flows for 1999, 2000 and 2002 years.

The most important set of variables deals with economic performance within a region. In comparison to the first model the situation changed: not all these factors perform well. Despite the fact that 1% rise in unemployment rate decreases net migration flows by about 530 persons (0.5295706) the level of significance for this variable is too low. Contrary, wages and money income are at 1% level significance, but obtained sign for the former variable is unexpected and surprising. The only explanation of this distortion I can find is a bias in statistics due to high level of informal (so-called "pocket wage") wage when the understated instead of true figures are presented for the avoidance of high taxes. Fortunately, income variable monitor the real situation well. If income has a positive change by 1%, number of net migrants increases by about 4 (4.467284) thousand of people. Hence, general conclusion for group of economic factors is following: since only one variable has no problems with significance level and the character of correlation (while two other have one of these problems) regional labor mobility in 1999, 2000 and 2002 year may not be fully explained by this set.

To answer the question whether it may be a group of social factors (life expectancy, number of doctors and hospital beds) that are primary-interest for potential movers we should examine their statistics. According to Tiebout hypothesis, people "vote with their feet" for better provision of local public goods. Greater number of doctors, hospital beds, phones etc. decreases population outflow and at the same time stimulate migration inflow. Hence, we can expect that net migration will also rise. Obtained statistics confirms above-mentioned hypothesis: as a number of doctors per 10.000 increases by one person, number of net migrants rises by about 147 (0.1469986) persons; as a

number of hospital beds per 10.000 population increases by one thing, net migration increase by only 14 (0.0139979) persons. The latter result is not surprising given that significance level for this variable is very low. As it can be seen from the table, life expectancy is absolutely insignificant. Hence, there is no reason to examine how it affects net mobility flows.

In comparison to previous years crime remains the factor that is important for potential migrants in their decision. Coefficients show, that if number of crimes in region increases by one thousand, ceterus paribus, then net migration changes negatively by about 55 persons (0.0054852). Variable is significant at 5% level.

It can be see that the role of such factors as distance of moving and number of institutes and colleges has changed dramatically. While the distance was one of the leading variables in early 90-s, during the recent years one additional thousand of km causes only 4 person decrease in net migration. The results are rather surprising and may be explained only by significantly increased role of other factors (first of all, costs of moving I think). Contrary to previous model, number of institutes of higher education is positively correlated to migration flows. Such result is consistent with the findings for many countries: the greater number of colleges attracts more people into that region. Furthermore, traditionally is thought that people with more education are more likely to outmigrate. Hence, an increase in net migrants by 128 persons shows that the effect of education on incoming flows dominates the effect of the same variable on outcoming flows.

Finally, the situation with housing possession remains invariable for this time period too. This variable is not significant at all due to estimation bias. The majority of incomers are renting instead of buying houses. Unfortunately, such

statistics is not observed for Ukraine case. Hence, there is no solution available for nowadays for the problem with house market situation.

As it was mentioned above the use only net migration flows model has some drawbacks. To clarify the situation with determinant factors of labor mobility for 1999, 2000 and 2002 year I also regress both in- and outcoming migration.

The results of random effect GLS for inmigration estimations are reported in Table 3, Appendix 3. Hausman test is accepted at the 1% level in all specifications so that the fixed effect model is not valid. Briefly examination of variables that have significant influence on number of inmigrants shows that were the following: wage, education, urbanization, distance and services variable. Even possession of housing affects inmigration flows that is rather surprising. For further detailes and tendencies in inmigration flows for this time period see statistics provided in the Appendix.

Table 4 (Appendix 3) reports the results for outmigration. The procedure of identifying proper form of the equation is equivalent to previous methodology. Firstly, Breusch and Pagan Lagrangian multiplier test shows that comparing random effect and pooled regression we should choose the former one. Since p-value is 0, the H_0 (that pooled OLS is better) is rejected: The next step is the comparison of random and fixed effects. For this purpose one should use Hausman test with H_0 that there is no correlation between the error and the regressor and the RE model is applicable. We can accept this hypothesis at 10% significance level.

The general tendencies in outmigration flows are the following. The most important result is that in this case wage variable is significant and has expexted sign. Hence, the difference in regional labor market conditions can be partially explained by this variable. Unfortunately, it is income and unemployment rate

that have some problem with significance level or the character of the correlation. Hence, empirical variables matter a little in explanation regional labor mobility in Ukraine.

For 1999, 2000 and 2002 indicators of healthcare performance in the oblast is absolutely insignificant. Because of this fact there is no need to examine their impact in migration. Education variable confirms the theoretical hypothesis of many researches that higher educated people are more likely to outmigrate. As the number of institutes and colleges increases, it automatically raises the number of high-educated persons who are willing to leave by about 127 people.

Finally, urbanization rate of the region and its crime level has close relationship. Higher urbanization rate implicitly assumes higher rate of committed crimes. Thus, every additional thousand of crimes increases the number of outmigrants by 84 persons while additional percentage in urbanization rate raises outmigration flow by 57 persons.

Further statistics of each variable effect on outmigration flow can be found in Appendix.

Chapter 5

CONCLUSIONS

The main aim of my research was to analyze the nature of regional labor mobility in Ukraine and find out how important it may be in equilibrating regional labor market disparities. With the purpose to monitor the general tendencies of migration among the Ukrainian regions during transition time, not only a general model was specified and some regressions were run, but also two time periods were distinguished. The first one relates to the very beginning of the transformation process, when collapse has only happened and people have no time to adapt to new economic situation. Hence, their behavior was almost the same to the actions in communism. The second time period describes resent years (1999, 2000 and 2002) when comparative stabilization after dramatic economic shocks became. Obviously, that such changes in the entourage have a significant effect on people behavior.

So, in the research process I tried to find out how has the impact of different economic and social factors changed; what variables were supreme then and play a leading role nowadays. On the basis of obtained statistical results, also using economic intuition and be familiar with some specifics of our country, I can make some comparisons (on the base of Table 1, Appendix 4) between the very beginning and the middle of transition and general conclusions about the situation.

The general pattern shows that net migration in 1990-1995 can be partially explained by the regional difference in such main indicators of economic performance of the oblast as wage and unemployment rate. Comparing the share of economic and social factors in explanation dependent variable variance, we can easily see that the former group dominates.

Such situation may be explained in different ways. Fist of all, at the early 90-s the informal migration did not exist at all or was too low to bias the results. It is very important point that should be stressed, because unaccounted labor migration during the transition became the biggest barrier to researchers in correct estimation of regional labor mobility. Secondly, since transition has only begun, the structure of the economy and the main economic process were almost similar to Former Soviet Union. As we know from the theory, regional migration is a traditional adjusted mechanism in equilibrating RLM disparities that is widely used for efficient labor source reallocations in the developed countries. Despite the fact that one can claim FSU economy cannot be regarded as independent and effectively operating economic system because of huge distortions, I insist on the statement that it can be enrolled in developed countries of that time period.

The results of the second model show that situation became absolutely different. The main changes and shocks passed, people adapt to these events and started to act in a way, which maximizes their own utility. Because not only economic factors affect its level, but also a whole series of such social factors as healthcare system performance, life expectancy, education situation, public goods and services provision etc. we cannot explain regional labor mobility in Ukraine during the last years only by economic disparities. But as we can see from the obtained results, some factors that describe a situation with social sector, infrastructure and housing market condition are also insignificant. Hence, a probability that some variables were not taken into account exists. Since R-sq. (which is one of the indicators that model specified correctly) is rather high, these missing variables are not crucial but sometimes may play important role in identifying further expectation of a person. I think that one of such factors may be the cost of migration process.

Special attention should be paid to evolution of region unemployment pattern in Ukraine which role has raised considerable interest in earlier migration studies. According to my results, the relationship between regional

unemployment and mobility is vague. While an official registered unemployment level from 1992/93 is much more lower than hidden unemployment, the results shows that this factor is significant in explanation regional mobility. When for the second time period correctly estimated unemployment rate was taken (ILO data), the significance of this variable fall dramatically.

The found result that the efficiency of migration in facilitating regional adjustment to asymmetric shocks is rather low has important policy implications. First, because regional disparities will remain persistent (according to my predictions), other mechanism of efficient source reallocation (particularly inter-regional capital mobility) should be paid more attention. Finally, due to recent EU enlargement, considerable part of labor sources can become emigrants, automatically decreasing labor mobility between the regions of Ukraine that is very low even now.

APPENDIX 1

Table 1. **Model specification**

	Variable	Definition	Units
1	Net	Net migration flow (difference between people migrated in and from the region)	Thousand
2	Inc	Inmigration flows in the region	Thousand
3	Outc	Outmigration flows from the region	Thousand
4	Wg	Average monthly wage of employees (log)	Hrn
5	Income	Money income of population	Hrn
6	Un	Rate of registered unemployment (logs)	Percentage
7	Serv	Rendering of services on paid basis	Mln. Hrn
8	Beds	Number of hospital beds per 10.000 population	Things per 10000 popul.
9	Doctors	Number of doctors per 10.000 population	Persons per 10000 popul.
10	Crimes	Number of crimes per 10.000 population	Thousands per 10000 pop
11	Housing	Accommodation provision per 10.000 population	Sq meters per 1 person
12	Exp	Life expectancy from birth	Years
13	Urb	Share of urban population	Percentage
14	Ed	Number of institutes and universities	Things
15	Dist	Average distance between the centres of regions	Thousand km
16	Dp	Average distance between the centres of regions / population	Thousand km

APPENDIX 2

Table 1. **Descriptive statistics for 1990-1995 data period**

Variable	Obs	Mean	Std.Dev.	Min	Max
Net	156	2.017949	9.299528	-26.6	39.5
Wg	156	6.8989.25	1.512552	4.718499	9.464983
Un	156	-1.392381	0.7463521	-3.218876	0.4054651
Crime	156	18.49872	15.48943	3	814
Housing	156	18.49615	1454377	14.8	22.9
Doctors	156	42.17821	9.675338	31.2	81.3
Beds	156	131.2064	9.810716	104.1	149.1
Ed	156	7.096154	7.452022	1	45
Urb	156	61.3859	15.73833	39	100
Dp	156	0.3504451	0.141544	0.1339677	0.6974326
Exp	156	68.85962	1.494064	65.4	72.1
Serv	156	1761617	2.566363	0.0481011	15.41835

Breusch and Pagan Lagrangian multiplier test for random effects:

Test: Var(u) = 0

chi2(1) = 0.21

Prob > chi2 = 0.6447

Table 2. **Net migration flows, 1990-1995. Panel data estimation output**

Num of obs = 156 R-squared = 0.3693

F (11, 144) = 7.67 Adj. R-squared = 0.3212

Prob > F = 0.0000 Root MSE = 7.662

Net	Coef.	Std.Err	t	P>|t|	[95%	Conf.Interval]
Wg	1.979013	0.6028264	3.28	0.001	0.7874816	3.170545
Un	-3.00146	1.032306	-2.91	0.004	-5.041891	-0.961029
Crime	-0.122476	0.0822183	-1.49	0.139	-0.2849866	0.0400345
Housing	-2.297229	0.6065435	-3.79	0.000	-3.496108	-1.098351
Doctors	0.3558786	0.1060473	3.36	0.001	0.1462681	0.565489
Beds	0.267662	0.0783777	0.34	0.733	-0.1281532	0.1816857
Ed	-0.9243582	0.1496508	-6.18	0.000	-1.220154	-0.6285621
Urb	0.0697309	0.0833719	0.84	0.404	-0.09506	0.2345218
Dp	-26.08502	8.296902	-3.14	0.002	-42.48447	-9.685569
Exp	0.1747269	0.5889993	0.30	0.767	-0.9894744	1.338928
Serv	-0.4024518	0.3937892	-1.02	0.308	-1.180806	0.3759021
Cons	10.5167	47.65728	0.22	0.826	-83.6815	104.7149

APPENDIX 3

Table 1. **Descriptive statistics for 1999, 2000 & 2002**

Variable	Obs	Mean	Std.Dev.	Min	Max
Net	78	-0.042218	3.880737	-3.74	17.992
Inc	78	10185.18	7072.336	2835	40537
Outc	78	10227.4	4162.386	3796	22545
Wg	78	5.389695	0.3900278	4.718499	6.466145
Income	78	7.204005	0.4594601	6.344232	9.011865
Un	78	2.444351	0.2172081	1.722767	2.95491
Crime	78	19.43718	14.27975	4.6	65.6
Housing	78	20.87949	1.76895	18	26.3
Doctors	78	44.39487	9.717208	32.6	85.2
Beds	78	94.70256	9.368432	80.1	117.5
Ed	78	12.12821	13.59083	3	67
Urb	78	61.35385	15.72657	36.7	100
Dist	78	0.5114504	0.7057645	0.1474122	3.943368
Exp	78	67.93333	1.374221	65.6	70.6
Serv	78	0.3085446	0.6923605	0.0476122	4.481868

Breusch and Pagan Lagrangian multiplier test for random effects:

Test: Var(u) = 0 chi2(1) = 21.46

Prob > chi2 = 0.0000

Table 2. **Net migration flows; 1999, 2000 &2002. Panel data estimation output**

Num of obs = 78 R-squared = 0.8571

F (12, 65) = 32.50 Adj. R-squared = 0.8308

Prob > F = 0.0000 Root MSE = 1.5965

Net	Coef.	Std.Err	T	P>|t|	[95%	Conf.Interval]
Wg	-3.536397	1.284172	-2.75	0.008	-6.101066	-.9717291
Income	4.467284	1.608431	2.78	0.007	1.255025	7.679543
Un	-0.5295706	1.200639	-0.44	0.661	-2.927412	1.868271
Ed	0.1217819	0.0382391	3.18	0.002	0.0454132	0.1981507
Crime	-0.054852	0.024496	-2.24	0.029	-0.1037739	-0.0059302
Doctors	0.1469986	0.0636686	2.31	0.024	0.0198436	0.2741535
Dist	-0.0043208	0.0023723	-1.82	0.073	-0.0090586	0.0004171
Housing	-0.044378	0.1632347	-0.27	0.787	-0.3703801	0.2816241
Beds	0.0139979	0.0265679	0.53	0.600	-0.0390619	0.0670576
Urb	-0.0159244	0.0340788	-0.47	0.642	-0.0839844	0.0521357
Exp	-0.0128282	0.292624	-0.04	0.965	-0.5972387	0.5715823
Serv	-0.1781646	0.3385815	-0.53	0.601	-0.8543586	0.4980294
Cons	-14.73742	20.13922	-0.73	0.467	-54.95821	25.48337

Table 3. **Inmigration labor flows; 1999, 2000 &2002**

R-sq: within = 0.2264 Num of obs = 78

between = 0.9239 Wald chi2(12) = 359.21

overall = 0.9203 Prob > chi2 = 0.0000

Inc	Coef.	Std.Err	T	P>|t|	[95%	Conf.Interval]
Wg	-2.137028	0.7934981	-2.69	0.007	-3.692256	-0.5818007
Income	0.9942378	0.946417	1.05	0.293	-0.8607055	2.849181
Un	-0.8000543	0.8120955	-0.99	0.325	-2.391732	0.7916237
Housing	0.8381048	0.2486201	3.37	0.001	0.3508183	1.325391
Ed	0.352775	0.0593199	5.95	0.000	0.2365101	0.4690399
Urb	0.0740418	0.0305685	2.42	0.015	0.0141287	0.1339549
Dist	-0.0095081	0.0039002	-2.44	0.015	-0.0171524	-0.0018639
Serv	0.5510068	0.3702305	1.49	0.137	-0.1746316	1.276645
Crime	0.0368453	0.0311737	1.18	0.237	-0.024254	0.0979446
Doctors	0.0950286	0.0754234	1.26	0.208	-0.0527986	0.2428558
Beds	-0.0198942	0.0307079	-0.65	0.517	-0.0800805	0.0402921
Exp	0.0742797	0.281876	0.26	0.792	-0.4781871	0.6267466
Cons	-12.44683	20.77704	-0.60	0.549	-53.16907	28.27542

Breusch and Pagan Lagrangian multiplier test for random effects:

Test: Var(u) = 0 chi2(1) = 43.20

Prob > chi2 = 0.0000

Hausman test

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 3.21

Prob>chi2 = 0.9877

Table 4. **Outmigration labor flows; 1999, 2000 &2002**

R-sq: within = 0.3405 Num of obs = 78

between = 0.8508 Wald chi2(12) = 157.10

overall = 0.8457 Prob > chi2 = 0.0000

Outc	Coef.	Std.Err	T	P>|t|	[95%	Conf.Interval]
Wg	-1.722067	0.5779301	-2.98	0.003	-2.85479	-0.5893452
Income	1.647587	0.6850986	2.40	0.016	0.3048187	2.990356
Un	-0.754707	0.5980623	-1.26	0.207	-1.926888	0.4174736
Crime	0.0846595	0.0245332	3.45	0.001	0.0365754	0.1327437
Housing	0.6448922	0.2037428	3.17	0.002	0.2455637	1.044221
Ed	0.1266728	0.0484591	2.61	0.009	0.0316946	0.2216509
Urb	0.0556113	0.0233247	2.38	0.017	0.0098957	0.1013269
Doctors	-0.001488	0.0589237	-0.03	0.980	-0.1169764	0.1140004
Beds	-0.0057372	0.0233387	-0.25	0.806	-0.0514802	0.0400058
Dist	-0.0045839	0.0033644	-1.36	0.173	-0.0111779	0.0020101
Exp	0.0925103	0.2132634	0.43	0.664	-0.3254782	0.5104988
Serv	0.4573209	0.2796696	1.64	0.102	-0.0908215	1.005463
Cons	-13.66954	15.95204	-0.86	0.391	-44.93498	17.59589

Breusch and Pagan Lagrangian multiplier test for random effects:

Test: Var(u) = 0 chi2(1) = 47.78

Prob > chi2 = 0.0000

Hausman test

chi2(11) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 16.07

Prob>chi2 = 0.1386

APPENDIX 4

Table 1. **Comparative statistics of both models**

Net	Model 1 (1990-1995)	Model 2 (1999, 2000&2002)
Wg	1.979013 (0.6028264)***	-3.536397 (1.284172)***
Income	____	4.467284 (1.608431)***
Un	-3.00146 (1.032306)***	-0.5295706 (1.200639)
Crime	-0.122476 (0.0822183)*	-0.054852 (0.024496)**
Housing	-2.297229 (0.6065435)***	-0.044378 (0.1632347)
Doctors	0.3558786 (0.1060473)***	0.1469986 (0.0636686)**
Beds	0.267662 (0.0783777)	0.0139979 (0.0265679)
Ed	-0.9243582 (0.1496508)***	0.1217819 (0.0382391)***
Urb	0.0697309 (0.0833719)	-0.0159244 (0.0340788)
Dist	-26.08502 (8.296902)***	-0.0043208 (0.0023723)*
Exp	0.1747269 (0.5889993)	-0.0128282 (0.292624)
Serv	-0.4024518 (0.3937892)	-0.1781646 (0.3385815)
Cons	10.5167 (47.65728)	-14.73742 (20.13922)

* 10% significance level
** 5% significance level
*** 1% significance level

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