

## РАЗДЕЛ II. ЭКОНОМИКО-МАТЕМАТИЧЕСКОЕ МОДЕЛИРОВАНИЕ

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### ***DETERMINANTS OF REGIONAL MIGRATION FLOWS FROM FORMER SOVIET REPUBLICS TO RUSSIA***

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The dissolution of the Soviet Union two decades ago created a new migration situation in the region. Although former Soviet republics develop independently, the region remains a common area for the vast majority of population. The post-Soviet movement of people is facilitated by shared transportation and communication systems, a regionally recognized language (Russian), education systems, complementary labor markets, and similar mentalities and behavior patterns. Russia is an important place of destination for regional migration. This may be attributed to notable income differentiation between former Soviet republics and Russia. Relevant changes of demographic profile in both directions also predict and reflect the patterns and flows of regional movement of people. This paper is aimed at analyzing and identifying factors affecting regional migration flows to Russia. The gravity model, being a key empirical tool, has been utilized in the paper. The research approach to the topic of interest remains interdisciplinary as it incorporates both economic and non-economic factors of migration patterns. The key finding of the paper is that the level of income in source countries and population in places of origin and destination are influential for migration. Socio-cultural factors which reflect a common historical background remain significant in all estimations.

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*Keywords: regional migration flows; post-soviet countries; gravity equation.*

#### **Introduction**

As a result of rapidly rising degree of interdependence and globalization processes there is a continuous increase in volume and size of international migration worldwide. The estimated number of international migrants increased from 191 million people in 2005 to 214 million people in 2010 [21].

While United States represents the top immigrant receiving nation worldwide, Russia is an important place of destination for regional migration. This may be attributed to notable income differentiation between post-Soviet countries and Russia. Changes of demographic profile in both directions also predict the flow of regional movement of people. In addition to this, the propensity to migration is facilitated by common historical and social background, geographic proximity, a regionally recognized language and absence of visa regime between Russia and its former satellite countries. Migratory flows in post-Soviet region seem to have internal pattern and characteristics.

The primary objective of the paper is to analyze and investigate empirically factors of regional migration from former Soviet republics to Russia. Our analysis will cover the period from 1997 through 2010 as we were able to collect the necessary data for this particular time period.

We choose the gravity model as the key empirical tool that has been widely used in migration studies before [11; 12]. Our approach to the topic is interdisciplinary since we incorporate economic and non-economic factors in our analysis.

The present paper will make some contributions to the literature. Earlier studies have mainly focused on international migration to North America and other industrialized countries.

This may be related to fact that post-Soviet migration has recently started. Although there are wide discussions on this topic, an empirically designed study has not been conducted yet. Lastly, findings of the paper may serve as an important tool for policy recommendations and implications both for source countries and Russia.

#### **1. Review of Previous Literature**

International migration has been an integral part of human history. People move from one area to another due to certain factors. While economic motives are important, there exist other reasons explaining the trends and dynamics of the geographic mobility of people.

Massey et al. [14] describe international migration within a framework of several theories: neoclassical theory, new economic theory, dual labor market theory, world systems theory and theories of

social capital, and cumulative causation. The fundamental idea of all economic theories postulates that international migration occurs due to changes in supply and demand at labor market which determines the level of wage differentiation and expected income between two regions. So migration takes place between two countries or regions until equilibrium at the international labor market is reached [4].

It is important to emphasize that changes in supply and demand at labor market reflects population growth rates in places of origin and destination. Countries that experience population growth have higher level of labor supply and lower wages which motivates the process of out-migration to regions where there exist steady demand for foreign labor and higher expected salaries.

However, some scholars cast some doubt on driving factors of international migration that focus on economic and demographic variables. Past studies have shown that social capital plays an important role in further continuation and perpetuation of international mobility processes. Social capital leads to the development of migrant networks that stands for the source of employment opportunities at a foreign labor market. Such networks are developed as a result of friendship and kinship links among experienced and potential migrants. These networks reduce the potential costs and risks associated with migration [14; 7]. As a result of cumulative causation which originates from social capital accumulation the likelihood of additional trips toward the destination area tends to increase.

Another theory that contributed to exploring international migration refers to world systems theory. It interprets international movement of people on a global level and it assumes that capital and labor resources move in opposite direction between the core and periphery economies. It does not take into account the cost benefit analysis, resources and sources of international migration. From this theory it seems to be unclear how migratory flows are initiated and perpetuated over time and across countries and regions. Therefore, world systems theory remains primarily as a concept, it was not tested and measured empirically and as result it cannot serve as a direct reference for migration studies and forecasting [2].

Hence, the existing literature explored this topic within a framework of different disciplines and level of analysis. Most of proposed theories have been tested on the basis of Mexico-US migration flows as case test. These studies mainly utilized household-level data, while some scholars incorporated both micro and macro variables in their analysis [14]. This reflects the multi-level and multi-disciplinary nature of international migration that cannot be explicitly investigated by utilizing tools from a single field of study [14; 5].

In our study we utilize aggregate variables as they fit well our chosen empirical model. Our variables of interest help us to determine which factors initiate and predict post-Soviet migration patterns. However, the gravity model does not include a predictor that may serve as a proxy for social capital. Indicators of social capital mainly come from household data.

Several scholars used the gravity model to explore patterns of international migration. Vanderkamp[19] believes that it is potentially useful approach as its application will help us to understand that any economy is capable of reaching an equilibrium path once it utilizes the required number of labor whose supply can be regulated by migration.

Karemera et al. [11] applied this model in the case of international migration to North America. They concluded that population size in countries of origin and income level in the US and Canada are two key factors explaining international movement of people to this continent.

In their study Lewer and Van den Berg [13] showed that the patterns of international movement of people follow a similar fashion as in the case of international trade of commodities.

A recent study by Kim and Cohen [12] provided an empirical evidence that the size of population as well as infant mortality rate, which is used as a proxy for standard of living, are most influential factors of international migratory flows to industrialized countries.

## 2. Model, Variables and Data

### A. The Gravity Equation

The idea of gravity equation comes from a famous Newton's law of universal gravitation. Initially, it has been extensively used for empirical studies in international trade. This model implies that the trade flow between two countries is proportional to the product of their GDPs and it is inversely proportional to their distance [16]. Although the empirical gravity equation does not have a theoretical foundation, it allowed to investigate empirically the impact of distance, customs unions, exchange rate mechanism, and presence of common border and language similarities on the size and volume of trade [1].

This approach has been successful in migration studies as well. Its modified version reflects the size of migratory flows from a country  $i$  to country  $j$  in which the former has more population as compared with the latter. Hence, an excessive part of population in country  $i$  moves toward a labor scarce country  $j$  in which there exists demand for foreign labor. The distance remains a factor of negative impact on migratory flows. Mathematically, it can be expressed as follows:

$$M_{ij} = \gamma_0 P_i^{\gamma_1} \cdot P_j^{\gamma_2} \cdot D_{ij}^{-\gamma_3} \cdot \varepsilon_{ij}, \quad (1)$$

where  $M_{ij}$  is migratory flows from a country  $i$  to country  $j$ ,  $P_i$  and  $P_j$  reflect population sizes in both countries and  $D_{ij}$  is distance between places of origin and destination and  $\gamma$  denotes constant. In this equation  $\varepsilon_{ij}$  is a multiplicative error term that gives  $\mu_{ij} = \log(\varepsilon_{ij})$  in equation (2). For empirical purposes the equation is used in log-linearized form as it is appropriate to estimate the parameters of interest by least squares method. Hence, we have:

$$\log(M_{ij}) = \gamma_0 + \gamma_1 \log(P_i) + \gamma_2 \log(P_j) + \gamma_3 \log(D_{ij}) + \mu_{ijt} \quad (2)$$

## B. Estimation Methodology

To explore determinants of regional migration from post-Soviet republics to Russia we extend the equation (1) by adding more independent variables which may have potential to affect the migratory flows. Our sample covers the period of 1997 through 2010. For this time period we were able to collect the necessary data on migratory flows in the region.

In this study we estimate two equations. The first model will include all fourteen former Soviet republics. In the second model our analysis consist of countries in Central Asia, Caucasus and Moldova as they have had resource based economies. Since population is an important determinant of migration we will investigate how population support ratio, share of urban and rural population in sending countries and Russia affect geographic mobility of people in post-Soviet region. Hence, we will estimate the following set of equations:

$$\begin{aligned} \log(M_{iRt}) = & \gamma_0 + \gamma_1 \log(GDP_{it}) + \gamma_2 \log(GDP_{Rt}) \\ & + \gamma_3 \log(PSR_{it}) + \gamma_4 \log(PSR_{Rt}) \\ & + \gamma_5 \log(D_{iR}) + \gamma_6 \log(LL_i) \\ & + \gamma_7 \log(LA_i) + \gamma_8 \log(COMLNG_{iR}) \\ & + \gamma_9 \text{Dummies} + \mu_{ijt} \quad (3) \end{aligned}$$

$$\begin{aligned} \log(M_{iRt}) \\ = & \gamma_0 + \gamma_1 \log(GDP_{it}) + \gamma_2 \log(GDP_{Rt}) \\ & + \gamma_3 \log(URPOP_{it}) + \gamma_4 \log(URPOP_{Rt}) + \gamma_5 \log(D_{iR}) \\ & + \gamma_6 \log(LL_i) + \gamma_7 \log(LA_i) + \gamma_8 \log(COMLNG_{iR}) \\ & + \gamma_9 \text{Dummies} \\ & + \mu_{ijt} \quad (4) \end{aligned}$$

$$\begin{aligned} \log(M_{iRt}) \\ = & \gamma_0 + \gamma_1 \log(GDP_{it}) + \gamma_2 \log(GDP_{Rt}) \\ & + \gamma_3 \log(RUPOP_{it}) + \gamma_4 \log(RUPOP_{Rt}) + \gamma_5 \log(D_{iR}) \\ & + \gamma_6 \log(LL_i) + \gamma_7 \log(LA_i) + \gamma_8 \log(COMLNG_{iR}) \\ & + \gamma_9 \text{Dummies} \\ & + \mu_{ijt}, \quad (5) \end{aligned}$$

where PSR, URPOP, RUPOP reflect population support ratio, urban and rural population of the total population, LL and LA are landlock and land area of country  $i$ . COMLNG is whether Russian is a common language in country  $i$ . Dummies represent Baltic, Central Asia and the Caucasus as compared with a reference group which is Belarus and Ukraine.

## C. Variables and Data

The dependent or response variable of all equations is represented by the annual number of migrants from country  $i$  to Russia in year  $t$ . Independent variables comprise economic, demographic, socio-cultural and geographic characteristics of countries of origin and destination that are frequently used as determinants of migration. Thus, we have the following variable groups:

a) *Economic factors* affecting migratory flows from a source to a host country. GDP is used as a proxy for the level of economic development and it determines the push and pull factors of regional migration from country  $i$  to Russia. Karemera et al. [11] believe that a migration flow from country  $i$  to country  $j$  is a negative (positive) function of income in home (host) country.

b) *Demographic factors* are represented by population support ratio, the share of urban and rural population in places of origin and destination. Population support ratio is the number of people aged 15-64 divided by the number of persons aged 65 and over [12]. It is assumed that a migration flow from the places of origin to an area of destination depends negatively (positively) on the population size in host (source) country [11]. The potential support or dependency ratio indicates population aging and reflects the shortage of working-age population in Russia that may be compensated by attracting foreign labor force.

c) *Geographic factors* include distance between capital cities, land area and whether a source country is landlocked or not. Since data for transportation costs are not available the distance between capital cities in source and host countries is ordinarily used a proxy for transportation costs [3].

d) *Socio-cultural factors* refer to the common language, i.e. whether Russian is used as a second language in post-Soviet countries. This variable represents a proxy which reflects past and current relationships that have occurred as a result of similar historical and political background. A positively significant coefficient of this variable implies its positive impact on the size of migration flows.

For some variables such as landlocked and common language the value of 10 and 1 were chosen since  $\log_{10} 10 = 1$  and  $\log_{10} 1 = 0$ . This expression shows standard dummy variables with values 1 and 0. For instance, if Russian is the second language in a country  $i$  then value is assigned to 10, otherwise it is 1.

Data for the present study come from several sources. Information on annual number of migrants is taken from the Russian Federal State Statistics Service. Data on distance between capital cities in a source country and Russia are from an online source [20]. Other explanatory variables are accessed from the World Bank Online Indicators. WDI is the primary collection of development indicators, which are collected and compiled from officially recognized sources and regarded as the accurate global development data-set (World Bank). A detailed description of variables is given in appendix.

## 3. Empirical Results and Discussions

The primary purpose of the paper is to analyze and identify factors affecting international movement of people from post-Soviet region to Russia.

The collapse of centralized planning and gradual decline of demand for traditionally produced commodities had a negative impact on unemployment rates in these post-Soviet countries. Our analysis drawn from this geographic location will help us to identify whether people from this region are more prone for migration toward Russia.

Table one reflects summary statistics of all variables used in this study. Our sample includes 196 observations with relevant demographic, social, geographic and economic indicators that are frequently utilized in migration studies.

Table 1

Summary statistics					
Variable	Mean	SD	Min	Max	N
Log migrants	3.89	0.65	2.53	5.37	196
Log GDP(origin)	9.82	0.483	8.86	10.73	196
Log GDP(Russia)	11.5	0.09	11.35	11.64	196
Log Potential Support Ratio (origin)	1.81	0.03	1.72	1.86	196
Log Potential Support Ratio (Russia)	1.85	0.01	1.83	1.86	196
Log Urban Population (origin)	1.72	0.13	1.42	1.87	196
Log Urban Population (Russia)	1.86	0.00	1.86	1.87	196
Log Rural Population (origin)	1.64	0.13	1.41	1.87	196
Log Rural Population (Russia)	1.43	0.00	1.42	1.43	196
Log Distance between capital cities	3.18	0.24	2.83	3.47	196
Log Land Area (origin)	5.16	0.54	4.45	6.43	196
Log Land Locked (origin)	0.65	0.48	0	1	196
Log Common Language (origin)	0.5	0.5	0	1	196
Dummy for the Caucasus	0.29	0.45	0	1	196
Dummy for Central Asia	0.36	0.48	0	1	196
Dummy for Baltic	0.21	0.41	0	1	196

In the second table we see corresponding results from the sample. In particular, estimated OLS and beta coefficients are reported in relevant models. Beta coefficients show how migration flows change due to increases and decreases in standard deviations of explanatory variables. In an equation with potential support ratio, which is used as a proxy for the share of working age population in source countries and Russia the economic variable denoted by GDP in both places is statistically significant. Although the coefficient for population support ratio in countries of origin has its expected sign, it is not influential. However, in the case of a host country this variable is negatively significant

which points to the fact that a decline in the share of working age population is an important factor to draw migrants. As compared with the reference group consisting of Belarus and Ukraine, regional dummies yield our expected results. In particular, countries in Central Asia and the Caucasus send more migrants to Russia, while Baltic countries do not. This shows that Central Asia and the Caucasus have an excess of labor force which cannot be completely utilized in places of origin, while Baltic republics are faced with shrinking population. Russian being as the second language in some former Soviet republics facilitates the migratory flows.

Table 2

Gravity Equation						
	Model (3) OLS	Beta	Model (4) OLS	Beta	Model (5) OLS	Beta
<b>Economic Determinants</b>						
Log GDP (origin)	0.756 (0.150)***	0.565	0.655 (0.187)***	0.489	0.635 (0.198)***	0.474
Log GDP (Russia)	2.254 (0.705)***	0.342	0.533 (0.926)	0.081	0.659 (0.917)	0.10
<b>Demographic determinants</b>						
Log Potential Support Ratio (origin)	1.828 (1.889)	0.084				
Log Potential Support Ratio (Russia)	-49.05*** (7.515)	- 6.688				
Log Urban Population (origin)			-1.161 (0.479)**	- 0.227		
Log Urban Population (Russia)			160.636 (60.28)***	0.354		
Log Rural Population (origin)					1.311 (0.544)**	0.268
Log Rural Population (Russia)					-61.077 (21.881)***	- 0.365
<b>Geographic determinants</b>						
Log distance between capital cities	-0.286 (0.481)	- 0.104	-0.530 (0.417)	- 0.193	-0.496 (0.415)	- 0.181
Log land area (origin)	0.242 (0.237)	- 0.204	0.238 (0.348)	0.20	0.253 (0.374)	0.213
Log landlocked (origin)	-0.309 (0.107)	- 0.022	-0.157 (0.123)	- 0.116	-0.202 (0.138)	0.149

Gravity Equation						
	<i>Model (3)</i> OLS	Beta	<i>Model (4)</i> OLS	Beta	<i>Model (5)</i> OLS	Beta
<b><i>Social and historical determinants</i></b>						
Log common language (Russian in countries of origin)	0.441 (0.061)***	0.341	0.395 (0.073)***	0.306	0.416 (0.073)***	0.322
Dummy for Caucasus	0.782 (0.251)***	0.547	1.012 (0.205)***	0.708	0.930 (0.203)***	0.268
Dummy for Central Asia	0.957 (0.311)***	0.709	0.569 (0.391)	0.422	0.453 (0.432)	0.651
Dummy for Baltic	-1.047 (0.195)***	-0.665	-0.669 (0.250)***	-	-0.655 (0.268)**	-
<i>Constant</i>	59.466 (7.147)***		-306.08 (122.345)**		75.148 (22.069)***	
$R^2$	0.84	0.84	0.82	0.82	0.82	0.82
N	196	196	196	196	196	196

Note: Dependent Variable: Log (Migrants). Robust standard errors are in parentheses, \*significant at 10%, \*\*significant at 5% and \*\*\* significant at 1%.

The last equation reveals that rural inhabitants in sending countries are more prone for migration. The coefficient for this variable in the case of Russia is negative as it shows a significant shortage of labor force in rural areas. Economic and socio-cultural variables and regional dummies produce similar results obtained in previous estimations.

#### 4. Conclusions

In this paper we attempted to analyze and identify determinants of regional migration flows from post-Soviet republics to Russia. Our approach to the topic has been interdisciplinary as we looked at various factors, including economic, demographic, geographic and sociocultural variables. The shortage of reported data on migratory flows allowed us to consider a relatively shorter period of time as compared with previous migration studies that focused on a longer time span [12]. A gravity model of migration has been our key empirical tool and our estimations are drawn from pooled least squares technique.

In our model GDP in places of origin, working age population, and the share of urban and rural population were influential for migratory processes. As compared with the reference group two regions were prone to regional migration in opposite direction. In particular, the Caucasus was more active, while Baltic were not. In all regression estimations the sociocultural factor denoted by whether Russian is a second language in source countries has been an important determinant of migration in post-Soviet region. Kim and Cohen [12] believed that as developed countries experience aging population associated with a lower fertility rate and increased life expectancy potential support ratio in the host country is negative implying that there is steady need for migrant labor. This evidence has been noticed in this study as well since Russia follows similar trends and dynamics of demographic transition which prevail in Western countries.

A robust finding reveals that in places of origin rural inhabitants seem to be more active to migration as compared with urban residents. This may be a relevant conclusion as there are more economic

opportunities in cities, while in rural areas such opportunities are limited.

An interestingly important finding has been found in our model. More specifically, GDP in sending countries facilitate migratory flows to Russia. Since GDP is used as a proxy of economic development [11] it may represent the level of income in migrant sending nations. An attempt to undertake international trips to new areas of destination have certain costs, including transportation, adjustment costs, etc. Consequently, income level in source countries may determine the degree of migratory flows.

The overall findings of the paper are consistent with previous studies on migration whose focus was on different countries and geographic locations. This study confirms that Western countries that are in the last stage of their demographic transition are faced with the necessity to supplement the shortage of labor in their societies and Russia is not an exception. Russian being widely used in some former Soviet republics as the second language reflects a common historical and social background, which ultimately has a significant impact on regional movement of people.

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#### **ДЕТЕРМИНАНТЫ МИГРАЦИОННЫХ ПОТОКОВ ИЗ БЫВШИХ СОВЕТСКИХ РЕСПУБЛИК В РОССИЮ**

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Распад Советского Союза два десятилетия тому назад обусловил новую миграционную ситуацию в регионе. Хотя бывшие союзные республики развиваются независимо, этот регион остается общим пространством для большей части населения. Перемещение людей в постсоветском пространстве вызвано наличием общих систем транспорта и коммуникации, регионально признанного языка (русский язык), систем образования, дополняющих рынков труда, а также схожим менталитетом и моделью поведения. Россия является важной страной пребывания для региональной миграции. Это может быть связано с заметной дифференциацией в доходах между бывшими советскими республиками и Россией. Соответствующие изменения демографической ситуации в обоих направлениях прогнозируют и отражают также закономерности и потоки регионального движения людей. В статье проанализированы факторы, влияющие на международные миграционные потоки в Россию. Модель гравитации как эмпирический инструмент исследования используется в данной статье. Исследовательский подход темы является междисциплинарным, поскольку она учитывает как экономические, так и неэкономические факторы. Основные выводы работы заключаются в том, что уровень дохода в стране происхождения, а также население в принимающих и отправляющих государствах значимы для миграции. Социально-культурные факторы, отражающие общую историю, важны во всех оценках.

*Ключевые слова: международный миграционный поток, бывшие советские республики, уравнение гравитации.*

#### **Пробьба ссылаться на эту статью в русскоязычных источниках следующим образом:**

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