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INTER-REGIONAL MIGRATION IN CZ AND SK: THE EMPIRICAL STUDY OF PANEL DATA AT NUTS3 LEVEL

Abstract:

The aim of this paper is to define the relationship between migration, income, and unemployment rates, and therefore estimate these relationships using vector autoregression and the Granger causality test. This study focused on inter-regional migration at NUTS3 level in the Czech and Slovak Republics. The analysed period is from the year 2004 to 2013, and the final panel data is set for one variable, and therefore contains a total of 220 observations. According to the results, the regional migration in the Czech and Slovak Republics was determined by income differences and it is in accordance with the neoclassical theory. The causal relation was not confirmed for differences in unemployment rate. The changes of income and unemployment rates in the Czech Republic and Slovakia were not caused by migration. These results do not support conclusions of the neoclassical model of migration.

Keywords:

globalization, migration, panel data, Granger Causality Test, economic indicators, NUTS3

JEL Classification: C01, J60, F02

Introduction

One of the oldest, most distinctive, and omnipresent forms of globalization is the migration of populations (Stojanov et al., 2006). Migration works as an accelerator of globalization; but on the other hand, migration itself is supported and accelerated by other globalization processes (development of information technology, transport infrastructure, education, etc.) – see Procházková and Illinitchi (2010). In comparison with the past causes, aspects of current migration are changed significantly, and are characterized also by countless types of temporary and cyclical migrations of various lengths (Poku and Graham, 2000).

According to Kowalska and Strielkowski (2013, p. 343) “The basis theory dealing with the economics of migration states that the most important drivers of migration flows from a less wealthy country or region to a more wealthy one are: wage differential, economic disparities, differences in GDP per capita, and unemployment differentials” – for more, see these examples: Hannan, 1970; Todaro; 1969; Walsh, 1974; Strielkowski, 2012 etc.). Of course,other reasons for migration processes also exist.

Kureková and Hejduková (2016) mentioned how particular theoretical concepts of migration are different, especially in their assumptions and often in the conclusions. Some models of migration exist which are different in the definition of consequences of migration towards economic growth in the theories. For example: some of these theories are optimistic and say that migration supports economic growth, while some are pessimistic and suggest that there are many negative effects of migration in the current world. One single coherent or complete theory does not exist, and Stojanov et al. (2006) points out that for most of them, they are characterized by a multicultural approach.

One of the first studies which researched the causes of migration was written by Massey et al. (1993). The other papers which assessed theoretical models of migration, their comparison, and critical evaluation were the following: Massey et al. (1994), Boyle et al. (1998), Hagen-Zanker (2008) etc.

Considering an increasing range of international migration, there should be a devotion to the creation and evaluation of the theoretical aspects and impacts of migration on the economy. Migration plays a very important role at the NUTS3 level in the Czech Republic and Slovak Republic.

This study is focused on inter-regional migration in the Czech and Slovak Republics, specifically, the empirical study of panel data at NUTS3 level. The paper begins with a brief overview of the selected theoretical concepts of migration. Then, the methodology, research question, and data collection are presented. After this, the results are discussed, and at the end of the paper, we conclude by making some suggestions for future research.

The aims of this paper are the following: to define the relationship between migration, income, and unemployment rates, to learn about on-going migration flows in the Czech Republic and Slovak Republic, and to find out how the selected economic indicators are

contributing to changes in the migration in these states. This paper used the Granger causality test for examining the impacts of migration in the Czech and Slovak Republics. The data which was used in this paper comes from the Eurostat Database, The Czech Statistical Office (CZSO), and The Statistical Office of the Slovak Republic (SOSR).

Theoretical background of migration and existing research studies

This part of the paper presents existing selected research studies of migration. This chapter is concretely focused on two theories: the Neoclassical model of migration and the theory of cumulative causes.

The Neoclassical model of migration theory is particularly focused on disparitiesin wages, and also on the other conditions for employees between countries, as well as costs which are related to migration (Brázová et al., 2011). According to the Neoclassical model, migration should contribute to balancing the migration disparities in individual countries or regions, or migration should have a positive contribution to overall economic growth (Kumpikaite and Zickut, 2012). We can see with the example of Granato et al. (2015) how the impact of low/medium-skilled migration is consistent with traditional Neoclassical reasoning, suggesting that labour mobility reduces differences in regional unemployment rates. In contrast, the migration of high-skilled workers tends to reinforce disparities. The neoclassical model of migration understands migration as an individual decision of an individual who is trying to maximize his or her income. Along with the neoclassical theory of migration, come these following critical authors: Drbohlav & Uherek (2007), Arango (2000) or De Haas (2010). The critics of this model ask the question: “Why do so few people migrate, when considering the big differences in incomes, salaries, and life standards?” The concept of a “new economy of migration” exists – as a reaction to the neoclassical model – It is typified by the fact that the labour market is not the only important factor, but also by other markets – it means that according to this concept, it is not the decision of an individual, but family decision. – For an example of more on this topic, see: Massey et al. (1997).

The theoryof cumulative causes – Migration causes change in individual motivation and social structures by use of ways which increase the likelihood of further migration flows (see more Myrdal, 1957, Massey 2001). The special form of migration in this theory is called “brawn drain”. This concept comes from Myrdal´s postulates (Myrdal, 1957), and is based on the thesis that migration is an evolutionary process which is caused by institutional and socioeconomic changes thanks to a mechanism of feedback connections. Migration further supports changes in behaviour of migrants, as well as environmental and structural contexts in which migrants operate (Drbohlav and Uherek, 2007). The representatives of this theory argue that migration leads to inequality within communities in countries of origin, and in this way deprivation is supported (de Haas, 2010). Migration could deepen backwardness, and it could cause other migration flows – for more, see the following examples: de Haas (2010) and Reichert (1981). The supporters of this model do not take into account empirical evidence, backed by extensive research, which talks about the economic development of the particular

region in the medium term, and therefore generates emigration (compare de Haas, 2010; Stojanov and Novosák, 2008).

Today, migration processes are very major problems in economics, sociology, and also demography. The Neoclassical model of migration says that the increase of the number of foreigners in the country causes an increase of supply of workers and the decline in wages. Here we can see some results of the Neoclassical theory of migration in practice: the first empirical studies on the American markets (Ottaviano and Peri, 2007; Autor et al., 2006 or Goos and Manning, 2007) show that the impact of migration in wages is almost zero. With the creation of this research study, we would like to find out if the differences in income and employment cause migration in the selected countries, and if we can confirm the Neoclassical theory of migration by use of practical data of the Czech and Slovak Republics.

Methodology, research questions, and data collection

This study provides an answer to the following central research question: Are the empirical results about inter-regional migration consistent with the conclusions of the theoretical neoclassical model? In other words: Do differences in income and employment cause migration? Does regional migration contribute to the convergence of economic indicators at NUTS3 level?

In addition to the central research question, the following specific research questions, based on the research results, were formulated: What is migration at NUTS3 level in the Czech Republic and Slovakia? How does migration affect income and unemployment rates? Based on the literature review, given the specific research questions, and the following data-collection questions, these two hypotheses were formulated:

Hypothesis A: The inter-regional migration at NUTS3 level is affected by differences in income and unemployment rates.

Hypothesis B: Migration contributes to the convergence of income and unemployment rates in CZ and SK at NUTS3 levels.

For the analysis, statistical indicators from the Eurostat database were selected and used from the Czech statistical office and Statistical Office of the Slovak Republic. Complete data sets contained the period from the year 2004 to 2013. Therefore, the final panel data set for one variable contains a total of 220 observations. Statistical indicators were chosen to reflect their theoretical counterparts. There is an assumption that gross domestic product properly represents income developments in individual regions in the Czech Republic and Slovakia. The list of variables is presented in the following Table 1:

Table 1: Overview of variables

Variable	Statistical indicator	Note	
MIG	Statitical indicator is defined as the ratio of net migration (including statistical adjustment) during the year to the average population in that year.	The value is expressed per 1000 persons. The net migration plus adjustment is calculated as the difference between the total change and the natural change of the population..	
INC	Gross domestic product per capita and is expressed in the so-called PPS (i.e. an artificial currency unit used by Eurostat).	For graphical expression and further analysis variables INC and UNEMPL were calculated from statistical indicators as the percentage difference between the variable and the reference value	For the calculation of the Granger causality test, this variable is expressed in absolute value (absinc; absunempl)
UNEMPL	It stands for the unemployment rate		

Source: own based on Eurostat, CZSO, SOSR

Variables INC and MIG at the national level (NUTS0) have already been used in Kureková and Hejduková (2016). These variables were available at Eurostat at NUTS2 and NUTS3 levels as well. The problem was with the availability of variable UNEMPL. It was only available at NUTS2 level on Eurostat, and it was necessary to take this indicator from CZSO and SOSR. These institutions published the unemployment rates at the NUTS3 level. Table 1 describes the original statistical counterparts for theoretical variables, and the furthest-right column notes additional calculations that were made. For the variable MIG, Eurostat performs this calculation itself. The calculation of variables INC and UNEMPL were carried out for the purposes of our analysis. In order for variables INC and UNEMPL to represent the wage and employment disparities, which are discussed in the theory as the key determinants of migration, the reference value was chosen to do so. This reference value is the average of the variable at the national level (NUTS0). It was also calculated using the percentage difference between the variable and the reference values. Given that we are interested in whether MIG contributes to convergence or whether it reduces the differences between the INC and UNEMPL, these values were inserted into the empirical model as absolute values.

To verify the validity of the both hypotheses, the Granger causality test was used. First, the estimated time series had to be tested in order to meet the conditions for using an

estimation of vector autoregression (VAR), which is necessary in order to use the Granger causality test. Estimates and results are presented in the following chapter.

Results and discussion

Question No. 1: What is the inter-regional migration in CZ and SK?

According to this question, number 1, we calculated the basic statistics (see Tab. 2) and depicted values in graphs (see Fig. 1). We try to find out based on variable MIG what the inter-regional migrations were in CZ and SK at NUTS3 level. Development of variables INC and UNENPL were also analysed for a complete and complex picture of inter-regional migration and development of possible economic determinants of migration.

Descriptive statistics for selected variables are presented in Table 2. The values of the variables INC and UNEMPL are not currently presented as the percentage difference between the reference values. Descriptive statistics showed that the Czech and Slovak regions had an average positive rate of migration. However, in the CZ, this indicator is almost 20 times higher than in SK. Regarding the average values of INC and comparisons between states, the CZ has a higher average GDP of nearly 1,350 PPS than the SK, but if it is compared only the maximum value the income in the Slovak Republic was higher nearly of 100 PPS than in the Czech Republic. There are regions in Slovakia with very low values of GDP, which decreases the average value of INC. We can also see that the average unemployment rate is almost 1.7 times higher in Slovakia than in the Czech Republic. The maximum value of UNEMPL was 20.81%, and it was observed in Banskobystricky region in 2012.

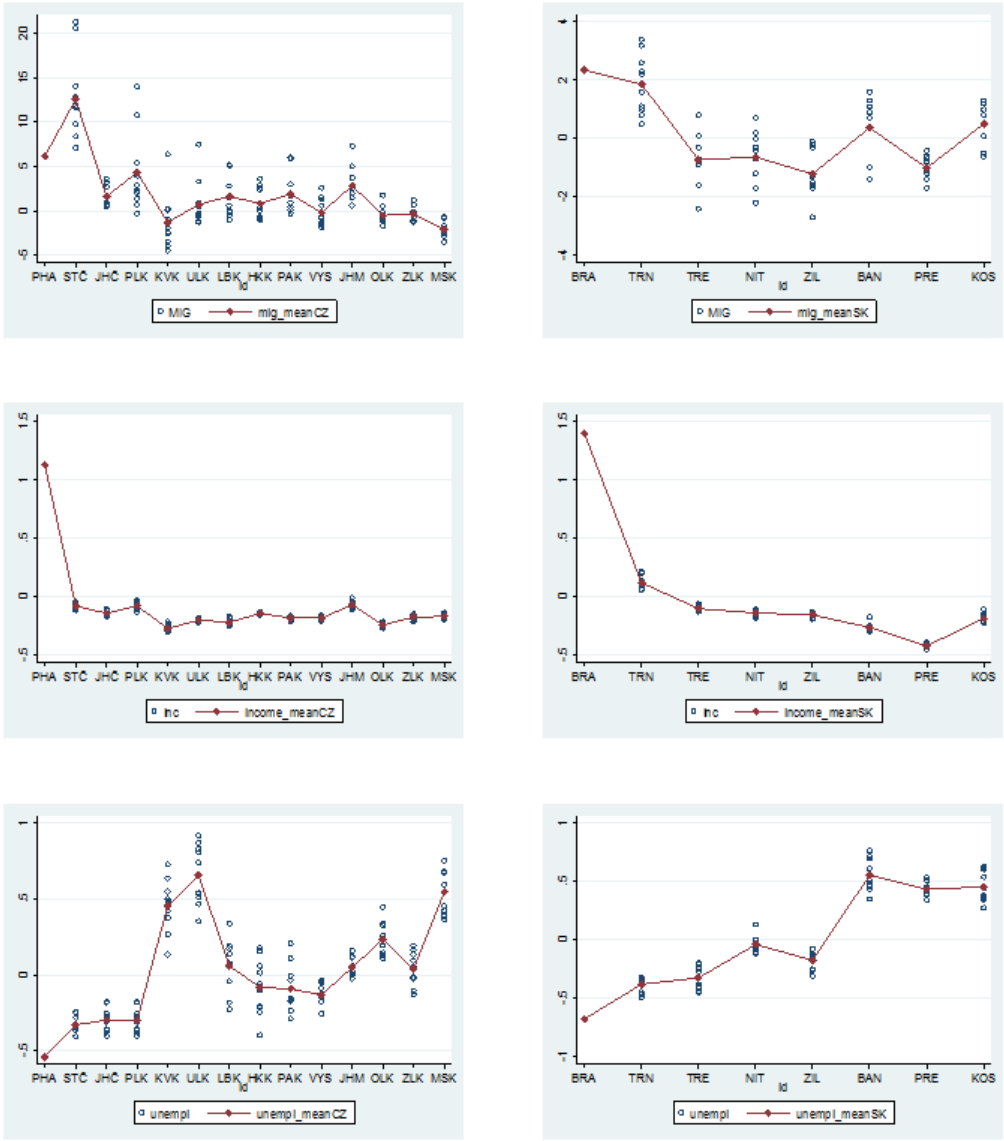
Table 2: Variables and basic statistics

		Obs	Mean	Std. Dev.	Min	Max
CZ	MIG	140	2.015	4.616	-4.50	21.30
	INC	140	12 591	5 045	7 400	33 600
	UNEMPL	140	6.891	2.677	1.90	14.50
SK	MIG	80	0.189	1.905	-2.70	7.50
	INC	80	11 248	6 647	3 900	33 700
	UNEMPL	80	11.482	5.362	1.98	20.81

Source: own based on Eurostat, CZSO, SOSR

The variables were depicted in each graph to better understand and compare their development. We can see the development of variables over the CZ and SK regions in Figure 1.

Figure 1: Development of MIG, INC and UNEMPL in Czech and Slovak regions



Source: own based on Eurostat, CZSO, SOSR

The individual observations were treated equally as in the case of Pooled OLS. This assumption allows for the use of the Dickey-Fuller test (DF test) to estimate vector auto-regression (VAR) and to test Granger causality. According to the results of the DF test, all-time series were stationary. Therefore, it was not necessary to use the first differences of time series. Then, we are able to estimate the VAR model. We are looking for an appropriate length of delay using information criteria (Akaike, Schwarz, Hanna-Quinn) that used the logarithm of the determinant of the estimated covariance matrix of the residuals and tried to minimize these criteria. So the first step was to identify the degree of length in the VAR model. Therefore, we used Akaike information criteria (AIC) and minimized AIC. After that, we created estimates of two VAR(4) models. The first

VAR(4) model used a combination of variables MIG and INC.The second VAR(4) model used a combination of variables from MIG and UNEMPL.

Question No. 2: How do income and unemployment rates affect inter-regional migration?

Hypothesis A: Inter-regional migration is not affected by differences in income and employment.

To verify hypothesis A, the Granger causality test is crucial.It has been estimated for both VAR (4). Based on P-values in Table 3, it may be seen that changes in income determine changes in inter-regional migration. Further changes in migration did not affect changes in variables Since UNEMPL is at the 5% significance level, we are not able to reject the null hypothesis in favour of the alternative hypothesis.

Table 3: Granger causality test for Hypothesis A

Granger causality Wald tests					
Equation	Ecxluded	F	Df	df_r	Prob > F
MIG	INC	3.314	4	207	0.0117**
MIG	UNEMPL	1.710	4	207	0.1490

note:*** p<0.01, ** p<0.05, * p<0.1

Source: own based on Eurostat, CZSO, SOSR

Question No. 4: How does migration affect income and unemployment rates?

Hypothesis B: Migration does not contribute to the convergence of income and unemployment rates in CZ and SK at NUTS3 levels.

Granger's causality test is crucial to verify hypothesis B. From the values of Table 4, one can see that the changes in the variable MIG did not affect changes in the differences of income and unemployment rates. Since the null hypothesis of no Granger causality was not rejected at the 5% significance level, we conclude that the changes of income and unemployment rates are not affected by changes in inter-regional migration. So, migration does not contribute to the convergence of income and unemployment rates in CZ and SK at NUTS3 levels.

Table 4: Granger causality test for Hypothesis B

Granger causality Wald tests					
Equation	Ecxluded	F	df	df_r	Prob > F
absINC	MIG	0.997	4	207	0.4102
absUNEMPL	MIG	1.591	4	207	0.1778

note:*** p<0.01, ** p<0.05, * p<0.1

Source: own based on Eurostat, CZSO, SOSR

According to the results of the causality test, we can say that migration in Slovakia and the Czech Republic was determined by income differences, and it is therefore in accordance with the Neoclassical theory. Additionally, this causal relation was not confirmed by differences in the unemployment rates. According to the results, the changes of income and unemployment rates in the Czech Republic and Slovakia were not caused by migration.

Conclusion

The purpose of this study was to investigate and compare inter-regional migration at the NUTS3 level in The Czech and Slovak Republics. Variables INC and MIG at the national level (NUTS0) have already been used in Kureková and Hejduková (2016). There was a problem with the availability of variable UNEMPL, as it was on Eurostat, but only available at the NUTS2 level. Therefore, it was necessary to take this indicator from CZSO and SOSR. Results showed that Czech and Slovak regions had an average positive rate of migration. Regarding the average values of INC and comparisons between states, the CZ has a higher average regional GDP than the SK. In Slovakia, there are regions with very low values of GDP, which decreases the average value of INC. We can also see that the average unemployment rate is almost 1.7 times higher in Slovakia than in Czech Republic.

Two hypotheses were formulated in this paper, and they allowed us to conclude that migration in the Czech Republic and Slovakia was determined by income differences and that this causal relation was not confirmed by differences in unemployment rates. According to the results, changes of income and unemployment rates were not caused by migration. These results do not support conclusions of the Neoclassical model of migration about convergence of regions due to migration flows. Results of our study show interesting information about inter-regional migration between The Czech Republic and Slovakia, and may also provide a useful basis for future research in this area. If we compare the results from Kureková and Hejduková (2016), we can see as well that it was not confirmed that migration at NUTS0 level contributed to convergence or divergence in selected economic indicators at a national level.

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