DEPOPULATION PHENOMENON OF LITHUANIA: UPCOMING CHALLENGES FOR THE COUNTRY'S ECONOMY

RIČARDAS MILERIS[1]

Fenomén depopulácie v Litve: nadchádzajúce výzvy pre hospodárstvo krajiny

Abstract: *The Lithuanian depopulation phenomenon that has continued for the current twenty-six years motivates many economists to foresee the possible consequences for the Lithuanian economy of this negative trend. This research aims to predict the Lithuanian population changes in future twenty-three years and to highlight the forthcoming challenges for the Lithuanian economy when becoming the highly depopulated country. The demographic and emigration factors evidently cause the Lithuanian population decline, so the main economic differences between Lithuania and other EU countries were analyzed to understand the economic reasons of emigration and depopulation. The comparative analysis of EU economies allowed to determine the purposive values of Lithuanian macroeconomic indicators when the reduction of emigration could be expected. As Lithuania belongs to the group of EU countries with the least macroeconomic indicators, the continuous huge depopulation in future is very probable.*

Keywords: *demographics, population, economic development, emigration, macroeconomics*

JEL Classification: E 27, J 11, J 61

Introduction

The economists and demographers continually study the changes of population in different countries and traditionally place a strong emphasis on a long-range view of population change, which in the future has the important impact on the country's development and economy. The first stage of demographic researches is usually aimed at the estimation of current demographic trends and highlighting the main factors that influence the population growth or decline. The second stage in demographic researches

[1] Assoc. Prof. Dr. Ričardas Mileris, Kaunas University of Technology, Lithuania; e-mail: ricardas.mileris@ktu.lt

is aimed at the explanation of population change and predicting its future development [5]. The reliable regional population statistics are essential for future planning purposes. Traditionally, the population analysis is prepared based on natural birth and death and migration patterns within a geographic area [19].

At a time when many areas face problems associated with rapid human population growth, others are confronted with the effects of the rapid population loss. The effects of those changes on the distribution of populations have important implications for socioeconomic life in geographic areas [2]. Lu and Keller [12] also agree that population issues are critically important in the field of human geography. The size, growth, composition, distribution, and the movement of the human population affect everything from cultural and political patterns to economic and social development and growth of cities. The decline of population usually emerges when the total fertility rate drops below replacement level, and birth rates are persistently below death rates, causing population to decrease over time [12].

The aim of this research is to analyze the Lithuanian depopulation phenomenon and to foresee the forthcoming challenges for the Lithuanian economy. As the rapid depopulation of Lithuania continues for the current twenty-six years, it is important to understand the future consequences of this phenomenon if the current trends remain the same. The loss of labour force and consumers, population aging, growing social costs associated with low population densities, increasing burden for the state's social insurance system, the necessity to close many schools and other education institutions, declining attractiveness for new businesses due to the constantly decreasing home market, growing cost-prices of products and services, and declining demand and prices of real estate are the possible effects that can be caused by the country's high depopulation. Only the understanding of the seriousness of these possible problems can raise the discussions seeking to find the decisions how to make Lithuania more attractive to live for the citizens of this country and improve the Lithuanian economy.

1 Literature review

The literature review chapter of his research aims to analyze the importance of non-declining population for country's economy and highlight the possible negative economic consequences of country's depopulation. Analyzing the country's economic growth and population growth, Huang and Xie [10] found their two-way interrelationships. While population growth is generally thought to cause the economic growth, it is also possible that the economic growth causes the population growth. The strong economic growth frequently causes population growth either through increased birth rates or immigration.

In contrast, the economic growth increases women's income, but increasing opportunity costs of raising children usually reduce fertility. In many economic theory models, the fertility rate is linked with income and social fundamentals. According to Shin [22], also the fertility rate of population decreases as the income increases. The declining factors in birth rate are deeply related to the economic development. The determinants of birth rate have been sought in the decline of death rate, the increased standards of children life quality, the increase of the opportunity cost and increase in the status and education of women, urbanization, social security systems, religious values, social values, etc. [22].

While the growing economy in advanced countries reduces the fertility, population size is a very important factor of economic growth. The New Economic Growth Theory explaining the long-run economic growth has put an emphasis on demographic factors as an essential element in explaining the dynamics of economic growth. While usually the common focus of economists was on the impact of capital on the development of the economy, the New Growth Theory has put back into focus formation of human capital and population size. This theory has shown that the economic and social dynamics of transformation from the economics with no growth of income per capita to the economics with a steady growth rate of income per capita are due to endogenous changes in population growth and the formation of human capital [7]. Kaur and Singh [11] also agree that the human capital is the most important factor of country's development. The growth of modern economy depends more on the technologies and knowledge rather than only upon the physical factors of production. As many advanced economies have achieved the economic and social development by investing in knowledge and technologies, this trend must be considered by developing economies in determining their strategic outlook what will serve as a keystone to sustain a rapid rate of economic growth and enhance international competitiveness [11]. People are a country's real wealth, therefore, wanting to make the country attractive to live the basic well-being conditions of economy must be ensured: the ability to obtain adequate education and to be able to access the resources needed to achieve a decent standard of living [20].

As the human capital of a country has the crucial impact on its economic development, it is important to analyze, what consequences can cause the high emigration and braindrain in developing countries. While it seems reasonable to assume that international migrants to industrialised countries mainly migrate by choice, and in particular, to benefit from better economic opportunities in the host country, many migrants between developing countries are fleeing natural disasters, political instability or armed conflicts. Migration in the first case can be described as *chosen* or *voluntary*, while the second case concerns

more *forced* migration [3]. Nijhoff and Gordano [16] used the following dimensions to classify international migrants: *intended duration of stay* and *ties to family/home country*. These led them to identify four types of migrants: (a) *migrants oriented on returning*, (b) *transnational migrants*, (c) *settlement migrants*, and (d) *global nomads*. Migrants oriented on returning have a short intended duration of stay in other countries and a strong connection to their country of origin and families. Transnational migrants share the connection to home, but have a long-intended duration of stay. Settlement migrants have a similar long-intended duration of stay, but do not feel connected to their home country, and the final category, global nomads, do not intend to stay for a long time and are not connected to the country of origin and families [16].

Nowadays, migration and crisis all over the world have become a routine association, with particular emphasis either on *crisis migration* from an emigration perspective, or on the *migration crisis* from an immigration perspective. In many countries the long-term crisis can be described as a constant crisis, where crisis itself becomes normality [1]. The formation of the European Union (EU) and consequent easing of restrictions on the mobility of capital and labour have created opportunities and challenges for Europe. Citizens of the EU now have the right to live and work anywhere within the EU. Policy-makers have recognized migration as an engine for the optimal allocation of the production factors, overcoming skill shortages in certain regions, and overall, as an enabling factor in economic development. With the integration of eastern Europe into the EU, the dynamics of migration has changed with eastern Europe emerging as a labour supply region [18]. Cross-border mobility as expressed in temporary and permanent movement is an important element of post-communist restructuring in eastern Europe. The two enlargements of the EU, which incorporated twelve countries of eastern Europe, changed the map of mobility from the former region towards the EU, while offering a view of a Europe without borders. These events favoured an increase in human mobility that, together with the convergence of communications and transportation, led to a new kind of movement, which is captured within the framework of the *new paradigm of mobility* [14].

The European countries today are facing different levels of unemployment, as well as demographic problems. Such demographic problems, which are traditionally concerned with welfare issues, in certain countries involve two interrelated factors: the aging of the population and the increasing levels of labour migration. As the working-age population shrinks, there is an understandable concern about who will fill the public coffers to sustain pensions, welfare benefits, and other public services that ensure the well-being of Europe's citizens. Labour migration frequently affects active working population of 25 – 45 years old and mostly in certain circumstances, when

local unemployment is high [8]. Europe's economic and fiscal problems are and will increasingly be exacerbated by the continent's demographic situation and its projected development. In this respect, with the exception of Germany, the countries of eastern and southern Europe are set to experience the worst demographic developments because they have some of the most expensive pension systems, the worst demographic trends, and already the worst fiscal positions [9]. Therefore, we can conclude that the actual low level of fertility, as recorded in several countries in southern and central Europe, is more likely due to external conditions rather than intentional choices. The mortality and migration rates together with current levels of fertility suggests that the population may dramatically shrink. Moreover, fertility rates below those needed to assure generation replacement may cause a range of unfavourable social and economic effects because of changes in the population structure than reductions in its size. These changes in population structure refer to the balance between the proportion of older persons and the share of children in the overall population and to the sustainability of the working-age population (20 – 64 years old). This leads us to the aging process and demographic crisis in Europe [6]. For example, like Lithuania and many other European societies, the Latvian population is rapidly aging due to a low birth-rate and large-scale emigration, particularly of younger people. During the years 2000 – 2010, the proportion of the population aged 65 and more increased from 14.8% to 17.4% of the total inhabitants. In this period the Latvian population declined from 2.3 to 2.0 million due to the same combination of mass emigration and sub-replacement fertility [13].

The growing dependency ratio is a particular concern for public pension systems in countries where most current pensions are financed through tax contributions from current employees. Even with the policy of increased retirement age, the ratio of old-aged to working population will still rise [21]. In year 2050, the global population will reach a peak of 9 or 10 billion people before it begins to decline. Long before it reaches its expected peak, the world's population will age dramatically, spinning many of the social and economic institutions into chaos. Of this population, a massive 20% to 25% will be aged 65 or over. All these people will be hoping to be retired, receiving living wage pensions, and expensive old age and infirmity care [17].

Despite the negative depopulation consequences of emigration, its positive impacts include some economic and non-economic aspects. The recent literature concerned with the economic impacts examined the role of remittances, return migration, investment in education, and the creation of business and trade networks [4]. The new economics of labour migration theory (NELM) challenged classical assumptions by asserting a role for migration as a way to reduce household's poverty, even while upholding

the assumption that individuals are income maximising, basing decisions on estimates of potential costs and benefits of mobility on the basis of preferences, choice alternatives, information and competition. Remittance streams serve as an insurance mechanism, reducing household vulnerabilities to economic cycles by distributing constituent members to various locations and pooling resources. Households can thereby reduce the impact of economic stressors at home, as long as migration decisions are significantly diversified [24]. Given that the most obvious cause of migration from developing countries is the disparity in the levels of income, employment and social well-being, one solution often proposed by some scholars, development practitioners and politicians is to promote social and economic development in the less-developed migrant-sending countries as a way of curtailing immigration. In particular, development aid and trade liberalisation are commonly advocated as more effective instruments to reduce migration than restrictive immigration laws and intensified border controls. Thus, development promotion policies are expected to address the root causes of migration and lead to the reduction in the migrant flows [23].

2 Empirical research methodology

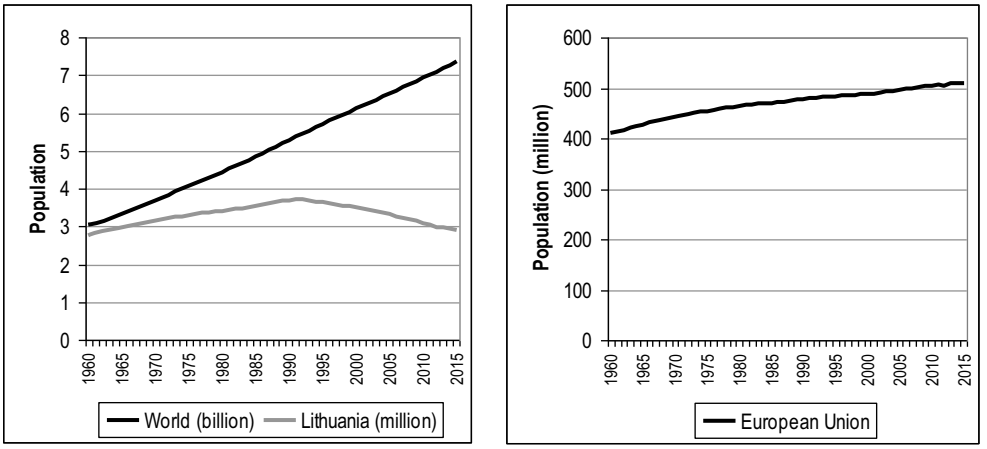
Firstly, the changes of Lithuanian, European Union, and world's population will be analyzed and the statistical models will be developed to predict the Lithuanian population in future twenty-three years. Secondly, the demographic and migration factors will be analyzed to estimate their impact on Lithuanian depopulation phenomenon and the statistical model to predict the total number of Lithuanian emigrants will be developed. Also the analysis of EU macroeconomic indicators and population changes will be implemented to find the statistical dependences between them. The purposive macroeconomic indicators of Lithuania will be estimated that have to be reached in order to reduce the emigration. The multiple regression model will be developed to predict the net migration of Lithuanian inhabitants considering macroeconomic variables. Finally, the possible forthcoming challenges for Lithuanian economy will be analyzed that are expected if the current depopulation continues. The linear and logarithmic regression, Pearson correlation, canonical correlation, determination coefficients, mean absolute percentage errors (MAPE), mean absolute deviation (MAD) errors, coefficients of variation and cluster analysis methods will be applied in this statistical research. The statistical indicators from Statistics Lithuania, EUROSTAT and World Bank will be used.

3 Statistical trends in Lithuanian population

The world population in 2015 reached 7.3 billion people and this number is constantly increasing since 1960 with the average 1.62% annual growth rate. The population of 28 European Union countries in 2015 was 509.7 million people. This number since 1960 grew on average by 0.4% every year. But Lithuanian population in this period had no constant growth. In period of 1960 – 1991 the population of Lithuania grew on average by 0.93% every year and conversely, since 1991 it decreases in average by 1%. The break point of 1991 (3,7 million inhabitants) has changed the direction of Lithuanian population and there were no signs until 2017 to stop this sudden depopulation of the country (Figure 1).

Figure 1

Population of world, the European Union and Lithuania in 1960 – 2015



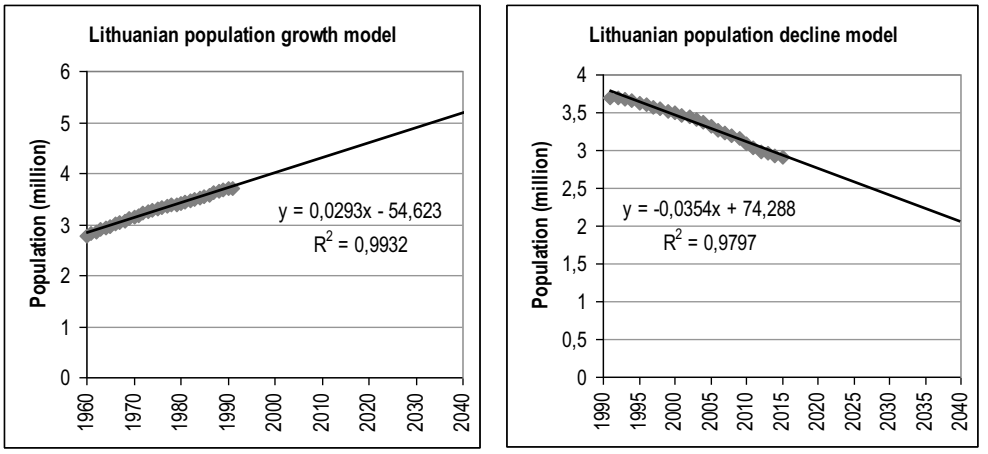
Source: Own processing based on data of the World Bank.

Two linear regression models were developed to predict the Lithuanian population assuming these prerequisites (Figure 2):

- Assumption 1: The Lithuanian population did not stop growing in 1991. What population should Lithuania have in 2017 and 2040?
- Assumption 2: The Lithuanian population continues decrease as in period of 1991 – 2017. What population will Lithuania really have in 2040?

Figure 2

Linear regression models for the prediction of the Lithuanian population until 2040



Source: Own processing based on data of the World Bank.

Model 1 for the prediction of hypothetical number of inhabitants (million):

$$POPULATION_1 = 0{,}0293 \times YEAR - 54{,}623 \quad (1)$$

According to the Assumption 1, Lithuania in 2017 should have 4,475 million inhabitants (currently it had only 2,842 million in 2017) if the 1960 – 1991 years' population growth trend remains the same without starting the depopulation in 1991. This theoretical modelling allows consider that in 2040 Lithuanian population should be 5,149 million inhabitants (correlation coefficient of model $r = 0.9966$, determination coefficient $R^2 = 0{,}9932$, mean absolute percentage error MAPE = 0,8705%).

Model 2 for the prediction of number of Lithuanian inhabitants under the condition of current country's depopulation (million):

$$POPULATION_2 = -0{,}0354 \times YEAR + 74{,}288 \quad (2)$$

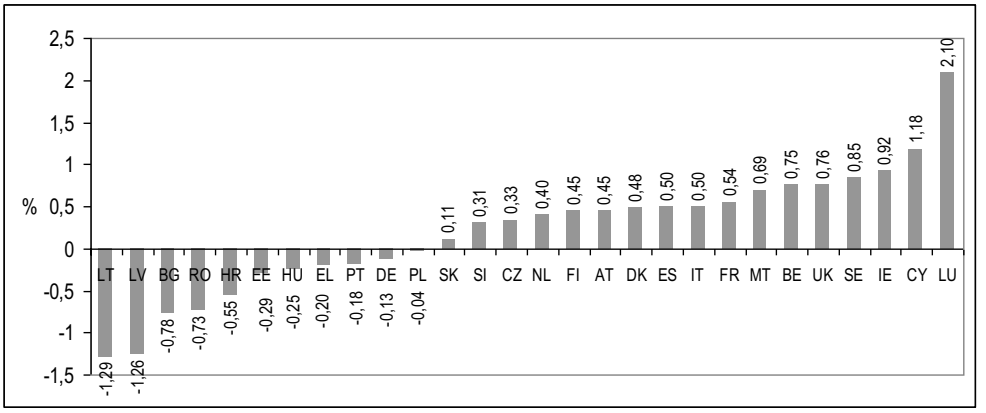
According to the Assumption 2, in 2040 Lithuania will have only 2,072 million inhabitants if the current depopulation trend of 1991 – 2017 years remains the same in future twenty-three years (correlation coefficient of model $r = -0{,}9898$, determination coefficient $R^2 = 0{,}9797$, mean absolute percentage error MAPE = 1.0667%). Compared to the peak-point of Lithuanian population in 1991 (3,704 million), this number is lesser by 44.06%. This huge depopulation of Lithuania can cause very serious economic and social problems in this country.

4 Changes in the Lithuanian population in the European Union and world context

Analyzing the changes of population in the European Union of 2006 – 2015, Lithuania can be considered as country, which loses the highest proportion of inhabitants in current years (Figure 3). The average annual population decrease rate of this country is -1.29%. The other EU countries that meet the depopulation problem are Latvia (-1.26%), Bulgaria (-0.78%), Romania (-0.73%), and Croatia (-0,55%). The highest population growth can be observed in Luxembourg (+2.10%), Cyprus (+1.18%), Ireland (+0.92%), Sweden (+0.85%), and the United Kingdom (+0.76%). The rest 18 EU countries that were not mentioned have the average population change in the range [-0.29%; 0.75%].

Figure 3

Average annual change of EU population in 2006 – 2015



Source: Own processing based on data of the World Bank.

The analysis of world's population statistics has shown that the highest average annual depopulation in 2006 – 2015 was observed in Andorra (-1.85%), Northern Mariana Islands (-1.35%), Georgia (-1.29%), Lithuania (-1.29%), Latvia (-1.26%), Puerto Rico (-1.01%), Bulgaria (-0.78%), Romania (-0.73%), American Samoa (-0.60%), and Croatia (-0.55%). So it can be concluded that Lithuania is the first country in the European Union and the fourth country in the world according to the depopulation statistics. The next chapter aims to reveal the main factors of such huge loss of Lithuanian inhabitants in current years.

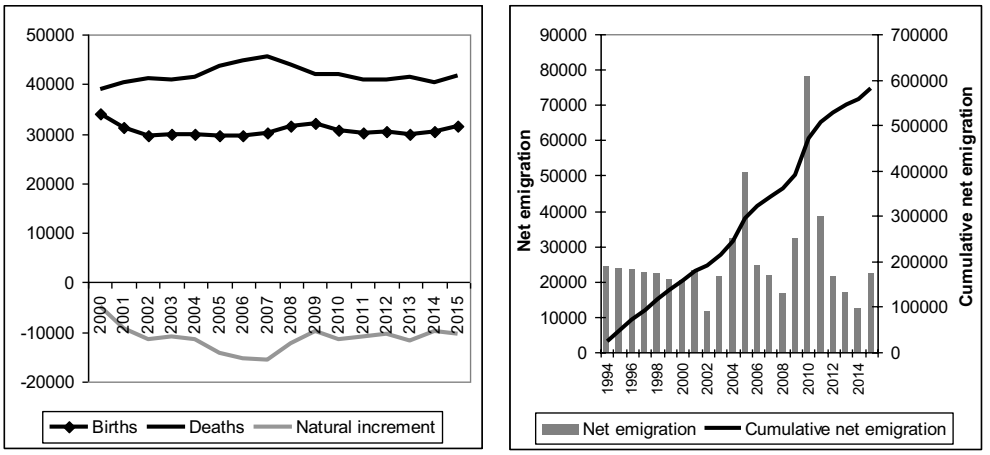
5 Factors of Lithuanian depopulation

The mortality of Lithuanian inhabitants exceeds the birth-rates, so the natural increment of population is negative (Figure 4). In 2000 – 2015 the total number of births was 490,590, while the total number of deaths was 670,454. In these fifteen years Lithuania lost 179,864 inhabitants due to negative natural increment.

The average annual number of births in Lithuania is 30,662 (standard deviation – 1 221.5 births, coefficient of variation – 4.0%), while the average annual number of deaths is 41,903 (standard deviation – 1 775.3 deaths, coefficient of variation – 4.2%). The low variation of current statistics indicates that the negative natural increment of Lithuanian population is quite stable (on average –11 241 yearly) and it can be expected that this negative number with insignificant fluctuations will remain the same.

Figure 4

Demographic factors of Lithuanian depopulation



Source: Own processing based on data of Statistics Lithuania.

The second demographic factor of Lithuanian depopulation is high emigration. Since 1994 the net migration of Lithuanian inhabitants was always negative, which means that every year this country loses population due to negative migration flows. The net emigration statistics (emigrants minus immigrants) is fluctuating but the cumulative net emigration line shows the constant trend of lost Lithuanian population (Figure 4). In average Lithuania loses 26,371 inhabitants every year since 1994 due to emigration. In period of 2001 – 2015 the average annual net migration rate was -8.9 persons to 1,000 inhabitants. The emigration peaks were reached in the years 2005 and 2010. The first peak was influenced by the Lithuania's admission to the

European Union in 2004 when free migration rights became available. The net emigration in 2005 reached 51,096 people, and it was -15,4 persons to 1,000 inhabitants. The second peak was in 2010 when the net emigration reached 77,944 people, and it was -25.2 persons to 1,000 inhabitants. This second peak was caused by the crisis of Lithuanian economy in 2009 – 2010, when the GDP decreased by 17.7% from 32,7 billion EUR in 2008 to 26,9 billion EUR in 2009. The number of bankrupted enterprises in 2009 increased by 92.7%, the unemployment rate in 2010 reached 17.8%. These unfavourable economic condition were significant factors of sudden emigration growth of Lithuanian inhabitants.

Because the cumulative net emigration statistics resembles a straight line (Figure 4), the linear regression model was developed to predict this indicator:

$$NET\ EMIGRATION_{LT\ (thousand)} = 27{,}778 \times YEAR - 55\ 392 \quad (3)$$

The cumulative net emigration of Lithuanian inhabitants in 2015 was 580,2 thousand. The statistical prediction of Lithuanian population cumulative net emigration in 2020 is 719,6 thousand, in 2030 – 997,3 thousand, in 2040 – 1 275,1 thousand inhabitants (correlation coefficient of prediction model r = 0,9927, determination coefficient R^2 = 0,9855, MAPE = 13,9%).

The high emigration of Lithuanian inhabitants is directly related to economic indicators of this country. In 2015 Lithuanian GDP per capita was 12,900 EUR (22nd rank in the EU) and it was lower than EU average by 55.2% (Table 1). 29.3% of Lithuanian population live at risk of poverty or social exclusion (23rd rank in the EU), and this rate is higher than EU average by 5.6%. The compensation of employees per capita in Lithuania was 5,332 EUR (22nd rank in the EU) while the EU average was higher by 157%. The consumption expenditure of households per capita in Lithuania is 8 074 EUR, which means 49.5% of EU average and 20th rank in the list of EU countries.

The Lithuanian inhabitants' average consumption expenditure (8,074 EUR) of one year is higher by compensation of employees (5,332 EUR) because money for consumption purposes is spent not only from salaries, but also from other income sources. The remittances of emigrants are very important for Lithuanian economy having imperfect macroeconomic indicators. The exports of labour force improves the Lithuanian economy due to high cash flows into this country. According to the World Bank's statistics in 2006 – 2015, the emigrants remitted USD15.9 billion, which is in average USD1.6 billion yearly. As the cumulative net emigration of Lithuanian inhabitants is constantly growing (Figure 4), the emigrants' remittances to this country also have tendency to grow (logarithmic regression model in Figure 5). In recent ten years, the amount of remittances was 3.3% – 4.5% of Lithuanian GDP.

The emigration peak of year 2010 (83,157 people) and highest remittances allowed reduce the negative consequences of 2009 – 2010 years' economic crisis and stimulated the consumption in the domestic market (Figure 5).

Table 1

Economic indicators of EU countries in 2015

Rank	GDP per capita		People at risk of poverty or social exclusion		Compensation of employees per capita		Consumption expenditure of households per capita	
	Country	EUR	Country	%	Country	EUR	Country	EUR
1	LU	89 900	CZ	14.0	LU	43 836	LU	27 893
2	IE	55 100	SE	16.0	DK	24 851	UK	25 822
3	DK	47 800	NL	16.8	SE	21 733	DK	22 643
4	SE	45 600	FI	16.8	UK	19 744	FI	21 147
5	NL	40 000	DK	17.7	NL	19 632	AT	20 882
6	UK	39 600	FR	17.7	AT	19 055	SE	20 666
7	AT	39 400	AT	18.3	DE	18 929	DE	20 148
8	FI	38 200	SK	18.4	FI	18 725	IE	18 851
9	DE	37 100	LU	18,5	BE	18 430	BE	18 749
10	BE	36 600	SI	19.2	FR	17 117	FR	18 091
11	FR	32 800	DE	20.0	IE	16 914	NL	17 860
12	IT	27 000	BE	21.1	ES	10 987	IT	16 479
13	ES	23 200	MT	22.4	IT	10 688	CY	14 468
14	CY	20 800	PL	23.4	CY	9 224	ES	13 456
15	MT	20 300	UK	23.5	SI	9 162	PT	11 357
16	SI	18 700	EE	24.2	MT	8 993	EL	11 313
17	PT	17 300	PT	26.6	PT	7 545	MT	10 841
18	EL	16 200	HU	28.2	EE	7 395	SI	9 749
19	CZ	15 800	ES	28.6	CZ	6 315	EE	8 075
20	EE	15 400	IT	28.7	SK	5 575	*** LT ***	**8 074**
21	SK	14 500	CY	28.9	LV	5 452	SK	7 971
22	*** LT ***	**12 900**	HR	29.1	*** LT ***	**5 332**	LV	7 484
23	LV	12 300	*** LT ***	**29.3**	EL	5 257	CZ	7 443
24	PL	11 200	LV	30.9	HR	4 922	PL	6 612
25	HU	11 100	EL	35.7	HU	4 599	HR	6 097
26	HR	10 400	RO	37.3	PL	4 178	HU	5 491
27	RO	8 100	BG	41.3	RO	2 606	RO	4 958
28	BG	6 300	IE	...	BG	2 596	BG	3 932
-	*** EU ***	**28 800**	*** EU ***	**23.7**	*** EU ***	**13 703**	*** EU ***	**16 296**

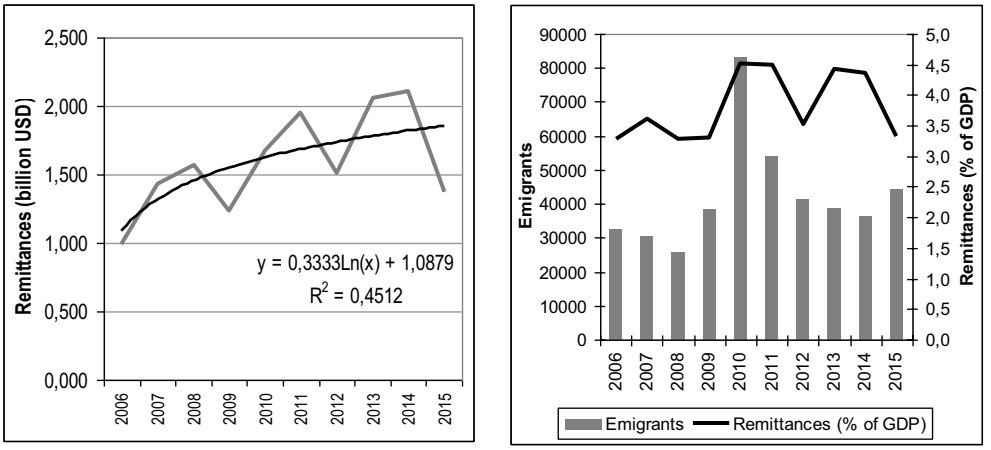
Source: Own processing based on EUROSTAT data.

According to the average annual change of EU population in 2006 – 2015 (Figure 3) the EU countries were classified into three clusters to analyze the main economic factors of countries' attractiveness for their inhabitants and international migrants:

- Cluster 1: Countries with higher than 0.5% annual population growth rate (Luxembourg, Cyprus, Ireland, Sweden, United Kingdom, Belgium, Malta, and France).
- Cluster 2: Countries with annual population growth rate in range [-0,5%; 0,5%] (Italy, Spain, Denmark, Austria, Finland, Netherlands, Czech Republic, Slovenia, Slovakia, Poland, Germany, Portugal, Greece, Hungary, and Estonia).
- Cluster 3: Countries with higher than -0.5% annual population decrease rate (Croatia, Romania, Bulgaria, Latvia, and Lithuania).

Figure 5

Remittances received from Lithuanian emigrants in 2006 – 2015



Source: Own processing based on data of the World Bank.

The average values and coefficients of variation (V) were calculated of GDP per capita, people at risk of poverty or social exclusion (POVERTY), compensation of employees per capita (COMPENSATION), and consumption expenditure of households per capita (CONSUMPTION) in these clusters (Table 2). The most attractive to live EU countries (Cluster 1) have the highest economic indicators. The GDP per capita in Cluster 3, compared to Cluster 1, is lower by 76.5%, the proportion of people at risk of poverty or social exclusion is higher by 11.4%, compensation of employees is lower by 78.6%, consumption expenditure of households is lower by 68.6%. The coefficients of variation in Cluster 1 vary from 20.5% to 55.7%, while the indicators of Cluster 3 are more typical for all countries because the values of coefficients of variation are in range of [16.2%; 34.8%]. It is highly improbable that Lithuanian macroeconomic indicators could really reach the averages of the most developed EU countries of Cluster 1 to become an attractive country to live, but it is probable, that the emigration could be reduced or stopped

if Lithuanian macroeconomic indicators could reach the values of Cluster 2 where the annual population change of these countries is in range of [-0.5%; 0.5%]. In this case the Lithuanian GDP per capita must grow by 148.6%, the proportion of people at risk of poverty or social exclusion must be reduced by 10.2%, compensation of employees per capita must grow by 175.6%, consumption expenditure of households per capita must increase by 118,9%. To reach the average macroeconomic rates of Cluster 1 and to become the EU country attractive to live, Lithuanian GDP per capita must increase by 325.9%, the proportion of people at risk of poverty or social exclusion must be reduced by 11.4%, compensation of employees per capita must grow by 366.3%, consumption expenditure of households per capita must increase by 217.9%.

Table 2

Economic indicators in clusters of EU countries in 2015

	Cluster 1		Cluster 2		Cluster 3	
	Average	**V (%)**	**Average**	**V (%)**	**Average**	**V (%)**
GDP per capita (EUR)	42 588	52.6	24 860	49.6	10 000	27.9
POVERTY (%)	21,2	20.5	22,4	27.0	32,6	16.2
COMPENSATION (EUR)	19 499	55.7	11 526	59.1	4 182	34.8
CONSUMPTION (EUR)	19 423	28.5	13 375	44.7	6 109	28.1

Source: Own processing based on EUROSTAT data.

The Pearson correlation coefficients (r) were calculated between the average population change rate (%) of EU countries in 2006 – 2015 and macroeconomic indicators of Table 2. The values are: $r_{\text{GDP per capita}} = 0,77$, $r_{\text{POVERTY}} = -0,58$, $r_{\text{COMPENSATION}} = 0,75$, $r_{\text{CONSUMPTION}} = 0,74$ what means that there is quite significant statistical dependence between these indicators. The lower interdependence between the population change and the proportion of people at risk of poverty or social exclusion can be explained by the lower differences of percentage values in EU countries; however, undoubtedly the absolute and relative poverty levels in highly developed EU countries of Cluster 1 are higher than in Cluster 3 countries, which increases the attractiveness of developed countries for their inhabitants and immigrants. The poverty risk level in Lithuania is 60% of disposable income median what in 2015 for one person was 259 EUR/month, for the household of two adults and two children up to 14 years old – 544 EUR/month (Statistics Lithuania, 2016). Finally, the canonical analysis results allow to conclude that factors GDP per capita, COMPENSATION, and CONSUMPTION have significant direct impact on the population change in the EU countries (canonical $R = 0,78$), so the economic growth of Lithuania could reduce the emigration, but there is risk

that for highly depopulated country it can be very difficult to ensure the fast economic development.

The multiple regression model was developed to predict the year's net migration (NET MIGRATION) of Lithuanian inhabitants considering the relative differences of analyzed four Lithuanian and average EU indicators: GDP per capita, POVERTY, COMPENSATION, and CONSUMPTION. In addition, the gross capital formation (investments) EUR per capita (INV) and exports EUR per capita (EXP) were included in the analysis. The model is:

$$NET\ MIGRATION_{LT} = -1477149 \times \frac{GDP_{LT}}{GDP_{EU}} - 122096 \times \frac{POVERTY_{LT}}{POVERTY_{EU}} + 563427 \times \frac{COMPENSATION_{LT}}{COMPENSATION_{EU}} +$$
$$+ 98731 \times \frac{CONSUMPTION_{LT}}{CONSUMPTION_{EU}} + 249109 \times \frac{INV_{LT}}{INV_{EU}} + 299524 \times \frac{EXP_{LT}}{EXP_{EU}} + 181196 \quad (4)$$

Table 3

Statistical parameters of multiple regression model

	Beta	Std. Err.	B	Std. Err.	t(3)	p-level
Intercept			181196	345779	0,524022	0,636514
GDP	-4,06188	4,437161	-1477149	1613623	-0,915424	0,427472
POVERTY	-0,62612	0,788485	-122096	153757	-0,794086	0,485160
COMPENSATION	1,11330	5,162416	563427	2612624	0,215656	0,843086
CONSUMPTION	0,27367	7,585359	98731	2736538	0,036079	0,973486
INV	0,76575	1,288314	249109	419107	0,594382	0,594100
EXP	2,51588	2,581466	299524	307332	0,974595	0,401641

Source: Own processing based on EUROSTAT data.

The multiple R of model is 0,85, R^2 = 0,73 what indicates the strong statistical relationship between the net migration of Lithuanian inhabitants and the relative differences of macroeconomic variables in Lithuania and the European Union. The mean absolute deviation (MAD) of the model is 7.680 inhabitants, the other statistical parameters of multiple regression model are given in Table 3. The previous analysis has shown that reduced differences of Lithuanian macroeconomic indicators allow to expect a lower emigration, so the developed multiple regression model enables to measure quantitatively what net migration of Lithuanian inhabitants is probable. As the sudden significant positive changes in the Lithuanian economy are hardly expected, the next chapter aims to foresee the main challenges for the Lithuanian economy that are related to the country's depopulation phenomenon.

6 Forthcoming challenges for the depopulated Lithuanian economy

The first challenge is the constantly decreasing domestic market and final consumption. Manufacturing enterprises that produce products only for home market will meet the problem of decreasing demand, which will necessitate to reduce the manufacturing volume if it is not possible to find the foreign markets for exports. Especially the decreasing demand is typical for services or trading activities where business companies are oriented towards local regional markets. The decreasing demand will cause the necessity to reduce the number of employees in business companies, which worsens the economy by reducing the income of Lithuanian inhabitants and their consumption.

The second challenge is the decline of business efficiency, when the decreasing demand increases the cost price of products and services due to the growing proportion of fixed costs for one production unit. The loss of economies of scale will decrease the competitiveness of manufacturing enterprises compared to the cheaper imported products in the Lithuanian markets. The trading companies also will be forced to increase the prices to keep the business activity profitable when the demand declines. The growing prices will stimulate inflation or in worse scenario stagflation if the real manufacturing volumes decrease.

The third challenge is the risk of losing business investments due to the declining domestic market and lack of labour force. Exporting industries significantly increase the Lithuanian GDP but the attractiveness for the investments of this country can be lost because of sudden declining number of human resources. After the 2009 – 2010 economic crisis, the gross capital formation (investments) in Lithuania increased from EUR4.7 billion in 2010 to EUR7,2 billion in 2015, which means that current average annual growth rate of investments is 8.8%. The accumulated foreign direct investments in 2015 were 13.5 billion EUR. Since 2010 these investments grew in average by 6.1% yearly. The warning signal about future possible slowing of investments' growth can be seen from the stopped growth of Lithuanian exports. In period of 2009 – 2013 the Lithuanian exports grew on average by 20.4% every year until this indicator reached EUR29.4 billion in 2013. In 2014 exports grew only by 0.7% and in 2015 exports decreased by 4.3% to 28.3 billion EUR. The foreign markets are very important to ensure the development of Lithuanian economy under the circumstances of country's depopulation and the loss of demand in other countries can restrict the investments and Lithuanian business development.

The fourth challenge is insufficient development of Lithuanian regions. The decreasing population can cause the chain reaction when the business

investments in regions are restricted by decreasing domestic market and the lack of qualified labour force, while the decreasing business activity causes the higher emigration. The growth of burden for the state's social care system is highly anticipated in slowly developing regions due to poverty cycle effect.

The fifth challenge is increasing pressure for the state's social insurance system. The previous research [15] has shown that in 2040 Lithuania will have only about 2 million inhabitants. Moreover, the structure of the society will be significantly different because of the aging of population. Currently, the economic dependency ratio in Lithuania is 76.3% but in 2040 this predicted indicator will be 135.3%. It means that 100 of employed people will have 135.3 dependants, which is 1.8 times more than today. The current proportion (18.7%) of old-age people (65 years and more) in Lithuanian population will grow to 40.6%. The state's social insurance system will need the essential decisions how to ensure the payments of pensions when the number of labour force declines. The average Lithuanian old-age pension in 2016 is only 255,4 EUR what currently cannot be financed sufficiently from the state's social insurance fund's income because it is highly indebted (the debt of Lithuanian social insurance fund in 2016 was 3.722 billion EUR).

The sixth challenge is growing public debt of Lithuania. The general government's gross debt to GDP increased from 14.6% in 2008 to 42.7% in 2015. During that period, the public debt grew on average by 18.8% yearly and in 2015 reached 15.9 billion EUR. The public debt burden to 1 inhabitant increased from 1.482 EUR in 2008 to 5.456 EUR in 2015. It is evident that the reduction of government's expenditures is necessary to reduce the national budget's deficit because the decreasing population in future can cause the serious problems of public debt's repayment and financing of public expenditures.

In addition, the depopulation of Lithuania can reduce the immovable property prices when the demand of this property declines while the supply grows. In 1996 – 2015 the total living area increased from 75.6 to 89.3 million square meters. The average living area for one inhabitant in this period increased from 21.0 to 30.7 square meters. If the average annual living area increase rate remains the same (0.88% yearly) in 2040 the total living area in Lithuania could be 111.2 million square meters. Divided this expected area by predicted 2,072 million inhabitants in 2040, the average living area for 1 inhabitant could be 53.6 square meters. Decreasing demand to immovable property in depopulated country can reduce its market prices significantly.

Conclusions

The research shows shown that since 1991 Lithuania has encountered a continuous depopulation problem, which is the most significant in the European Union and it is the fourth country in the world according to the depopulation statistics. For the current twenty-five years, Lithuania has lost in average 1% of population every year. This long-term negative trend is quite stable, so there are no signs of possible positive changes in Lithuanian population because of demographic problems and high emigration flows. Under these circumstances, after twenty-three years in 2040 the Lithuanian population will be only 2.072 million people, which is less by 44% than in 1991.

The imperfect economic conditions compared to most other EU countries are very important factors of Lithuanian depopulation. Due to this reason, Lithuania becomes a country exporting its labour force and getting remittances that partly improve the consumption, investments, and economic growth. The statistical analysis allowed to quantitatively measure the strong dependence between the macroeconomic indicators of EU countries and population change rates. The comparison of Lithuanian and EU macroeconomic indicators and statistical modelling allow to expect that the emigration of Lithuanian inhabitants could be reduced if country's GDP per capita could be increased by 148.6%; the proportion of people at the risk of poverty or social exclusion could be reduced by 10.2%; compensation of employees per capita could grow by 175.6%, and the consumption expenditure of households per capita could be increased by 118.9%.

The main forthcoming challenges for the Lithuanian economy caused by the depopulation of country are related to the decline in labour force and domestic market. The decreasing demand for goods and services can restrict the business investments of enterprises that do not export to the foreign markets. The fall of business efficiency can reduce the competitiveness of Lithuanian enterprises due to the growing cost price of their products and services. As the Lithuanian economy highly depends on exports, the non-growing or decreasing demand in foreign countries can worsen the Lithuanian economy significantly, so the priority of Lithuanian economic policy must focus on the promotion of exports, growing industry and services. The Lithuanian regional policy must be oriented towards business promotion to avoid the poverty cycle effect in the undeveloped regions. These decisions can reduce the forthcoming pressure for the state's social insurance system, the income of which is highly dependent on labour force of the country and its economic growth. The productivity growth of the Lithuanian labour force is crucial. The attraction of foreign investments to the regions must become the priority of every municipality. Since currently Lithuania having 2.856 million

inhabitants copes with the problem of national budget's deficit and a growing public debt, the future challenges in public finance management when the population declines will be more complicated.

References

[1] ABDIN, Z. U. – ERDAL, M. B. 2016. Remittance – Sending among Pakistani Taxi-Drivers in Barcelona and Oslo: Implications of Migration-Trajectories and the Protracted Electricity Crisis in Pakistan. In: *Migration and Development.* 2016. Vol. 5, issue 3, p. 378 – 393. ISSN 2163-2324.

[2] ALADOS, C. L. – ERREA, P. – GARTZIA, M. – SAIZ, H. – ESCOS, J. 2014. Positive and Negative Feedbacks and Free-Scale Pattern Distribution in Rural–Population Dynamics. In: *PLOS ONE.* 2014. Vol. 9, issue 12, p. 1 – 17.

[3] ARESTOFF, F. – BRAZ, M. K. – MOUHOUD, E. M. 2016. Remittance Behaviour of Forced Migrants in Post-Apartheid South Africa. In: *The Journal of Development Studies.* 2016. Vol. 52, issue 6, p. 824 – 837. ISSN 0022-0388.

[4] BEINE, M. – SEKKAT, K. 2014. Emigration and Origin Country's Institutions: Does the Destination Country Matter? In: *Middle East Development Journal.* 2014. Vol. 6, issue 1, p. 20 – 44. ISSN 1793-8120.

[5] BILLARI, F. C. 2015. Integrating Macro- and Micro- Level Approaches in the Explanation of Population Change. In: *Population Studies.* 2015. Vol. 69, issue 1, p. 11 – 20. ISSN 0032-4728.

[6] BLANGIARDO, G. C. – RIMOLDI, S. 2013. The Role of Families in the Population Crisis. In: *International Review of Sociology.* 2013. Vol. 23, issue 3, p. 504 – 521. ISSN 0390-6701.

[7] BREZIS, E. S. – YOUNG, W. 2016. Population and Economic Growth: Ancient and Modern. In: *The European Journal of the History of Economic Thought.* 2016. Vol. 23, issue 2, p. 246 – 271. ISSN 0967-2567.

[8] CENCI, A. 2015. A "Capability View" on Migration: Some Theoretical Issues Raised by the Southern Euro Zone Highly Skilled Mobility. In: *Innovation: The European Journal of Social Science Research.* 2015. Vol. 28, issue 4, p. 443 – 463. ISSN 1351-1610.

[9] HANSEN, R. – GORDON, J. C. 2014. Deficits, Democracy, and Demographics: Europe's Three Crises. In: *West European Politics.* 2014. Vol. 37, issue 6, p. 1199 – 1222. ISSN 0140-2382.

[10] HUANG, T. H. – XIE, Z. 2013. Population and Economic Growth: A Simultaneous Equation Perspective. In: *Applied Economics.* 2013. Vol. 45, p. 3820 – 3826. ISSN 0003-6846.

[11] KAUR, M. – SINGH, L. 2016. Knowledge in the Economic Growth of Developing Economies. In: *African Journal of Science, Technology, Innovation and Development.* 2016. Vol. 8, issue 2, p. 205 – 212. ISSN 2042-1338.

[12] LU, M. – KELLER, K. 2016. Perspectives on Population in AP Human Geography. In: *Journal of Geography.* 2016. Vol. 115, p. 101 – 105. ISSN 0022-1341.

[13] LULLE, A. – KING, R. 2016. Ageing Well: The Time-Spaces of Possibility for Older Female Latvian Migrants in the UK. In: *Social & Cultural Geography.* 2016. Vol. 17, issue 3, p. 444 – 462. ISSN 1464-9365.

[14] MARCU, S. 2016. Learning Mobility Challenging Borders: Cross-Border Experiences of Eastern European Immigrants in Spain. In: *Mobilities.* 2016. Vol. 11, issue 3, p. 343 – 361. ISSN 1745-0101.

[15] MILERIS, R. 2016. Changes of Economic Dependency Ratio in Lithuania: Statistical Perspective of 25 Years. In: *Proceedings of 6th International Conference on Changes in Social and Business Environment – CISABE'2016*. 2016, p. 37 – 44. ISSN 1822-7090.

[16] NIJHOFF, K. G. – GORDANO, M. C. 2016. Looking at Intra-European Mobilities through Migrant Types: Young Spanish and Polish Migrants in London and The Hague. In: *Innovation: The European Journal of Social Science Research.* 2016, p. 1 – 22. ISSN 1351-1610.

[17] PASSIG, D. – GERSTENHABER, M. 2014. A Possible Pension-Savings Paradigm for a Sustainable Future: A Developed Country Case Study (UK). In: *Journal of Organisational Transformation & Social Change.* 2014. Vol. 11, issue 3, p. 207 – 229. ISSN 1477-9633.

[18] PAVLIČKOVA, A. – DAYANANDAN, A. 2015. Social Networks and Emigration in Slovakia. In: *Migration and Development.* 2015. Vol. 4, issue 2, p. 220 – 231. ISSN 2163-2324.

[19] ROLFE, J. – KINNEAR, S. 2013. Populating Regional Australia: What Are the Impacts of Non-Resident Labour Force Practices on Demographic Growth in Resource Regions? In: *Rural Society.* 2013. Vol. 22, issue 2, p. 125 – 137. ISSN 1037-1656.

[20] SANZ, M. T. – MICO, J. C. – CASELLES, A. – SOLER, D. 2014. A Stochastic Model for Population and Well-Being Dynamics. In: *Journal of Mathematical Sociology.* 2014. Vol. 38, p. 75 – 94. ISSN 0022-250X.

[21] SEARLE, B. A. – MCCOLLUM, D. 2014. Property-Based Welfare and the Search for Generational Equality. In: *International Journal of Housing Policy.* 2014. Vol. 14, issue 4, p. 325 – 343. ISSN 1461-6718.

[22] SHIN, I. 2016. Change and Prediction of Income and Fertility Rates Across Countries. In: *Cogent Economics & Finance.* 2016. Vol. 4, p. 1 – 34.

[23] TELLI, H. 2014. Less Poverty, More Emigration: Understanding Migrant Flows from Developing Countries. In: *Migration and Development.* 2014. Vol. 3, issue 1, p. 54 – 72. ISSN 2163-2324.

[24] WRATHALL, D. J. – SUCKALL, N. 2016. Labour Migration Amidst Ecological Change. In: *Migration and Development.* 2016. Vol. 5, issue 2, p. 314 – 329. ISSN 2163-2324.