Research Article

Correlation of Income Inequality and Entrepreneurial Activity

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Abstract

The fact of growth of inequality in distribution of income both inside the national economies and between the countries is confirmed by many empirical studies. In particular, these are annual reports of the World Bank, UNIDO and European Commission. The growth of inequality in distribution of income causes social tension inside the countries and promotes conflicts between the countries. Entrepreneurship serves as a form of softening social tension. Entrepreneurial activity ensures a significant percentage of employment and self-employment in many countries providing the income of the population at the level above the minimum consumption rate. In some cases, entrepreneurship could serve as a social lift for transition to a higher level of income distribution.

The goal of this article is a statistical check of dependence between the level of income inequality and entrepreneurial activity in countries with different levels of GDP. A system approach and correlation analysis are used as the study methods.

The statistical check of a correlation between the Gini index and level of entrepreneurial activity showed significant differences in the correlation degree of the said indicators for different countries and time periods. An assumption was made that there is a statistical dependence between the indicators, however, inclusion of additional parameters, among which we can find inequality of the property distribution and the level of institutional support of entrepreneurship, is required.

Keywords: entrepreneurship, Gini index, GEM, entrepreneurial activity, digital economy, .income of top 10%

1. Introduction

The fact of growth of inequality in distribution of income, both inside the national economies and between the counties, is confirmed by many empirical studies. In particular, these are annual reports of the World Bank (2016), UNIDO (2014) and European Commission (2015).

The high level of inequality creates a social tension inside the countries and political instability between the countries. Migration flows increase and the shadow and unnoticeable economy sector grows.

The world knows quite a number of economic mechanisms of solution of the problem of income inequality: from the progressive taxation to social payments, reduced payments and subsidies. Each of them has advantages and disadvantages. As it is shown by K. Lansing and A. Markiewicz (Lansing et al., 2011), the redistribution of income reached 16% of GDP at the state level in the United States in 2008. Entrepreneurship is considered in this article as a mechanism of involvement of the human and social capital in achievement of the necessary and sufficient quality of life by means of increase of the level of general income (Ponomarenko and Gontareva, 2017). Selection of the object of the study is explained by its affordability for a wide circle of

economic subjects with different interests and levels of possibilities.

The properties of manageability and self-organization serve as the subject of the study, while the specific goal of this paper is a statistical check of dependence between the level of income inequality and entrepreneurial activity in the countries with different GDP levels.

Before conducting a statistical analysis (Clause 4), the logic of selection of the Gini index as a method of measurement of income inequality can be found in Clause 2 and a generalized scheme of factors that influence entrepreneurial activity would be formed in Clause 3. Clause 5 contains the authors' interpretation of the statistical analysis results. A system approach and correlation analysis are used as the study methods.

2. Brief Literature Review

Starting with the works of S. Kuznets (1955), inequality in distribution of income is connected with the so-called 'skill premium'. S. Kuznets explained emergence of the skill premium by a shortage of specialists, acquainted with a new technology at the first stages of its use. A shortage of specialists activates the demand-supply mechanism. The market increases the cost of labour of those categories of workers that could and wanted to master new technologies. The skill premium should

disappear at the next stages of development until a new technology emerges.

The skill premium is identified by a correlation of wages of qualified and unqualified workers, Initially, in macroeconomic studies, the qualification level was identified by the length of education. Those workers who had high school education and below, that is they studied less than 12 years, were considered to be unqualified workers. Those workers who had higher special education, that is they studied for more than 15 years, were considered to be qualified workers (see, in particular, Romer, 1990).

This approach to understanding qualification doesn't reflect its economic essence as a degree of differences in a complexity of performed operations. In order to assess the labour complexity, Krusell et al. (2000) offered to take additionally into account the capital-skill complementarity. Complementarity, in this case, should be understood to mean the level of elasticity of the connection between the labour and capital. If machines rather easily replace the labour, it is considered to be low-qualified.

E. A. Hanushek and D.D. Kimko (2000), in their turn, introduce the concept of quality of education. They acknowledge that a correct measurement of qualification is contextual and is possible at the micro level only, while it is a latent variable for macro analysis.

These issues became actual in the digital economy (Shorikov & Babenko, 2014). First, it is at the initial stages of its development; second, the professional structure of the labour market and requirements to employers and employees change; and, third, the information and communication technologies deeply penetrate into all spheres of social life creating a new way of life - the information society in terminology of M. Castells (2000). As a result, a 'bundle' of S. Kuznets cycles, interaction between which results in nonlinear and heterogeneous effects, emerges.

Statistics shows that, in a greater degree, inequality manifests itself during analysis of functions of the innovation process participants. According to Bakija et al. (2008), the growth of income of top 1% of the US population was 11.2% during the period of 1998-2005.

Only 1.3% out of them could be referred to the income of entrepreneurs, inventors and research engineers. Financiers and managers of major corporations got the main share of income. J. Song et al. (2012) showed that the difference in wages is explained, most probably, by income inequality between firms rather than by inequality inside a firm (Song et al., 2015). In general, about 80% of all income for this period was received by top 10% of the US population (Bakija, Cole & Heim, 2012), which mostly contained financiers, lawyers, actors and sportsmen.

It is more logical to use more generalized indicators, the most well-known among which the Gini index is (Aghion, 2016), in such a situation for measuring inequality. It is most frequently used in the reports of international organizations. The Gini index is a macro-economic indicator, which reflects the degree of deviation of actual distribution of money income from their complete equality. The range of its deviation is from 0 to 1. The index allows comparing distribution of income for the countries with a different size of population and scale of economy in dynamics. A high level of generalization has the reverse side. In particular, the Gini index doesn't take into account the sources of income, which could be received as dividends from the proprietary rights and as entrepreneurial income or wages. Moreover, statistics takes into account only the official income, which might conceal the real value of the indicator for the countries with a high level of the shadow market. That is why, the data from 10 countries for 20 years will be used for checking the hypothesis about a correlation between the income inequality and entrepreneurial activity. It should reduce, to a certain extent, the margin of error in the calculations.

3. Entrepreneurship as a Stabilizing Factor

According to statistical studies of A. Atkinson, T. Piketty & E. Saez (2011), the degree of inequality of income distribution in the United States is close to the historical maximum (Figure 1), creating a U-shaped curve.
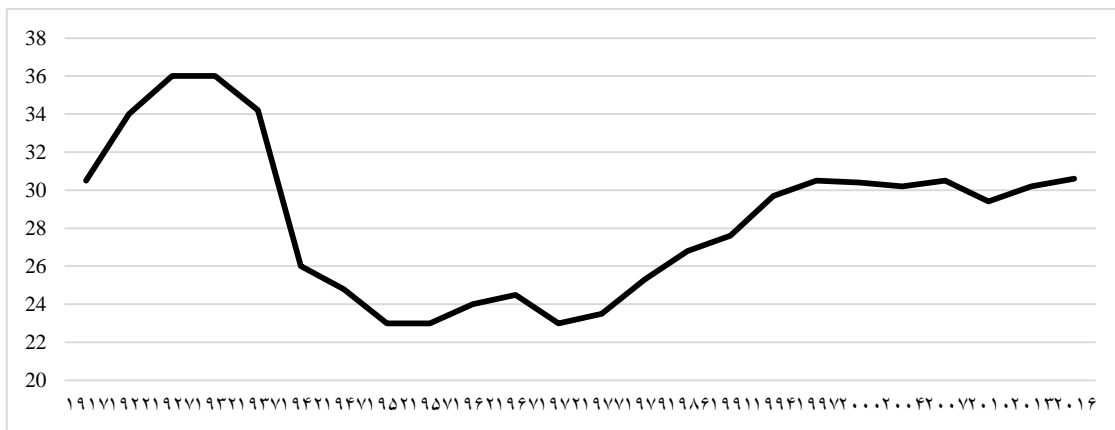

Fig. 1. Income of top 10% in the United States (based on Atkinson, Piketty & Saez, 2011 and Income share held by highest 10% (World Bank estimate)

In different countries, the U-shaped curve may have a flatter second branch (Germany, France, Japan, etc.) or even steeper ascent (the countries, which previously were the parts of the USSR), but the general tendency is observed all over the world, with maybe one exception - Cuba. The correlation between the wealth in distribution of income and inequality in life quality manifests itself differently in each of the countries. The society may have a tolerant attitude towards existence of various standards of consumption of basic goods with the overall access to these goods. The situation is very different in poor countries, where the population doesn't always have means for decent existence.

The opinion that entrepreneurship is one of the basic means of increasing the general level of economic development could be considered to be rather justified (see, for example, Commission of the European Communities, 2003, Davidsson P., 2016 and Gontareva I. et al., 2020). Entrepreneurial activity is a consequence of interaction and complementarity of many internal and external incentives. The role of the basic internal factor is played by the quality of human capital, especially such its characteristics as the general level of education, tendency to analysis, creativity, commitment to achievement of the

result and confidence in own powers. Human capital doesn't emerge by itself but reflects specific features of character building in the family, national traditions, the general level of education in a country, the overall attitude of the society to labour, wealth and poverty in general and income distribution inequality in particular.

Global Entrepreneurship Monitor (GEM, 2017) and World Bank (The World Bank, 2017) provide the most complete data on entrepreneurial activity. There are certain differences between them on identification of the entrepreneurial life cycle stages and methods of formation of statistical samplings. We will use the World Bank data further on, since it simultaneously provides the Gini index data. Entrepreneurship is identified as a percentage of population, which wants to carry out entrepreneurial activity, looks for opportunities, starts own businesses and tries to stay in the market (22. Total early-stage Entrepreneurial Activity (TEA) / The World Bank, 2017).

4. Empirical Analysis

The results of the analysis of the Gini index changes in different countries of the world in dynamics during the period from 2000 until 2016 are shown in Fig. 2.
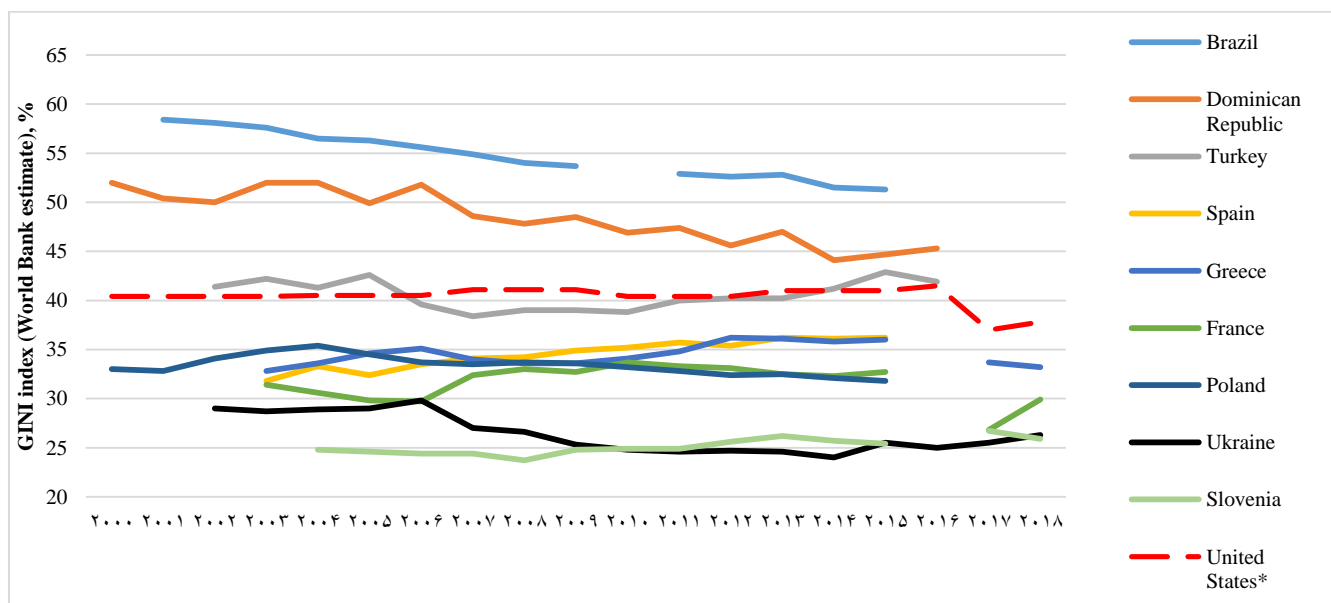
*the US data are not complete in (GINI index (World Bank estimate)
Fig. 2. The Gini index in different countries of the world for the period 2000-2018 (processed on the basis of (GINI index (World Bank estimate)

The Gini index in Brazil is the highest one despite its decrease from 58.4 to 51.4 in 2015. The index reaches 41.4 in the US in 2016 and coincides with the trajectory of change in Turkey, where the value was 41.9 in 2016 and decreased in 2017-2018.

Ukraine and Slovenia have the lowest values in this sampling. The Gini index in Ukraine decreased from 29 in 2002 to 25 in 2016, while the tendency worsens in Slovenia where the Gini index increased from 24.8 in 2004 to 26.7 in 2017.

The next stage is assessment of entrepreneurial activity (TEA) in the countries under consideration (Fig. 3).

The highest level of entrepreneurial activity is observed in Brazil (20.3 in 2017) and Dominican Republic. Turkey and the US have lower values of entrepreneurial activity if compared to Brazil. Thus, the index of entrepreneurial activity in 2018 was 14.2% in Turkey and 15.6% in the US. These four countries also have the highest Gini index. At the same time, insignificant fluctuations in entrepreneurial activity, which was 5.2% in 2018, were observed in Poland in 2010-2018, while the Gini index in

Poland also fluctuates within 5%. Dependence between the index of entrepreneurial activity and Gini index is also not clearly observed in other countries under consideration. Due to this, the hypothesis about interdependence (correlation) between these two indices should be checked.

Let's calculate the Pearson coefficient to determine the adequacy of the data for trustworthiness of calculations. In the event of finding critical values for the Pearson coefficient, the number of the degrees of freedom is 19 (k = 19), consequently n - 2 = 19 - 2 = 17, while $r_{кр} = 0.58$. Thus, the general Pearson coefficient ($r_{кр} = 0.58$) is significant, since it is higher than 0.56 ($r_{кр} > 0.56$).
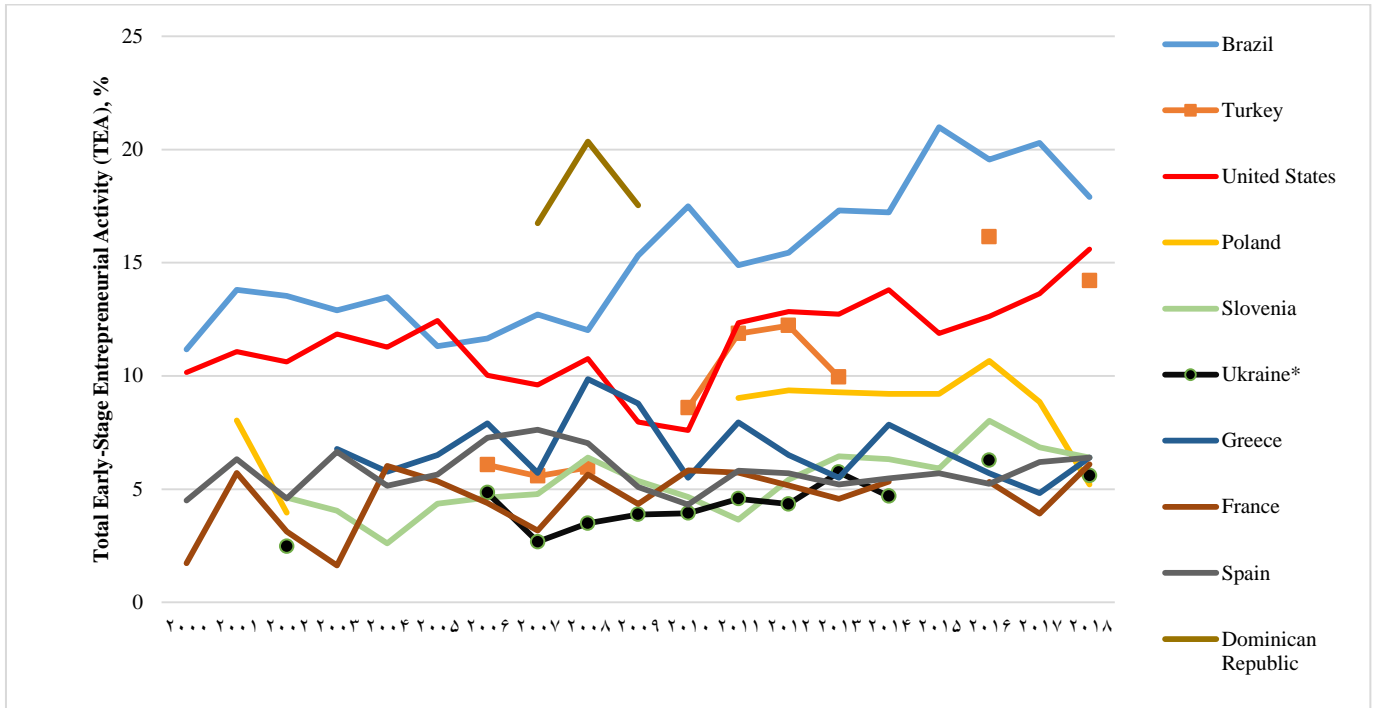
*authors' assumptions

Fig. 3. The levels of entrepreneurial activity (TEA) in different countries of the world in 2000-2018 (processed on the basis of (Total early-stage Entrepreneurial Activity (TEA) / The World Bank.)

Table 1
Correlation coefficient between TEA – Gini

Country	Correlation coefficients between TEA – Gini
Total	**0.765**
Brazil	-0.689
Dominican Republic	-0.996
France	0.331
Greece	-0.162
Poland	-0.369
Slovenia	0.464
Spain	-0.427
Turkey	-0.213
Ukraine	-0.426
United States	-0.476

The level of correlation between the Gini index and index of entrepreneurial activity for the period of 2000-2018 is identified with the use of the correlation analysis (Table 1).

The Gini index is significantly connected with the index of entrepreneurial activity on the basis of all countries. The total correlation coefficient between TEA - Gini shows a significant level of dependence (0,765). This is also confirmed by the correlation coefficient values for such countries as Brazil (-0.689) and Dominican Republic (-0.996). Besides, there is a reverse causality in Brazil and Dominican Republic. The correlation between the indices in other countries is insignificant.

Intermediate calculations in cumulative total over years for each of the 10 countries and the general value are presented in Table 2.

Table 2
Intermediate calculations of the correlation coefficient between TEA – Gini

Years	Total	Brazil	Dominican Republic	France	Greece	Poland	Slovenia	Spain	Turkey	Ukraine	United States
2001	0.967	-									
2002	0.868	1.000				-1.000					
2003	0.845	0.997				-1.000					
2004	0.871	0.307		-1.000	-1.000	0.143		-1.000			0.241
2005	0.861	0.683		-0.785	-0.199	0.143	-1.000	-0.954			0.583
2006	0.862	0.784		-0.654	0.545	0.143	-0.921	-0.004		1.000	0.197
2007	0.855	0.623		-0.617	0.474	0.143	-0.937	0.402	1.000	0.666	-0.486
2008	0.813	0.644	-1.000	-0.183	0.053	0.143	-0.941	0.457	0.953	0.457	-0.397
2009	0.819	0.007	-0.996	-0.167	-0.024	0.143	-0.714	-0.002	0.953	0.161	-0.603
2010	0.821	0.007	-0.996	0.053	-0.062	0.143	-0.655	-0.317	-0.055	0.007	-0.328
2011	0.825	-0.241	-0.996	0.144	0.019	-0.123	-0.693	-0.313	0.641	-0.194	-0.375
2012	0.824	-0.413	-0.996	0.167	-0.093	-0.289	-0.313	-0.329	0.773	-0.270	-0.413
2013	0.821	-0.532	-0.996	0.162	-0.249	-0.359	0.149	-0.393	0.769	-0.397	-0.240
2014	0.819	-0.639	-0.996	0.169	-0.164	-0.409	0.269	-0.413	0.769	-0.440	-0.063
2015	0.814	-0.703	-0.996	0.169	-0.175	-0.443	0.305	-0.408	0.769	-0.440	-0.024
2016	0.808	-0.703	-0.996	0.169	-0.175	-0.443	0.305	-0.408	0.894	-0.449	0.105
2017	0.907	-0.703	-0.996	0.169	-0.175	-0.412	0.470	-0.408	0.894	-0.449	-0.272
2018	0.765	-0.689	-0.996	0.331	-0.162	-0.369	0.464	-0.427	-0.213	-0.426	-0.476

We can see from Table 2 that the general correlation coefficient significantly reduced in 2018 to 0.765 compared to 0.907 in 2017. Significant changes were observed in Turkey from 0.894 in 2017 to -0.213 in 2018. The similar significant changes were also observed in 2009-2010: 0.953 and -0.055 respectively. This characterizes the processes of recession in the country. The fall of the national currency and slowdown of economy were observed in Turkey in 2018 (Gall, 2019).

Due to the insufficient coincidence of the data by countries, the hypothesis about correlation between the income inequality and entrepreneurial activity is only partially confirmed.

5. Discussion

Results of the empirical analysis suggest that there is a correlation between the income inequality and entrepreneurial activity. On the other hand, the Gini index on income distribution alone is insufficient for describing this connection. There are many prerequisites for the second assumption. Authors believe that two most significant prerequisites are high mobility of capitals and differences in regulatory policies of national governments. High cash flows facilitate accumulation of the capitals, which freely flow in the modern conditions from one country to another and from one industry to another. The capital movement incentives are either expectations of a fast speculative profit or, vice versa, interest in relatively small but stable income. Similarly, the human capital may also flow either in the shadow market or labour markets with a relatively high and stable wages. The Gini index for Ukraine goes down namely due to the outflow of the financial and human capital.

The positive correlation between TEA - Gini for France and Slovenia is based, in its turn, on the significant support of entrepreneurship at the legislative level as well as in financial and information terms. Apparently, a balance between the support and reduction of motivation to entrepreneurial activity has been found.

6. Conclusion

The growth of the income distribution inequality causes social tension inside the countries and promotes conflicts between the countries. Entrepreneurship serves as a form of softening social tension. Entrepreneurial activity ensures a significant percentage of employment and self-employment in many countries providing the income of the population at the level above the minimum consumption rate. In some cases, entrepreneurship could serve as a social lift for transition to a higher level of income distribution. The most widespread generalized assessment of income inequality is the Gini index. The statistical check of a correlation between the Gini index and level of entrepreneurial activity showed significant differences in the degree of correlation of the said indicators for different countries and time periods. An assumption was made that there is a statistical dependence between the indicators, however, inclusion of additional parameters, among which we can find inequality of the property distribution and the level of institutional support of entrepreneurship, is required.

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