

# The Impact of Social Factors on Macroeconomic Stability: Empirical Evidence for Ukraine and European Union Countries

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## Abstract

The main objective of the paper is to study the role and power of the influence of social factors on macroeconomic stability. The integral indicator of human capital is suggested that allows to consider social factors that need urgent attention from the position of a potential source of increasing macroeconomic stability in the context of the future of the European vector of development of Ukraine. A block diagram is proposed for estimating the integral index of human capital, which consists of five main stages. The results of the work testify to the presence of a positive and statistically significant connection at the level of 5% between social factors and macroeconomic stability of Ukraine in the period 2000-2015. Along with social factors, the openness of the economy and the volume of foreign direct investment are used to increase the accuracy of the model describing the dynamics of macroeconomic stability.

**JEL Classification:** E60, C19, O15, O20, O40.

**Keywords:** economic growth, macroeconomic stability, social factors, EU, index.

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## Introduction

The last global financial and economic crisis has led to an acceleration in the growth rates of disproportions in the socio-economic development of countries. The two main negative aspects of the impact of the crisis were the experience of high and stable rates of unemployment and the growth of social inequality (Castells-Quintana & Royuela, 2012).

As shown in official statistical data in Figure 1, the European standard of living, measured by gross domestic product per capita in the period 2008-2016 remains statistically lower than in the pre-crisis period. Thus, during the period 2000-2007, the rate of GDP growth per capita in the EU countries averaged about 4%. The most positive dynamics of this indicator on average for 2000-2007 demonstrated the economy of Latvia (9.67%), Lithuania (8.73%), Estonia (8.5%), Bulgaria (7.2%), Romania (6.75%). It is noteworthy that the average unemployment rate for the analyzed period (7.16%) in the countries mentioned only in Romania was lower than for the EU countries as a whole (8.25%). In general, only 5 EU countries occupied positions in the upper quartile for both indicators – the Czech Republic, Slovenia, Hungary, Ireland and Romania. These countries had the highest average growth rates of GDP per capita with a minimum level of unemployment (see Figure 1).

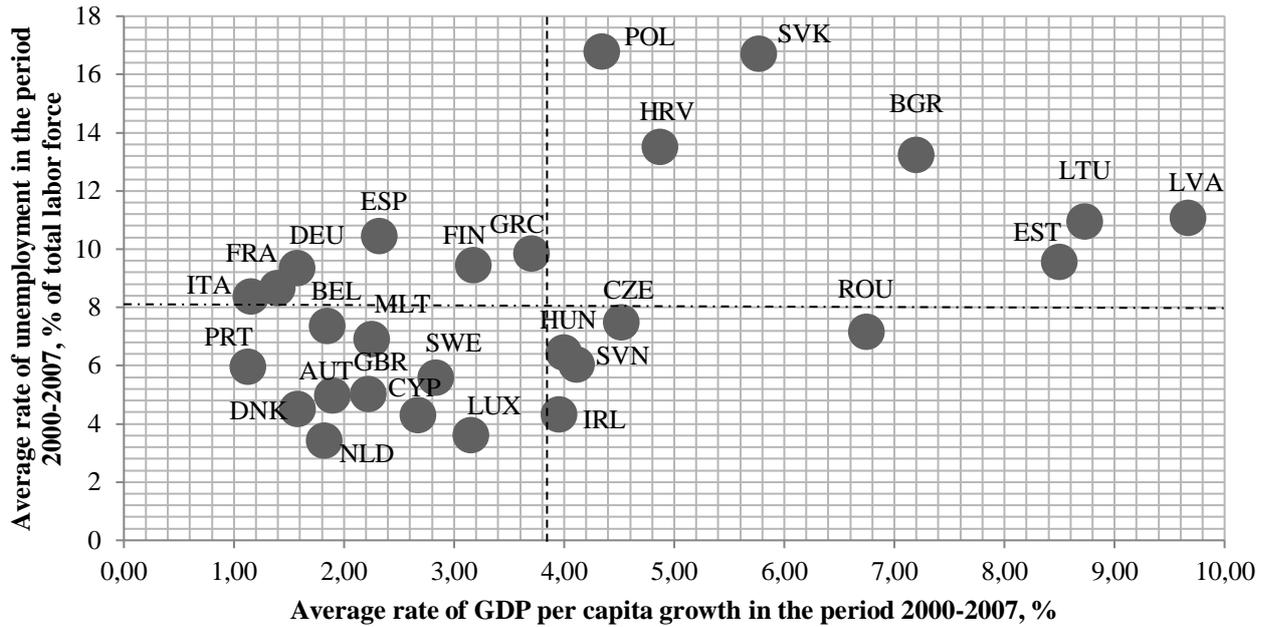
The trend of changes in the growth rates of GDP per capita ( $Y$ ) in the EU countries from the unemployment rate ( $Un$ ) for the period from 2000 to 2007 is described by the regression model (1):

$$Y(Un) = 6.1447850 - 0.2810339 \times Un \quad (1)$$

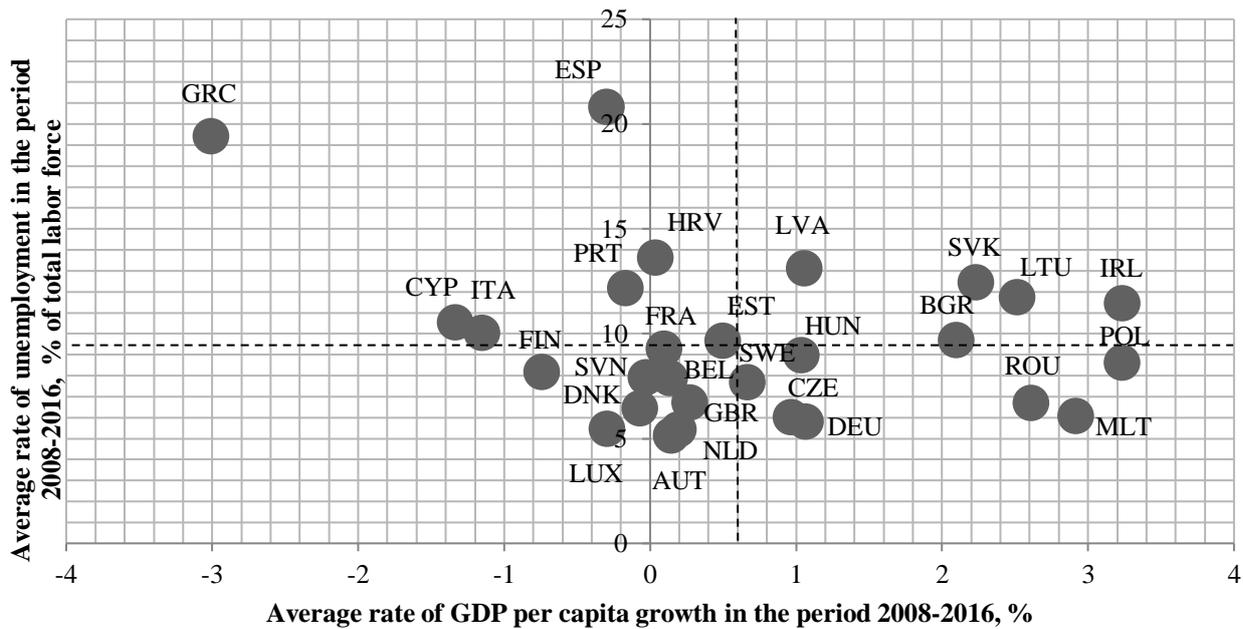
The regression model indicates that the unemployment rate has a negative and very significant impact on the economic growth of the EU countries in the period 2000-2007. The main characteristics of the obtained regression model are given in Table 1.

The results of a panel analysis of the dependence of GDP growth rates per capita in the EU countries on the level of unemployment for the period from 2000 to 2007

	Coef.	Std. Err.	$t$	$P >  t $	[95% Conf. Interval]
$Un$	-0.2810339	0.0561092	-5.01	0.000	-0.3916926 -0.1703752
Const	6.144785	0.474773	12.94	0.000	5.208436 7.081134



a)



b)

Notes: Austria–AUT; Belgium–BEL; Bulgaria–BGR; Cyprus–CYP; Czech Republic–CZE; Germany–DEU; Denmark–DNK; Spain–ESP; Estonia–EST; Finland–FIN; France–FRA; United Kingdom–GBR; Greece–GRC; Croatia–HRV; Hungary–HUN; Ireland–IRL; Italy–ITA; Lithuania–LTU; Luxembourg–LUX; Latvia–LVA; Malta–MLT; Netherlands–NLD; Poland–POL; Portugal–PRT; Romania–ROU; Slovak Republic–SVK; Slovenia–SVN; Sweden–SWE.

Source: the authors' own calculations based on World data (World Bank, 2017)

**Figure 1. Comparison of the average rates of economic growth per capita and unemployment in the member countries of the European Union: a) in 2000-2007, and b) in 2008-2016 years.**

In the period from 2007 to 2016, the economies of the EU countries were in the greatest recession. So in the year 2009. From all EU countries only in Poland there was GDP growth per capita (2.75%), significant negative changes occurred in Estonia (the fall in GDP per capita at 14.56%), Lithuania (13.86%), Latvia (12.98%) and Slovenia (8.63%). From 28 EU countries only 8 on a parity of indicators of growth of gross national product per capita and unemployment have occupied positions in the upper quartile. They are Swit-

zerland, the Czech Republic, Germany, Hungary, Bulgaria, Romania, Malta and Poland. However, as noted above, the average level of GDP growth per capita in the EU countries was 0.64% in 2008-2016, which is almost six times less than in the pre-crisis period. From 2008 to 2016 the largest increase in this indicator, more than four times regarding the mean value for 28 EU countries took place in Ireland (5.06%), Malta (4.57%), Poland (5.06%), Romania 4.08%).

According to the criteria proposed by the European Commission for the detection, prevention and emergence of potentially harmful macroeconomic imbalances that could adversely affect economic stability in the member states of the EU (European Commission, 2015), the excess of 10% of the average unemployment rate for the last three years occurred in Greece (14.97%), Spain (12.03%), Croatia (5.53%), Cyprus (4.67%), Portugal (2.47%), Slovakia (1.47%), France (0.27%). The lowest average annual unemployment rate in the last three years was recorded in Germany (4.57%), Austria (5.77%), Czechia (5.03%), Great Britain (5.4%), Malta (5.3%).

In the period 2008-2016, the main characteristics of the regression model (2) of the dependence of GDP per capita ( $Y$ ) in the EU countries on the unemployment rate ( $Un$ ) are given in Table 2.

$$Y(Un) = 1.406869 - 0.0805075 \times Un \tag{2}$$

Table 2. The results of a panel analysis of the dependence of GDP growth rates per capita in the EU countries on the rate of unemployment for the period from 2008 to 2016

	Coef.	Std. Err.	$t$	$P >  t $	[95% Conf. Interval]
$Un$	-0.0805075	0.0562327	-1.43	0.152	-0.1907217 0.0297066
Const	1.406869	0.6016552	2.34	0.019	0.2276466 2.586092

The transformations in Ukraine because of the global financial and economic crisis occurred in most aspects of public life such as the rate of employment, wages, incomes, or the amount of state spending for social purposes and the like. So the unemployment rate in 2016 increased by 3% compared to 2007 and amounted to 9.4% or 1691.5 thousand people (Ukraine, 2017). A consequence of this negative trend was an increase in the unemployment rate among the population aged 15-24 (23%). It should be noted that for the first time since 2007 this unemployment rate exceeded by 0.7% the average for the EU countries (in 2016 – 8.7%). However, throughout the analyzed period only in 2002 the average unemployment rate exceeded 10% and amounted to 10.73% (see Figure 2).

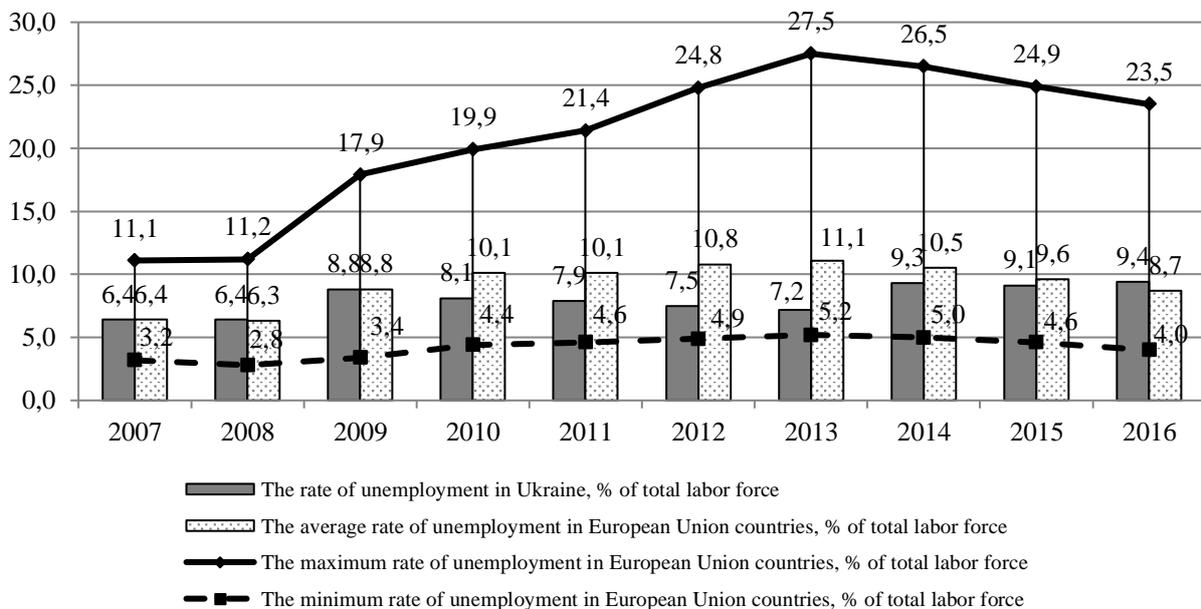
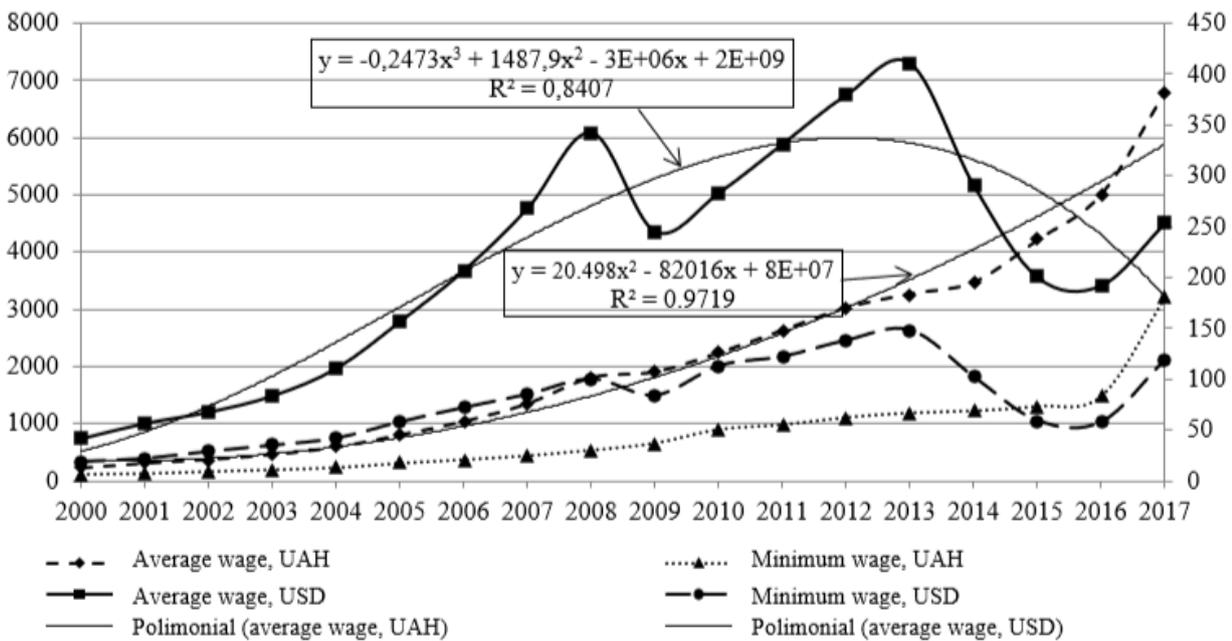


Figure 2. The comparison of the unemployment rate in Ukraine and the EU in the period 2007-2016

Source: the authors' own calculations based on World data (World Bank, 2017).

The level of average and minimum wages in the hryvnia equivalent since 2000 rapidly grew and amounted in 2017 to 6785 UAH and 3200 UAH, respectively. But relative to the dollar there is an ambiguous trend according to Figure 3: in the period from 2000 to 2008 the level of minimum and average wages grew, and in 2014-

2017, due to the growth of the dollar, it rapidly declined to its minimum in 2016 (\$58), which corresponded to the level of 2005 (\$58). Its maximum level of minimum and average wages in the pre-crisis and after the crisis period reached in the years of constant marks of the dollar, so in 2008 its level was \$100 and \$342, and in 2013 it comprised \$148 and \$410 (see Figure 3). Among the EU countries, as of January 1, 2017 according to Eurostat (2017) the minimum wage was in Bulgaria (EUR 235), which was able to achieve a high relative growth since 2008 (+ 109%) compared with the 22 EU member states in which the minimum level of wage is legally established. Ukraine according to the current trend of 2014-2017 and the level of the minimum wage falls several times behind the EU member states, in particular, with which it borders. So Poland and Romania were able to raise the minimum wage in 2014 from 12.3% to 44.74% (Poland from 404€ per month in 2014 to 453€ per month in 2017 as of January 1, Romania from 190€ to 275€ per month). In absolute terms, the highest level of the minimum wage as of January 1, 2017 was reached in Luxembourg (1999€ per month), and in Great Britain – an absolute growth (+146€ per month) (Eurostat, 2017).



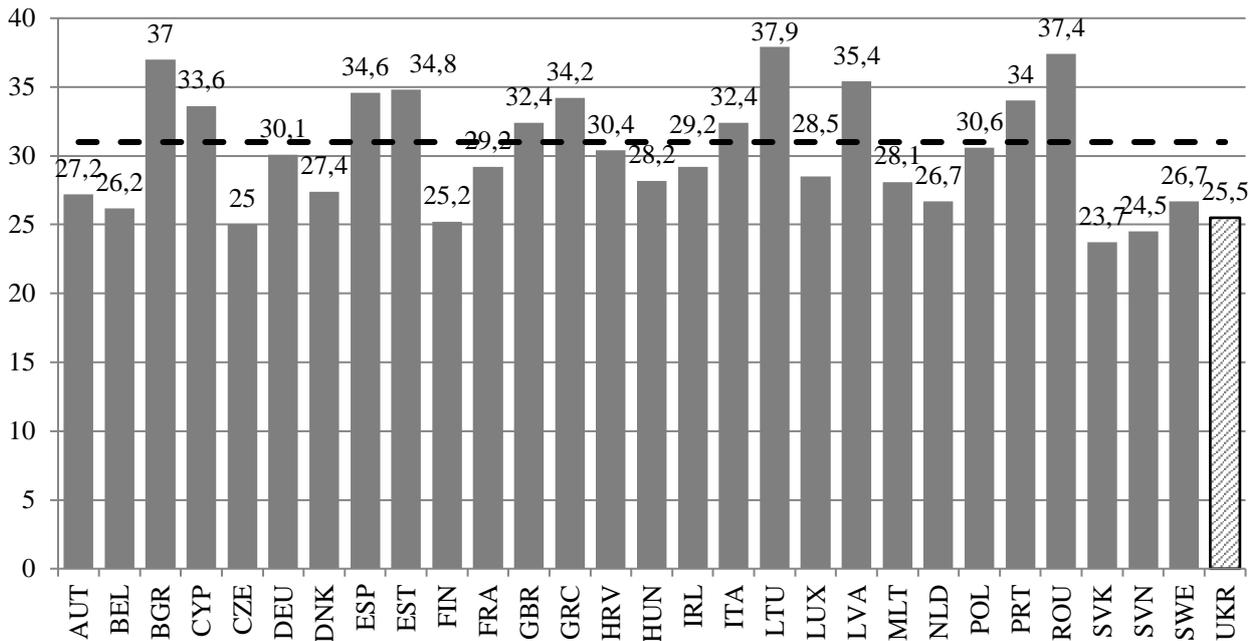
**Figure 3. The dynamics of average and minimum wages in Ukraine for 2000-2017**

Source: the authors' own calculations based on State statistics service of Ukraine (Ukrainy, 2017).

The inequality of income distribution has a significant negative impact on the country's economic growth (Cingano, 2014). Inequality hinders the political process and democratic governance because it generates the appearance of corruption due to the concentration of wealth and income in certain groups of people (You and Khagram, 2005). The Gini index is the most common measure of inequality, which is estimated on a scale from 0 (complete equality) to 100 (general inequality) (World of Work Report, 2008).

In 2015, Ukraine made significant progress in ensuring an even distribution of income among the population (the Gini index was 25.5). Comparing this indicator with the EU countries (see Figure 4) only Slovenia (24.5), Slovakia (23.7), Finland (25.2) and the Czech Republic (25) had a lower income inequality level than Ukraine. Bulgaria, Lithuania, Romania had the highest level of the Gini index in 2015, which exceeded the average for the EU by 6, 6.9 and 6.4 points, respectively.

The conducted correlation-regression analysis of the influence on the growth of Ukrainian GDP structure of the population by age in the period 1991-2016. It showed a statistically significant and positive relationship between GDP and the population aged 15-64 (Table 3). According to the data given in Table 3, it can be argued that along with other factors that need to be considered since the proposed model only describes the interdependence by 25%, an increase in the structure of the population aged 15-64 can lead to an increase in GDP.



Notes: Austria–AUT; Belgium–BEL; Bulgaria–BGR; Cyprus–CYP; Czech Republic–CZE; Germany–DEU; Denmark–DNK; Spain–ESP; Estonia–EST; Finland–FIN; France–FRA; United Kingdom–GBR; Greece–GRC; Croatia–HRV; Hungary–HUN; Ireland–IRL; Italy–ITA; Lithuania–LTU; Luxembourg–LUX; Latvia–LVA; Malta–MLT; Netherlands–NLD; Poland–POL; Portugal–PRT; Romania–ROU; Slovak Republic–SVK; Slovenia–SVN; Sweden–SWE; Ukraine–UKR.

Source: the authors' own calculations based on Eurostat data (Eurostat, 2017).

Figure 4. Gini Coefficient (2015)

Table 3. The relationship between GDP and the population of Ukraine during 1991-2016

Source	SS	df	MS			
Model	2.07109762	1	2.07109762	Number of obs =		
Residual	5.94261987	24	.247609161	F( 1, 24) =		
Total	8.01371749	25	.320548699	Prob > F =		
				R-squared =		
				Adj R-squared =		
				Root MSE =		

GDP	Coef.	Std. Err.	t	P> t	[95% Conf. In	
POP	14.76598	5.105583	2.89	0.008	4.228575	2
_cons	-37.38261	21.59233	-1.73	0.096	-81.94699	7

Source: the authors' own calculations based on World data (World Bank, 2017).

### Literature review

Marco Buti, Director General for Economic and Financial Affairs at the European Commission in his work "Balancing Imbalances: Improving Economic Governance in the EU after the Crisis" notes that one of the main reasons for the negative impact of the recent financial and economic crisis on the economies of the EU member states was the accumulation of increasing macroeconomic instability (Buti, 2011).

Theoretical and applied prerequisites for the influence of social factors on macroeconomic indicators were comprehensively considered in the works of foreign scientists. Ana-Maria Popa uses an econometric model to test the direction and significance of social factors on the economic growth of the EU countries in the period 2005-2009 (Popa, 2012). The author uses the real GDP per capita as the dependent variable and the independent variables are: population at risk of poverty, unemployment rate, life expectancy and expected years of schooling. The result of the study was the confirmation of the hypothesis of the existence of a strong connection between the human and economic development of the country. In addition, for a more complete

analysis, except the proposed parameters, in the opinion of the authors, additional financial, political and legislative factors are needed in the framework of each country under study.

More I. and Aye G.C. (More & Aye, 2017) use the Cobb-Douglas production function (3) to show role of social infrastructure in economic growth and inequality in South Africa for the period 1994-2013.

$$Y = f(GDCF, LFPR, EDUEXP, HEXP, T) \quad (3)$$

where  $Y$  – GDP per capita; GDCF – gross domestic capital formation; LFPR – labour force; EDUEXP – education expenditure; HEXP – health expenditure;  $T$  – trade openness.

The authors come to the conclusion that there is a different orientation and power of influence on economic growth and inequality in spending on education and health (More & Aye, 2017). So, for economic growth, the impact of spending on education was statistically significant and positive, and health care expenditure was negative and statistically insignificant. On inequality, education costs were expected to be negatively affected, but this dependence was statistically insignificant, as opposed to health expenditure had a significant and negative impact (More & Aye, 2017).

Empirical research in the work “The impact of basic and social infrastructure investment on South African economic growth and development” recognizes that the basic and social infrastructure has a positive impact on economic growth and social development on South African (Gnade et al., 2017). The authors note that “the economic growth and social development return would be greater in rural municipalities” (Gnade et al., 2017).

David Castells-Quintana and Vicente Royuela (2012) investigated the relationship between economic development and unemployment. They found that along with rising income inequality high and stable rate of unemployment has a negative and significant effect on long-term economic growth. However, the authors note that “unemployment may seriously harm growth not only because it is a waste of resources, but also because it has serious distributional effects: it generates redistributive pressures and subsequent distortions; it depreciates existing human capital and deters its accumulation; it drives people to poverty; it results in liquidity constraints that limit labour mobility; and finally it erodes individual self-esteem and promotes social dislocation, unrest and conflict” (Castells-Quintana & Royuela, 2012).

Mahmoud A. Al-Habees and Mohammed Abu Rumman (2012) claim that there is a significant correlation between economic growth and changing rates of unemployment in Jordan and Some Arab Countries. Main results of the study of Shatha Abdul-Khaliq, Thikraiat Soufan and Ruba Abu Shihab show that an increase in economic growth of 1% will lead to a decrease in the unemployment rate 0,16% (Abdul-Khaliq et al., 2014).

David E. Bloom, David Canning and Jaypee Sevilla considering in their work “Economic Growth and the Demographic Transition” the relationship between population change and economic development in particular regions of the world: East Asia; Japan; OECD, North America and Western Europe; South-central and Southeast Asia; Latin America; Middle East and North Africa; Sub-Saharan Africa; and Eastern Europe they come to the conclusion that it is necessary to carry out the corresponding population policies of the countries, since the age structure of the country’s population, which is characterized by the economic activity of people at different stages of life, can have a significant impact on the country’s economic development and competitiveness (David et al, 2001). The authors’ study is based on three main hypotheses: 1) population growth restricts economic development (the pessimistic theory); 2) population change can fuel economic growth (the optimistic theory); 3) population change has no significant effect on economic growth (the neutralist theory). An additional factor of the country’s economic growth is the level of education of its population (Lutz et al., 2008). The use of the modified Cobb-Douglas model in the work (Odit, 2010) allowed the authors to conclude that one of the explanations for the impressive growth factors of Mauritius GDP in the period 1990-2006 was the education of the population, it really serves as an instrument for increasing labor productivity. The analysis of the main determinants of economic growth in more than 100 countries between 1960 and 1995 showed a positive relationship between economic growth and the starting level of average years of school attainment of adult males at the secondary and higher levels (a insignificantly related to years of school attainment of females at the secondary and higher levels (Barro, 2000).

The purpose of the article is to determine the influence of social factors on macroeconomic stability.

## Results

The global financial and economic crisis, the processes of globalization, the growth of the need for limited resources, the aging of the society determined the need for the new member states to implement the structur-

al reforms, based on the transition from the paradigm of the continuous social and economic development of the concept of sustainable development (EPSC, 2016). One of the key documents that reflected the principles of sustainable development in the post-crisis was the Europe 2020 strategy (European Commission, 2010). The Europe 2020 strategy was adopted in 2010 lays the groundwork for the adoption by EU member countries of policy investing in education and human potential, and does so in a manner that favors the protection of the environment and achieves reasonable and sustainable economic growth. The main driver and source of balanced development is human capital, therefore accepted by Ukraine the vector of European development should take into account the relevant main trends in the implementation of economic growth policies. As noted by the authors of the work (Ukraine, 2017), the factors of security, culture, science, education, and healthcare acquire urgent attention from the position of the future development of Ukraine.

Considering the above, we propose to use the integral Human Asset Index (HAI), which is calculated based on three basic subindices "Life, Health, Well-being", "Science, Education, Culture", "Freedom, Equality, Safety" and considers the factors of security, culture, science, education, health:

$$HAI = \sqrt[3]{I_{LHW} \times I_{SEC} \times I_{FES}} \quad (4)$$

where  $I_{LHW}$  is the subindex "Life, Health, Well-being",  $I_{SEC}$  is the subindex "Science, Education, Culture",  $I_{FES}$  is the subindex "Freedom, Equality, Safety".

Each of the subindexes of formula (4) is calculated as the square root of the arithmetic mean of the sum of squared indicators of the components of the corresponding subindex:

$$I_i = \sqrt{\prod_{j=1}^n X_{jt}} \quad (5)$$

where  $I_j$  is the  $i$ -th subindex,  $X_{jt}$  is the corresponding normalized indicator of the  $j$ -th indicator for the  $t$ -th period of the  $i$ -th subindex.

The main stages of calculating the integral Human Asset Index are shown schematically in Figure 1 (see in Appendix).

With this approach of calculating the integral Human Asset Index (HAI), the use of a single system of indicators allows for a comparative analysis of different countries to identify fluctuations in their development and to carry out the impact assessments on the country's macroeconomic stability.

The sources of information and the method of calculation for each indicator, which we used to build an integral Human Asset Index is presented in Table 4.

Table 4. The calculation and sources of information on variables that are included in the analysis

Variable	Calculation	Source	The direction of impact
The subindex "Life, Health, Well-being"			
Human development index	The index ranges from 0 to 1	Human Development Report (HDR, 2016)	stimulator
Global hunger index	The index ranges from 0 – the best score (without starvation) to 100 – the worst	The International Food Policy Research Institute (GHI, 2017)	destimulator
Prosperity index	The index ranges from 0 to 100	Legatum institute (LPI, 2017)	stimulator
Health expenditure, total (% of GDP)	Total health expenditure is the sum of public and private health expenditure to GDP	World Development Indicators (World Bank, 2017)	stimulator
Population ages 15-64 (% of total)	Total population between the ages 15 to 64 as a percentage of the total population	World Development Indicators (World Bank, 2017)	stimulator
Population ages 0-14 (% of total)	Population between the ages 0 to 14 as a percentage of the total population	World Development Indicators (World Bank, 2017)	stimulator
GNI per capita (current US\$)	GNI per capita is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population	World Development Indicators (World Bank, 2017)	stimulator

Table 4 (cont.). The calculation and sources of information on variables that are included in the analysis

Variable	Calculation	Source	The direction of impact
Poverty headcount ratio at national poverty lines (% of population)	National poverty headcount ratio is the percentage of the population living below the national poverty lines. National estimates are based on population-weighted subgroup estimates from household surveys	World Development Indicators (World Bank, 2017)	destimulator
Life expectancy at birth, total (years)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life	World Development Indicators (World Bank, 2017)	stimulator
The subindex "Science, Education, Culture"			
Patent applications, residents	Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention--a product or process that provides a new way of doing something or offers a new technical solution to a problem	World Development Indicators (World Bank, 2017)	stimulator
Global innovation index	The index is ranged: from 0 to 7 (2007-2010) from 0 to 100 (2011-2017)	Cornell University, INSEAD, and the World Intellectual Property Organization (GII, 2017).	stimulator
Government expenditure on education, total (% of GDP)	General government expenditure on education (current, capital, and transfers) is expressed as a percentage of GDP	World Development Indicators (World Bank, 2017)	stimulator
Gross enrolment ratio, tertiary, both sexes (%)	Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown	World Development Indicators (World Bank, 2017)	stimulator
Research and development expenditure (% of GDP)	Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications.	World Development Indicators (World Bank, 2017)	stimulator
The subindex "Freedom, Equality, Safety"			
Index of economic freedom	The index ranges from 0 (minimum freedom) to 100 (maximum freedom)	The Heritage Foundation (EF, 2018).	stimulator
Press Freedom Index	The index is ranged from 0 (the best indicator) to 100 (the worst indicator)	Reporters Without Borders (PFI, 2017).	destimulator
Civil liberties index	The index ranges from 1 (maximum freedom) to 7 (minimum freedom)	The Freedom House (CLI, 2018).	destimulator
International property rights index	The index ranges from 0 to 10	DC-based Property Rights Alliance (IPRI, 2017)	stimulator
Networked readiness index	The index ranges from 1 (maximum freedom) to 7 (minimum freedom)		destimulator

Since within the framework of the proposed methodology for calculating the integral HAI, the information base of indices of both stimulants and destimulators is used, the procedure for their normalization acquires the urgency by means of the following formulas:

- for stimulant indicators which increase is accompanied by an increase in the integral HAI:

$$X_{jt} = \frac{k_{jt}}{\max_t \{k_{jt}\}} \tag{6}$$

where  $k_{jt}$  is the actual value of the i-indicator for the j-th period;

$X_{jt}$  – normalized j-th index for a t-th period.

– for indicators-destimulators, which increase is accompanied by a decrease in the integral HAI:

$$X_{jt} = \frac{\max_t \{k_{jt}\} - k_{jt}}{\max_t \{k_{jt}\} - \min_t \{k_{jt}\}} \tag{7}$$

It should be noted that in the absence of official information on the maximum or minimum value of the proposed indicators in Table 4, we propose to compare them with the development parameters of a specific EU country, which is the most economically powerful in this case.

The properties of these main explanatory indices of the integral HAI and their description are given in Table 5.

Table 5. Descriptive statistics of the main explanatory indicators of the integral Human Asset Index (based on our own calculations)

Variable	Mean value	Standard deviation	Minimum value	Maximum value
Human development index	0.7211875	0.0237661	0.673	0.748
Global hunger index	4.972941	2.545208	1.9	13.7
Prosperity index	52.75636	0.6532274	51.75	53.93
Health expenditure	6.776947	0.7071699	5.588903	7.807534
Population ages 15-64	69.52356	.4272054	68.60608	70.16267
Population ages 0-14	14.9422	.8896512	14.10357	17.11799
GNI per capita	2265.882	1076.691	700	3800
Poverty headcount ratio at national poverty lines	27.21333	29.43246	3.8	83.3
Life expectancy	69.25442	1.381256	67.85951	71.18951
Patent activity	3139.882	1421.289	1601	7208
Global innovation index	23.93727	16.94854	2.24	37.6
Government expenditure on education	5.911403	0.8269676	4.16794	7.31364
Gross enrolment ratio	72.68068	12.62112	48.70301	84.1975
Research and development expenditure	0.8792119	0.1509864	0.61742	1.11322
Index of economic freedom	49.25	3.031647	45.8	55.8
Press Freedom Index	35.69167	11.44866	19.3	54
Civil liberties index	2.583333	.5149287	2	3
International property rights index	4.06	.2796824	3.4	4.3
Networked readiness index	3.788	.2482292	3.48	4.2

With a view to approbation of the methodology we proposed, we calculated the values of HAI and its subindexes for Ukraine in the period 2000-2015 (Table 6).

Table 6. Integral HAI for Ukraine in the period 2000-2015 (based on our own calculations)

Year	The subindex "Life, Health, Well-being"	The subindex "Science, Education, Culture"	The subindex "Freedom, Equality, Safety"	The integral Human Asset Index
2000	0.438001	0.31474	0.478	0.403911
2001	0.448497	0.339052	0.485	0.419362
2002	0.41648	0.259105	0.482	0.373284
2003	0.479307	0.267234	0.511	0.403004
2004	0.412642	0.336875	0.537	0.421055
2005	0.416914	0.337549	0.681909	0.457829
2006	0.43329	0.337559	0.693269	0.466312
2007	0.51921	0.332889	0.655212	0.48381
2008	0.563385	0.33304	0.605088	0.484217
2009	0.588606	0.324972	0.588305	0.482789
2010	0.569229	0.242975	0.52361	0.416824
2011	0.56961	0.294811	0.50478	0.43928

Table 6 (cont.). Integral HAI for Ukraine in the period 2000-2015 (based on our own calculations)

Year	The subindex “Life, Health, Well-being”	The subindex “Science, Education, Culture”	The subindex “Freedom, Equality, Safety”	The integral Human Asset Index
2012	0.567057	0.308142	0.500701	0.443934
2013	0.586373	0.308142	0.533333	0.458466
2014	0.600309	0.29108	0.542448	0.455948
2015	0.585397	0.149037	0.514046	0.35529
Coefficient of variation	14.41%	16.79%	12.88%	8.92%

It should be noted that the analysis of the variation of these subindexes and the integral Human Asset Index (Table 6) does not exceed 33%, which makes it possible to characterize the given aggregate as homogeneous. The average level of integral HAI during the entire analyzed period is 0.44 units, corresponding to a moderate level of development. After analyzing the data given in Table 6, it is fair to say that one of the factors restraining the positive dynamics of the integral Human Asset Index were the components of the subindex “Science. Education. Culture” the average level of which during the analyzed period was 0.3 units and was marked by the greatest variability.

To check the statistical significance of the relationship between social factors on macroeconomic stability, we suggest using the model proposed in the paper (Melnyk, 2018), which can be written in the form of a regression equation:

$$MI = \alpha + \beta(HAI) + \delta(Z) + \varepsilon, \tag{8}$$

where *MI* is an integral indicator of macroeconomic stability (Vasylieva, 2018), which is based on the methodology for determining the average arithmetic normalized indicators: 1) the ratio of the fiscal deficit to GDP ratio; 2) the sum of the unemployment and inflation rates; 3) the ratio of the external debt-to-GDP ratio (Briguglio et al., 2009); *Z* is a vector of variables that explain the behavior of macroeconomic stability over time (the openness of the economy measured as the percentage of total trade to GDP (Openness), прями інвестиції (FDI));  $\alpha$ ,  $\beta$  and  $\delta$  are the constants of the equation;  $\varepsilon$  is the error associated with the approximation of the model and the stochasticity of its factors.

Considering the data given in Table 7, the results of the evaluation of the impact of social factors on the macroeconomic stability of Ukraine for the period 2000-2015, the regression equation (8) can be written as follows:

Table 7. The results of assessment of the impact of social factors on Ukrainian macroeconomic stability for the period 2000-2015 (based on our own calculations)

Source	SS	df	MS	Number of obs = 16			
Model	.653552027	3	.163388007	F( 4, 11) =	9.04		
Residual	.198767859	12	.018069805	Prob > F =	0.0017		
				R-squared =	0.7668		
				Adj R-squared =	0.6820		
Total	.852319885	15	.056821326	Root MSE =	.13442		

MI	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
Openness	.0851309	.7423848	0.11	0.911	-1.548847	1.719109
FDI	.073064	.058469	1.25	0.237	-.0556255	.2017535
I <sub>ПК</sub>	1.090892	.5034568	2.17	0.053	-.0172089	2.198993
_cons	11.06019	5.369536	2.06	0.064	-.7580848	22.87846

$$MI = 11.06019 + 1.090892 * (HAI) + 0.0851309 * (Openness) + 0.073064 * FDI \tag{9}$$

According to the main results, the empirical findings of the study indicate a positive and statistically significant relationship at the level of 5% between social factors and macroeconomic stability of Ukraine in the period 2000-2015. The results of the empirical study show that the growth of the integral human asset index HAI by 1% increases the level of macroeconomic stability by more than 1.09%. The selected set of factors

almost by 77% percent describes the dynamics of changes in Ukrainian macroeconomic stability during 2000-2015.

The results of calculating the integral human asset index serve as an information base for the introduction of appropriate measures to increase the country's macroeconomic stability.

## Conclusions

The last global financial and economic crisis has led to the acceleration in the growth rates of disproportions in the socio-economic development of countries. The two main negative aspects of the impact of the crisis were the experience of high and stable rates of unemployment and the growth of social inequality. As the analysis showed, the excess of 10% of the average unemployment rate for the last three years occurred in Greece (14.97%), Spain (12.03%), Croatia (5.53%), Cyprus (4, 67%), Portugal (2.47%), Slovakia (1.47%), France (0.27%). The lowest average annual unemployment rate in the last three years was recorded in Germany (4.57%), Austria (5.77%), the Czech Republic (5.03%), Great Britain (5.4%), Malta (5.3%), the living standard, measured by gross domestic product per capita in the period 2008-2016 remains statistically lower than in the pre-crisis period.

One of the main reasons for such negative impacts of the recent financial and economic crisis on the economies of the EU member states was macroeconomic instability. Therefore, in the context of identifying factors that enhance macroeconomic stability, social factors take on a special place. The authors, based on the experience of the EU member states, have determined that the factors of security, culture, science, education, and healthcare are of vital importance from the perspective of future development of Ukraine. In particular, the development of the indicator of the level of the country's human capital as a target for the construction of an appropriate monitoring system and, in the future, the implementation of measures of stabilization macroeconomic policy is of great importance.

It was noted that along with significant progress in ensuring an even distribution of income among the population in Ukraine, the current trend of 2014-2017 and the level of the minimum wage is several times behind that of the EU member states. Since 2007 the unemployment rate for the first time was 0.7% higher than the average for the EU countries (in 2016 – 8.7%).

The structural scheme of an estimation of integrated human asset index which consists of five basic stages is developed in the work: identification of relevant indicators which will be formed by each of subindexes; filtering selected at the previous stage relevant indicators based on the analysis of the correlation matrix of each of the subindexes; normalization of indicators in each of the subindexes, calculation of the integral indicator for each of the subindexes, calculation of the final integral human asset index.

The proposed integral human asset index allows us to provide a quantitative assessment of the level of development of security factors, culture, science, education, health, whose target point should be considered its approximations to unity.

The calculation of integral human asset index for Ukraine for 2000-2015 showed that one of the factors restraining the positive dynamics of the integral human asset index were the components of subindex "Science. Education. Culture", the average level of which during the analyzed period was 0.3 units and was marked by the greatest variability. In general, in Ukraine, the average level of the integral index *HAI* throughout the analyzed period was 0.44 units, corresponding to a moderate level of development. At the same time, the empirical findings of the study of the influence of the integral index *HAI* on the macroeconomic stability of Ukraine in the period 2000-2015 evidenced a positive and statistically significant relationship at 5% between them. The results obtained assert that growth of integral human asset index *HAI* by 1% increases the level of macroeconomic stability more than by 1.09%.

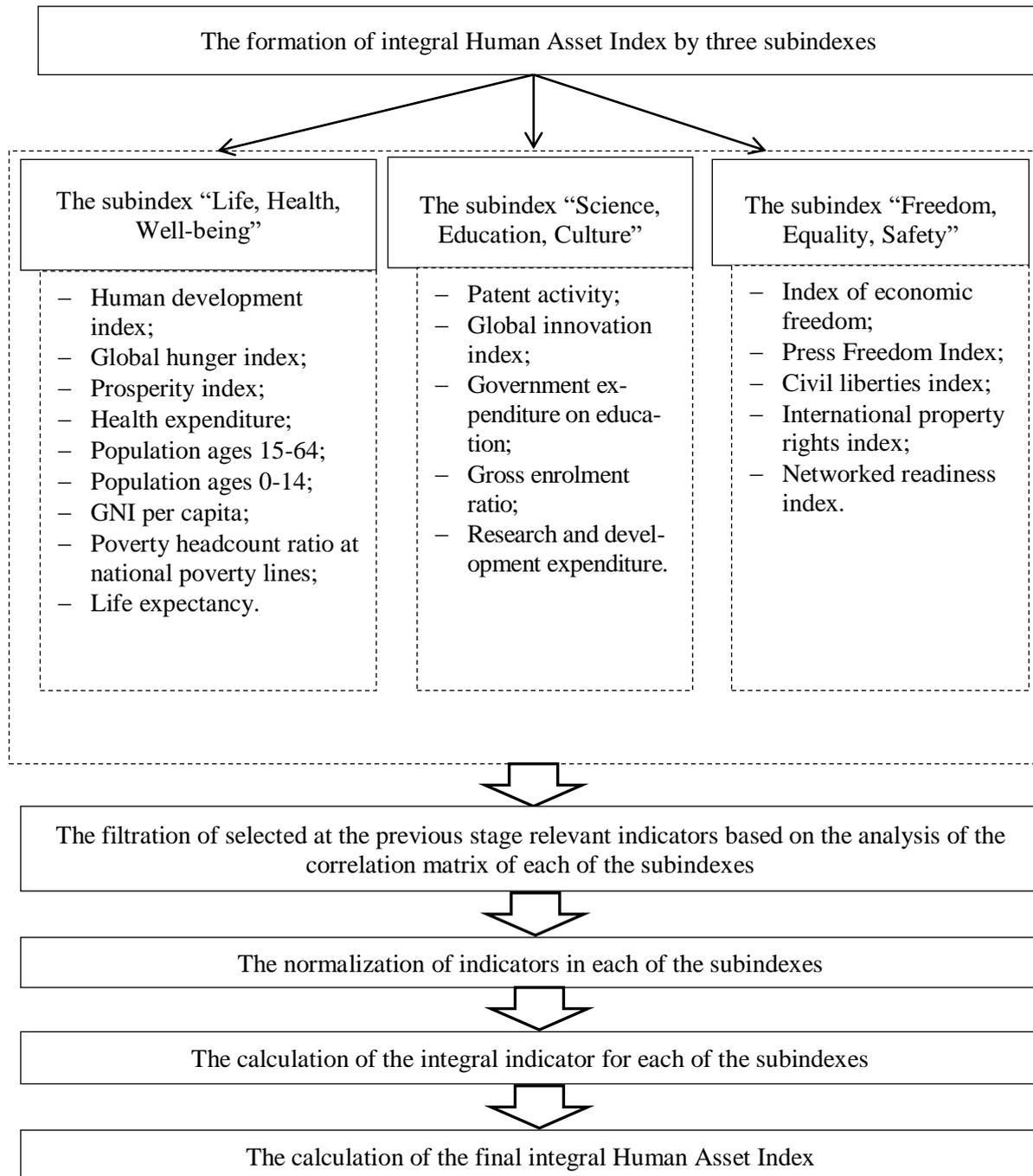
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**Appendix**



Source: based on (Ukraine, 2017).

**Figure 1. Structural diagram of the evaluation of the integral Human Asset Index**