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dr Khrystyna Shparyk (PhD)

ORCID ID: <https://orcid.org/0000-0002-9896-2392>

Ivan Franko National University of Lviv

INFLUENCE OF INSTITUTIONAL FACTORS ON THE ECONOMIC EFFICIENCY OF THE COUNTRIES OF THE WORLD

Introduction

Despite the fact that considerable human and natural resources are concentrated in some countries of the world, they remain economically ineffective. Scientists believe that the reason for the difference in income between countries of the world is productivity rather than factors accumulation (Tiffin, 2006). The difference in productivity arises at different levels of technological development and production efficiency. Assuming that technologies are equally available, the question arises – how to increase efficiency? Efficiency is the ability to bring the effect, the effectiveness of the project, etc., which are defined as the ratio of the effect (the result) to the costs that provided this result. The effectiveness shows not the result itself, but the price at which it is achieved (Mochernyj, 2000). We believe that institutions, both formal and informal constraints and incentives that influence the ability of an individual to act productively, play a key role in increasing efficiency. Institutions characterize the structure of the state and are its indispensable components.

1. Material and methods

According to Rodrick, Subramanian and Trebbi (2004) all economic schools that are investigating the problem of uneven economic development, that is, find out the reasons for the significant difference between the incomes of rich and poor countries in the world, can be divided into three groups, namely:

1. Followers of geographic theory, who believe that the geographical position of the country is the main determinant of its level of development, since it affects the climate and the provision of natural resources, which in turn affects the spread of illness, transport costs and the level of technology spread. All of these factors have a significant impact on agricultural productivity and human potential (Diamond 1997; Gallup, Sachs, and Mellinger 1998, and Sachs 2001).

2. Followers of the theory of integration, who believe that international trade is the driving force behind productivity growth and income in the country. They argue that barriers for participation in world trade are determinants of

economic convergence between regions of the world, and in the globalization debate followers of integration theory point out benefits from world economic integration; (Frankel and Romer (FR,1999) and the pre- geography work of Sachs (Sachs and Warner 1995).

3. Proponents of institutional theory, defending the rule of law and private property. According to the principles of this theory, “rules of the game in society” determine the level of development of the state (North (1990), Hall and Jones (1999), Acemoglu, Johnson, and Robinson (AJR, 2001).

Following the institutional theory of D. North, S. Johnson and J. Robinson, we believe that the quality of the institutions depends to a large extent on the effectiveness of the mechanisms of economic development of the state. The concept of the institution is quite broad, but in this study attention is focused on such indicators as rule of law, political and economic freedom, the fight against corruption, the effectiveness of government policy, the independence of the judiciary, the protection of private property rights, freedom of international trade, etc. (Fraser Institute (2013). The effectiveness of the institutional mechanism in the state determines its level of development, and the effectiveness of the economy, in the main, is influenced by economic institutions, which, in turn, are influenced by political institutions.

1.1. Theoretical considerations

Scientists distinguish several sources of inefficiency (Tiffin, 2006):

1. Unproductive activity (theft, smuggling, political lobbying for the production of unnecessary goods).
2. Inefficient use of resources (unemployment is caused not only by macroeconomic instability, but also by the inefficiency of state-owned enterprises).
3. Inappropriate distribution of factors of production between sectors, which may cause mobility constraints (price per factor does not correspond to marginal productivity).

Let's assume that inefficiency as deviation from production capacity, is a function of certain economic and institutional variables. We examine the influence of institutions and economic variables on the efficiency of world economies in order to determine the factors affecting global economic unevenness. The survey covered 185 countries in the 1980, 1990, 2000 and 2010, and is based on a slightly expanded model of L. Adkins, L. Mumo and A. Savvides, since more countries and longer periods of time were taken into account (Adkins, Mumo & Savvides, 2002). The analysis also covers more factors that can affect performance.

We use the indicators of some endogenous variables, namely the level of economic freedom, the level of political freedom, the level of development of human capital, labor force, gross fixed capital accumulation and GDP. We also include fragile state index.

1.2. Data

We analyze the following endogenous variables:

- the level of economic freedom (The Heritage Foundation, 2013) (ECF) – index proposed by The Heritage Foundation and The Wall Street Journal is based on 12 quantitative and qualitative factors, grouped into four broad categories, or pillars, of economic freedom such as rule of law (property rights, government integrity, judicial effectiveness), government size (government spending, tax burden, fiscal health), regulatory efficiency (business freedom, labor freedom, monetary freedom), open markets (trade freedom, investment freedom, financial freedom);
- the level of political freedom (Freedom House, 2013) – index created by Freedom House which is an annual study of political rights (PR) and civil liberties (CR). It analyses the electoral process, political pluralism and participation, the functioning of the government, freedom of expression and of belief, associational and organizational rights, the rule of law, and personal autonomy and individual rights;
- the level of human capital development (United Nations Development Programme, 2013) (HUM) – index used to measure a country's development by the United Nations Development Program (UNDP)'s Human Development Report Office. The HDI is the geometric mean of normalized indices for each of the three dimensions: the health dimension is assessed by life expectancy at birth, the education dimension is measured by mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita;
- the level of state fragility (The Fund for Peace, 2015) (FAIL) – index created by The Fund for Peace includes twelve conflict risk indicators, namely cohesion indicators (security apparatus, factionalized elites and group grievance), economic indicators (economic decline, uneven economic development, human flight and brain drain), political indicators (state legitimacy, public services, human rights and rule of law), social and cross-cutting indicators (demographic pressures, refugees and IDPs, external intervention);
- labor force (World Bank, 2013) (L), namely the population of the country aged 15 and older, which is consistent with the definition of the International Labor Organization as an economically active population. The indicator covers the employed and unemployed citizens;
- gross fixed capital accumulation (World Bank, 2013) (K) (constant, USD, 2005) as the basis for ensuring the capitalization of the country's economy;
- Gross Domestic Product (World Bank, 2013) (GDP) (constant, USD, 2005).

1.3. Empirical Analysis

To calculate economic growth, we use the "stochastic boundary method" to assess the efficiency of resource use, as well as to evaluate the production function, given that resources can be used inefficiently. For the first time, the stochastic production function was developed in 1977 independently by two groups of economists – D. Aigner, S. Lovell, P. Schmidt (Aigner, Lovell & Schmidt, 1977) and W. Meeusen and J. van den Broeck (Meeusen, Van den Broeck, 1977). Researchers came to the conclusion that the residual member of the regression equation of the production function consists of two elements, one of which reflects the influence of random factors, and the other - the level of technical inefficiency (Krasnikova & Podvysotska, 2009). To a certain extent, this model was improved by G. Battese and T. Coelli in 1995, by proposing a method for estimating the stochastic production function for unbalanced panel data (Battese & Coelli, 1995), which allows the remaining inefficiencies to vary over time and has the following form:

$$y_{it} = x_{it}\beta + (V_{it} - U_{it}); \quad i = 1, \dots, N \quad t = 1, \dots, T,$$

where y_{it} – logarithm of the output of the country i dependent on time variable t (for example, GDP for the country's production function);

x_{it} – vector of inputs (labor, physical and human capital);

β – vector of unknown parameters;

V_{it} – random variables that are assumed to be independently and identically distributed $iid N(0; \sigma_v^2)$;

U_i – random variables that account for inefficiency in production $N(m_i; \sigma_u^2)$.

It is assumed that $N(m_i, \sigma_u^2)$ is independently distributed.

The average value of inefficiency is the deterministic function of the p explanatory variables

$$m_{it} = z_{it} \delta,$$

Where δ – p - measurable vector of model parameters to be evaluated.

According to a study by G. Battese, G. Corra (Battese & Corra, 1977) we know that:

$$\sigma^2 = \sigma_v^2 + \sigma_u^2$$

and

$$\gamma = \frac{\sigma_u^2}{\sigma_v^2 + \sigma_u^2}.$$

Accordingly, inefficiency (U_{it}) can be presented in the form:

$$U_{it} = z_{it}\delta + W_{it},$$

where W_{it} has truncated normal distribution, mathematical expectation 0 and dispersion σ^2 .

Therefore, the inefficiency of the i country in the time period t has the following representation:

$$TE_{it} = \exp(-U_{it}) = \exp(-z_{it}\delta - W_{it}).$$

Consequently, inefficiency is modeled as a function of several exogenous variables that determine differences in efficiency between countries in the world.

2. Results and discussion

In total, the database of this study has more than 700 observations, but there are no indicators that characterize certain time periods in individual countries either because of the fact that such studies were not conducted or because of their inaccessibility.

Here is a correlation analysis calculated on the basis of data:

Table 1. Correlation Matrix
Tabela 1. Macierz korelacji

Correlation/ korelacja							
t-Statistic/ wartość statystyki t							
Probability/ prawdopodobieństwo	GDP	K	L	ECF	PR	CR	HUM
GDP	1.000000 ----- -----						
K	0.969697 [66.88892] (0.0000)	1.000000 ----- -----					
L	0.311498 [5.524305] (0.0000)	0.431938 [8.070882] (0.0000)	1.000000 ----- -----				
ECF	0.261724 [4.569948] (0.0000)	0.249400 [4.340107] (0.0000)	-0.086009 [-1.454837] (0.1468)	1.000000 ----- -----			
PR	-0.180201 [-3.087350] (0.0022)	-0.142724 [-2.430109] (0.0157)	0.145664 [2.481240] (0.0137)	-0.415223 [-7.691889] (0.0000)	1.000000 ----- -----		
CR	-0.192604 [-3.307760] (0.0011)	-0.156437 [-2.669190] (0.0080)	0.175344 [3.001447] (0.0029)	-0.488436 [-9.433049] (0.0000)	0.921296 [39.92674] (0.0000)	1.000000 ----- -----	

HUM	0.283379	0.268207	-0.058828	0.679256	-0.438693	-0.475782	1.000000
	[4.979709]	[4.691799]	[-0.993103]	[15.59748]	[-8.226893]	9.115905]	----
	(0.0000)	(0.0000)	(0.3215)	(0.0000)	(0.0000)	(0.0000)	----

Source: created by the author

Źródło: Badania własne

Student's t-test is given in [] for the coefficients of correlation between variables, and their *p*-values is given in ().

As can be seen from the matrix (Table 1), the coefficients of correlation between *GDP*, *K*, *L*, *ECF*, *PR*, *CR*, and *HUM* are significant, except for *L* and variables *ECF*, *HUM*. In particular, we observe a strong direct relationship between the variables *GDP* and *K*, which means that with the increase of *GDP*, *K* increases. *PR* and *CR*, *HUM* and *ECF* are also closely interconnected. Such results confirm the assumption that economic freedom is a prerequisite for economic development and contributes to the improvement of the quality of life of the population.

We are analyzing the statistical characteristics of the indicators on the basis of 286 observations. The use of logarithms of variables in empirical modeling is due to the economic theory, which points to the harmonization of theoretical economic relations, as well as the statistical properties of the studied series.

Table 2. Statistical characteristics of indicators

Tabela 2. Charakterystyka statystyczna wskaźników

	GDP	K	L	ECF	PR	CR	HUM
Mean/ Średnia	4.02E+11	8.83E+10	25050197	6.524371	2.842657	2.919580	0.670678
Median/ Mediana	4.81E+10	1.03E+10	4687411.	6.690000	2.000000	3.000000	0.696500
Maximum/ Maksymalna	1.36E+13	2.63E+12	7.74E+08	8.760000	7.000000	7.000000	0.939000
Minimum/ Minimalna	4.82E+08	77728759	62883.00	2.800000	1.000000	1.000000	0.232000
Std. Dev. / Odch. Stand.	1.30E+12	2.84E+11	84537245	1.143913	2.008683	1.625618	0.166200
Skewness/ Asymetria	7.028182	6.374080	6.763764	0.654097	0.671750	0.399980	-0.562087
Kurtosis/ Kurtoza	61.37554	49.57971	52.34571	3.274325	1.968399	2.036471	2.498608
Jarque-Bera	42962.98	27791.87	31197.75	21.29062	34.19119	18.68920	18.05570
Probability/ Prawdopodobieństwo	0.000000	0.000000	0.000000	0.000024	0.000000	0.000087	0.000120
Sum/ Suma	1.15E+14	2.52E+13	7.16E+09	1865.970	813.0000	835.0000	191.8140
Sum Sq. Dev./ Suma Kwadratów Odchyleń	4.85E+26	2.29E+25	2.04E+18	372.9328	1149.920	753.1503	7.872354
Observations/ Obserwacje	286	286	286	286	286	286	286
	LOG(GDP)	LOG(K)	LOG(L)	ECF	PR	CR	LOG(HUM)

Mean / Średnia	24.67477	23.07165	15.50839	6.524371	2.842657	2.919580	-0.436527
Median/ Mediana	24.59568	23.05580	15.36039	6.690000	2.000000	3.000000	-0.361688
Maximum/ Maksymalna	30.24077	28.59715	20.46731	8.760000	7.000000	7.000000	-0.062940
Minimum/ Minimalna	19.99383	18.16874	11.04903	2.800000	1.000000	1.000000	-1.461018
Std. Dev./ Odch. Stand.	2.082442	2.154116	1.652135	1.143913	2.008683	1.625618	0.288148
Skewness/ Asymetria	0.231441	0.177865	0.170836	0.654097	0.671750	0.399980	-1.162020
Kurtosis/ Kurtoza	2.362713	2.405613	3.374556	3.274325	1.968399	2.036471	3.983839
Jarque-Bera	7.393025	5.718081	3.062969	21.29062	34.19119	18.68920	75.89844
Probability/ Prawdopodobieństwo	0.024810	0.057324	0.216214	0.000024	0.000000	0.000087	0.000000
Sum/ Suma	7056.985	6598.492	4435.399	1865.970	813.0000	835.0000	-124.8467
Sum Sq. Dev./ Suma Kwadratów Odchyłeń	1235.921	1322.462	777.9217	372.9328	1149.920	753.1503	23.66331
Observations/ Obserwacje	286	286	286	286	286	286	286

Source: created by the author

Źródło: Badania własne

It is important to note that the average value of *GDP*, *K*, *L*, and *PR* exceeds the median sample.

The value of the mean square deviation is generally small compared to the mean value, so the data is densely concentrated around the mean value and not scattered over a wide range relative to it.

The coefficient of asymmetry in *GDP*, *K*, *L*, *PR*, *CR* is positive, which means that the right side of the distribution is much longer than the left. Consequently, the probability of falling into the right (relatively average) part of the distribution is greater than the probability of falling to the left. In our case, this would mean that the probability of belonging to countries where *GDP*, gross capital accumulation, labor force and political freedom of which exceeds the average, is higher than the opposite.

The coefficient of excess for each variable is positive which means that the distribution curve has a higher and sharpest vertex than the normal curve, therefore, the probability of getting into the lateral parts of the distribution is much less than the probability of getting into its main part.

Jarque–Bera test is a statistical test that verifies observation of normality by equating the asymmetry and excess coefficients to the corresponding standard normal distribution coefficients. Using the Jarque-Bera test, the zero hypothesis $H_0 / S = 0, K = 3$ is tested against the alternative hypothesis $H_1 / S \neq 0, K \neq 3$, where *S* and *K* are the coefficients of asymmetry and excess, respectively. The value of the Jarke-Beer statistics indicates an abnormality of the distribution of all variables, except for the variable *l* = labor, which is normally distributed.

In modeling we use the natural logarithms of the variables. The statistical characteristics used in modeling the series are shown in Table. 3. We build a stochastic production function based on the specification of the Cobb-Douglas model.

Table 3. Results of model evaluation

Tabela 3. Wyniki ewaluacji modelu

Dependent Variable/ zależna zmienna: LOG(GDP)

Method/ Metoda: Pooled Least Squares / najmniejszych kwadratów

Sample (adjusted) / Próba (skorygowana): 1982-1984

Included observations/ Liczba obserwacji: 3 after adjustments/ 3 po korektach

Cross-sections included/ Przekrojowe : 119

Total pool (unbalanced) observations/ Łączna pula obserwacji: 286

Cross sections without valid observations dropped/ Przekrojowe bez utraty znaczących obserwacji

Variable/ Zmienna	Coefficient/ Współczynnik	Std. Error/ Błąd Standardowy	t-Statistic/ Wartość statystyki t	Prob. / Prawdo- podobieństwo
C	15.92035	1.280500	12.43292	0.0000
LOG(K)	0.263376	0.033569	7.845908	0.0000
LOG(L)	0.193472	0.081278	2.380374	0.0185
LOG(HUM)	0.616600	0.188354	3.273623	0.0013
ECF	-0.000886	0.015094	-0.058679	0.9533
PR	0.015620	0.014935	1.045838	0.2972
CR	-0.031516	0.020589	-1.530712	0.1278

Source: created by the author

Źródło: Badania własne

We evaluate the econometric model for panel data with fixed effects of countries (objects) and fixed time effects. We also estimate the model parameters which are computed using the generalized least squares method for panel data. The dependent variable is GDP. The model, built for 119 countries, takes into account observations in 1990, 2000 and 2010 (a total of 286 observations).

As a result of the study a model was obtained:

$$GDP_{it} = c + a_i + \tau_t + \lambda_1 K_{it} + \lambda_2 L_{it} + \lambda_3 HUM_{it} - \lambda_4 ECF_{it-1} + \lambda_5 PR - \lambda_6 CR$$

$$(7,84^{**}) \quad (2,38^*) \quad (3,27^{**}) \quad (-0,05) \quad (1,04) \quad (-1,5^*)$$

$$R^2 = 0,99, \quad F = 776,63, \quad DW = 2,24.$$

In this model, a_i denotes the fixed effects of the countries that determine their effectiveness, and the variable τ_t serves as a substitute for technological changes in time meaning the temp of technology growth in time.

The value of Student's t-test of model parameters is given in brackets, the definition * indicates their statistical significance at the level of reliability of 95%,

** - 99%. Analyzing the value of t-test, we see that all endogenous variables, other than the variables *ECF*, *PR* and *CR*, are significant.

The purpose of this model is to show the interdependence of GDP and institutional and economic variables. Parameters of the model determine the coefficients of influence of elasticity of GDP by the corresponding factors included. The economic content of the parameters is that they measure the marginal effect of the included factors on the level of GDP, assuming that all other variables do not change.

The coefficients of the model determine the elasticity of GDP according to the factors, namely capital, labor, and human capital. Capital elasticity is 0.26 which means that if capital increases (for a country or a certain period of time) by 1%, GDP will be higher by 0.26%. Consequently, the growth of capital leads to GDP growth. Human capital is also significantly affected by the GDP: as a result of its growth of 1%, GDP will increase by 0, 61%, which is twice the capital indicator, and three times the labor indicator. Student's t-test indicate that *ECF*, *PR*, *CR* have a small impact on GDP. The results of the modelling are presented in Table 4.

The determination coefficient R^2 of the model is 0.99 and is sufficiently close to one. This suggests that the model explains 98.5% of the dispersion of GDP change. While checking the model for adequacy based on Fisher's statistics we can see that the value of F - statistics is so large that $P = 0,000000$, we come up to the conclusion that the constructed model adequately describes the data. The calculated value of the Darbin-Watson statistics $DW = 2.24$ indicates the absence of autocorrelation in the residuals from a statistical regression analysis.

Table 4. Diagnosing the model
Tabela 4. Diagnozowanie modelu

Cross-section fixed (dummy variables)/ Przekrojowe stałe (zmienne zerojedynkowe)
Period fixed (dummy variables)/ Stały przedział czasowy (zmienne zerojedynkowe)

R-squared/ Współczynnik determinacji R do kwadratu	0.998361	Mean dependent var/ średnią wartość zależnej var	24.67477
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu	0.997062	S.D. dependent var / Odch. Stand. var	2.082442
S.E. of regression/ Odch. Stand.	0.112874	Akaike info criterion/ Kryterium informacyjny Akaike'a	-1.224064
Sum squared resid / Resztowa suma kwadratów odchyłeń	2.025748	Schwarz criterion/ Kryterium Schwarzca	0.399401
Log likelihood/ Log prawdopodobieństwo	302.0411	Hannan-Quinn criter./ Kryterium Hannan-Quinn	-0.573331
F-statistic/ wartość statystyki F	768.6339	Durbin-Watson stat/ Wartość statystyki Durbina-Watsona	2.248155

Prob(F-statistic)/ Prawdopodobieństwo
(statystyki F) 0.000000

Source: created by the author
Źródło: Badania własne

The introduction into the specification of the model different values of a_i allows us to take into account that the dependence of GDP on the factors influencing it may vary for different countries, and the values of τ_t take into account time differences in ties. At the same time, the estimated parameters β_j are the same for all objects and all periods of time. Statistical tests show significant differences between fixed effects of countries and time effects. (Cross-section $F = 12, 54^{**}$, Period $F = 21, 63^{**}$).

Table 5. Statistical tests
Tabela 5. Testy statystyczne

Redundant Fixed Effects Tests/ testowanie efektów trwałych
Pool: POOL02
Test cross-section and period fixed effects/ Testowanie przekrojowe i stały przedział
czasowy

Effects Test / Testowanie efektów	Statistic / wartość statystyki	d.f.	Prob. / Prawdo- podobieństwo
Cross-section F/ Przekrojowe F	12.541704	(118,159)	0.0000
Cross-section Chi-square / Przekrojowe Chi-square	667.206320	118	0.0000
Period F/ Przedział czasowy F	21.637682	(2,159)	0.0000
Period Chi-square / Przedział czasowy Chi-square	68.847566	2	0.0000
Cross-Section/ Period F	13.093792	(120,159)	0.0000
Cross-Section/ Period Chi-square	682.716300	120	0.0000

Source: created by the author
Źródło: Badania własne

Here is a generalized translogarithmic model constructed on the basis of the production function with a constant elasticity of the substitution (CES-function) (Lukyanenko & Krasnikova, 1998).

Table 6. Generalized translographic model (CES – function)
Tabela 6. Uogólniony model translograficzny (CES – funkcja)

Dependent Variable/ Zmienna zależna: LOG(GDP)
Method / Metoda: Pooled Least Squares/ najmniejszych kwadratów
Included observations/ Liczba obserwacji: 3 after adjustments / 3 po korektach
Cross-sections included/ Przekrojowe: 119
Total pool (unbalanced) observations/ Łączna pula (niewyrównanych) obserwacji : 286
Cross sections without valid observations dropped/ Przekrojowe bez utraty znaczących obserwacji

Variable/ Zmienna	Coefficient/ współ- czynnik	Std. Error/ Błąd Stan- dardowy	t-Statistic/ Wartość statystyki t	Prob./ Prawdopo- dobieństwo
C	8.850310	5.899152	1.500268	0.1356
LOG(K)	-1.167433	0.422526	-2.762984	0.0064
LOG(L)	3.143352	0.610245	5.150966	0.0000
LOG(HUM)	2.120563	2.442805	0.868085	0.3867
0.5*(LOG(L))^2	-0.077859	0.044361	-1.755120	0.0812
0.5*(LOG(K))^2	0.094877	0.036607	2.591783	0.0105
0.5*(LOG(HUM))^2	2.707936	0.733223	3.693198	0.0003
LOG(K)*LOG(L)	-0.057730	0.036589	-1.577815	0.1166
LOG(K)*LOG(HUM)	-0.284695	0.149187	-1.908308	0.0582
LOG(L)*LOG(HUM)	0.486876	0.160117	3.040762	0.0028
ECF	-0.000160	0.010860	-0.014712	0.9883
PR	0.010018	0.011568	0.865984	0.3878
CR	-0.040724	0.015179	-2.682905	0.0081
R-squared / Współczynnik determinacji R do kwadratu	0.999050	Mean dependent var/ średnią wartość zależnej var		24.67477
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu	0.998254	S.D. dependent var/ Odch. Stand. var		2.082442
S.E. of regression/ Odch. Stand.	0.087021	Akaike info criterion/ Kryterium informacyjny Akaike'a		-1.741828
Sum squared resid/ Resztowa suma	1.173749	Schwarz criterion/ Kryterium Schwarzca		-0.067230
Log likelihood/ Log prawdopodobieństwo	380.0814	Hannan-Quinn criter./ Kryterium Hannan-Quinn		-1.070599
F-statistic/ wartość statystyki F	1254.271	Durbin-Watson stat/ Wartość statystyki Durbina-Watsona		2.676354
Prob(F-statistic)/ Prawdopodobieństwo (statystyki F)	0.000000			

Source: created by the author
Źródło: Badania własne

This model confirms that human capital is an important factor, since all model factors that contain the variable *HUM* are statistically significant. According to this model, *CR* also has a significant impact on *GDP*, since its reduction by 1 leads to an increase in *GDP* by 4%.

On the basis of this model, we will determine the level of efficiency of economies for each country. In order to outline the country's largest and smallest sample, we build a series of average performance values over the entire time frame and place them in descending order. The efficiency coefficient is calculated using the a_i parameter normalization. According to the calculations, the most effective economies of the world are the USA, Japan, Germany, Great Britain and France, which efficiency varies from 1 to 0.953, and the least effective ones are Mongolia, Malawi, Lesotho, Burundi and Belize with an average efficiency of 0.730; 0.78; 0.725; 0.718 and 0.716, respectively. (Annex A).

Here is an efficiency model in which * indicates the statistical significance of the parameter at the level of 10%, ** the statistical significance of the parameter at the level of 5%, **** the statistical significance of the parameter at the level of 1%.

Table 7. Values of variables of the model of efficiency
Tabela 7. Wartości zmiennych modelu efektywności

Dependent Variable/ Zmienna zależna: LOG(EFEC)
Method/ Metoda: Pooled Least Squares/ Najmniejszych kwadratów
Included observations/ Liczba obserwacji: 3 after adjustments/ 3 po korektach
Cross-sections included/ Przekrojowe: 119
Total pool (unbalanced) observations/ Łączna pula (niewyrównanych) obserwacji: 307

Variable / Zmienna	Coefficient/ Współczynnik	Std. Error / Błąd Standardowy	t-Statistic / Wartość statystyki t	Prob. / Prawdopo- dobieństwo
LOG(HUM)	0.010986	0.000782	14.05124***	0.0000
ECF	0.000291	8.96E-05	3.248231***	0.0014
PR	-0.000185	9.51E-05	1.947748*	0.0530
CR	-0.000267	0.000123	-2.169367**	0.0313
C	-0.180785	0.000941	-192.1447***	0.0000

Source: created by the author
Źródło: Badania własne

As seen from this model, *PR* and *CR* significantly affect the efficiency of production. Increasing *ECF* by 1 results in an *EFEC* increase of 0.029%, while a

decrease in *PR* of 1 results in an *EFEC* increase of 0.018%. Correspondingly, reducing *CR* by 1 will result in an increase in efficiency by 0,026%.

Table 8. Model weighting
Tabela 8. Wagi modelu

R-squared/ Współczynnik determinacji R do kwadratu	0.950534	Mean dependent var/ średnią wartość zależnej var	6.488403
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu	0.948360	S.D. dependent var/ Odch. Stand. var	1.053207
S.E. of regression/ Odch. Stand.	0.139504	Sum squared resid/ Resztowa suma	5.312924
F-statistic/ wartość statystyki F	437.1648		
Prob(F-statistic)/ Prawdopodobieństwo (statystyki F)	0.000000		

Source: created by the author
Źródło: Badania własne

The determination coefficient *R*-squared explains the variability of the response data around its mean, which means that the factors used in the model, namely political and economic freedom and human capital (*ECF*, *CR*, *PR*, *HUM*), explain 95% of the difference in efficiency between countries. Also, as can be seen from Table. 8, the corrected determination coefficient is 0, 94, the standard error of regression is 0, 13, F-statistics – 437,16, and the sum of the squares of the remnants is 5, 31.

The indicator of the economic efficiency is significantly influenced by the failed state index, since it reflects the state's ability to control the integrity of its borders, economic, demographic, political and sociological situation in the country. The most fragile state in 2018 was South Sudan. It outstripped Somalia, which for many years was ranked first. The reason for this is the fact that the indicators that have the most impact on the failed states, namely widespread lawlessness, ineffective government, terrorism, and crime do not increase in Somalia but albeit at a steady level. The countries that have suffered the worst situation are Qatar (due to the financial and political blockade), Spain (through the referendum in Catalonia), the United States (a significant number of political upheavals) and Great Britain (Brexit) (The Fund for Peace, 2019). Interestingly, in 2014, this group of countries was attributed to CAR, Syria and Libya. The main reason for the deterioration of the index in all these countries was civil wars. Instead, Haiti, Iraq and Nepal improved thier index in 2018 (The Fund for Peace, 2015).

We have constructed the model based on the study of the relationship between efficiency and this index (figure 1).

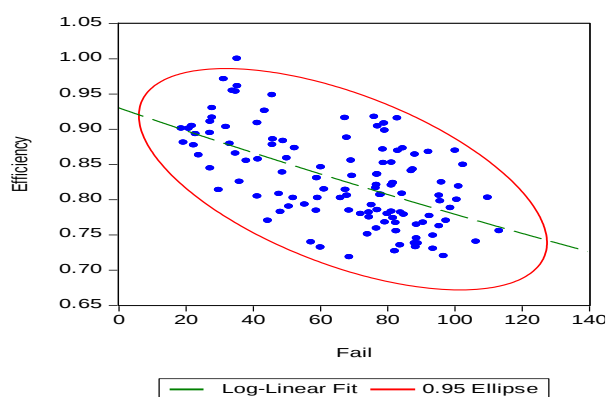


Figure. 1 Interdependence between the fragile state index and the efficiency of the economy
Rysunek. 1 Współzależność między wskaźnikiem niestabilności państwa a efektywnością gospodarki

Source: created by the author

Źródło: Badania własne

Table 9. Model of the impact of fail state index on economic efficiency

Tabela 9. Model wpływu Indeksu Państw Upadłych na efektywność ekonomiczną

Dependent Variable/ Zmienna zależna: LOG(EFEC)

Method/ Metoda: Pooled Least Squares/ Najmniejszych kwadratów

Cross-sections included/ Przekrojowe: 119

Total pool (balanced) observations/ Łączna pula (niewyrównanych) obserwacji: 119

Variable / Zmienna	Coefficient / współczynnik	Std. Error / Błąd Standardowy	t-Statistic / Wartość statystyki t	Prob./ Prawdopodobieństwo
C	-0.072381	0.016679	-4.339703	0.0000
FAIL	-0.001771	0.000235	-7.536190	0.0000
R-squared/ Współczynnik determinacji R do kwadratu	0.326790	Mean dependent var/ średnią wartość zależnej var		-0.190422
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu	0.321036	S.D. dependent var/ Odch. Stand. var		0.075877
S.E. of regression/ Odch. Stand.	0.062522	Akaike info criterion/ Kryterium informacyjny Akaike'a		-2.689918
Sum squared resid/ Resztowa suma	0.457360	Schwarz criterion/ Kryterium Schwarzca		-2.643210
Log likelihood / Log prawdopodobieństwo	162.0501	Hannan-Quinn criter./ Kryterium Hannan-Quinn		-2.670951

F-statistic/ wartość statystyki F	56.79416	<i>Durbin-Watson stat./ Wartość</i> <i>statystyki Durbina-Watsona</i>	<i>0.000000</i>
Prob(F-statistic)/ Prawdopodobieństwo (statystyki F)	0.000000		

Source: created by the author
Źródło: Badania własne

The relationship between economic efficiency, which is the effectiveness of economic systems, and the Fail state index is quite dense. For example, if FAIL is less than 10, then the efficiency is greater by 1.7%. It is indisputable that the ability of the state to control the integrity of its borders and political stability to a significant extent influence economic growth. Wars, conflicts and disputes are the most devastating factors of the economy, since under war conditions, production, consumption, savings and investments are changing, which leads to a drop in GDP and a recession of the economy. In order to stabilize the economy, international support, economic reforms and the investments are needed.

Conclusions

Thus, the level of political and economic freedom that we analyze as institutional factors greatly influences economic efficiency, which confirms our hypothesis that the level of development of the state depends on the effectiveness of institutional mechanisms, which means the increase of economic and political freedoms increases efficiency.

The most successful economies in the world are the United States, Japan, Germany, Great Britain and France, which are the most developed economies in the world and are characterized by high per capita income. This confirms the calculations of our economic efficiency.

According to a generalized translogarithmic model built on the basis of a production function with a constant elasticity of substitution, human capital is an important economic category, it stimulates the growth of labor productivity and income growth.

Human capital is a factor of rapid economic development, because educated people can quickly absorb new methods, innovate and work more productively. But the way people can use their education depends to a large extent on the internal economic system. For example, under socialism, people received a good education, but the system made it impossible to use their skills appropriately, so their productivity grew slowly and the economy developed slowly. A similar level of general education in conditions of free competition provided much faster growth of labor productivity, and therefore – faster improvement of living conditions of people. Again, critically important remains the internal economic system.

As can be seen from Table 1, which shows a correlation matrix of indicators, there is a high correlation between human capital and economic freedom, so we can assume that one of the conditions for the development and improvement of the quality of human capital is the high index of economic freedom. Investing in human capital has a significant and long-lasting economic and social impact.

Consequently, based on the built econometric model for panel data with fixed effects of countries and fixed temporal effects, the purpose of which is to show the interdependence of GDP and institutional and economic variables, we conclude that the level of political and economic freedom taken for institutional factors to a large extent affects economic efficiency. This verifies the theoretical assumption that the level of state development depends on the effectiveness of institutional mechanisms, so an increase in economic and political freedoms increases efficiency.

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WPLYW CZYNNIKÓW INSTYTUCJONALNYCH NA EFEKTYWNOŚĆ EKONOMICZNĄ PAŃSTW ŚWIATA

Streszczenie

Przeprowadzone badania dotyczą kwestii nierównomiernego rozwoju gospodarki światowej. W świetle nowoczesnego paradygmatu naukowego, nierównomierny rozwój gospodarczy jest analizowany przez pryzmat skuteczności państwowych mechanizmów instytucjonalnych jako głównego narzędzia do kształtowania warunków dla wzrostu gospodarczego. Celem opracowania jest próba przedstawienia wpływu ekonomicznych i instytucjonalnych zmiennych (tj. poziomu wolności gospodarczej oraz wolności politycznej, która uwzględnia prawa polityczne i swobody obywatelskie, kapitał ludzki, siłę roboczą i gromadzenie kapitału trwałego brutto) na wzrost gospodarczy, który jest obliczany w oparciu o modele ekonometryczne dla danych panelowych o efektach stałych i zmiennych. Model został zbudowany dla 119 państw świata, uwzględniając obserwacje z lat 1990, 2000 i 2010. Przeprowadzona analiza korelacyjna pozwala twierdzić, że współczynniki korelacji między większością zmiennych osiągnęły wysoki poziom, co potwierdza założenie, że wolność gospodarcza jest przesłanką rozwoju gospodarczego i przyczynia się do poprawy jakości życia. W opracowaniu został również przedstawiony model translogarytmiczny, skonstruowany na podstawie metody funkcji produkcyjnej ze stałą elastycznością substytucji (funkcja CES), która jest nieliniową modyfikacją funkcji Cobb-Douglasa. Z obliczeń wynika, że poziom wolności politycznych i gospodarczych, kształtowane przez czynniki instytucjonalne, ma znaczący wpływ na efektywność ekonomiczną. Przeprowadzona analiza potwierdza zależność między efektywnością a Indeks Państw Upadłych, która wskazuje, że kontrola granic państwa i stabilność polityczna w znacznym stopniu wpływa na rozwój gospodarczy, natomiast wojny i konflikty mają najbardziej niszczycielski wpływ na gospodarkę.

Słowa kluczowe: nierównomierny rozwój gospodarczy, instytucje, efektywność ekonomiczna, Indeks Państw Upadłych, wolność polityczna, wolność gospodarcza.

Summary

This research focuses on the problem of uneven economic development of the world economy. Within the modern scientific paradigm, uneven economic development is studied through the prism of effectiveness of institutional mechanisms of the state as the main tool to create conditions for economic growth. The goal is to show the effect of economic and institutional variables (namely the level of economic freedom, the level of political freedom which takes into account political rights and civil liberties, human capital, labor force and gross fixed capital accumulation) on economic growth which is calculated using econometric models for panel data with fixed effects of countries and fixed temporal effects. The model is built for 119 countries of the world and takes into account observations in 1990, 2000 and 2010. A correlation analysis is made which shows that the correlation coefficients between most of the variables are high which confirms the assumption that economic freedom is a prerequisite for economic development and contributes to the improvement of the quality of life of the people. The paper also presents a generalized translogarithmic model constructed on the basis of the production function with constant elasticity of the substitution (CES function), which is a nonlinear modification of the Cobb-Douglas function. The calculations prove that, in particular, the level of political and economic freedoms that are taken by institutional factors significantly influence the economic efficiency. The relation between efficiency and failed state index is identified, indicating that the controllability of the state's borders and political stability largely affect economic development because wars and conflicts have the most devastating impacts on the economy.

Keywords: uneven economic development, institutions, economic efficiency, failed state index, political freedom, economic freedom

*JEL Classification:*F01, F02, F60, F63

Annex A. Estimates of the level of economic efficiency of some countries of the world in 1990, 2000 and 2010

Aneks A. Oszacowany poziom efektywności ekonomicznej poszczególnych krajów świata w latach 1990, 2000 i 2010

Country/ Państwo	1990	2000	2010	Average efficiency regarding the world level/ Średnia wydajność w odniesieniu do poziomu światowego
USA/ Stany Zjednoczone	1.000	1.000	1.000	1.000
Japan/ Japonia	0.971	0.971	0.971	0.971
Germany/ Niemcy	0.961	0.961	0.961	0.961
United Kingdom/ Wielka Brytania	0.954	0.954	0.955	0.954
France/ Francja	0.953	0.953	0.953	0.953
Italy/ Włochy	0.948	0.948	0.948	0.948
Canada/ Kanada	0.929	0.929	0.930	0.929
Spain/ Hiszpania	0.925	0.926	0.926	0.926
Netherlands/ Holandia	0.915	0.916	0.917	0.916
Brazil/ Brazylia	0.915	0.915	0.916	0.915
China/ Chiny	0.914	0.915	0.915	0.915
Australia/ Australia	0.909	0.910	0.911	0.910
South Korea/ Korea Południowa	0.907	0.908	0.909	0.908
Switzerland/ Szwajcaria	0.903	0.904	0.904	0.904
Turkey/ Turcja	0.903	0.904	0.904	0.904
Belgium/ Belgia	0.902	0.902	0.903	0.902
Norway/ Norwegia	0.900	0.900	0.901	0.900
Sweden/ Szwecja	0.899	0.900	0.901	0.900
Austria/ Austria	0.893	0.894	0.895	0.894
Denmark/ Dania	0.891	0.892	0.893	0.892
South Africa/ Afryka Południowa	0.886	0.887	0.888	0.887
Greece/ Grecja	0.884	0.885	0.886	0.885
Poland / Polska	0.882	0.882	0.883	0.882
Finland/ Finlandia	0.879	0.880	0.881	0.880
Portugal/ Portugalia	0.878	0.878	0.879	0.878
Argentina/ Argentyna	0.876	0.877	0.878	0.877
Ireland/ Irlandia	0.875	0.876	0.877	0.876

OAE/ Zjednoczone Emiraty Arabskie	0.871	0.872	0.873	0.872
Israel/ Izrael	0.871	0.872	0.873	0.872
Indonesia/ Indonezja	0.868	0.868	0.869	0.868
Singapore/ Singapur	0.864	0.865	0.866	0.865
New Zealand/ Nowa Zelandia	0.861	0.862	0.863	0.862
Hungary/ Węgry	0.857	0.858	0.859	0.858
Czech Republic/ Czechy	0.855	0.856	0.857	0.856
Malaysia/ Malezja	0.853	0.854	0.855	0.854
Chile/ Czili	0.853	0.854	0.855	0.854
Algeria/ Algieria	0.851	0.852	0.853	0.852
Thailand/ Tajlandia	0.850	0.851	0.852	0.851
Pakistan/ Pakistan	0.847	0.848	0.849	0.848
Egypt/ Egipt	0.841	0.842	0.843	0.842
Philippines/ Filipiny	0.838	0.840	0.841	0.840
Morocco/ Maroko	0.834	0.835	0.836	0.835
Peru/ Peru	0.833	0.834	0.836	0.834
Ukraine/ Ukraina	0.831	0.832	0.834	0.832
Bangladesh/ Bangladesz	0.822	0.823	0.825	0.823
Ecuador/ Ekwador	0.821	0.822	0.824	0.822
Dominican Republic/ Dominikana	0.818	0.820	0.821	0.820
Guatemala/ Gwatemala	0.818	0.819	0.820	0.819
Cote d'Ivoire/ Wybrzeże Kości Słoniowej	0.816	0.817	0.819	0.818
Vietnam/ Wietnam	0.814	0.815	0.816	0.815
Tunisia/ Tunezja	0.811	0.813	0.814	0.813
Azerbaijan/ Azerbejdżan	0.806	0.807	0.809	0.807
El Salvador/ Salvador	0.804	0.806	0.807	0.806
Serbia/ Serbia	0.804	0.805	0.807	0.805
Cameroon/ Kamerun	0.803	0.804	0.806	0.804
Uruguay/ Urugwaj	0.802	0.803	0.805	0.803
Democratic Republic of the Congo/ Demokratyczna Republika Konga	0.800	0.801	0.803	0.801
Costa Rica/ Kostaryka	0.800	0.801	0.802	0.801
Panama/ Panama	0.800	0.801	0.802	0.801
Trinidad and Tobago/ Trynidad i Tobago	0.799	0.801	0.802	0.801
Kenya/ Kenia	0.797	0.798	0.800	0.798
Sri Lanka/ Sri Lanka	0.795	0.796	0.798	0.796
Gabon/ Gabon	0.789	0.791	0.792	0.791
Ethiopia/ Etiopia	0.785	0.787	0.788	0.787
Jordan/ Jordania	0.782	0.784	0.785	0.784
Botswana/ Botswana	0.781	0.783	0.784	0.783
Bahamas/ Bahamas	0.781	0.783	0.784	0.783
Tanzania/ Tanzania	0.780	0.781	0.783	0.781
Zambia/ Zambia	0.779	0.780	0.782	0.780

Namibia/ Namibia	0.779	0.780	0.782	0.780
Honduras/ Honduras	0.776	0.778	0.780	0.778
Paraguay/ Paraguay	0.776	0.778	0.780	0.778
Bolivia/ Bolivia	0.776	0.777	0.779	0.777
Republic of the Congo/ Republika Kongo	0.774	0.775	0.777	0.775
Senegal/ Senegal	0.772	0.773	0.775	0.773
Mozambique/ Mozambique	0.770	0.772	0.774	0.772
Mauritius/ Mauritius	0.767	0.768	0.770	0.768
Uganda/ Uganda	0.767	0.768	0.770	0.768
Mali/ Mali	0.764	0.766	0.768	0.766
Burkina Faso/ Burkina Faso	0.764	0.766	0.767	0.766
Nicaragua/ Nicaragua	0.764	0.765	0.767	0.765
Cambodia/ Kambodża	0.761	0.763	0.764	0.763
Nepal/ Nepal	0.759	0.761	0.762	0.761
Benin/ Benin	0.756	0.757	0.759	0.757
Chad/ Chad	0.752	0.754	0.755	0.754
Madagascar/ Madagascar	0.752	0.754	0.755	0.754
Armenia/ Armenia	0.747	0.749	0.751	0.749
Sierra Leone/ Sierra Leone	0.745	0.747	0.749	0.747
Rwanda/ Rwanda	0.741	0.743	0.745	0.743
Central African Republic/ Republika Środkowoafrykańska	0.737	0.738	0.740	0.738
Togo/ Togo	0.734	0.736	0.738	0.736
Mauritania/ Mauretania	0.734	0.736	0.738	0.736
Kyrgyzstan/ Kirgistan	0.729	0.730	0.733	0.731
Mongolia/ Mongolia	0.728	0.730	0.732	0.730
Malawi/ Malawi	0.726	0.728	0.730	0.728
Lesotho/ Lesotho	0.723	0.725	0.727	0.725
Burundi/ Burundi	0.716	0.718	0.720	0.718
Belize/ Belize	0.714	0.716	0.718	0.716