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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-

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. Meuesen and J. van den Broeck (Meuesen, 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:

\[ y_{it} = x_{it} \beta + (V_{it} - U_{it}); \]

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);

\( \beta = \) vector of unknown parameters;

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

\( U_{it} = \) random variables that account for inefficiency in production \( N(m_{it}; \sigma_u^2) \).

It is assumed that \( N(m_{it}; \sigma_u^2) \) is independently distributed.

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

\[ m_{it} = z_{it} \delta, \]

Where \( \delta = p \)-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 \( \sigma^2 \).

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] | 1.000000 | ----- | ----- | ----- | ----- | ----- |
| L        | 0.311498 [5.524305] | 0.431938 [8.070882] | 1.000000 | ----- | ----- | ----- | ----- |
| ECF      | 0.261724 [4.569948] | 0.249400 [4.340107] | –0.086009 [–1.454837] | 1.000000 | ----- | ----- | ----- |
| PR       | –0.180201 [–3.087350] | –0.142724 [–2.430109] | 0.145664 [2.481240] | –0.415223 [–7.691889] | 1.000000 | ----- | ----- |
| CR       | –0.192604 [–3.07760] | –0.156437 [–2.669190] | 0.175344 [3.001447] | –0.488436 [–9.433049] | 0.921296 [39.92674] | 1.000000 | ----- |
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 | 1.043913 | 1.008683 | 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 | 1.968392 | 2.036471 | 2.498608 |
| Jarque-Bera | 42962.98 | 27791.87 | 31197.75 | 21.29062 | 18.6920 | 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 Odchylen | 4.85E+26 | 2.29E+25 | 2.04E+18 | 372.9328 | 1149.9207 | 753.1503 | 7.872354 |
| Observations/ Obserwacje | 286 | 286 | 286 | 286 | 286 | 286 | 286 |
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.
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:

\[
\begin{align*}
GDP_{it} & = c + a_i + \tau_t + \lambda_1 K_{it} + \lambda_2 L_{it} + \\
& + \lambda_3 HUM_{it} - \lambda_4 ECF_{it} + \lambda_5 PR - \lambda_6 CR \\
R^2 & = 0.99, \quad F = 776.63, \quad DW = 2.24.
\end{align*}
\]

In this model, \(a_i\) denotes the fixed effects of the countries that determine their effectiveness, and the variable \(\tau_t\) 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 Durbin-Watson statistics $DW = 2.24$ indicates the absence of autocorrelation in the residuals from a statistical regression analysis.

Table 4. Diagnosing the model

| 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 informacyjne | −1.224064 |
| Sum squared resid / Resztowa suma kwadratów odchyleń | 2.025748 | Schwarz criterion/ Kryterium Sczwarca | 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 |
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 $\tau_i$ take into account time differences in ties. At the same time, the estimated parameters $\beta_j$ 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. / Prawdopodobieństwo |
|---------------------------------------|---------------------------------|------|---------------------------|
| Cross-section F/ Przekrojowe F        | 12.541704                       | (118,159) | 0.0000                     |
| Cross-section Chi-square              | 667.206320                      | 118   | 0.0000                     |
| / Przekrojowe Chi-square F            | 21.637682                       | (2,159) | 0.0000                     |
| Period F/ Przedzial czasowy F         | 68.847566                       | 2     | 0.0000                     |
| Period Chi-square/ Przedzial czasowy Chi-square | 13.093792                          | (120,159) | 0.0000                     |
| Cross-Section/ Period F               | 682.716300                      | 120   | 0.0000                     |

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/ Przekroje: 119
Total pool (unbalanced) observations/ Lączna pula (niewyrównanych) obserwacji : 286
Cross sections without valid observations dropped/ Przekroje bez utraty znaczących obserwacji

| Variable/ Zmienna | Coefficient/ współczynnik | Std. Error/ Błąd Standardowy | t-Statistic/ Wartość statystyki t | Prob./ Prawdopodobieństwo |
|-------------------|--------------------------|----------------------------|-------------------------------|------------------------|
| 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                 |
| 0.5*(LOG(L))^2     | 0.077859                 | 0.044361                   | 1.755120                      | 0.0812                 |
| 0.5*(LOG(HUM))^2   | 0.094877                 | 0.036607                   | –2.591783                     | 0.0105                 |
| LOG(K)*LOG(L)     | 2.707936                 | 0.333223                   | 3.693198                      | 0.0003                 |
| LOG(K)*LOG(HUM)   | –0.057730                | 0.036589                   | –1.577815                     | 0.1166                 |
| LOG(L)*LOG(HUM)   | 0.486876                 | 0.160117                   | 3.040762                      | 0.0028                 |
| ECF               | –0.000160                | 0.010860                   | –0.01712                      | 0.9893                 |
| 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
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu: 0.998254
S.E. of regression/ Odch. Standar: 0.087021
Sum squared resid/ Resztowa suma: 1.173749
Log likelihood/ Log prawdopodobieństwo: 380.0814
F-statistic/ wartość statystyki F: 1254.271
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 $a_1$ 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

| Variable  | Coefficient/ Współczynnik | Std. Error / Błąd Standardowy | t-Statistic / Wartość statystyki $t$ | Prob. / Prawdop. 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
Žródło: 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

| R-squared/ Współczynnik determinacji | 0.950534 |
|--------------------------------------|----------|
| R do kwadratu                        | Mean dependent var/ średnia wartość zależnej var |
| Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu | 0.948360 |
| S.E. of regression/ Odch. Stand.     | 0.139504 |
| F-statistic/ wartość statystyki F    | 437.1648 |
| Prob(F-statistic)/ Prawdopodobieństwo (statystyki F ) | 0.000000 |

Source: created by the author

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 their 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

| 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
Adjusted R-squared/ Skorygowany współczynnik determinacji R do kwadratu 0.321036
S.E. of regression/ Odch. Stand. 0.062522
Sum squared resid/ Resztowa suma 0.457360
Log likelihood / Log prawdopodobieństwo 162.0501

Mean dependent var/ średnia wartość zależnej var −0.190422
S.D. dependent var/ Odch. Stand. var 0.075877
Akaike info criterion/ Kryterium informacyjny Akaike’a −2.689918
Schwarz criterion/ Kryterium Schwarz −2.643210
Hannan-Quinn criter./ Kryterium Hannan-Quinn −2.670951
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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Streszczenie
Przeprowadzone badania dotyczą kwestii nierównomiernego rozwoju gospodarki światowej. W świetle nowoczesnego paradynamu naukowego, nierównomierny rozwój gospodarczy jest analizowany przez przyznal 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 efektałach 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 Indeksem 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 ekonomiczną, 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                                                                                          |
| Country/ Country | 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/ Ekador    | 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/ Vietnam   | 0.814 | 0.815 | 0.816 | 0.815 |
| Tunisia/ Tunezja   | 0.811 | 0.813 | 0.814 | 0.813 |
| Azerbaijan/ Azerbejdzan | 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 |
| Country/ Country | 0.779 | 0.780 | 0.782 | 0.780 |
|------------------|-------|-------|-------|-------|
| Namibia/ Namibia  |       |       |       |       |
| 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 Konga | 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/ Mauretanje | 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 |