DEGREE OF ECONOMIC FREEDOM AND RELATIONSHIP TO ECONOMIC GROWTH AND HUMAN DEVELOPMENT

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keywords:

liberalism, economic growth, index of economic freedom

Abstract:

Presented in this article is an analysis of the relationship between the Index of Economic Freedom and indices of economic growth, i.e. GDP per capita and the Human Development Index. The McPherson coefficient of correlation was calculated from several different perspectives. Described in the final part of the article is the testing of the hypotheses, while a short commentary on the results obtained is also presented.

INTRODUCTION

Freedom is an intrinsic element of the life of every person, yet is often noticed only in the event that attempts are made at limiting it. It is possible today to select many areas in which it is more or less consciously diminished. One of these is the field of economic freedom, which may be reduced through bureaucracy for example, as well as through various forms of concession. The means of preventing this particular weakening of the development of an economy may be a gradual liberalization of it.

Individuals aspire to gain happiness through the fulfillment of their needs, assistance in which may be provided by an increase in income. Economic growth triggers an increase in the income of individuals, but is also equated with an increase in access to such goods as better medical care or education. On account of this it becomes vital to investigate the influence of the liberalization of an economy on economic growth.

The purpose of this article is to examine the relationship between the Index of Economic Freedom and indices of both human development, in HDI, and GDP per capita. The conception that level of economic freedom has an influence on economic growth was investigated. Confirmation of this hypothesis may assist in answering the

question of whether liberalization of an economy leads to an improvement in economic growth, and thereby in the living conditions of the society.

1. DATA COMPLETION METHOD

Data for the study was obtained from reports available, accessible at the sites www.heritage.org and www.worldbank.org. On account of their incompleteness, it was necessary to extrapolate and interpolate using data contained within them. The greatest number of values were lacking in the Human Development Index and constituted 10.34% of its data. In general it was necessary to supplement almost 6.5% of the data.

It was necessary to select a method of estimating the data from among those which adjust values lacking to linear or exponential trends. Chosen therefore were two functions of the spreadsheet of Microsoft Office Excel: REGEXPW and REGLINW. The REGEXPW function fits the exponential curve $y = b \times m^x$ to existing data relating to year (x) and index value (y) [http://office.microsoft.com/pl-pl/excel/HP052091081045.aspx]. The REGLINW function utilizes the method of least squares to fit a linear function to known values [http://office.microsoft.com/pl-pl/excel/HP052093201045.aspx?pid=CH062528311045].

The functions mentioned above give various values in estimation. It is thus necessary to check whether the data available better fit the linear trend or the exponential trend. States were selected for which all data were available, with these countries representing five categories of the Index of Economic Freedom (IEF) and GDP and four groups of the Human Development Index (HDI). Initial years were assumed to be unknown and their extrapolation was performed with the use of both functions. Checked next was error, calculating the absolute value from the difference in real and extrapolated values.

In all indices the average percentage value of the error of REGLINW was greater than that with the use of the function REGEXPW. On account of this it was necessary in estimating the values lacking to use the REGEXPW exponential function, which best filled the deficiencies in the data presented.

2. CORRELATION BETWEEN THE INDEX OF ECONOMIC FREEDOM AND GROSS DOMESTIC PRODUCT PER CAPITA

The relationship between the IEF and GDP per capita was investigated on the basis of data on the 150 states selected. From among all 183 states of the Index of Economic Freedom (contained in the report from 2009) it was necessary to reject those for which no data on gross domestic product was made note of. Also excluded were those

countries in which the number of cells with data available for both GDP and the index of freedom was lower than 50% of all values. Given that the report relating to the Index of Economic Freedom is published on the basis of data from the preceding year it was necessary to take this into consideration in calculating the correlation coefficient. As such, the linear relationship was counted with the use of Index of Economic Freedom data from the given year and GDP per capita for the preceding year.

Presented in Graph 1 are values of the McPherson coefficient for correlation between the Index of Economic Freedom in a given year and GDP per capita from later years. Year 1 for Index of Economic Freedom 1995 is 1995 of GDP per capita, with year 2 of GDP per capita being 1996. The graph shows with which years of GDP per capita the index is most correlated, that is, on which years of GDP per capita the Index of Economic Freedom has the greatest influence.

Following calculation of the coefficients of correlation between individual years, their mean average was found. The manner in which this was calculated is presented by the following formula:

$$\rho_{IEF,\ PKB\ per\ capita} = \frac{+\ \dots\ +\ \rho_{IEF\ 2009,\ PKB\ per\ capita\ 2008}}{13}$$

where:

$\rho_{IEF,\ PKB\ per\ capita}$ is the average McPherson coefficient of correlation from the 13 years studied;

$\rho_{IEF\ rok1,\ PKB\ per\ capita\ rok2}$ is the McPherson coefficient of correlation for a given pair of years.
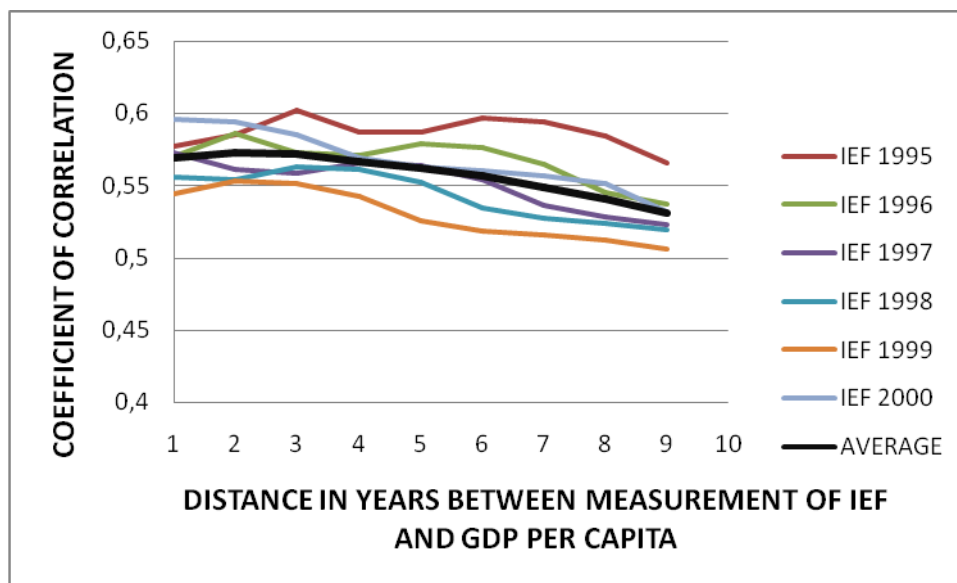
Graph 1 Influence of the Index of Economic Freedom on later years of GDP per capita

The value of the coefficient of correlation fluctuated between 0.602 in the second year and 0.51 in the ninth year. On average the Index of Economic Freedom is most correlated with year of GDP per capita x+2 and x+3. That is, for example, IEF 1995 (calculated for 1994) has the greatest influence on GDP per capita in the years 1996-1997. This shows that the improvement of the Index of Economic Freedom through liberalization of an economy brings with it growth in GDP per capita with a delay of around two years. The more distant the years of GDP per capita from the year of the Index of Economic Freedom, the lower the coefficient of correlation (following the third year of GDP per capita). This means that the Index of Economic Freedom has an ever smaller influence on GDP per capita in later years.

Presented in Graph 2 are average values of GDP per capita for 2008 achieved in individual categories of the Index of Economic Freedom 2009. The numbers in the legend denote the number of countries in a given category. Countries belonging to the category of free countries possess the greatest average GDP per capita (USD 42,643). Immediately behind them are the mainly free countries, the GDP per capita of which is slightly smaller. The two highest categories enjoy a decisive advantage in size of GDP per capita compared with the remainder. Average GDP per capita of countries in the free countries category is over twelve times greater than the average GDP per capita of unfree countries. There is quite a large difference between states mainly free and

moderately free and this amounts to around USD 29,000. In general, the lower the category of freedom, the lower the average GDP per capita. An exception are the two final categories, where GDP per capita of unfree countries is around USD 400 greater than GDP per capita of mainly unfree countries.
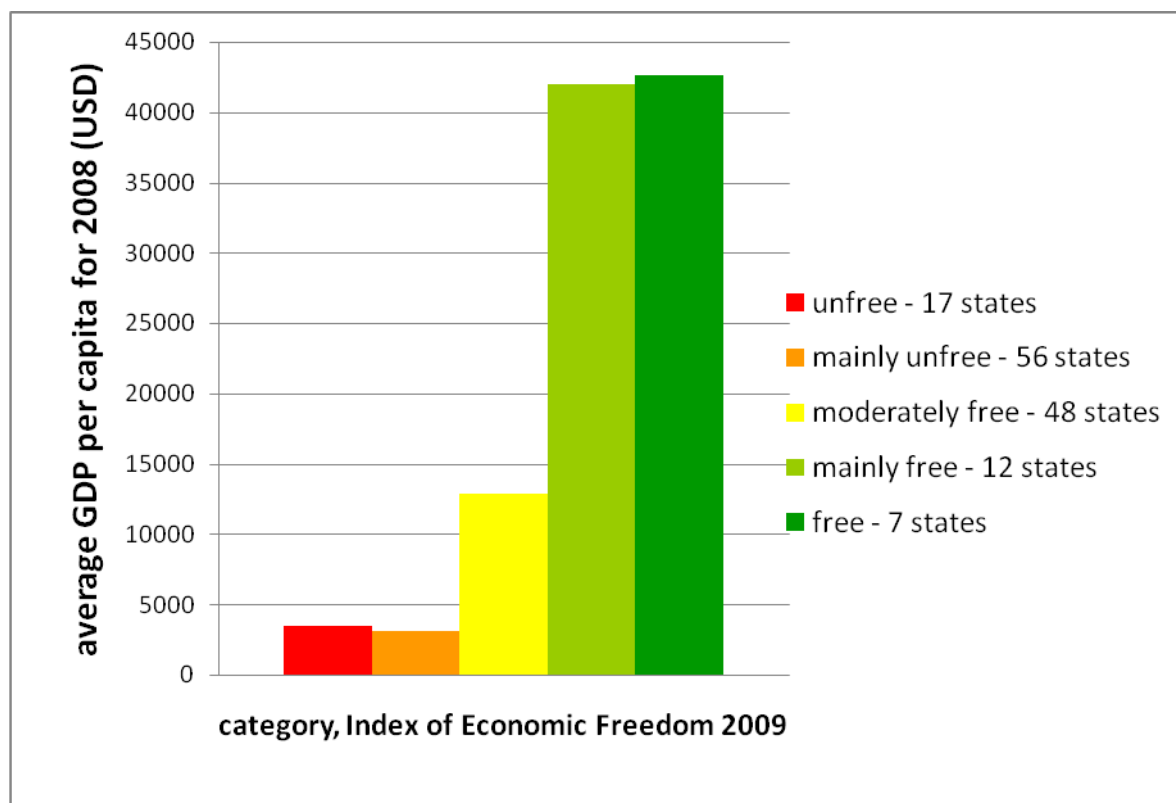
Graph 2 Average GDP per capita in categories of the Index of Economic Freedom

Analyzing data for 2009 in individual categories of the Index of Economic Freedom, it may be observed that the category of mainly free countries is characterized by the greatest distribution of GDP per capita. Influencing this were the data for Luxembourg, which achieved a very high income per person, and Mauritius, in which GDP per capita was quite low. This variance amounted to over USD 104,000. In remaining categories this distribution ranged between a level of over USD 15,600 in unfree countries to a level of around USD 47,600 in moderately free countries.

Presented in Table 1 are three countries which recorded the greatest improvement Index of Economic Freedom in the course of 13 years. The percentage change of individual indices was calculated by use of the following formula:

$$\text{Zmiana} \% = \frac{Wk - Wp}{Wp} \times 100\%$$

The value of a given index in the earliest year is denoted in the formula as Wp, and in the latest as Wk.

In Azerbaijan a change in the index of 93% caused a growth in GDP per capita of 1,242%, and in Angola of 1,051%. The countries given in the table achieved some of the highest growths in GDP per capita. Greater growth occurred solely in Equatorial Guinea (over 7,600%), where the Index of Economic Freedom grew in the course of these years by 16%.

TAB. 1 Countries with the greatest improvement in the Index of Economic Freedom

	Index of Economic Freedom			GDP per capita		
	1996	2009	change (%)	1995	2008	change (%)
Azerbaijan	30.0	58.0	93	397.20	5,330.03	1,242
Angola	24.4	47.0	93	401.90	4,627.10	1,051
Bosnia-Herzegovina	28.1	53.1	89	560.18	4,890.39	773

[Source: Own compilation on the basis of http://www.heritage.org/index/Explore.aspx?view=by-region-country-year and http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2]

Table 2 shows three countries with a greatest fall in the Index of Economic Freedom in the course of 13 years. In Zimbabwe a drop in the index of 51% caused a drop in GDP per capita of 23%. In the remaining two countries GDP per capita grew, yet in comparison with other countries this is a very small growth.

TAB. 2 Countries with a greatest fall in the Index of Economic Freedom

	Index of Economic Freedom			GDP per capita		
	1996	2009	change (%)	1995	2008	change (%)
Zimbabwe	46.70	22.70	-51	607.11	466.40	-23
The Central African Republic	75.94	48.30	-36	325.20	445.39	37
Argentina	74.70	52.30	-30	7,407.28	8,235.12	11

[Source: Own compilation on the basis of http://www.heritage.org/index/Explore.aspx?view=by-region-country-year and http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2]

The average coefficient of correlation between the Index of Economic Freedom and GDP per capita amounts to 0.612 and is calculated for a range of years: 1995-2007 for GDP and IEF 1996-2008 (coefficient of correlation was investigated for pairs of years, i.e. for GDP per capita for 1995 and IEF 1996 etc.). This value for the McPherson coefficient of correlation indicates a significant linear relationship between IEF and GDP per capita. The positive level of the coefficient of correlation provides the information that growth in gross domestic product per capita may be caused by growth

in the value of the Index of Economic Freedom. The level of the coefficient of correlation increased gradually with the passage of the years, achieving in 2006 its highest value (0.66). In subsequent years the coefficient fluctuated slightly (by no more than 0.03). The indicator for linear determination shows that in over 37% of cases the changes in GDP per capita could be determined by changes in the Index of Economic Freedom.

3. CORRELATION BETWEEN THE INDEX OF ECONOMIC FREEDOM AND THE HUMAN DEVELOPMENT INDEX

The relationship between the IEF and HDI was investigated for 132 states. Rejected were those countries for which Human Development Index data were not collected and those which had an insufficient number of data.

Graph 3 presents average sizes of the Human Development Index, achieved by selected countries grouped in the categories of the Index of Economic Freedom for 2007 (the research was conducted at the end of 2009 and beginning of 2010, at which time 2007 was the last year for which it was possible to collect data for such a significant number of countries). It may be observed that the higher the range of the IEF, the higher the average HDI. The highest level for the Human Development Index was obtained by free countries. The greatest difference between the average level of the Human Development Index in neighboring categories came between mainly unfree and moderately free countries (0.168).
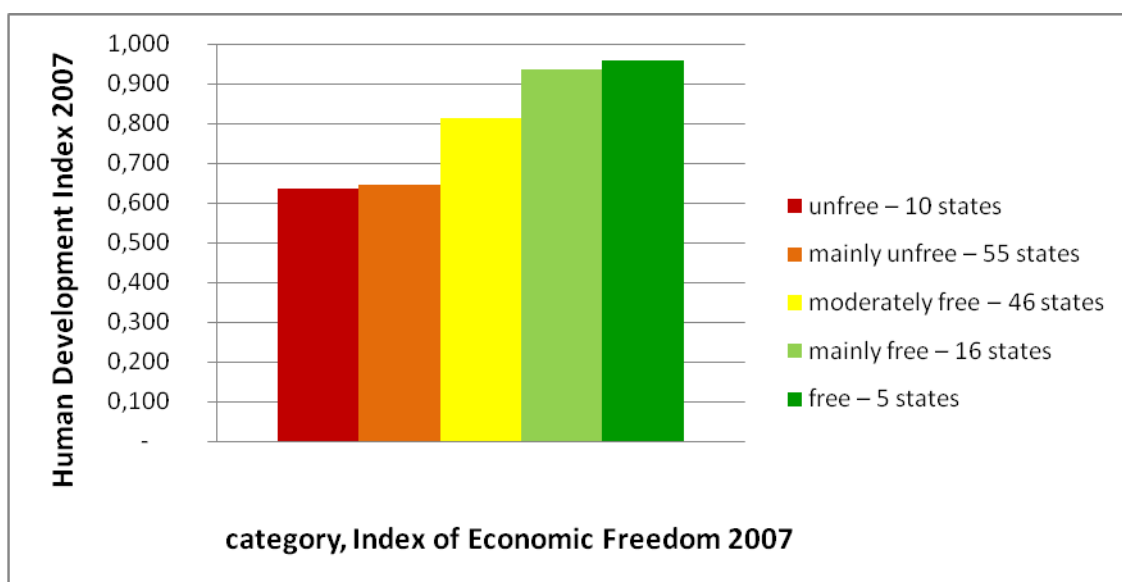
Graph 3 Average level of the Human Development Index in categories of the Index of Economic Freedom

[Source: Own compilation on the basis of http://www.heritage.org/index/Explore.aspx?view=by-region-country-year and http://hdr.undp.org/en/media/HDI_trends_components_2009_rev.xls]

Analyzing data of the Index of Economic Freedom for 2007, it may be observed that countries from the mainly unfree category are characterized by the greatest distribution of values for the Human Development Index. Influencing this was, among others, the data for Greece, which achieved a very high level of HDI, and Niger, where the Human Development Index achieved very low values. This variance amounted to 0.602 of a point. In the category of free countries this distribution was considerably lower. Quite a low level of variance in data was also seen in the mainly free countries (0.099).

The average coefficient of correlation measured for individual years, utilizing the value for the Index of Economic Freedom and Human Development Index, amounts to 0.598 (this was calculated as the mean average of the coefficients of correlation for the years 1995, 2000, 2005, 2006 and 2007, in that the HDI in earlier periods was calculated every five years). This is a moderately high level for the coefficient of correlation, indicating a significant linear relationship between the Index of Economic Freedom and Human Development Index. The coefficient of correlation takes positive values, which indicates that growth of the Index of Economic Freedom may cause growth of the Human Development Index. In individual years the value of the coefficient rose, the greatest being in 2006 and holding the level of 0.65. The indicator for linear determination shows that in over 34% of cases the changes in the Human Development Index are determined by changes in the Index of Economic Freedom.

Analyzing the connections between the Index of Economic Freedom and Human Development Index, it may be concluded that people live longer in freer societies. On account of the fact that the HDI also contains information on the health of citizens it may be inferred that an increase in the index causes also an improvement in the health of inhabitants. Individuals feeling safe in a given environment may freely develop various spheres of their own lives. Taking into consideration the third component of the HDI, i.e. gross enrolment ration, availability of education is also determined by level of economic freedom. The prosperity which springs from economic freedom leads to wider access to education. This access is one of the basic conditions of development of societies. Reducing illiteracy and increasing the number of pupils at various levels of education leads to dynamism being added to the process of development.

It may be observed that the average HDI of the most free countries is 1.5 times greater than in the case of the countries least free.

4. TESTING OF HYPOTHESES

Supplementing analysis of the coefficient of correlation is performance of a test of hypotheses for the coefficients of correlation. The hypotheses put were H_0: $\rho = 0$, denoting that the features are not correlated, and the alternative hypothesis, H_1: $\rho \neq 0$.

The test statistics were calculated according to the formula [8]:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

where r is the coefficient of correlation from the test, with n the size of the test.

With the level of significance $\alpha = 0.05$, the critical value read from the Student's t tables for 148 degrees of freedom (in testing correlation between the Index of Economic Freedom and GDP per capita) amounted to $t_{\alpha 1} = 1.976$, and for 130 degrees of freedom (in testing correlation between the Index of Economic Freedom and Human Development Index) $t_{\alpha 2} = 1.978$.

The test statistics for the correlation of GDP per capita and the IEF amount to $|t_1| = 9.41$, and for the HDI and IEF $|t_2| = 8.5$. In both cases $|t| > t_\alpha$, and it is therefore necessary to reject the hypothesis of a lack of correlation, H_0, and accept the alternative hypothesis. This means that the relationship between the variables studied is statistically significant.

5. DISCUSSION OF RESULTS AND SUMMARY

It should be remarked that it is not possible to reach unambiguous conclusions solely through analysis of the coefficient of correlation. This is confirmed only by a linear connection of both factors in a strictly mathematical sense. Correlation does not necessarily indicate a cause-effect relationship between the features described.

It is not possible to say clearly that an increase in the index of freedom is certain to trigger growth in GDP per capita or the Human Development Index. It may, however, be stated that in more free societies higher indices of economic growth were observed. It may not be ruled out that rapid economic growth caused by other factors led in some countries merely to evolution of the societies in the direction of more liberalized.

Citing the analysis of the coefficient of correlation conducted, it is possible to find the existence of a perceptible connection between the size of the indices of economic growth and the Index of Economic Freedom. The most significant connection could be

observed between the Index of Economic Freedom and gross domestic product per capita. It may be concluded from the research presented that economic freedom resulting from the liberalization of an economy positively influences the income of citizens. In general it may be stated with a large measure of probability that in a more liberal economy inhabitants live better, on account of a higher level of human development.

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