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The role of religion and political regime for human capital and economic development

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In this paper, we focus on the research of the impact of religion and political regime on human capital and economic development. There is a lot of incentive literature concerning the impact of political regime and religion on the economic development. However, we use different approach to show the mutual dependence of variables and offer another aspect of economic development relating to religion which is secularization and the principle of equal rights. We use three equation model to verify two hypotheses in our paper. The first, that differences in GDP per capita among countries determined by technological progress are influenced by religion and political regime. The second, that there is the interplay between GDP and educational level and education and political regime.

Keywords: economic development, political regime, religion, human capital

Introduction

Why are some countries rich and some poor? Many interesting books concerning the causes of differences in the nations' wealth offer a lot of explanations. Human capital, physical capital and technological progress are not the only factors that influence the economic development. The modern growth models are based on the neoclassical approach considering economy with no restrictions and with perfect competition. However, the reality is opposite. Economies are working in some environment that has significant impact on them. These specific characteristics of every single economy may influence the interaction of physical capital, human

capital and technological progress in such way that the growth theory does not need to be valid at all.

The most frequently mentioned specific characteristics are history, culture, geographic location, political regime and religion. Religion and political regime play an important role among these specific characteristics and are usually titled as the institutional factors of the economic development.

From the historical point of view the Judaic-Christian tradition is emphasized as essential factor of the European economic development. Conception of property rights dates back to biblical times and Christianity sustained and transformed it (Landes, 2004). Development of Christianity was accompanied by the crises which led in its separation. Reasons were usually connected with the efforts to gain the political power. The third and last splitting in the sixteenth century led to the creation of Protestantism as the critique of Roman-Catholic Christianity which influenced positively not only political regimes but also supported private property and business. Main requirement was to return to original sources. The Bible was translated into the original languages to enable common people reading it and its original thoughts could not be modified at authorities' discretion. Secular rulers, even Church, could not do and take what they wanted. In other words, they could not leave out the property rights. In addition, it was followed by the dividing of power on secular and Church. Fractionalism and splitting of power led to the support of freedom and competition which are important factors of technological progress and economic development.

Islam is, on the other hand, often considered as the barrier to economic development. The religion dominated and controlled everything and ideal government was the government of holy men. So called oriental despotism was characterized by principle that the ruler, considered as God, could dispose of lives and properties of his retainers. Lack of freedom and limited (if not any) property rights naturally suppress business, competition and economic development. On the other hand, there is an opposite idea trying to prove that it is not Islam what caused the economic underdevelopment of the Muslim world. They stress the role of institutions.

To sum up, one group of researchers and scientists, such as (Huntington, 2001), (Landes, 2004) or (Weber, 1930) claims that religion plays an important role in

economic development by affecting personal behaviour and values such as honesty, thrift, the will to work hard etc. This argument is motivated by the difference in economic development and standards of living between Western Europe, North America and other cultural offshoots of Western Europe on the one side and Muslim world on the other. The critics of this approach try to offer broader explanations considering Muslim attitudes as dependent variables (Kuran, 2004, 2007), (Lewis, 2002).

The effect of political regime on economic development is studied in a vast number of literature. Majority of this research is concentrated on the relation between political regime and growth. Our approach is different in two aspects. The first, we use GDP per capita level as dependent variable because our model is based on the classical Cobb-Douglas production function. Dynamics of development is represented by means of panel data system. The second, we study the mutual dependence between political regime and GDP as literature suggests. The importance of democracy for economic development is accented in principle by institutional economics (North 1990; DeLong and Shleifer 1993). The opposite idea, that economic growth leads to institutional improvements is supported by (Lipset 1960) and later by e.g. (Przeworski 2004; Barro 1999; or Glaeser et al. 2004).

This paper wants to bring more light into the relation between religion, political regime and economic development. The first part of this study is focused on the summary and evaluation of existing literature concerning this topic.

The second aim of this study is the evaluation of mutual dependence of human capital and economic development. On the one hand, human capital belongs among other major factors of the economic growth, and on the other hand the economic growth influences demand for human capital. Economic development is determined by technological progress which generates demand for higher human capital, in other words for higher educated people. The more developed economy leads to higher demand for education and its higher importance for society. This relationship was especially evident in history during industrial revolution since when the role of education for economic development significantly increased.

On the basis of our hypotheses coming from our cluster analysis and previous literature, we designed the model of three equations where the first equation is

simple Cobb-Douglas production function added by the variable of political regime. The second equation presents the impact of GDP, political regime and religion on educational level. The third equation expresses the influence of GDP and religion on the political regime.

The structure of this paper is as follows. The first chapter evaluates literature relating to the impact of religion and political regime on economic development. The second chapter consists of discussion about data and methodology used in the empirical analysis. The third chapter includes the analysis of the impact of political regime and religion on education and economic development of the countries. The first part uses the method of cluster and descriptive analysis which divide countries into groups on the basis of similarity of the selected variables. It is followed by regression analysis of the relations between educational level, GDP per capita and religion and political regime. The results are summarized in the conclusion.

1. Relation to existing work

Methodology, data and results of relating literature were considered when carrying out this research as the basis for establishing the hypotheses and methodological approach.

Impact of political regime on economic development

Literature usually offers the interplay between democracy and economic development. The importance of democracy for securing property rights and economic development is stressed in principle by institutional economics (North 1990; DeLong and Shleifer 1993). The opposite idea that economic growth causes institutional improvements is associated with (Lipset 1960) supported later by (Przeworski 2004; Barro 1999; or Glaeser et al. 2004).

(Barro 1996) estimates two kinds of functional relationships (not only) between growth and democracy. The first one examines the influence of the following variables on the real GDP per capita growth rate. Independent variables were: log of GDP, years of male schooling, years of female schooling, log of life

expectancy, log of GDP multiplied by human capital¹, log of fertility rate, government consumption ratio, public educational spending ratio, black-market premium, rule-of-law index, terms-of-trade change, investment ratio, democracy index and its square and two democracy index dummies. Functional relationship is estimated as a panel system of three functions, where each function corresponds to the period of 11 years². The estimation is done by instrumental variables method, where most of the instruments are lagged values of the regressors. Barro results in the statement that there is non-linear relationship between democracy and growth, precisely – of the quadratic form. The coefficients estimated are all statistically significant and signs are correct³. This means, that the initial change of the political regime from the low-level value will bring relatively large increment of the economic growth rate. However, as the political regime tends to be more and more democratic, the contributions of these changes to the growth raise will be decreasingly significant.

However, this approach does not allow for mutual relationship between democracy and growth. Instead, (Barro 1996) tests the possible influence of the economic development on the democracy in the separate system of equations. Again, there are three equations in the system, where each of them corresponds to the 10 years interval. Dependent variable is average of the democracy index during the corresponding interval. Independent variables are: lagged variables of the democracy index, log of GDP, years of attainment of the male and female primary schooling, infant mortality rate. Here the result is that level of economic development significantly influences the level of democracy, or put differently, the kind of political regime. So, Barro concluded that the advanced countries should export their economic systems to poor countries, rather than their political systems which are supposed to be more democratic automatically with the higher standard of living.

In addition, (Barro 1996) performs addition regressions, when he adds the following variables in the system which estimates influence of aforementioned regressors on the democracy index. The additional variables are: log of life

¹ Overall human capital is the sum of the levels of the male and female school attendance and the log of life expectancy multiplied by its respective coefficient.

² I.e. the first equation in the system is for 1965 – 1975. The second one is for 1975 – 1985. And the third one stands for 1985 – 1995.

³ Positive for the democracy index and negative for the democracy index squared.

expectancy, income inequality, urbanization rate, OPEC dummy, log of population, ethnolinguistic fractionalization, dummy for former colony, dummies for contemporaneous colonies and dummies for kinds of religions⁴. From the religions dummies only the Hindu dummy was statistically significant. This leads him to the conclusion that religion is rather unimportant to the level of democracy. (Minier 1998) uses panel regression, control group analysis and regression-tree analysis to find out that countries with positive changes in democracy index experience significantly faster growth than countries with opposite characteristics. Most of existing studies work with the GDP growth as dependent variable, so they analyze impact of democracy on economic growth. We consider in our approach the impact of political regime on the standard of living expressed by the level of GDP per capita. We want to verify the hypothesis that „growth unfriendly“ political regime may cause stagnation and in the long time decline of living standard in economy (compared to other countries). To be more precise, the history proves that autocratic political regimes (aside from some exceptions) are in the long time associated with lower economic development or in some extreme examples with the bankruptcy of economy.

Impact of religion on economic development

(Barro R. J. et al. 2003) uses a cross-country panel including up to 59 countries to study the interaction between church attendance and religious beliefs and economic development. Data are derived from individual information in six international surveys between 1981 and 1999. First, the impact of economic development on the religiosity is analyzed with the result that religiosity tends to reduce with the overall economic development. This analysis is then used to estimate the effect of religion on economic growth with the presumption that higher religious beliefs stimulate growth because they influence individual behaviour that enhances productivity such as work ethic or thrift. The results confirm this hypothesis. On the other hand, increases in church attendance, for given religious beliefs, reduce economic growth. This approach is concentrated on the examination of the impact of religiosity on the economic growth even if some

⁴ Dummies for colonies: British, French, Spanish, Portuguese, other. Dummies for religions: Muslim, Protestant, Eastern, Hindu, Jewish, other. Dummies for colonies and religions are put together to the regression of the democracy index.

growth equations include the shares of seven religion categories which are jointly statistically significant. Our approach is emphasized on the impact of certain religions such as Catholic, Protestant, Muslim, etc. on the political regime and education and thus on economic development.

One group of researchers and scientists, such as (Huntington, 2001), (Landes, 2004) or (Weber, 1930) claims that religion plays an important role in economic development by affecting personal behaviour and values such as honesty, thrift, the will to work hard etc. Christianity and especially Protestantism are believed to have positive influence on economic development by means of support of the private property and business which led to competition and technological progress. Private property and law ensuring its existence supported later the dividing of power on secular and Church. So called secularization meant that the public goods and affairs were provided by the secular government and no more by the Church. Secular government was more flexible, reacting faster on social and economic development by establishing the adequate institutions. Secularization is stressed by mentioned authors as the positive factor of economic development in Europe. On the other side, (Stark, 1994) as sociologists tried to deny the concept of secularization by means of argument that majority of society in the Middle Ages was not more religious than today. The authors say that secularization is a myth and thus could not happen at all. We can not agree with this statement because secularization, as defined, is not connected with the ordinary people and religiosity of the whole society. Secularization relates to the breaking of powers and thus influences the governments and institutions in a country.

The Weber's argument explains the positive effect of Protestant ethics on economic development and was examined by various authors. (Becker, 2007) by means of simple growth model with human capital modified this argument with the statement that Protestantism led to higher educational level which positively influenced the economic growth. In other words, the Protestant ethics such as honesty, thrift, the will to work hard were not the "engines" of economic growth in the Western Europe as stressed by Weber. However, the translation of Bible into the national languages led to higher educational level of population and was the base for the economic growth in the Protestant countries. (Blum, 2001) tested growth theories in the period of 1500 – 1750 and did not prove the Weber's hypothesis about the positive impact of Protestant ethics on economic growth in

Europe, too. On the other hand, they supported some of the Weber's hypotheses, e.g. positive influence of information networks, high level of specialization of the Protestant cities or the observation of contracts among people who did not know each other.

The role of religion for education and thus economic development was seen in Jewish history, too. (Botticini, 2005) emphasized the transformation of Jewish religion about the year 70 a.d. toward understanding Tora. Each Jew was responsible for teaching his sons to read and understand Jewish rules. By this fact Jews gained the competitive advantage in the form of human capital that could be offered in the market.

In terms of Islam, there are also two groups of researchers. One group emphasizes the negative effect of Islam on economic development while the other one is trying to prove that it is not Islam itself that works against the economic growth. The first group (e.g. Huntington, 2001, Landes, 2004) claims that the conviction that God is the only one, almighty, sovereign, eternal and disposes of lives and properties of his retainers led to not only lack of freedom and limited property rights suppressing business, competition and economic development but also to fatalism. Another aspect of Islam is insignificance of individuals. Human being is part of the society serving to God. This aspect is evident in common worship. It discouraged the individual efforts and thus competition. Other factors which hold down the economic development are personalism, laziness, lack of curiosity, mistrust of science, conservatism and traditionalism. These features are commonly called Islamic culture. On the other hand, (Kuran, 2007) tries to explain that the cause of economic underdevelopment in the Muslim world should be seen in inadequate institutions. He claims that all of the previously mentioned characteristics can not be denied but can be seen in other religions, too. He emphasizes that mentioned characteristics of human behaviour are symptoms of institutional deficiencies that started to reveal in times of industrial revolution in the western civilizations in the 18th and 19th centuries. The Middle East suffered from the lack of adequate organizational capabilities to use new technologies. Islamic law formed a system of institutions that are responsible for low economic level of the Muslim world. These institutions include law of partnerships, inheritance regulations and waqf. As Kuran says "these elements of Islamic law delayed the transition from personal to impersonal exchange, discouraged the use

of the technologies of mass production, kept civil society weak, and set the stage for sustained authoritarian rule”.

2. Data and methodology

The first part of the analysis is based on the cluster methodology with the aim to divide countries into groups with the similar characteristics. Clusters are established on the basis of four variables: religion (as the prevailing religion in the country), political regime, GDP per capita and average years of education.

Data for religion is taken from the World Almanac and Book of Facts⁵ and include: Buddhism, Hinduism, Indigenous, Aboriginal, Animist, Traditional faith groups, Judaism, Islam, Orthodox Christianity, Protestant Christianity, Roman Catholic Christianity, Confucianism and Christianity imported to Africa strongly influenced by the traditional faiths.

The measure for political regime is based on data from the Polity IV⁶ data collection. A country's so called Polity score, which ranges from -10 for a full autocracy to +10 for a full democracy. Indicator for each country is counted as the average Polity score from 1975 to the present. The average for the long period is used to express long-term positive or negative impact of the political regime on the economic development and education. GDP per capita in the year 2003 is taken from the World Bank database and is expressed in the purchasing power parity, in constant 2000 international \$. Data for average years in education in the year 2003 is also taken from the World Bank database. The analysis is carried out on the sample of 110 countries.

The second part of the analysis carries out regression analysis of the relation among education, GDP per capita, political regime and religion. The analysis is based on the panel data covering 60 countries (cross-sections) and spans over 6 years (1998-2004). We had made a restriction on the length of time-series, since data about educational level are very rare before the year 1998. We are aware of the fact, that namely a political regime influences the economy in the long-run,

⁵ Normally, the only source of information about the religion make up of a country comes from that country's government census. Sometimes political concerns influence the government's reports. Data is based on self – reporting. If a person considers himself to be a Christian, he or she is counted as a Christian. Various religious groups use other criteria for membership.

but because we did not want to drop education variable from our analysis (and possibly make a misspecification error), we have chosen a short time span instead. However, even after reducing our data time dimension to six years, there are still a few gaps in them. Due to availability of data about education, indicator had to be changed and is measured as total public expenditure on education as a percent of GDP. Physical capital is expressed as gross fixed capital formation as a percent of GDP. Data for both indicators is taken from the World Bank Statistics. Data about GDP p.c. is taken from International Monetary Fund, religion and political regime as in the cluster analysis. All data presented here are in yearly frequencies. More details about data in our analysis are described later in section Data limitations.

3. Empirical analysis of the impact of political regime and religion on education and economic development

Cluster and descriptive analysis

The countries are divided into two groups according to cluster analysis. Groups are created on the basis of four variables: religion, education, political regime and GDP per capita. The first cluster includes 49 countries and the second one 61 countries.

The first cluster includes 49 countries⁷ with the total population of 1,4 mld. and the characteristics:

14,5 years of education, average GDP per capita at the level of 16413 \$, usually democratic political regimes (5,8 on average), 100 % of Roman Catholic Christian countries, 100 % of Protestant Catholic countries, 18,2 %

⁶ Data is taken from Polity IV Country Report 2003 Series edited by Center for International Development and Conflict Management, University of Maryland.

⁷ USA, Canada, Mexico, United Kingdom, Ireland, Netherlands, Belgium, France, Switzerland, Norway, Denmark, Sweden, Finland, Spain, Portugal, Austria, Czech Republic, Slovak Republic, Italy, Slovenia, Croatia, Greece, Japan, Australia, Israel, Cyprus, Philippines, Estonia, Latvia, Lithuania, Hungary, Poland, Dominican Republic, Jamaica, The Republic of Trinidad and Tobago, Guatemala, El Salvador, Nicaragua, Costa Rica, Panama, Colombia, Venezuela, Peru, Brazil, Bolivia, Paraguay, Chile, Argentina, Uruguay

of Orthodox Christian countries, 100 % of Judaism (only Israel) and 16,7 % of Buddhist countries.

The second cluster consists of 61 countries⁸ with 3,9 mld. inhabitants (this cluster includes two most populated countries, China and India) and the characteristics:

9,9 years of education, 3615 \$ of GDP per capita, usually not democratic political regime (-2,4), 81,8 % of Orthodox Christian countries, 100 % of Muslim countries, 100 % of Hindu countries, 100 % of Christianity influenced by the traditional faiths (mainly in Africa), 83,8 % of Buddhist countries, 100 % of Confucian countries (only China) and 100% of Indigenous, Aboriginal and Animist countries.

The analysis shows that the higher level of GDP and education is connected with democratic political regime and mainly Roman Catholic and Protestant Christianity and Judaism. On the other side, low level of GDP and education is characterized by more autocratic political regimes and predominantly Islam and Hinduism.

Figure 1 Statistical verification of variables in the cluster analysis

Regarding statistical verification of variables in the cluster analysis, all variables contribute to the formation of the clusters because the values of Student's t test for continuous variables and Chi-square for categorical variable exceed the critical line. Positive values of statistics indicate that the variable takes generally larger than average value, negative values indicate that the variable takes generally smaller than average value. So, in the first cluster, GDP per capita, education and indicator of political regime is usually higher than average value. On the opposite, the variables usually get lower than average values in the second cluster.

It is supposed that the length of education in the economy is determined by the level of GDP and institutional factors, mainly by the type of political regime and religion. Political regime and religion make up the institutional environment influencing the behaviour of individuals and thus economic relations and the

⁸ Guyana, Albania, Macedonia, Bulgaria, Moldova, Romania, Russian Federation, Ukraine, Belarus, Armenia, Georgia, Azerbaijan, Mali, Senegal, Mauritania, Niger, Guinea, Burkina Faso, Ghana, Cameroon, Chad, Congo, Uganda, Rwanda, Djibouti, Ethiopia, Eritrea, Zimbabwe, South Africa, Namibia, Lesotho, Swaziland, Comoros, Mauritius, Morocco, Algeria, Tunisia, Iran, Turkey, Egypt, Jordan, Tajikistan, Kyrgyzstan, Uzbekistan, Kazakhstan, China, Mongolia, Korea,

economic success expressed by the level of GDP. The level of GDP determines the demand for education because more developed economies have higher need for education which is expressed by higher wages connected with higher education. And this is subsequently the factor for motivation of people to invest more in education and offer their “human capital” as the factor of economic growth. That is why GDP influences education and education influences GDP.

Figure 2 Education and GDP

Figure 3 Education and pol. regime

Figure 2 shows relation between education and GDP. It is evident that higher GDP is connected with higher education. However, the curve is not linear. At the beginning, when the GDP and education is low, there is little interaction between educational level and GDP. GDP and education are mostly correlated in the interval between 10 and 15 years of education and about 7000 and 20 000 \$ of GDP per capita. Higher GDP associated with more technologically developed countries brings higher demand for education and thus better utilization of the human capital. At the other end of the curve the slope is decreasing because the length of formal education at schools does not grow unlimitedly (the limit is graduation at university). The Pearson Correlation coefficient of education and GDP is 0,78 at 0,01 level.

Figure 3 showing distribution of education and political regime also indicates positive influence of political regime on the education even if there is a higher deviation. More democratic regime is connected with longer education. The Pearson Correlation coefficient (0.65) is statistically significant at the 0.01 level.

It is evident that democratic systems support higher educational level. Democracy supports freedom but also independence and responsibility for own life. These aspects encourage business and competition which are important features of western democratic civilizations. The need to compete motivates individuals to invest more in education which enables them to gain better paid job and better social position.

On the other side, higher level of education and economic development has positive feedback on democracy (stressed also in Glaeser et al. 2007). Educated

people require political participation and equality of the rights. Modern education brings freedom from preconceptions and traditional forms of authority. It is supposed that educated people do not follow authorities but try to think independently. They better understand their private interests and are able to think in long-term periods. Fear of educated people is one of the reasons of low level of education in the totalitarian systems in spite of the fact that it is not possible to deny (in particular nowadays) the necessity of high number of highly qualified people for the economic development.

The most economically developed regions, The Western Europe and The Northern America, which have the oldest and the most stable liberal democracies, are the examples of the impact of economic development on the democratization. The Southern Europe joined them in the 1970s. Similar impact of economic development on the democratization of society is evident in Asia, too. Japan was the first country which reached the fastest economic development in Asia in the 20th century as well as the stable liberal democracy. Australia and New Zealand, countries with strong European influence, naturally recorded the economic development and democratization long before the World War II. Regarding formerly communist countries of Eastern Europe, the most developed of them (Hungary, Czech Republic, Slovak Republic and Poland) reached the full democracy earlier than less developed ones (Bulgaria, Romania, Albania). Russian Federation is on the similar level of the economic development as some other Latin American countries, e.g. Argentina, Brazil, Chile or Mexico and as well as they Russia does not have ensured stable democratic system. Africa, as the least developed part of the world, has nowadays only several democratic countries that are moreover not stable according to the Polity IV indicator. The only exception presents the Middle East where some countries reach high level of GDP per capita although they have autocratic political regimes. This is caused by the income from the oil production.

Figure 4 Education and religion

Figure 4 shows the distribution of education depending on religion. The highest level of education is connected with Protestant Christianity, followed by the

Roman Catholic Christianity and Judaism. Lower level of education is linked to Orthodox Christianity, Buddhism and Hinduism. The third group is made up of Muslim countries that reach the lowest level of education.

Distribution of religion, GDP and political regime is described in a more detail in tables 4 and 5. Education is divided into four groups that are similar to ISCED classification. The numbers in brackets express average years spent in education within each education category.

“Without” category includes 14 countries with the lowest level of education, the lowest GDP per capita, autocratic political regimes. 79 % countries within this category are Muslim countries and 14.3 % Indigenous, Aboriginal and Animist.

33 countries are included in the “Primary” category with the median GDP at the level of 2669 \$, unstable and more autocratic political regimes. GDP in this category is higher by 253.9 % compared to the “Without” category and indicates significant interaction between GDP and level of education. There are mostly Muslim countries and countries with Christianity mixed with the traditional faiths within this category.

“Secondary” education is connected with 6126 \$ of GDP per capita which means smaller change compared to primary education. Political regime could be characterized as unstable and undemocratic and majority of the countries endorse to Roman Catholic Christian, Muslim and Orthodox Christian religion.

“Tertiary” education indicates another large change of GDP compared to the previous category (353.9 %) and median GDP exceeds 20000 \$. Political regime is more democratic and prevailing religions are Roman Catholic and Protestant Christianity.

The highest level of education “Tertiary upper” consists of only 5 the most developed countries with the highest GDP per capita, democratic political regime and mainly Protestant Christianity.

Percent distribution of the countries with certain religion in education categories is included in the table 6. 36.4 % of the Protestant Christian countries reach the highest (Tertiary upper) education, 54.5 % Tertiary and 9.1 % Secondary. Roman Catholic Christian countries reach mostly Tertiary and Secondary education. Only 2.9 % of them are included in Tertiary upper category. Judaism is represented

only by one country which falls into category Tertiary. Tertiary education is reached also by 16.7 % of Buddhist, 9.1 % Orthodox Christian countries and 7.7 % of Christian countries with the features of traditional faiths. On the other side, Muslim countries reach max. secondary education (25.9 %), 33.3 % are included in the category primary and 40.7 % in the category without education.

Data shows the correlation between religion and education. However, it is not possible to make explanation without reference to political regime. Since it was religion what influenced mainly formation of the political regime which determined the institutional environment in society. The significant impact of political regime on economic development and education was described in the previous sections. The analysis resulted in the statement that more democratic political regime brings higher GDP per capita and higher level of education.

Religion that supports education and democracy should include toleration and equalitarianism in the sense of equal rights. Then, it is no wonder that the Christian countries generally belong to developed democratic societies.

Christianity has already adopted this principle of equal rights for all people on the basis of their ability of moral choice in the times of the Reformation. Literature offers two reasons for this development. (Blum, 2001) or (Botticini, 2005) emphasized the role of education. According to them, the translation of Bible into the national languages and understanding Tora led to higher education with the positive impact on democratization and economic development. On the other hand, (Landes, 2004) and (Huntington, 2001) connect positive development in the Christian countries with the process of secularization. They stress that the separation of secular and Church power led to the support of property rights, private property and business which is positive for the economic development particularly in consequence of its impact on the democratization of society. The driving force for the secularization in Christianity was Protestantism and 80 % of countries with the highest level of GDP per capita and highest level of education are countries endorsing to the Protestant Christianity.

Regression analysis

Cluster and descriptive analysis and other related literature support hypotheses that are summarized as follows:

- Economic level (expressed usually as GDP per capita) and growth is determined by human capital (approximated the most frequently by the educational level), physical capital and technological progress. This approach is based on the neoclassical conditions of economic growth and thus on the assumption of no restrictions in economy. However, the reality is different. The conditions of business and any behaviour of “participants” in a society are determined by institutions that are established by the political regime.
- Educational level is influenced by the economic level in a society, by political regime and religion. Political regime establishes institutions and directly influences the extent, quality and access to education. Higher GDP per capita is connected with technological progress that creates higher demand for more educated people.
- Political regime is influenced by religion and educational level. Religion played and has been playing the important role for establishing of priorities and values in a society and thus influencing political regime and education. Moreover, the religion has also direct political power in countries which are not secularized (or only partially). Regarding the impact of educational level on political regime, it is supposed that more educated people prefer democratic political system.

Defining the model

In accordance with suggested hypotheses we define our baseline model used for empirical analysis of expected relationships between selected variables. The model has a following form:

$$\begin{aligned}
GDP_{zt} &= \alpha_1 + \beta_1 * CAP_{zt} + \beta_2 * EDU_{zt} + \sum_{n=0, i=3}^{n=5, i=8} \beta_i * REG_{z(t-n)} + \varepsilon_{zt} \\
EDU_{zt} &= \alpha_2 + \beta_{10} * GDP_{zt} + \sum_{n=0, i=11}^{n=5, i=16} \beta_i * REG_{z(t-n)} + \sum_{k=1, i=17}^{k=8, i=24} \beta_i * REL_{ztk} + \nu_{zt} \quad (1) \\
REG_{zt} &= \alpha_3 + \sum_{n=0, i=26}^{n=5, i=31} \beta_i * GDP_{z(t-n)} + \sum_{k=1, i=32}^{k=8, i=39} \beta_i * REL_{ztk} + \delta_{zt}
\end{aligned}$$

Where:

$$z \in \{1, 2, \dots, 60\}$$

$$t \in \{1, 2, \dots, 6\}$$

$$\varepsilon, \nu, \delta \approx IID(0, 1)$$

Apparently, we have a panel-data system consisting of three equations. All variables, except for religion dummies, are in natural logarithms. *GDP* denotes Gross domestic product per capita, *CAP* means physical capital, *EDU* expresses human capital approximated most frequently by educational level, *REG* is an indicator of political regime⁹, *REL* is a set of dummies determining the type of prevailing religion in a given country. α_1 , α_2 and α_3 are constants where α_1 includes the effect of technological progress resp. multifactor productivity and α_2 , α_3 the effect of benchmark religion category. β_1 to β_{39} are coefficients, where β_1 , β_2 , β_{10} and $\beta_{(26-31)}$ are strongly expected to be positive.

The first equation in the system is simply a Cobb-Douglas production function extended by political aspects. We have added this variable to C-D function to express the impact of political regime on economic development.

The second equation captures the influence of GDP, political regime and religion of given economy on the education. Although the political regime variables are included in the first equation of the system (1) and therefore their influence is already built in GDP p.c. variable, we include them in the second equation once again. This decision is based on our assumption that political regime influences the education not only through GDP p.c. indirectly, but also more firmly (e.g.

⁹ PolityIV index can be found here: <http://www.cidcm.umd.edu/polity/data/>. For purpose of estimation, we have modified it by adding a scalar of arbitrary value 11.1. This allows us to take logs of all (namely negative) values of indexes. Since this alteration is proportional to all values, the results are intact.

political regime and religion may influence a structure, quality and access to education). Inclusion of religion and GDP into the second equation corresponds to our hypothesis about the influence of religion and GDP on the educational level.

The third equation shows the expected impact of GDP and religion on the political regime. The hypothesis rather supposes the impact of educational level (instead of GDP) on the political regime in the sense that more educated people usually prefer more democratic regime. However, we are forced to use GDP indicator because of availability of data about education.¹⁰ The impact of data on the results of our research is discussed in a more detail in the section *Data limitations*. Supposing the mutual dependence of GDP and educational level we therefore replaced education by GDP.

Since, at least theoretically, and as our cluster analysis and other literature suggests, should be wealth, the level of education and the political regime mutually dependent, we employ the model given by the system (1). We suggest using panel data system not only to observe more data but prevalingly to show the dynamics of development. In other words, we want to show the dependence of regressands on suggested explanatory variables both across countries and in time. We also suggest using indicator of political regime in the first two equations and GDP in the third equation as lagged variables since it is supposed that GDP and educational level respond to the change of political regime with a lapse of time and with the long-run effect. Political regime will react on the change of educational level (in our case unfortunately approximated by GDP) with the delay, too. Our aim is therefore confirmation or rejection of suggested hypotheses.

Data limitations

Regarding the data availability, the quantification of human capital poses the biggest problem. Due to its qualitative character, the indicator of human capital will always be the approximation of the real value of human capital. Literature offers three approaches how to measure human capital: 1) the highest attained education which is usually described by either the share of labour force with at

¹⁰ The only publicly available data (that were available for us) about education that would cover at least several years for the most possible number of countries is data expressing public education expenditure as a percent of GDP.

least upper secondary education or average years in education; 2) direct measurement of skills; and 3) estimation of market value of human capital on the basis of wage. The most frequently used approach for empirical analysis is the first one because of availability of data. However, although these two indicators are published by several international organizations, e. g. World Bank, Unesco or OECD, data is not (at least publicly) available for longer time. Intending apply panel data system, we were forced to choose another indicator associated with education with data available for sufficient number of countries and years. The only acceptable indicator meeting our demands was the total public education expenditure as a percent of the GDP for which we received at least six years (1998-2004) in a row. However, there are still a few gaps in data. Thus, our panel and therefore whole system (1) is unbalanced. It is necessary to take it into consideration when interpreting the results of our analysis.

Expression of physical capital as gross fixed capital formation as a percent of the GDP has its limitations, too. It does not really measure the whole stock of physical capital but it is generally accepted in empirical works.

Which type of religion seems to influence the education the most?

Here we want to decide, which kind of religion was the most influential one, in terms of the impact on the educational level. Any religion category could be used as benchmark dummy variable but for easier readability of our estimations we want to use religion which is connected with the highest level of education. However, considering the limitations of our indicator of educational level and supposing the interdependence between the GDP and educational level, we estimate the impact of religion on the GDP. Therefore, we employ function A(1), which we treat as an auxiliary regression considered as some kind of help-tool.

$$GDP_{zt} = \sum_{i=1}^9 \beta_i * REL_{i,zt} + \varepsilon_{zt} \quad A(1)$$

Where

$$z \in \{1,2,\dots,51\}$$

$$t \in \{1,2,\dots,30\}$$

$$\varepsilon \approx IID(0,1)$$

The *GDP* is in non-logarithmic form. Constant was dropped to allow us to identify the “strength” of the various kinds of religion, in terms of their influence on a wealth. Regression output can be found in table 6.

We can clearly see, that the most influential one, in terms mentioned above, was Protestant Religion, closely followed by Buddhism. The “worst” ones were clearly the Indigenous, Hindu and Muslim religion dummies. One can immediately see the huge gap between this group of religion types and the others. These findings are fully consistent with results of our cluster analysis and with our theoretical expectations.

Results of the system (1)

To solve the system (1), Zellner’s SUR method was used¹¹. This should make our results robust to cross-sectional heteroskedasticity and serial-correlation. The output of regression from the software package appears in table 7.

Results from the first equation suggest that only human capital (approximated by public education expenditures per GDP) had the influence on wealth. What is quite surprising is the statistical insignificance of the capital and technological factors. Both of them are quite highly insignificant (although they have correct signs). There may be several reasons for that: The first, our data time span is too short to be able to discover and confirm expected relationship between variables of the system (1). The second, there are some gaps in the data for some cross-sections. The third, our sample of included countries is relatively small (60 countries). All of these may have rendered our results to be a somewhat misleading and, thus, the theoretical relationships strongly suggested by various literature or by our cluster analysis were not empirically confirmed.

The second equation shows, that GDP p.c. influenced the education, as expected. From political regimes variables, only those lagged by five (in the 1st equation) and four and five years (in the 2nd equation) are statistically significant. What seems really interesting is, that signs of coefficients change between years. One possible reason for this may be, for example, the negative change in the political

regime of given country and the simultaneous or the subsequent positive change of the GDP. The rise of the GDP may have been influenced by some other, non-political factors. Hence, the linear relationship suggested by the regression may appear to be negative. The regression results may confirm the fact, that political regime influences wealth and education namely in the long run and with a long-lasting effect.

From religion dummies, in the second equation only Roman Catholic Christian and Buddhism dummies were statistically significant. In the third equation, only Muslim and Imported Christian dummies were significant. Looking at the coefficients of given significant coefficients, we may conclude, that the influence of these kinds of religion on the education and political regime respectively is weaker compared to the benchmark dummy (Protestant Christian).

When examining the possible influence of GDP on the political regime, our results look quite disappointing, since all coefficients are highly statistically insignificant. But we should bear in mind, that firstly, with better data availability the indicator of educational level would be used here instead of GDP as our hypothesis suggests. Secondly, economic level most probably influences the type of political regime with much longer delay. Although wealth and educational level of the citizens grow, their striving for a more democratic regime will probably take quite a lot of time, before the change of the political regime happens.

Considering the whole model, we may see, that it performs quite well, if we take into consideration the relatively poor data availability, the rough proxy used for the education variable and gaps in the data. Graphical residuals testing shows a mild and relatively weak cross-correlation between the equations' residuals. Using the correlation matrix of the residuals indicates again the only minimal and negligible correlation. Breusch-Pagan test of independence thus displays highly statistically significant results of the F-statistics, again confirming possible cross-correlation between equation of the system (1). Using the rule-of-thumb of the exceeding the value of the pair-wise correlation between regressors set to 0.8, we conclude that the collinearity is not present (the maximum value in the correspondent correlation matrix was slightly above 0.4). The testing of the

¹¹ All estimated models were tested for heteroskedasticity, autocorrelation, multicollinearity and normality of residuals. All models are valid in terms of these tests unless it is said otherwise.

residuals for the normality shows that residuals are most probably asymptotically normally distributed. Thus, one has to be cautious in interpreting the results or when making some conclusions and predictions.

Testing the long-run influence of political regime on wealth

Since in the system (1) we were restricted to only six observations per a cross-section, we could not make use of data about GDP p.c. and political regime, which span over the period of 1975 – 2004¹². Thus, we will now test the equation (1), where the GDP p.c. is solely dependent on the current and lagged up to 5 years political regime, added by religion which would be ideally used in the second and third equation in our system. This will allow us to check our hypothesis of strong and long-lasting influence of these factors on wealth in the long-run. Equation (1) is defined as:

$$GDP_{zt} = \alpha_1 + \sum_{i=1, n=0}^{i=6, n=5} \beta_i * REG_{z(t-n)} + \sum_{i=7}^{14} \beta_i * REL_{zt} + \varepsilon_{zt} \quad (1)$$

Where:

$$z \in \{1, 2, \dots, 51\}$$

$$t \in \{1, 2, \dots, 30\}$$

$$\varepsilon \approx IID(0, 1)$$

Output from the regression package can be found in table 8. Note, that we had to reduce the number of cross-sections to 51 to obtain balanced panel and the third and the seventh religion dummy (Orthodox and Buddhist) had to be dropped to avoid collinearity. Other dummies are relative to the Protestant Catholic dummy. We had to employ the FGLS regression to account for cross-sectional heteroskedasticity and serial-correlation.

The results are fairly clear. All independent variables are highly statistically significant, and Wald test shows, that all the regressors are jointly significant as well. Notice, that all religion dummies perform worse than the Protestant Catholic (benchmark) dummy. These results are in line with our theoretical expectations as well as with results of our cluster analysis and our auxiliary “religion”

¹² Data for GDP p.c. variable was taken from World Bank Statistics for the purpose of this estimation.

regression's (A(1)) results. It is also clear, that the political regime is influential in the long-run and has a positive and statistically significant long-lasting effect.

Although we only apply the linear relationship between GDP and political regime, our results confirm (Barro's 1996) conclusion, that political regime matters in the economic development and its influence on wealth is positive.

Conclusion

The cluster and descriptive analysis showed mutual relation between education and economic development, political regime and religion. It is evident that education as the significant part of the human capital belongs together with the physical capital and technological progress to the main factors of economic growth. Nevertheless, there must be demand for education which increases with the economic development. Education seems to be the motivation factor since the industrialization of economy.

Education and economic development is influenced by political regime and religion which both determine the institutional environment. The highest education and economic level are reached in the countries with full democracy. Democratic regime influences positively, in the sense of ensuring the freedom and property rights, that support business and competition and thus economic development. Economic development subsequently requires a larger number of qualified, educated inhabitants. Educated persons subsequently have backward impact on the support of democratic regime by involving in political affairs and require freedom and equal rights. Fear of educated people may be the reason why the autocratic systems usually have low level of education and GDP per capita.

Furthermore, the results show that democratic regimes are successfully established particularly in the Christian countries. The reasons why seem to be firstly in the process of secularization that began much sooner in the Christian countries than in other religions. This aspect is supported by (Landes, 2004) and (Huntington, 2001). Secondly, establishing of the principle of equal rights and translation of Bible into the national languages in the times of Reformation and understanding Tora are emphasized by (Blum, 2001) or (Botticini, 2005) as the factors for higher education with the positive impact on democratization and economic development. On the contrary, the Muslim countries, where Islam

significantly influences law and political regimes, are usually autocratic with low level of economic development and education. So, the results suggest that religions which set forward the process of secularization with the dividing of secular and Church power and adopted the principle of equal rights support education and democratic political regimes which subsequently positively influence economic development. And educated people consequently positively support democratic regime.

However, we do not want to say that Islam is a source of economic underdevelopment in the Muslim countries. We do not emphasize the positive effect of Protestant ethics on economic development. We really agree with Kuran's or Rubin's arguments that Islamic law formed a system of inadequate institutions that are responsible for low economic level in the Muslim world. We offer another aspect of religion influence on economic development which is secularization and the principle of equal rights.

On the basis of cluster and descriptive analysis we established the model. The regression analysis proved that it performs quite well and thus is supportive regarding the mentioned results. However, one has to consider the poor data availability for the indicator of human capital that forced us to use short period. It would be interesting and useful to verify the model with better indicator for human capital, e.g. average years in education, which would be available for each country and for more years in a row.

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FIGURE 1 STATISTICAL VERIFICATION OF VARIABLES IN THE CLUSTER ANALYSIS

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Tab 1 Cluster distribution

	N	% of Total
Cluster 1	49	44,5%
2	61	55,5%
Total	110	100,0%

Tab 2 Centroids of the clusters

	longPol		GDP		edu	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Cluster 1	5,79	4,05	16412,85	10276,37	14,69	2,43
2	-2,42	4,20	3615,29	3076,81	9,90	2,98
Comb.	1,23	5,81	9316,02	9619,97	12,03	3,64

Tab 3 Distribution of religions in the clusters

	1,00		2,00		3,00		4,00	
	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.	Freq.	Perc.
Clust 1	34	100%	11	100%	2	18,2%	0	,0%
2	0	,0%	0	,0%	9	81,8%	27	100%
Com.	34	100%	11	100%	11	100%	27	100%

Continuation

5,00		6,00		7,00		8,00		9,00		10,00	
Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc	Freq	Perc
1	100%	0	,0%	0	,0%	1	16,7%	0	,0%	0	,0%
0	,0%	3	100%	13	100%	5	83,3%	1	100%	3	100%
1	100%	3	100%	13	100%	6	100%	1	100%	3	100%

Note: 1 = Roman Catholic Christianity, 2 = Protestant Christianity, 3 = Orthodox Christianity, 4 = Islam, 5 = Judaism, 6 = Hinduism, 7 = Christianity (influenced by the traditional faiths in Africa), 8 = Buddhism, 9 = Confucianism, 10 = Indigenous, Aborigin, Animist, Traditional faith groups

Tab 4 GDP, political regime and religion depending on the level of education

Average years in education	GDP per capita (median)	Change of GDP (%)	Pol (median)	Number of countries	Religion (% of countries within educational categories)
Without (5,4)	1051		-4.4	14	79%M , 14,3%I, 7%CHimp*
Primary (10,2)	2669	253.9	-2.4	33	18.2%R, 27.3%M , 12.1%B, 6.1%H,O, 3% I,C, 24.2%CHimp
Secondary (12,8)	6126	229.5	0.7	33	36.4%R , 21.2%M, 24.2%O, 3.1%B,P,H, 9.1CHimp
Tertiary (15,8)	21682	353.9	7,6	25	60%R , 24%P, 4%B,J,O,CHimp
Tertiary (upper) (19)	27506	126.9	10	5	80%P ,20%R

* CHimp = Christianity imported to Africa (influenced by the traditional faiths)

Tab 5 Religion depending on education

	Religion %									
	O	P	R	J	CHimp	M	B	H	I	C
Without					7.7	40.7			66.7	
Primary	18.2		17.6		61.5	33.3	66.7	66.7	33.3	100
Secondary	72.7	9.1	35.3		23.1	25.9	16.7	33.3		
Tertiary	9.1	54.5	44.1	100	7.7		16.7			
Tertiary (upper)		36.4	2.9							
Total	100	100	100	100	100	100	100	100	100	100

Note: O = Orthodox Christianity, P = Protestant Christianity, R = Roman Catholic Christianity, J = Judaism, CHimp = Christianity in Africa influenced by the traditional faith groups, M = Muslims, B = Buddhism, H = Hinduism, I = Indigenous, animist and traditional faith groups, C = Confucianism

Tab 6 Regression output for GDP – religion relationship

Variable	Coefficient	Standard errors
----------	-------------	-----------------

<i>Independent variable - GDP</i>		
REL1 Roman Christian	8315.5290	263.8740
REL2 Protestant Christian	21400.6600	426.8033
REL3 Orthodox Christian	14970.9600	821.0328
REL4 Muslim	2539.0400	170.5849
REL5 Judaism	18281.8400	1072.6670
REL6 Hindu	1545.0400	79.2418
REL7 Imported Christian	3854.9870	233.5141
REL8 Buddhism	21247.7900	1388.6570
REL9 Indigenous	937.6007	43.5471
Wald-test probability	0.0000	-

Note: All coefficients were significant at 1% level. Method: FGLS.

Tab 7 Regression output for System (1)

Variable	Coefficient	Standard Errors
<i>Equation 1. – Dependent variable: GDP</i>		
Constant	0.8825	1.2022
CAP	0.4453	0.2922
EDU	1.7911***	0.2396
REG	1.4240	7.7485
REG(-1)	-0.6238	7.7659
REG(-2)	-1.1438	0.9504
REG(-3)	2.0054	1.3715
REG(-4)	1.7379	1.3382
REG(-5)	-1.9395**	0.8039
Adj. R ²	0.3440	-
F-stat. probability	0.0000	-
<i>Equation 2. – Dependent variable: EDU</i>		
Constant	0.0249	0.4313
GDP	0.2166***	0.0402
REG	-2.0164	2.6803
REG(-1)	2.0526	2.6803
REG(-2)	0.0606	0.3351
REG(-3)	-0.6885	0.4731

REG(-4)	-0.8434*	0.4625
REG(-5)	1.3081***	.02533
REL Roman Catholic	-0.1460**	0.0659
REL Orthodox	-0.0485	0.1100
REL Muslim	-0.0464	0.1279
REL Judaism	0.1705	0.1716
REL Hindu	-0.1127	0.1426
REL Imported Christian	0.1937	0.1228
REL Buddhism	-0.4193**	0.1719
REL Indigenous	-0.0401	0.2160
Adj. R ²	0.4927	-
F-stat. probability	0.0000	-
<i>Equation 3. – Dependent variable: REG</i>		
Constant	1.4498**	0.6681
GDP	-0.7101	1.7241
GDP(-1)	1.3255	2.6863
GDP(-2)	-0.9887	2.0607
GDP(-3)	-0.3209	2.7755
GDP(-4)	0.1519	2.5580
GDP(-5)	0.7088	1.6722
REL Roman Catholic	0.0612	0.1008
REL Orthodox	0.0596	0.1705
REL Muslim	-0.3991**	0.1846
REL Judaism	-0.0612	0.2655
REL Hindu	-0.0946	0.2085
REL Imported Christian	-0.4548***	0.1751
REL Buddhism	0.1188	0.2582
REL Indigenous	-0.0464	0.3801
Adj. R ²	0.3295	-
F-stat. probability	0.0000	-

*, **, *** marks significance at 10%, 5% and 1% level, respectively. Statistically significant coefficients are bolded. Method: SUR.

Tab 8 Regression output for the equation (1)

Variable	Coefficient	Standard Errors
<i>Dependent variable: GDP</i>		
Constant	9.4660	0.0444
REG	0.0235	0.0030
REG(-1)	0.0140	0.0031
REG(-2)	0.0051*	0.0031
REG(-3)	0.0218	0.0030
REG(-4)	0.0168	0.0029
REG(-5)	0.0240	0.0027
REL Roman Catholic	-0.7863	0.0473
REL Muslim	-2.0832	0.0473
REL Judaism	-0.1647	0.0518
REL Hindu	-1.2785	0.1255
REL Imported Christian	-1.0856	0.0771
REL Indigenous	-2.7767	0.0530
Wald-test probability	0.0000	-

Note: All coefficients, except for REG(-2) were significant at 1% level. * marks significance at 10% level. Method: FGLS.