

## Determinants of Education System in OECD Countries

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### Abstract

The education system is subjected to the influence of macroeconomic factors and environmental shocks, under the influence of which the effectiveness and the efficiency of the analyzed social subsystem changes. The purpose of the study is to determine the factors that influence the population number with a certain level of education. Financial macroeconomic indicators and labor market indicators are tested among the regressors.

The results of the study based on the development of panel data models for 30 OECD countries during the period of 2000-2016 show that the higher education system is significantly influenced by financial macroeconomic indicators, while the secondary education system is more influenced by labor market indicators. The long-term interest rate was insignificant both for the model built for higher education and for secondary education model, which can be explained by the relatively low level of the indicator in OECD countries.

The model with fixed effects is built for higher education system. This model takes into account the individual effects of OECD countries. The choice is made for upper secondary education, based on statistical tests, in favor of the model with random effects, which indicate a relative unification of this stage of education in OECD countries.

The conclusions of the study are of practical interest for decision-making at the state level.

**Keywords:** Education System, Tertiary, Upper Secondary, Unemployment, Inflation, Saving Rate, OECD.

### Introduction

Higher education is a social institution that promotes the development of human capital of a certain quality. The influence of higher education on the country economic development is realized in various aspects. The effects of higher education on the macroeconomic level are manifested in productivity growth, in GDP growth (Blundell 1999, Sianesi and Van Reenen 2003, Bloom et al. 2006), in the distribution of sustainable development values (Cortese 2003, Kolesnikova et al., 2016).

The system of higher education, in its turn, is the part of a more complex system of social life and is subject to the influence of environmental factors. Various indicators are examined as the macroeconomic factors influencing the system of higher education. Dima et al. (2017) identify Gross Domestic Product (GDP), Research and Development (R & D) investment level,

government expenditure on education, exports of high-tech, costs of exploiting intellectual property. The authors examine the influence of macroeconomic factors on the convergence of higher education systems in Europe.

Menon et al. (2016) group the factors which influence the demand for private higher education, in the following way: economic, social, institutional and individual ones. According to the results of their research, the place of residence does not influence the aspiration of school leavers to obtain higher education. Besides, the financial crisis has influenced the perception of return rate on higher education by students.

The traditional relationship between the labor market and higher education is indicated in a number of studies where easy access to higher education, on the one hand, leads to a higher productivity of the country economy, but, on the other hand, causes mass unemployment in a number of countries like Europe (Tribe 2003), and the East Asian countries (Yang and Chan 2017). Green and Henseke (2016) examining the graduate underemployment in 21 OECD countries concluded that higher education creates disproportions in the labor market, however, it has certain advantages of the social plan.

The impact between such a macroeconomic indicator as the level of savings and the training system can also be analyzed from two sides. A significant number of studies have been devoted to the analysis of training program impact on the individual savings behavior (Solmon 1975, Bernheim et al. 2001, Lusardi 2009). The aspect of targeted saving stimulation aimed at the payment for education and higher education is disclosed in the work by Hossler and Vesper (1993). The authors analyze the factors that affect the savings of parents in order to pay higher education.

Loans can be seen as negative savings. Best and Keppo (2014) conclude that the demand for higher education is influenced by higher education prices, but a high correlation of prices with borrowing leads to the fact that credit restrictions act as a financial barrier to increase the number of higher education students.

### Methods

The goal of the study is the determination of macroeconomic factors that influence higher education in 30 OECD countries. The hypotheses of research consist in following positions:

1. The number of people who have received higher education is influenced by financial macroeconomic indicators, such as interest rate, inflation, savings level,

which determines the availability of higher education in terms of its financing possibility.

2. Labor market indicators, in particular the employment and the level of unemployment, make an impact on higher education system, since they determine the employment opportunities of people with higher education, the privileges and additional benefits from higher education.

The subject of the study was 30 OECD countries with the exception of Turkey. The time period covers the data from 2000 to 2016. The official OECD indicators are the source of the data. The econometric methods were used during the study, in particular, the models for panel data, during the construction of which 510 observations were used.

**Results**

In order to assess the impact of macroeconomic factors on higher education, we use the data on the level of adult education, which shows the proportion of the population at the age of 25-64 with a complete education level. The upper secondary and tertiary education was chosen as the levels of education. The Upper secondary level implies the termination of lower secondary schooling. During the design of models, Tertiary and Upper Secondary were used as dependent variables, respectively. There are differences between

the Tertiary and Upper Secondary levels in OECD countries. Thus, the share of people with higher education makes 29% on the average during the period of 2000-2015, while with education at the upper secondary level this share makes 45% on the average [authors' calculations according to data, OECD (2017a)].

The following macroeconomic factors were selected as the factors affecting the system of higher and secondary education:

- 1) Unemployment is a harmonized level of unemployment, adjusted for seasonality, in percentage;
  - 2) CPI includes a percentage change in consumer price index for all goods and services as compared to the previous period;
  - 3) Wages - the data on the average level of annual wages, in constant prices of 2016, in US dollars;
  - 4) Interest rate - long-term interest rate, in percent;
  - 5) Saving rate represents the level of savings as an unspent part of the income in the percentage of GDP.
- Model 1 is designed to assess the influence of regression factors on the proportion of the population with a higher education (Tertiary) for panel data in 29 OECD countries with fixed effects. The simulation results are presented in Table 1.

Table 1. Model 1 for Tertiary

	Coeff.	St.dev.	t-stat.	P-value
const	-10,0421	2,27885	-4,407	1,37e-05 ***
CPI	-0,389068	0,0761231	-5,111	5,07e-07 ***
Wages	0,00113510	5,83618e-05	19,45	4,67e-059 ***
Savingrate	-0,273685	0,0468009	-5,848	1,07e-08 ***
R-squared	0,609750			

\*\*\* important at 1% level

Model 1 is designed as the model with fixed effects, since the robust test for differing group intercepts (p-value = 2,64778e-186) and the Hausman test (p-value = 5,81316e-006) confirmed the choice in favor of this type of models for panel data.

Inflation (CPI), wages, saving rate were the macroeconomic factors under study significant for higher education. At the same time, wage growth leads to the increase in the proportion of people with higher education. The reduction in inflation leads to a similar result. The following relationship is revealed with regard to the savings rate: the growth of the savings

rate reduces the proportion of people with higher education.

Two macroeconomic factors - the unemployment rate and the long-term interest rate were insignificant in the model of higher education, that is, according to the constructed model 1 they do not have a significant impact on the share of people with higher education in OECD countries.

For the upper secondary education level, the simulation results show the relationships that differ from higher education (see Table 2).

Table 2. Model 2 for Upper Secondary

	Coeff.	St.dev.	z	P-value
const	50,7946	3,18338	15,96	2,58e-057 ***
Wages	-0,000210104	4,17931e-05	-5,027	4,98e-07 ***
Unemployment	0,215086	0,0352240	6,106	1,02e-09 ***

\*\*\* Important at 1% level

Breusch-Pagan test for the variance of observational-specific errors (p-value = 0) and Hausman's test (p-value = 0.969367) testify to the validity of the least-squares method estimates in favor of the random effects model, which is presented in Table 2. Based on the obtained results obtained, the share of persons with completed secondary education is influenced by the level of wages and unemployment. At the same time, such macroeconomic factors as inflation rate, long-term interest rate, saving rate turned out to be insignificant ones.

An annual average wage leads to the decrease in the proportion of people with upper secondary education, which follows from model 2. The unemployment rate, on the contrary, contributes directly to the growth of people proportion with upper secondary education.

**Discussion**

Panel data models, developed for 30 OECD countries during the period of 2000-2016 allowed to identify the macroeconomic factors that affect the number of people with higher education and with an average complete education. In accordance with the designed model, higher education is influenced by inflation, average annual wages and the level of savings. Concerning the hypothesis about the impact of financial indicators, we can conclude that it was confirmed partially.

The share of people with upper secondary education is affected by the level of wages and unemployment in the country. Despite the fact that both models contain the average annual salary level as a regressor factor, the higher education model makes a direct impact on the number of people with higher education, and this situation is opposite for the upper secondary model. This fact can be explained by the fact that for upper secondary education income appears as the index of the labor market and there are more motives for the population to work than for education with the growth of salaries. For higher education system, wages are a financial factor, that is, with an increase in income, the incentives for higher education are growing in terms of its financing ability.

The saving rate affects the share of people with higher education. At that, the growth of the saving rate is accompanied by the reduction of the proportion of people with higher education. In OECD countries under study, it is impossible to determine a single trend in the dynamics of the savings rate during 2000-2014.

In a number of countries, such as the United Kingdom (-0.4), Portugal (-2.5), Greece (-9.8), negative savings were observed, as compared to the high level of savings in Norway (22.6% of GDP) [OECD (2017b)]. However, the conducted research has shown that the savings rate negatively affects the number of people who received higher education. It can be assumed that there is a temporary lag between the savings rate and higher education, which will be tested in subsequent studies. Hossler and Vesper (1993) revealed the relationship between the level of parents' savings and higher education, which also implies the inclusion of a temporary lag in the model.

The long-term interest rate does not affect the number of people with higher and secondary education. During the study Menon et al. (2016) found that the rate of return from higher education changes under the influence of environmental shocks. It can be assumed that, in taking a decision on an appropriate education and investment in own human capital, an individual is less focused on the long-term interest rate, which did not exceed the level of 4.15% per annum on average in OECD countries for the period of 2000-2016 [the author's calculations according to data, OECD (2017c)], that is, the interest rate is not a benchmark for the evaluation of the financial system volatility. The relative stability of long-term financial indicators may be the reason that the interest rate is not perceived by the population as a determinant of the education system.

The model with fixed effects is chosen for the higher education model, based on statistical tests. It indicates the existence of individual effects dictated by the features of education system functioning in OECD countries. Indeed, according to OECD data (2017a), the percentage of people with higher education in a number of OECD countries is almost twice than in other OECD countries. For example, in 2015, this indicator in Canada was 55%, in the Czech Republic - 22%.

The system upper secondary education is subject to a greater unification in comparison with higher education, so when a panel data model is designed, statistical tests show that a model with random effects is best suited for relationship development among the population with upper secondary education.

## Conclusions

The education system is closely related to the economic system of society and is influenced by macroeconomic factors. The review of literature showed that research is aimed mainly at the analysis concerning the impact of the education system on the country economic development and its significant social effects. However, the scientific and practical interest from the point of view of public policy is the identification of the factors that influence the education systems of countries.

The results of a study based on the construction of panel data models for 30 OECD countries during the period 2000-2016 revealed that the higher education system is significantly influenced by financial macroeconomic indicators, while the secondary education system is more influenced by labor market indicators. The long-term interest rate was insignificant both for the model built for higher education and for the model of secondary education, which can be explained by the relatively low level of the indicator in OECD countries.

## Summary

The efficiency and effectiveness of the education system is influenced by macroeconomic factors, such as financial indicators that characterize the population income, their stability and the ability of use for other purposes than consumption. The number of people with upper secondary education is influenced by labor market indicators. Thus, when you carry out public policies aimed at higher education system support, the priority should be given to financial support of population, while the upper secondary education system is influenced by labor market indicators.

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