

National Competitiveness and Expenditure on Education, Research and Development

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Abstract

National (macroeconomic) competitiveness is one of words in vogue that is mostly used by politicians, economists among others in today's globalized world. However, the concept of competitiveness is also a very controversial issue. There are lots of concepts and approaches to a country's overall competitiveness. In this paper, the author applies a comprehensive and established indicator used by The United Nations – The Human development index, to measure competitiveness at the national level. The main goal of this paper is to find whether higher expenditure on education, research and development leads to higher competitiveness. In evaluating the relationship, countries such as the United States, Japan and European Union countries (27) - the Triad countries were used. The panel data analysis was used to investigate the relationship and it was found that, expenditure on education and R & D positively leads to national competitiveness.

Key words: National competitiveness, Human development index, expenditure on education, expenditure on research and development, panel data model.

1 INTRODUCTION

Competitiveness is a concept that has become one of most used and vogue word in today's globalized world. It is very often discussed concept and we can hear it from many sides. There are several forms of competitiveness, e.g. firm, sub-sector, regional or national competitiveness. The concept of competitiveness at macroeconomic (i.e. national) level is still not clear. There are many definitions and concepts of competitiveness. Political parties, policy-makers or international organizations very often aim to increase national competitiveness. Lisbon Strategy or Europe 2020 may be two examples.

There are lots of processes in the economy including competitiveness relating human beings and their activities; hence people and their value added is the cornerstone of national competitiveness. We assume higher value added relates to higher human capital associated with higher level of education and thus higher expenditure of education. Higher value added (e.g. innovation) is connected with the results of research and development.

The European Union also aims to improve country's overall competitiveness by means of i.a. research, development, innovation and more educated population.

Aim of this paper is to find out whether higher expenditure on education, research and development (R&D) tend to higher competitiveness. The Triad countries were included to evaluate the relationship between the national competitiveness and expenditure on education and R&D. The Triad countries are composed of The USA, Japan and European Union countries as the center of world trade (compare with e.g. Poon, 2000).

This paper is structured as follows. The next section briefly describes the Lisbon Strategy and Europe 2020. Section 3 presents some concepts of national competitiveness, section 4 briefly introduces the Human development index – author’s measuring of national competitiveness, section 5 presents evaluated countries and indicators, in section 6, there is data evaluation under panel data analysis and finally section 7, conclusion.

2 EUROPE 2020 AND EUROPEAN COMPETITIVENESS

In this section there are two strategic documents of European Union briefly presented.

2.1 Lisbon Strategy

The main reasons for the Lisbon Strategy document were high unemployment and lack of competitiveness of the European Union (EU), particularly against the United States of America (USA) and Japan. The European Council held a special meeting in March 2000 in Lisbon for new strategic development plan for the EU in starting the new decade. The main objective was to make EU (Lisbon European Council, 2000) *„the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”*. Realizing these goals requires an overall plan focused i.a. (Lisbon European Council, 2000) *„better policies for the information society and R&D“*. Research and development and investment to research and development are thus one of the major factors for increasing competitiveness. We know that these objectives were not met.

2.2 Europe 2020

New strategy for a current decade is called Europe 2020 which is based on three priorities (European Commission, 2010):

- a) smart growth – increasing country based on knowledge and innovation,
- b) sustainable growth – promoting a more resource efficient, more ecological and more competitiveness country,
- c) inclusive growth – achieving high-employment country leading to economic, social and territorial cohesion.

European Union wants to reach five goals till 2020:

- a) employment rate – increase the employment of the population aged 20-64 to at least 75 %,
- b) research, development and innovation – grow the investment to research and development (R&D) and innovation (public and private sector),
- c) climate change and energy – reduce greenhouse emissions, rising the share of renewable energy sources and increase in energy efficiency,
- d) education – rise the share of tertiary educated population of the population aged 30-34 to at least 40 %, decrease school drop-out rate,
- e) poverty and social exclusion – diminish the number of inhabitants in or at risk of poverty or social exclusion.

Achieving all the goals is important for increasing competitiveness of European Union, especially education (human capital investment), research, development and innovation.

3 COMPETITIVENESS OF NATIONS

There are many definitions and concepts of competitiveness at national level and hence there is not only one approach to macroeconomic competitiveness. Its definition is still not unique. „*Defining the competitiveness of nations is a controversial issue*” (Aiginger, 1998). The easiest way is to define the competitiveness of nations according to export performance, e.g. (CESES, 2004) comprehensive concept expressing the possibility of national economy to stand the test of international products. It means the capability of a country to sell more abroad than it purchases, thus a trade balance (or current account balance) should be assumed as national competitiveness. We can also link external balance and domestic performance (or internal balance – product at potential output level).

Ulengin (2002) confirms trade balance and market share are insufficient indicators of overall competitiveness. Previous approach does not take into account products quality, products safety, labor conditions, standard of living or environment.

Scott and Lodge (1985) refer competitiveness as “*country’s ability to create, produce, distribute, and service products in international trade while earning rising returns on its resources*”. But it is still all about business.

According to Porter (1998) “*the only meaningful concept of competitiveness at national level is national productivity*”. Based on that and relating approaches (e.g. Schwab, 2010) someone could consider productivity and competitiveness as a synonym words. However, competitiveness and productivity are not always the same because they are conceptually different. (The economy can increase competitiveness by changing strategies only without rising productivity, e.g. currency devaluation). Önsel et al. (2008) and Oral et al. (1999) refer to internal company capacity while national competitiveness relates to the relative position to its competitors.

Interesting attitude to the concept of national competitiveness has Krugman (1994, 1996), who likened it to a “*dangerous obsession*” and the debate over it “*a matter of timehonored fallacies about international trade being dressed up in a new and pretentious rhetoric*”.

There are some institutional approaches to national competitiveness too. The well-known organization dealing with competitiveness at national level is the World Economic Forum (WEF). WEF has published its annual Global competitiveness report since 1979 which analyzes and evaluates competitiveness. WEF (Schwab, 2010) defines competitiveness as “*the set of institutions, policies, and factors that determine the level of productivity of a country*” and measures by the Global competitiveness index (since 2005) based on over 100 criteria in 12 pillars.

Index is calculated from hard and soft data (executive opinion survey), it is composed of qualitative factors too. WEF distinguishes (consistent with the economic theory of stages of development) three groups of countries according to their stage of development due to different influence on competitiveness (e.g. in some developing or developed economy):

- a) factor-driven economies,
- b) efficiency-driven economies,
- c) innovation-driven economies.

European Union define competitiveness like an ability to provide its citizens high and still rising standard of living and employment to all who wants to work (Klvačová & Malý, 2008).

Boltho (1996) explains competitiveness as the longer-run aim of rising standard of living, Fagerberg (1996) extends this approach and competitiveness is an ability of an economy to secure a higher living standard than comparable economies for the present and the future. As we can see modern approaches to national competitiveness emphasize the standard of living and human well-being. Aiginger (1998) macroeconomic competitiveness must be done regards to main goals of nations, especially the well-being of a nation or its citizens.

4 HUMAN DEVELOPMENT INDEX

One of the ways to express the quality of human life or the human well-being is by means of the comprehensive indicator – the Human development index. The Human development index (HDI) has been presented annually since 1990, when the first Human development report (HDR) was launched.

The better way to evaluate the human quality of life is by HDI rather than gross domestic product (GDP or its modification – growth of GDP, GDP per capita). HDI is a composite indicator and combines three dimensions (until HDR 2009, United Nations [UN], 2009):

- a) decent standard of living,
- b) access to knowledge,
- c) long and healthy life.

HDI is composed of four sub-factors (for further information see UN, 2009):

- a) life expectancy at birth (years),
- b) adult literacy rate (%),
- c) combined gross enrollment ratio in education (%),
- d) GDP per capita (USD by PPP).

As a result of the function is the HDI index between 0 and 1. One means the best human development and null the worst case. The HDI was an effort to move the development discussion beyond the sphere of economic indicators such as GDP by incorporating elements for education and health (Kelly, 1991). Although the methodology has changed since 1990, the principle remains the same. There are lots of friends and critics to the HDI, e.g. due to the quality of dates or disadvantages relates to GDP per capita. Nevertheless, the HDI is often used due to simplicity, transparency and time series evaluation.

5 COUNTRIES AND INDICATORS

The Triad economies were included to evaluate the relationship between the macroeconomic competitiveness and expenditure on education and research and development on the other hand. Triad countries (The USA, Japan and EU-27) are considered as the center of world trade and according to Schwab (2010) similar stage of development.

Expenditure on education should direct (positively) influence the human capital formation as evidenced by numerous studies (e.g. Kaganovich & Zilcha, 1999 or Blankeanu & Simpson, 2004). Similarly, expenditure on research and development and higher human capital jointly should positively influence the processes in the economy leading to increasing national com-

petitiveness. The article focuses on those important input factors only – expenditure on education and R & D expenditure.

Expenditure on R & D we understand total gross expenditure on R & D as a percentage of GDP (so-called GERD). Expenditure on education (EDET) we understand total public expenditure on tertiary education related to groups included in ISCED 5 - 6 (in % of GDP). ISCED means the International Standard Classification of Education. ISCED 5 and 6 includes two stages of tertiary education – tertiary programmes with academic orientation or occupation orientation and studies leading to advanced research qualification (for more details see ISCED 1997). Time series are available at Eurostat between 2002 – 2007. Data are shown in table 1. The average value of 27 countries of European Union is used for EU HDI indicator.

Tab. 1 – The Triad indicators 2002 – 2007. Source: Eurostat, Human Development Report

	HDI (%)			GERD (% of GDP)			EDET (% of GDP)		
	EU	Japan	USA	EU	Japan	USA	EU	Japan	USA
2002	89,3	93,8	93,9	1,9	3,2	2,6	1,2	0,5	1,4
2003	89,9	94,3	94,4	1,9	3,2	2,6	1,1	0,6	1,5
2004	90,5	94,9	94,8	1,8	3,2	2,5	1,1	0,7	1,3
2005	91,4	95,6	95,5	1,8	3,3	2,6	1,2	0,6	1,3
2006	91,8	95,8	95,5	1,9	3,4	2,6	1,1	0,6	1,4
2007	92,1	96,0	95,6	1,9	3,4	2,7	1,1	0,6	1,3

6 PANEL DATA ANALYSIS

Panel data or pooled data (Gujarati & Porter, 2009) enable movement over time of cross-sectional units. It allows the inclusion of data for cross-section and time periods. The combined pooled data matrix offers a variety of estimation methods (Asteriou & Hall, 2007).

Panel data analysis is used to investigate the relationship between competitiveness of the Triad countries and their expenditure on education and R& D from 2002 to 2007.

The relationship between variables can be written (1):

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \mu_{it} \quad (1)$$

where:

- Y_{it} HDI,
- X_1 EDET,
- X_2 GERD,
- α intercept,
- β_1, β_2 coefficients,
- i cross-section (EU, Japan, USA),
- t time periods (2002 - 2007).

In general, simple pooled data model can be estimated using three different methods:

- a) common constant method,
- b) fixed effects method,
- c) random effects method.

The common constant method results the universal constant (α) for all cross-section dimensions, hence there are no differences between countries. The results of this model are shown in equation 2:

$$Y_{it} = 78.79 + 3.65X_{1it} + 4.29X_{2it} \quad (2)$$

The resulting equation has a high coefficient of determination ($R^2=0.8557$) and so does adjusted coefficient of determination (adj. $R^2=0.8365$). Model and variables are significant at 5 % significance level. The signs are also in accordance with expectations. Whenever there is an increase in expenditure on education or R & D (*ceteris paribus*), competitiveness (HDI) also increases.

Fixed and random effects models were estimated too and checked whether fixed or random effects should be included in the model. Both tests confirmed, there is no reason to included fixed or random effects in the model.

7 CONCLUSION

Competitiveness is a concept that has become one of most used and vogue word in today's globalized world. There are many concepts and approaches to competitiveness at macroeconomic level (national competitiveness). Some of them extends business dimension with better standard of living and human well-being. Therefore the Human development index as a comprehensive indicator of national competitiveness was used.

The new strategy for European Union called Europe 2020 also aims to improve country's overall competitiveness by means of i. a. research, development, innovation and more educated population associated with higher expenditures to these dimensions. Panel data analysis was applied to investigate the relationship between competitiveness on the one hand and expenditure on higher education and R & D on the other hand in the Triad countries between 2002 and 2007. The positive relationship was evaluated, hence increasing of expenditure leads to increasing of competitiveness (*ceteris paribus*).

According to our results, we cannot say rising of expenditures on education and on R & D always positively causes the national competitiveness. It depends on lots of other factors, processes and the level of development of particular economy but reducing expenditure on that dimensions is not meaningful regarding to national competitiveness in long-run.

References

1. Aiginger, K. (1998). A framework for evaluating the dynamic competitiveness of countries. *Structural change and economic dynamics*, 9, 59-88.
2. Asteriou, D., & Hall, S. G. (2007). *Applied econometrics: a modern approach using EVIEWS and Microfit* (Rev. ed.). New York: Palgrave Macmillan.

3. Blankenau, W. F., & Simpson, N. B. (2004). Public education expenditures and growth. *Journal of Development Economics*, 73, 583-605.
4. Boltho, A. (1996). The assessment: international competitiveness. *Oxford Review of Economic Policy*, 12 (3), 1-16.
5. CESES. (2004). *Strategické taby pro Česou republiku*. Praha: ČTKrepro.
6. European Commission. (2010). *Europe 2020: A European strategy for smart, sustainable and inclusive growth*. Retrieved March 28, 2011 from http://europa.eu/press_room/pdf/complet_en_barroso___007_-_europa_2020_-_en_version.pdf.
7. Eurostat. (2011). *Population and social conditions: Education and training*. Retrieved March 20, 2011 from <http://epp.eurostat.ec.europa.eu/portal/page/portal/education/data/database>.
8. Eurostat. (2011). *Science, technology and innovation*. Retrieved March 19, 2011 from http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/data/database.
9. Fagerberg, J. (1996). Technology and competitiveness. *Oxford Review of Economic Policy*, 12 (3), 39-51.
10. Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). Boston: McGraw-Hill.
11. Kaganovich, M., & Zilcha, I. (1999). Education, social security and growth. *Journal of Public Economics*, 71, 289-309.
12. Kelly, A. C. (1991). The Human development index: handle with care. *Population and Development Review*, 17 (2), 315-324.
13. Klvačová, E., & Malý, J. (2008). *Domnělé a skutečné bariéry konkurenceschopnosti EU a ČR* (1st ed.). Praha: Vzdělávací středisko na podporu demokracie.
14. Krugman, P. R. (1994). Competitiveness: a dangerous obsession. *Foreign affairs*, 73 (2), 28-44.
15. Krugman, P. R. (1996). Making sense of the competitiveness debate. *Oxford Review of Economic Policy*, 12 (3), 17-25.
16. Lisbon European Council. (2000). Lisbon Strategy. Retrieved March 27, 2011 from http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/cc/00100-r1.en0.htm.
17. Önsel, S. et al. (2008). A new perspective on the competitiveness of nations. *Socio-Economic Planning Sciences*, 42, 221-246.
18. Oral, M. et al. (1999). Linking industrial competitiveness and productivity at the firm level. *European Journal of Operational Research*, 118 (2), 271-277.
19. Poon, J. P. H. et al. (2000). Myth of the triad? The geography of trade and investment blocs. *Transactions of the Institute of British Geographers: New Series*, 25 (4), 427-444.
20. Porter, M. E. (1998). *The competitive advantage of nations: With a new introduction* (Rev. ed.). New York: Free Press.
21. Schwab, K. et al. (2010). *The Global Competitiveness Report 2010-2011* (1st ed.). Geneva: World Economic Forum.
22. Scott, B. R., & Lodge, G. C. (1985). *U. S. competitiveness in the world economy* (1st ed.). Boston: Harvard Business School Press.
23. Ulengthin, F. et al. (2002). A power-based measurement approach to specify macroeconomic competitiveness of countries. *Socio-Economic Planning Sciences*, 36, 203-226.

24. United Nations. *Human development reports. 2003 – 2009*. Retrieved March 18, 2011 from <http://hdr.undp.org/en/reports/global/hdr2010/>.
25. United Nations Educational, Scientific and Cultural Organization. *International Standard Classification of Education*. Retrieved March 28, 2011 from http://www.uis.unesco.org/TEMP/PLATE/pdf/isced/ISCED_A.pdf.

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JEL Classification: C12, I31, O47

