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WHAT IS THE CAUSALITY BETWEEN ECONOMIC GROWTH AND ITS MAJOR DETERMINANTS IN THE CASE OF TRANSITION ECONOMIES?

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Abstract

Analysis is divided into two parts. In the first part, we analysed the data for the variables which we expect are the main determinants of economic growth and check whether these variables are determinants of economic growth for 10 CEE countries. We select the variables for our analysis and show, what are the main determinants of economic growth in the group of 10 CEE countries. In the second part, we analyse the direction of causality between selected variables from the first part and economic growth. Consequently, analysing the factors of growth in the new EU10 members should give us a perspective on economic development for the countries yet in the process of full or adjoined EU membership.

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I. INTRODUCTION AND MOTIVATION

Economic growth is a field that has been the subject of intensive research during the past decade. The emphasis of this effort was on "endogenous growth", which results from the knowledge-acquisition actions of profit-seeking agents. These recent developments cannot be followed without a solid understanding of the basic Solow model (presented in discrete time), with and without technical progress. It will then turn to the basic classes of endogenous growth models: the Romer model, quality-ladder models and "human-capital" models.

Empirical research on economic growth has witnessed an enormous interest during the last 20 years. One of the first such studies was by Baumol (1986), who argued that homogenous groups of countries grow according to the concept of convergence; while heterogeneous groups of countries reveal rather divergence processes. Furthermore, empirical analyses on economic growth were popularized by Barro (1989), Mankiw et al. (1992) and Barro and Sala-i-Martin (2003). Their analyses are mostly based on two methods. The first one is the Barro-regression, where economic growth is regressed on the initial GDP level and other economic growth determinants. The second one is the Mankiw-Romer-Weil method, where economic growth is regressed on the initial income level and the variables which determine the steady-state of a given country according to the Solow model. Nevertheless, the pace of the catching-up process has been very slow.

This paper aims to check the real causal relationship between GDP growth rate and its major determinants for 10 Central and Eastern European countries (CEE) in the period 1993-2005. Thus the main goal of this paper is to provide the understanding of main problems and main developments of the emerging theory of transformation of the former centrally planned economies as to understand the processes of transition from a socialist, centrally planned economy to a capitalist mixed market economy. Extensive comparisons will be made with the experience economies in transition. We shall examine current transition problems, such as achieving economic growth, and try to found out its determinants. The conventional wisdom suggests that differences in economic performance are associated mostly with "good" and „bad" policies, in particular with the progress in liberalisation and macroeconomic stabilisation: countries that are more successful than others in introducing market reforms and bringing down inflation are believed to have better chances to limit the reduction of output and to quickly recover from the transformational recession. In general this may well be true, but „the devil is in the details", which often do not fit into the generalisation and make the whole explanation look trivial. The final task of this paper was to examine to what extent differences in economic performance in post-communist countries during transition are associated with: Financial sector development (money supply i.e. level of GDP, market capitalization) and International trade (industrial policies i.e. import substitution vs. export oriented growth). Thus this analysis encompasses some new ideas which are seldom used in other empirical studies or which are not so emphasised.

First, we measure economic growth as the annual growth rate of real GDP. We do not analyse – widely used in the literature – GDP per capita nor GDP at PPP due to the following reasons. According to macroeconomic theory, the basic measure of the pace of economic growth is real GDP growth rate. This index is also reported as the basic measure of economic growth in many economic publications as well as by many statistical offices, both domestic and international. We do not use per capita GDP because it is influenced by changes in population. In the analysed period, population changes in CEE countries were significant that resulted in huge differences between total and per capita GDP growth rates.[1] We do not also analyse GDP at PPP. It is influenced by changes in exchange rates and price levels and does not measure correctly the pace of economic growth. GDP at PPP should rather be used in cross-country comparisons of income levels but not growth rates. Second, our analysis is based on separate time series for each country and not on panel data. This allows us to assess the relationship between economic growth and its determinants for each country. Such results are more detailed than those obtained in cross-country regressions where inverse relationships between economic growth and its determinants observed for some countries can be 'compensated' by correct results noted in other countries. Third, we are very careful in formulating the results on causality. At the beginning, we run the correlation analysis. This allows us to exclude from further testing these cases for which 'incorrect' correlation coefficients were achieved that might result in spurious results on causality. Moreover, we check whether the results on causality are robust to the number of lags and whether the lagged variables in the VAR model have 'correct' signs of parameters. The paper is composed of 4 points. Point 1 is this introduction. Point 2 describes data used. Point 3 presents the methodology. The results are described and interpreted in point 4.

II. DATA

Our analysis covers 10 CEE countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) and the period 1993-2005. We measure the rate of economic growth using the real GDP annual growth rates (expressed in percentage terms). We test six variables as the determinants of economic growth: (a) gross fixed capital formation (INV), (b) net foreign direct investment (FDI), (c) exports of goods and services (EXP), (d) imports of goods and services (IMP), (e) domestic credit provided by banking sector (CRE), (f) market capitalization of listed companies (CAP). All the variables are expressed as percentage of GDP. The data are derived from World Bank *World Development Indicators* and IMF *World Economic Outlook* databases. All the calculations were carried out using STATA/SE 9.2 software.

III. METHODOLOGY

The methodology of testing the causality between GDP and its major determinants is composed of two parts: (a) the correlation analysis, (b) the causality analysis. The correlation analysis, which is not examined in many papers concerning causality, is a very important step. It allows us to assess the direction and the strength of the relationship between GDP and selected variables. In our opinion, only significant positive correlations indicate that a given variable can be further tested as a determinant of economic growth.[2] If the correlation is insignificant or strongly negative, causality tests can give misleading results.[3] Thus, the causality tests are carried out only for the countries and variables characterised by significant positive correlations with GDP. In the second step, we

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[1] For example, in Latvia and Estonia population dropped by 10.6 and 9.7% respectively during 1993-2004. It implied that in these countries average GDP per capita growth rate exceeded average total GDP growth rate by 1.1 percentage point in the period 1993-2004 (5.5% vs 4.4%). The population also strongly decreased in Bulgaria (8.4%), Lithuania (6.7%), and Romania (4.8%). Only two countries (Slovakia and Slovenia) recorded the increase of population.

[2] All the analysed variables are of the form: the greater their value, the higher economic growth should be.

[3] It can be easily proved. For example, if GDP is negatively correlated with current values of explanatory variables, it is very probable that such a negative correlation will be maintained for lagged values of explanatory variables. Moreover, if the regression parameters for lagged variables were significant, the causality would be confirmed by econometric tests. But this conclusion is questionable because such a regression equation, characterised by inverse signs of parameters, is rather spurious.

test the causality between GDP and its major determinants. This analysis is based on the VAR model of the following form:

$$GDP_t = \alpha_0 + \sum_{i=1}^{2} \beta_i GDP_{t-i} + \sum_{i=1}^{2} \gamma_i X_{t-i} \quad (1)$$

$$X_t = \alpha_0 + \sum_{i=1}^{2} \beta_i X_{t-i} + \sum_{i=1}^{2} \gamma_i GDP_{t-i} \quad (2)$$

where GDP is the annual growth rate of real GDP and *X* is one of the variables which we test as economic growth determinants. We apply standard methodology of testing Granger causality. By definition, *X* Granger causes *Y* if it can be shown that past values of *X* give statistically significant information on current values of *Y*. Thus, in order to test this causality we calculate the VAR model described by equations (1) and (2). The current values of explained variable are regressed against lagged values of explained and explanatory variables. Equation (1) allows us to assess whether *X* Granger causes GDP. It is so when the hypothesis 'the parameters of lagged values of *X* are jointly zero (H_0: $\gamma_1 = \gamma_2 = 0$)' is rejected. Equation (2) allows us to test whether GDP Granger causes *X*. It is so when the analogous hypothesis 'the parameters of lagged values of *GDP* are jointly zero (H_0: $\gamma_1 = \gamma_2 = 0$)' is rejected. If the causality were confirmed by both equations, we would deal with bidirectional or mutual causality.

However, we do not only base on Granger causality tests in assessing the real causal relationship between GDP and its determinants. It is of great importance for us that the parameters of lagged explanatory variables in the VAR model have 'correct' sign. This allows to conclude that a given explanatory variable really positively contributes to economic growth (or vice versa when reverse causality is tested). If the parameters of lagged explanatory variables take negative values, we do not make any decision on causality because such a model indicates (probably incorrectly) the negative contribution of one variable to another. This approach of formulating conclusions constitutes i.a. the value added of our research. Recent empirical literature on the subject emphasizes the need of testing stationarity and cointegration before executing causality tests. We do not do this due to two reasons. First, the explained variable expressed as a growth rate and explanatory variables expressed as percentage of GDP should be stationary.[4] Second, stationarity and cointegration analysis is associated with a significant modification of time series and with introduction of new variables to the model that can hide real relationships existing between original time series. We arbitrary assume two lags in the VAR model. In this choice, we are constrained by quite a short analysed period. Including more lags to the model would significantly reduce the number of observations in the regression equations. Nevertheless, in order to check whether the results are robust to our arbitrary choice of lags, we alternatively test the VAR model with one lag.

IV. RESULTS AND INTERPRETATION

Table 1 presents the correlation coefficients between GDP and its determinants for each analysed country. The grey cells indicate significant positive correlations and are the most important in our analysis. The data show very weak correlation between explanatory

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[4] Of course, the unit root tests which were carried out by us do not confirm the existence of stationarity unanimously. But we have expected such a result because the literature survey indicates a very huge diversity of the results of unit root tests which much depend on the number of lags, the exogenous variables included, and the specified form of the tests. Nevertheless, the economic interpretation allows us to assume that our variables, which are not expressed as levels, are stationary.

variables and GDP. The best correlation exists in the case of Bulgaria and Hungary where four out of seven variables are significantly and positively correlated with GDP. In Latvia two variables are well related with GDP whereas in the remaining countries maximum one variable reveals significant positive correlation. As regards the particular variables, the best correlated is gross fixed capital formation and market capitalisation where significant and positive correlation coefficients were achieved in the case of four countries. Exports and imports reveal 'correct' correlation in the case of two countries whereas FDI – in one country. Domestic credit is not well correlated with GDP in any case.

Table 2 presents the results of Granger causality tests. The tests were carried out only for the countries and variables where significant and positive correlation coefficients were observed. Causality tests are based on the VAR model with one or two lags. Table 2 reports the statistics for the null hypothesis $\gamma_1 = \gamma_2 = 0$ (in the case of two lags) or $\gamma_1 = 0$ (in the case of one lag). Rejection of such a hypothesis (marked by stars) indicates the econometric existence of causality where direction is specified in the second column of the table. But our conclusions are not only based on the econometric results of the tests. For each estimated VAR model, we check whether the parameters of the lagged values of explanatory variables have correct (i.e. positive) signs. Such models are marked by the word "OK" in the respective cell. The last column of Table 2 concludes about the observed causality between economic growth and its determinants. In formulating these conclusions, we analyse two issues. First, we take into consideration only those models which have correct signs of parameters (marked by "OK"). Second, if two models (with one and two lags) are marked by "OK", the causality is indicated only when it is confirmed by both models. We have to add that when causality is not observed by our analysis, it does not mean that there is no causal relationship. The causality may not exist or it may exist but it is not confirmed by the model.

There are many causes of weak correlation. First we do not use level data (e.g. GDP level is better correlated with exports and investments levels than exports and investments expressed as percentage in GDP because by definition GDP levels include exports and investments levels). Second fact is that structural reforms influence the growth rate and also transparent activity institutions influence growth rate. Impact on the week correlation can be found in the reason that reconstruction of economy from centrally planned to market economy also influences the growth rate. Yearly growth rates include cyclical fluctuations and thus are rather explained by growth rates of the determinants and not by the determinants expressed as percentage in GDP. At the end, but not list important we have to mention that external and internal shocks influence economic growth.

Table 1
Correlation with GDP

	INV	FDI	EXP	IMP	CRE	CAP
Bulgaria	0.70** (13)	0.79** (12)	0.48 (13)	0.67* (13)	–0.81** (13)	0.69* (11)
Czech Rep.	0.29 (12)	–0.09 (12)	0.10 (12)	0.21 (12)	–0.19 (13)	0.54* (12)
Estonia	0.62* (12)	0.34 (12)	0.49 (12)	0.67* (12)	0.65* (13)	0.07 (9)
Hungary	0.86** (13)	–0.19 (12)	0.81** (13)	0.81** (13)	–0.78** (13)	0.83** (13)
Lithuania	–0.22 (13)	0.48 (12)	–0.65* (13)	–0.67* (13)	0.22 (13)	0.45 (11)
Latvia	0.73** (13)	0.45 (12)	–0.87** (13)	–0.11 (13)	0.49* (13)	0.87** (11)
Poland	0.07 (13)	0.13 (12)	–0.35 (13)	–0.42 (13)	–0.47 (13)	–0.37 (13)
Romania	0.35 (13)	–0.05 (12)	0.52* (13)	0.44 (13)	–0.20 (13)	0.39 (12)
Slovakia	–0.15 (13)	–0.04 (12)	0.18 (13)	0.11 (13)	–0.66* (13)	0.57* (12)
Slovenia	0.18 (13)	–0.25 (12)	–0.28 (13)	–0.20 (13)	–0.25 (13)	–0.43 (12)

** Significant at the 1% level. * Significant at the 10% level. Number of observations in brackets. Grey cells indicate significant positive correlations.

Table 2
Granger causality tests

Country	Causality tested	Granger causality Wald statistics		Conclusion
		Lag = 1	Lag = 2	
Gross fixed capital formation (INV)				
Bulgaria	INV → GDP	0.06	3.89	GDP → INV
	GDP → INV	3.27* (OK)	30.35**	
Estonia	INV → GDP	1.93	5.68*	GDP → INV
	GDP → INV	5.40* (OK)	11.09**	
Hungary	INV → GDP	8.18** (OK)	21.79** (OK)	INV → GDP
	GDP → INV	0.08 (OK)	0.12 (OK)	

Latvia	INV → GDP GDP → INV	3.85* (OK) 3.39* (OK)	0.46 36.50** (OK)	INV ↔ GDP
Foreign direct investment (FDI)				
Bulgaria	FDI → GDP GDP → FDI	13.94** (OK) 1.01 (OK)	22.08** (OK) 2.11 (OK)	FDI → GDP
Exports (EXP)				
Hungary	EXP → GDP GDP → EXP	4.19* (OK) 5.07* (OK)	6.97* (OK) 3.06	EXP ↔ GDP
Romania	EXP → GDP GDP → EXP	0.14 (OK) 1.99 (OK)	3.42 35.56**	
Imports (IMP)				
Bulgaria	IMP → GDP GDP → IMP	3.13* (OK) 2.92* (OK)	3.01 (OK) 8.46* (OK)	GDP → IMP
Hungary	IMP → GDP GDP → IMP	3.68* (OK) 3.54* (OK)	4.23 1.09 (OK)	IMP → GDP
Market capitalization of listed companies (CAP)				
Bulgaria	CAP → GDP GDP → CAP	0.56 (OK) 1.01	3.65 1.42	
Hungary	CAP → GDP GDP → CAP	23.64** (OK) 0.87	24.76** (OK) 4.26	CAP → GDP
Latvia	CAP → GDP GDP → CAP	4.32* (OK) 3.15*	160.2** (OK) 18.37**	CAP → GDP
Slovakia	CAP → GDP GDP → CAP	3.18* (OK) 0.06 (OK)	3.15 6.18*	CAP → GDP

** Significant at the 1% level. * Significant at the 10% level.

→ One-way causal relationship. ↔ Two-way causal relationship.

V. REFERENCES

1. Caves, Richard E., Jeffrey A. Frankel and Ronald W. Jones, World Trade and Payments: An Introduction, 8th Edition, Reading: Addison-Wesley, 1999.
2. Easterly, William. The Elusive Quest for Growth. Cambridge: MIT Press, 2002.
3. Falvey, Rod, and Norman Gemell, "Factor Endowments, Nontradables Prices and Measures of 'Openness,'" Journal of Development Economics 58, February 1999, 101-122.
4. Fischer, Stanley, "Lunch Address Given at the Conference on 'Promoting Dialogue: Global Challenges and Global Institutions'," American University, Washington, DC, April 13, 2000.
5. Frankel, Jeffrey, and David Romer, "Does Trade Cause Growth?" American Economic Review, June 1999, 89(3), 379-399.
6. From The Concise Encyclopedia of Economics, David R. Henderson, ed. Liberty Fund, 2007. Reprinted by permission of the copyright holder.
7. Gerschenkron, Alexander, Bread and Democracy in Germany, Berkeley and Los Angeles, University of California Press, 1943.
8. Helpman, Elhanan. The Mystery of Economic Growth. Cambridge: Harvard University Press, 2004.
9. Krueger, Anne O., "Why Trade Liberalisation is Good for Growth," The Economic Journal, 108, September 1998, 1513-1522.
10. North, Douglass C. Institutions, Institutional Change, and Economic Performance. Cambridge: Cambridge University Press, 1990.
11. Olson, Mancur. "Big Bills Left on the Sidewalk: Why Some Nations are Rich, and Others Poor," Journal of Economic Perspectives. Vol. 10, No. 2. Spring 1996. pp. 3-23
12. Rodríguez, Francisco, and Dani Rodrik, "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Literature," NBER Working Paper 7081, April 1999.
13. Rodrik, Dani, The New Global Economy and Developing Countries: Making Openness Work, Overseas Development Council, Washington, DC, 1999.
14. Rogoff, Kenneth, "The Purchasing Power Parity Puzzle," Journal of Economic Literature, XXXIV, June 1996, 647-668.
15. Romer, Paul. "Endogenous Technological Change," Journal of Political Economy. Vol. 98, No. 5, Oct. 1990. pp. S71-S102.
16. Rosenberg, Nathan. Inside the Black Box: Technology and Economics. Cambridge: Cambridge University Press, 1982.
17. Stiglitz, Joseph E., "Towards a New Paradigm for Development: Strategies, Policies, and Processes," 1998 Prebisch Lecture at UNCTAD, Geneva, October 19, 1998.
18. Wacziarg, Romain, "Measuring the Dynamic Gains from Trade," World Bank Working Paper, no. 2001, November 1998.
19. Yarbrough, Beth M. and Robert M. Yarbrough, The World Economy: Trade and Finance, Fifth Edition, Fort Worth: Harcourt College Publishers, 2000.