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The nexus between economic freedom and growth: Evidence from CEE countries in transition

Henryk Gurgul and Łukasz Lach*

ABSTRACT

This study sought to examine the causal links between economic freedom and economic growth of new EU members in transition in the period 2000-2009. The empirical results suggest significant causality running from monetary and fiscal freedom, trade openness, regulation of credit, labour, and business, legal structure and security of property rights, and access to sound money to growth, especially in less and moderately developed CEE transition countries. Moreover, we found evidence that economic freedom was one of the factors stimulating the convergence of these economies towards rich EU members. The evidence of causality in the opposite direction was much weaker.

JEL Classification: O10, O40.

I. INTRODUCTION

According to Ricardo output is the result of application of labour, natural resources, and capital in the production process. The growth of output is an outcome of larger amounts of inputs and/or of better technology being applied. The most important assumption of the Ricardian theory is that an economy's potential, as defined by its resources and technology, will be fully utilized. However in the case of countries in transition the main problem is not a lack of potential, but rather the inability to achieve it. Thus, the proper focus of transition economics is to investigate to what extent and under which conditions this potential can be fully achieved. The crucial subject of this stream of contributions is the impact of economic freedom, political stability and government size on economic growth.

The evidence in the existing literature confirms the relevance of economic freedom and political stability as explanatory factors of economic growth. In an economically free society people are free to work, produce, consume, and invest in any way they want. This freedom should be both protected and unconstrained by the state.

Two indexes are most often applied as a measure of overall economic freedom: the *Index of Economic Freedom* provided by the Heritage Foundation and the index provided by the Fraser Institute in annual reports entitled *Economic Freedom of the World*. In general, there is ongoing scientific discussion on these two indexes, especially in terms of pointing out the advantages and disadvantages of each one. Some authors say that the best choice for researchers is the measure provided by the Heritage Foundation, since it is primarily based on policy variables which governments can actually control (Heckelman 2000). On the other hand, the index provided by the Fraser Institute is often described as the most ambitious attempt to quantify economic freedom, and the one which has been used more extensively in academic

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contexts (Berggren 2003).¹ To summarize, the application of both these measures in one empirical study seems to be especially important in terms of comprehensiveness of analysis as well as robustness and validation of empirical findings.

It seems to follow from the numbers, explanations and graphs included in the annual reports that there may be a positive relationship between economic freedom and economic growth. However, these reports do not present the results of any rigorous empirical tests, which could formally support such a relationship. Moreover, most of the results presented in the literature are at first sight clear, but thorough analysis leads to the conclusion that some of them are inconclusive or plain contradictory. In general, these results strongly depend on the choice of methodology and sample size. In addition, a set of control variables should be included in the model to ensure the robustness of the analysis.

It is also important to note that causal relationship between economic growth and economic freedom may often be present for particular areas of freedom, even when there are no dynamic links between the overall index and growth. Thus, besides the examination of overall measures of freedom it seems prudent to additionally take into consideration the set of the components of a general economic freedom index. In this paper we have examined the components of economic freedom provided by both the Heritage Foundation and the Fraser Institute. In general, these indicators provide detailed information on freedom in the areas of international trade, monetary policy, the level of government involvement in the economy, combating corruption and establishing economic-activity-friendly laws and regulations. A detailed analysis of causal links between economic growth and measures of freedom from both an overall and component perspective should provide useful policy recommendations for new EU members during further stages of the transition processes of their economies.

In order to perform the respective tests properly, it is necessary to define the variables which constitute the notion of economic freedom and to collect sufficient datasets for many countries. Another important requirement is the issue of the heterogeneity of a group of countries under study, which often causes serious statistical difficulties with the evaluation of panel datasets. Therefore, performing causality tests in a proper way is not straightforward, especially in the case of a group of developing countries or countries in transition. In the last case researchers are usually forced to take into account the small number of countries analyzed and the short time series of observations.

The lack of data has a strong impact on the methodology used. In so far as any new paper contributes to subject-specific methodology in a certain way, it should be welcome. This conviction is behind our contribution, which is oriented towards an analysis of economies in transition in Europe on the basis of some carefully selected econometric methods. The main goal of this paper is to examine the structure of causal dependencies between economic growth and various measures of economic freedom using data on ten new EU members in transition for the period 2000-2009. This empirical study is also aimed at testing whether economic freedom had a causal influence on the process of the convergence of Central and Eastern European new EU countries towards old and highly developed EU members.

In general, the motivation to analyze the dynamic links between economic freedom and economic growth in the case of new EU member countries in transition is twofold. First, it seems reasonable to expect that the dynamic links between variables should be definitely much stronger for the rapidly transforming economies of Central and Eastern Europe (CEE) region than for stable and developed economies, which already have a high standard and quality of law and regulation. Thus, the examination of this particular group of countries should provide a lot of useful information about the real importance of economic freedom for economic growth. Second, to the best of our knowledge, in the literature there have been no detailed analyses (which would use the longest available annual data gained from the

¹ One should bear in mind that Index of Economic Freedom in every year actually refers to the level of freedom in previous year. On the other hand, Economic Freedom of the World Annual Report in year x actually refers to the year $x-2$. Moreover, the Fraser Institute provides annual data on its indexes starting from 2000. Therefore, the period 2000-2009 is the longest possible for which data on both indexes was available in the moment of preparation of this paper.

Heritage Foundation and the Fraser Institute along with reliable methodology) dedicated to the issue of growth-freedom links for the group of CEE economies in transition.²

This paper is organized as follows. In the next section we present a literature overview and provide the Reader with the most important notions and key ideas concerning the role of economic freedom, political stability and other institutional variables in stimulating economic growth. In the third section we formulate the main conjectures concerning causalities between the variables used. In the fourth section we present the dataset applied and give a short description of all considered measures of freedom. In the fifth section we discuss the methodology of applied Granger causality tests. Section six contains empirical results. Finally, in the last section we draw major conclusions and suggest directions for future research.

II. LITERATURE OVERVIEW

Empirical research on the impact of economic freedom on growth is relatively recent. Only a few empirical studies were conducted before the middle of 1990s. However, from the 1990s onwards there has been a rapidly growing interest in this issue, mostly due to the availability of longer time series of freedom indexes. In this short literature review we focus on the most recent studies concerning the interrelation between economic freedom and economic growth. In general, in almost all contributions the dependent variable is related to economic growth. On the other hand, a suitable measure of economic freedom is typically one of the explanatory variables. In early studies economic growth rates were usually regressed on the levels of economic freedom. However, more recent contributions show that it is changes in economic freedom, rather than its levels, that are causally related to economic growth. De Haan et al. (2006) criticized the tendency in many studies to use both the level and the change in the economic freedom (EF) index as regressors in the growth model. In their opinion only changes in the EF index should be taken into account. On the other hand, Lawson (2006) advocated the use of both level and change EF indicators.

Empirical studies concentrate mainly on the relationship between economic growth on the one hand and various forms of economic freedom and political stability on the other. In order to test the interrelations between economic freedom and political rights, and their relation to growth, some intensive research has been conducted, which, in general, has led to the suggestion that there may exist a virtuous circle between economic freedom, growth and political stability. These relations have been tested in the literature, using mainly cross-section and, to a lesser extent, panel data. Some contributors point out that there are also indirect channels through which freedom may affect growth (Aixala and Fabro 2009; de Haan et al. 2006).

When discussing the relationship between economic freedom and growth, strong and beneficial effects of the level of economic freedom and of its improvement on growth rates are usually stressed (Ali 1997; Ali and Crain 2001, 2002; Barro 1997; Clark and Lawson 2008; Dawson 2003; de Haan and Siermann 1998; de Haan and Sturm 2000; Gwartney et al. 2006; Heckelman and Stroup 2000; Lawson 2006). In addition, most contributors clearly stress that economic growth depends not only upon various areas of economic and political freedom, but on purely economic factors as well, which establishes a need to test the discussed dynamic dependencies in a multidimensional framework.

Easton and Walker (1997) concluded that economic freedom is important with respect to income levels, which increases the explanatory power of the neoclassical growth model. In addition, La Porta et al. (1997, 1998) demonstrated

² One should also note that most previous papers were based on an examination of very large groups of countries. In the face of the relatively small number of data points (in time dimension) available, this enabled the use of asymptotic-based tests in a panel framework. However, for extremely large sets of (often different and incomparable) countries the results could significantly suffer from a heterogeneity bias, which was often insufficiently controlled or even ignored by researchers (for more details see de Haan et al. 2006).

that several legal variables, such as respect for the rule of law, protection of property rights, enforceability of contracts, and legal heritage, exhibit a causal relationship with levels of economic growth.

Heckelman (2000) investigated causality between growth and economic freedom by means of the index of the Heritage Foundation. Because of short time series only short-term relations were checked. Moreover, the application of this index made it necessary to use annual data on GDP growth. However, this did not dispose of effects resulting from the business cycle. The major finding of the paper is that the level of economic freedom precedes growth while growth supports only some of the components of freedom.

Guiso et al. (2004) provided empirical evidence that differences in local financial development explain the spread of entrepreneurship and economic growth. Equal access to financial sources is an important feature of economic freedom. The contributors constructed a new indicator of financial development by estimating the regional effect of probability that *ceteris paribus* a household is shut off from the credit market. By using this indicator, they found that financial development at a regional level equalizes the opportunity to get credit and therefore enhances the probability that an individual can start his own business, increases competition, favours entry of new firms, and promotes growth.

Cole (2003) argued that the positive effect of economic freedom on economic growth seems to be independent of the theoretical framework used. The particular measure of economic freedom employed - the Economic Freedom of the World (EFW) index - was found to be quite robust with respect to relatively major changes in model specification. This conclusion has important implications because the EFW index stresses a broad set of policy variables that are known to affect economic efficiency: inflation rates, taxes, public spending, government enterprises, state-directed investment, tariff protection, nontariff trade barriers, price controls, and distortions in labour and credit markets. The negative effects of these policy-induced distortions are almost surely mutually reinforcing and, in any case, tend to be highly correlated (countries with a poor system of laws tend to be consistently bad along many policy dimensions), thus it is hard to sort out their separate effects.

As already mentioned, some authors have not concentrated solely on the impact of economic freedom on economic growth, but searched somewhat deeper by asking what the main sources of economic freedom are. Most of them stressed that the most important precondition for economic freedom is political freedom.

The impact of political freedom on economic freedom has been proven by de Haan and Sturm (2003) using cross-section and panel data. According to the authors higher levels of political freedom cause increases in economic freedom in developing countries and in that way contribute to economic growth. A similar conclusion was drawn by Pitlik and Wirth (2003). By means of panel data, they found a significantly positive impact of an increasing degree of democracy on the magnitude of economic liberalization. Moreover, these results were supported by suitable theoretical arguments.

Doucoulagos and Ulubasoglu (2006) in their quantitative review of the literature found that the relation between economic freedom and growth was overestimated when capital was excluded from a growth regression model (the problem of omitted variables). However, in a more recent study that used panel data, Stroup (2007) pointed out that the expansion of economic freedom significantly improves economic welfare (economic growth).

The position of the OECD on these questions was presented in a report from 2009. According to the OECD (2009), governments must be cautious and avoid jeopardizing economic freedom or political stability when seeking methods to strengthen and restructure their economies. In other words, nations must try to support and promote economic freedom and political stability. The concern in this context is that the abandonment of economic freedoms and/or policies consistent with political stability could lead to a reduction in economic growth and a slowdown in the world economy.

Faria and Montesinos (2009) found a positive and significant statistical and economic relation between growth, income level and the EFW index. The findings of this paper, including results of instrument validity tests, support the importance of policies and institutions for increasing economic freedom and fostering prosperity.

Aixala and Fabro (2009) studied the causal relations between institutional dimensions (economic freedom, civil liberties and political rights) and economic growth, using Granger methodology with panel data for 187 countries and five-yearly observations for the period 1976-2000. From the analysis of the indirect channels through which freedom may affect growth, the authors draw two main conclusions. Firstly, the level of investment in physical capital is determined by the levels and changes in economic freedom (the relationship is bilateral in the case of levels). Secondly, the three dimensions of institutional quality analyzed exhibit bilateral causality with investment in human capital (also in levels). With respect to the interrelations between institutional variables, both civil liberties and political rights cause economic freedom. Furthermore, in the case of political rights the direction of causality is bilateral. It can be observed that in almost all cases the causal relationships emerge in the short and medium run (for five or ten years), and disappear in the long term. In addition, the results confirm the theoretical argument about the existence of a virtuous circle, i.e. economic freedom generates growth and the latter supports the expansion of civil liberties, which, in turn, support economic freedom.

A study by Cebula (2011) investigated the impact of ten forms of economic freedom developed by the Heritage Foundation, as well as a measure of political stability developed by the World Bank (2009), on economic growth in OECD countries. The author found that both panel least squares estimations and panel two-stage least squares estimations show that the natural logarithm of purchasing-power-parity adjusted per capita real GDP in OECD countries was positively impacted by monetary freedom, business freedom, investment freedom, labour freedom, fiscal freedom, property rights freedom, and freedom from corruption. Economic growth was also found to be positively influenced by political stability.

Wu (2011) noted that the Chinese economy grew about 10 percent per year during the sample period, but its rapid economic growth was accompanied by a relatively undeveloped legal and financial system, lack of economic freedom, and a high level of corruption. The author asked some important questions: “What is the secret of China’s economic miracle? Can it continue without sound legal, financial, and political institutions and economic freedom?” He stressed that we do not have clear answers to these questions – an obvious indication of some possible areas for future research.

It is also worth noting that some contributors argue that state control (which clearly contradicts the principle of economic freedom), if properly applied, can actually promote growth (see e.g. Cao 2008). This phenomenon is usually explained by the fact that competition is not always effective.

Taking into account the research results and views presented in the above overview of the literature, in the next section we will formulate the main hypotheses concerning the impact of economic freedom on economic growth of CEE countries in transition. To the best of our knowledge, this is the first contribution which examines freedom-growth links for the group of new EU members in transition on the basis of the most recent statistical data and carefully selected methodology.

III. MAIN RESEARCH CONJECTURES

A mere glance at measures of freedom shows that new EU member countries in transition have indeed launched political, institutional and economic reforms, which in consequence have caused a rise in economic freedom. At this point an important question arises: “Was this rise in economic freedom a causal factor for a dynamic growth in GDP and did it support the catching-up process of the new EU members towards the old EU countries?” To examine this issue one should test the following hypothesis, which also partly reflects the major findings of the papers mentioned in the previous section:

Conjecture 1: Economic freedom played an important role in the economic growth of new EU members in transition in the period 2000-2009. Moreover, it was one of the factors stimulating the process of convergence of these countries towards highly developed EU members.

In recent decade relatively different countries gained access to the EU. At the moment of accession CEE countries in transition exhibited different levels of economic development, especially in the rate of GDP growth. On the one hand the highest levels of GDP per capita had been reached by Slovenia and the Czech Republic, while Bulgaria and Romania showed the lowest levels of this indicator. Thus, the question arises whether the differences in initial economic development between new EU members in transition were reflected in the structure of the causal links between economic freedom and economic growth. It seems likely that these dynamic links would be more pronounced for less developed countries. In order to verify this supposition one should test:

Conjecture 2: The role of economic freedom in supporting economic growth was especially important in the case of less and moderately developed new EU members. In general, the sign of this impact was positive.

Another important research problem is to analyze which areas of economic freedom are most important for promoting economic growth. In the light of economic theory and the empirical results reviewed in Section 2, monetary policy, trade openness and suitable policy reforms seem to play important role in promoting economic growth. Thus, it is likely that following hypothesis holds true:

Conjecture 3: The most important areas of economic freedom in the case of CEE countries in transition with respect to the promotion of economic growth were monetary and fiscal policy, trade openness and labour and business regulations.

In recent years, economic growth has been the highest priority of all CEE transition countries, especially in the first decade of transition. On the other hand, improving economic freedom was slightly less important. Work on freedom from corruption, or the practical implementation of the principle of equality before the law causes special problems in transitional countries (mostly in those countries, where there are still remnants of Soviet mentality). However, as pointed out in the previous section, some empirical studies, especially on well developed market economies, detected significant reverse causality running from economic growth to economic freedom. To summarize, one may claim that the following conjecture could also hold true:

Conjecture 4: Causality running from economic growth to economic freedom for the group of CEE countries in transition in the period 2000-2009 was statistically significant.

As already mentioned, in the light of results reported in previous empirical studies causality running from economic growth to economic freedom seems to be more likely for developed economies, as they e.g. pay more attention to combating corruption and their societies support the introduction of various reforms, which in turn boost economic freedom. This process is conditioned by the rule of law in countries with an established democratic system. In the period under consideration the CEE transition countries introduced important political and economic reforms and their economic and legal systems became similar to the systems of highly developed market economies. All these facts provide a basis to formulate the following:

Conjecture 5: Economic growth was a significant causal factor for economic freedom mostly for moderately and highly developed new EU members in transition in the period 2000-2009. In general, the sign of this impact was also positive.

The last test of causal links between economic growth and economic freedom is somewhat the reverse of the one expressed in Conjecture 3. Taking into consideration previous empirical papers one may expect that changes in GDP

would cause such areas of economic freedom as freedom from corruption, government size and expenditure and freedom for international trade:

Conjecture 6: In the case of the group of economies under study economic growth significantly promoted (in the causal sense) freedom from corruption, reduction of government size and expenditure and freedom to trade internationally.

All the hypotheses listed above will be tested by causality analysis. The details on applied dataset are presented in the next section.

IV. THE DATASET AND ITS PROPERTIES

The dataset used in this paper contains annual data on GDP per capita in Purchasing Power Standards (PPS) expressed in relation to the European Union (EU-27) average in ten new EU member countries in transition in the period from 2000 to 2009.³ The choice of such an indicator ensures that as well as analysing the existence of causal dependencies between economic growth and economic freedom one may check whether these links were important for countries under study in relation to the economic growth of the whole European Union, including the old and rich member countries. Thus, any evidence of causality may provide some additional information about the role of economic freedom in the process of convergence of CEE countries towards old EU members. Moreover, we used annual data on employment in the period from 2000 to 2009 for all ten countries, since a simple two-dimensional approach based only on GDP and one measure of economic freedom is likely to produce spurious results due to the omission of an important variable. The technical aspect is not the only reason for including employment in the model, since this variable is also important in terms of basic theoretical growth models.⁴ The data on GDP and employment was obtained from the Eurostat database.

A common problem related to the Index of Economic Freedom provided by the Heritage Foundation and the index provided by the Fraser Institute is the fact that each of them transforms large sets of statistical data from various fields (financial sector, demography, property rights etc.) into a single annual value. This is naturally helpful for general applications, such as answering the question whether economic growth and freedom are somehow dynamically linked, but the formulation of useful and detailed policy recommendations is almost impossible. In order to deal with this difficulty, along with overall measures of economic freedom we have applied several central components of both indexes, which are related to different aspects of economic freedom.

One of the major technical problems related to analysing the role of economic freedom for each individual CEE country, especially in terms of causal interrelations with the country's economic growth, is the lack of reliable time series data of sufficient size. This means that a traditional causality examination based on time series modelling for individual countries is hardly applicable due to poor statistical properties of the test. Moreover, uncertainty about the application of asymptotic distribution theory is also present for small panel datasets. Therefore, the analysis of causal dependencies between economic growth and various measures of economic freedom applied in this paper has been based on an alternative approach to the evaluation of panel datasets. Moreover, as well as asymptotic distribution theory we have also applied bootstrap critical values. Detailed information on the methodology is presented in Section 5.

³ In the period 2004-2007 twelve countries joined the EU. However, Malta and Cyprus have not been taken into consideration in this study since the evolution of the economies of these countries is significantly different than that of the ten other new EU members (e.g. the economies of Malta and Cyprus have never been in a transition phase).

⁴ As stressed by de Haan et al. (2006) the set of additional variables is notably varied among previous empirical papers. Moreover, in the short-run employment is often treated as the only variable factor of production (Takayama 1985; Mansfield 1991). Thus, values of employment seem to be a reasonable alternative to the application of large number of additional and control variables, which would seriously reduce the number of degrees of freedom in case where the group of economies analyzed is relatively small.

Table 1 contains some basic facts on the size and economic development of the countries examined in this paper, which should be especially useful for the Reader who is less familiar with the economic profile of CEE economies in transition.

INSERT TABLE 1 AROUND HERE

As one can see the new EU members in transition vary in terms of area, population and the level of GDP per capita. However, a common fact across all the ten countries examined in this study is that they have experienced significant economic growth in comparison to the EU average in the period 2000-2009. This paper is partly aimed at answering the question whether during the ongoing process of the transformation of these economies the change in the level of economic freedom has been an important factor in the convergence towards highly-developed old EU members.

In this paper abbreviations were used for all variables. Table 2 contains a summary of some basic information on all variables.⁵

INSERT TABLE 2 AROUND HERE

It should be noted that along with the overall score the Heritage Foundation provides detailed information on 10 major components of the index. In this paper we have not applied the component data on Investment Freedom, Financial Freedom and Property Rights indexes, since for most of countries under study these variables were found to be quasi-constant, which in general excludes the possibility of using them (especially their first differences) in regression-based causality testing.⁶ Moreover, the index of Labour Freedom was also not taken into consideration, since in this case the annual data was available only from 2005 onward. To summarize, in this paper we have applied two overall indexes, six component indexes provided by the Heritage Foundation and five component indexes provided by the Fraser Institute.⁷

In the initial part of our analysis we examine some basic properties of our data. Instead of presenting a large number of descriptive statistics, we have decided to present the data in plots. Figure 1 contains the plots of *GDP* and *EMPL* variables for sample countries.

INSERT FIGURE 1 AROUND HERE

The aim of Figure 1 is not to reflect the performance of each individual economy, but rather display the properties of the whole group and eventually provide some detail before the formulation of any subgroups. In general, one can easily note upward tendencies in the graphs of $GDP_{i,t}$ for $i=1, \dots, 10$ and $t=2000, \dots, 2009$. This implies that in the period under study this group of economies has significantly moved towards the EU-27 average, at least in terms of per capita GDP. However, Figure 1 also suggests that this catch-up effect was not uniform for all new EU members in transition, as subgroups of “leaders” (the Czech Republic and Slovenia) and “followers” (Bulgaria and Romania) may be tentatively identified. In general the upward tendency is also visible in most of the employment rate graphs. However, the fluctuations in these plots are larger than for per capita GDP. Finally it should be noted that Figure 1 provides some general information on the reaction of all the economies to the crisis of 2001 and especially of 2008.

⁵ Throughout this paper (especially for model presentation purposes) the subscript i describes the alphabetical order of sample countries (i.e. for Bulgaria $i=1$, for the Czech Republic $i=2$, etc.).

⁶ In some cases these indexes remained unchanged during the whole period under study. For example, the Heritage Investment Freedom Index for Estonia was at a level of 90 each year in the period 2000-2009.

⁷ It is worth noting that in this study all Fraser component indexes were applied in their *chain-linked* versions, which are most consistent through time (Gwartney et al. 2011). All Fraser indexes were also multiplied by 10 to be of similar order of magnitude as other data.

To shed some light on the evolution of economic freedom in these countries one should analyze the plots of both overall economic freedom indexes.⁸ Figure 2 contains suitable information.

INSERT FIGURE 2 AROUND HERE

In general the plots presented in Figure 2 show that both overall indexes have risen for all the countries. This suggests that in the period under study the new EU members in transition have implemented suitable policies towards increasing their economic freedom. However, for some countries (e.g. Bulgaria, Romania) the rise in indexes was much higher than for others (e.g. Czech Republic, Slovenia).⁹

In this context two natural questions arise. First, one may want to check whether the recently observed economic growth of this group of countries was somehow dynamically linked with changes in their economic freedom. Second, it seems interesting to examine which areas of economic freedom (described by the components of both overall indexes) have played a key role in forming the shape of dynamic causal relationships with economic growth.

V. METHODOLOGY

In this paper we use the method of evaluating panel datasets developed by Granger and Huang (1997). This approach focuses on the forecasting properties of examined models rather than on significance tests (as in the case of the traditional approach). This method has often been used in recent empirical papers dealing with panel-based causality analysis (e.g. Weinhold and Reis 2001; Pérez-Moreno 2009), since it is relatively simple to use, free of complex pretesting procedures and may be applied even for relatively short time series or a small number of observations in each cross-section.

In order to present this idea we will analyze the case of testing for causality in the direction from economic freedom measured by the Heritage overall index to economic growth.¹⁰ Let I denote the group of examined countries (e.g. all examined countries, all but the poorest countries etc.) and T denote the number of time points. Next, consider the following two models:

$$GDP_{i,t} = \mu_i + \sum_{j=1}^p \alpha_j GDP_{i,t-j} + \sum_{j=1}^p \beta_j EMPL_{i,t-j} + \sum_{j=1}^p \gamma_j HERITAGE_{i,t-j} + \zeta_{i,t} \quad (1)$$

$$GDP_{i,t} = \mu'_i + \sum_{j=1}^p \alpha'_j GDP_{i,t-j} + \sum_{j=1}^p \beta'_j EMPL_{i,t-j} + \zeta'_{i,t} \quad (2)$$

where $i \in I$, p denotes the lag length and $t=p+1, \dots, T$. A constant source of conflict in the freedom-growth literature is the appropriate use of fixed and random effects. It turns out that previous empirical studies used different, and often even incompatible, definitions of these two effects.¹¹ As a consequence the same factor could be “fixed” according to one definition and “random” in another. This problem was caused not only by subtle intricacies in mathematical aspects of

⁸ In order to save space we only present the plots of both overall economic freedom indexes. Naturally, all component indexes will be taken into consideration during causality analysis, which is the main focus of this research.

⁹ These results may also suggest that the change in economic freedom in the period under study is partly related to initial GDP (comp. Figure 1). In general, countries with a relatively high GDP in 2000 were in advanced stages of the transition process and often a significant improvement in the level of economic freedom had already taken place. Poorer countries (e.g. Bulgaria, Romania), which started from low levels of GDP and economic freedom in 2000 were in the early stages of transition and had more to improve in their levels of economic freedom. These facts provide some additional justification of the need to examine specific subgroups of “leaders” and “followers”.

¹⁰ Testing for causality in the opposite direction and/or based on the application of different indexes requires an analogous procedure.

¹¹ In practice the Hausman test is often applied to choose which type of effects should be considered. However, this procedure has relatively poor small sample properties. Moreover, the results of this simple test cannot be treated as more important than the well-justified theoretical structure of the model.

models, but often by the lack of a clear conception of the research. In this paper we follow the suggestions of Gelman (2005) and instead of using the overloaded terms “fixed” and “random” we consider two types of effects (or coefficients) in a multilevel model: “constant”, if they are identical for all members of a group, and “varying”, if they are allowed to differ from country to country. Thus, the models in (1) and (2) allow for varying effects in the intercept terms.¹² When turning to estimation details (including the choice of method of evaluating variance of the error term), we rely on the standard OLS-related methods, since in the case of our dataset it is rather hard to justify the use of linear unbiased prediction (Robinson 1991) approach.¹³

However, one should bear in mind that in case of samples as small as the one analyzed in this paper, several problems occur during estimation of panel models for variables in their levels.¹⁴ The simplest solution is the application of first differences, which may easily eliminate individual characteristics (varying effects expressed in intercepts μ_i and μ'_i) and significantly improve the performance of least squares estimators. Therefore, instead of evaluating equations (1) and (2) one could analyze the following (differenced) equations:

$$\Delta GDP_{i,t} = \sum_{j=1}^p \alpha_j \Delta GDP_{i,t-j} + \sum_{j=1}^p \beta_j \Delta EMPL_{i,t-j} + \sum_{j=1}^p \gamma_j \Delta HERITAGE_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

$$\Delta GDP_{i,t} = \sum_{j=1}^p \alpha'_j \Delta GDP_{i,t-j} + \sum_{j=1}^p \beta'_j \Delta EMPL_{i,t-j} + \varepsilon'_{i,t} \quad (4)$$

It is easy to see that formulas (3) and (4) describe competitive models of changes in per capita GDP in the countries included in group I . According to Granger and Huang (1997), if model (3) forecasts a change in GDP more accurately than model (4), one may claim that information on the past values of economic freedom is indeed important. In other words, economic freedom has significant explanatory power in describing fluctuations of economic growth in the countries included in group I .

Following previous papers of Granger and Huang (1997), Weinhold and Reis (2001) and Pérez–Moreno (2009), we have applied two forecast–based testing procedures to test for Granger causality in the discussed framework:

PROCEDURE I

(count method)

1. Set $i_0 \in I$.
2. Estimate models (3) and (4) using $i \in I \setminus \{i_0\}$ and $t=p+1, \dots, T$.
3. Obtain two sequences of forecasts for i_0 -th country for $t=p+1, \dots, T$, using models (3) and (4).
4. Obtain two sequences of forecast errors, i.e. $\{\eta_t^{i_0}\}_{t=p+1, \dots, T}$ (forecast errors for model (3)) and $\{\xi_t^{i_0}\}_{t=p+1, \dots, T}$ (errors for model (4)).
5. After performing points 1–4 for all possible choices of $i_0 \in I$, define $p_1 = n\left(\left\{(i,t) \in I \times \{p+1, \dots, T\} : (\eta_t^{i_0})^2 > (\xi_t^{i_0})^2\right\}\right)$ and $p_2 = n\left(\left\{(i,t) \in I \times \{p+1, \dots, T\} : (\eta_t^{i_0})^2 < (\xi_t^{i_0})^2\right\}\right)$, where $n(A)$ denotes the number of elements of set A .

¹² Some preliminary results (available from the authors upon request) based on significance tests provided no solid evidence in favor of adding any time trends (constant or varying) in models (1) and (2).

¹³ As already mentioned, application of one simple model constructed for a very large group of (often dissimilar) countries may sometimes lead to formulation of spurious conclusions. This paper is aimed at describing the structure of freedom-growth causal links only for a particular group of (relatively similar) CEE countries. In other words, in our research the sample used exhausts the underlying population, which actually makes decomposition of the variance of error term needless (Gelman 2005).

¹⁴ Note that an estimation of all varying intercepts in models (1) and (2) (using e.g. an LSDV approach) would significantly reduce the number of degrees of freedom.

6. Let $z_{1-\frac{\omega}{2}}$ denote the $(1-\frac{\omega}{2})$ -quantile of standard normal distribution. If:

a) $\frac{p_1}{p_1 + p_2}$ lies outside the interval $\left(\frac{1}{2} - \frac{z_{1-\frac{\omega}{2}}}{2\sqrt{p_1 + p_2}}, \frac{1}{2} + \frac{z_{1-\frac{\omega}{2}}}{2\sqrt{p_1 + p_2}} \right)$;

b) the variance of $\{\eta_t^i\}_{t=p+1, \dots, T}$ is smaller than the variance of $\{\xi_t^i\}_{t=p+1, \dots, T}$,

then the $\Delta HERITAGE_{i,t}$ Granger causes $\Delta GDP_{i,t}$ for countries included in group I at $(100 \cdot \omega)\%$ significance level.

PROCEDURE II

(out-of-sample sum-difference test)

1. Conduct points 1–4 from PROCEDURE I.

2. Define $\{SUM_t^i\}_{t=p+1, \dots, T} := \{\eta_t^i + \xi_t^i\}_{t=p+1, \dots, T}$ and $\{DIFF_t^i\}_{t=p+1, \dots, T} := \{\eta_t^i - \xi_t^i\}_{t=p+1, \dots, T}$.

3. Estimate via OLS the regression: $SUM_t^i = a + b \cdot DIFF_t^i + \varepsilon_t^i$.

4. If:

a) the result of a t -Student test rejects the null that $b=0$ (at chosen significance level);

b) the variance of $\{\eta_t^i\}_{t=p+1, \dots, T}$ is smaller than the variance of $\{\xi_t^i\}_{t=p+1, \dots, T}$,

than the $\Delta HERITAGE_{i,t}$ Granger causes $\Delta GDP_{i,t}$ for countries included in group I (at a chosen significance level).

In general, both procedures presented above are based on finding out-of-sample forecasts for models (3) and (4) and then checking whether the augmented model is indeed more accurate than the restricted one. PROCEDURE I is not always as powerful as PROCEDURE II but it is robust to any covariance between and heteroscedasticity of the errors (Granger and Huang 1997). For the sake of the comprehensiveness of our research we additionally applied a traditional in-sample Granger causality procedure:

PROCEDURE III

(in-sample test)

1. Estimate model (3) using all available information (i.e. $i \in I, t = p+1, \dots, T$).

2. Test the null hypothesis that $\forall_{j=1, \dots, p} \gamma_j = 0$.

3. If the null hypothesis is rejected at the chosen significance level then the $\Delta HERITAGE_{i,t}$ Granger causes $\Delta GDP_{i,t}$ in the case of countries included in group I .

One should be aware of two problems which arise while performing significance tests (e.g. t -test, F -test) of regression coefficients on the basis of asymptotic distribution theory (as in step 4a of PROCEDURE II or step 2 of PROCEDURE III) or establishing asymptotic-based confidence intervals (step 6a of PROCEDURE I). Firstly, if some required modelling assumptions do not hold, the application of asymptotic theory may simply lead to spurious results (Lütkepohl 1993). Secondly, when dealing with small samples, the distribution of the test statistic may still be significantly different from an asymptotic pattern, even when all modelling assumptions are generally fulfilled. One possible way to overcome these difficulties is the application of the bootstrap technique. Bootstrapping is used to

estimate the distribution of a test statistic (or to construct a confidence interval) by resampling the data. Since the estimated distribution depends only on the available dataset, one may expect that this procedure does not require assumptions as strong as parametric methods.

In order to minimize the undesirable influence of heteroscedasticity, the bootstrap test was based on resampling leveraged residuals. This approach has often been applied in recent empirical causality investigations based on relatively small datasets (see e.g. Gurgul and Lach 2011a, 2011b). A detailed description of this resampling procedure may be found in Hacker and Hatemi (2006).¹⁵ In case of PROCEDURE I we applied percentile bootstrap confidence intervals.

Academic discussion on the establishment of the number of bootstrap replications has attracted considerable attention in recent years (see e.g. Horowitz 1995). In this paper we have applied the procedure of establishing the number of bootstrap replications developed by Andrews and Buchinsky (2000). In all cases we aimed to choose a value of the number of replications which would ensure that the relative error of establishing the bootstrap critical values (at a 10% significance level) would not exceed 5% with a probability equal to 0.95. The Gretl script including the complete implementation of PROCEDURES I–III is available from the authors upon request.

The application of such a variety of methods is believed to ensure the verification of robustness and the validation of empirical findings. Despite using differenced data (elimination of varying effects), the structure of dynamic interrelations between economic growth and the various aspects of economic freedom may still depend, at least to some extent, on individual characteristics of sample countries (comp. e.g. Table 1, Figure 1 and Figure 2). In other words, even within the group of new EU member countries in transition one may select “leaders”, “moderate ones” and “followers” clusters. Therefore, to examine this issue we also use several possibilities of choosing members of group *I*.

6. EMPIRICAL RESULTS

In this section the results of examining causal dependencies between economic growth and various indexes of economic freedom in new EU members in transition are presented. The data analyzed in this paper covers the period from 2000 to 2009 (this naturally means that the data in first differences covers the period from 2001 to 2009).

Before performing a Granger causality analysis we decided to establish several variants for *I* – the set of countries to be analyzed. Taking into account all previously presented remarks (based mainly on a visual inspection of variables), we have distinguished a subgroup of “leaders” comprising Slovenia and the Czech Republic and a subgroup of “followers” comprising Bulgaria and Romania. However, it should be underlined that the outcomes of analysis of causal dependencies for groups containing data only on two specific countries would be seriously biased.¹⁶ Therefore, we have decided to analyze “all but the followers” and “all but the leaders” subgroups. The complete list of groups of countries examined in this paper is presented in Table 3.

INSERT TABLE 3 AROUND HERE

For the sake of the comprehensiveness three values of the lag parameter were applied for each of the pairs of models (augmented and restricted) analyzed.¹⁷ Despite using first differences, we examined the stationarity properties of

¹⁵ In order to control for heteroscedasticity one may alternatively use the well-known concept of *wild bootstrap* (Liu 1988). For the sake of the comprehensiveness we have additionally considered this standard approach. Because the results obtained after the application of both bootstrap approaches were not significantly different, in further parts of this paper we will report only the results obtained by the leverage-based scheme.

¹⁶ Note that when the Granger-Huang (1997) approach (PROCEDURE I and II) is applied to the panel of two countries the forecasts for each country are based only on the data on the other one, which may lead to significant errors, especially in the case of weak similarity between the two economies. Moreover, the statistical performance of all approaches (including traditional PROCEDURE III) is also likely to suffer from the small (extremely small in the case of two economies) sample considered.

¹⁷ In addition, the application of up to three years of lags is important in terms of obtaining unbiased results, as it helps to minimize the risk of picking up normal business cycle effects unrelated to the real impact of economic freedom (Heckelman 2000).

the (differenced) data, since it is a well known fact that an OLS-based approach is likely to produce spurious results for short (in both the time and cross-sectional dimensions) nonstationary panels and time series (Phillips 1986). Moreover, at present there are only some preliminary theoretical results on the availability of bootstrap to provide any asymptotic refinements when the analyzed data is integrated or cointegrated (Horowitz 1995). Thus, before performing pooled-OLS-based tests of significance (PROCEDURE III) we applied a number of unit root tests allowing for common (Levin, Lin and Chu test, Breitung test) or individual (Im, Pesaran and Shin test) unit root processes. Similarly, we used ADF, KPSS and PP tests before performing each sum-difference test (PROCEDURE II). We applied the Schwarz criterion for choosing the optimal lag length before unit-root testing and the Newey and West (1987) method for bandwidth selection. In all cases (various freedom indexes, different groups of countries, time series tests (PROCEDURE II) and pooled-OLS-based tests (PROCEDURE III)) we found no evidence of nonstationarity at a 5% level.

The importance of economic freedom for economic growth

Table 4 contains the results of testing for Granger causality in the direction from the set of freedom measures to the economic growth of all countries (group I_0). All testing procedures were performed at a 10% significance level. In order to present the empirical results in the possibly most readable way we used shading to mark the finding of significant causality in Tables 4-11 (in case of significance tests shading was used when the asymptotic- or bootstrap-based p -value was smaller than or equal to 0.10). Results obtained after the application of bootstrap-based critical values are presented in square brackets.¹⁸

INSERT TABLE 4 AROUND HERE

As one can see, the test results provided relatively solid and robust evidence that economic freedom Granger caused the economic growth of all countries, which is especially visible in the results obtained for the Fraser overall index and supports Conjecture 1.¹⁹ When turning to component indexes one can see that the most robust and strong evidence of causality was found for *HERITAGE*⁵ (monetary freedom), *HERITAGE*³ (fiscal freedom), *HERITAGE*⁶ (freedom from corruption), *FRASER*² (legal structure and security of property rights), *FRASER*³ (access to sound money) and *FRASER*⁵ (regulation of credit, labour, and business), which clearly supports Conjecture 3. On the other hand, both government-size-related indexes (*HERITAGE*⁴, *FRASER*¹) were found to have a very weak causal impact on economic growth.

In order to examine the stability of these results we repeated the causality analysis for all subgroups listed in Table 3. Results obtained for group I_1 are presented in Table 5.

INSERT TABLE 5 AROUND HERE.

In comparison to previous case the evidence of causality running from summary freedom measures to economic growth is much weaker. Moreover, for countries in group I_1 relatively solid evidence of causality was found only in the case of the *HERITAGE*³, *HERITAGE*⁵, *HERITAGE*⁶ and *FRASER*⁵ indexes. One may interpret these results as evidence supporting the hypothesis that economic freedom was especially important for economic growth in poorer and less developed CEE countries.

¹⁸ In this paper the number of replications chosen according to Andrews and Buchinsky (2000) algorithm varied between 1979 and 3259 for each bootstrap application. In general, results obtained after construction of asymptotic- and bootstrap-based confidence intervals were not significantly different in the case of each conducted test, so we present detailed results of asymptotic variant only.

¹⁹ Note that variables in both sets (related to GDP and freedom measures) have in general experienced stable growth, which provides some information on sign of the causal impact. Visual inspection may often turn out to be a helpful method supporting description of the signs of causal links, as traditional vector-autoregression-based estimates of impulse response analysis are often criticised due to their high sensitivity to misspecification of the underlying properties of the data, which leads to serious inaccuracy of results, especially for small datasets and relatively long horizons (see e.g. Faust and Leeper 1998; Phillips 1998).

In order to confirm this supposition one should analyze the outcomes obtained after an analysis of group I_2 . Relevant results are presented in Table 6.

INSERT TABLE 6 AROUND HERE

In general, the results of Granger causality analysis presented in Table 6 are in line with the outcomes presented in Table 4, both for overall and component indexes. This in turn would mean that although, in general, economic freedom was found to be important for all new EU member countries in transition, its influence was especially present in the case of less and moderately developed countries. Moreover, since evidence supporting the causal impact of *HERITAGE*⁶ on economic growth was much weaker this may imply that freedom from corruption was not a key area of economic freedom in this context.

The analysis conducted for the group of “moderate ones” would provide some more detail, important for the verification of the above-mentioned suppositions. Table 7 contains relevant data.

INSERT TABLE 7 AROUND HERE

In general, the outcomes presented in Table 7 are in line with the results presented in Table 4 and Table 6, since the strongest evidence of causality was found for *HERITAGE*⁵, *HERITAGE*³, *FRASER*⁵ and *FRASER*². However, in this case some weak evidence supporting the causal impact of *FRASER*⁴ and *HERITAGE*¹ was also found.

To summarize, the results of causality analysis conducted for groups I_0 – I_3 provided a solid basis to claim that in the period 2000-2009 economic freedom was an important growth factor, especially for less and moderately developed new EU economies in transition, which supports Conjecture 2. Moreover, one may specify the areas of economic freedom which were found to be especially important for economic freedom (based on relatively strong and robust evidence of causality provided by both traditional and forecast-based tests), i.e. monetary and fiscal freedom; trade openness; regulation of credit, labour, and business; legal structure and security of property rights; access to sound money.

The importance of economic growth for economic freedom

An important research avenue is to examine causal dependencies in the opposite direction, i.e. from economic growth to economic freedom. This analysis may also help to specify which areas of economic freedom were especially influenced by economic growth. In other words, it may provide some general information on areas of economic freedom most important for the policy of new EU members in transition. Table 8 contains results of testing for Granger causality in the direction from economic growth to the set of freedom measures in case of all countries (group I_0).

INSERT TABLE 8 AROUND HERE

In general, the results presented in Table 8 provided evidence of relatively weak (e.g. not supported by any of out-of-sample tests) causality running from economic growth to both summary freedom measures, which partly contradicts Conjecture 4. However, the analysis of component indexes provided stronger evidence in favour of causality running from economic growth to *HERITAGE*⁵ (monetary freedom), *HERITAGE*⁶ (freedom from corruption), *FRASER*¹ (size of government: expenditures, taxes, and enterprises), *FRASER*² (legal structure and security of property rights) and *FRASER*⁵ (regulation of credit, labour, and business). For the remaining freedom measures the weaker and even less robust evidence of causality was found.

As in the previous subsection, the causality analysis was also performed in the case of the three subgroups listed in Table 3. The results obtained for group I_1 are presented in Table 9.

INSERT TABLE 9 AROUND HERE

In comparison to the previous case the results presented in Table 9 provided even weaker evidence of causality running from economic growth to both summary freedom measures. However, it is worth noting that strong and robust evidence of causality was found for *FRASER*⁴. On the other hand, no evidence of significant causality was reported for *HERITAGE*³, *HERITAGE*⁴ and *HERITAGE*⁶.

The next table (Table 10) contains results of causality analysis performed for group I_2 .

INSERT TABLE 10 AROUND HERE

In this case the evidence supporting causality running from economic growth to both summary economic freedom indexes was similar to the one based on Table 8. The strongest evidence of causality was found for *HERITAGE*⁵, *HERITAGE*⁶ and *FRASER*¹.

The last part of our research was dedicated to an examination of causal links in the direction from economic growth to economic freedom in the case of countries included in group I_3 . Relevant results are presented in Table 11.

INSERT TABLE 11 AROUND HERE

To summarize, the results presented in Tables 8-11 provided a basis to claim that economic growth had a causal impact on economic freedom mostly for countries listed in group I_3 and I_2 , while markedly weaker evidence was found in the case of group I_1 , which in turn provides only partial support for Conjecture 5. Moreover, this impact was especially important for areas of freedom from corruption, government size and expenditure and freedom to trade internationally, which in turn provides quite solid evidence in favour of Conjecture 6.²⁰

In order to examine the impact of the financial crisis of 2008 on the structure of these causal links we additionally re-ran all causality tests on the basis of the pre-crisis subsample (2000-2008). In general, only slight differences were found between results obtained for both samples, thus, we do not present pre-crisis results in separate tables. However, it is without question that this issue deserves more attention in the future, when more post-crisis data will be available.²¹

7. CONCLUDING REMARKS

To the best of our knowledge, this is the first contribution which analyses the role of economic freedom for a particular and relatively small group of economies. The main goal was to examine the structure of Granger causal links between economic growth and economic freedom in ten new EU countries in transition. In addition, the specific choice of variables enabled an examination of the impact of economic freedom on the process of convergence of these economies towards highly developed old EU members. Taking into account the ongoing academic discussion on the relevant sources of data on economic freedom, we applied annual data (covering the period from 2000 to 2009) provided by the two sources most often used in recent empirical investigations: the Heritage Foundation and the Fraser Institute. Using both sources was important in terms of the robustness and validation of the major empirical findings of this study.

²⁰ One should note that the analysis of growth-employment and employment-freedom *direct* dynamic links (on the basis of suitably adapted models (3) and (4)) can provide some information on the *implicit* dependencies between growth and freedom. In most cases, we found that the results of the analysis of these indirect links are not contradictory to the outcomes presented in Tables 4-11, which may somewhat be interpreted as further evidence of the robustness of the major findings of this paper. These supplementary results are available from the authors upon request.

²¹ One should note that in the case of every group listed in Table 3 the difference between the size of the full and reduced sample is equal to the number of considered countries, thus it is hard to expect that suitable results (PROCEDURE III) could differ significantly, even in the face of possible structural change in third quarter of 2008. In the case of out-of-sample tests (PROCEDURE I and II) one should also bear in mind that forecasts based on equations (3) and (4) suffer *equally* from all model specification imperfections (Granger and Huang 1997). Moreover, we measured GDP in relation to EU-27 average, which additionally made the impact of crisis less apparent.

In order to examine the stability of the results we additionally performed empirical investigations on three specific subgroups chosen on the basis of differences in the levels of initial economic development of sample countries. Moreover, three methods of testing for Granger causality were applied (two out-of-sample procedures and a traditional significance test) in asymptotic- and bootstrap-based variants, which was also important for the validation of the empirical findings.

The results of first part of the causality analysis provided a solid basis to claim that in the period 2000-2009 economic freedom was an important growth factor, especially for less and moderately developed new EU economies in transition. In addition, this result implied that economic freedom was one of the significant factors stimulating the convergence of these countries towards highly developed EU members. The empirical analysis also provided a basis to specify the areas of economic freedom which were found to be especially important for economic growth - monetary and fiscal freedom; trade openness; regulation of credit, labour, and business; legal structure and security of property rights; access to sound money. These findings are in line with empirical results published by other authors, since to the best of our knowledge a causal link from economic freedom to growth is reported as an empirical regularity in most of the contributions addressing the subject. Thus, market liberalization indeed seems to be an appropriate reform for countries whose concerns include relatively fast economic growth.

On the other hand, the test outcomes provided a basis to claim that economic growth had little causal impact on economic freedom. This relatively weak effect was more pronounced for moderately developed new EU economies in transition mostly in respect to freedom from corruption, government size and expenditure and freedom to trade internationally.

Our empirical research indicated the existence and direction of causality between economic freedom and economic growth. However, further attention needs to be paid to a theoretical explanation of the economic mechanisms of the established causalities.

Economic freedom is essential for business start-ups. Freedom creates the market discipline necessary to keep new ventures and established businesses responsive to the preferences of consumers. An interesting empirical observation is that countries with more economic freedom have both more entrepreneurship and a higher rate of business failure. High rates of business failure are not prejudicial to the economy as a whole. Combined with a high rate of overall entrepreneurship, business failure is a sign that many new investments are being started. One can say that the market process is at work in sorting out the good ones from the bad, which in consequence speeds up the economic growth.

Another conclusion is that the initial level of economic development (including the level of economic freedom) of countries in transition has a significant impact on their rates of economic growth in subsequent periods. This observation was the reason for building clusters of countries mostly on the basis of the initial level of their economic development. The econometric analysis conducted seems to confirm - with respect to the rate of economic growth - the influence of backwardness, which sometimes may promote economic growth even more strongly than economic freedom. A detailed interpretation of the causality results has to take into account that the observed impact of backwardness in the case of less developed countries in transition has been partly created by the capitalist development of Western societies. We have to point out that wages and salaries in CEE members of EU, especially poorer ones, are still essentially lower than in old EU members. This simply attracts foreign capital to invest in this part of Europe and to displace existing production from the "old" to the "new" part of Europe, which in turn increases the rate of economic growth of host countries.

It is also worth to mention that the effect of state control on the transition from a centrally planned to a market economy is not always straightforward. The belief that competition definitely stimulates economic efficiency and growth, may often turn out to be an oversimplification as the issue of possible market failure and the problem of excessive competition should also be considered.

Besides labour, some other variables such as economic policy may play important roles in the context of freedom-growth relations. Moreover, *ceteris paribus*, wise economic policy is expected to promote economic growth. Therefore, this issue seems especially interesting for the further research of freedom-growth linkages in case of CEE countries in transition.

An important topic is the impact of economic freedom on economic growth in the period of financial crises. In general, the results of our research turned out to be robust when a pre-crisis subsample was applied, although, as already mentioned, this could be mainly due to the mathematical properties of the test conducted. It seems that it may still be too early to formulate reliable comments on the real role of economic crises; researchers need to wait until longer time series are available and then obtain precise and credible results. An interesting example in this area is the economy of a particular transitional country - China. There are indications that the limited freedom in its financial markets and cross-border capital flows may have shielded China from the recent financial crises that took place over our sample period.

It is likely that institutional reforms in CEE countries promoting economic freedom and globalization have different effects in the long and short terms. Usually some positive effects of economic reforms may come at a short-term cost. However, after passing through an initial “valley of tears” the positive effects of certain reforms will be seen after several years. Thus, the analysis of freedom-growth dependencies in the long-run also seems to be an important research avenue. This investigation, however, requires significantly longer time series of data.

Our empirical research suffers from the drawback that the relevant time series are too short to conduct a causality analysis based solely on the time series for individual countries. Despite using carefully selected econometric methods and examining a small group of relatively similar economies, we conducted our analysis with the risk of possible heterogeneity, which could have a slight negative impact on the precision of the results. Thus, in the future, as relevant time series become longer, an analysis on a time series basis for individual CEE countries in transition should also be conducted as a supplement to the presented results.

One should note that reliance on overall economic freedom measures in order to predict economic growth might sometimes lead to the premature conclusion that freedom does not significantly affect growth. However, it may still be true that more economic freedom in general is beneficial to growth, but not that all economic freedoms have an equal effect (actually some may even have counter effects). Our research was designed to help uncover which freedoms stimulate growth and which are less important. Another goal, quite original in the literature on the subject, was to check whether economic freedom has indeed played a significant role in the process of the convergence of CEE transition economies towards rich members of the EU. In general, the results of this paper confirmed a positive role of economic freedom in economic growth and this convergence. However, the freedom-growth link still deserves considerable attention of researchers as many important questions remain open.

LIST OF FIGURES

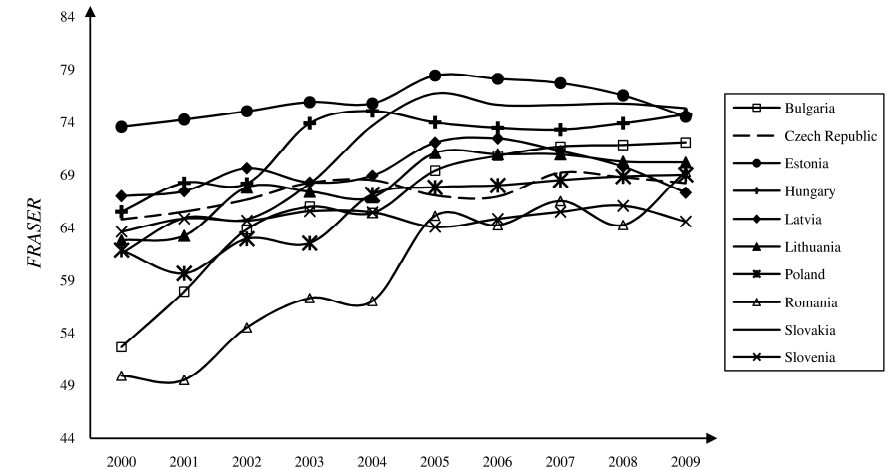
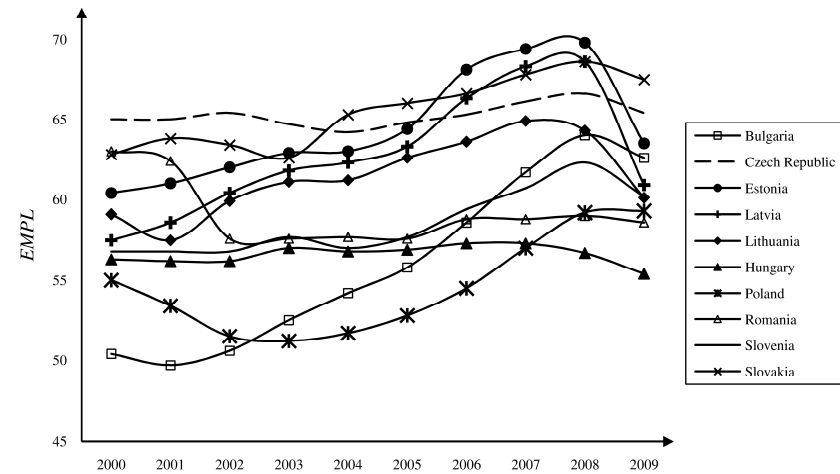
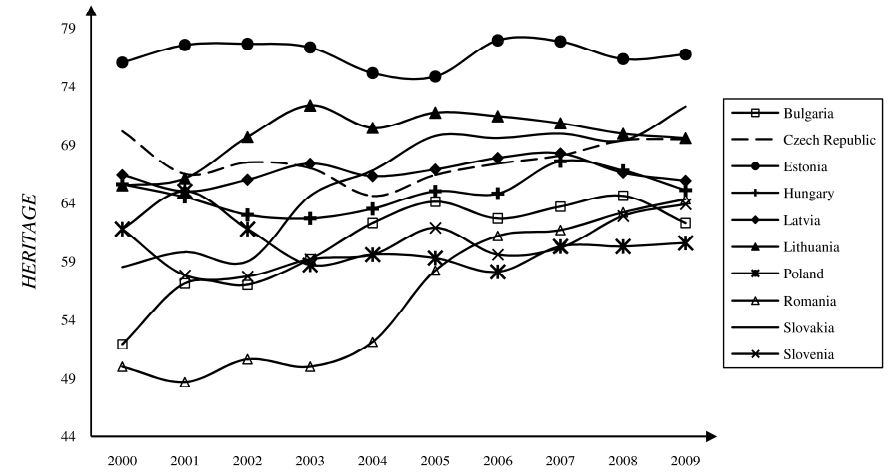
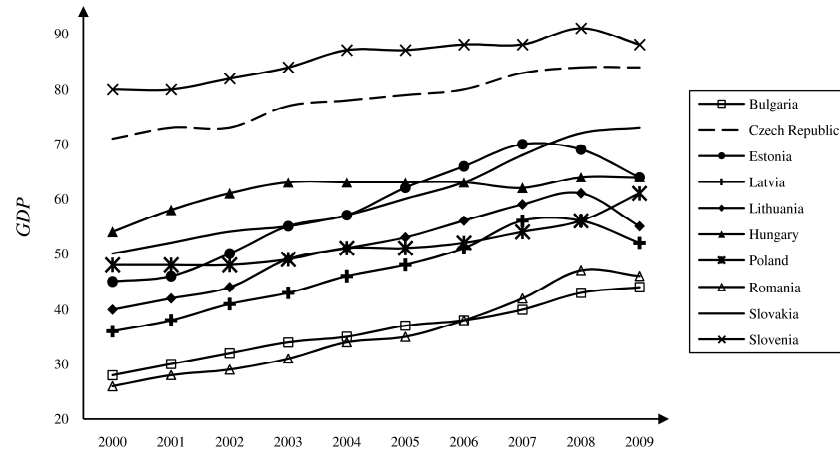


Figure 1. Plots of *GDP* and *EMPL* variables for all countries under study.

Figure 2. Plots of *HERITAGE* and *FRASER* variables for all countries under study.

LIST OF TABLES

Table 1. Short description of countries examined in this study.

| Country | GDP per capita in 2009 as a percentage of EU-27 average (EU-27 PPS) | Percentage change in GDP per capita between 2000-2009 with respect to EU-27 average (EU-27 PPS) | Total population [million] (2009 data) | Area [thousands km ²] |
|----------------|---|---|--|-----------------------------------|
| Bulgaria | 44% | +16% | 7.60 | 110.91 |
| Czech Republic | 84% | +13% | 10.46 | 78.86 |
| Estonia | 64% | +19% | 1.34 | 45.22 |
| Hungary | 64% | +10% | 10.03 | 93.03 |
| Latvia | 52% | +16% | 2.26 | 64.58 |
| Lithuania | 55% | +15% | 3.34 | 65.20 |
| Poland | 61% | +13% | 38.13 | 312.68 |
| Romania | 46% | +20% | 21.49 | 238.39 |
| Slovakia | 73% | +23% | 5.41 | 48.84 |
| Slovenia | 88% | +8% | 2.03 | 20.27 |

Source: Eurostat database.

Table 3. Description of the groups of countries examined in this paper.

| Group of countries | Countries included |
|--------------------|---|
| I_0 | All sample countries; |
| I_1 | All but the followers (i.e. Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia); |
| I_2 | All but the leaders (i.e. Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia); |
| I_3 | All but the followers and leaders (i.e. Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia). |

Table 2. Abbreviations and short description of examined variables.

| Full name [Abbreviation] | Short description |
|--|---|
| GDP per capita in country i in year t in Purchasing Power Standards (PPS) expressed in relation to the EU-27 average [$GDP_{i,t}$] | The application of values expressed in PPS, i.e. a common currency that eliminates the differences in price levels between countries, allows meaningful volume comparisons of GDP between countries and may provide some basic information on the convergence process. |
| Employment rate in age group 15-64 in country i in year t [$EMPL_{i,t}$] | This indicator is based on the EU Labour Force Survey, which covers the entire population living in private households and excludes those in collective households such as boarding houses, halls of residence and hospitals. |
| Heritage overall index of economic freedom in country i in year t [$HERITAGE_{i,t}$] | The summary index of economic freedom provided by the Heritage Foundation based on the average of 10 economic measurements. |
| Heritage business freedom index in country i in year t [$HERITAGE^1_{i,t}$] | The business freedom index reflects the individual's right to establish and run an enterprise without interference from the state. The most common barriers to the free conduct of entrepreneurial activity are redundant and burdensome regulations. |
| Heritage trade freedom index in country i in year t [$HERITAGE^2_{i,t}$] | The trade freedom index reflects an economy's openness to the import of goods and services from around the world. Moreover, this index measures the citizen's ability to interact freely as buyer or seller in the international marketplace. |
| Heritage fiscal freedom index in country i in year t [$HERITAGE^3_{i,t}$] | The fiscal freedom index measures the extent to which individuals and businesses are permitted by government to keep and control their income and wealth for their own benefit and use. |
| Heritage government spending index in country i in year t [$HERITAGE^4_{i,t}$] | The burden of excessive government is one of the key issues in economic freedom, both in terms of generating revenue (comp. fiscal freedom index) and in terms of spending. Some expenditure, such as providing infrastructure or funding research or even improvements in human capital, may be thought of as investments. However, excessive government spending runs a serious risk of crowding out private consumption, thereby thwarting the choices of individuals. Moreover, a government's insulation from market discipline often leads to inefficiency and waste. |
| Heritage monetary freedom index in country i in year t [$HERITAGE^5_{i,t}$] | Every economy needs a steady and reliable currency as a medium of exchange and store of value. Without monetary freedom, it is extremely difficult to create long-term value. |
| Heritage freedom from corruption index in country i in year t [$HERITAGE^6_{i,t}$] | Corruption can simply infect all parts of an economy. Political corruption manifests itself most commonly in the form of graft, bribery, nepotism or embezzlement. Openness in regulatory processes and procedures can promote equitable treatment and improve regulatory efficiency. |
| Fraser overall freedom index in country i in year t [$FRASER_{i,t}$] | The summary index provided by the Fraser Institute reflects the average degree of economic freedom measured in five major areas. |
| Fraser size of government: expenditures, taxes, and enterprises index in country i in year t [$FRASER^1_{i,t}$] | This index measures the degree to which a country relies on personal choice and markets rather than government budgets and political decision-making. |
| Fraser legal structure and security of property rights index in country i in year t [$FRASER^2_{i,t}$] | The protection of persons and their rightfully acquired property is a key element of economic freedom and civil society. By common consent it is the basic function of every government. |
| Fraser access to sound money index in country i in year t [$FRASER^3_{i,t}$] | The absence of sound money undermines gains from trade. Sound money is essential to protect property rights and, thus, economic freedom. |
| Fraser freedom to trade internationally index in country i in year t [$FRASER^4_{i,t}$] | In a world of high technology and relatively low costs of communication and transportation, freedom of exchange across national boundaries is a natural ingredient of economic freedom. |
| Fraser regulation of credit, labour, and business index in country i in year t [$FRASER^5_{i,t}$] | This index focuses on regulatory restraints that limit freedom of exchange in the credit, labour, and product markets. |

Source: Gwartney et al. (2011), The Heritage Foundation database, Eurostat database.

Table 4. Results of testing for Granger causality from indexes of economic freedom to economic growth in all countries in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|-----------------------------|---------------------|-----------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✓ | - | ✗ | <i>p</i> -value=0.49 [0.55] | ✓ | <i>p</i> -value=0.08 [0.01] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.52 [0.51] | ✗ | <i>p</i> -value=0.21 [0.29] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.75 [0.79] | ✗ | <i>p</i> -value=0.33 [0.38] |
| HERITAGE ¹ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.57 [0.48] | ✗ | <i>p</i> -value=0.59 [0.62] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.78 [0.68] | ✗ | <i>p</i> -value=0.62 [0.71] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.65 [0.53] |
| HERITAGE ² | 1 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.91 [0.96] | ✗ | <i>p</i> -value=0.94 [0.92] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.44 [0.43] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.85 [0.58] | ✗ | <i>p</i> -value=0.62 [0.74] |
| HERITAGE ³ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.34 [0.23] | ✓ | <i>p</i> -value=0.02 [0.03] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.40 [0.27] | ✓ | <i>p</i> -value=0.08 [0.09] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.37 [0.49] | ✓ | <i>p</i> -value=0.01 [0.00] |
| HERITAGE ⁴ | 1 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.82 [0.75] | ✗ | <i>p</i> -value=0.56 [0.61] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.54 [0.39] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.97 [0.95] | ✗ | <i>p</i> -value=0.93 [0.83] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.51 [0.38] | ✓ | <i>p</i> -value=0.09 [0.01] |
| | 2 | ✓ | - | ✓ | <i>p</i> -value=0.15 [0.09] | ✓ | <i>p</i> -value=0.10 [0.02] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.59 [0.48] | ✓ | <i>p</i> -value=0.09 [0.06] |
| HERITAGE ⁶ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.75 [0.82] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.33 [0.39] | ✓ | <i>p</i> -value=0.03 [0.00] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.84 [0.79] | ✓ | <i>p</i> -value=0.13 [0.04] |
| FRASER | 1 | ✓ | - | ✓ | <i>p</i> -value=0.22 [0.08] | ✓ | <i>p</i> -value=0.02 [0.08] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.59 [0.42] | ✓ | <i>p</i> -value=0.00 [0.06] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.54 [0.39] | ✓ | <i>p</i> -value=0.05 [0.05] |
| FRASER ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | <i>p</i> -value=0.01 [0.04] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.30 [0.32] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.41 [0.52] |
| FRASER ² | 1 | ✓ | - | ✗ | <i>p</i> -value=0.58 [0.53] | ✗ | <i>p</i> -value=0.83 [0.74] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.67 [0.52] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.46 [0.39] | ✗ | <i>p</i> -value=0.55 [0.54] |
| FRASER ³ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.51 [0.52] | ✓ | <i>p</i> -value=0.01 [0.03] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.74 [0.53] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.89 [0.61] |
| FRASER ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.48 [0.51] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.61 [0.72] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.55 [0.39] |
| FRASER ⁵ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.53 [0.61] | ✓ | <i>p</i> -value=0.02 [0.01] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.42 [0.39] | ✓ | <i>p</i> -value=0.09 [0.00] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.47 [0.45] | ✗ | <i>p</i> -value=0.32 [0.26] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 5. Results of testing for Granger causality from indexes of economic freedom to economic growth for countries included in group I₁ in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|-----------------------------|---------------------|-----------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✓ | - | ✗ | <i>p</i> -value=0.87 [0.83] | ✗ | <i>p</i> -value=0.33 [0.39] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.62 [0.46] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.68 [0.59] |
| HERITAGE ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.76 [0.82] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.22 [0.31] | ✗ | <i>p</i> -value=0.36 [0.39] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.89 [0.94] |
| HERITAGE ² | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.66 [0.62] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.87 [0.81] | ✗ | <i>p</i> -value=0.38 [0.43] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.79 [0.74] |
| HERITAGE ³ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.37 [0.45] | ✓ | <i>p</i> -value=0.04 [0.02] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.56 [0.61] | ✓ | <i>p</i> -value=0.12 [0.19] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.67 [0.72] | ✓ | <i>p</i> -value=0.03 [0.04] |
| HERITAGE ⁴ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.88 [0.79] | ✗ | <i>p</i> -value=0.81 [0.71] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.68 [0.53] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.78 [0.72] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.84 [0.78] | ✓ | <i>p</i> -value=0.09 [0.02] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.64 [0.59] | ✓ | <i>p</i> -value=0.19 [0.10] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.20 [0.18] |
| HERITAGE ⁶ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.88 [0.74] | ✗ | <i>p</i> -value=0.43 [0.42] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.33 [0.41] | ✓ | <i>p</i> -value=0.01 [0.02] |
| | 3 | ✓ | - | ✗ | <i>p</i> -value=0.55 [0.41] | ✓ | <i>p</i> -value=0.03 [0.04] |
| FRASER | 1 | ✓ | - | ✗ | <i>p</i> -value=0.42 [0.50] | ✓ | <i>p</i> -value=0.10 [0.12] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.26 [0.32] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.39 [0.51] |
| FRASER ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.18 [0.14] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.52 [0.45] | ✗ | <i>p</i> -value=0.59 [0.24] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.64 [0.57] |
| FRASER ² | 1 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.82 [0.89] | ✗ | <i>p</i> -value=0.62 [0.44] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.71 [0.84] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.66 [0.75] |
| FRASER ³ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.64 [0.58] | ✓ | <i>p</i> -value=0.07 [0.02] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | <i>p</i> -value=0.19 [0.27] | ✗ | <i>p</i> -value=0.82 [0.73] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.49 [0.31] |
| FRASER ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.84 [0.71] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.91 [0.83] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.88 [0.79] |
| FRASER ⁵ | 1 | ✓ | - | ✗ | <i>p</i> -value=0.23 [0.29] | ✓ | <i>p</i> -value=0.05 [0.01] |
| | 2 | ✓ | - | ✗ | <i>p</i> -value=0.38 [0.31] | ✓ | <i>p</i> -value=0.07 [0.13] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | <i>p</i> -value=0.33 [0.46] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 6. Results of testing for Granger causality from indexes of economic freedom to economic growth for countries included in group I_2 in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✓ | - | ✗ | p -value=0.40 [0.49] | ✓ | p -value=0.04 [0.01] |
| | 2 | ✓ | - | ✓ | p -value=0.27 [0.09] | ✓ | p -value=0.09 [0.06] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.17 [0.02] |
| HERITAGE ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.28 [0.33] |
| | 2 | ✓ | - | ✗ | p -value=0.59 [0.50] | ✗ | p -value=0.46 [0.32] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.23 [0.26] |
| HERITAGE ² | 1 | ✓ | - | ✗ | p -value=0.98 [0.92] | ✗ | p -value=0.72 [0.70] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.49 [0.52] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.62 [0.65] |
| HERITAGE ³ | 1 | ✓ | - | ✗ | p -value=0.50 [0.42] | ✓ | p -value=0.06 [0.00] |
| | 2 | ✓ | - | ✓ | p -value=0.24 [0.09] | ✓ | p -value=0.05 [0.09] |
| | 3 | ✓ | - | ✗ | p -value=0.93 [0.85] | ✓ | p -value=0.05 [0.09] |
| HERITAGE ⁴ | 1 | ✓ | - | ✗ | p -value=0.93 [0.85] | ✗ | p -value=0.71 [0.65] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.55 [0.59] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.87 [0.81] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | p -value=0.61 [0.42] | ✓ | p -value=0.11 [0.01] |
| | 2 | ✓ | - | ✓ | p -value=0.23 [0.04] | ✓ | p -value=0.11 [0.07] |
| | 3 | ✓ | - | ✗ | p -value=0.75 [0.82] | ✓ | p -value=0.15 [0.05] |
| HERITAGE ⁶ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.75 [0.62] |
| | 2 | ✓ | - | ✗ | p -value=0.41 [0.33] | ✗ | p -value=0.50 [0.34] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.78 [0.72] |
| FRASER | 1 | ✓ | - | ✓ | p -value=0.02 [0.15] | ✓ | p -value=0.01 [0.02] |
| | 2 | ✓ | - | ✗ | p -value=0.72 [0.60] | ✓ | p -value=0.00 [0.00] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.00 [0.00] |
| FRASER ¹ | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.21 [0.39] | ✓ | p -value=0.08 [0.04] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.33 [0.23] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.43 [0.47] |
| FRASER ² | 1 | ✓ | - | ✗ | p -value=0.72 [0.73] | ✗ | p -value=0.43 [0.31] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.52 [0.54] |
| | 3 | ✓ | - | ✗ | p -value=0.69 [0.65] | ✗ | p -value=0.37 [0.35] |
| FRASER ³ | 1 | ✓ | - | ✗ | p -value=0.78 [0.68] | ✓ | p -value=0.02 [0.00] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.01 [0.03] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.49 [0.31] |
| FRASER ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.41 [0.39] |
| | 2 | ✓ | - | ✗ | p -value=0.79 [0.82] | ✗ | p -value=0.24 [0.23] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.37 [0.58] |
| FRASER ⁵ | 1 | ✓ | - | ✗ | p -value=0.69 [0.33] | ✓ | p -value=0.06 [0.09] |
| | 2 | ✓ | - | ✗ | p -value=0.71 [0.76] | ✓ | p -value=0.06 [0.11] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.04 [0.06] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 7. Results of testing for Granger causality from indexes of economic freedom to economic growth for countries included in group I_3 in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✓ | - | ✗ | p -value=0.64 [0.62] | ✓ | p -value=0.21 [0.09] |
| | 2 | ✓ | - | ✗ | p -value=0.59 [0.38] | ✓ | p -value=0.06 [0.10] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.21 [0.29] |
| HERITAGE ¹ | 1 | ✓ | - | ✗ | p -value=0.47 [0.32] | ✗ | p -value=0.30 [0.43] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.66 [0.82] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.80 [0.75] |
| HERITAGE ² | 1 | ✓ | - | ✗ | p -value=0.62 [0.65] | ✗ | p -value=0.95 [0.82] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.86 [0.78] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.99 [0.95] |
| HERITAGE ³ | 1 | ✓ | - | ✓ | p -value=0.39 [0.10] | ✓ | p -value=0.05 [0.07] |
| | 2 | ✓ | - | ✗ | p -value=0.94 [0.87] | ✓ | p -value=0.14 [0.08] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.12 [0.04] |
| HERITAGE ⁴ | 1 | ✓ | - | ✗ | p -value=0.56 [0.47] | ✗ | p -value=0.93 [0.86] |
| | 2 | ✓ | - | ✗ | p -value=0.79 [0.62] | ✗ | p -value=0.40 [0.51] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.57 [0.52] |
| HERITAGE ⁵ | 1 | ✓ | - | ✓ | p -value=0.71 [0.74] | ✓ | p -value=0.23 [0.10] |
| | 2 | ✓ | - | ✓ | p -value=0.48 [0.39] | ✓ | p -value=0.15 [0.03] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.24 [0.09] |
| HERITAGE ⁶ | 1 | ✓ | - | ✗ | p -value=0.54 [0.43] | ✗ | p -value=0.35 [0.22] |
| | 2 | ✓ | - | ✗ | p -value=0.58 [0.56] | ✗ | p -value=0.43 [0.40] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.41 [0.38] |
| FRASER | 1 | ✓ | - | ✓ | p -value=0.24 [0.08] | ✓ | p -value=0.05 [0.02] |
| | 2 | ✓ | - | ✗ | p -value=0.51 [0.29] | ✗ | p -value=0.23 [0.17] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.45 [0.48] |
| FRASER ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.14] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.33 [0.23] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.43 [0.47] |
| FRASER ² | 1 | ✓ | - | ✗ | p -value=0.51 [0.32] | ✗ | p -value=0.83 [0.43] |
| | 2 | ✓ | - | ✗ | p -value=0.99 [0.83] | ✓ | p -value=0.28 [0.09] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.69 [0.75] |
| FRASER ³ | 1 | ✓ | - | ✗ | p -value=0.46 [0.28] | ✓ | p -value=0.18 [0.06] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.83 [0.71] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.62 [0.35] |
| FRASER ⁴ | 1 | ✓ | - | ✗ | p -value=0.92 [0.99] | ✗ | p -value=0.73 [0.89] |
| | 2 | ✓ | - | ✗ | p -value=0.84 [0.83] | ✗ | p -value=0.31 [0.20] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.29 [0.28] |
| FRASER ⁵ | 1 | ✓ | - | ✗ | p -value=0.55 [0.63] | ✗ | p -value=0.26 [0.29] |
| | 2 | ✓ | - | ✗ | p -value=0.91 [0.72] | ✓ | p -value=0.14 [0.02] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.18 [0.10] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 8. Results of testing for Granger causality from economic growth to indexes of economic freedom in all countries in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.14 [0.09] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.12 [0.02] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.48 [0.52] | ✗ | p -value=0.74 [0.68] |
| HERITAGE ¹ | 1 | ✓ | - | ✗ | p -value=0.87 [0.82] | ✗ | p -value=0.93 [0.82] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.89 [0.84] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.95 [0.93] |
| HERITAGE ² | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.29 [0.79] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.88 [0.91] | ✓ | p -value=0.04 [0.16] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.06 [0.14] |
| HERITAGE ³ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.04 [0.09] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.36 [0.41] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.32 [0.39] | ✗ | p -value=0.80 [0.73] |
| HERITAGE ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.79 [0.81] |
| | 2 | ✓ | - | ✗ | p -value=0.65 [0.58] | ✗ | p -value=0.86 [0.73] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.95 [0.81] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | p -value=0.94 [0.89] | ✗ | p -value=0.34 [0.54] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.87 [0.75] | ✓ | p -value=0.05 [0.02] |
| | 3 | ✓ | - | ✗ | p -value=0.72 [0.54] | ✓ | p -value=0.15 [0.04] |
| HERITAGE ⁶ | 1 | ✓ | - | ✗ | p -value=0.84 [0.77] | ✓ | p -value=0.08 [0.03] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.40 [0.32] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.19 [0.09] |
| FRASER | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.00 [0.04] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.88 [0.87] | ✗ | p -value=0.12 [0.16] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.46 [0.67] |
| FRASER ¹ | 1 | ✓ | - | ✗ | p -value=0.41 [0.47] | ✓ | p -value=0.03 [0.08] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.02] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.47 [0.48] |
| FRASER ² | 1 | ✓ | - | ✗ | p -value=0.76 [0.80] | ✓ | p -value=0.07 [0.04] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.40 [0.42] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.37 [0.34] |
| FRASER ³ | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.36 [0.32] | ✓ | p -value=0.06 [0.03] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.35 [0.43] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.07 [0.01] |
| FRASER ⁴ | 1 | ✓ | - | ✗ | p -value=0.77 [0.82] | ✗ | p -value=0.42 [0.43] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.63 [0.62] | ✗ | p -value=0.78 [0.75] |
| | 3 | ✓ | - | ✗ | p -value=0.89 [0.92] | ✗ | p -value=0.97 [0.92] |
| FRASER ⁵ | 1 | ✓ | - | ✗ | p -value=0.74 [0.72] | ✓ | p -value=0.00 [0.01] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.09] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.57 [0.51] | ✓ | p -value=0.06 [0.01] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 9. Results of testing for Granger causality from economic growth to indexes of economic freedom for countries included in group I_1 in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.98 [0.89] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.86 [0.73] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.82 [0.88] |
| HERITAGE ¹ | 1 | ✓ | - | ✗ | p -value=0.96 [0.92] | ✗ | p -value=0.42 [0.32] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.69 [0.70] | ✗ | p -value=0.51 [0.44] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.40 [0.36] |
| HERITAGE ² | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.00 [0.05] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.51 [0.37] | ✓ | p -value=0.01 [0.00] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.04 [0.05] |
| HERITAGE ³ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.27 [0.31] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.72 [0.77] | ✗ | p -value=0.68 [0.63] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.73 [0.62] |
| HERITAGE ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.80 [0.72] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.84 [0.83] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.66 [0.58] |
| HERITAGE ⁵ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.81 [0.84] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.68 [0.55] | ✓ | p -value=0.09 [0.03] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.13 [0.29] |
| HERITAGE ⁶ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.23 [0.27] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.88 [0.76] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.52 [0.53] | ✗ | p -value=0.61 [0.57] |
| FRASER | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.02 [0.14] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.81 [0.77] | ✗ | p -value=0.21 [0.16] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.73 [0.59] |
| FRASER ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.17 [0.16] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.04] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.47 [0.48] |
| FRASER ² | 1 | ✓ | - | ✗ | p -value=0.85 [0.82] | ✗ | p -value=0.61 [0.65] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.79 [0.68] |
| | 3 | ✓ | - | ✗ | p -value=0.90 [0.95] | ✗ | p -value=0.81 [0.78] |
| FRASER ³ | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.64 [0.67] | ✓ | p -value=0.16 [0.07] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.58 [0.63] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.19 [0.27] |
| FRASER ⁴ | 1 | ✓ | - | ✓ | p -value=0.09 [0.02] | ✓ | p -value=0.08 [0.03] |
| | 2 | ✓ | - | ✓ | p -value=0.10 [0.14] | ✗ | p -value=0.30 [0.35] |
| | 3 | ✓ | - | ✓ | p -value=0.03 [0.00] | ✗ | p -value=0.95 [0.93] |
| FRASER ⁵ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.00 [0.00] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.02] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.28 [0.31] | ✓ | p -value=0.01 [0.00] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 10. Results of testing for Granger causality from economic growth to indexes of economic freedom for countries included in group I_2 in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.20 [0.23] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.21 [0.20] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.12 [0.03] |
| HERITAGE ¹ | 1 | ✓ | - | ✗ | p -value=0.96 [0.94] | ✗ | p -value=0.78 [0.83] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.55 [0.47] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.64 [0.62] |
| HERITAGE ² | 1 | ✗ | 6a) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.86 [0.82] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.62 [0.40] | ✗ | p -value=0.29 [0.22] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.20 [0.15] |
| HERITAGE ³ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.35 [0.38] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.86 [0.72] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.34 [0.28] |
| HERITAGE ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.42 [0.39] |
| | 2 | ✓ | - | ✗ | p -value=0.71 [0.74] | ✗ | p -value=0.59 [0.56] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.63 [0.59] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | p -value=0.86 [0.84] | ✗ | p -value=0.36 [0.38] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.41 [0.43] | ✓ | p -value=0.11 [0.08] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.50 [0.51] |
| HERITAGE ⁶ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.28 [0.19] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.58 [0.43] |
| | 3 | ✓ | - | ✗ | p -value=0.47 [0.43] | ✓ | p -value=0.18 [0.09] |
| FRASER | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.01 [0.02] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.07 [0.01] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.41 [0.22] |
| FRASER ¹ | 1 | ✓ | - | ✗ | p -value=0.43 [0.40] | ✓ | p -value=0.02 [0.00] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.04 [0.13] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.35 [0.33] |
| FRASER ² | 1 | ✓ | - | ✗ | p -value=0.84 [0.89] | ✗ | p -value=0.21 [0.15] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.25 [0.47] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.32 [0.25] |
| FRASER ³ | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.36 [0.29] | ✓ | p -value=0.06 [0.01] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.33 [0.20] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.10 [0.03] |
| FRASER ⁴ | 1 | ✓ | - | ✗ | p -value=0.72 [0.64] | ✗ | p -value=0.46 [0.32] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.85 [0.59] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.85 [0.86] |
| FRASER ⁵ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.00 [0.00] |
| | 2 | ✗ | 6a) unfulfilled | ✗ | p -value=0.29 [0.38] | ✓ | p -value=0.06 [0.10] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.05 [0.00] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

Table 11. Results of testing for Granger causality from economic growth to indexes of economic freedom for countries included in group I_3 in the period 2000-2009.

| Index of economic freedom | Lag | PROCEDURE I | | PROCEDURE II | | PROCEDURE III | |
|---------------------------|-----|---------------------|-----------------|---------------------|------------------------|---------------------|------------------------|
| | | Result ^a | Details | Result ^a | Details | Result ^a | Details |
| HERITAGE | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.47 [0.37] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.51 [0.50] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.33 [0.29] |
| HERITAGE ¹ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.80 [0.83] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.47 [0.52] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.72 [0.69] | ✗ | p -value=0.43 [0.39] |
| HERITAGE ² | 1 | ✓ | - | ✗ | p -value=0.92 [0.81] | ✗ | p -value=0.93 [0.82] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.10 [0.07] |
| | 3 | ✗ | 6a) unfulfilled | ✗ | p -value=0.19 [0.31] | ✓ | p -value=0.04 [0.01] |
| HERITAGE ³ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.15 [0.09] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.39 [0.15] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.11 [0.07] |
| HERITAGE ⁴ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.98 [0.74] |
| | 2 | ✓ | - | ✓ | p -value=0.19 [0.08] | ✗ | p -value=0.37 [0.29] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.48 [0.42] |
| HERITAGE ⁵ | 1 | ✓ | - | ✗ | p -value=0.58 [0.46] | ✗ | p -value=0.82 [0.75] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.26 [0.08] |
| | 3 | ✓ | - | ✗ | p -value=0.44 [0.36] | ✗ | p -value=0.58 [0.59] |
| HERITAGE ⁶ | 1 | ✓ | - | ✗ | p -value=0.82 [0.71] | ✗ | p -value=0.52 [0.42] |
| | 2 | ✓ | - | ✗ | p -value=0.84 [0.79] | ✗ | p -value=0.73 [0.65] |
| | 3 | ✓ | - | ✓ | p -value=0.08 [0.04] | ✓ | p -value=0.67 [0.51] |
| FRASER | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.45 [0.29] | ✓ | p -value=0.00 [0.02] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.06 [0.07] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.51 [0.47] |
| FRASER ¹ | 1 | ✓ | - | ✗ | p -value=0.90 [0.82] | ✓ | p -value=0.05 [0.01] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.02 [0.03] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.43 [0.47] |
| FRASER ² | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.63 [0.49] | ✗ | p -value=0.51 [0.42] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.53 [0.47] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.65 [0.59] |
| FRASER ³ | 1 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.09 [0.11] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.41 [0.56] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✗ | p -value=0.25 [0.23] |
| FRASER ⁴ | 1 | ✓ | - | ✓ | p -value=0.15 [0.09] | ✗ | p -value=0.14 [0.19] |
| | 2 | ✓ | - | ✗ | p -value=0.48 [0.46] | ✗ | p -value=0.34 [0.27] |
| | 3 | ✓ | - | ✗ | p -value=0.33 [0.27] | ✗ | p -value=0.92 [0.88] |
| FRASER ⁵ | 1 | ✗ | 6a) unfulfilled | ✗ | p -value=0.43 [0.58] | ✓ | p -value=0.00 [0.00] |
| | 2 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.06 [0.01] |
| | 3 | ✗ | 6b) unfulfilled | ✗ | 4b) unfulfilled | ✓ | p -value=0.12 [0.04] |

^a The symbol ✓ (✗) denotes finding (not finding) causality at a 10% significance level.

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SUMMARY

This paper presents the results of examining the causal links between different areas of economic freedom and economic growth of new EU members in transition in the period 2000-2009. In order to obtain robust empirical results we applied a variety of econometric methods of testing for causal effects, including traditional and out-of-sample procedures in both asymptotic and bootstrap variants.

The empirical results suggest significant causality running from specific areas of economic freedom (such as monetary and fiscal freedom; trade openness; regulation of credit, labour, and business; legal structure and security of property rights; access to sound money) to growth, especially in less and moderately developed CEE countries in transition. Moreover, we found evidence that economic freedom was one of the factors stimulating the convergence of these economies towards rich EU members. On the other hand, the evidence suggesting the existence of causality in the opposite direction was much weaker and reported mostly for moderately developed countries in the areas of freedom from corruption, government size and expenditure, and freedom to trade internationally.

Our research confirmed that economic liberalization was a crucial reform in CEE transition economies. It turns out that increasing economic freedom has allowed new EU members to increase their growth rate. Moreover, we found evidence that economic freedom has played an important role in the ongoing process of catching-up with rich EU members.