CRACOW UNIVERSITY OF ECONOMICS
FACULTY OF ECONOMICS AND INTERNATIONAL RELATIONS
DEPARTMENT OF ENTREPRENEURSHIP AND INNOVATIVENESS

PhD thesis summary

THE MAIN DETERMINANTS OF ECONOMIC GROWTH IN POLAND IN THE EARLY YEARS OF THE XXI CENTURY

Author: Łukasz Lach, MSc

Supervisor: Henryk Gurgul, professor

Cracow 2013

The main determinants of economic growth in Poland in the early years of the XXI century

The mechanism and main factors causing economic growth have been the subject of numerous theoretical and empirical studies. The vast majority of previous studies was focused on developed economies or was based on panel datasets. The lack of time series of sufficient length in case of post-Soviet countries of Central Europe excluded the possibility of conducting research on individual economies. However, exploring the ways of stimulating economic growth (both in the short and long run) is still one of the principal issues for economists, especially in transition economies, as it is also important for long-term socio-economic policy and impacts country's overall development.

The first years of the twenty-first century were a period in which economy of Poland continued the process of transformation started in the 1990's. During this period economy of Poland experienced a significant and relatively stable growth, which was quite an outstanding achievement among the group of Central and Eastern European (CEE) transition economies, especially if one takes into account two global economic crises which outbroke in 2001 and 2008. The main objective of the discussed doctoral dissertation is to perform a thorough analysis in order to identify the key determinants and consequences of the economic growth in Poland in the period under study.[1] One may claim that after carrying out such an extensive and comprehensive analysis it will become possible to formulate important social and economic policy implications which in turn could significantly improve the strategy for the further economic development of Poland. Moreover, such an analysis may turn out to be helpful in verifying various, often contradictory, theories related to the main sources and mechanisms influencing economic growth. These general conclusions may easily turn out to have useful policy implications for other countries, especially CEE transition economies.

Previous research on the factors of economic growth has led to a development of quite extensive body of literature. Although previous literature is a source of some general and universal conclusions, the differences in the results of previous empirical studies confirm that determining significant growth factors strongly depends on the specificity of the analyzed region or country. Therefore, in order to achieve the main research goal of the discussed doctoral dissertation, the most reliable quarterly and annual economic, social and political data was applied. Moreover, an attempt to carry out the empirical research using methods and procedures, which (according to previous econometric literature) would be most suitable in analysing the relatively short time series

[1] The discussed dissertation summarizes the effects of several years of research on main factors of economic growth in Poland in the early years of the XXI century, which has been carried out by the author under the supervision of Professor Henryk Gurgul in Department of Applications of Mathematics in Economics at AGH University of Science and Technology in Cracow. The author also wishes to gratefully acknowledge the financial support for this dissertation received from the National Science Centre of Poland (Research Grant no. 2011/01/N/HS4/01383) and the Foundation for Polish Science (START 2012 Scholarship, START 2013 Scholarship).

available, was also made. This way discussed doctoral dissertation is one of the first comprehensive research projects devoted to the analysis of the impact of selected macroeconomic variables and social indicators on the rate of economic growth in Poland in the early years of the twenty-first century. It is worth to note that this analysis takes into account the reaction of the structure of the dynamic relationships between selected macroeconomic and social indicators and rate of growth of the economy of Poland to the economic crises of 2001 and 2008 as well as the accession of Poland to the European Union, which took place in 2004.

To summarize, the motivation to prepare the discussed doctoral dissertation generally comes from three main facts:

- *First, an analysis of each economic process or phenomenon should combine strict theoretical arguments and thorough empirical verification, which provides an opportunity to look at the examined problem from a broad perspective, taking into account the different circumstances and conditions. This way the level of risk associated with future business decisions may be significantly reduced.*

- *Second, the analysis of the previous literature provides a basis to claim that sources and consequences of economic growth are strongly country- or region-dependent. In other words, using general economic policy recommendations, without taking into account the local and individual specificity of each country as well as the influence of time factor, may have a negative impact on the economic development.*

- *Third, it is worth to note that for many years lack of datasets of sufficient size has been leading to the situation, in which the research on individual transition economies from the Central and Eastern Europe has not been providing many useful and reliable conclusions. This issue seems to be especially noticeable in case of the economy of Poland, for which the lack of comprehensive studies (i.e. studies which besides the classical determinants, such as the level of employment, physical capital or investments, would also analyse those potential growth factors that have received considerable attention from economists in recent years, e.g. globalization, economic freedom, political stability etc.). To the best knowledge of the author, in the light of previous research on the growth of economy of Poland the discussed dissertation is one of the first quantitative analyses, which take into account those less-known potential growth factors on the one hand, and use carefully selected econometric methods on the other hand.*

By analysing more than three hundred journal articles and books (mostly foreign), which focus on different sources of economic growth in developing and developed countries, ten most frequently mentioned and analysed growth factors were identified. The list of these factors is presented below:

Factor 1. *The size of the workforce.*

Factor 2. *The availability of natural resources and the effectiveness of their use (mainly energy consumption).*

Factor 3. *Fixed assets and foreign direct investment.*

Factor 4. *Investment in human capital (including health care, education).*

Factor 5. *Budgetary expenditure (total expenditure and outlays on national defence). The level of budget deficit.*

Factor 6. *The level of technology and innovation.*

Factor 7. *The size and development of financial sector.*

Factor 8. *Globalisation (including openness of economy).*

Factor 9. *Inequality in income distribution.*

Factor 10. *Economic freedom and political stability.*

The empirical part of the discussed dissertation was devoted to the analysis of the causal relationships between economic growth in Poland in the early years of the twenty-first century and the abovementioned set of ten economic, social and political potential determinants. In general, the research was based on the analysis of Granger causal links over the period 2000-2012. Taking into account both the specificity of the transformation of economy of Poland in the early years of the twenty-first century as well as the results of previous theoretical and empirical research (which, in general, was mainly devoted to the analysis of developed economies), the following dissertation hypothesis has been formulated:

> ***Besides classical determinants, such as labour and the level of capital and investment, also other factors (such as the level of human capital, technological progress, financial development, globalization, economic freedom and political stability) played statistically significant role in stimulating economic growth in Poland in the period under study. The economic crisis which outbroke in* 2008 *had a significant impact on the structure of determinants of economic growth in Poland as it caused the reduction of growth-stimulating effects of key growth factors, especially the factors related to the level of innovativeness of economy of Poland, which still remains relatively low.***

The impact of each pre-selected factor on economic growth in Poland in the period under study was examined in a separate research stage. After examining the causal links between economic growth and each individual factor, a detailed summary has been prepared. This detailed summary deals with all the socio-economic conclusions formulated on the basis of conducting the ten individual research stages. Moreover, an extensive discussion aimed at comparing and collating the outcomes obtained in all research stages is also provided. All these facts provide conditions which are required to test the main hypothesis of the dissertation. The discussed dissertation was divided into five chapters. It is worth to note that the empirical results presented in the discussed PhD thesis extend and complement the outcomes of author's previous research, which have been published in Polish and international journals.

The aim of the first chapter of the discussed dissertation was to present the main theories of economic development and growth. Due to the fact that the main goal of the dissertation was to test the research hypothesis based on the results of the extensive empirical study, the first chapter presents only a brief description of the most important and most influential concepts. Such a brief overview of key theoretical concepts, however, seems to be one of the conditions required to construct the relevant historical context for the analysis and discussion of mechanism and factors influencing economic growth in Poland in the early years of the twenty-first century.

In the second chapter the subject area of discussed issues was clearly narrowed. The attention was paid to the analysis of the results of previous empirical studies and their links with existing theories on determinants of economic growth. It is worth to note, that due to the technical limitations (asymptotic properties of estimators, multicollinearity, etc.) and the need to ensure a sufficient number of degrees of freedom, it is not possible to build and analyze econometric models which use too many variables at one time. Moreover, rapidly growing body of empirical literature has led to a situation when one can consider not only dozens but even hundreds of different variables and indicators that can be considered as possible direct or indirect growth factors. Therefore, the first part of the second chapter of the discussed dissertation provides some insights into the problem of reducing the set of hundreds various quantitative and qualitative economic, social and political factors to the reduced form, which would allow carrying out more complex and detailed quantitative research.

Conclusions presented in the initial part of the second chapter, based mainly on the analysis of previous literature, led to establishment of the subset of ten potential areas to be extensively examined in the empirical part of the dissertation. In the next part of the second chapter for each of the ten pre-selected factors the overview of the results of previous empirical studies on the structure of causal links with economic growth has been presented. As mentioned earlier, with the exception of some countries and regions (e.g. CEE transitions economies) the previous empirical literature on growth factors is rather extensive. Therefore, in the second chapter of the discussed dissertation the detailed overview of the results of previous empirical studies covers only those papers and books, which have gained relatively considerable attention among economists in recent years. The main conclusions resulting from this literature overview are as follows:

- *One may claim that previous literature has not provided conclusive results in the area of determining the directions and/or signs of causal links between economic growth and the ten selected potential growth factors.*
- *It is also worth to note that for some of the ten selected potential growth factors the number of empirical studies devoted to the analysis of causal relationships with the economic growth in Poland is rather small. Moreover, in case of some potential factors the causal links have never been examined so far. It seems that both these problems were consequences of unavailability of datasets of sufficient size.*
- *Methodology of previous empirical research has often been limited only to basic and therefore less relevant procedures, which weakens (or in some cases even undermines) the robustness of the results and the reliability of formulated conclusions.*

The third chapter of the discussed dissertation presents the econometric methods used in empirical research carried out in order to fill the abovementioned gap in the literature. The goal of the author was to use carefully selected econometric methods and procedures in order to verify statistical robustness of the empirical outcomes on the one hand and maximize the reliability of formulated conclusions on the other hand. The third chapter of the doctoral dissertation contains both the detailed description of the econometric methods applied as well as the concise presentation of the main advantages and disadvantages of the concept of causality in economics. It is worth to note that to the best knowledge of the author some of the econometric procedures presented in the third chapter of the doctoral dissertation have never been used to analyse Polish macroeconomic data so far.

In the beginning of the third chapter the evolution of the concept of causality in economics has been deeply discussed. Special attention has been paid to the ongoing scientific and philosophical debate on the definition, meaning and interpretation of the results of analysis of causal links in economics. In the second part of the third chapter the traditional econometric procedures used in the literature have been presented. The traditional approach to analysing linear short- and long-run Granger causal links,[2] in particular the methods of estimation and statistical analysis of vector autoregressive models (in VAR and VEC framework), as well as the alternative approach proposed by Toda and Yamamoto[3] have been discussed. Moreover, the issue of testing nonlinear Granger causality, in particular the testing procedure proposed by Diks and Panchenko, has also been presented.[4] In the subsection presenting standard econometric methods used in testing and analysing Granger causal links the methods of analysing the signs of linear causal links, in particular the idea of examining the impulse response functions based on orthogonal residuals and the Cholesky decomposition, were also introduced.

The second part of the third chapter discusses the non-standard econometric procedures used in the doctoral dissertation. In this part of the dissertation the bootstrap based on leveraged residuals – an econometric procedure which is especially useful in analysing relatively small samples (like the sample examined in the dissertation) – is introduced. In the next step a brief description of the Canning and Pedroni's approach, which is an alternative method of analysing the impulse responses, is presented.[5] Next, the out-of-sample Granger and Huang procedure, which in turn is an alternative approach to the standard analysis of panel models, is discussed. The final part of the third chapter of the discussed dissertation presents the econometric procedures and discusses the statistical software used to analyse recursive models with qualitative endogenous variables.[6,7,8,9]

[2] Granger, C.W.J. 1969. Investigating causal relations by econometric models and cross–spectral methods. Econometrica 37, 424-438.
[3] Toda, H.Y., Yamamoto, T. 1995. Statistical inference in vector autoregressions with possibly integrated processes. Journal of Econometrics 66, 225-250.
[4] Diks, C.G.H., Panchenko, V. 2006. A new statistic and practical guidelines for nonparametric Granger causality testing. Journal of Economic Dynamics and Control 30, 1647-1669.
[5] Canning, D., Pedroni, P. 2008 Infrastructure, long–run economic growth and causality tests for cointegrated panels. The Manchester School 76, 504-527.
[6] Adkins, L.C. 2009. An Instrumental Variables Probit Estimator Using Gretl. EHUCHAPS, Universidad del País Vasco, Facultad de Ciencias Económicas y Empresariales.
[7] Maddala, G.S. 1983. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press.
[8] Maddala, G.S., Lee, L-F. 1976. Recursive Models with Qualitative Endogenous Variables. Annals of Economic and Social Measurement 5(4), 168-188.
[9] Roodman, D. 2011. Estimating fully observed recursive mixed-process models with 'cmp'. Stata Journal 11(2), 159-206.

The main goal of the fourth chapter, which is one of the key parts of the doctoral dissertation, was twofold. First, this chapter was devoted to introduce and describe in detail the dataset used in the empirical research. Second, it was aimed at the presentation of the main results of the multi-stage analysis of causal relationships between the economic growth in Poland in early years of the twenty-first century and the set of ten potential determinants defined in the second chapter. The intention of the author was to present the results of this relatively extensive empirical study in such a way, which would highlight only the most relevant results on the one hand (hence some results have not been presented in detail, as they had rather minor importance for the main research goals of the doctoral dissertation) and provide a sufficient level of detail of description of the econometric procedures applied and the steps taken in order to maximize the robustness of the results on the other hand. At this place it is worth to underline once again that all the results presented in the fourth chapter of the doctoral dissertation extend and complement the outcomes of author's previous research which have been published in both Polish as well as international journals.

The last chapter of the doctoral dissertation provides an extensive summary, conclusions and economic interpretation drawn from all stages of the empirical research. In the first step, the key determinants of economic growth (in terms of statistically significant causal links), both in the long and short run, are presented and discussed. Beside analysing the outcomes of all individual research stages, an attempt to outline the main conclusions drawn from the comparison and collation of the empirical results has also been made. The next section of the fifth chapter introduces and discusses the economic and social consequences of economic growth in Poland in the period under study, which have been found as statistically significant after performing the analysis of Granger causal links. Both parts of the fifth chapter of the dissertation refer to the empirical results of the research conducted separately for the pre-crisis sub-sample (covering the period 2000-2008) as well as the full sample. Comparing the results obtained for both samples provides an opportunity to test the robustness of the established causal links to the impact of the global economic crisis, which outbroke in the third quarter of the year 2008.

What is even more important, a detailed analysis of the conclusions resulting from the empirical research was supplemented by numerous references to the official government reports on the condition of economy of Poland in the early years of the twenty-first century. More precisely, in the last chapter of the doctoral dissertation the results of the empirical research have been confronted with preliminary assumptions of the strategy for the further economic development of Poland in 2014-2020 (in general, the discussion refers mainly to the *National Development Strategy* 2020*: Active society, competitive economy, efficient state* adopted by the Council of Ministers on September 25, 2012 and the document titled *Programming* 2014-2020 - *Assumptions to the Partnership Agreement* adopted by the Council of Ministers on January 15, 2013). Additionally, in the light of the empirical results the main prospects and obstacles on the road towards further development of economy of Poland were also discussed. The last chapter of the doctoral dissertation ends with the presentation of the forecasts of economic growth in incoming years, both in Poland as well as in the countries which seem to have strongest links with the condition of the economy of Poland.

As a result of the extensive empirical study the main goal of the doctoral dissertation has been achieved and the main research hypothesis has been positively verified. The list of key findings of the discussed doctoral dissertation is presented below:

CONCLUSIONS ON THE MAIN DETERMINANTS OF ECONOMIC GROWTH

- **Human capital, technological progress and increasing globalization (including the rise in the openness of economy of Poland) positively influenced (in terms of statistically significant Granger causal links) growth of economy of Poland in the early years of the twenty-first century.**

The results of the empirical study confirmed the growth-stimulating effects of expenditures on human capital, especially outlays on schooling, higher education and science. The research also suggests that at the end of the day the benefits of investment in the R&D may significantly outweigh the costs bore, considering both the size of the rate of return, as well as its long-run persistence. This suggestion seems to be especially important for the further growth of economy of Poland, therefore the discussed issue should be deeply re-examined in the nearest future. The results of the empirical research have also shown that lack of substantial increase in the level of public and private involvement in the R&D sector seems to be a cause for serious concern as in the next few years instead of the long-awaited increase in the level of innovativeness of the economy of Poland this country may experience the stagnation or even decline in the rate of technological progress. The results also suggest that in order to stimulate growth and development of economy of Poland it is important to increase exports as well as focus on further export diversification, in particular rethink the role of the eastern trade partners, which have gained in importance after the outbreak of the crisis in 2008*. In case of the globalization processes, the results confirmed that besides the economic dimension also the social aspects of globalisation, in particular facilitating Internet access and stimulating the processes of computerization and digitization, are statistically significant growth factors.*

- **The factors considered in the classical growth theories, such as the level of employment, the level of capital and investment (also including foreign direct investment), had statistically significant positive impact on the rate of growth of economy of Poland in the early years of the twenty-first century.**

At this place it is worth to note, that the results of the empirical study confirmed that the outbreak of the global economic crisis in 2008 *has significantly weakened the strength of the positive causal impact of the classical factors on the rate of economic growth in Poland. It also seems important to underline that transport infrastructure is still one of the weakest sides of economy of Poland. Therefore, it is not surprising that the results of the conducted empirical analysis clearly confirmed the positive growth effects of increasing the level of gross fixed capital formation (which in recent years has in general mainly consisted of investments in the infrastructure, realized partly with the support of the European Funds). In other words, one of the main challenges in front of the future economic policy in Poland will be to ensure the desired rate of development of the infrastructure, nevertheless the negative external conditions caused by the global economic crisis of* 2008.

• Raising the level of economic freedom, especially in the area of freedom of starting, operating and closing a business, legal reforms, and protection of private property, was statistically significant Granger causal factor stimulating economic growth in Poland after the year 2000. This phenomenon was also an important factor stimulating the convergence of economy of Poland towards the most developed EU countries.

At this point it is worth to recall the need to intensify the process of streamlining economy of Poland, which in consequence could significantly improve the business climate. This conclusion follows directly from the analysis of causal links between economic growth and the indexes of economic freedom published by the Fraser Institute and the Heritage Foundation. Therefore, the fact that in recent years Poland has been falling in the rankings of economic freedom should be a source of serious concern.

• The development of the financial sector was a statistically significant factor positively influencing economic growth in Poland in the early years of the twenty-first century.

The empirical analysis confirmed that the development of the stock exchange was a significant factor stimulating the rate of growth of economy of Poland after the year 2000*. What is even more important, the strength of the growth-stimulating effects has been clearly reduced after the outbreak of the financial crisis in* 2008*. The study has also showed that the slowdown in credit growth had a significant negative impact on the level of investment and consumption, which in consequence has led to the slowdown of economic growth in Poland in the period under study. This phenomenon has clearly become more intensified after the outbreak of the* 2008 *global financial crisis. However, the active policy of state-owned banks (mainly the PKO BP) has partly reduced the negative effects of this phenomenon.*

• Enlargement of the energy sector was one of the key factors (in the sense of Granger causal links) stimulating economic growth in Poland in the early years of the twenty-first century.

The empirical results confirmed that meeting the growing demand for energy is one of the key conditions required for the further development and growth of economy of Poland. The analysis has confirmed the strategic importance of ensuring the supply of electricity, oil and natural gas since all these energy sources were found to be statistically significant Granger causal factors. In the long run, also the level of consumption of lignite (which, in general, is the main energy source used in the process of production of electricity) was found to exhibit statistically significant growth-stimulating effects. The empirical analysis has also showed that the policy of reducing the size of hard coal mining sector has not significantly slowed down the rate of GDP growth in Poland. The results showed that the process of restructuring the coal sector in Poland, which is one of the key elements of the transformation towards a low-emission economy, did not impose harmful effects on economic growth. At this place it is worth to note, that the ongoing discussion on the future of Polish energy system should focus on both the European environmental standards as well as the conclusions resulting from the available forecast on energy consumption.

- **The observed changes in the distribution of income among Polish provinces, which are related to the promotion of higher economic efficiency, were statistically significant factors influencing (in Granger's sense) economic growth in Poland at the beginning of the twenty-first century.**

The empirical analysis has confirmed that in the early years of the twenty-first century rising inequalities in regional income distribution led (in the sense of Granger causal relationship) to faster economic growth, which, in general, is a characteristic feature of most of economies in transition. However, an important question about the sustainability of this effect and its dynamics in the upcoming years still remains open.

- **Total budgetary expenditure imposed growth-stimulating effects in Poland in the early years of the twenty-first century. On the other hand, in this period statistically significant negative causal link running from the size of the budget deficit to the economic growth in Poland and the rate of convergence to the most developed EU countries, has also occurred.**

The empirical results provide a basis to claim that in case of most of the examined kinds of budgetary expenditures (i.e. expenditure on human capital, education, science, higher education, national defence) raising the level of outlays was a source of direct or indirect growth-stimulating effects. For some categories of budgetary expenditures no direct positive causal effects have been found, however these categories of expenditures significantly contribute to improving the standard of living (i.e. healthcare expenditures) or stimulate technological progress (i.e. public spending on research and development), which seems to be an important argument justifying the need for their further increase. On the other hand, the empirical analysis confirmed that the rising administrative expenditures were statistically significant factors slowing down the economic growth in Poland in both examined periods. Therefore, the results suggest that due to the negative growth effects of the budget deficit, the size of the administrative expenditures should be significantly reduced.

- **Political instability was statistically significant factor negatively affecting economic growth in Poland in the early years of the twenty-first century.**

Results presented in the discussed dissertation suggest that political instability (approximated by the propensity for major government change) in the group of ten CEE transition economies (including Poland) could lead to a significant slowdown of real economic growth. On the other hand, in case of inefficient government, serious cabinet reshuffles may turn to be a proper solution in terms of further economic growth. Due to lack of sufficient amount of statistical data the empirical study on the impact of political instability on economic growth has been carried out for the panel dataset comprising 10 *selected European countries, not just Poland. Adopting such a research strategy, although inevitable, can in turn reduce the possibility of practical application of the empirical results to implement policies effectively stimulating the economic growth in Poland. Therefore, in the future, when the amount of statistical data will allow analysing solely the case of economy of Poland, one should repeat the research on the impact of political instability on economic growth. This, in turn, should help to verify the conclusions resulting from the current research carried out for the panel dataset.*

CONCLUSIONS ON THE MAIN CONSEQUENCES OF ECONOMIC GROWTH

- **In the first years of the twenty-first century economic growth was statistically significant factor leading (in the sense of Granger causality) to the rise of inequalities in the distribution of income among Polish regions.**

In other words, in the first years of the XXI century the residents of the wealthy provinces in Poland gained relatively more benefits of the growth of economy of Poland in comparison to the residents of poorer regions. It is worth to note that despite the growth-stimulating effects observed in the period 2000-2012*, further rise in the level of social inequality can easily lead to internal economic crisis in Poland, which stems from both the purely theoretical arguments (i.e. the concept of Kuznets Curve and its subsequent modifications and extensions), as well as the results of the discussed empirical research. The latter follows from the fact that in some cases the regional disparities in income distribution can lead to social unrest and political instability, which (as shown in the discussed doctoral dissertation) may impose a direct negative causal impact on economic growth. These findings highlight the need to revise the current regional policy in Poland, taking into account both the issue of intensification of the digitization and the development of the transport infrastructure in poorer regions, as well as the need to increase the level of regional specialization (e.g. specialization in the agricultural regions aimed at production and export of wholefood).*

- **Growth of Polish economy was statistically significant Granger causal factor leading to the increase of public expenditure in the early years of the twenty-first century.**

In recent years one may have observed a tendency to maintain the level of outlays on R&D sector in Poland at relatively constant level in relation to the GDP. Decreasing number of patents registered with the Polish Patent Office may be a symptom of the fact that technological progress in economy of Poland is slowing down, which in turn may negatively affect the rate of economic growth. Furthermore, it can be concluded that maintaining the current linear rate of growth of real expenditures on R&D in Poland no longer seems to guarantee that the rate of growth of number of patent applications will increase or even maintain at the current level. In other words, the results suggest that the level of innovativeness of economy of Poland has reached a critical point beyond which a substantial increase in the scale of public and private commitment in financing research and development activities is needful in order to continue the process of technological development. The research has also shown that positive Granger causal impact running from economic growth to the administrative expenditures should be seen as an alarming signal. It is difficult to find an explanation for the situation when the benefits of economic growth are used to increase the administrative expenditures, which - according to the empirical results presented in the discussed dissertation as well as the suggestions of public and private institutions analysing the growth and development of economy of Poland - should be reduced and reorganized in the nearest future (comp. the need to reduce bureaucracy in Poland, unsatisfactory position of Poland in the Doing Business Report, etc.).

- **In the first years of the twenty-first century economic growth was statistically significant long-run Granger causal factor stimulating the development of the banking sector in Poland.**

GDP growth led to the increase in the propensity to save and invest, which in turn resulted in increasing interest in the banking services. It is also worth to note that the slowdown in GDP growth caused by the economic crisis of 2008 *had negative impact on the development of the banking sector in Poland.*

- **Economic growth was statistically significant Granger causal factor stimulating the level of energy consumption in Poland, in terms of both aggregated as well as disaggregated usage.**

The results presented in the discussed dissertation confirmed that the growth and development of economy of Poland led to the increased demand for energy. The latter had a special importance for the process of restructuring the energy sector in Poland. It seems that in the upcoming years the structure of the causal relationship between economic growth and energy consumption in Poland will be influenced mainly by the mattes related to the problem of energy efficiency (comp. the new Energy Efficiency Act adopted on April 15, 2011*), the problem of reduction of greenhouse gases emissions and the issue of energy security (including the diversification of energy sources and an attempt to increase the domestic production of oil and gas as well as the intensification of works related to the shale gas extraction).*

***

In order to assess the reliability of conclusions formulated in the discussed dissertation, one should recall the specificity of the quantitative analysis performed. At the moment there is no undisputed and universal concept of causality in economics, which would satisfactorily refer to the economic theory and allow to look at the analyzed problem in as broad perspective as possible. At the same time, the problem of lack of general econometric tools, which would enable to perform effective investigations of economic causal relations, is also often underlined. In the light of the shortcomings of the available quantitative methods the empirical analysis presented in the discussed doctoral dissertation was aimed at providing the highest possible level of statistical robustness.

For this purpose, a variety of theoretical models and a number of econometric methods have been discussed and applied. In consequence, the formulated conclusions comprise the effects of using multiple testing procedures, which often differ significantly in terms of technical specifications. The intention of the author was to use such procedures which would complement in terms of strengths and advantages. Such a comprehensive approach ensures that the conclusions seem to be characterized by relatively high level of reliability and robustness. Naturally, the interpretation of the empirical results may still lead to formulation of conclusions which may not turn to be fully trustable. This, however, is a common feature of all empirical studies in economics and, in general, cannot be fully eliminated.

In order to assess the added value of the discussed dissertation, one should recall an important fact. Although in case of classical growth factors (e.g. employment, physical capital or investments) it is relatively easy to point out some theoretical and empirical studies devoted solely to the analysis of economy of Poland, in case of less-known potential growth factors, such as globalization, human capital, technological progress, economic freedom and political stability, lack of thorough empirical research focused on the analysis of causal relations is rather evident. It is also important to note that all the empirical results presented in the fourth chapter of the doctoral dissertation extend and complement the outcomes of author's previous research which have been published in Polish and international scientific journals. This seems to justify the correctness of the methodology used (including the choice of the analyzed variables) as well as the originality and importance of the research outcomes.

Despite added value of the discussed dissertation, some important research problems related to the issue of investigating growth factors still remain open. Therefore, it seems that the main directions of future research should focus on:

• Systematic verification of the structure of causal links between growth of Polish economy and its main determinants, which may turn to be helpful in decision making following rapid changes of the economic environment.

• Time-series-based examination of growth effects of those potential factors, for which the analysis of causal links has been performed in the panel framework comprising ten selected European economies in transition (which was a consequence of insufficient amount of time series data on Poland available at the moment of preparation of the discussed dissertation). It seems that the study based on the examination of time series data would provide more useful policy implications.

• Conducting deeper and more specialized research in case of the set of the factors, which have been found to impose statistically significant causal effects on growth of Polish economy in the early years of the twenty-first century, also after the outbreak of the global economic crisis in 2008. It is worth to note that economy of Poland is most likely entering the period in which the negative effects of the global economic crisis will become much more noticeable. Therefore, all the conclusions formulated after the analysis of the dataset covering the period 2009-2012 will require formal quantitative verification.

All these directions for future research, however, seem to require a significant increase in the amount and the level of detail of available statistical data.