Factors of EU Economic Growth

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A Multi-Level Investigation

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I would like to dedicate this book to my grandmother and, especially, to my mother, Lenuta Boldeanu, who provided support in many different ways and without whom I would not be the person I am today.

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LIST OF ABBREVIATIONS

ASEAN	= Association of Southeast Asian Nations
COFOG	= Classification of the Functions of Government
EU	= European Union
EUROSTAT	= European Statistical Service
FDI	= Foreign direct investment
FE	= Fixed Effects Model
FGLS	= Feasible Generalized Least Squares
FMOLS	= Fully Modified Ordinary Least Square
GDP	= Gross Domestic Product
GMM	= Generalised Method of Moments Estimator
GNP	= Gross National Product
GVA	= Gross Value Added
ICT	= Information and communications technology
IMF	= International Monetary Fund
LM	= Lagrange multiplier
N.e.c	= Not elsewhere classified
NUTS	= Nomenclature of Territorial Units for Statistics
OECD	= The Organisation for Economic Cooperation and Development
OLS	= Ordinary Least Square
PPS	= Purchasing Power Standard
QML	= Quasi-maximum likelihood
R&D	= Research and Development
REM	= Random Effects Model
UN	= United Nations

CHAPTER ONE

INTRODUCTION

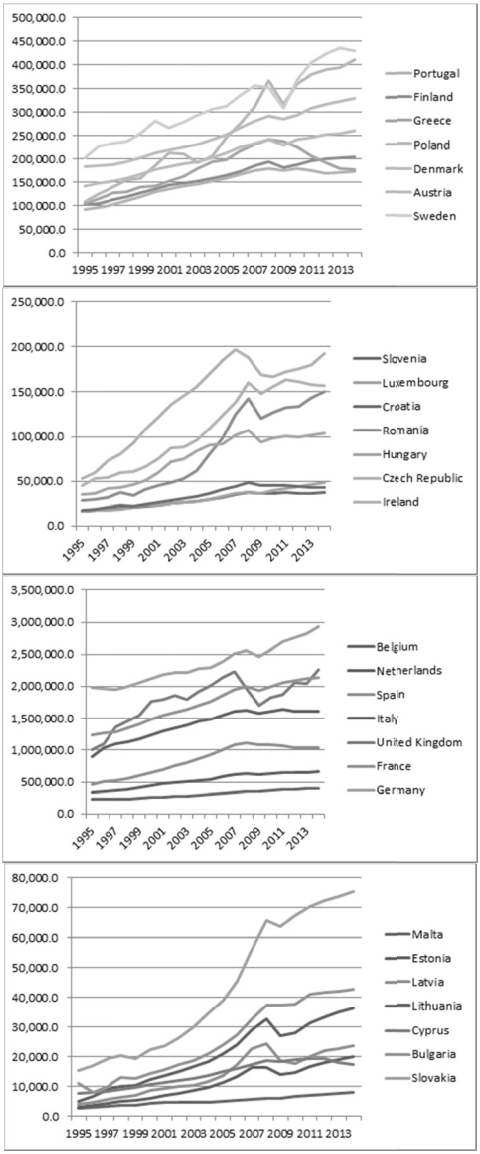
The motivation for choosing the theme and the importance of the subject

Researchers, Nobel Prize winners and public institutions have tried to find a convincing definition of the concept of economic growth, so why should we focus again on this dry statistical issue? The simple answer is that economic growth remains a central and crucial issue in the well-being of billions of people. From the advantages brought by the industrial revolution, advanced countries that experience constant growth help their citizens to live well and live longer. The recent economic crisis of 2008 showed that certain events can also play a role in determining the variation of GDP. A better understanding of the mechanism behind what influences the economy will help us in mitigating or removing the negative outcomes that affect economic development.

Gross domestic product in the EU has risen considerably. Fig. 1-1 shows that between 1995 and 2014 many states saw improvements regarding economic development. For most of the Eastern European countries, European integration was an advantage because of new capital investments and the benefits of open trade. Economic growth epitomises the twentieth century; entire nations continue to see it as an extremely important economic and political objective: indeed, the only factor that ensures the economic success of a nation in the long-term.

The theme proposed for this scientific research aims at showing how private and public variables have had an influence on economic growth in the European Union at different territorial levels, more specifically at country, regional—NUTS areas—and metropolitan level.

Fig. 1-1: The evolution of GDP (MM euros) for the 28 EU countries from 1995 to 2014



Source: own contribution

The link between government investment and economic development is a widely explored topic. Research studies that have targeted the public sector are important for policy-makers from different countries, who are interested in allocating government funds more efficiently. The analysis of the influence of the private sector on economic growth is a less well investigated theme in the literature. Very often in research papers that have focused on the public sector, there have also been some private variables included (gross capital formation, public investment, FDI, exports, etc.).

GDP is an aggregate indicator. It is important to quantify the exact factors that influenced the rise in EU economic growth. This book examines which factors have determined economic growth in the EU for different territorial levels and attempts to both quantify and make a comparison with other studies. This book will be important for policy-makers in better establishing the exact factors that foster economic growth.

Placing this analysis in a scientific context

The shifts that have been taking place in the economy over recent years have seen many developing states play a more important role in the world. Migration, globalisation and the opening of new trade markets have helped states such as China, India and Brazil to achieve a sustained economic growth rate year on year.

Emerging markets account for more than 50% of the world's total output and China has already outpaced the US as the top economy (in PPP classification). Regarding the European Union, the 2008 economic crisis had a negative impact on many nations. Greece has lost more than a third of its GDP since the onset of the economic crisis, and Western European countries have had each year a growth rate below 1% of GDP. Are these outcomes a direct result of the austerity measures? What were the determinants of economic growth for the European Union states? These factors can be measured using economic variables, but some of them, like trust, uncertainty, panic, political instability are non-economic factors.

The literature makes a clear distinction between economic and non-economic factors. For example "proximate" or economic sources refer to factors such as capital accumulation, technological progress and labour. "Ultimate" or non-economic sources refer to factors such as government efficiency, institutions, terrorism, political and administrative systems, cultural and social factors, geography and demography (Rodrik 2003; Acemoglu et al. 2005; Arvanitidis 2007; Acemoglu 2009).

Europe is in the middle of a changing economic and political landscape. The developing nations of the EU are seeing improved

economic growth with the industrialised countries facing more political and social problems than economic ones. The 2016 vote for Brexit in the UK may have a negative impact on Europe if policy-makers will fail to come to an agreement on common measures. The huge waves of migrants and the rise of terrorism have, and will continue to have, serious consequences on the economy as well as on human trust.

Are the existing economic growth models still viable in this ever-changing world economy? More and more people are involved in creating virtual goods which are produced with smaller costs and distributed more easily. All one needs to achieve this is access to the internet and an innovative idea. We should not ignore the space industry, which generates 300 billion euros each year. This industry is very likely to have a significant impact on the economy in the future.

Knowledge stage

Economic growth theories and econometric models highlight the various ways in which present economic activity can influence the future and identify sources that may lead to continuous growth. These theories have evolved over time, depending on the dynamics of the economic reality and the evolution of economic analysis tools. The interest in this subject has been (and remains) high; from classical economists to contemporary new economic growth theory, this topic is still hotly debated and intensively researched. There are many scientific investigations in this field, as demonstrated by the considerable number of articles, books, journals and other such available works. Many theoretical and empirical works have helped improve the knowledge regarding the determinants of economic growth. There are a large number of economists who have devoted an important part of their life studying the concept of economic growth. I will only reference the most renowned of them here: A. Smith, D. Ricardo, T. Malthus, J. M. Keynes, R.J. Barro, R. Solow, Sala-I-Martin.

Research studies have investigated the impact on economic growth of such determinants as investment, human capital, economic and fiscal policies, trade openness, foreign direct investment, research and development, institutional and political framework, socio-cultural factors, geography and demography. These studies have been conducted mostly on country samples, but in recent decades there has been a surge of empirical analysis concentrating on regional, metropolitan or city samples. Many authors have dealt with the relationship between public expenditure, foreign direct investment, openness, public or private investment, non-economic

variables, and economic growth at country level (Khan and Reinhart 1990; Barro 1990; Barro and Sala-I-Martin 1995; Devarajan et al. 1996; Brasoveanu et al. 2008; Arpaia and Turrini 2008; Acemoglu 2009; Bagli and Adhikary 2014; Shera et al. 2014). Some of this research has focused on a single field of study, for example, the role of health or education in economic growth, or the role of public or private investment.

The empirical research in the field of regional economic growth has sought to determine which variables have an influence on growth while also seeking to come to a consensus on the relevant sign of the variation. There are several research studies that have determined a significant link between innovation (R&D expenditures, patent application, population employed in research), transportation (airport infrastructure, roads, highways), population growth, capital formation, energy consumption, public investments and economic growth at EU regional level (Bottazzi and Peri, 2002; Parent and LeSage 2012; Rodriguez-Pose et al. 2012, 2015). As in the case of economic growth at country level, there is still no consensus on the effects of some variables. Also, contradictions in results may appear in studies conducted for different regions, for example: South America, China, North America or Russia (Golubchikov 2007; Spiezia and Weiler 2007; Hartono et al. 2007).

The notion that cities and metropolitan regions are a source of economic growth is gaining more and more traction in recent research. Cities and urban zones are considered to be the fundamental sites for the concentration of economic activity. This is in part because of the new research done by many scholars in the field of new economic geography (agglomeration economies) or those involved in "new growth theory" (Glaeser et al. 1992; Combes 2000; Melo et al. 2009).

Urban areas are human centres that allow for the exchange of goods, ideas and people and, in turn, society reaps the rewards from trade and specialisation (Christiaensen and Todo 2013; Glaser et al. 1992; Combes 2000). Such centres facilitate the concentration of those factors and forces that allow for greater production and increased labour specialisation. Towns and cities have developed to become market places in which goods and services are transferred more rapidly and more efficiently.

These concepts and findings will represent the theoretical and methodological framework for this book. Also, this investigation will use the latest research regarding the concept of economic growth. The study will identify the possibilities to extend the investigation in this field, while also providing comprehensive comparisons and contrasts with the findings arrived at in previous studies. All of the available literature of relevance will be presented at the end of the book in the Bibliography.

The main objectives of the book

The most important objective of this book is to determine the main factors that influence economic growth in the European Union. This objective will be researched in three empirical chapters (chapters four, five and six).

The first empirical chapter will have as its main objective the identification of the most important factors that have impacted on economic growth for the 28 European Union countries. In addition, and stemming from this, the chapter aims to provide a comprehensive overview of exactly which public or private variables play the most important role in economic growth. Furthermore, the division of education into primary, secondary and tertiary levels will show which type of schooling is most significant. By using a dynamic panel data model, the lag dependent variable will also allow us to arrive at some key insights into the strengths and weaknesses of the economic convergence hypothesis.

The second empirical chapter has as its main objective to provide conclusive information regarding the most relevant determinants at regional/territorial level in the European Union for 98 NUTS and 273 NUTS 2 areas. As such, an important objective will be to establish if the convergence hypothesis holds for the above-mentioned regions. It is by graphically illustrating the changes that took place between 2000-2013 that the convergence hypothesis will be confirmed or denied.

The objective of the last empirical chapter is to establish the most important factors that have influenced economic growth at EU metropolitan level. Stemming from this will be the identification of precisely which economic sectors are significant in fostering economic development. One further goal is to determine whether population measured by density, size and growth and net migration have had a significant effect on the variation of per capita gross domestic product at metropolitan level. Lastly, this chapter seeks to present conclusive findings regarding the difference between Western and Central and Eastern European metropolitan regions.

The methodology and the expected results

The methodology of this book is an empirical one in the sense that it uses econometric models by which the influence of the most important factors determining economic growth in the European Union (at country, regional and metropolitan level) can be evaluated. The data for this empirical investigation is collected from credible sources such as the

World Bank's Statistical Database, the European Commission's statistical database (Eurostat), the Annual Macroeconomic database of the European Commission (AMECO), all of which process the information gathered from state and private institutions.

Documentation and literature review: involving the use of references and theoretical documentation through the consultation of journals, books, national or international papers. Also, this documentation comprises of further processing and a complex interpretation of the findings.

Mathematical and statistical methods: requiring the use of classification, static and dynamic analysis, the correlation between variables, econometric modelling, and the use of panel data techniques suited for the models created, graphic representations to show the trend of the variables used in the models, representing the minimum-maximum, mean, and standard deviation.

Interdisciplinary methods: based on economic (use of economic variables such as GDP, FDI, etc., or of economic ratios), econometrics (using certain specification tests for determining the proper models to be used, such as Hausman, Fisher, Parm, In-Pesaran-Shin, Breusch-Pagan), mathematics and informatics (the use of the STATA program).

Overall, the study will aim to demonstrate precisely which determinants are the most important in fostering economic growth in the European Union at different territorial levels; namely at country, regional and metropolitan division. A secondary objective is to determine whether the convergence hypothesis still holds for the EU.

Following the two theoretical chapters, the structure of the book will comprise of three remaining chapters, each containing three empirical investigations. These chapters have the following methodology:

Chapter Four aims to provide conclusive factual data regarding the variables that have determined economic growth in the 28 European Union[1] countries between 1990-2014. It will investigate empirically the relationship between the dependent variable, real gross domestic product per capita and the independent variables; these being: life expectancy, final energy consumption, financial sector leverage, general government debt, total general government expenditure, government deficit, employment rate, exports, imports, trade openness, private sector debt, real labour productivity per hour worked, gross fixed capital formation, foreign direct investment, inflation, population size, primary, secondary and

[1] The 28 EU countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

tertiary education. The investigation will use several dummy variables to determine whether the governance indicators (control of corruption, absence of violence of terrorism, government effectiveness, rule of law, etc.) used by the World Bank have an influence on economic growth and if there is any difference between Western, Eastern, Northern, Southern or Western Asian regions. The study will use a dynamic panel data model and the variables will be logarithmated using the neglog transformation, which avoids dropping observations from the panel. The chapter will highlight summary statistics for the variables (mean, std.dev, observations, etc.) and the correlation matrix. Some preliminary tests will be conducted to determine which kind of econometric model would be appropriate for this investigation; such as, for example: the Fisher and Im-Pesaran-Shin unit-root tests, Hausman, Breush-Pagan/Cook-Weisberg, LR for panel-level heteroscedasticity and Wooldridge tests. The Pesaran, Frees and Friedman test will also be computed to determine the cross section independence. To add more robustness to the results, several panel date techniques will be used, namely, the pooled OLS, REM, FGLS and FMOLS regressions. The investigation will also use the GMM and system GMM estimations. These two methods are popular for dynamic panel investigation. They increase the efficiency of estimation, are suited to autocorrelation and heteroskedasticity, and they function as correctives for endogeneity biases. The estimated results of this chapter will demonstrate the extent to which government expenditure, trade openness, productivity, foreign direct investment, employment, energy consumption, gross fixed capital formation and life expectancy have a positive influence on economic growth. The negative variables that might hinder growth are likely to be public deficit, imports, public and private debt. Governance indicators should show that control of corruption, rule of law or the absence of terrorism have a positive influence on economic growth. Because of the lag evident between the investment in primary and secondary education and its impact on GDP, tertiary education is likely to be the most important schooling variable. Finally, the methodology will determine whether the model is fit for purpose by conducting some normality tests—Ramsey, Shapiro Wilk W—and by plotting the residuals.

Chapter Five will continue the investigation by empirically analysing the factors that determine economic growth for the 98 NUTS 1 and 273 NUTS 2 regions. The period investigated is 2000-2013. The NUTS regions are part of the 28 EU countries studied in the above chapter. The present chapter will investigate empirically the relationship between the two dependent variables used to measure economic growth, namely, real GDP/capita and real GDP per inhabitant in purchasing power standard.

The independent variables are population size, fertility rate, life expectancy, early-leavers from education and training, persons with tertiary education, average hours of usual weekly hours of work at a main job (male and female), employment rate (total, male and female), R&D expenditures, infrastructure (motorways and other roads), total nights spent by residents and non-residents in tourist accommodation, the stock of vehicles, population density and net migration. This study will also use a dynamic panel data model and the neglog transformation. Some preliminary tests will be conducted to determine which type of econometric model will be most effective; for example, the Fisher unit-root test, Hausman (to decide between a fixed or random effects model) and Parm tests. To offer robustness, the GMM, system GMM and QML methods will be used. The quasi-maximum likelihood method does not use any instruments as is the case with the GMM or system GMM methods; also, the weak instruments that might be used in the GMM and SysGMM are avoided in QML estimation. It is expected that this chapter should be able to demonstrate the following: fertility rate, life expectancy, persons with tertiary education, employment, R&D expenditure and infrastructure endowment positively correlate with regional economic growth. Also, agglomeration should yield positive results as stated by the findings of the agglomeration economies theory (Dogaru 2015). Regional economic growth would be positively influenced by domestic and international tourism; domestic tourism playing a more important role than international tourism at regional level (Paci and Marrocu 2014). By graphically illustrating the variation of GDP/capita between 2000-2013 the chapter also hopes to determine whether or not the convergence hypothesis holds. Because of the 2008 crisis, many regions saw a drop in output and this in turn affected GDP.

Chapter Six will investigate the variables that have played an important role at the metropolitan level in the European Union. The investigation is carried out over a 14-year period (2000-2013). The chapter will investigate empirically the relationship between two dependent variables used to measure growth, namely metropolitan real GDP/capita and real GDP per inhabitant in purchasing power standard. The explanatory variables that will measure the impact of certain economic branches on economic growth are: the share of metropolitan gross value added of agriculture, forestry and fishery, industry, manufacturing, construction, wholesale and retail trade, transport, accommodation and food service activities and finally, information and communication in total metropolitan gross value added. Other independent variables are the number of employees, population size, density and growth, economically active population, net migration and a

dummy variable that controls for the effects of European enlargement. This chapter will also use a dynamic panel data model and the neglog transformation. The Hausman test will be used to determine whether the model is a random or fixed effects one. The Parm test will be used to show if the model needs time-fixed effects. As in the previous chapter, the GMM, system GMM and QML methods will be used. To further improve efficiency and offer more robustness, the study will opt to split the time period in two (2000-2008 and 2008-2013) and also divide the panel sample to measure the difference between Western and Central and Eastern metropolitan areas. Because of the high-level of industrialisation, the results should demonstrate the determining role of industry in shaping economic growth. Because the chapter uses population size, growth and density, the empirical outcomes should reveal if agglomeration plays a significant part in advancing metropolitan economic growth. Finally, with the considerable migration wave experienced by the EU since 2015, it is important to observe the extent to which this variable positively impacts on economic growth.

Research limitations

The concept of economic growth has some inherent limitations which need to be underlined as they may have serious economic and social repercussions. For this research, a primary limitation is the problem of measurement or the occurrence of systematic errors, which can have a negative effect on the outcomes of any empirical analysis through the resulting bias of the results. Another problem regarding economic growth analysis is the fact that missingness has been a common occurrence, especially for large panel data. For regional and metropolitan data, missing values can affect the empirical results of the analysis. This study tries to overcome this problem by using several panel data techniques, and by applying the quasi-maximum likelihood which is best suited for this type of analysis.

CHAPTER TWO

LITERATURE REVIEW ON ECONOMIC GROWTH AND ITS MAIN DETERMINANTS

Introduction

In general, there is a consensus on the need for sustainable economic development. Growth theories and econometric models draw attention to the various ways in which present economic activity can influence the future development of a nation/region and identify sources that may lead to continuous growth. These theories have developed over time, relying on the dynamics of the economic reality and the evolution of economic analysis tools (Boldeanu and Constantinescu 2015).

In this chapter the focus will be on highlighting the main growth theories and the stages in the development of new ways of measuring and refining the models to suit the actual period under analysis. This will be achieved by coming to a better understanding of exactly what economic growth means through a review of the available literature.

Economic growth

The concept of economic growth has, over time, been the subject of a multitude of interpretations. Researchers, Nobel Prize winners and public institutions have tried to arrive at a viable definition of economic growth: so why should we focus on this apparently dry statistical issue again? The answer is that economic growth remains a key factor in the well-being of billions. Thanks to the advantages brought by the industrial revolution, those advanced countries that have experienced constant growth have helped their citizens to live well and live longer. We cannot say the same for the poorer countries that have, now in the twenty-first century, a GDP/capita lower than Europe had in the nineteenth-century.

Economic growth epitomises the twentieth century; entire nations continue to see it as an essential economic and political objective: the only factor that ensures the economic success of a nation in the long-term. At

first glance, we are tempted to limit the definition of economic growth to gross national product per capita growth, but, in fact, we are better measuring it by improving living standards.

The World Bank defines economic growth as an expansion of, or a quantitative change in, a state's economy. Economic growth is calculated as the percentage change of gross domestic product, or gross national product during one year (World Bank Publications 2004). Denison (1962) considers that economic growth is an expansion of real GDP or GDP per capita, an increase of the national product that is calculated in constant prices.

Economic growth can have two different forms: if the growth is "extensive," then the economy uses more capital (resources) in the form of human, physical or natural capital, or the economy can grow "intensively" by using the above-mentioned resources productively (an increase in efficiency); if the expansion of the economy is due to the use of more human capital (labour), then there is no per capita growth. However, if this economic growth is a result of employing all of these resources, the outcome is an increase in per capita income growth. This leads to an improvement in living standards (World Bank Publications 2004). We have to consider that, in the first case, the economic growth approach is made in terms of production and not through the well-being of citizens (the consumers). From this standpoint, the use of gross national product (GNP) as a whole or per capita seems lacking. A series of elements considered as consumer expenditures would be better to be classed as investments, such as health and education spending. Also, some public expenditure—expenditure for arming, national defence—should be excluded. In addition, we should take into account household service expenditures and "do-it-yourself" activities (Toffler 1981). The amount of free time should also be included as a value of externalities—positive or negative. William Nordhaus and James Tobin have tried to make these correlations, creating a new indicator—the measure of economic welfare—which is estimated to be modified in the same way as GNP but with a lower rate (Nordhaus and Tobin 1972). Robinson defined economic growth as an increase in aggregate productivity, total or per inhabitant, without any changes in the structure of the economy or in social or cultural values (Robinson 1972).

I think that economic growth should be considered a long-term process because the production capacity can only be increased over a longer time period. Sustainable long-term growth in operational terms is an increase in environmentally net domestic product, keeping in mind some specific conditions (Bartelmus 1994).

Economic growth is determined by direct factors such as human resources (the increase of the active population, education—investing in human capital), natural resources (underground resources, soil, climate conditions), the increase in capital employed or technological changes/advancements. It is also influenced by indirect factors such as institutions (private administrations, financial institutions, etc.), the size of the aggregate demand (the absorption capacity of the internal market), the efficiency of the banking system, investment rates and saving rates, the migration of labour and capital, fiscal and budgetary policies of the state and the efficiency of the government (Boldeanu and Constantinescu 2015).

Economic growth in the long-term has two major sources:

- Quantitative growth of production factors (the number of people, the amount of fixed or working capital used). This is also called extensive growth.
- Qualitative growth factors, i.e. the factors of production efficiency (productivity). This is the result of intensive economic growth.

Thus, economic growth is derived from the existing quantity and quality of human capital (labour force). Consequently, the quantity of human capital may lead to sustainable growth in economic terms only if the stock of capital increases. Otherwise, increasing the amount of the workforce used, when the capital stock remains the same, can lead to a less efficient use of production factors. This, in turn, can have a negative effect on production per capita (because of decreasing returns).

The human capital quality refers both to the qualifications, degree of culture, and the health of the population: its longevity.

Increasing the amount of capital used increases the quantity of goods and services that are produced in a national economy, but in the same manner as the increasing amount of labour. Technical progress, described as a "residual factor" in the established economic models (that of Robert Solow and those that followed him), is one of the most significant determinants of economic growth, an important source of growth and productivity (Solow 1957).

Economic growth brings economic benefits; these include the improvement in living standards. Increasing the volume of final goods and services in a country is usually equivalent to a change in consumption. Long-term economic growth brings an increase not only in the quantity of the goods and services consumed, but also in their quality. Furthermore, if the income distribution is correct (no corruption and other inequalities), economic growth can alleviate poverty. Increasing production capacities

can generate more jobs and therefore more numerous sources of income for households. Another benefit is the change in the consumption structure. In recent decades, in countries with developed economies, economic growth has led citizens to focus more and more on other needs such as education, culture, leisure, communication, etc., because physiological and safety needs such as food, shelter and water (Maslow 1943) are ensured by a part of their income. However, economic growth has its costs. Pollution has been one of the most significant bi-products of economic growth in the nineteenth century and especially the twentieth century. A considerable proportion of state funds are allocated to environmental protection each year (water treatment, waste management and pollution abatement), in order to treat the hazardous problems of pollution.

The allocation of resources for growth means the allocation of opportunity cost. The opportunity cost of economic growth consists of sacrificed current consumption. In a world dominated by scarcity, almost nothing is free. Such growth requires a massive investment of resources in capital goods, which do not always cause immediate benefits (i.e. the investment in education), thus the present generation must be prepared to make some sacrifices.

The social costs and personal costs of economic growth should also be highlighted. An economy that traverses a process of growth is a changing economy. The constant innovation associated with growth means that people must constantly adapt to changes. New technologies require new skills and intensive training and those who fail to adapt will have to suffer the consequences, e.g. loss of employment. In this regard, progress will be better suited to the younger generation.

Finally, a further downside of economic growth might be considered the distribution of costs and benefits over time; the immediate cost of technological change must be met in the present, while the benefits are felt in the future.

Theories of economic growth

There are four main determinants of economic growth: human resources (including labour, education), natural resources, capital formation and technological progress. However, the importance attached to each factor by economists has always varied (Boldeanu and Constantinescu 2015). Prominent economists (Smith 1776; Ramsey 1928; Young 1928; Schumpeter 1934; Knight 1944) have developed, historically, the essential components of modern economic growth

theories. Some of their ideas address the competitive behaviour approach and dynamic equilibrium, the role of decreasing yields and their relation to labour force and physical capital accumulation. Other concepts developed by the forefathers of economic growth theory include: the population growth rate and the rate of per capita income, the effect of technological progress in deepening the specialisation of human capital, the introduction of new products and methods of production, and the role of the monopolies—as an incentive to technological progress. Understanding the concepts and factors involved in growth requires an investigation into the theory of economic growth, understood as a theoretical response to the demands of economic life and the struggle with the restrictions of a natural and man-made environment. It is in relation to all of the above problems that the concept of economic growth must be addressed.

A. The classical theory of economic growth

British classical economists studied the first elements of a theory of economic growth; their classical economic models having described the evolution of the economy in terms of growing population and limited land (Smith 1776; Malthus 1798; Ricardo 1817). The model first elaborated by Adam Smith (1776) and developed by Malthus (1798) had an agrarian underpinning. While the land was free population growth was unlimited; all individuals in this situation could obtain, through their work, enough produce to survive and support their families.

Classical theoreticians were witness to rapid changes in their societies, and in particular the replacement of a feudal system with industrial capitalism. By developing the discipline of political economics, they sought to explain the main forces governing the new economic system. Also, there was a philosophical concern with the concept of progress and the accompanying need to explain which social forces are necessary to foster economic growth. The forces that hinder economic growth were also a major concern. It is generally thought that the most sophisticated model of this type of classical economics can be found in the work of David Ricardo (1817).

In “Wealth of Nations,” Adam Smith (1776) introduced the founding concepts of economic development. He began by describing a time when the Earth was free for all people, and capital accumulation was unnecessary. Since there was no capital, a doubling of production would result in a doubling of population. With salaries alone accounting for the entire national income, as there was no rent for lands, there would be no interest in the accumulation of capital. With production increasing at the

same pace as the population, real wages per worker would remain constant over time. Without technical progress, population growth would result in the total usage of the land that is available. With an increasing population density the law of decreasing returns would mean there was no more land or income for workers. Economic growth would thus lead to higher land rent and, in parallel, lowering wages.

Ricardo (1817) researched the main laws governing distribution. He concluded that:

> Political economy is an inquiry into the nature and causes of wealth. I think it should rather be called an inquiry into the laws which determine the division of the produce of industry among the classes which concur in its formation (Hedlund 1983).

Ricardo analysed profit as a residual component of the surplus. Furthermore, he eliminated the rent component that was calculated as a difference between the product on marginal land and the one on intra-marginal units (Harris 1978). Ricardo found a link between the total rate of profit and the wage rate. This outcome was determined only for the sector of corn production, corn being a commodity that could be used both as a wage to be paid to the work force and also a capital good that enters the production cycle.

When all the land was cultivated, the further increase in population meant that the number of workers on the same land surface was supplemented. Each new worker produces an amount of supply that decreases over time. The reduced marginal production of labour implies that real wages decrease. For how long can such a worsening situation continue? Malthus believed that population continues to increase as long as wages are above the level of subsistence (Malthus 1798). The pressure of excess population can have major implications for an economy where wages fall below the subsistence level, something that leads to increased mortality and a reduction of the population. According to Malthus:

> It is, undoubtedly, a most disheartening reflection that the great obstacle in the way to any extraordinary improvement in society is of a nature that we can never hope to overcome. The perpetual tendency in the race of man to increase beyond the means of subsistence is one of the general laws of animated nature which we can have no reason to expect will change (Malthus 1798).

Malthusian equilibrium is reached when salaries fall to subsistence level, below which a job offer is no longer reproduced at the same level