The Effect of Manufacturing Value Added on Economic Growth: Empirical Evidence from Europe

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ABSTRACT

The manufacturing sector plays an essential role in achieving economic growth in any nation. Because of the growing phenomenon of deindustrialization the manufacturing sector has become increasingly important as the engine and driver of economic growth in both developing and developed economies. The purpose of this study is to uncover the impact of manufacturing sector on economic growth in selected European economies. Moreover, the association between investment, labor force and technology with economic growth in selected economies has been investigated.

This thesis is an empirical analysis to assess the factors which affect economic growth in 25 of Europe's most competitive economies by conducting a descriptive analysis, Pearson correlation, pooled OLS, fixed and random effects model. In this study as the dependent variable, GDP has been used as a measure of economic growth. On the other hand, manufacturing value added, gross fixed capital formation, employment ratio and high-tech export are employed as explanatory variables.

To quantify the relationship between explanatory variables and economic growth, an eclectic model consisting of both the Kaldor's first law of growth and the neoclassical growth model was estimated. Moreover in order to search for the factors affecting economic growth, a panel data approach methods have been employed. A sample data of 25 Europe's most competitive economies from the World Economy Forum (WEF) and World Bank database are selected on an annual basis, from 1995 to 2016.

The result of this study revealed that the economic growth has a significantly positive association with manufacturing, labor force, and technology. The unexpected interesting result is that the association between economic growth and investment is significantly negative.

Keywords: Economic Growth, Manufacturing Value Added, European Economy, Kaldorean Approach and Neoclassical Growth Model.

ÖZ

Üretim sektörü, herhangi bir ülkede ekonomik büyümenin sağlanmasında önemli rol oynamaktadır. Endüstrileşme olgusunun giderek artması nedeniyle imalat sektörü, hem gelişmiş hem de gelişmekde olan ekonomilerde ekonomik büyümenin motoru ve itici gücü olarak giderek önem kazanmıştır. Bu çalışmanın amacı, seçilen Avrupa ekonomilerinde imalat sektörünün ekonomik büyüme üzerindeki etkisini göstermektedir. Ayrıca, seçilmiş ekonomilerde yatırım, işgücü ve teknoloji arasındaki ekonomik büyümenin ilişki araştırılmıştır.

Bu tez, tanımlayıcı analiz, Pearson korelasyon, havuzlanmış OLS, sabit ve rastgele efekt modeli ile 25 adet Avrupa'nın rekabetçi ekonomisinde ekonomik büyümeyi etkileyen faktörleri değerlendirmek için ampirik bir analizdir. Bu çalışmada bağımlı değişken olarak GSYİH, ekonomik büyümenin bir ölçüsü olarak kullanılmıştır. Öte yandan, imalat katma değeri, brüt sabit sermaye oluşumu, istihdam oranı ve yüksek teknoloji ihracatı açıklayıcı değişkenler olarak ayrılmıştır.

Açıklayıcı değişkenler ile ekonomik büyüme arasındaki ilişkiyi ölçmek için, hem Kaldor'un ilk büyüme yasası hem de neoklasik büyüme modelinden oluşan eklektik bir model tahmin edilmiştir. Ayrıca ekonomik büyümeyi etkileyen faktörleri araştırmak için panel veri yaklaşımı yöntemleri kullanılmıştır. Dünya Avrupa Forumu'ndan (WEF) ve Dünya Bankası veritabanından 25 adet Avrupa'nın rekabetçi ekonomilerinden oluşan örnek veriler, 1995'ten 2016'ya kadar yıllık olarak seçilmiştir.

Bu çalışmanın sonucu, ekonomik büyümenin imalat, işgücü ve teknoloji ile anlamlı derecede pozitif bir ilişkisi olduğunu ortaya koymuştur. Öte yandan, ekonomik büyüme ve yatırım arasındaki ilişki önemli ölçüde olumsuzdur.

Anahtar Kelimeler: Ekonomik Büyüme, Üretim Değeri Eklendi, Avrupa Ekonomisi, Kaldorean Yaklaşımı ve Neoklasik Büyüme Modeli.

DEDICATION

To my lovely family

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LIST OF ABBREVIATION

EMP	Employment Ratio
EU	European Union
GCI	Global Competitive Index
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
HTE	High-Tech Export
MVA	Manufacturing Value Added
NACE	Statistical Classification of Economic Activities in the European Community
RGDP	Real Gross Domestic Product
WEF	World Economic Forum

Chapter 1

INTRODUCTION

A nation's manufacturing sector has a key role to play in its economic development, and this applies to both developed and developing economies. It is well supported in development and growth literature that a strong causal relationship exists between a nation's growing manufacturing output and its GDP growth (Pacheco-López & Thirlwall, 2013).

Manufacturing has been described as merchandise production using tools, machines, and labor, biological and chemical formulation or processing for the purpose of sale or use. It may also refer to a variety of human activities, ranging from handcraft to advanced tech. However, it is more generally used for industrial production involving the large-scale transformation of raw materials into finished goods. Other manufacturers may buy such finished goods for the production of further complex products like household appliances, aircraft, automobiles, sports equipment, or furniture. The finished goods could also be purchased by wholesalers, from whom retailers buy to sell to consumers (European Commission, 2014).

Historically, manufacturing has played essential role in economic development in any nation (Naude & Szirmai, 2016). Manufacturing is renowned as being bedrock of several national economies and as a major sector that creates jobs and economic growth (Warren, 2013). National economies that could quickly harness its power,

had realized abundant wealth, productivity, and significant development in their countries through manufacturing (Oyati, 2010). The stories of the advanced nations and those of emerging economies like India, China, North Korea, Singapore, and Malaysia showed a positive connection between national economic growth and the growth of manufacturing sector (Banjoko, Iwuji & Bagshaw, 2012). Value added is the net of output after adding all outputs and subtracting intermediate inputs .The manufacturing sector engaged 29.9 million persons in gainful employment in the year 2014, generating €1.710 billion of added value. Using these measures, manufacturing was NACE's second-biggest section within Europe's non-financial business economy in terms of what it contributes in job creation (22.1 %) and the major contributor to non-financial business economy value added, which accounts for more than one-quarter of the total (26.0 %) (Eurostat, 2017).

The McKinsey Global Institute reported that the part manufacturing plays in the economy varies with time and it is different depending on what stage of development the country's economy is. In advanced and developed countries, manufacturing sector has the capability to increase the innovation, trade and, productivity (McKinsey, 2012). In spite of all these well-known advantages, for a number of years now, Europe and some other parts of the world have moved into a deindustrialization process (Dhéret & Morosi, 2014). Deindustrialization in advanced economies, which is given away by the incessant decline in manufacturing sector's contribution to job creation and the GDP as well as the increase in contribution of service sector to the GDP, has not been generally viewed as a negative occurrence, but rather as an expected result in the process of economic development (Rowthorn & Ramaswamy, 1997). A recent report of the European Commission (2014), has placed emphasis on the significance of the real economy, and robust industry as a

driver of employment and economic development. In its policy vision, the targeted input of industry to the growth of GDP by 2020 has been raised up to 20%. For Europe's competitiveness and economic recovery, a robust industrial base is seen as fundamental.

The purpose of this thesis is to investigate the role that manufacturing sector has played in driving the growth of the 25 of Europe's most competitive economies over the period of 1995-2016 by conducting a descriptive analysis, OLS regression, Pearson correlation, fixed and random effects model. To quantify the correlation between economic growth and manufacturing output, an eclectic model consisting of both the Kaldor's first law of growth and neoclassical growth model was estimated.

1.1 Research Gap

According to European Central Bank in 2016, with nearly 340 million people, the euro area is one of the biggest economies in terms of population. While in terms of its share of global GDP, it is the third-largest economy, coming after the United States of America and the People's Republic of China. Based on Eurostat (2015), the manufacturing sector plays an essential role in economic growth with a huge contribution to job creation (22.1 %). For several decades Europe and other parts of the world have come into a deindustrialization process (Dhéret & Morosi, 2014). This process can somewhat be credited to shifts in policies and drastic economic reforms than to the maturity of economic structures (i.e. the transmission to the tertiary sector) (Palma G., 2005). Investigation of the long-standing correlation that exists between economic growth and manufacturing output for Europe's most competitive economies in the period of the phenomenon of deindustrialization has been rarely investigated in the literature. Therefore, it is essential to find the

correlation between manufacturing and economic growth for the future policies in the Europe's economic region.

Table 1: Share of World GDP of the Euro Area in 2016

	Unit	Euro Area	The U.S.	Japan	China
Population	Millions	340.2	323.4	127.0	1382.7
GDP (share of world GDP in PPP)	%	11.7	15.5	4.4	17.7

Source: European Central Bank, 2016

1.2 Research Question

In order to examine the connection between economic growth and manufacturing output of selected European countries, two primary questions will be investigated. These main questions that are pursued in this thesis are as follow:

i) Does manufacturing output have an impact on GDP in Europe's most competitive economies?

ii) Is there any significant relationship between manufacturing output and GDP in Europe's most competitive economies?

1.3 Research Objective

The current thesis intent to carry out an empirical study on the determinants of manufacturing output on economic growth in 25 of Europe's competitive economies over the period of 1995-2016. This study empirically examines the association between the manufacturing outputs as a gauge of the Gross Domestic Product (GDP) and also account for the factors which influence GDP. These factors consist of Labor Force (L), Technology (A) and Capital (K) based on Kaldor's first law and neoclassical growth theory model.

1.4 Significance of Study

This thesis is the original study that empirically examines the determinants of manufacturing output on the economic development of Europe's most competitive economies. The quick process of decentralization due to the economic and financial crunch of 2008/2009, underscored the susceptibility of Europe's industry, particularly the manufacturing sector. As a result, it is imperative to find different sources of economic development (Dhére & Morosi, 2014).

This is expected to provide important implications for future studies and administration of Europe's economic policies and developing economic models. Of late, the European Commission has placed emphasis on the significance of the real economy and robust industry as a driver of employment and economic growth. In its policy vision, the targeted input of industry to the growth of GDP by 2020 has been raised up to 20%. (European Commission 2014a, p.23).

1.5 Scope of Study

In this thesis, 25 developed countries in Europe which are listed as the most competitive economies in the in Global Competitive Index (GCI) have been chosen. The selected data are based on the financial information have been retrieved from the World Bank database for the period from 1995 through 2016. As such, there are 25 country- year observations for this study.

1.6 Structure of Study

This thesis consists of five distinct chapters. The first chapter aims to give an overview of the manufacturing sector and the variables use in this study. The second chapter aims to investigate the essence of the relationship between the manufacturing sector and economic development as well as to also discuss theories which have

been used in previous related studies. This chapter is divided into two main parts as follows: empirical framework and theoretical framework. The third chapter is data analysis and result segment which explains data collection, a model of the study, and all estimation methods which have been conducted. Chapter three analyzes the model of the study as well as compares the results with previous scholars as well. Finally, chapter four provides the summary of the study and ends with a conclusion, implication, limitation and future of study.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

Macroeconomic theory and policy's most significant part is allocated to the study of economic development, which is the study of quantitative associations between the factors of production and the level of final output and at the national level. Theories of economic development deal with the problems of dynamic equilibrium as well as attempts to give a satisfactory solution to the problem of what kind of usage of the existing factors of production can bring, in the long-run, a sustainable growth in real GDP per capita. The full economic growth rate is realized when the highest probable increase in factors of production is used in the most efficient way (Cvetanović, 1997, p. 11). Based on theoretic and various empirical researches in the literature, manufacturing output, the level of technology, investment and employment ratio play an essential role in any nation as the main important factors to increase real gross domestic in long run. Kaldor's growth theory (Kaldor, 1966) and neoclassical growth theory (Solow, 1957) separately show the importance of the mentioned factors in long-run economic growth.

2.2 Theoretical Framework

2.2.1 Kaldor Theory

Nicholas Kaldor's paper was published in 1966, on the reasons for the United Kingdom's poor economic progress in that particular period. In those days, the best justification for Britain's economic decline was centered on neoclassical growth

theories. Reasons such as ineffective handling of British businesses, the higher emphasis placed on humanities rather than engineering by the educational system, very restraining trade unions, the reluctance of citizens to work, inadequate investment, or biases in the government economic policies that drive the price system were to be blamed. Though he admitted that quite a few of the aforementioned factors might be acceptable in the local context, Kaldor debated that these factors were not acceptable in comparative terms. Without any expanding on the facts of the argument, the author set a substitute approach founded on the examination of "development phases", as earlier carried out by Rostow (1956). Kaldor carried out a structural, empirical and comparative study, concentrating on the part the manufacturing sector plays roles in economic development. He concluded that the economy of Britain underwent "premature maturity" with the manufacturing industry declining in strength when compared to other economies with a comparable level of income. Kaldor said before Britain reaching peak of productivity, its growth potential was exhausted (Kaldor, [1966], p. 102).

This 1966 paper of Kaldor came to be an important reference as it contains the basis of the hypothetical formulation which was later acknowledged as "Kaldor's growth laws". Kaldor's growth laws acclaim vital significance to the manufacturing industry for economic growth. He further posited that the growth passage of advanced nations in the post-war era (over the period 1952-54 to 1963-64) displayed the association between industrial development and the entire economic performance of a nation. This statement formed the basis for the first law of Kaldor which says that a close association exists between an increase in manufacturing output and an increasing gross domestic product (GDP). This first law can be expressed briefly as the

“manufacturing industry is the engine of economic growth”. The linear specification of the first law of Kaldor is as follow:

$$"gGDP = a_0 + a_1\ gMAN"$$

Where: "$gGDP$ is the growth of total output and $gMAN$ is the growth of the manufacturing output.

It is significant to be aware that the association these two variables have is not only as a result of the manufacturing output representing a huge constituent of total output. The total rate at which the economy grows is connected to the excess rate of growth of the manufacturing output over the rate of growth of the non-manufacturing output. All this implies that good growth is typically found in circumstances where manufacturing industry’s share in the GDP is increasing (Libanio, 2006). Kaldor’s work turned out to be an essential turning point in the economic growth literature.

2.2.2 Neoclassical Growth Theory

The theory of economic growth has developed with Robert Solow(1956). Some are of the opinion that the theory of economic growth, developed in the middle of the twentieth century, recognizing the set of technological advancement as a significant element of the economic development of nations (Solow, 1956, 1957). He paid attention to the course of capital formation as well as presumed that production was a function of labor, technology, and capital. He observed that if the only drawback to economic development were capital, then producers will replace capital with labor. At that juncture, his input focused on the result that sustainable growth is influenced by changes in technology and not investment or savings. Saving only has an impact on growth temporarily, or growth on its way to sustainability, for the reason that the

economy will trip into diminishing returns as the ratio of capital per worker rises. The structure for the development of the "total factor productivity (TFP) concept, is provided by Solow's model where labor augmenting technological change and the increase of capital per worker explain the long-term growth of the economy per worker. Of late, conditional convergence, a model which is a derivative of these models is widely in use. This empirical property is founded on the supposition of capital's diminishing return as a result economy with reasonably low capital per worker rates have a tendency to develop quicker owing to higher rates of return (Dragutinović et al., 2015, pp. 91-96).

The production function is the logical beginning point of Solow model; the linear specification of the Solow model is as follow:

$$Y = TF(K, L)$$

Where; K is physical capital, T is technology, L is amount of work and Y is production (GDP).

Neoclassical growth model reveals that, at the point of long-term steady equilibrium, technological changes effect on economic development. The first to unmistakably recognize and analyze the group of technological changes as the engine that drives economic growth, and concluded after some empirical examinations, that this was really the most significant influence on economic dynamics were the neoclassicists.

2.3 Empirical Framework

2.3.1 Manufacturing and Economic Growth

There are a great number of publications investigating the link between manufacturing and economic growth with different approaches and case studies. The

results are different, which can be attributed to different structures and policies applied by countries and states. However, different methods lead to inconsistent findings.

Historically, manufacturing has played essential role in economic development in any nation (Naude & Szirmai, 2016). Manufacturing is renowned as being bedrock of several national economies, and as a major sector that creates jobs and economic growth (Warren, 2013).

From the inception of the industrial revolution early in the nineteenth century, all economies have been transformed by manufacturing sectors through its spillover impacts into other sectors (Naude & Szirmai, 2009). National economies that could quickly harness its power, had realized abundant wealth, productivity, and significant development in their countries through manufacturing (Oyati, 2010).

A World Economic Forum Report emphasized that manufacturing sector is considered essential to the wealth of nations as more70% of 128 nations' income differences are accounted for by variances in the export data of product manufactured (World Economic Forum, 2012). Manufacturing has spillover effects, is really linked to the other parts of the economy. This connection to other sectors can both be "backward" (as with construction or mining), or "forward" (as with, business services, transportation and wholesale and retail trade) (Veugelers, 2013).

Inter-connections between services and manufacturing have been emphasized in several contemporary studies (Spelman, 2013; Eurostat database, 2015; Westkämper 2014). Manufacturing has more spillover effects within it than within other sectors

(Herman, 2011; Szirmai, 2009; The Manufacturing Institute, 2012). The growing demand for manufacturing encourages employment opportunities, innovations, and investments (The Manufacturing Institute, 2012). In addition, manufacturing is central to SMEs and very important for innovation and education (Westkämper, 2014).

The first to propose and empirically exam the "engine of growth hypothesis" with a 12 OECD cross-country estimation over two different periods (1952 and 1964) was Kaldor (1966). Kaldor showed the positive strong correlation that exists between economic development and manufacturing in the engine of growth hypothesis by some theoretical laws. Decades after Kaldor's first tests, the subject matter remains relevant due to the fact there is an increasing literature focusing on the part that services play as an engine of economic growth (Shin, 2009). These contributions seem to cause a decline in the importance placed on the role that manufacturing plays in economic development. Following Kaldor's tests, a lot of progress has been made methodologically in econometric literature. Availability of datasets and panel analyses now allows for more accurate estimates generally confirming Kaldor law's validity.

Szirmai and Verspagen (2015) analyzed the correlation between the manufacturing value-added (MVA) and GDP for 92 countries in the period of 1950–1970, 1970–1990 and 1990–2005 using random effects, fixed effects and Hausman tests. They discovered that the manufacturing sector performances the role of a growth engine for low and a few middle-income economies if there is an adequate level of manpower. These kinds of growth engine characteristics are not applicable to the service sector.

Szirmai and Verspagen (2015) re-examined the part that manufacturing plays as a growth driver in industrialized and emerging economies during 1950–2005 period the indicator as manufacturing value added (MVA) for manufacturing output. The examination reported that there is a reasonable positive effect of MVA on economic development.

Necmi (1999) attempted to verify Kaldor's inferences to confirm if it is still valid after the 1970s glory days of fast industrialization and catch-up. Over the period of 1960-1994 for 45 developing economies he applied an instrumental variable econometric technique. His findings established Kaldor's statement that "manufacturing acts as engine of economic development" for most emerging economies incorporated into his study, with the likely exemption of sub-Saharan economies. For advanced economies, McCausland and Theodossiou (2012) establish that Kaldor's proposition mostly holds true for the period of 1992-2007.

Real growth rates of GDP were regressed on manufacturing growth rates by Fagerberg and Verspagen (1999). The regression results show that the manufacturing was an engine of economic development in East Asia's and Latin America's developing countries; nonetheless, there is no significant result of manufacturing in the developed countries. Subsequently, Fagerberg and Verspagen (2002) analyzed the effect of manufacturing and services on economic development in these three periods: 1966–1972, 1973–1983 and 1984–1995 for 76 countries. They discovered that before 1973 manufacturing had greater positive impacts than after 1973.

Aggarwal and Kumar (2015) reported that Chakravarty and Mitra (2009) and Kathuria and Natrajan (2013) tested the engine of development hypothesis in India, a

place where the service sector plays a significant role in the economic growth. In a previous study by Chakravarty and Mitra, (2009), covering the 1973 to 2004 period, it was found that manufacturing, services, and construction have been the drivers of growth. Kathuria and Raj (2013) examined the same hypothesis in India for 15 states in 1994-1995 to the 2005-2006 period and came to the conclusion that manufacturing had strong effect in economic growth in India, in spite of its diminishing GDP share.

Kaldor's first law was tested in 18 Latin American economies. The findings supported Kaldor's law however it could not be confirmed that the most important engine of growth is manufacturing when likened to services. Corresponding outcomes were reported by Labanio and Moro (2013) for seven Latin American economies.

Teshome Adugna (2014) purposed an article base on Kaldorian approach to show the manufacturing effect on economic growth in Ethiopia between1980-2009. The result revealed that the manufacturing sector has a major role to play in the structural transformation of the country. The future economic growth in the country rests on how well the country's manufacturing sector performs. Hence the government should strengthen its current effort on development of the manufacturing sector in the country.

Pacheco-López and Thirlwall (2013) argue that emerging economies with services and agricultural orientation came up with a number of ways to keep the growth of their manufacturing sectors ongoing. The manufacturing sector has a major role to play in the economic development of advanced as well as emerging countries. Now it

is well proven in development and economic growth literature that a strong causal relationship exists between manufacturing output's growth and GDP growth.

Szirmai (2012) reiterated no uncertainty about manufacturing being a significant growth driver in most emerging economies. He concluded that out of the 90 countries sample during the 1950–2005 period, the statistical findings reveals that manufacturing's prominent role is uncertain and therefore questions if manufacturing will remain growth engine of economies.

Gregory (2006) argues that manufacturing sector is set to drive the economy. Given that the correct policies are implemented, a hard and slowing recovering economy will resuscitate. After all, the greatest multiplier effect on any other sector of the economy comes from the manufacturing sector. The growth of developing economies largely relies on how well the manufacturing sector performs and is structured in those nations. In the past centuries, the growth of economies that have made the move to high incomes regularly entails the significant growth of the manufacturing sector.

By a contrast of several nations' export summaries with their per capita GDP Hausmann et al. (2007) evidently confirmed that manufacturing exports remains prevalent among the nations with top per capita GDPs in the world with the exemption of predominantly high-income countries abundant in natural resources, like Norway, United Arab Emirates and Australia. In general, a strong relationship can be observed between nations categorized as high-income (Japan, Germany and the USA) and the biggest manufactured goods exporters; in contrast to natural-resource exporting lagging countries like Latin-American and African economies.

Loto, (2012) and Westkämper (2014) based on empirical studies debate that manufacturing is a sector of high export with reasonably higher salaries, a foremost driver for job creation in other sectors, which includes services, a significant source of investment in development and research.

Banjoko, Iwuji & Bagshaw (2012) mentioned that according to experience in developed and developing economies of India, China, North Korea, Singapore, and Malaysia a positive correlation exists in between the growth of manufacturing sector and the growth of national economies.

Boppart (2013) shows that rise in the manufacturing sector share in the economy prelude economic development. That economic growth is connected to important shifts in the sectoral output, job creation and consumption structure is the well-documented experimental fact.

2.3.2 Manufacturing Sector in Europe

Based on Eurostat (2017) report, 29.9 million were employed and more than 1 710 billion Euro of value added were generated in manufacturing sector in 2014. Using these measures, manufacturing was NACE's second-biggest section within Europe's non-financial business economy in terms of what it contributes in job creation (22.1 %) and the major contributor to non-financial business economy value added, which accounts for more than one-quarter of the total (26.0 %). Based on a report of the European Commission (2014), of late the European Commission has placed emphasis on the significance of the real economy, and robust industry as a driver of employment and economic growth. In its policy vision, the targeted input of industry to the growth of GDP by 2020 has been raised up to 20%. For Europe's competitiveness and economic recovery, a robust industrial base is seen as

fundamental. Some statistics underscores the present importance of industry in enhancing development and employment opportunities in Europe:

- Makes up to 17.3% of GDP (2015) in Europe in terms of value added;
- 80% of innovation and private research and focuses on it;
- 23.6% of European workers are employed in the sector and for every extra job, 0.5-2 jobs are created in other sectors;
- It's responsible for more than 80% exports from Europe, creating a surplus of €365 billion in the sales of manufactured products;
- Has a huge internal content of manufacturing exports, at about 85% of value added and extra complexity and sophistication than goods traded by most countries.

However, even though industry continues to provide a substantial contribution to the economy of Europe, this share has steadily declined. In the 2000s and in all of Western Europe the share of manufacturing in the gross value added has gradually declined. Germany is an exception however; manufacturing's share has more or less remained the same. This declining tendency is less significant in EU-13. Even though the diminishing significance of manufacturing can be as a result of the substantial contribution of the service sector to the GDP growth, in a few economies, it is as a result of weakening international competitiveness. Nonetheless, European economies are mostly transiting to the tertiary sector of the economy. Dasgupta and Singh (2006) argue that it is not an unexpected economic occurrence, because the regular outline of economic growth will culminate in service after manufacturing which comes after agriculture. Besides economies categorized as advanced trailed this path with one or two exemptions like India, hence emerging economies are also

following a similar path. Based on European commission for economic policy report (2017) on the trend of the past two decades, the contribution of value-added services to GDP in the EU grew in 1995 from 61.4% to 66.1% ten years later, whereas that of manufacturing dropped to 17.3% from 21% in the same period. For a number EU member states such as France, the Netherlands and the United Kingdom, value-added services contribution to GDP is now above 70% .The European Commission (2013) has recently underscored that at the European Union level, manufacturing "has a huge spill-over effect to other sectors of the economy - extra final demand in manufacturing gives rise to about half as much extra final demand in other parts of the economy".

The part manufacturing plays in the economy do not remain the same with time and it varies based on the country's stage of economic growth (McKinsey Global Institute, 2012). As a result, in advanced countries, manufacturing has the capability to stimulate trade, innovation and productivity growth. Europe and some other parts of the world have moved into a deindustrialization process (Dhéret & Morosi, 2014). Deindustrialization in advanced economies, which is given away by the incessant decline in manufacturing sector's contribution to job creation and the GDP as well as the increase in the contribution of service sector to the GDP, has not been generally seen as a negative incidence, but rather as an expected result in the process of economic development (Rowthorn & Ramaswamy, 1997).

Emilia Herman (2015) using statistical analysis of the Romanian economic data affirmed that the process of deindustrialization is demonstrated by the decrease in the share of manufacturing in job creation and GDP. Since the year 2000, the force of the process of deindustrialization decreased allowing manufacturing to continue as the

backbone of the Romanian economy. Moreover, the outcomes of his study revealed that, in the period 2008-2012, in Romania, the foremost pointers of manufacturing industry (GDP, the number of enterprises, employment etc.) underwent a bad trend as a result of the latest economic crisis. More than 50% of manufacturing value added and job are accounted for by four low and medium-technology manufacturing sub-sectors of the manufacturing sector ("Motor vehicles, trailers, and semi-trailers", "Basic metals & metal products", Food, beverage & tobacco"). Based on Manufacturing Institute (2012), Warren (2013) and the European Commission (2013), in Europe and in the USA the manufacturing industry is regarded as a significant source of development. Dhéret and Morosi (2014) stressed that presently, deindustrialization is no more seen as a normal course in economic growth. European Commission (2013) stated at the EU level, many believe that manufacturing sector needs to be relaunched in a bid to end the economic decline in the EU. In agreement and based on the Europe's Strategy 2020, the European Commission has set a target to increase the contribution of manufacturing to the GDP to 20% by 2020 from 15.6% (2011).

2.3.3 Investment

An investment is an item or asset which is bought due to the desire to appreciate or to generate profit in the future. From the economic view, investment is the action of purchasing some goods which are not consumed today, but they would be utilized in the future to generate wealth instead. Economic growth can be enhanced through the use of investments at any level of the economy. When a company acquires or constructs a new piece of equipment to raise the total number of outputs within the facility, the increased production can be conducive to improving the nation's Gross National Product (GDP). It also helps the economy flourish via increased production,

on the basis of previous equipment investment. Researchers have done many investigations to find empirical evidence about this relationship in various cases and time horizons, using different kinds of investments. A part of the related literature will be mentioned in this part.

Investment in equipment and machinery is strongly associated with growth, using the Penn World Table and the United Nations Comparison Project between 1960 and 1985 (De Long & Summers, 1991).

Blomstrom, Lipsey, and Zejan (1993) showed that an increase in the formation rate of fixed capital would cause a rapid growth in per capita GDP via using the simple causality by working on 100 countries.

Nazmi and Ramirez (1997) used another type of investment. They took public investment expenditure as a proxy and showed a significant and positive effect on the growth of the output. Equally, Gyimah-Brempong and Traynor (1999) found the same result. They denoted that capital as a factor of production has a positive effect on GDP.

Banister and Berechman (2001) argued that investment conditions can address additional economic development in the presence of economic and institutional conditions.

Colecchia (2002) denoted that investment in information and communication technology (ICT) contributes between 0.2 to 0.5 annual percentage points to

economic development by using data employed from the 1980s and 1990s in such countries, like Finland, Japan, Canada, France, United States, Australia, and Japan.

Choe (2003) discovered that economic growth as effect on FDI and vice versa by using FDI as a proxy for investment in 80 countries during 1971-1995. By looking deeper into results, we will see that the impact of growth on FDI is more apparent than the effect of FDI on growth. Additionally, Gross Domestic Investment (GDI) as another type of investment does not have any causal effect on economic development, while economic development strongly Granger-causes GDI. The data from the Sub-Saharan African countries showed a significant and positive effect of DI (Domestic Investment) on the development of the economy. The similar results are also shown in the study by Adams (2009) on the data during 1990-2003.

Podrecca and Carmeci (2010) found a dual-directional causal relationship between economic development and fixed investment for the 1960-1990 period in 104 countries. Didier and Reed (2014) found a positive effect of Agriculture Research & Development investment on economic development by using annual data of 57 developing countries during 1981-2010.

Kolmakov, Polyakova, and Shalaev (2015) showed that Venture Capital Investment (VCI) significantly affects GDP in Russia and US at a 4-6 lag on a yearly basis during 1998-2011. Ibrahim and Okunade (2015) denoted that the data of the years between 1980 and 2013 of Nigeria conveys a significantly strong influence of domestic and foreign investment on economic development in a long and short run.

Nasreen, Anwar, and Waqar (2015) showed that both human and physical capital investment has a positive impact on the growth of the economy via using data from 94 countries during 1985-2009.

Ali (2015) examined the effect of gross fixed capital formation on the economic growth in Pakistan using annual time series data from 1981-2014 and by using of Johansen Co-integration and Vector Error Correction Model (VECM) .The research revealed that there was a significant long-run relation between the gross fixed capital formation and economic growth.

Dritsakis, Varelas, and Adamopoulos (2006) empirically investigated the causality among economic growth, gross capital formation, exports, and foreign direct investments for Greece over 1960-2002 period using a multivariate autoregressive VAR model. The results of co-integration test submitted that only one co-integrated vector exists between the examined variables, whereas Granger causal relationship tests revealed a unidirectional causality between gross fixed capital formation and export, the unidirectional causal relationship also exists between economic growth and foreign direct investments.

2.3.4 Labor Force

For many years, the association between economic development and job creation has been one of the broadly researched topics in economics. The starting point of association between job creation and economic development is formulated by Robert Solow (Blanchard, 2000). The model organizes the connection between total output and the inputs in production. The Okun's law is based on the spirit of connection between job creation and economic development. It states that on the supply side for every 1% point of the rate of actual unemployment surpasses the natural

unemployment rate; real GDP drops by 2-3%. Regarding the importance of the effect of the labor force on economic, there are plenty of theoretical and empirical studies in the literature. On demand side, many empirical studies attempt to find the correlation between economic growth and employment in different nations.

William Seyfried (2011) examined the correlation between employment and economic growth (measured both by output gap and real GDP) from 1990 to 2003 in the biggest ten states. To estimate the employment strength of economic development as well as the timing of the association between economic development and employment, models were developed. Employment intensity was calculated to vary from 0.31-0.61 in particular states against the 0.47 estimate for the whole US. Likewise, results indicated that although economic development does have some direct effect on employment, its impacts remained for a number of quarters in most states examined.

Evangelista and Perani (1996) reported an indication that the reformation of key sectors of the economy reduces the relationship between economic growth and employment. Of all the G7 nations they examined (which excluded Canada), a significant and positive relationship exists between employment growth in value added was only reported for the US and Germany.

Boltho and Glyn (1995) investigated the correlation between economic growth and employment in a set of OECD economies. The results revealed that employment's intensity was 0.5 and 0.63 in the 1973 -1979 and 1982-1993 periods respectively while it was 0.49 in 1075-1982 periods. In this study the changes of elasticity clearly

shows that the relationship between employment and economic growth are affected by economic situation of each country.

2.3.5 Technology

For almost five decades, the association between economic growth and technology has been reported extensively in formal models. The first neoclassical models such as that of Solow (1956) assumed technological advancement to be an exogenous variable, demonstrating how economic development that is sustainable depends only on exogenous technological advancements. Technology was endogenized by Arrow (1962) assuming learning by doing and he indicated that it rose at a constant rate, and stated that economic development on the long-term critically hinges on the growth of population. Contributions that were significant were made in the 1960s by Uzawa (1965), Phelps (1966), Conlisk (1967, 1969) and Shell (1967) and others. They all associated technological advancement to a few descriptions founded on labor capitals dedicated to the improvement technological ideas and initiative. Conversely, the other current kind of models of the endogenous growth studies by Romer (1990), Grossman and Helpman (1991a, 1991b) and Aghion and Howitt (1992) believe that a continuous rise in the total resources expended on the development of innovative technologies results in a continuous rise in economic development.

Jones (1995a) gives a number of reasons for the conflicting correlation between the productivity growth and state of technology, identified in the literature as the productivity paradox. These justifications are in part motivated by a paper published by Romer (1987). The reasons are that some offsetting effect happens in the movement of other variables that perpetually impacts the growth of the economy, or that ongoing fluctuations in policies that ought to have a lasting impact on economic development, in fact, do not. After a long experimental analysis, Jones settles that

these justifications cannot be validated and that endogenous growth models are as a result varying from evidence provided by time series.

Chan and Yang (2005), Fu (2005), and Kim and Park (2006) argued that the overriding cause of high-income nations' trade patterns in technology-specific products is technological advancements and diffusion. The increase in technical abilities is as a result of technological advances, improvements, and creations that occurred in a series of nations on a number of fronts.

Azmat Gani (2009) examined the association between per capita economic growth in nations with advanced levels of technological success and high-tech exports. The panel regression results for 45 countries in the period of 1996-2004 shown that high-tech exports have a positive significant impact on the development of the technical leader category of nations and a statistically insignificant but positive impact on the potential leader category of nations.

Ayoub Yousef (2010) examined if information and communication technology (ICT) has facilitated the economic development and to what extent. For the period of 2000–2006, estimates of the growth model using time-series cross-country data of 62 countries and the result showed that economic development's influence of ICT varies across various income category of different economies. The study concludes that ICT has a key part to play in the growth of upper-middle and high-income clusters, but for the lower-middle income category, it doesn't contribute.

Sulaiman, Bala, Tijani, Waziri and Maji (2015) article examined the effect of technology and human capital on economic development in Nigeria. They used

yearly time series data for a year period (1975-2010) and used autoregressive distributed lag approach to co-integration to study the association between technology, human capital, and economic growth. The results of the study showed that human capital had a positive significant effect on economic development. In addition, it was revealed that technology also has a positive and significant effect on economic development. In conclusion, their study confirmed that technology and human capital are a significant contributing factor to development in Nigeria.

Aali Bujari and Venegas Martínez (2016) analyzed the effect of technical improvement on the growth of the economy of twelve Latin American nations in for the 1996-2008 period. For the examination, he came up with a dynamic panel data model and estimated with Generalized Method of Moments (GMM) system. Their examination revealed that in the Latin American region, technological innovation processes have a positive impact on economic development.

The effect of information and communication technologies (ICT) on the economic development of developed, emerging and developing economies was examined by Niebel in 2014. The examination was based on a sample drawn from 59 nations for the 1995 to 2010 period. Several panel data regressions confirmed the positive association between GDP growth and ICT capital. The regressions for the subsamples of developed, emerging and developing countries do not show any significant statistically variances of the output elasticity of ICT between these different groups of countries.

Jae Ho Cho (2007) investigated the impact of information technology on economic development in Korea. In his study, yearly investment series for three types of

software assets, communications equipment and computers were investigated. From the side of output, the outcomes revealed since 1995, IT output's contribution has to turn out to be a Korea's main source of GDP growth.

Martin Falk (2009) investigated the effect of the high-tech export on economic development. He calculated a growth model on panel data for 22 OECD nations in the period of 1980–2004.Employing the system GMM panel estimator that adjusts in case of simultaneity, he discovered that the share of high-tech exports and the intensity of R&D for business are positively and significantly linked to the GDP.

2.4 Hypotheses

Based on the above literature reviews it has been determined that manufacturing, investment, labor force and technology influence GDP in the long-term. Previous literature reviews also demonstrated that because of the deindustrialization phenomena, the impact of these factors on GDP has been changed. In this case, the following hypotheses have been proposed to account for the impact of each explanatory variable on GDP based on the majority results of previous studies:

H1: Manufacturing output has a statistically positive and significant influence on GDP.

H2: Investment has a significant and positive influence on GDP.

H3: Labor force has a significant and positive influence on GDP.

H4: Technology has a positive and influence on GDP.

Chapter 3

DATA ANALYSIS AND RESULTS

3.1 Methodology

3.1.1 Collection of Data

This sample's data has been collected from the World Bank database where the most recent and precise global development data containing over 800 indicators covering more than 150 economies are available. Twenty-five countries which are classified as Europe's most competitive economies (World Economic Forum, 2017) between 1995-2016 have been selected for this study. Moreover, the period was selected due to data availability for the chosen countries. As such, the sample includes 551 country-year observations.

3.1.2 Measurement of Variables

Due to dispersion of variables means and in order to transfer the data to more symmetric forms (normal distribution) the natural logarithm of variables has been used in this study, which shows the growth percentage in every unit of them. Furthermore, Real Gross Domestic Product (RGDP) has been taken as the proxy of an economy size which plays the role of the response variable in its aforementioned modified form. Additionally, manufacturing value added is used as indicator of manufacturing output (Szirmai & Verspagen, 2015), gross fixed capital formation (% of GDP), as a proxy for investment (Oburot & Ifere, 2017), employment (% of populations) as proxy for labor force (Wane & Vistrand, 2006), and high-tech

exports as a proxy for technology (Fagerberg, 1997; Mani, 2000; Lall, 2000; Kadeřábková & Srholec, 2001; Srholec 2006).

Table1 denotes an abbreviation of the variables and their final forms which are used in the model specification. The letter L indicates the natural logarithm of the variable.

Table 2: Summary of the Variables

Variable Name	Proxy	Abbreviation
Economic Growth	Real Gross Domestic Products (GDP)	LGDP
Manufacturing Output	Manufacturing Value Added	LMVA
Investment	Gross Fixed Capital Formation (% of GDP)	LGFCF
Labor Force	Employment Ration (% of population)	LEMP
Technology	High-Tech Exports	LHTE

3.1.3 Model Specification

The theory employed to explore the connection that exists between manufacturing output and economic development is combination of Kaldor first law and neoclassical growth theory. The current study discloses the impacts of four different variables on economic growth in twenty-five of Europe's most competitive economies. In fact, the LGDP is the dependent variable and other four independent variables are LMVA, LGFCF, LEMP, and LHTE. Accordingly, the model specification will be as follows:

$$\text{LRGDP}_{it} = \beta_0 + \beta_1 \text{LMVA}_{it} + \beta_2 \text{LGFCF}_{it} + \beta_3 \text{LEMP}_{it} + \beta_4 \text{LHTE}_{it} + \varepsilon_{it}$$

In which *i* ranges from 1 to 25 are the number of each country, and *t* is the years between the periods of 1995-2016.

3.1.4 Data Analysis

In this study, first of all, descriptive statistics has been analyzed. After that, correlation analysis and VIF test have been conducted to uncover the correlations and see whether multicollinearity exists among the variables. In addition, the Unit Root Test is used to see if the data is stationary which shows that the mean, variance and covariance of each variables has not been changed over time . To estimate the correlation between variables, the Ordinary Least Square (OLS) regression method has been used. In order to establish that no connection exists between the individual effect and any variables as dependents, random effects model is employed. In addition, to examine the differences in the intercept, the fixed effects model has been conducted. Finally, the results of OLS, random effects model and fixed effect model have compared with each other based on the Hausman test result.

3.2 Results

3.2.1 Descriptive Analysis

Descriptive statistics provide a general overview of the data, and it is depicted in the following table via E-views software. The table below (Table 2) contains results which make it easy to interpret and understand the analysis.

Table 3: Descriptive Statistics

	Observation	Mean	Median	Minimum	Maximum	Std. Dev.
LRGDP	550	26.075	26.233	21.725	28.961	1.704
LMVA	550	24.043	24.304	20.612	27.404	1.992
LGFCF	550	3.0812	3.0833	2.4342	3.6481	0.179
LEMP	550	3.9628	3.9815	3.5723	4.1820	0.124
LHTE	550	21.286	22.578	13.683	26.020	4.930

Here, 550 observations were employed in this thesis for all the variables in the results provided above. According to the table, all variables' mean, median are positive. The maximum and minimum standard deviations (Std.Dev) are 4.93 and 0.12 respectively.

3.2.2 Correlation Analysis

This examination is done to investigate the correlation between the variables which are LGDP, LMVA, LGFCF, LEMP, and LHTE. Pearson correlation coefficients are calculated to study the connection among these variables as shown in Table 3.

Table 4: Pearson Correlation Matrix

	LGDP	LMVA	LGFCF	LEMP	LHTE
LGDP	1.000				
LMVA	0.833	1.000			
	(0.000)***				
LGFCF	-0.052	0.001	1.000		
	(0.216)	(0.979)			
LEMP	0.239	0.132	0.256	1.000	
	(0.000)***	(0.001)***	(0.000)***		
LHTE	0.669	0.549	0.233	0.431	1.000
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

The result of the correlation matrix demonstrates that the connection among LGDP as dependent variables with three of the independent variable is significant. The correlation between LGDP with LMVA, LEMP, and LHTE is positive and significant. On the other hand, LGFCF has a negative and non-significant association with LGDP. The highest association is between LGDP and LMVA which is at 83 %. Also LHTE correlation with LGDP is high at 66 %. LEMP has the lowest correlation between independent variables with LGDP which is 23 %.

3.2.3 Multicollinearity

The connection between independent variables is a sign of multicollinearity problem. For investigation whether there is multicollinearity problem between explanatory variables or not, the tolerance and variance inflation factor (VIF) have been employed. The table below (Table 5) depicts the results of these tests.

Table 5: Multicollinearity

	Tolerance	VIF
LMVA	0.756	1.153
LGFCF	0.965	1.036
LEMP	0.593	1.552
LHTE	0.454	1.334

In the most cases, the VIF is used in the regression analysis to determine the extent of multicollinearity of an explanatory variable through the other explanatory variables, quantifying the level of multicollinearity. It determines the level of growth in variance of an estimated regression coefficient as a result of collinearity and for tolerance, it is reversed (Gujarati & Porter, 2009, p. 340). According to Kutner, Nachtsheim, and Neter (2005;p. 409), if the VIF exceed 10 or the tolerance surpasses 1, there is a sign of multicollinearity. As it is shown in Table 6, VIF for all variables is around one. On the other hand, tolerance for all variables is less than 1 which shows that there is no multicollinearity problem.

3.2.4 Unit Root Test

In this study, various unit root tests for panel framework data are used. These tests are the unit root test developed by Levin, Lin, and Chue (2002) as well as by Im, Pesaran, and Shin (2003) hereafter, IPS, Fisher-PP and Fisher-ADF. Moreover, the level of integration of the time series will be determined. The output is shown in Table 5. Clearly, it has been disclosed that some variables such as LRGDP, LMVA, LEMP, and LGFCF are not stationary in their levels, while they are stationary in their first difference level. In addition, LHTE is stationary both in their level and first difference level.

Table 6 : Unit Root Tests

	Level				*First Differences*			
Statistics	Levin, Lin & Chu	Fisher-ADF	Fisher-PP	IPS	Levin, Lin & Chu	Fisher-ADF	Fisher-PP	IPS
LRGDP								
Statistic	-6.203	61.615	133.820	-1.479	-9.423	138.084	155.656	-7.008
Prob.	0.000 (***)	0.125	0.000 (***)	0.069 (*)	0.000 (***)	0.000 (***)	0.000 (***)	0.000 (***)
LMVA								
Statistic	13.309	63.646	355.594	-1.536	63.785	204.206	570.645	-10.535
Prob	1.000	0.093 (*)	0.000 (***)	0.0632 (*)	1.000	0.000 (***)	0.000 (***)	0.000 (***)
LGFCF								
Statistic	-2.195	61.838	46.736	-1.704	-8.611	171.503	202.711	-8.605
Prob	0.014 (**)	0.121	0.605	0.044 (**)	0.000 (***)	0.000 (***)	0.000 (***)	0.000 (***)
LEMP								
Statistic	-3.708	75.966	55.023	-2.698	-4.660	111.335	170.407	-5.409
Prob	0.000 (***)	0.010 (**)	0.290	0.003 (***)	0.000 (***)	0.000 (***)	0.000 (***)	0.000 (***)
LHTE								
Statistic	-5.735	84.416	79.960	-2.626	-7.744	149.231	282.719	-7.631
Prob	0.000 (***)	0.001 (***)	0.004 (***)	0.004 (***)	0.000 (***)	0.000 (***)	0.000 (***)	0.000 (***)

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

3.2.5 OLS Regression

Pooling the data together and running a regression based on Ordinary Least Square (OLS) is the first method performed on the data to extract the sign association that may exist between the variables. In fact, LGDP as a dependent variable has been taken to check its association with regard to other variables in this analysis. Table 6 depicts the results of OLS regression model to identify the association between dependent and independent variables.

Table 7: OLS Regression

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
Constant	12.81796	1.571452	9.6424554	0.0000(***)
LMVA	0.454699	0.034588	10.657438	0.0400(**)
LGFCF	-1.868048	0.202577	-7.625738	0.0020(***)
LEMP	0.537471	0.475515	3.1525414	0.0220(**)
LHTE	0.162319	0.008774	12.882541	0.0000(***)
R^2	0.557117	F-statistic	420.0425	
Adjusted R^2	0.555482	Prob(F-statistic)	0.000000(***)	

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

According to the results, all the variables are strongly significant at the 1% and 5% confidence level. While all variable effect the economic growth in a positive direction, the gross fixed capital formation (LGFCF) influences the economic growth in opposite direction among them.

The specification model based on this analysis will be:

$$LGDP_{it} = 12.81 + 0.45LMVA_{it} - 1.86\ LGFCF_{it} + 0.53\ LEMP_{it} + 0.16\ LHTE_{it} + \varepsilon_{it}$$

Based on the output depicted in Table 6, a 1 % increase in the rate of the Gross Fixed Capital Formation causes nearly 1.86 % decreases in economic growth. In contrast, other significant variables have a positive impact on economic growth such that a rise of about 1 % in them will cause economic growth to augment almost 0.45 % by manufacturing value added (LMVA) and 0.53 % by employment (LEMP) and 0.16 % by high-tech export (LHTE). The output also shows the F-statistic of nearly 420.0425 and its p-value equal to zero which implies the strong significance of the overall model.

3.2.6 Fixed Effects Model

The table 7 below displays the outcomes of fixed effect models from the dependent variable, LGDP, and independent variables, like LMVA, LGFCF, LEMP and LHTE. The overall results are similar to the OLS's model.

Table 8: Fixed Effects Model

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
Constant	18.64542	0.452144	38.52022	0.0000(***)
LMVA	0.061542	0.008141	6.935021	0.0300(**)
LGFCF	-0.132541	0.082411	-4.190071	0.0215 (**)
LEMP	1.786124	0.263328	7.221468	0.0000(***)
LHTE	0.028712	0.003414	8.025044	0.0000(***)
R^2	0.471215	F-statistic	2467.287	
Adjusted R^2	0.572426	Prob(F-statistic)	0.000000(***)	

Note: * = Significant at 10%, ** = Significant at 5%, *** = Significant at 1%.

Based on the fixed effects estimation model, the resulting equation is as follows:

$$LRGDP_{it} = 18.64 + 0.06LMVA_{it} - 0.13LGFCF_{it} + 1.78LEMP_{it} + 0.02LHTE_{it} + \varepsilon_{it}$$

Based on the output in the preceding table, the effects of manufacturing value added (LMVA), employment ratio (LEMP) and high-tech export (LHTE) are positive, while the impact of gross fixed capital formation, is negative. Based on this analysis, the change in the rate of economic growth is about 0.06% by manufacturing value added in terms of every 1 % rise in the independent variables. Equally, this rate is 1.78 % by employment ratio, 0.02% by high-tech export and -0.13 % by gross fixed capital formation. Meanwhile, the p-value for the overall test in the total model denotes that it is generally significant.

3.2.7 Random Effects Model

The first panel of Table 8 revealed the association that exists between the various variables, in which the LRGDP is the dependent variable. The same is true for the essence of the nexus among the variables in the random effects model. Except for the negative effect of gross fixed capital formation (LGFCF) all other variables have positive impact on economic growth.

Table 9: Random Effects Model

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
Constant	17.54211	0.687455	35.98972	0.0000(***)
LMVA	0.088584	0.006100	9.685414	0.0060(***)
LGFCF	-0.311254	0.061872	-4.88012	0.0001(***)
LEMP	1.681241	0.168541	9.368807	0.0000(***)
LHTE	0.039612	0.003128	8.397451	0.0000(***)
R^2	0.375217	F-statistic	38.31458	
Adjusted R^2	0.376375	Prob(F-statistic)	0.000000(***)	

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

The initial equation is as follow, according to the random effects estimation model:

$$LRGDP_{it} = 17.54 + 0.08LMVA_{it} - 0.20LGFCF_{it} + 1.68\,LEMP_{it} + 0.01\,LHTE_{it} + \varepsilon_{it}$$

Indeed, this method demonstrates a 0.08% increase for every 1% increase in the rate of manufacturing value added, while the increase rates is about 1.68% and 0.01% in terms of every 1% increase in the employment ratio (LEMP) and high-tech export (LHTE) respectively. In contrast, the gross fixed capital formation has a negative influence on the rate of economic growth which is about -0.31% in terms of 1% rise in this variable.

3.3 Comparison of models

Table 9 shows the pooled OLS findings of GDP with different independent variables and their correlations. In addition, fixed and random effects estimation models are presented.

Table 10: Comparison between OLS, Fixed, and Random Effects Model

	Dependent variable: *LGDP*		
Independent variables	OLS	Fixed effect	Random effect
Constant	12.81796	18.64542	17.54211
	(0.000)***	(0.000)***	(0.000)***
LMVA	0.454699	0.061542	0.088584
	(0.040)***	(0.030)***	(0.006)***
LGFCF	-1.868048	-0.132541	-0.311254
	(0.002)***	(0.021)***	(0.000)***
LEMP	0.537270	1.786124	1.251219
	(0.020)***	(0.000)***	(0.000)***
LHTE	0.162319	0.028712	1.681241
	(0.000)***	(0.000)***	(0.000)***
R^2	0.557117	0.471215	0.375217
Adjusted R-squared	0.555482	0.472426	0.376375

Note: *Significant at 10%, **Significant at 5%, ***Significant at 1%.

In the regard to the all these three regression models, all of the explanatory variables consist of LMVA, LGFCF, LEMP, and LHTE have a significant relationship with LRGDP. Therefore, it can be concluded that based on this research they do have an effect on LRGDP. The sign of dependent variable and other explanatory variables are same in these three estimation model and but the value of the coefficients are different.

Based on the OLS and random effects model GFCF has a negative association with GDP at the 1% significance level. Furthermore, fixed effects model also indicates that GFCF is negatively association with GDP at 5% significant level. Furthermore,

according to OLS regression and fixed effect models, MVA is positively associated with GDP at the 5% significant level. MVA has a positive relationship with GDP at the 1% significant level based on random effects model. Regarding the three regression models, the employment ratio has a significant positive association with GDP at the 99% confidence level in OLS, random effects and fixed effects models. In addition, based on the three regression models HTE is correspondingly positively associated with GDP at the 99% confidence level.

3.3.1 Hausman Test

The Hausman test has been employed to choose the best model between the random effects model and the fixed effects model. The result is presented in Table 10. Indeed in this test, the null hypothesis is such that the fixed effects model is the best one, due to the fact that it is rejected at the 5% confidence level based on the p-value of nearly $p < 0.000$.

Table 11: The Hausman Test

Summary of Test	Chi-Sq. Statistic	d.f.	Prob.
Cross-section random	419.338384	4	0.0000

As a result, the Hausman test denotes the validity of fixed effects model. Finally, based on the fixed effects model results LMVA, LGFCF, LEMP, and LHTE have an impact on LRGDP.

Based on the output in the preceding table, the effects of manufacturing value added (LMVA), employment ratio (LEMP) and high-tech export (LHTE) are positive, while the impact of gross fixed capital formation, is negative. Based on this analysis, the change in the rate of economic growth is about 0.06% by manufacturing value

added in terms of every 1 % rise in the independent variables. Equally, this rate is 1.78 % by employment ratio, 0.02% by high-tech export and -0.13 % by gross fixed capital formation. Meanwhile, the p-value for the overall test in the total model denotes that it is significant.

In this specification, a significant positive influence is exerted on the GDP by the manufacturing value added (MVA) at the 5% significance level. Because of this reason, H1 is accepted. This is consistent with many preceding scholars (e.g. Fagerberg & Verspagen, 1999; Gregory, 2006 ; Hausmann et al., 2007; Oyati, 2010; Lavopa & Szirmai, 2012; Banjoko, Iwuji & Bagshaw, 2012; Boppart, 2013; Labanio & Moro, 2013; Warren, 2013; Adugna, 2014; Szirmai, Verspagen, 2015 ; Naudé & Szirmai, 2016) but is inconsistent with a few earlier studies (e.g. Fagerberg & Verspagen, 1999; Szirmai, 2012; Herman, 2015).

For GDP, the gross fixed capital formation has a negative influence at the 5% significance level based on the result. Because of this reason, H2 is rejected. This is consistent with many preceding scholars (e.g. De Long & Summers 1991; Blomstrom, Lipsey, & Zejan, 1993; Nazmi & Ramirez, 1997; Gyimah-Brempong & Traynor, 1999; Banister & Berechman, 2001; Adams, 2009; Podrecca & Carmeci, 2010; Kolmakov, Polyakova, & Shalaev, 2015; Gulzar Ali, 2015; Hong, 2016) but is not consistent with some of the previous studies (e.g. Dritsakis, Varelas & Adamopoulos, 2006; Eren & Zhuang, 2015; Darma & Ali, 2016).

Employment ratio (EMP) has a positive significant influence on GDP but at the 1% significance level. As such, H3 is accepted and it is in harmony with many earlier studies (such as Padalino & Vivarelli, 1997; Walterskirchen, 1999; Seyfried, 2005)

but not in accordance with some preceding scholars too (e.g. Pianta, Evangelista & Perani, 1996; Pini, 1997).

Likewise, high tech export (THE) has a positive significant impact on GDP at 1% level of significance. Thus, H4 which depicts that there is a positive significant association between HTE and GDP is accepted. This is consistent with many preceding scholars (e.g. Romer, 1990; Grossman & Helpman, 1991a, 1991b; Aghion & Howitt, 1992; Chan & Yang, 2005; Fu, 2005 as well as Kim & Park 2006; Gani, 2009; Falk 2009)

Chapter 4

DISCUSSION & CONCLUSION

4.1 Discussion

The study's goal is to probe the dynamics influencing economic growth in 25 of most competitive economies in Europe. The accelerating process of deindustrialization, due to the economic and financial crunch of 2008-2009, underscored the susceptibility of the European industry, particularly the manufacturing sector. Therefore, it's an imperative need to find other means of economic development (Dhéret & Morosi, 2014). A World Economic Forum Report emphasized that manufacturing is considered essential to the wealth of nations as more 70% of 128 nations' income differences are accounted for by variances in the export data of product manufactured (World Economic Forum, 2012). Based on Eurostat (2017), manufacturing was the second biggest economic sector (within Europe's non-financial business economy) of the NACE sections in Europe as per its biggest contribution to non-financial business economy value added and job creation. This topic has not been considered among the most competitive economies in Europe so far. However, managing economic growth and its determinants, specifically the manufacturing sector, is fundamentally important in every country. Therefore, this thesis is an interesting area for research.

Twenty-five top European economies in the global competitive index have been chosen to specify the factors which affect the economic growth during 1995 - 2016.

Furthermore, Gross Domestic Product (GDP) has been taken as the dependent variable, and MAV, GFCF, EMP, and HTE are the independent variables. Thus, different regression models, such as OLS, fixed effects model, and random effects model are run to achieve the thesis' goal. Additionally, the Hausman tests have been employed in determining the model that is most appropriate between the random effect model and the fixed effects model. The corresponding results specified that the random effects model is outperformed by the fixed effects model. As a result, it is explored that the explanatory variables that have significant effects on economic growth.

4.2 Conclusion

According to the empirical results, the relationship between manufacturing value added and economic growth is significantly positive. It is applicable for policymakers, such that the manufacturing output attributes to an upside trend in economic growth, due to the fact that this nexus is not almost one to one; that is, in terms of a 6 % percentage rise in the manufacturing value added rate, the rate of increase in economic growth is about 1%. Therefore, they will be able to raise the level of economic development and enhancing European countries' competitiveness by increasing the manufacturing value added. Unfortunately, there is a significantly negative effect on economic growth (dependent variable) by investment which shown by gross fixed capital formation in the model. After the financial crisis 2009 most of European countries reduced their domestic investment level (Ksantini & Boujelbène, 2014) and the European Commission debated over more investment in order to accelerate the recovery process of economic growth (European Commission report, 2009). The effects of those funds and increase in financial costs had a negative effect on economic growth (Andrade & Duarte, 2017). This negative effect

is known as Dutch Disease which implies the causal relationship between the development of a specific sector and a decline in other sectors .Actually, the expansion of a sector (e.g. natural resources or truism) can play an important role in enhancing total foreign exchange earning which causes depreciation of domestic currency. Consequently, other sectors become less competitive in international market and the export level of country decrease which can affect the GDP negatively .Furthermore the conducted research indicates that for countries that joined the European Union in the last years, the intensified investment process triggered an increased demand for working capital, due to the undercapitalization of companies during the transition period. At the same time, the greater demand for working capital could also be a result of a lower efficiency in using the production factors in comparison with West European countries (PAVELESCU, 2008). It clearly shows that policy makers should focus on investment policies to increase physical assets for recovering economic development in future. Moreover, the other two explanatory variables, labor force, and technology, denotes a significantly positive growth effect on the economy. It shows that the government should decrease the unemployment rate by creating new job opportunities by several ways such as cutting tax rate, reducing prices, increasing employee salaries and wages, hiring workers directly and etc. in order to accelerate the economic growth. In addition to technology, effective investment and stimulus policies in the technology and innovation sector will help the countries to enhance the rate of economic growth. Of late, an emphasis has been placed on the role of a robust industry and real economy as a drive for employment and economic development by the European Commission.

4.3 Implication

Based on result of this study we know that industrialization acted as an engine of growth in Europe's competitive economies during the past decade. According to future European Commission objectives, the policies should now focus on the modalities by which industrialization takes place and, in particular, on the drivers of this process. It is recommended that policy makers should invest in those policies that can enhance the growth of the manufacturing sector by increases of manufacturing productivity and increases in the manufacturing employment share to create new job opportunities in this sector in order to have sustainable, healthy and competitive economic development in future. In other words, structural change towards the manufacturing sector and increased manufacturing productivity are the key policy variables to be prioritized by policymakers (Cantore, Clara, Lavopa, & Soare, 2017). Based on results and positive role of technology growth on economic development, the European Commission should design the policies in order to open the doors for inventors and entrepreneurs by legislating incentive laws for registering new ideas, localize the inventions, monitoring the innovation policies and legislating new policies (Firth & Mellor, 1999; Borrus & Stowsky, 1997). With regards to the negative effect of investment on economic growth in third biggest economic region in the world, it implies that not only the amount of fixed investments plays a significant role in countries' development process but also the structure of investment across economic activities matters as it affects the rates of economic growth (Tvaronavičius & Tvaronavičiene, 2008). The European Commission structural changes has focused more on investing in small markets (economic of scale) and according to this point that in the European economic region larger markets seem to attract capital of all types of sectors with a more even relative

allocation (Stirböck, 2002), it might be more effective for European Union to allocate more expenditure to invest in large markets as well. Furthermore, main role in compounding parts of fixed investment in Europe region is being attributed to equipment and construction capital formation activities (Tvaronavičius & Tvaronavičiene, 2008). Thus, the policy makers should allocate more consideration to other sectors such as manufacturing in order to create a positive effect of investment on economic growth.

4.4 Limitation and Future of Study

The most significant restriction of this research is the lack of statistical data for the variables in selected countries before 1995. Another important limitation is that this study used only OLS regression which precludes the author from running a time series regression corresponding to each country so as to compare the connections that exist between the variables among cross-sections. Probably, future studies should focus on the other regressions models such as GMM (Generalized Method of Moments) dynamic model to make a comparison between the variables among cross-sections. Additionally, another limitation is that this study employed high-tech export as the proxy for technology. Again, future studies should focus on different types of technology proxies as well as different activities such as expenditure on Research and Developed (R&D) as a factor that might influence GDP.

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