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International Competitiveness in the European Monetary Union

The Case of Greece

TU Delft

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International Competitiveness in the European Monetary Union

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Master Thesis submitted to Delft University of Technology in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in **Management of Technology**

Faculty of Technology, Policy and Management

by

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Preface

"As technology is poised to play a key role in future productivity, I am deeply convinced that the MSc in Management of Technology is the ideal next step towards my occupying a leadership role in project management, enhancing my capability to forecast and assess technological change". With that phrase, two years ago, I completed the motivation letter which couple of weeks later gave me access to Delft University of Technology and a life altering journey started. The ambition of learning how to discover and shape the future is what accompanied me throughout this experience and as Socrates said "the secret of change is to focus all of your energy not on fighting the old, but on building the new".

In TU Delft I had the chance to build a new side of myself, beyond the technical, engineering knowledge I had acquired. I can recall my first "encounter" with the economic courses of the program where I was really charmed from the notions which derive from their concepts and saw its importance for the society. My strong interest in this field was expressed through my decision to follow the Economics and Finance specialization during the second year at this MSc. Dr. Servaas Storm was a great inspiration and increased my eagerness to learn more for this field, while my Greek origin and the experience of the financial crisis made me desire to understand the economic reality of my country. This Master Thesis embodies almost everything I was contemplating these years and attempts to bring in the foreground the importance of technology nowadays within an economically efficient framework. The existence of a stable and robust economic framework is also what, hopefully, will help to the recovery of the countries worldwide in the aftermath of the corona virus pandemic which we nowadays experience and is expected to hit the economic system harsher than the financial crisis of 2008.

At this point, I would like to express my gratitude to Prof. dr. C.P. (Cees) van Beers for his insights and comments on the econometric model of this study and his inspiring lectures on frugal innovation. Additionally, I would like to deeply thank Dr. Servaas Storm for the inspiration and the abundant knowledge and perspectives he imparted during his engaging lectures but also for the insightful and eye-opening discussions we had throughout the implementation of this project. I would also like to express my sincere appreciation to Dr. Udo Pesch for his contribution to my understanding of technology from a philosophical perspective through his lectures in the Technology Dynamics course and our discussions on effective policy orientation.

I really hope I will have the chance to work with all of you again in the future.

Delft, August 2020

Panagiotis Alexandros Sevdalis

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Executive Summary

In 2008, the Global Financial Crisis caused by the collapse of the U.S. financial system, had immense negative repercussions especially for the Eurozone countries. Albeit all Eurozone economies were badly affected by the global recession, the fall-out of the global crisis turned out to be quite different for the "economically healthy" economies of Northern Europe and "core" and the economies of the Southern "sick periphery", with the latter still suffering and trying to recover. The initial aspiration for the European Monetary Union (EMU) was to bring about macro-economic convergence between the Member States in terms of economic growth and strengthening of financial performance. Such convergence was expected to follow from the economic and monetary integration itself, because the 'lagging' countries of the EMU periphery would benefit from greater access to the internal Eurozone market and from the more eminent and cheaper availability of finance and capital (supplied by banks and investors in the core countries of EMU). Countries of the core of the EMU including Germany, Austria and the Netherlands continued to invest in manufacturing (high-tech) activities and services, whereas countries of the Eurozone periphery including Greece, Italy, Portugal and Spain focused more on the non-traded, low-tech sectors like real estate and tourism. Consequently, the latter group of countries has faced serious issues with their Balance-of-Payment (BoP) deficits which deteriorated with the onset of the crisis, when they almost defaulted on their sovereign debt. Economists stress that the existing asymmetries in trade and indebtedness among the countries constitute the main cause of the crisis and they single out differences in international (cost) competitiveness as the factor which has been driving the diverging trajectories between core and periphery countries.

Therefore, the strengthening of the international (cost) competitiveness of the periphery countries which were most forcefully hit by the financial crisis is considered as a necessary condition for them to recover and return to prosperity. However, the notion of international competitiveness does not have a straightforward (operational) definition, because it has many dimensions and determinants of both a quantitative and more qualitative nature. The restructuring of the crisis-struck European economies started by almost exclusively focusing on the price/cost competitiveness of these countries and this was followed by the implementation of fiscal consolidation and internal devaluation policies. The rationale behind internal devaluation policies is that by decreasing a country's unit labour costs, it would become more cost-competitive and consequently it would be able to increase its export performance and improve its BoP. Accordingly, the center of attention was turned to the reduction of wage growth (relative to labour productivity growth), rather than to structural improvements in the technological and productive capabilities and national innovation systems of the countries concerned. Greece was one of the countries which embraced these policies of internal devaluation and fiscal consolidation, under pressure of and cooperating with its European partners. Nevertheless, as is argued in this thesis, its economic performance afterwards did not justify this decision and the international competitiveness of the Greek economy was not increased in any structural manner.

The negative experience of Greece and other countries of the EMU periphery confirmed the perceptions of those economists who argued that a country could improve its international competitiveness in a meaningful and lasting way only through the development of its non-price/technological competencies and structural strengthening of its technological capabilities and national innovation system. Thus, this research investigates how the international competitiveness of EMU Member States is affected on the one hand, by its international cost/price competitiveness, and on the other hand by its technological competencies.

The thesis first scrutinizes the extent of divergence between twelve EMU countries in terms of unit labour cost and prices and in terms of non-price/technological competitiveness. We find that unit labour costs and prices did not substantially diverge between the EMU countries; this suggests that trade imbalances cannot be explained by diverging international cost competitiveness. On the other hand, significant indicators, considered as determinants of a country's technological competencies, indicate the existence of considerable divergence in non-price or technological competitiveness between EMU countries. In particular, countries of the EMU core are more specialized and engaged in manufacturing and innovation-related activities than those of periphery. This is expressed also when elaborating the value-added per sector for the two group of countries and is finally characterizing the existing export regime within EMU.

To investigate further the contribution of either price/cost or technological variables to the international competitiveness of an EMU country, this study uses an econometric model which operationalizes a country's international competitiveness either in terms of a country's export growth or as its export market share in the EMU exports and examines its causal connections with price/cost or technological variables. Additionally, the research examines the influence of a country's institutions and of political (in-)stability on international competitiveness in order to provide conclusions which concern the wider framework of a country.

The results of the econometric model quite strongly suggest that the international competitiveness of an EMU country is not affected (in a statistically significant manner) by its (relative) unit labour costs, but by its technological competencies (for the period of observation 2001-2018). We also observe (based on our econometric analysis) that the operation of institutions and political (in-)stability do exert a statistically significant effect on a country's performance when it attempts to improve its competitiveness. Based on these econometric findings, we can understand why the implemented policies (internal devaluation and fiscal consolidation) were not effective in improving the international competitiveness of EMU countries in general and Greece in particular, and these insights help us to delineate the (policy) direction that should be followed by countries in a similar predicament.

Greece constitutes a relevant example of those countries which experienced a failure of the abovementioned implemented policies. The results of this study provide the country a policy-orientation, based on long term structural changes and developments which intent to strengthen its international competitiveness and export performance in alignment to the utilization and deployment of its productive and technological capabilities.

Keywords: International Competitiveness, Technological Capabilities, EMU Crisis, Convergence in EMU

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List of Abbreviations

Abbreviation	Definition
AIA	Athens International Airport
BoP	Balance of Payments
CIP	Competitive Individual performance Index
EAP	Economic Adjustment Program
ECB	European Central Bank
EIS	European Innovation Scoreboard
ELVO	Hellenic Vehicle Industry
EMU	European Monetary Unification
EU	European Union
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
GSII	Global Summary Innovation Index
HAI	Hellenic Aerospace Industry
HFE	Hellenic Federation of Enterprises
ICT	Information and Communication Technology
IMF	International Monetary Fund
MIP	Macroeconomic Imbalance Procedure
MOT	Management of Technology
OECD	Organization for Economic Cooperation and Development
OSE	Hellenic Organization of Railways
PMR	Product Market Regulation
PPC/DEH	Public Power Corporation
PPP	Public-Private Partnership
RCA	Revealed Competitive Advantage
R&D	Research and Development
SGP	Stability and Growth Pact
SMEs	Small and Medium Enterprises
S&T	Science and Technology assessment
SII	Summary Innovation Index
UCC	Unit Capital Cost
(R)ULC	(Relative) Unit Labour Cost
UNIDO	United Nations Industrial Development Organization
VAT	Value Added Tax

Chapter 1. Introduction

"My revenge is fraternity! No more frontiers! The Rhine for everyone! Let us be the same Republic, let us be the United States of Europe, let us be the continental federation, let us be European liberty, let us be universal peace!"

Victor Hugo

1.1. Maastricht Treaty: A unified aspiration

Union originates from the Latin word "unionem" and it refers to the oneness that occurs as the result of joining more than two things into one and function as undivided. Nowadays, this word is used to declare alliances, partnerships and cooperation among people, associations, institutions, firms and countries. In contemporary times, the European Union (EU) constitutes perhaps one of the most recognizable and important examples of an existing political, economic and monetary union. The first steps in the process of European Unification were initiated back in 1950 as a trade agreement among 6 counties is currently comprised by 27 countries with the aspiration to increase even more. Almost three decades ago (1992), European leaders signed the Treaty for European Union, known as the Maastricht Treaty aiming to deepen the integration process that started in 1950 and introducing a common currency (the euro).

The Maastricht Treaty brought together countries with different economic structures and levels of technological capabilities under the umbrella of the common European institutions and is considered as pioneering since it encompassed the notion of monetary integration. It initiated a substantial change since it signified the transfer of national competencies to a supranational, European level (Hooghe & Marks, 2009), and stressed the necessity for a European public sphere (Barth & Bijsmans, 2018). The prospect of European **Economic and Monetary Unification** (EMU) constituted a process that was based on no historical precedent as there did not exist a similar union before in a national scale (Eichengreen, 1993). EMU would transform European economy and the economies of each Member State individually by bringing the benefits of "greater size, internal efficiency and robustness" as European Commission mentions in its latest reports (2019). The main intention was to lead the way towards opportunities in stabilizing economies, increasing growth and reducing unemployment which would provide significant benefits to EU citizens. The prospect of EMU contained in theory the intention of economic policy coordination among Member States, the alignment of fiscal policies through limiting government debts and deficits, an independent monetary policy-run body, namely the European Central Bank (ECB), the supervision of financial Institutions within the union and most importantly a single currency (European Commission, 2019).

EMU was never intended to work as an end but as a means for improvement of EU citizens lives by providing stability and strong and sustainable growth for its Member states. As a matter of fact, the main operations of EMU were to ensure the implementation of an effective monetary policy with a common currency within euro area, the coordination of economic and fiscal policies of EU countries and the maintenance of a functional integrated common internal market (European Commission, 2018b). When referring to monetary policies, EMU could influence the interest and exchange rates by the ECB. National governments of Member States still control the fiscal policies in regard to their government budgets or the tax policies that ensures their incomes and the structural policies related to the labour and capital market regulations. Within EMU, all countries should coordinate their economic and fiscal measures considering the common objective of stability and growth (European Commission, 2018b). Taking this into consideration, the Maastricht Treaty included the Stability and Growth Pact (SGP) in order to enforce fiscal discipline among Member States. SGP impose to EU Member States to maintain a national debt below 60% of their gross domestic product (GDP) and a budget deficit of less than 3% of their GDP. Member States should submit an SGP report which is assessed for compliance from the EU Commission and the Council of Ministers and in case any country exceeds the debt limits, it should then provide a clear roadmap for its reduction in order to avoid incurring penalties.

When referring to the initial plans and ambitions it is clear that the Maastricht Treaty comprised the most significant decision for EU Member States and would have the most profound impact for the future development of European integration (European Council, 2020). However, EMU Member States were hit hard by the financial crisis of 2008-09, which revealed the vulnerability of the common currency conception and stressed their diverging paths (Botta, 2014). In fact, the vision of a monetary union and the usage of the common currency managed to mask many of the macroeconomic imbalances among member states due to the initial high growth performance (Storm & Naastepad, 2015).

1.2. EMU: Member States with diverging growth paths

Architects of EMU truly envisaged a converging trajectory towards growth for its Member States while introducing a single currency. Among the lines of the Maastricht Treaty it is clearly stated that the monetary union would try to promote " a harmonious balanced development of economic activities" which would occur through " a high degree of convergence of economic performance (…) and economic and social cohesion and solidarity among Member States" (Council of the European Communities, 1992). Convergence was defined as the precondition and the subsequent consequence of the monetary integration (Brülhart, 2001).

After the introduction of the common currency, Euro, the policy concern about convergence began to decline and it was replaced in policy-makers minds by notions like growth and increasing financial performance. Capital inflows, after the monetary integration enhanced substantially these notions while core (Germany, Austria, Netherlands) and periphery (Greece, Italy, Spain, Portugal) EU countries were significantly benefited, expanding rapidly their economies (Caldentey & Vernengo, 2012). Alberto Botta (2014) highlights that in some

cases periphery countries grew much faster than central economies, cultivating the sense of a potential center periphery macroeconomic convergence. However, according to him that was just a faulty assessment of the factors that influenced the economic performance of these countries and there was no convergence either in a structural or a competitiveness sense.

In fact, growth rates and economic expansion, have hidden the different paths that were taken by core and periphery countries. Particularly, core countries decided to use the EMU capital inflows to finance manufacturing (high-tech) activities, while periphery countries followed (in a way) their static comparative advantage by investing in the non-traded low-tech sectors which generated higher returns than other more technologically progressive activities (Pradhan, Arvin, Hall, & Nair, 2016). The inability of periphery countries to handle the big initial capital inflows in some cases led to asset price inflation and financial bubbles. Spain, Greece and Portugal were focusing on investing in tourism and the (non-traded) construction sector instead of building up their productive capacities and technological competencies in export-oriented industries (Midelfart, Overman, Redding, & Venables, 2004). The consequences are clearly illustrated in the data of Eurostat regarding balance-of-payments (BoP) where comparing core and periphery countries there is an obvious opposite trend. Periphery countries were diving into BoP deficits whereas core countries were either reducing them or had surpluses.

This led to serious repercussions which were revealed with the outbreak of the financial crisis of 2008-2009. It was back then when periphery countries almost defaulted on their sovereign debt, while core countries managed to reduce the impacts of this fatal hit. Germany functioned differently comparing to the other EMU countries as it had created a very strong base in high-tech and medium-tech industries (Storm & Naastepad, 2015). These differences among the countries clarify that asymmetries were enhanced within EMU. In addition, they constitute a significant explanation for the differing trajectories which core and periphery countries followed during the aftermath of the financial crisis as core countries recovered faster.

1.3. Eurozone Crisis: The result of accumulated asymmetries

The Eurozone crisis in 2008-2009 constituted a big shock with radical and very negative consequences for most of the Member States. According to Botta (2014), most economists described the crisis as a consequence of the benefits of the considerable and uncontrollable capital inflows, the worldwide financial dislocation that led to deep recession and forced national governments to bail out endangered private financial institutions and finally the loss of monetary sovereignty by EMU countries due to the increase of the sovereign debts. The last fact was deteriorated even more by the speculative attacks and capital “flights” away especially from indebted periphery countries.

The crisis in the USA in 2007-2008 constituted the external shock to the EMU countries and led to “imported” consequences for the Union and its Member States. However, it is undeniable that the abovementioned problems

originated also from the structural asymmetries between countries of core and periphery (Constantine, 2017). A closer look on the *Industrial Structure Reports* of European Commission suffice to see that periphery countries like Greece or Portugal have purely diversified productive and export structures focusing mostly on resource and labour intensive low-tech sectors that cannot contribute to the introduction of process and product innovation. Even in larger peripheral countries like Spain and Italy which have more diverse export and productive structures, it is illustrated that low-tech and less innovative sectors maintain a substantial share of their productive systems. On the contrary, EMU countries of the core like Germany, the Netherlands and Austria have followed a different path, focusing on the enhancement of diversified production and export structures. As a result, they demonstrated a comparative advantage in the medium and high-tech sectors that created the basis for long-term growth and innovation (Botta, 2014).

According to Eckhard Hein and co-authors (Hein, Truger, & Treeck, 2012), considering the finance-led nature of their growth process due to capital inflows growth and the abovementioned structural features, it is rational that periphery countries did not manage to control debt accumulation and violated the BoP constraints. All these asymmetries were revealed after the outbreak of the worldwide financial crisis where core countries reacted with an export-led recovery whereas periphery countries fell into recession. The consequences were unsustainable current account deficits and external debts for the periphery countries and high surpluses for the core (Storm & Naastepad, 2015). EMU tested its limits back then, but it was obvious that the stabilization of European economy could be guaranteed only with the reduction of the aforementioned trade imbalances between core and periphery countries.

1.4. Competitiveness: The driver back to prosperity

Economists have highlighted the existing asymmetries as causes of the crisis and argued that these imbalances should be reduced to ensure the stabilization of the economies of EMU Member States. The assumption from the aftermath of the crisis was simple- periphery countries should improve their BoP and reduce their deficits as fast as possible. This would be the only way to exit the vicious cycle they have entered, improve their economic performance and align to the same growth path. As economists stated, the relevant factor that illustrates the diverging trajectories of core and periphery countries is international competitiveness (Collignon, 2013).

International competitiveness constitutes a well-known and widely used term among economists. The term is frequently used in high-level (EU) policy reports, the media and discussions related to economic policies. Jan Fagerberg (1988) defined international competitiveness as the capability of a sovereign nation to reach its main economic policy goals, referring to increasing income and decreasing rate of unemployment, without facing balance-of-payments issues. However, after the financial crisis it had become obvious that core countries were having significant trade surpluses while periphery countries were running potentially hazardous trade deficits.

For many economists an increase of competitiveness would remedy the wounds of 2008-2009 financial crisis and would lead periphery countries back to growth.

Since the concept of international competitiveness is used to analyze a country's macroeconomic performance, economists could use it to explain the international trade trends by elaborating and comparing the salient economic features among different countries. However, this concept encompasses some qualitative factors that are not always (easily or at all) quantifiable. Martine Durand (1987) named some factors that could influence a country's trade performance positively like, the capacity of technological innovation, the level of product specialization, productivity growth, quality of the products involved and the level of after-sales service. However, according to Durand, these "structural" factors will not necessarily ensure the increase of the turnover on foreign markets. On the contrary these factors might look as improved throughout an exchange rate appreciation while on the same time the export performance remains unchanged. This reason and the inability to meaningfully and adequately measure the abovementioned factors in quantitative terms makes a lot of economists confine and measure competitiveness through the international cost/price differentials and specifically through the changes monitored in these measures (Fagerberg, 1988).

One of the measures that European Commission took after the financial crisis was to introduce the *Macroeconomic Imbalance Procedure* (MIP) in order to monitor "the real effective exchange rates and nominal unit labour costs" (Storm & Naastepad, 2015). These two indicators measure both price/cost competitiveness and consequently they provide alarming signals only if the imbalances are caused by a fluctuation (loss) of price/cost competitiveness. For many economists that was a measure in the right direction and it was sufficient to lead to the extrapolation of the right conclusions. As a matter of fact, policy makers and policy circles in Brussels, Frankfurt and Washington taking MIP into consideration, agreed that the countries of Eurozone periphery lost their competitiveness due to the disproportional increase of the unit labour cost (ULC) growth compared to their productivity growth (Storm & Naastepad, 2015). On the contrary Germany, Austria, Netherlands and Finland proceeded to domestic capabilities utilization and reforms, and succeeded by doing this, to improve unit-labour-cost competitiveness (Simonazzi, Ginzburg, & Nocella, 2013). As a result, they managed to maintain positive current account balance on the BOP and avoid the big trade deficits the periphery experienced. Other economists however promoted a different elaboration for the existing imbalances. In particular, they argue that the reduction of the international competitiveness of a country should not be measured through the price and costs but rather through its productive capabilities (Botta, 2014; Brülhart, 2001; Constantine, 2017; Storm & Naastepad, 2015). This brings back in mind what Durand named as structural factors and the necessity to quantify them. According to these economists, periphery countries should focus on increasing their technological (non-price) competitiveness by developing their productive and technological capabilities while cost/price competitiveness does not contribute substantially to this effort and on the contrary focus on that leads to internal devaluation, wage reductions and increase of unemployment (Collignon, 2013).

1.5. Existing Research Gap

EMU was expected to bring about balanced growth among EU countries assuring macroeconomic convergence that would lead to shared economic wealth and prosperity through common notions and without excessively intervening in member state sovereignty (European Commission, 2018a). Under the "umbrella" of common (monetary and fiscal) policies, joint members were supposed to proceed together enhancing their economies by eliminating government deficits and reducing public debts (Pradhan et al., 2016). However, the financial crisis revealed that this was not achieved in all EMU countries and the monetary union was not built on robust foundations (Regarding, 2017). Periphery countries like Greece, Italy and Portugal were compared to a bomb ready to explode due to the accumulated trade and government deficits and the inability of EU leadership to proceed with a common plan and a well-coordinated solution deteriorated the existing issues even more (Hein et al., 2012) Identifying the low international competitiveness of periphery countries as the main determinant of their vulnerability to the global financial crisis and aiming to reduce the trade deficits were steps towards the right direction. However, the situation was not elaborated in the right way, since economists and policy makers focused on improving competitiveness through policies of internal devaluation (which focused solely on lowering ULC and increasing cost competitiveness). These internal devaluations, in combination with fiscal austerity, did not help the crisis-hit countries to recover but exacerbated their situation (by weakening their already low international competitiveness) and led them into deeper recession (Collignon, 2013).

Among the periphery countries, Greece was one of those that faced greatly the repercussions of financial crisis. A large internal devaluation and hard austerity measures led to a big recession period from which Greek economy has still not completely escaped (Magoulios & Stergios, 2013). Although the measures aimed to increase the nation's international competitiveness by improving cost/price competitiveness, the results after the policies' implementation revealed more issues. The ECB, the International Monetary Fund (IMF) and the European Commission imposed strong austerity measures in order to bailout the Greek economy. They considered that wages had increased more than productivity before the crisis and that the Greek economy could become more cost-competitive and return to growth only by moderating them (Eleftheriadis, 2015). In line with this diagnosis, Greek ULC was reduced after 2009, but the internal devaluation had questionable results for the Greek economy. As a matter of fact, Greece still has not remedied its wounds from the catastrophic hit of the crisis, while it had to face the increased level of unemployment and households that could not afford their responsibilities due to the austerity policies (Eleftheriadis, 2015; Magoulios & Stergios, 2013; Massourakis, 2020).

Critics of this policy of internal devaluation argue that reducing wages will not automatically lead to a competitiveness recovery, but will likely help to maintain stagnation (Storm & Naastepad, 2015). For the supporters of this perception, competitiveness improvement and as a result trade deficit reduction depend on strengthening the productive capabilities of the countries (Vergara, 2018). This is something that, as the present literature review showed, core and periphery countries diverge on and played a very significant role to their

financial performance and debt accumulation. According to these economists, periphery countries should focus on restructuring their economies by rebuilding their technological (non-price) capabilities in order to escape from the vicious recession cycle they have entered (Andreoni, 2011). Narrowing this research to Greek economy which was forcefully hit by the crisis we will try to delineate those factors that affect the productive capabilities of the country the most and suggest ways to improve the current situation and increase wealth.

1.6. Research Question

Taking all the above into consideration the research problem can be summarized as follows:

"To what extent does the international competitiveness of firms in Greece and other Eurozone countries depend on (a) relative cost and price competitiveness, or on (b) relative technological and productive capabilities?"

The conducted literature review illustrated that there is no alignment among economists on the definition and measurement of the so called "international competitiveness" and as a matter of fact there is no consensus on the relative importance of cost/price drivers against the technological (non-price) capabilities. Taking these facts into consideration we could extrapolate some additional sub-questions which we need to address in order to tackle our research question. These sub-questions could be summarized:

1. To what extent did EU countries diverge in terms of price competitiveness?
2. How much did EU countries diverge in terms of technological capabilities?

Implicit in these sub-questions are two key questions concerning the conceptualization and measurement of competitiveness, namely:

3. How do we measure the price or cost competitiveness of an economy?
4. How do we operationalize a meaningful indicator of non-price technological competitiveness?

These sub-questions will be answered and elaborated throughout the main body of the thesis and will help us to discover additional actors that interact and would affect a country's competitiveness. In addition, they will facilitate us deploy our model including necessary variables in order to scrutinize the existing correlations and demonstrate valid research results.

1.6.1. Research Approach

The fulfillment of the research objective and the provision of an answer to the research question necessitates the implementation of a research based on two main steps. The first step includes the execution of an extensive literature review which will provide substantial insights and evidence for the existing structural differences and divergence on price competitiveness and technological competencies of the EMU countries (sample of the study), facilitating the reader to gain knowledge for the existing framework. Secondly, an econometric model

is built aiming to operationalize the notion of a country's international competitiveness while examining the influence of price/cost and non-price/ technological variables on it. Finally, the results obtained from the econometric model will be used to answer the research question. Table 1 below provides an overview of the research approach throughout this study.

	Research Question	Research Approach	Outcome
1	To what extent did EU countries diverge in terms of price competitiveness?	Literature Review & Statistical Analysis	Description of a country's level of price competitiveness and analysis of existing divergence/convergence
2	How much did EU countries diverge in terms of technological capabilities?	Literature Review & Statistical Analysis	Description of a country's level of technological capacity and analysis of existing divergence/convergence
3	How do we measure the price or cost competitiveness of an economy?	Literature Review & Econometric Analysis	Operationalization of price/cost competitiveness. Variables definition
4	How do we operationalize a meaningful indicator of non-price technological competitiveness?	Literature Review & Econometric Analysis	Operationalization of non-price/ technological capabilities. Variables definition
5	To what extent does the international competitiveness of firms in Greece and other Eurozone countries depend on (a) relative cost and price competitiveness, or on (b) relative technological and productive capabilities?	Econometric Analysis	The influence of price/cost & non-price/technological competitiveness to a country's international competitiveness

Table 1: Research Approach

In particular, the first two sub-questions will be elaborated further in Chapter 2 and 3, where it is conducted an extensive literature review and the available data are scrutinized in order to identify the existing framework and export patterns as far as price/cost and non-price/ technological competitiveness of a country is concerned. This is considered an essential step for the consolidation of the perception that countries diverge in certain economic activities. Furthermore, proceeding to the next Chapters and specifically the 4th, this study addresses the last two sub-questions defining the model that is adopted and the rational of the variables' selection. Finally, after collecting all those necessary insights from the abovementioned sub-questions, the research question of this study will be handled in the 5th Chapter of this study and after the elaboration of the econometric findings of the developed model.

1.7. Societal Relevance

EMU countries and specifically countries of periphery like Greece are trying to re-organize their policies and forecast as accurately as possible their economic performance, aiming to increase their wealth and assure prosperity for the future. Dealing with the unpredicted future, necessitates politicians and policy makers to take decisions in order to remedy wrong doings by proposing and implementing socially effective measures. Further lack of consensus in economic perspectives and misalignments would severely deteriorate the crisis-hit countries. As a matter of fact, it would be important to consider the difference in social efficiency when enhancing the international competitiveness of a country through improving cost/price relation versus updating its productive capabilities.

For EMU periphery countries like Greece, which suffered a deep recession and saw their economies stagnate after the implementation of austerity measures, elaborating a different way of growing international competitiveness could provide a roadmap out of their existing deadlock. By strengthening our knowledge on the conditions upon which international competitiveness could be enhanced, we can contribute to better (evidence-based) policymaking. In particular, if we find that wage reductions did not actually make the Greek economy more competitive but instead led to deeper recession (Magoulios & Stergios, 2013), and that international competitiveness depends more strongly on technological capabilities, then on that basis it will be possible to formulate economic (industrial and technology) policies to strengthen Greece's competitiveness in the medium to long run. Considering the repercussions that a wrong interpretation of economic reality can bring for society, this report aims to create a guideline to the right direction. Hence, by utilizing the output of this particular study, we aim to provide recommendations to EU policy makers and national governments in order to contribute to the specification of the most effective way to increase their country's competitiveness. Our literature review demonstrated that international competitiveness is considered a key issue for improving balance-of-payments and lowering trade deficits which is something that periphery countries suffered from. The research will focus, as already stated, on twelve EMU countries (split into core and periphery countries according to export share criteria) and (thereafter) especially on the case of Greece.

1.8. Academic Relevance

In the aftermath of financial crisis EMU countries are still trying to rebuild their economies. Economists have reconciled with the idea that trade deficits and an inability to adequately manage the balance-of-payments were the main reasons that led to the accumulation of such big imbalances. As the conducted literature review shows, economists and policy makers realized that competitiveness constitutes the main determinant of the abovementioned notions and they decided to proceed with developing policies that would focus on strengthening the international competitiveness of the severely hit periphery countries. However, although there is a large literature on 'international competitiveness', there is not an actual agreement on how to measure and

define “international competitiveness”. In addition, there is no consensus among economists and researchers, as it has been already discussed, on the relative importance of the cost/price drivers versus technological (non-price) capabilities.

Throughout the literature, the term of international competitiveness is used in the analysis of a country’s macroeconomic performance as it helps economists to compare many important economic features of a country and its trading partners (Martine Durand, 1987). The literature review shows that this concept encompasses a variety of qualitative factors or even factors that are not easily quantifiable but are substantial indicators and affect it. Jan Fagerberg (1988) states that although measures of the international competitiveness of a country versus other countries are used very frequently to provide valid comparisons in media, government reports and economic discussions, it is “rather rare” to see this concept clearly defined and the situation remains like this. Taken this into consideration as well as some definitions mentioned above for this concept, we could extrapolate that what international competitiveness must do is to enhance the link of growth and balance-of-payments. However, we are still missing the factors that influence this process the most. Thus, through this thesis we will attempt to provide sufficient evidence for the factors that contribute the most to international competitiveness and fill the existing gap that will lead economists to a consensus regarding the importance of technological (non-price) capabilities.

1.8.1. Relevance to Management of Technology Master Program

This graduation project occurs after the completion of all the courses of the Management of Technology (MOT) Master Program and integrates much of the pertinent knowledge gained from it. Throughout the MOT program it was always highlighted the contribution of technology to the contemporary society and economy and particularly its important role as a corporate resource which extends a company’s capacity to identify different opportunities and maintain a substantial competitive advantage. This program indicates the practices with which a firm could deploy technologies to ensure profitable outcomes and adopt to the radical changes and it could be argued that it provides a chance to elaborate the corporate environment (micro level). Taking advantage of the knowledge obtained, this study attempts to expand these horizons to a macro level by analyzing the significance of technology and innovation for the development of a country’s national competencies. In particular, as this research attempts to bring in the foreground the influence of productive capabilities to a country’s international competitiveness it will provide sizeable insights for the importance of technology on a national level. Finally, the recommended policies which will derive from the findings of this research will be aligned to the knowledge obtained from the MOT program identifying the framework within which technology could be integrated to a national economy and innovation system.

1.9. Research Methodology

To answer the research questions this thesis project will attempt to empirically (i.e. statistically) identify the key – cost versus technological – determinants of a country's international competitiveness. To do so, we will define an econometric model in which a country's competitiveness (as the dependent variable) is made a function of the following drivers (or the independent variables): a measure of relative cost competitiveness (notably, an appropriately defined measure of RULC) and measures of "technological" or "non-price" competitiveness.

A first (conceptual) issue concerns the measurement of the dependent variable (international competitiveness). Based on the literature review (in chapter 2 on the thesis report) we will operationalize the concept "international competitiveness" of country in two different ways:

a. The international competitiveness of country n (n = 1, .., 12) is defined in terms of the share of country n's exports in total EU exports (EMSn).

b. The international competitiveness of country n is defined in terms of the annual rate of growth of exports of country n (EGRn)

The cost competitiveness of a country will be operationalized in terms of the relative unit labour cost of country n (relative to weighted average unit labour cost in the other Eurozone countries). This variable (RULCn) is defined as:

$$RULC_n = \frac{ULC_n}{ULC_{Eurozone}}$$

ULC is defined following standard definitions by Eurostat as the ratio of the wage per hour and labour productivity per hour of work.

Non-price or technological competitiveness, which depends on the productive capabilities and the national system of innovation of a country, is a multi-dimensional concept. This study will use different indicators for the key aspects of "technological competitiveness" which are related to human resources, innovation environment, innovation financing, innovators, intellectual assets, employment shares, digitalization contribution and institutional framework. We will use factor analysis to construct "factors" (based on the correlations between dimensions of technological capabilities) in order to differentiate and rank Eurozone countries in terms of non-price competitiveness. These factors will be denoted by F_{1n}, F_{2n}, etc.

We consider also important to include variables that are related to the existing political and institutional framework in every country of our sample. Taking into consideration the institutional dimensions by using variables such as rule of law, government effectiveness and regulatory quality we will be able to provide additional evidence of how political choices per se could affect a country's international competitiveness and also understand how it interacts with RULC and productive capabilities. In this case we will use again a factor

analysis in order to see how these variables load to each other and if they can be used together as a single factor. These variables (factors) will be denoted by IF_{1n}, IF_{2n}, etc.

In addition, we will include country dummy variables D_n (n = 1, .., 12) to control for country-specific ("fixed effects") and a crisis dummy (CD_n), which captures the negative impact of the financial and Eurozone crises on country n.

The basis econometric model to be estimated using a panel data set for 12 Eurozone member countries (for the period 2001-2018) will be as follows:

(1) $$EMS_n\ (or\ ERG_n) = constant + \ \alpha\ RULC_n + \beta F_{1n} + \gamma F_{2n} + \cdots + \cdots + \zeta F_{7n} + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + error\ term$$

This model will be tested for n = 1, … ,12 EMU countries during the period 2001-2018 (t = 1, … 18). We will then examine the results of each country separately in order to elaborate their fluctuation and identify any differences between them. The data set created will consist of 216 (= 12 countries x 18 years) observations.

Where we hypothesize that coefficient $\alpha < 0$ (i.e. higher RULC are associated with lower export market share or lower export growth), coefficient $\beta > 0$ and $\gamma > 0$ (meaning: stronger technological capabilities are associated with higher export market shares or higher export growth). In addition, coefficient $\pi > 0$ since we consider that better institutional function contributes to the increase of international competitiveness affecting positively also productive capabilities. Coefficient ε is the income elasticity of export demand of country *n*. Coefficient μ will capture country-specific influences.

Based on the empirical results, we will be able to identify for each country the relative importance to international competitiveness of (i) RULC; and (ii) non-price "technological" capabilities.

Finally, we will extend the basic econometric model of equation (1) to specifically take into account the political stability in each country (following the Eurozone crisis). We define a new variable – political stability (PS_n) (based on available indicators – and we include this variable PS_n in the regression in two ways:

(2) $$EMS_n\ (or\ ERG_n) = constant + \ \alpha\ RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{1n}) + +\xi_{n2}(PS_n \times F_{2n}) + \cdots + \xi_{n7}(PS_n \times F_{7n}) \ + error\ term$$

We hypothesize that coefficient $\lambda_n > 0$, i.e. greater political stability is associated with higher export market shares or higher export growth. We interact the variable PSn with our "factors" measuring non-price competitiveness F_{1n} and F_{2n} in order to check whether political stability improves competitiveness via strengthening of technological capabilities (or national innovation systems).

In a nutshell, the econometric model of this study could be described from the flowchart below which demonstrates the most crucial[1] steps of our attempt to answer the research question set. Particularly, we operationalize as discussed above, the international competitiveness of a country in two ways, either as EMS or EGR and we examine in both cases the influence of price/cost and productive capabilities variables. The consideration of the Political Stability (PS) variable comprises an important addition since it introduces a moderator variable to the initial basic econometric model which is characterized as very significant in the existing literature. As the flowchart below depicts the examination of the two models (basic & extended) for the two dependent variables (EMS & EGR) will offer the chance to proceed to important comparisons between the effects which will be observed. The outcomes of the different tests for the countries of the sample is expected to add substantial robustness to our recommended policy orientation, enlightening the readers about this topic while in the end it will lead to the answering of the study's research question. Finally, it is also important to mention that since the quality of this research depends to a large extent on the validity of the data used, there will be utilized resources widely accepted and reliable, namely datasets from the World Bank, OECD and Eurostat (more information for the robustness of the econometric findings in Appendix A).

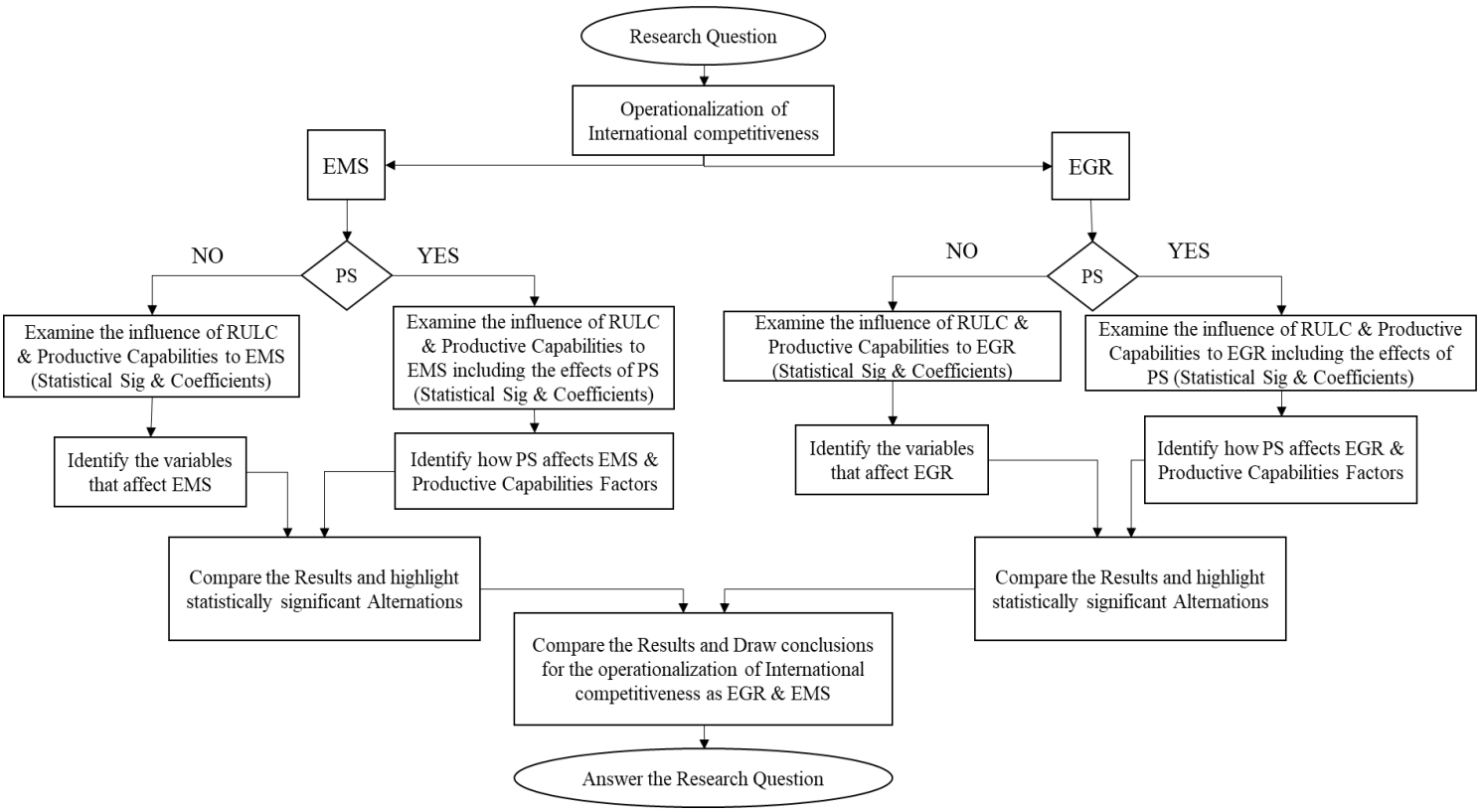

Figure 1: Flowchart of Econometric Model

[1] The Factor Analysis conducted for the grouping of productive capabilities' factors is not mentioned as the flow chart focuses mostly on the Regression Analysis per se.

1.10. Report Structure

The first Chapter of this Thesis introduces the existing economic framework of the EMU Member States which after the outbreak of the 2008-2009 financial crisis, faced a period of turbulence and tried to address the existing asymmetries by following specific policies. In this Chapter is explained the research scope and the existing gap which led to the articulation of the research question and sub-questions which are expected to be addressed utilizing the proposed methodology. Throughout an extensive literature review, Chapter 2 demonstrates the existing theoretical background for the notion of international competitiveness and the relevant policies which were found to influence it. Then in Chapter 3 it is defined the sample of the countries that will be examined and then it is presented a data analysis which intends to identify and explain the existing structural differences between them by examining variables related to the price/cost and non-price/technological competitiveness. In this Chapter there are also determined all the variables that will be considered in the econometric model. Furthermore, Chapter 4 and 5 are associated with the conducted econometric analysis and the obtained results. Particularly, Chapter 4 contains the results of the correlation and factor analysis conducted while Chapter 5 focuses on the outcome of the regression analysis which indicates the factors that contribute the most to a country's international competitiveness and leads to the answer of the research question. Chapter 6 utilizes the econometric findings and by focusing on the specific case of Greece it attempts to convert them into a potential policy orientation which when implemented could develop a country's international competitiveness. Finally, Chapter 7 includes the concluding remarks of this research and the authors reflections.

Chapter 2. Restructuring EU after Crisis

"The greatest enemy of knowledge is not ignorance; it is the illusion of knowledge"

Stephen Hawking

In this Chapter we proceed deeper into our Literature Review. In the aftermath of the 2008-2009 financial crisis, EU countries took measures in order to reconstruct and revitalize their economies. The response to the identified issue of less international competitiveness in countries of EU periphery was the implementation of the internal devaluation policy. Since countries which coexist in a currency union cannot proceed with nominal currency devaluations, internal devaluation referred to wage reductions. However, it is questionable if this decision brought about the expected results or deteriorated the existing issues. For many economists, internal devaluation could not provide an exit from the deadlock. Enrichment of the productive capabilities of a country, on the other hand, could lead to substantial results. In this Chapter we analyze the existing theories on these two concepts and we provide an exclusive analysis for the case of Greece and the results that internal devaluation had on the country.

2.1. International competitiveness and internal devaluation

Monetary unification in the EU was expected to function as means to economic prosperity and growth among the countries that would participate in the Union. The intention was to lead the way for economic convergence and growth of EU countries and enhance their sovereign power within the Union's framework (Christiansen, Duke, & Kirchner, 2012). The ambition was to create economically strong Member States with stable economies that under a common roof would prevail in the world economy and in global trade (Kay, Neil; Pantea, Smaranda; Pashev, Konstantin; Casini, 2015). The initial aspiration however was jeopardized by the increasing current account imbalances across EMU Member States, which consequently facilitated the build-up of external, unsustainable liabilities and the aggravation of the investment position of indebted countries. With the onset of the economic crisis, current account imbalances were recognized as the crucial reason of macroeconomic fragility and instability and were considered as the repercussion of low competitiveness in the deficit countries (of the Eurozone periphery).

Economists recognized immediately two different patterns within the union which were not aligned to the common initial targets. Peripheral countries of EMU like Greece, Italy, Portugal and Spain differed enormously from core countries like Germany, the Netherlands and Austria in economic performances as the former group has accumulated high current account deficits and external debts whereas the latter countries are having sizeable surpluses (Simonazzi et al., 2013). In a monetary union where a single country's currency appreciation or depreciation is not possible, when Member States are facing such competitiveness imbalances, the most

common measure is to modify their inflation rates in order to ensure stability again. In particular, this means that countries with surpluses raise their wages while countries which experience deficits need to moderate them. This practice was followed also in the case of EMU countries and the policy that was adopted is called "internal devaluation".

Economists of the ECB and the European Commission provided the following diagnosis of why firms in the periphery countries experienced considerable declines in their international cost competitiveness. In the countries of periphery wage growth structurally exceeded labour productivity growth for many years, which raised relative unit labour costs (RULC) and negatively affected their cost competitiveness (Uxó, 2014). The assumption was that due to the increase of their RULC, the export growth of these countries was lowered, leading to big trade deficits. Consequently, peripheral countries asked for foreign loans in order to finance their excess spending (Botta, 2014); the loans were forthcoming (from German, French and Dutch banks) willing to lend to other EMU countries (which were believed to be creditworthy because of their EMU membership). This constituted a vicious loop as countries of periphery never focused on reforming their trade and continuously increased their debt. Economists set as a priority the improvement of RULC competitiveness in order to revitalize the economies of periphery, raising exports, and to deal with that they tried to and reduce ULC (Storm & Naastepad, 2015).

Based on this diagnosis, it was recommended that the main way to reduce RULC would be through an 'internal devaluation'. What this practically means, taking into consideration that countries of EMU share the same currency and cannot separately devaluate them, is that they should proceed to wage reductions relative to wages in other Eurozone countries (Alexiou & Nellis, 2013; Passas & Pierros, 2017; Storm & Naastepad, 2015; Uxó, 2014). The basic idea was that by reducing wage growth and reaching levels below labor productivity countries could address the issue and increase cost competitiveness. Consequently, lower wages would lead to the reduction of RULC which was considered as an essential requirement so that a country could achieve higher export performance and decrease its imports. After reaching the desirable levels of RULC, the countries of the periphery would remedy the status of their economies and by reducing trade deficits, they would start function in a sustainable way (Constantine, 2017).

2.1.1.Critical review on International Competitiveness and Unit Labor Costs

International competitiveness is a notion in economic theory that has attracted a lot of attention and is considered substantial in understanding of a country's economic performance. A straightforward definition which derives from the trade theory puts forward that when the produced goods have relative cheaper inputs, these will be less expensive than others produced elsewhere and as a result, they will have a comparative cost advantage over any trading competitor. Though simplified, this approach should not hinder policy makers from identifying all the essential elements that render international competitiveness a key variable. One relevant simplification is the perception of Neoclassical economists, who consider that markets are perfectly competitive and consequently

the market mechanism per se could determine a market clearing price. As a matter of fact, they focused on trying to determine this market clearing-price.

While scrutinizing this concept it would be important to highlight one of the most significant variables from a firm's point of view, related to its competitiveness, namely Unit Labour Cost (ULC). ULC can be defined as the ratio of workers' wages (money) to labour productivity. The algebraic expression is:

$$ULC_n = {}^{W_h}\Big/\left(\frac{q}{L}\right)$$

Where w_h refers to labour wages, q is the output and L is the number of workers (e.g. employment). For a firm, this formula demonstrates the relationship between labour cost and labour productivity and plays a substantial role since in the case of negative economic growth due to increased ULC the firm should take measures to either boost productivity or reduce the wages. Constantinos Alexiou and Joseph Nellis (2013) stressed that when measuring ULC, it is important to take into account factors related to output and input issues as wages could have a completely different impact in high or low productivity sectors. They argue that a sole focus on the costs could be misleading as productivity contributes significantly to the ULC. Before them, Blanchard (2007) was wondering how reasonable it is to decrease nominal wages aiming to stimulate productivity, especially when thinking of the magnitude of the psychological issues for workers. According to him, it is questionable why workers in countries with high unemployment rates should accept lower nominal wages in order to support firms' competitiveness. The lack of empirical evidence vis-à-vis the precise relationship between an increase in ULC and economic growth challenges the mandate for labour market policies that supposedly boost cost competitiveness and hence 'ensure' economic growth (Alexiou & Nellis, 2013). Additionally, Kaldor (1978) demonstrated -with the well-known *Kaldorian paradox* – that even in cases where countries experience a reduction on their cost competitiveness alongside a rise of their ULC, they still can develop their international trade share and economic growth. Thus, it is difficult to argue for the existence of an unambiguous mechanism where competitiveness is directly affected by nominal wages (Alexiou & Nellis, 2013). Kaldor (1970, 1971) named word demand and international competitiveness of exports as the two specific factors that should be considered as the main determinants of the growth rate of exports. Fagerberg (1996) underpinned the perception of *Kaldor Paradox* and extrapolated that ULC is not that tightly connected to international competitiveness, while similar results were provided also by Meliciani (2001) and were based on more data. Finally, Storm and Naastepad (2015) showed through their findings that changes in relative unit labour cost (RULC) do not affect in a statistical significant manner import and export growth and consequently trade balances in the Eurozone countries.

2.1.2.Critical review on internal devaluation strategy

Historically, "the competitive disinflation policy" which was implemented by France in 1983 (O. J. Blanchard, Muet, Grilli, & Vial, 1993) was the most recent predecessor of internal devaluation strategy, but differs

substantially to the one experienced in EMU since it did not take place within a monetary union. Jorge Uxo et.al (2014) argue that Optimum Currency Area Theory constitutes the theoretical base of this strategy. According to this approach, it is essential to ensure flexibility in prices and wages in order to maintain the functionality of a monetary union, since Member States will not be able to use national monetary or exchange rate policies. Paul De Grauwe (2016) highlights that within a monetary union an asymmetric shock could only be tackled with price and wage adjustments that replace nominal devaluations. On the other hand, Constantinos Alexiou and Joseph Nellis (2013) put forward that this scheme is not that straightforward and its efficiency in restoring equilibria after adverse shocks suffers from important theoretical limitations. Furthermore, according to Jörg Bibow (2006), the flexibility in wages and prices facilitated the divergence between EMU Member States in the period before the crisis (1992-2008).

For proponents of internal devaluation policies, the explanation of the causes of the external imbalances within EMU was different. In particular, they believe that these imbalances constitute the repercussions of economic policy mistakes and thoughtless behavior from the deficit countries and they highlighted the increased relative unit labour costs and the important competitiveness losses (Arestis, Jesús, & Gutiérrez, 2009). Other economists like Uxo, Paul and Febrero (2011) argue that trade imbalances within the Eurozone occurred due to the wrongly coordinated growth model that was implemented within the EMU. They argued that some countries with weak domestic demand followed an export-led growth scheme, while others focused on increasing their growth by expanding their domestic demand which was funded by bank debt. There are also those economists who stress that in some cases the low labour cost increases, in core countries of EMU like Germany, did affect negatively competitiveness of the Eurozone periphery countries (Flassbeck & Lapavitsas, 2013). According to them the imbalances' correction does not rely only on wage reduction in the periphery deficit countries, but more on relative wage increases in the core countries (with surpluses) which need to increase their growth of wages and domestic demand. As a result, EMU countries is hoped to achieve *"a symmetric rebalancing of current accounts"*.

As it has been stated, internal devaluation policies are also justified by the perception that 'excessive' RULC affects price competitiveness and through the reduction of the wage costs policy makers can ensure lower price increases and therefore improve competitiveness. Felipe and Kumar (2011) expressed their disbelief on this argument putting forward that the RULC perspective does not suffice in assessing competitiveness. They show that unit capital cost (UCC) is also an important factor to be taken into consideration together with ULC. Richard Wood (2014) provides also a critical assessment regarding the use of the relative ULC as an indicator for competitiveness.

A final argument from the advocates of internal devaluation is that this strategy could lead a country to export growth. This is not that straightforward, since export-led growth requires dynamic and powerful domestic demand in most of the countries that participate in the union (Jörg Bibow, 2013). However, as it has been revealed from the literature review, this was not the case between EMU countries. In particular, the

implementation of internal devaluation policies in countries of periphery led to the reduction of the wages and affected negatively aggregate demand (Lavoie & Stockhammer, 2013; Storm & Naastepad, 2015). The results from Greece, which experienced this strategy, demonstrate that internal devaluation had negative effects on the disposable income and spending of households and it did not contribute positively on the growth of net exports (Nikiforos, Papadimitriou, & Zezza, 2015; Polychroniou, 2014). Finally, Uxó (2014) answers to those who argue that Greece, Spain and Portugal have improved their balance of goods and services because of the success of internal devaluation that this was not the case. According to him the fact that these countries improved their performance and Spain and Portugal have gone from net borrowers in 2008 to net lenders in 2013 (Table 2) was not because the policies were effective as desired, but because imports have collapsed. Why did Spanish and Portuguese imports decline? Because GDP in Spain and Portugal declined due to the crisis.

Country	2008	2012_{Q4}	2013
Spain	-8,966	1,5	2,036
Portugal	-11,904	2,6	1,644
Greece	-14,472	2,4	-2,063

Table 2:Current account balance (% of GDP) - Spain, Portugal, Greece. Source: The World Bank, Eurostat

2.2. International Competitiveness and Productive Capabilities

Our literature review demonstrated so far, that the emphasis for resolving the existing imbalances in trade performance between EMU countries and improving their international competitiveness was given on the moderation of RULC, albeit RULC can be shown to be a weak predictor of the potential export performance (Gaulier. & Vicard., 2012; Storm & Naastepad, 2015). We have already referred to the "Kaldor paradox" (Kaldor, 1978) which states that increases on RULC or prices do not affect significantly exports and market shares. Schumpeter highlighted the role of prices and costs in regards to exports even earlier, while he also talked for the importance of innovation to raise competitiveness (Schumpeter, 1942; Storm & Naastepad, 2015):

> *"Economists are at long last emerging from the stage in which price competition was all they saw. […] in capitalist reality, as distinguished from its textbook picture, it is not that kind of competition which counts, but the competition from the new commodity, the new technology, the new source of supply, the new type of organization […] – com- petition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives."*

Nicolas Kaldor realized the importance of innovation and technology for the increase of competitiveness and improvement of trade performance and talking about technological capabilities (1981, p. 605) suggested the following:

> *"Basically, in a growing world economy the growth of exports is mainly to be explained by the income elasticity of foreign countries for a country's products; but it is a matter of the innovative ability and adaptive capacity of its manufacturers whether this income elasticity will tend to be large or small."*

Jan Fagerberg (1996) tried to elaborate further the role of technology and its impact on trade performance and competitiveness. According to him international competitiveness can be enhanced in long-term, efficiently when a country and its firms promote and focus on innovation and technology diffusion. By specializing in variant areas and invest accordingly its R&D resources, a country could achieve higher growth and welfare.

Later economists argued that international competitiveness is connected to a country's technological competencies and ability to produce medium and high-tech products and not on costs and prices (Storm & Naastepad, 2015). Piergiuseppe Fortunato and Carlos Razo (2014, p. 281) stress the importance of updating national production structures and focus on more "sophisticated" activities. Productive capabilities function as the crucial determinant for driving productive transformation dynamics and develop export sophistication that could enhance economic performance. Furthermore, Jelena Trlaković, Danihela Despotović and Lela Ristić (2018) also demonstrated through their regression analysis, focused on the western Balkan countries the period of 2005-2015 that the structure and features of the industry producing commodities plays a substantial role on GDP per capita. They underline that the Balkan countries should deploy technology-intensive industries and update their processing methods in order to become competitive on their exports.

2.3. The case of Greece

Greece was one of those peripheral countries that focused on non-traded assets growth, after the monetary unification. Short-term profits and growth masked the fact that Greece was not able to have any trade surpluses and it was funding its responsibilities through debt (Maynou, Saez, Kyriacou, & Bacaria, 2016). As a result, the Greek economy had to deal with the challenge of "twin deficits" as both budget and current deficit had radically increased. Productive capabilities were never restructured constituting Greek products unable to compete in the global framework (Passas & Pierros, 2017).

Greece needed to find a way to finance its deficits, something that was not forthcoming however in the aftermath of the financial crisis of 2008-09 and this led the Greek economy close to the edge. The ECB, the IMF and the European Commission imposed strong austerity measures in order to bailout the Greek economy and the fiscal consolidation policies caused further social unrest. Greek governments and their institutional partners agreed thereafter on many measures having as their primary goal to remedy country's public sector solvency and international competitiveness. The intention was to reorganize the country and stabilize its damaged economy aiming to potential export-led growth (Passas & Pierros, 2017). Within the framework of EMU, the policy tools to reach their objectives were fiscal adjustment and internal devaluation. GDP growth however does not provide a positive justification vis-à-vis the efficiency of the policies. Figure 2 demonstrates that Greek economy

experienced an extended period of recession comparing to other EMU countries before it recorded again GDP growth.

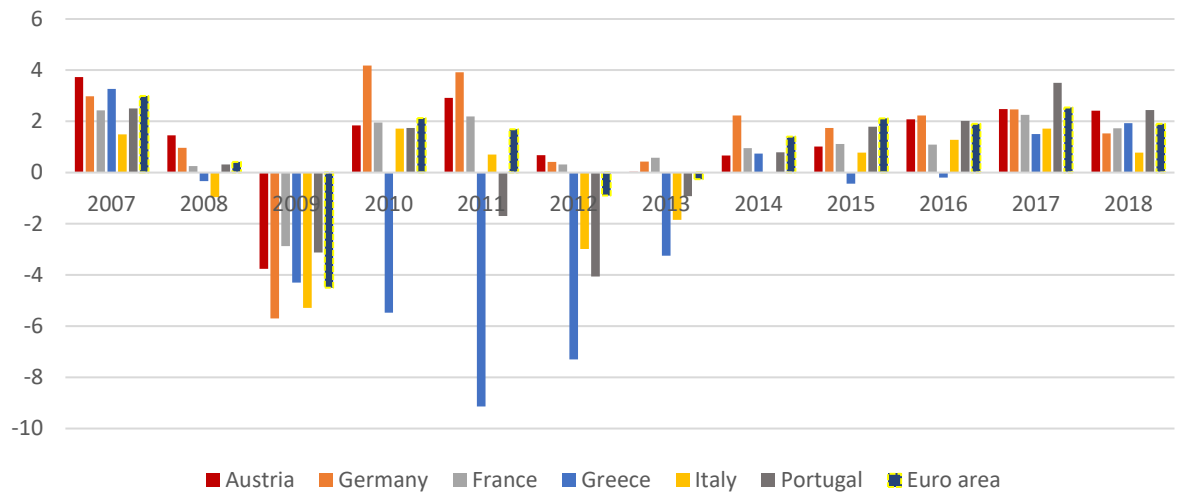

Figure 2:GDP Growth. Source: The World Bank

The institutional partners of Greece considered that wages have increased more than productivity and by moderating them, the Greek economy was expected to become more cost-competitive and to return to growth (Eleftheriadis, 2015). These practices seem aligned to austerity economics perception for ULC reduction, which however had questionable results for the Greek economy. As a matter of fact, Greece recovered much later comparing to other countries from the hit of the crisis, while it had to face the increased level of unemployment and households that could not afford their responsibilities due to the reduced waged (Magoulios & Stergios, 2013). In addition, the target for increase of competitiveness and balance-of-payments improvement was not achieved as Figure 3 depicts.

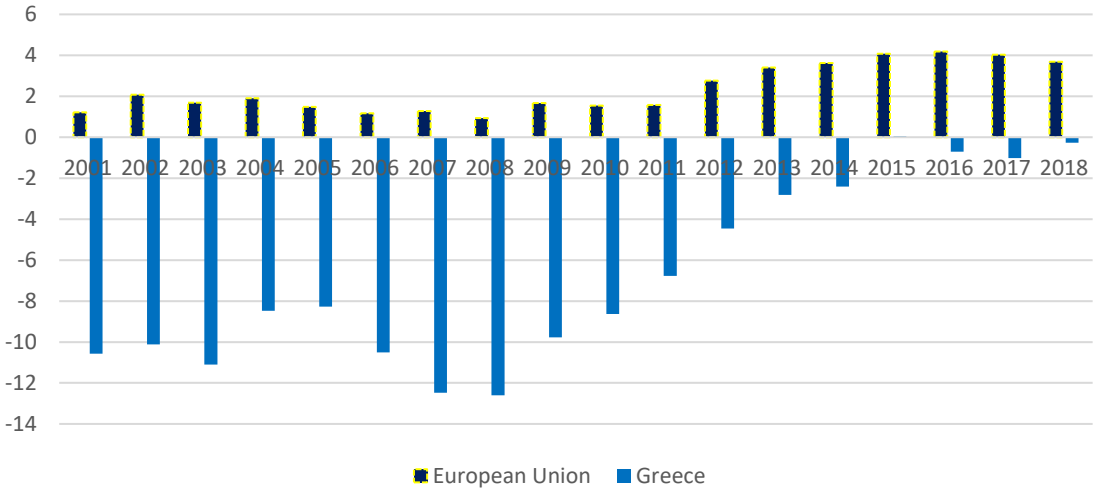

Figure 3:External balance on goods and services (% of GDP). Source: The World Bank

For economists advocating the restructuring and upgrading of productive capabilities (instead of internal devaluation) this looks like the wrong way to interpret and tackle the problem in Greece (Sondermann, 2012). According to them, in order to enhance its competitiveness, the Greek economy needs to reallocate its resources and focus on the right direction reforming its industry and manufacturing capacity and creating specializations that will help the country reduce and eliminate its trade deficits (Storm & Naastepad, 2015). Greece was and still is behind almost every average related to high-tech manufacturing within EMU as this was defined by the European Commission Innovation Scoreboard but still the focus is not on that (Scoreboard, 2019).

2.3.1.Export Patterns and Specialization in Greece

The ability to serve an expanded international market which generates continuous demand would provide a country and its firms a substantial competitive advantage against the rest, on trade and economic performance. Hence, created policies should aim in finding ways to increase shares in foreign markets. This led us to the inquiry for the main drivers of international competitiveness of a country. Taking into consideration the effects of RULC on trade and exports and thinking of the existing surrounding framework for a small economy of European periphery like Greece, we examine also how the country could improve its product quality ladder in order to become more competitive internationally. This necessitates a relevant literature review of country's performance comparing to other EMU countries regarding their products' features and sectors of specialization.

Evidence and results from relevant indexes showed that Greece failed to upgrade the quality of its products through the years. The low score of Greece in economic complexity index which assesses the ability of a country to utilize tacit knowledge in the production process, demonstrates how far behind the country was comparing to other EMU countries. Tacit knowledge embedded in production processes is demonstrated to be correlated to a country's macroeconomic performance even in a broad sense (Hausmann et al., 2011). Figure 4 depicts the performance of Greece in the relative index comparing to other countries of EMU with either higher or lower GDP like Slovenia and Slovakia. Greece is far behind the rest of the EMU countries and together with Portugal they constitute the two Western World economies where their high GDP per capita does not match to the scores of their economic complexity (Harvard University, 2019). Greece like other periphery countries did not manage to transform its industries from low-to-medium to medium-to-high technology industries (Bournakis & Tsoukis, 2017).

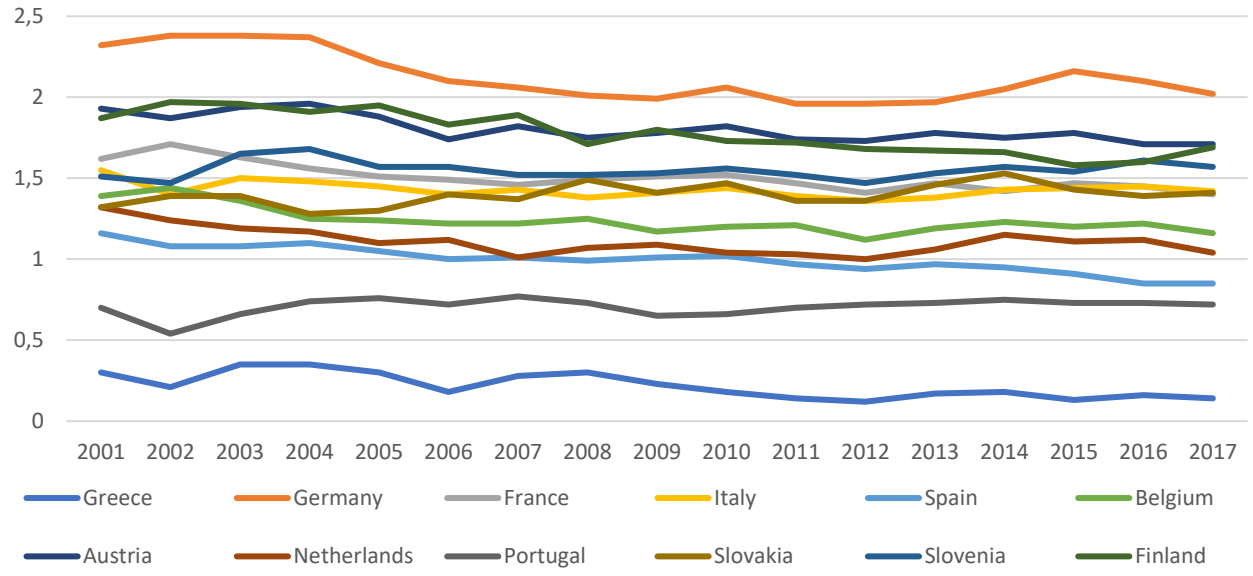

Figure 4: Countries Complexity Rankings. Source: Atlas of Economic Complexity. Source: Atlas of Economic Complexity

Additional evidence is provided in Figure 5 which illustrates the share of products per industry which Greece exported before, during and after the financial crisis. Exports on medium-high technology products refer to machines, namely less than 10% of the total country's exports. It can be seen that Greek exports mostly consist of raw materials and mineral products throughout all the years (2000-2016).

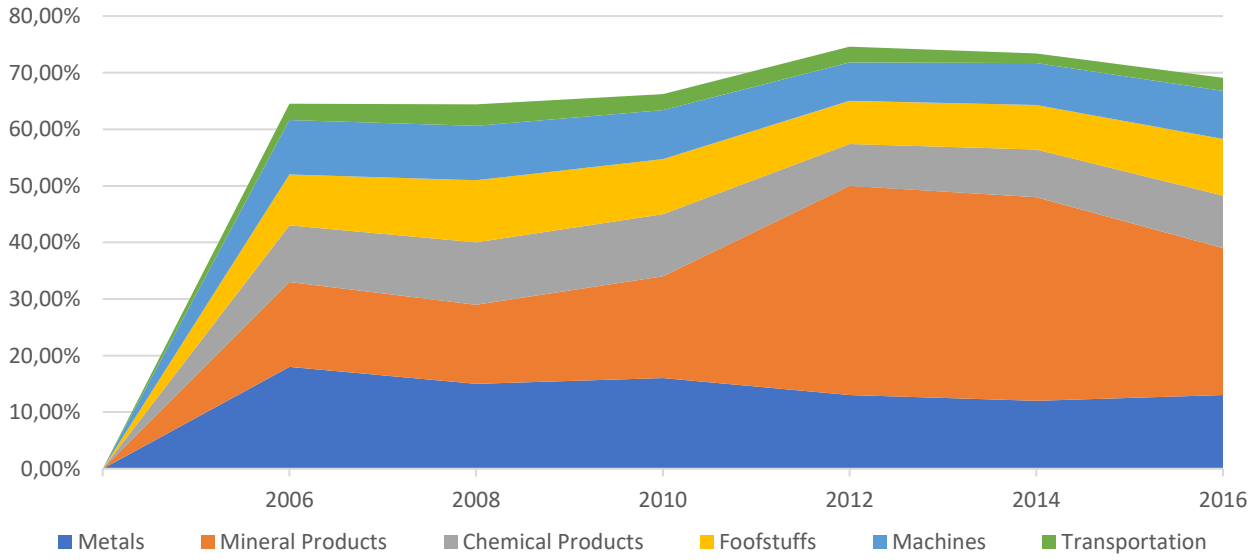

Figure 5: Product Share Exported in Greece. Source: Observatory of Economic Complexity

Another way to understand the pattern that was developed throughout the years in Greece is by identifying the specialization trends that were deployed. In Table 3 we provide the shares of value added to GDP of 12 aggregate sectors for three different period of times over 2001-2018, aiming to illustrate the evolution of Greece's production structure. In addition, we collected relevant data of the average of EMU countries throughout this

period for the same sectors in order to compare that to Greece. It seems that Greece is not focusing that much on industrialization, with the shares of manufacturing production and industry sectors remaining stagnant or falling throughout the years. On the same time, the average among EMU countries on the relevant sectors exceeds Greece's performance by approximately 7 percentage points. It is also visible that throughout this period Greece focused more on construction and real estate sectors and especially in the latter one it recorded double digit differences comparing to EMU countries' average.

	2001-2008		2009-2012		2013-2018	
Industry	Greece	EMU	Greece	EMU	Greece	EMU
Agriculture, forestry, fishing	4,59%	1,90%	3,35%	1,67%	4,04%	1,72%
Industry, including energy	13,59%	20,81%	12,03%	19,10%	14,24%	19,66%
Manufacturing	10,04%	17,76%	8,68%	15,76%	10,19%	16,57%
Construction	7,53%	6,01%	4,08%	5,63%	2,46%	5,01%
Wholesale, retail trade, repairs, transport; accommodation, food services	25,64%	19,21%	23,90%	18,88%	23,85%	18,85%
Information communication	3,93%	4,72%	3,66%	4,55%	3,48%	4,58%
Finance and insurance	4,40%	4,99%	4,78%	5,21%	4,44%	4,90%
Real Estate	11,31%	10,40%	18,26%	11,31%	27,67%	11,38%
Professional, scientific, support services	5,76%	10,19%	5,51%	10,50%	5,06%	11,13%
Public administration, defence, education, health, social work	19,07%	18,07%	21,76%	19,38%	20,54%	19,13%
Other services activities	4,09%	3,50%	4,09%	3,62%	4,15%	3,53%
Servicies	74,21%	71,17%	80,45%	73,63%	79,20%	73,53%

Table 3:Value Added shares to GDP (%) of aggregate sectors in Greece and EMU. Source: OECD indicators and Author's own calculations

The aim of this section was to make clear that it is important to scrutinize the economic structure and policy framework of the country before proceeding to the analysis of the labour cost evolution. What the tables and the graphs of this section demonstrate is that the production in Greece was moving towards non-tradeable sectors during 2001-2008, namely before crisis, which consequently indicates that there was little scope for exports and innovation and that Greek economy was diving into introversion.

2.4. Conclusions: Mistakes of the past, Reform and the Future

It was March 2011, right after Greece signed its first bailout agreement and with Ireland and Portugal facing the consequences of the crisis hit, when 23 EU members agreed on the Competitiveness Pact (Bournakis & Tsoukis, 2017). Through this agreement EU policy makers aimed to tackle the existing account imbalances and losses in competitiveness by setting specific quantitative targets on what countries should implement from that moment onwards. The Competitiveness Pact would impose all the necessary reform measures to the EMU countries that

experienced big deficits, by implementing export-led growth schemes and ensure the prevention of similar imbalances in the future.

As described in the literature review the measures of the Pact were mostly focusing on two main pillars, namely wages that would function as stabilizers for the increased government deficits and would help a country regain its international competitiveness and reduction on labour costs aiming to improve productivity and revitalize export growth. Although these policies look sensible, the conducted literature review has highlighted why a policy of internal devaluation might fail to improve competitiveness and perhaps even worsen the situation. The alternative strategy – to improve technological competitiveness – may provide a more robust way to economic recovery. Felipe and Kumar (2011) provided substantial evidence that countries which managed to ensure productivity gains experienced export growths regardless high RULC. Furthermore, the high level of RULC in Greece and other periphery countries of EMU constitute more the symptoms that the real cause of losses in competitiveness (Bournakis & Tsoukis, 2017). Particularly, in the case of Greece it could be argued that the main cause that deteriorated country's competitiveness is the failure of governance during the period of 2002-2009 to channel the large capital inflows into the appropriate economic activities that would add in long-term high value to the economy. Additionally, but to a lesser extent, the architecture of the Eurozone per se seems to suit better the core countries like Germany or France (Kool, 2005) rather than supporting the long term cohesion of the entire Eurozone.

Taking all these into consideration we think there are reasons to question the appropriateness of internal devaluation as a pre-condition and as a measure to enhance export growth and economic recovery. Relevant research demonstrated that a country could increase its exports by 7% to 17% approximately when in fiscal consolidation (Bista, Ederington, Minier, & Sheridan, 2016). However, it is highlighted that these gains derived mostly from the real exchange rates. Looking at trading partners of Greece, which are other EMU members and implement on parallel similar austerity policies, we could extrapolate that it is quite impossible to reach positive gains from fiscal consolidation (especially when this done throughout the Eurozone at the same time). As demonstrated above, Greece and other countries of periphery have followed a different path of economic development comparing to Germany, Netherlands and France, where the strengthening of productive capabilities was their main objective. However, utilization of productive structures and their development through technology and innovation might provide a sustainable way for them to improve substantially their economic performance and ensure export-led growth preventing potential deficits and the implementation of similar measures.

Chapter 3. Data Analysis

"We are what we repeatedly do. Excellence, then, is not an act, but a habit

Aristotle

In the previous Chapters we analyzed how EMU countries followed diverging paths in their economic development due to the inability of some of them to be competitive enough with their exports. One school of economists argues that the RULC of these countries was too high, while another school points to their lack of non-price technological competitiveness, arguing that the path towards the restructuring of an economy should be through the renewal of the economy's productive capabilities. We attempt to address these issues in Chapter 3, where we scrutinize relevant data for 12 Eurozone Member States and we demonstrate the RULC fluctuations since the adaption of the common currency. Then, we elaborate the diverging paths of the previously defined core and periphery countries vis-à-vis their productive capabilities, monitoring the evolution of export market shares providing relevant descriptive statistics. Finally, this process will lead us to the definition of the variables that we are going to use in our econometric model.

3.1. Sample Definition

This study will examine relevant indicators for EMU countries throughout the period 2001-2018, creating a panel data set of 216 (= 12 countries x 18 years) observations. A country was eligible for our sample when:

I. It constitutes an EU member
II. It constitutes an EMU member (having entered before 2004)
III. It has one of the highest GDP among the rest of the EMU countries
IV. It has one of the highest deficits among the rest of the EMU countries
V. It was affected by 2008-2009 financial crisis

Meeting the eligibility criteria which were set, this study will compare Austria, Belgium, Germany, Spain, Finland, France, Greece, Italy, the Netherlands, Portugal, Slovak Republic and Slovenia to each other. All twelve countries where members of EU and EMU before 2004, with Slovenia and Slovak Republic being the last added on 1st of May 2004. Furthermore, these countries have the highest GDP as the most recent data from OECD demonstrate. Additional data from OECD show that these countries had also big government deficits with Greece, Portugal and Spain recording on average 10% deficit of their GDP throughout 2001-2018. These countries were also damaged from the financial crash of 2008- 2009 with Greece (mostly), Portugal and Spain experiencing a long recession period until 2012. Analysing the GDP growth performance of these countries during 2008-2012 sufficed to understand the severity of the financial crisis hit **(**see Table in Appendix B**).**

A last important remark concerns additional demographic and economic parameters that we concerned for our choice. Particularly, we decided to focus on countries with more than 2 million inhabitants, in order to ensure the representativeness of the sample. Consequently, we ruled out smaller EU countries like Cyprus, Luxemburg, Estonia or Malta although they have relatively high economic performances. Additionally, we ruled out Ireland from our sample since as a country is characterized by strong specialization in particular economic activities such as financial services and considering the large amount of capital inflows from United Kingdom it would probably bias our structural and industrial-technological comparative analysis.

3.2. Data on RULC

RULC is considered by many economists as already mentioned, the indicator which characterizes the cost/price competitiveness of a country. Although many studies have demonstrated that labour costs are weak predictors of export performance, we collected the relevant data in order to explore in our model the role of RULC anew. By incorporating RULC in our model we intend to assess its relationship with international competitiveness (and exports) and its correlation to productive capabilities.

In section 1.8, RULC was determined as the ratio of the ULC of a country to the average ULC of the Euro Area. Furthermore, we use the standard definition of ULC from Eurostat considering it as the ratio of wage per hour and labour productivity per hour of work. Figure 6 depicts the average RULC for the 12 countries of the sample throughout 2001-2018 period. The EU average is also provided as a reference point for the performance of individual countries. It can be seen that only 4 out of the 12 countries exceed this average, one is almost equal with it and the rest are below it. In particular, Spain and Portugal exceed EU average by approximately 8% confirming those who argue that the periphery countries had a substantially higher ULC increase and are followed from the Netherlands and Slovak Republic which are slightly above the average. On the contrary, the lowest RULC for the 2001-2018 period is found in Finland which is 11% below the EU average, while Greece and Italy, though countries of EU periphery and often believed to have high RULCs are below the EU average. Greece and Italy are also slightly below Germany, which according to the literature review is exemplified for its RULC performance.

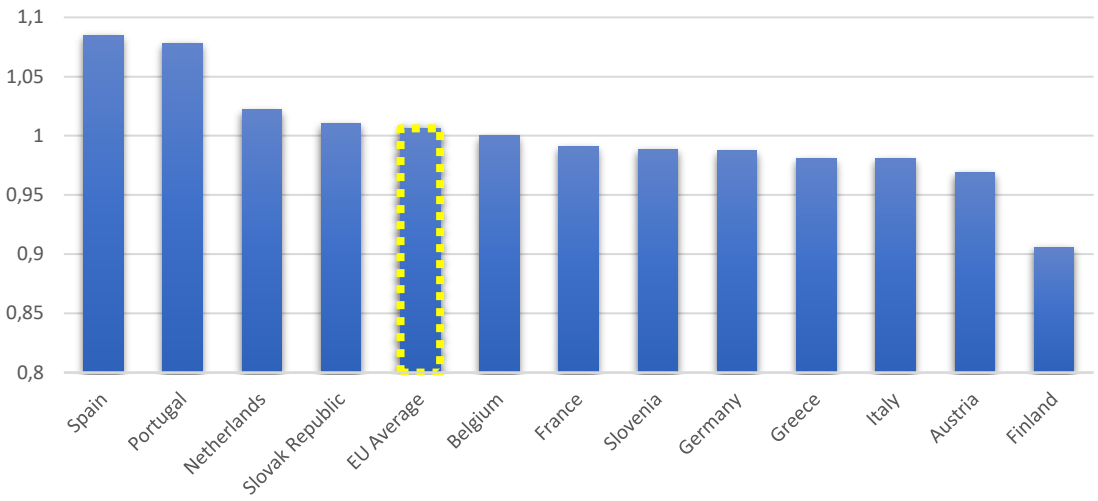

Figure 6:Average RULC, 2001-2018. Source: Source: Author's calculation based on OECD Data

It could be argued that Greece and Italy lowered significantly their ULC after the outbreak of the financial crisis and the implementation of internal devaluation policies. Thus, it would be useful, for the better understanding of RULC fluctuation, to provide additional evidence for the performance of the countries in specific periods of 2001-2018 timespan. We examine the performance of the 12 countries in three different periods, namely the pre-crisis period (2001-2007), the crisis period (2008-2012) and the post-crisis period (2013-2018). The results are in some cases surprising as it can be seen in Figure 7. It can be observed that in many cases countries experienced increases in their RULC during the crisis period, while the ULC in Eurozone was increasing (see Table in Appendix C). Consequently, many countries increased their ULC, although it was argued that the recovery-policies should focus on the opposite direction, namely the decrease of ULC in order to increase competitiveness. Spain demonstrates an increase in RULC close to 20% in the crisis period. An equal increase is depicted for Finland as well which was the country with the lowest RULC in the pre-crisis period. However, it has to be mentioned that even with this increase, Finland is below the EU average for that period. Portugal has the highest RULC in the pre-crisis period followed by Spain. However, they followed different paths with the outbreak of the crisis. In particular, though Spain, as explained before increased its RULC, Portugal decreased it. Other countries of the periphery like Greece and Italy maintain a lower than the EU average RULC and are also slightly below Germany and Austria. During the crisis they demonstrate only a slight increase of less than 2% on their RULC performance. Only Austria, Germany and the Netherlands reduced their RULC during the crisis period with Germany having the biggest reduction (-5%).

The post crisis period brought about some important changes in the RULC performance for some countries. It is obvious that Spain has faced the biggest reduction comparing to the rest of the 11 countries of the sample which is translated to a 17% decrease of its RULC in the post-crisis period. Taking into consideration that during this time span, the ULC of Eurozone was not decreased, it could be argued that Spain managed to substantially decrease its own ULC. Throughout this period Spain reaches an equal RULC performance with the EU average.

Portugal which was also above the EU average so far seems to follow Spain's direction, reducing its RULC during this period and reaching the EU average. It can be argued that most of the countries have in this period a relatively same level of RULC with very small differences. If Spain has suffered the biggest reductions in RULC, Finland is on the contrary the country with the biggest increase throughout the whole period. Although as it was seen in Figure 6 it constitutes the country with the lowest average, it has increased its RULC by approximately 25% in the 2008-2018 decade reaching the EU average. It is also interesting to mention that despite the really small increase in the post-crisis period for Greece and Italy, these countries are still aligned to the EU average. Furthermore, the error bars demonstrate that standard deviation declined for most of the countries of the sample in the post-crisis period, namely their RULC prices moved closer to the mean. Particularly, countries of periphery like Greece, Italy, Portugal and Spain present a noticeable reduction of their standard deviations in the post-crisis period while on the contrary, countries of the EU core like Germany, Austria and the Netherlands show a slight increase. These different trajectories can be attributed to the fact that core countries managed to recover from the financial crisis faster than those of periphery.

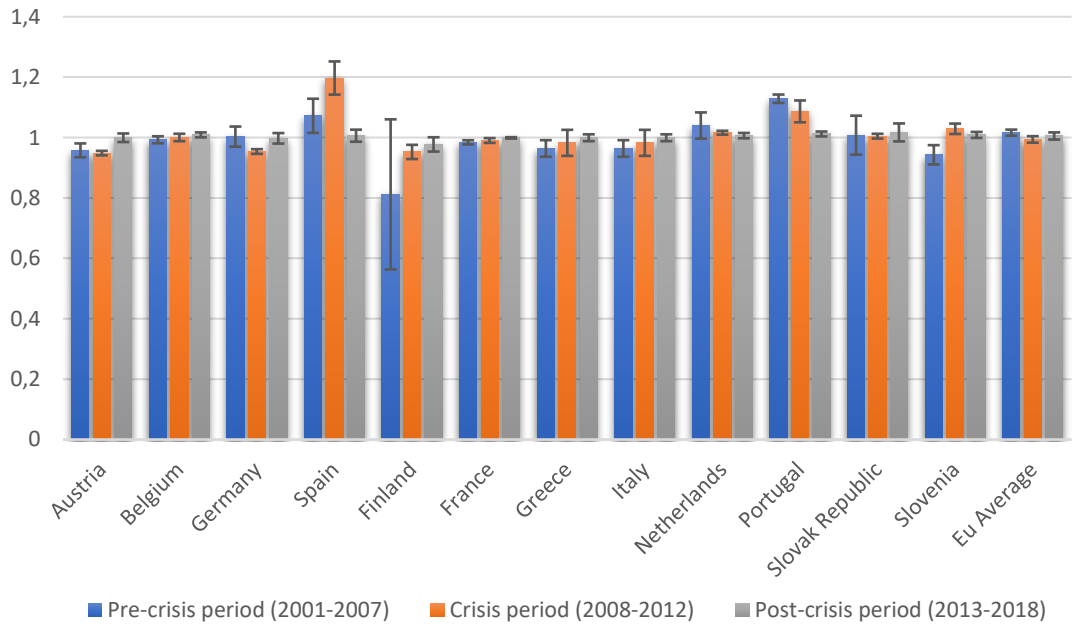

Figure 7: RULC performance in three periods. Source: Author's elaboration on OECD data

3.3. Data on Technological and Productive Capabilities

After elaborating the differences of the 12 EMU countries regarding their RULC for the period 2001-2018 it is important to scrutinize also their performance on productive/ technology capabilities. As has been already stated in the literature review, there is not an exclusive definition for the factors that should be always considered in relevant analysis. However, there are many indicators which can show a country's focus on its technological

competencies and by analysing them in this section we will be able to provide additional evidence for the paths that countries have followed.

3.3.1.Research and Development (R&D) intensity

R&D intensity constitutes the first and very significant factor that we use in our analysis. This measure is used in literature for various reasons, but mainly to explain the allocation of an industry to low, medium or high technological group and to express the innovation focus. By using R&D intensity we aim to demonstrate how much each country of the group is interested in innovation and focuses on improving its relevant competencies. We collected the necessary data and estimate R&D expenditures as a percentage of GDP on average for the period 2001-2018. In Figure 8, provided below, we observe that is the leading country in the sample, with average expenditures on R&D above 3% of its GDP. Considering that the average expenditures of the EU countries is approximately 1.8%, Finland outscores it almost two times. Germany and Austria follow Finland on this measure with their R&D expenditures exceeding 2.5% of their GDP. Belgium, France, the Netherlands and Slovenia constitute another group investing around 2% of their budgets on R&D, followed by Spain, Italy and Portugal which are below the EU average. Finally, Slovak Republic and Greece occupy the last places in this category with expenses on R&D below 1% of their GDP.

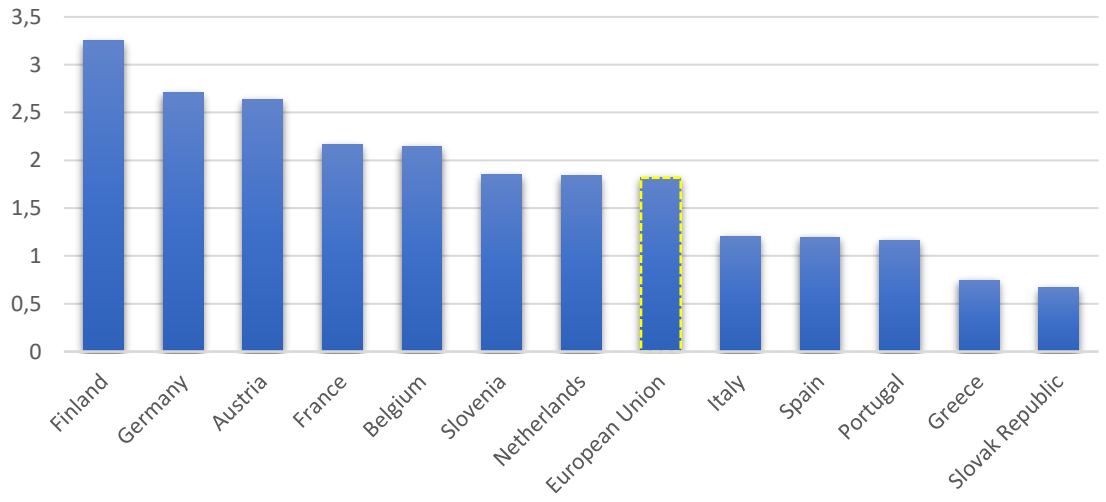

Figure 8: R&D Expenditures as % of GDP, 2001-2018 average. Source: Author's calculation based on OECD data

R&D intensity indicator provides some preliminary data for the focus of the 12 countries of the sample. Though early in our analysis we can observe that countries of the core of EU, like Germany and Austria demonstrate a relative higher tendency towards innovation comparing to big periphery countries like Spain and Italy. In addition, it is estimated that Greece which has on average a 415% higher GDP than Slovenia or 44% higher than Finland is investing so much less from these countries in R&D. The same point is also valid for countries like Spain and Italy which although they have a much higher national income comparing to Finland, Austria, Belgium, Slovenia and the Netherlands, they are investing much less on R&D.

3.3.2.Patents and Trademarks

A patent is defined as a right provided by a country or countries to an inventor or entrepreneur which depending on the life of the patent allows him or her to exclude others from constructing, using or selling his or her invention (Hadzima, 2008). Trademark on the other hand, is any recognizable word, phrase or symbol that characterizes a specific product, differentiating it from the rest of the existing similar products. Patents and trademarks could provide substantial competitive advantages to those who have innovated and pioneered in a sector. Consequently, it would be a serious omission if these indicators were not also included in our analysis.

Although patents are not necessarily converted in active applications but are simply a part of the innovation funnel process, they can provide evidence for the focus points of a country's firms. Thus, we could define patents as a measure if innovative initiation. In Figure 9, we demonstrate the average annual performance of the 12 countries of our sample in patterns for the 2001-2018 period. It is obvious that Germany prevails in creating patents with a big distance from the rest of the countries. It actually provides 58% of the total patents created from the whole sample and it has the biggest share within EU with more than 45% (see Table in Appendix C). Particularly, Germany issues annually approximately 47,000 patents, three times as much as France does, which is the second country on the relevant category. France and Italy are the only countries after Germany that are close to 10,000 patents per year. The rest of the countries are far behind. We could identify two groups. Spain, the Netherlands, Austria and Finland comprise one group with more than 2000 issued patents per year, while Belgium, Greece, Portugal, Slovenia and Slovak Republic have even less, issuing annually on average 450 patents. It is valid to mention that in the latter group of countries we identify the same countries that were last also in the R&D intensity indicator, namely Greece, Portugal and Slovak Republic. For these countries, there is an existing gap with Germany, but they also have substantial differences with other core EU countries like Austria and the Netherlands (more than 75% difference on average).

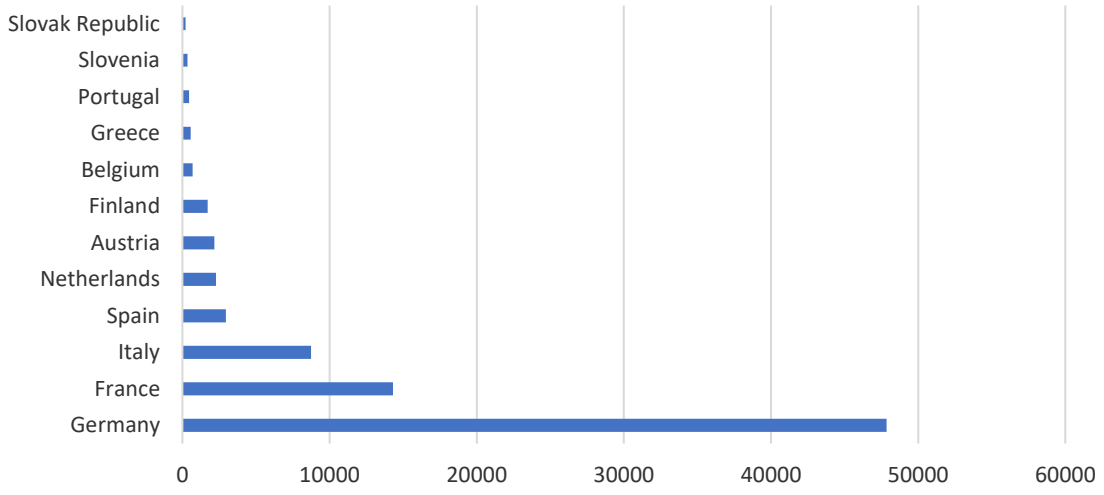

Figure 9: Average of patents per country during 2001-2018. Source: Author's calculation based on World Bank Data

Trademarks constitute a significant innovation indicator as well, characterizing mostly the service sector. Economic institutions and economists use trademarks in different analyses and indexes when the want to refer to innovation performance. In Figure 10 we calculate the ratio of a country's trademarks applications to its GDP adjusted in Purchasing Power Standard in order to provide more accurate economic statistics and compare the market conditions without including differences in prices. According to this indicator Austria has the lead with approximately 10 trademarks per billion of GDP. After Austria, there are noticeable three groups of countries. In one group Germany, the Netherlands, Finland, Spain and Slovenia with more than 6 trademarks per billion of GDP and on the second group Belgium, Italy, Portugal and France slightly below. Greece and Slovak Republic which can be considered as "trademark laggards", are the last according to this measure with at least two times less trademarks per billion of GDP than the countries of the previous group. In this indicator we see Greece and Slovak Republic for the third consecutive time on the last positions of the sample. On the contrary core countries of EU are again in the first positions of the relevant ranking. It could be argued that so far these countries have a continues presence on the first positions of the rankings that are related to innovation. In particular, Austria, Germany and the Netherlands are until now above most of the countries of the sample. Though we are still in early stages of our analysis, the first indicators demonstrate that countries are not aligned to each other in regard to their focus on innovative activities. Some of them perform much better than others and even if they are not always the "leading country" they are in the group of countries which prevail.

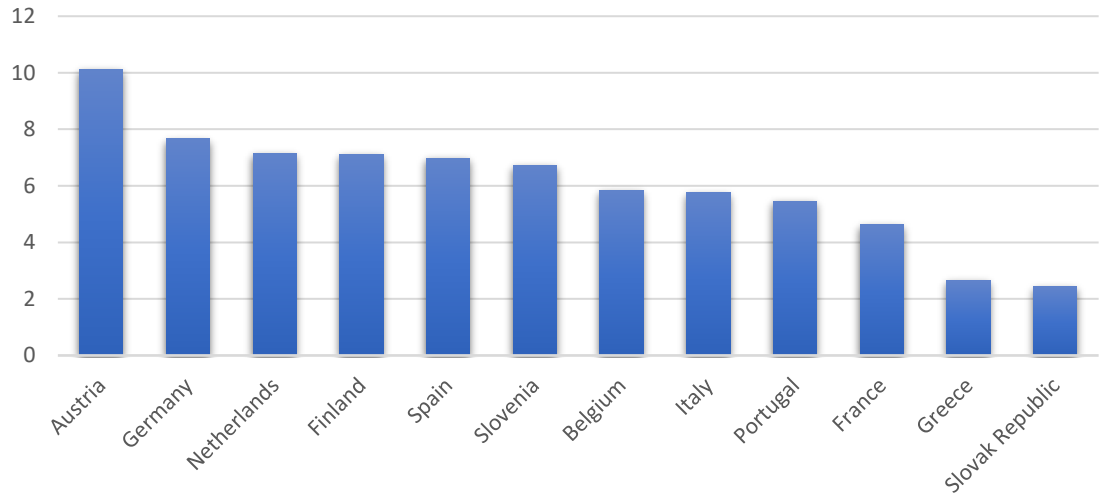

Figure 10:Average of trademarks per country during 2005-2018. Source: Author's calculation based on EIS Data

3.3.3.Small and Medium Enterprises (SMEs)

Small and medium-sized Enterprises (SMEs) are considered the backbone of the EU economy as they provide substantial opportunities for employment and economic growth. European Commission names SMEs all these firms which occupy less than 250 employees while reaching an annual turnover no more than 50 million Euro or having a balance sheet below 43 million Euro (European Commission, 2012). Furthermore, according to European Commission, SMEs represent almost 99% of active business in EU and throughout the years there

were many EU funding programs for them. OECD highlights on its reports that since innovation functions as a key driver of productivity and long-term growth, it should be also on the core of SMEs' strategies (OECD, 2019). In particular, an innovative SME could become more productive and consequently offer higher wages to its employees and better working conditions. In contemporary times, the continuous developments in technologies and the expansion of markets provide a significant opportunity for SMEs to innovate and grow. Hence, we consider innovative SMEs as an indicator of a country's productive capabilities.

There are many indicators that are used in indexes worldwide for calculating the innovative performance of SMEs. We first analyze the SMEs which are innovating in-house, namely the degree to which existing SMEs which have introduced an innovative product or process or have updated an existing one have innovated in-house. Innovative firms per se are defined as those firms which manage to introduce new products or processes either in-house or in combination with other firms. This indicator constitutes the ratio of those SMEs which innovate only in-house to the total SMEs of the country. As Figure 11 depicts, almost one out of two SMEs in Germany innovate in-house, on average, during 2001-2018 period. We observe that most of the countries are relatively close to EU average with only three countries falling slightly behind the rest. Particularly, Slovenia, Spain and Slovak Republic reach the last three positions according to this indicator as approximately only 20% of their SMEs innovate in-house. We can see that the countries which are above the average are all part of the core of EU while the countries which are found below the average are from EU periphery. France which was so far seen closely to the average performance, namely slightly below the core and slightly above periphery countries is now 13% below from the EU average.

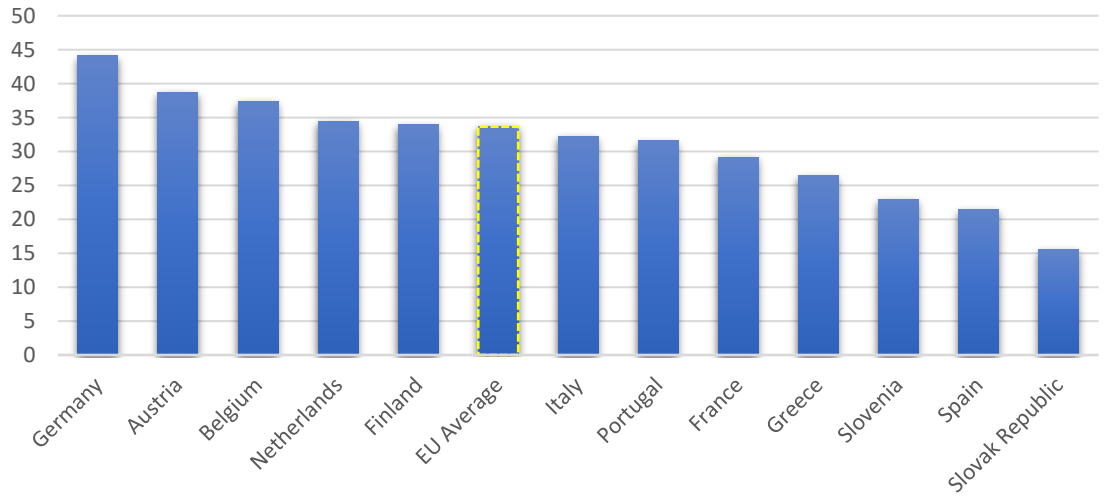

Figure 11: SMEs innovating in-house. Source: Author's calculation based on EIS Data

Except of those SMEs that innovate in-house as mentioned above there also these which create innovations through collaboration with others. Thus, it is also important to consider the indicator which will measure the extent to which SMEs of a country are involved in innovation cooperation. It is often observed that complex innovations depend on the capability to retrieve knowledge and information from diverse sources. Such an

indicator would be possible to estimate the flow of knowledge that firms exchange with each other or with public institutions like universities when cooperating for an innovation. As this indicator is defined in European Innovation Scoreboards (EIS), it constitutes the ratio of SMEs that have any cooperation agreements or innovation processes with other firms or institutions to the total number of SMEs which exist in a country. Figure 12 provides the relevant comparison for the 12 countries of our sample including also the EU average as a reference point. It can be seen that most of the countries exceed EU average for 2001-2018 period. Finland, Greece and Belgium reach the highest scores in this indicator surpassing other big countries like Germany and France. In the case of Germany this makes sense considering its in-house innovating performance that was mentioned previously. For Finland and Belgium this constitutes a proof that the majority of their SMEs are working on product or process innovations either in-house as mentioned before or through collaboration with others. In the case of Greece which for the first time so far is close to the leading countries in regards to innovative indicators it is observed that less than one out of two SMES there are focusing on innovations. It is also noteworthy that Italy and Spain are both below the EU average as in the relevant indicator of SMEs innovating in-house. Together with Portugal, these countries have less than half of their SMEs dealing with innovative products or processes. Spain has the worst performance in innovative SMEs considering also its GDP with less than 25% of its total SMEs being connected to innovative projects. Additionally, even though Greece has improved its performance on an aggregate level it is clear that periphery countries are still behind countries of EU core. The total percentages of Austria, Germany, the Netherlands and Belgium for innovating SMEs are way above those of Greece, Italy, Spain or Portugal.

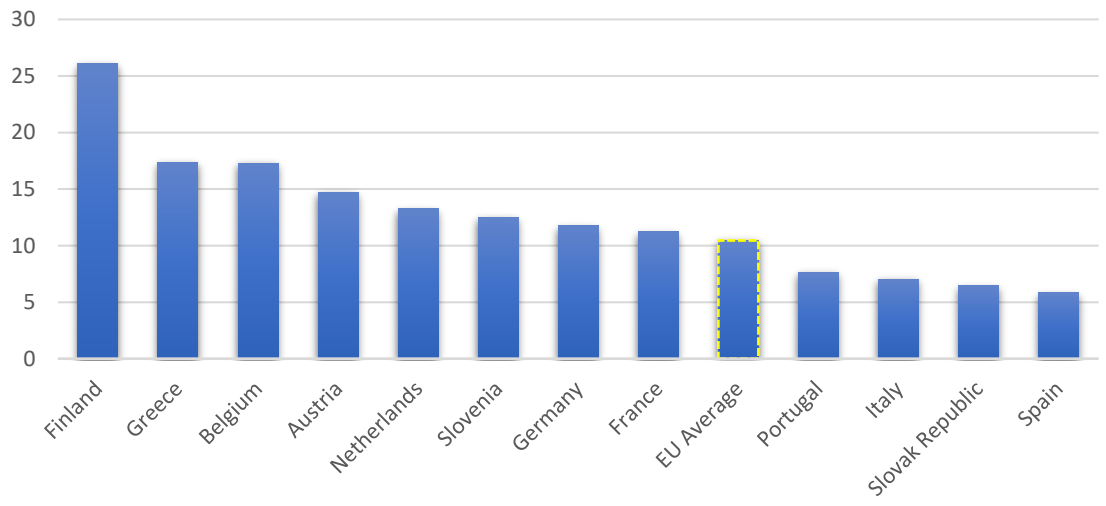

Figure 12: Innovative SMEs collaborating with others. Source: Author's calculation based on EIS Data

A final remark for the SMEs section is to examine how much these companies innovate themselves. Product or process innovation measurement can provide substantial evidence for the utilization of technological capabilities within the SMEs and the country per se. Considering that technological innovation is measured by the introduction of new products - both goods and services- and processes it is argued that it constitutes a key

ingredient to innovation in manufacturing activities. As a result, a high share of technological innovators contributes and should reflect to a high level of innovation activities. The indicator of the SMEs introducing product or process innovations is defined as the number of SMEs which introduced a new product or process to one of their markets to the total number of SMEs.

Figure 13 presents the percentage of SMEs on average that introduced a product or process innovation during 2008-2018 period. According to this indicator most of the 12 countries that constitute our sample are above the EU average. Particularly, 8 countries with Germany leading, have above 35% of their SMEs introducing product or process innovations throughout this period. On the contrary it is observed that two of the biggest exporters of EU are in the last positions of this analysis and below the EU average. France and Spain see less than 30% of their SMEs introducing innovations. Especially for Spain this constitutes the third indicator relevant to SMEs where the country reaches the last places of the ranking. For Portugal which climbed in this ranking to the first places this indicator demonstrates that more than 40% of its SMEs introduce annually a new innovation. Considering the previously mentioned indicators for the SMEs of the country, this implies that SMEs in Portugal are relatively innovative. Concluding, it is clear that there is a divergent path for countries of core and periphery of EU in the innovative activities.

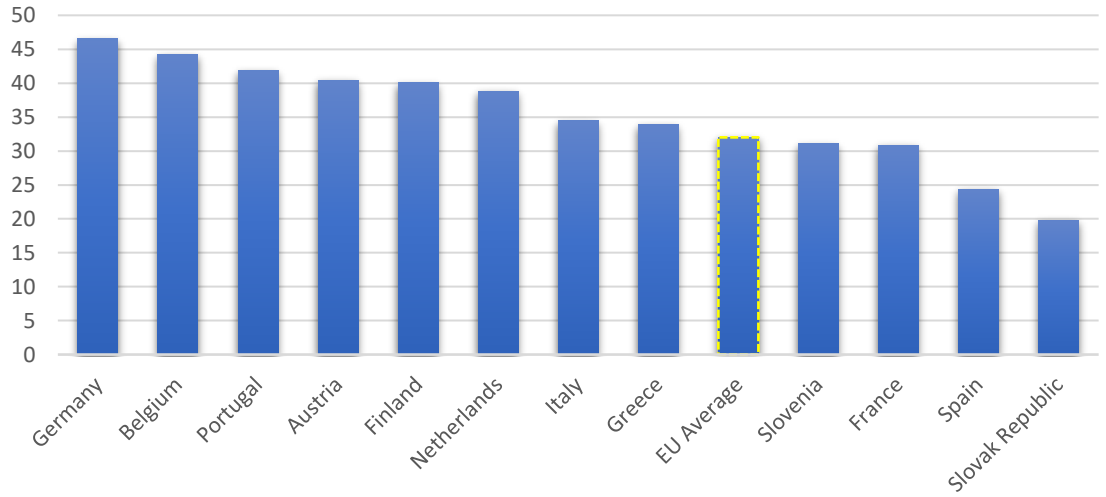

Figure 13:SMEs introducing product or process innovations (% of SMEs) 2008-2018 average. Source: Author's calculation based on EIS Data

3.3.4.Employment Share

In this section we elaborate the development of the employment shares of the 12 EMU countries throughout 2001-2018 period. This is substantial since the employment share indicates the industries that prevail in the employment mix and it provides insight for a country's workforce. Additionally, taking into account the race for competitive advantage, companies need to deploy and commercialize new technologies. Thus, existing high-tech sectors and enterprises constitute key drivers for the economic performance and productivity of a country and employment share in these sectors could explain its real dimensions for a country. We focus on the shares

of employment that highlight the orientation of a country towards the production of innovative technological products or processes, studying four indicators.

We firstly discuss the employment percentage in knowledge intensive activities (Figure 14). According to Eurostat an activity is defined as knowledge intensive if the employed, tertiary educated people, maintain more than 33% share of the total employment in that activity. The indicator is defined as the number of people employed in sectors recognized as knowledge intensive to the total number of employees. Four countries (France, the Netherlands, Finland and Germany) have more than 40% of their employees working in knowledge intensive activities according to Figure 14. The rest of the countries are below the EU average (36%) with Portugal demonstrating the lowest percentage of employees in knowledge intensive activities, namely 30%. It is noticeable that all periphery countries of EMU are below the EU average.

Narrowing our analysis to employment in high technology sectors like manufacturing or services per se, could provide additional insights. Figure 15 presents the employment in high-tech sectors on average for the period 2001-2018 for the 12 countries of the sample. According to this table, in Finland which leads this category, more that 10% of the total employed population works in a high-tech sector comparing to Greece which has the last position with only 4% of its employed population working in this sector. It is observed that the rest of the countries are close to the EU average, namely around 7%. The variance among their scores in this indicator is not large. However, this is not the case if we analyse solely the employment in medium and high-tech manufacturing. In Figure 16 it can be seen that the countries have noticeable differences, with Germany leading this category with 10% of the country's employees who have tertiary education working in medium and high-tech manufacturing companies. On the contrary, in the case of Greece, only one out of five people are working on medium and high-tech firms. Greece holds the last position according to the two lastly mentioned indicators showing that there are not many people working in technology sectors. The same path with Greece seems to have been followed also by Portugal, which reaches the last positions for these indicators as well. It is interesting to highlight the performance of two relatively small countries that maintain only a small share of the total EU exports, namely Slovenia and Slovak Republic. It can be seen that both are quite high in these rankings, higher than France, Italy or Spain with their people working more and more for high-tech firms.

A final remark aligned to the indicators describing employment shares refers to the percentage of the R&D personnel and researchers in firms (Figure 17). This share of employees contributes substantially to the R&D activities of institutions, enterprises and a country as a whole and they constitute a reference point in many similar researches and innovation indexes. R&D employees are highly trained researchers, specialized and trained technicians or supporting staff with the ability to contribute to R&D projects and activities. Among the 12 countries of the sample we observe that most of those that were prevailing in the lastly mentioned categories maintain their lead comparing to the EU average. Countries of the EU core have 1.5% of the employment share working in R&D sector comparing to EU periphery which is below 1%.

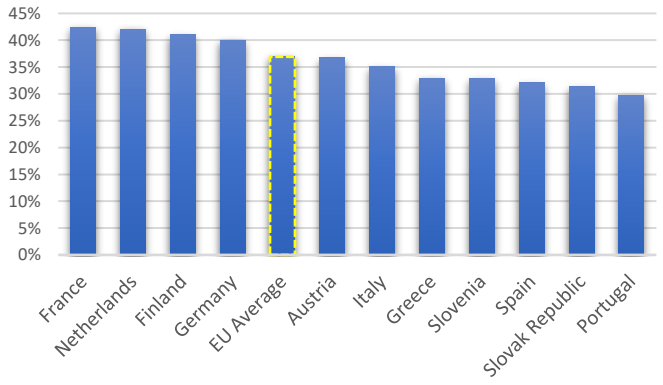

Figure 14: Employment in knowledge intensive activities. Source: Author's calculation based on Eurostat Data

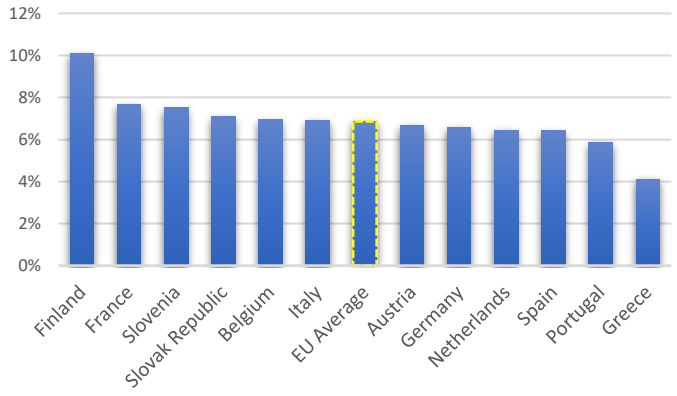

Figure 15: Employment in high technology sectors. Source: Author's calculation based on Eurostat Data

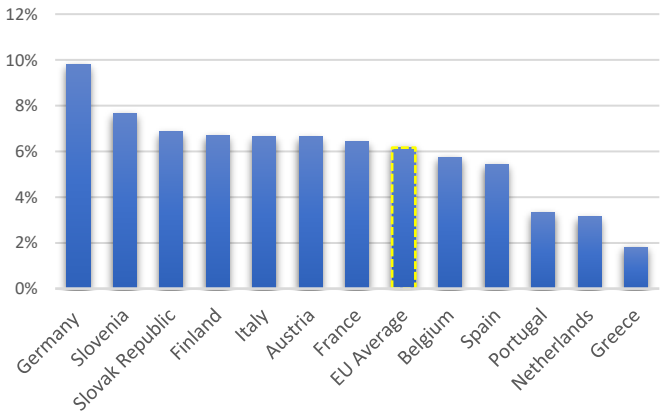

Figure 16: Employment in medium and high-tech manufacturing. Source: Author's calculation based on Eurostat Data

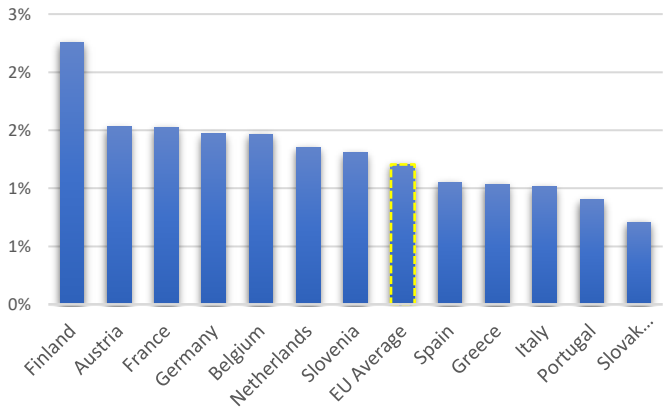

Figure 17: Total R&D personnel and researchers (% of total labour force and total employment). Source: Author's calculation based on Eurostat Data

3.4. Evolution of value added per sector

We analyze the market evolution of the 12 EMU countries of the sample by demonstrating the value added per activity throughout 2001-2018 period. Value added by activity shows the value added created by the various industries (such as agriculture, industry, utilities, and other service activities). The indicator presents value added for an activity, as a percentage of total value added. We present the evolution of the 6 sectors with a contribution of more than 10% on average of the value-added for the 12 countries of the sample during the 2001-2018 period. We consider industrial, manufacturing, tourism, finance, real estate, public and services sectors. We have noticed that there are sectors which present significant fluctuations throughout the 2001-2018 period while there are also others which maintain a stable mean. Additionally, in some cases the financial crisis seems to affect significantly the performance of a country which either manages to recover to the pre-crisis levels or faces important reductions in the value-added from the sector.

Considering the technological fields of the countries we refer to the industry (including energy) and manufacturing sectors. We examine the performance of the countries in three different periods within 2001-2018 timespan. In particular, we name as in a case before, the pre-crisis (2001-2007), crisis (2008-2012) and post-crisis (2013-2018) periods aiming to identify any existing fluctuations.

In the industry sector we observe that there are 5 countries above the EU average which prevail in the 2001-2018 period. It is surprising considering their performance so far in the innovation indicators that Slovenia and Slovak Republic are having more than 25% value added from this sector on average, namely the highest of all the rest countries. They are followed by countries well known for their performance in this sector like Germany and Austria. Italy is only slightly below the EU average while we see countries like Spain and France close to the bottom of the ranking. Greece is in the last position of the ranking in this sector with an overage of 13%. It is visible that most of the countries have experienced a downturn of their performance during the crisis period. In some cases, like Finland, Slovenia and Slovak Republic this reduction equals to more than 5 percentage points, while in the rest of the cases the differences are much less. Germany comprises the country of the sample that suffered the smallest percentage reductions in the value added from this sector remaining almost in its pre-crisis performance. Austria demonstrates a quite similar performance to Germany with only a slightly bigger decrease. The results after the crisis generate additional interesting observations. In particular in the post-crisis period, the majority of the countries did not recover to their pre-crisis performance did not gain the same value from the industry sector. Particularly, Slovak Republic and Finland have seen the value-added from the industry sector being reduced after the crisis by more than 5 percentage points. It can be argued that Finland is the most damaged country in this sector since it has lost almost 10 percentage points of added value after the pre-crisis period. On the contrary, Germany presents a slight increase and Austria maintained the same performance. For countries of periphery like Greece, Portugal and Italy the post-crisis period brought about an increase in the value-added from industry sector close to 2% reaching the standards of their pre-crisis records. However, these results should be elaborated cautiously as they are not accompanied by an increase of the economic performance of these countries. In fact, considering that the GDP of these countries had significantly declined from the outbreak of the financial crisis, this percentage increase is not translated to additional value gains. Thus, these results cannot be bestowed to the better performance of the country on this sector (nominator) but to the reduction of the value added in the country (denominator). It is observed that even in this case, Greece is still behind the EU average.

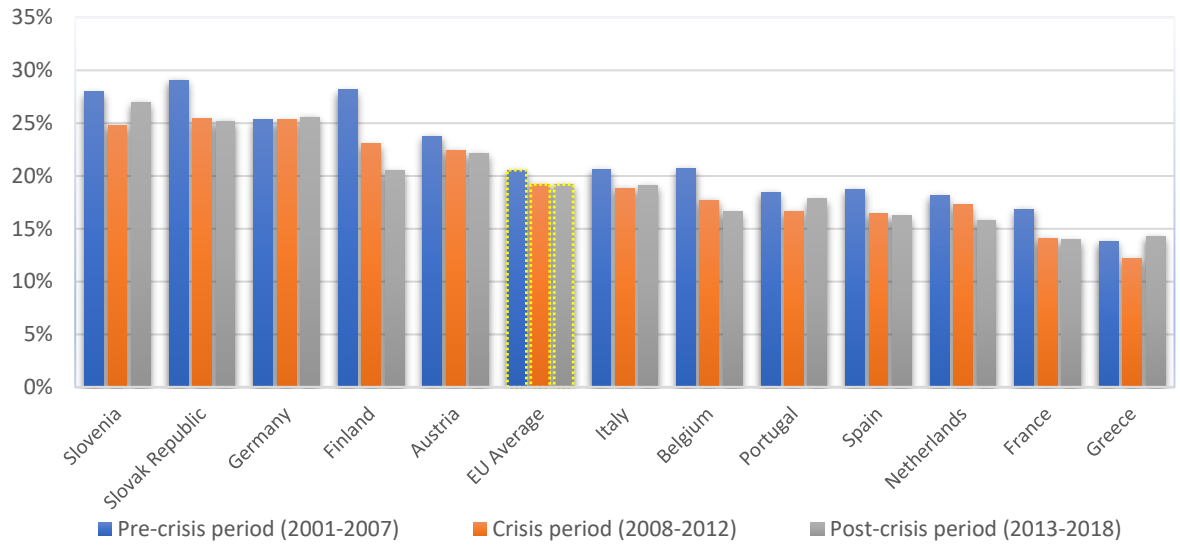

Figure 18:Value added by Industry. Source: Author's calculation based on OECD Data

The manufacturing sector seems to be aligned to the industry one. We observe that Slovenia and Slovak Republic also here in the first positions of the ranking while countries of the core like Germany and Austria are receiving high value from this sector as well. Greece stands in the last position with less than 10% on average of value-added per year from manufacturing sector. The country is more than 6% behind the EU average in the pre-crisis period and its performance is deteriorated during the crisis period. As Figure 19 depicts most countries have faced a steep decrease in their performance in the crisis timespan and most of them started to recover or stabilize their performances in the post-crisis period. Out of all, only Germany, Austria, the Netherlands and Slovenia have managed to almost reach their pre-crisis performance. The rest of the countries are recovering and recorded substantial losses. In particular, Finland has suffered an almost 10 percentage points loss in value-added from manufacturing sector since the outbreak of the financial crisis. It can be observed that it suffers the almost the same shrinkage as in the industry sector. Spain, France, Portugal and the Netherlands comprise the four countries which together with Greece capture the last positions of the ranking. Greece and Portugal are the only two out of these countries which after the crisis period gained additional value from their manufacturing sector. The other 3 countries managed to stabilize their performances and avoid further losses. It can be argued that countries of the European periphery are not harvesting much from sectors like manufacturing and industry. It is questionable how countries with so big industries like Italy, France or Spain obtain so less value from these sectors. In addition, Greece is in both cases way below the average of EU also followed by Portugal and they seem to develop their performance but in a very slow rate. The value-added from these sectors imply that these countries suffer in the production of medium and high-tech products or services.

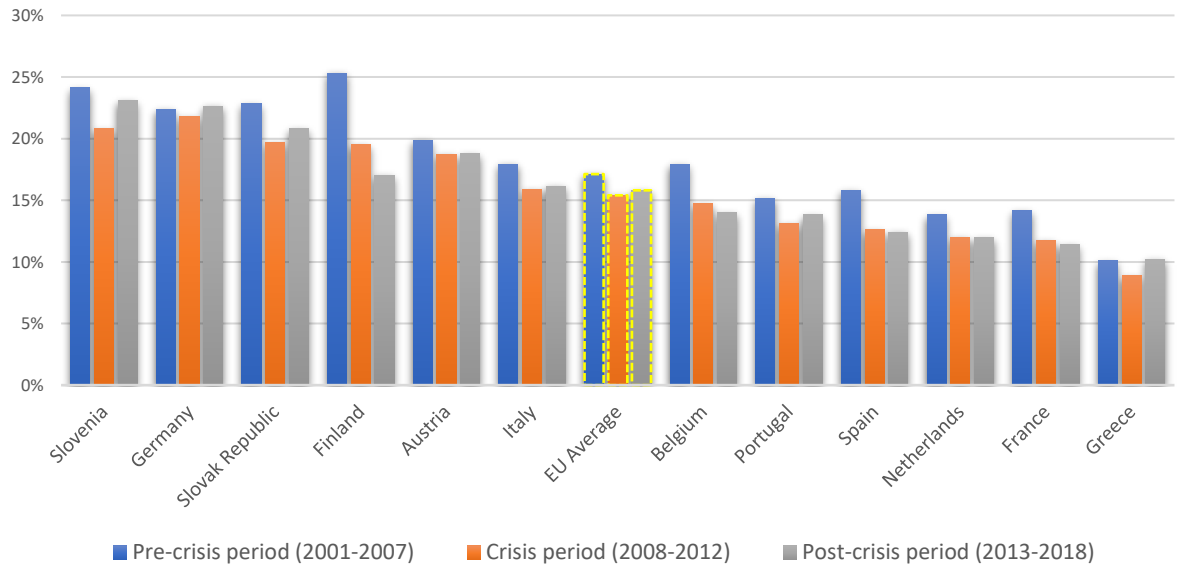

Figure 19:Value added by Manufacturing. Source: Author's calculation based on OECD Data

The magnitude of value-added in each country of the sample changes significantly when the real-estate sector is examined. In this case we can see that prevail these countries which were on the last positions for industry and manufacturing sectors, like Greece, Italy and France (Figure 20). Greece has more than 15% of its value-added from real estate sector and this performance is improved in the crisis and post-crisis period. Though Greece was below the EU average in the pre-crisis period it increases its performance by almost 8% until 2018. This is also bestowed to a big extent to the reduction of the country's GDP throughout this period but it can be recognized that this sector has a more significant contribution to the value gains of the country comparing to manufacturing and industrial sectors. Especially in the post-crisis period, the real-estate sectors' gains for Greece exceed EU average by more than 7%. Italy and Portugal present similar trends to that of Greece increasing continuously the value-added from the real estate sector both in the crisis and post-crisis periods but in their case the raise is only 4%. Italy has almost the same performance as it had in the manufacturing sector. It can be seen that even if some countries seem to have an important lead in this category, this sector does not add the same value as the aforementioned technological sectors. It can be seen that from core countries of EU only Germany maintains an average above EU but not much above it. In fact, the rest of the EU countries like Austria, Belgium and Austria are below the EU average all three different time spans. Besides this sector helps them gain only half of what technological sectors give them on value. The same point is valid for Slovenia and Slovak Republic as well, namely the two countries which added most of their value from industry and manufacturing sectors. In their case we observe a constant performance regardless the timespan. It could be argued already that we see a different trend among these countries which focus on technology-oriented sectors and these countries which pay attention to other activities.

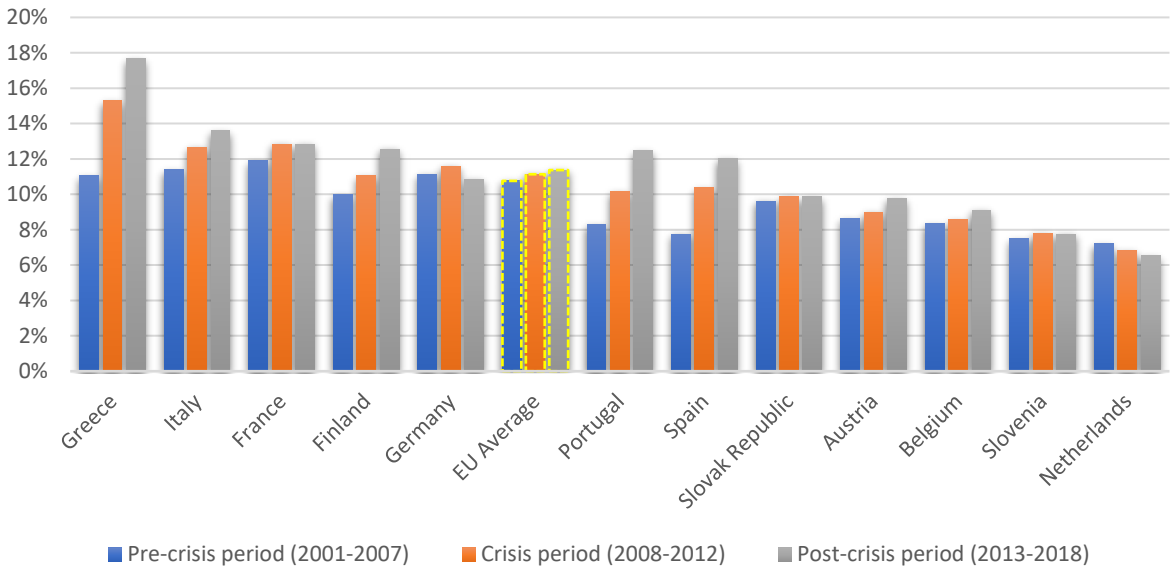

Figure 20: Value-Added from Real Estate sector. Source: Author's calculation based on OECD Data

Further evidence for the diverging paths of the countries are provided from the tourism sector's performance which is similar to the real estate sector but with higher value-added contribution. Tourism sector also includes accommodation and food services. In this sector, which is not related to technological competencies, it is demonstrated that Greece has a significant lead on average comparing to the other countries of the sample (Figure 21). In particular, Greece adds on average 25% of its value from this sector, 5% above the EU average. It reaches more value via this sector than industry and manufacturing sector combined. This performance was affected negatively from the financial crisis of 2008-2009, and it can be seen that Greece is losing some of the value added, close to 2%. The country did not manage to recover in the post-crisis period and maintained the same averages. Close to Greece and with more than 20% of value added from this sector on average, are Portugal and Spain. There are both countries of periphery and it is the first time we obtained results that have these two in leading positions. It can be argued that these countries, like Greece, are performing better in non-technological sectors like tourism and real estate than technological sectors like manufacturing and industry. Portugal managed to gain more value from tourism during the crisis period and in fact it increased its performance by 2% in the post-crisis period. Spain, on the other hand, lost some of the value during crisis, but managed to recover in the next period and enjoyed higher contribution to its economy from this sector. It can be seen that countries which prevailed in technological sectors like Germany and Finland are gaining less value from tourism sector. In fact, Germany is in the last position and below EU average gaining 15% value from this sector on average. If we compare the technology sectors to real estate and tourism, then it is visible that Germany wins much more from the former one. The same conclusion is also valid for Finland which despite its performance in technological sectors now gains less value from tourism than the EU average. The only exception for the core countries in this sector is Austria which albeit it had a poorer performance than the majority of the countries in

the real estate sector, it is emerging in tourism as the 4th on average country with a strong performance above 20%.

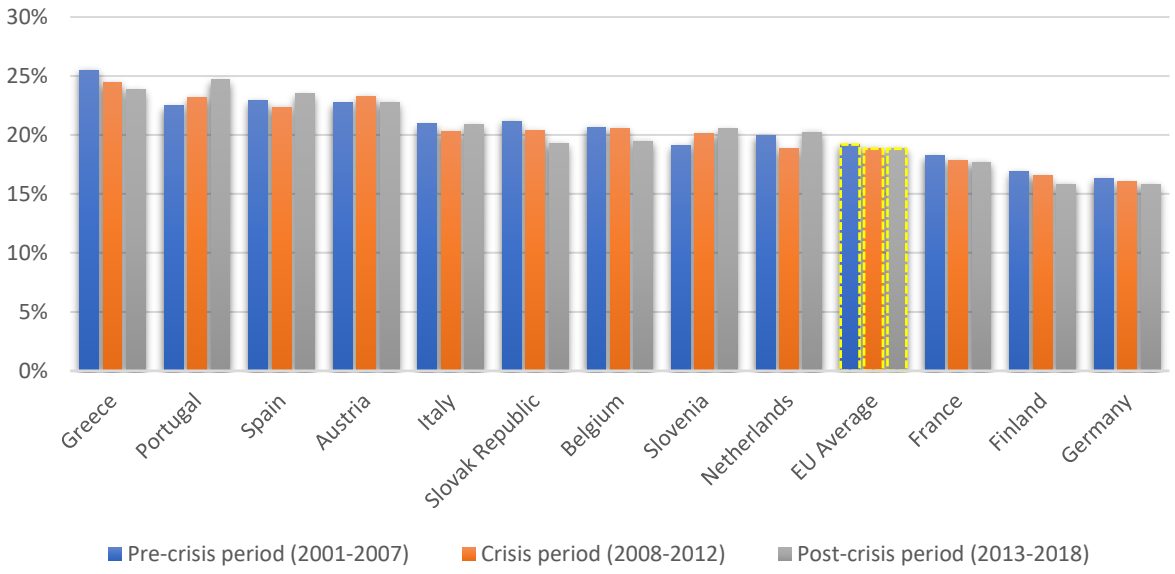

Figure 21: Value Added from Tourism sector. Source: Author's calculation based on OECD Data

Furthermore, public administration sector contributes substantially to the economies of all 12 countries of the sample with the average exceeding 15%. In the measurement there are also included health, defense and education. Figure 22 demonstrates that there are actually two groups of countries, namely those which maintain an average above 20% and those which are close to 15% and below of EU average. The variance in both groups is small, with only the Slovak Republic gaining less than 15% of value from this sector. It is noticeable that very few countries lost value from this sector during the crisis as only Portugal and Slovak Republic demonstrate relevant falls (1% in both cases). Greece on the other hand, is improving its performance and gains more value (33%) from public sector during the financial crisis period. Similarly, the Netherlands, Finland and Spain demonstrate a raise of 2% in the value-added from this sector the same period. The country which has the lead in this sector is France. It is the first time so far in our analysis that France prevails from the rest of the 12 countries and it could be argued considering the results of the examined indicators that the country is following a rather mediocre path. This sector adds important value also to Belgium and the Netherlands which are the first countries of the EU core that are seen in the ranking and follow both the same trend increasing slowly the contribution of the public sector to their economies from the crisis period onwards. A concluding remark for this sector is that it cannot be identified a specific pattern among countries as it was recognized in the abovementioned sectors. Countries of core or periphery have mixed places and it cannot be stated that either group comes first or second. In addition, comparing to other sectors, this one has the smallest range of price and no matter any differences all the countries of the sample are relatively close to each other.

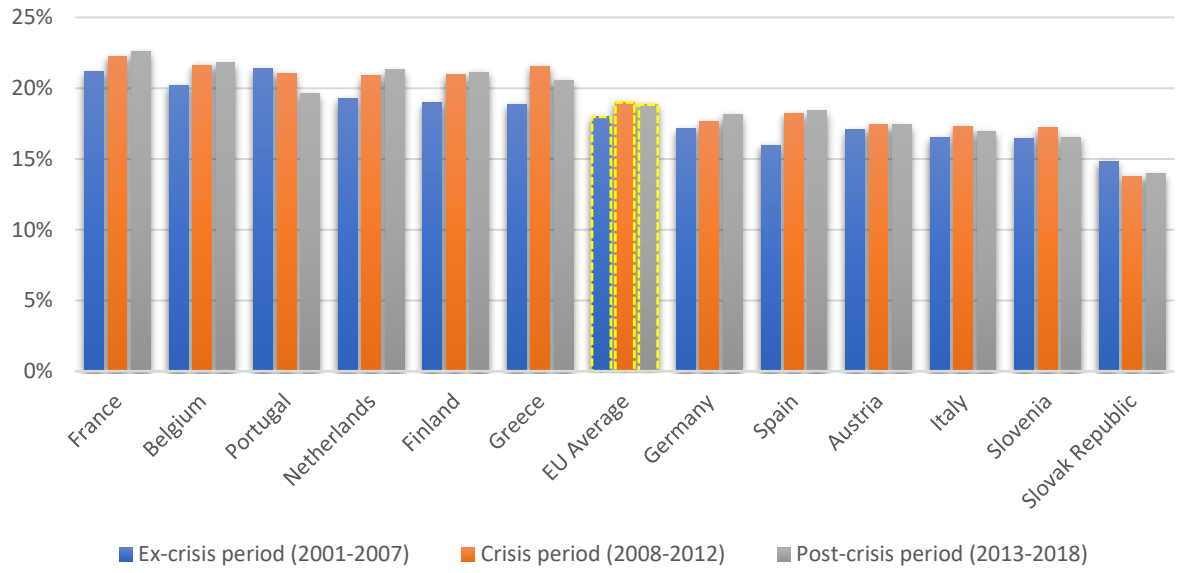

Figure 22: Value-Added from Public Administration, Defense, Education, Health & Social Work. Source: Author's calculation based on OECD Data

A final comment in this section is about the service sector which as it can be seen in Figure 23 contributes the most to the economies of all 12 countries. It is the most value-profitable sector providing on average more than 70% of value-added to the countries and there were not significant fluctuations throughout 2001-2018 period. In this sector, it is observed that countries which were gaining less from technological sectors are now prevailing. France and Greece base a huge part of their economies on the value-added from the service sector. They both gain 78% of their value from this sector. France does not present significant changes for the whole period of 2001-2018 comparing to Greece which increased the value-added from this sector during the crisis timespan by 7%. Greece and Spain are the only countries which managed to gain so much more from this sector after the pre-crisis period. The countries that were gaining more from the technological sectors like Germany, Austria, Finland, Slovenia and Slovak Republic are according to Figure 23 gaining less from the service sector comparing to the rest of the countries and the EU average. the Netherlands and Belgium are in the first places here as well "representing" countries of the EU core since Germany and Austria are found below the EU average. In particular, it is obvious that periphery countries of EU have better or equal performances to the EU average and the last places of the ranking are reached from core countries, Slovenia and Slovak Republic. We can recall that these countries were the countries that gaining the most comparing to the rest from the technological sectors.

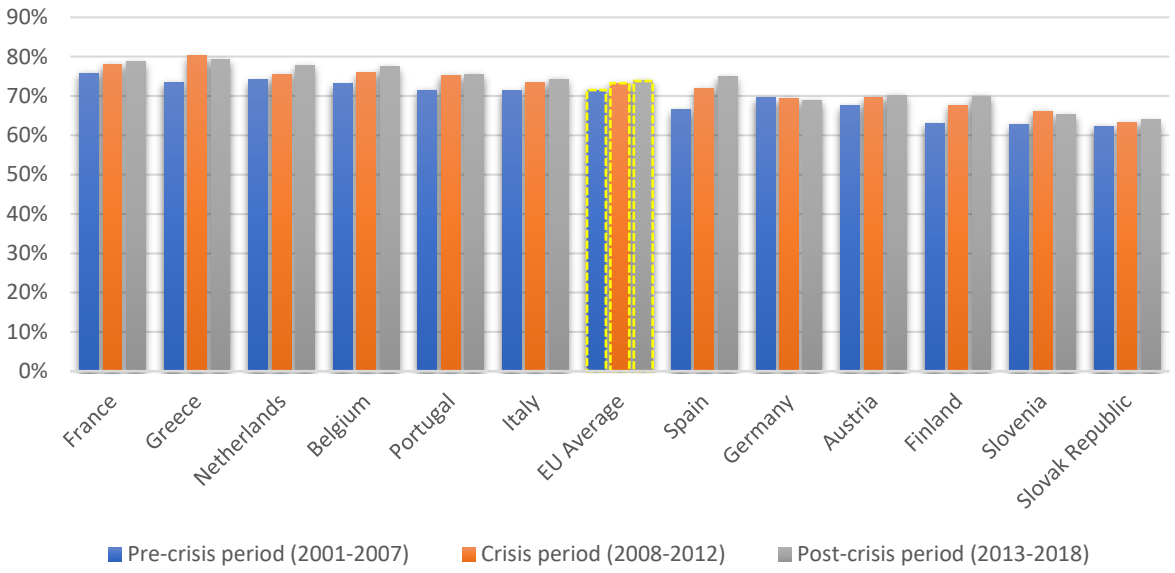

Figure 23: Value-added from Service Sector. Source: Author's calculation based on OECD Data

3.5. Export Growth

The 12 countries of the sample together account for more than 65% of EU exports on average throughout the 2001-2018 period as it shown from OECD data. Germany is by far the biggest exporter, accounting for more than 20% of the total EU exports on average during 2001-2018 (see table in Appendix C). In this section we will elaborate the export growth, estimating the average growth on exports of these countries in three different periods, namely pre-crisis period (2001-2007), crisis period (2008-2012) and post-crisis period (2013-2018). We will also monitor how much the export performance during these periods affected the economic growth and income of these countries. Finally, we will provide additional data regarding their export performance on medium and high-tech products and manufacturing.

Exports play a vital role in a country's economy as they can influence its economic performance and growth, the employment and the balance-of-payments. Growth in exports could create employment and as a component of aggregate demand its increase could lead to higher economic growth as well. Finally, the export performance determines significantly the current account deficits. Figure 24 demonstrates that before the financial crisis of 2008-2009 Slovak Republic and Slovenia had the biggest growth of exports on average comparing to any other country of the sample. They both had on average above 10% annual growth with Slovak Republic almost reaching a 16% growth per year. This constitutes a noticeable point especially when considering that these two countries have very small shares in the total EU exports (1.44% and 0.89% respectively). Germany, the export leader of EU has annually less than 8% of export growth. Finland and Austria are the last countries of this sample that had an export growth above the EU average in the pre-crisis period.

The outbreak of financial crisis damaged severely trade performance of the countries. The 2008-2012 period finds all of them with single digit or even negative growth. Slovak Republic which demonstrated the best performance before the crisis has lost 10 percentage points of growth after 2007. It was the country that suffered the biggest loss comparing to the others. However, it kept the highest annual growth with approximately 5%. Slovenia suffered from a 9-percentage points reduction, being the second most hardly hit country having during 2008-2012 period 1% growth. For Italy, Finland and Greece the financial crisis brought about a reduction of their export share per se, as they depicted negative growth. Greece had on average a negative growth of -1.8%, namely 6 percentage points below its pre-crisis average. In 2009 Greece recorded an 18% reduction of its export share which was moderated steadily until 2012. The rest of the countries and especially those from the core of EU faced smaller damages as Germany, the Netherlands and Austria managed to remain above the EU average during that period.

In the aftermath of the financial crisis countries tried to recover and rebuilt their export capacities aiming to reach as soon as possible their pre-crisis growth. However, as it can be seen in Figure 24 the majority of the countries did not reach their first period performance. Only Portugal has exceeded the pre-crisis annual growth by approximately 1 percentage point. Spain, Greece, Italy and the Netherlands have also manged to reach their first period performance but not exceed it. They still try to recover and regain their shares in total EU exports while they stand below the EU average export growth.

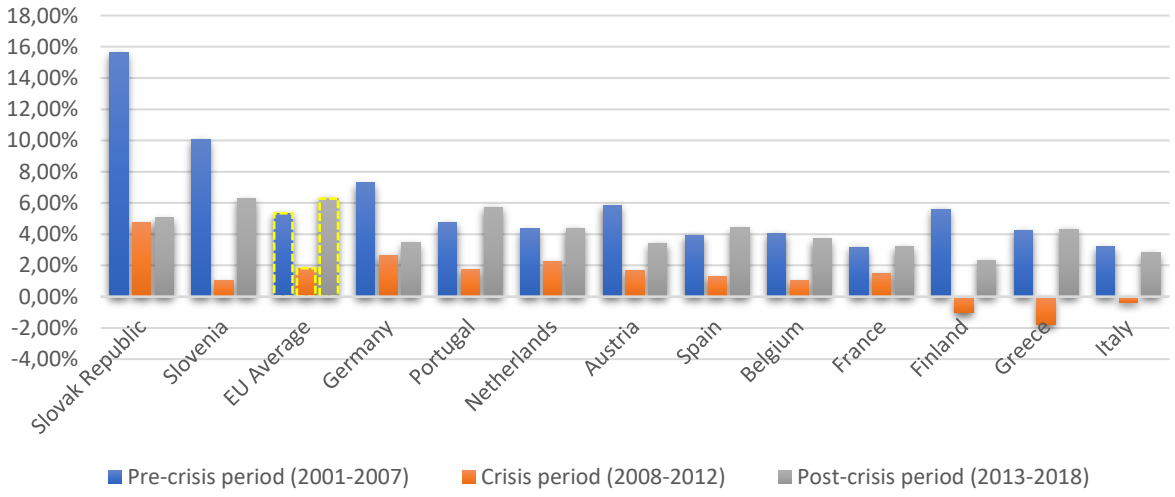

Figure 24: Export Growth. Source: Author's calculation based on World Bank Data

As it has been already argued, export performance of a country plays a very important role on its economic growth. A closer look on exports as a percentage of GDP will clarify its significance even more. Figure 25 depicts the exports of goods and services as a percentage of GDP of the 12 countries of the sample throughout the three periods as these were determined above. It can be seen that Slovak Republic which was the country with the highest export growth in the pre-crisis period is also one of the countries with an export-led economy since the value of its exports is close to 70% of its GDP. However, Slovak Republic is not the country with the

highest exports to GDP ratio in the pre-crisis period. In the case of Belgium, its exports value equals to 72% of its GDP in the pre-crisis period although the country had an average of only 4% annual export growth that period. The Netherlands and Slovenia are the countries that follow, with their exports value reaching approximately 60% of their GDP. Countries of the so-called core of EU maintain also percentages above the EU average with Germany which also has the biggest share on the EU exports, having exports value equal to 36% of its GDP. On the other hand, periphery countries of EU like Spain, Italy, Greece and Portugal together with France earn from exports less than 30% of their GDP. Greece which was recording more than 4% of annual growth on its exports, gains around 20% of its GDP from exports during the pre-crisis period having the worst performance among the rest of the 12 countries. Italy and France which together have almost 20% share of the total EU exports (see table 4, section 3.1) gain on average from their exports around 26% of their GDP during 2001-2007. During the crisis period all countries of the sample did not demonstrate reduction of the contribution of exports to their GDP. However, it cannot be argued that this has happened because of improvements in their export performance since during the crisis all countries faced substantial cuts on their GDP. As a result, during this period the real performance on trade from the 12 countries of the sample is masked from the decrease of GDP. From 2012 onwards, when the EU countries started to recover and increased their GDP, it can be seen a relative improvement in their export performance. In particular, most of the countries exceeded their pre-crisis performance. The countries that were prevailing before, maintained their lead. Countries of periphery like Greece, Spain, Portugal and Italy suffered big losses from the crisis but in the post-crisis period managed to increase the contribution of exports to their GDP. Portugal and Greece recorded substantial raises on their exports to GDP ratio close to 9% but remained below the EU average of the period. Additionally, the increase in the cases of Slovak Republic and Slovenia (13%) comprised a growth record for this period as the countries managed to increase the contribution of their exports to GDP in these years by more than 20%. The Netherlands is following a similar path recording a 17% percent increase of this ratio since the outbreak of the crisis until 2018.

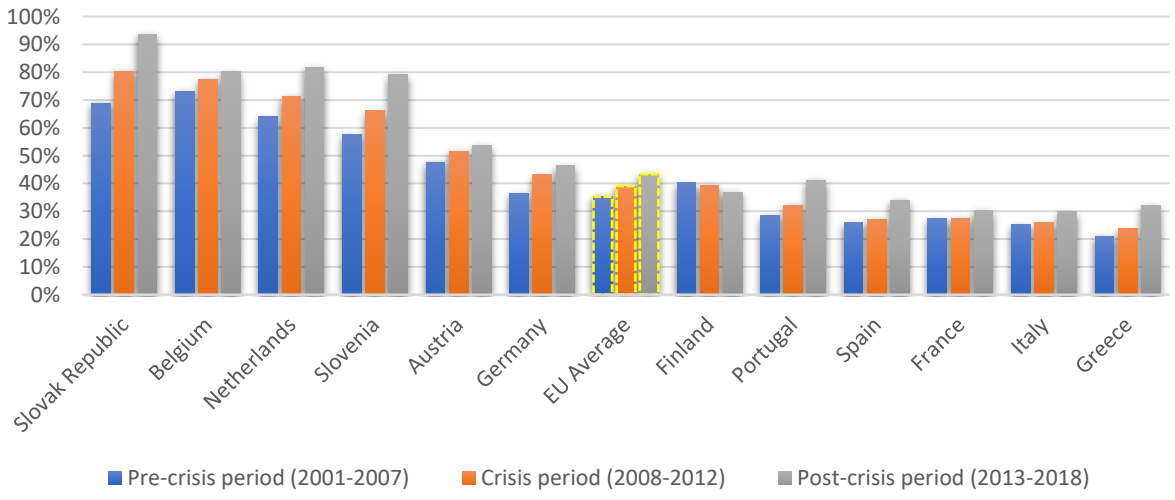

Figure 25: Exports of goods and services (% of GDP). Source: Author's calculation based on World Bank Data

After understanding the evolution of the export shares and growth throughout the 2001-2018 period and highlighting the existing fluctuations of countries' performances, we considered it essential to examine more specific export fields. Aiming to have better understanding of the export constituents we also examine the share of manufacturing goods to the total exports. Manufacturing goods contain commodities from chemicals, basic manufactures, machinery and transport equipment and miscellaneous manufactured goods. According to Figure 26 provided below, manufactured products have the biggest share of exported merchandised goods. The EU average is close to 80%, as four out of five exported goods from Slovak Republic, Slovenia, Germany and Italy are manufactured. Greece is the only countries which is far behind in this category. Particularly, in Greece only 44% of its exported goods belongs to the manufactured category. As we have seen in section 3.3 Greece is having more value-added in its economy from other than technological sectors. Figure 26 provides important data also for the Netherlands, which although is an export-led economy as we have seen, with its exports reaching 72% of its GDP, it demonstrates that the share of manufactured goods it exports is close to 60%, namely around 20 percentage points less than the EU average. As it was shown in section 3.3 The Netherlands does not gain a lot of value from the technological sectors.

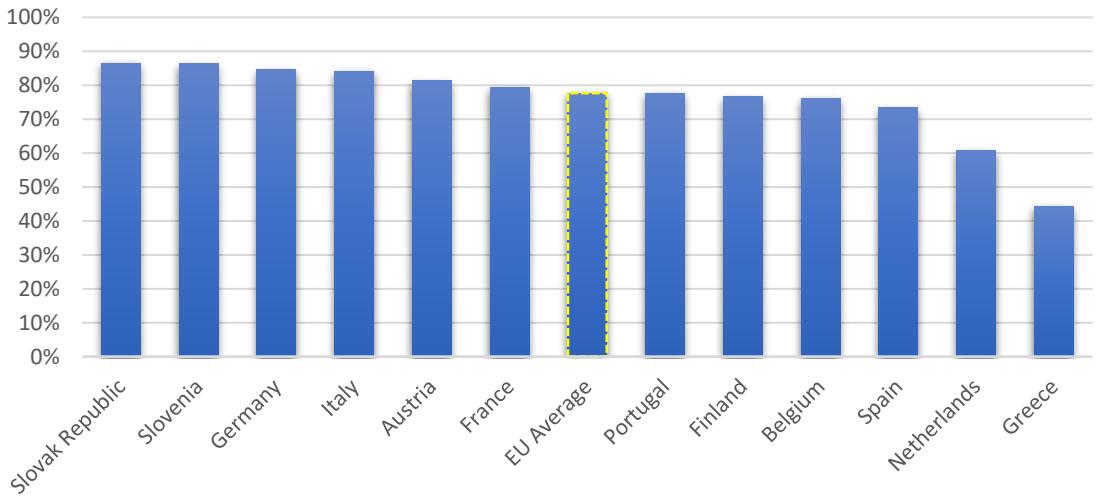

Figure 26: Share of manufacturing exports to total exports, (2001-2018). Source: Author's calculation based on World Bank Data

Among manufactured goods there is one category of goods which refers to machinery and transport equipment. These categories include medium and high-tech products and it is substantial to elaborate them separately since they provide additional evidence for the productive capabilities of the countries. By examining their export shares, we will be able to understand their contribution to the total exports of the country.

Machinery category includes products like engine parts, computers, telecommunication systems, electrical and electronic systems and circuits while in the transportation category can be found vehicle parts, cars, specialized vehicles and aircraft parts etc. What can be observed instantly from both Figure 28 and 29 is that Slovak Republic leads both categories. It constitutes one of the fastest growing export countries, with high value added from technological sectors, the highest contribution of exports to its GDP and with the biggest share of

manufactured products in its exports. These two Figures show that out of the 86% of its manufactured products that it exports, more than half are either machinery or transportation products, namely medium and high-tech. Germany is the only country after Slovak Republic which has close to 50% of its manufactured goods in these two categories. Slovenia which was the second country with the highest share of manufactured goods in its exports has less than 40% of its exported manufactured goods related to these two categories. In addition, Italy which is also one of the countries that has more than 80% of its exported goods being manufactured, does not demonstrate such a strong performance on machinery and transportation products. The Netherlands confirms also in this case that manufacturing sector does not contribute that significantly in its economic performance. In particular, the Netherlands which had around 60% of its total exported products in the manufactured category has less than 30% of machinery and transportation products. It is also noticeable that Belgium, a country with exports equal to 76% of its GDP and one of the best export performances within EU has close to 20% of its manufactured products belonging to these two categories. Finally, Greece which has the worst performance in exports of manufactured goods as Figure 29 depicts, it has only 11% of its manufactured goods being machinery or transportation products. Considering that Greece gains from exports around 25% of its GDP and out of the total exported goods those that are manufactured are less than 45%, it can be argued that Greece has been far behind from the rest of the EU countries during the 2001-2018 period as far as export performance is concerned. In similar position with Greece we find other countries of EU periphery like Portugal and Italy.

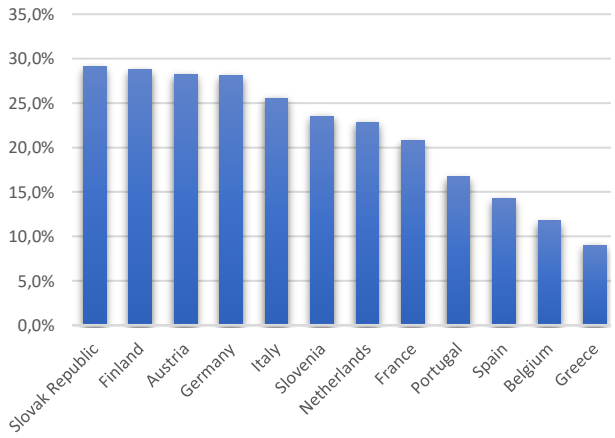

Figure 27: Machinery goods as % of total exports, Source: Author's calculation based on OEC Data

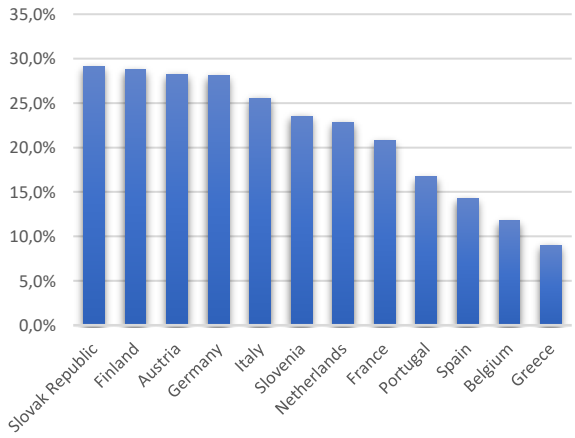

Figure 28: Transportation goods as % of total exports. Source: Author's calculation based on OEC Data

After this section it is clear that EU countries have followed different trajectories in regard to their trade deployment. On the one hand there were those countries like Slovak Republic, Germany and Austria which focused on rising the value of their exports, increasing their contribution to GDP and deployed their manufacturing sector with attention to medium and high-tech products. On the other hand, there were countries like Greece, Italy, Spain and Portugal which did not manage to increase significantly their export performance, exports contributed less to their GDP and deployed much less their medium and high-tech products. Taking also into consideration section 3.3 and the valued added from the different sectors it is clarified that countries have followed a diverging path during this period.

3.6. Definition of Model Variables and Descriptive Statistics

Throughout Chapter 3 we have elaborated different indicators in order to analyse and explain the trajectories of the 12 EMU countries of our sample after the introduction of the common policy. These indicators were not randomly picked but constitute factors of indexes that are used worldwide in order to scrutinize the productive and technological capabilities of a country. Antonio Andreoni (2011) defines in the United Nations Industrial Development Organization's (UNIDO) working paper, productive capabilities as all those personal and collective competencies, productive knowledge and experiences which physical agents and organizations per se have and are essential for firms in order to perform effectively various productive tasks without staying outdated, but having the ability to espouse and undertake in-house improvements.

This model includes indicators known as national level indicators, which were developed for different goals, namely national science and technology (S&T) assessment to innovation and competitiveness analysis. Our intention is to select those indicators which would be more suitable to measure accurately the level of productive capabilities of a country. We use the two approaches of measuring the national productive capabilities which are described in UNIDO working paper (Andreoni, 2011). In particular, we consider country-level indicators which contain information from both input-based and output-based variables (group 1) and the so-called "trade-based" indicators (group 2). Trade-based indicators offer the ability to measure indirectly the productive capabilities of a country. In this case, the estimation of a county's productive capabilities is based on the degree of sophistication of the products which are exported from this country.

At first indicators from group 1 derived when considering European Innovation Scoreboard which comprises a Summary Innovation Index (SII). We include factors which facilitate us to measure innovation inputs, namely innovation and entrepreneurship, knowledge, innovation sources and its outputs, like intellectual properties. We also include factors for infrastructure and absorptive capacity, like ICT expenditures as these were explained in the Global Summary Innovation Index (new GSII) in 2008. Furthermore, in the model are used quantitative variables from the Innovation Capability Index (UNCTAD) aiming to directly measure technological processes and human capital. This includes the Technology Activity Index variables as well with the Human Capital index variables (Andreoni, 2011). In this model there are also considered indicators aligned to industrial competencies. These are estimating the skills, the technological effort, the foreign direct investments (FDI) and the infrastructures. Additionally, we considered variables from Competitive Industrial Performance Index (CIP) in order to capture the different dimensions of a country's competitiveness as far as production capacity is concerned. As a result, we include variables to estimate the value added from manufacturing as well. Specifically, the variables that are going to be used and are aligned to group 1 are:

Indicator	Numerator	Denominator
Exports of goods and services (% of GDP)	The value of all goods and other market services provided all over the world	Gross Domestic Product
Manufacturing exports	The sum of chemicals, basic manufactures, machinery and transport equipment, miscellaneous manufactured goods	Total exports
Medium and high-tech exports	The sum of of medium and high-tech manufactured products	The sum of manufactured products exported
Share of tourism in exports	Sum of international tourism receipts	Sum of exported goods and services
Trade Openness	Sum of exports and imports of goods and services	Gross Domestic Product
ICT goods exports	The sum of the information and communication technology goods like computers, communication equipment, consumer electronic equipment etc.	Total exports
ICT service exports	Sum of computer and communication service exports	Total exports
ICT manufacturing industries	The absolute number of ICT manufacturing industries	
ICT service industries	The absolute number of ICT service industries	
Foreign Direct Investment (FDI)	Net inflows in a reporting economy from foreign investors	Gross Domestic Product
Port container traffic	Flow of containers from land to sea transport and vice versa[2]	
Air transport and registered carrier departures	Domestic and foreign take-offs of air carriers registered in a country	
Patent applications-residents	The sum of patents where the first-named applicant is a resident of the country	
Patent applications-non residents	The sum of patents where the first-named applicant is outside of the country	
Trademark applications	Number of trademarks	Gross Domestic Product in Purchasing Power Standard
Scientific and technical journal articles	Scientific and technical journal articles published in physics, biology, mathematics, engineering etc.	
Population completed tertiary education	Number of people in age class having completed first or second stage of tertiary education	Population between 25 and 64 years
Lifelong Learning	Number of people involved in life-long learning	Population between 25 and 64 years
Venture Capital	Private equity being raised for investment in companies	Gross Domestic Product
R&D intensity	Gross Expenditure in R&D	Gross Domestic Product
Public R&D expenditures	All the R&D expenditures in the government sector	Gross Domestic Product
Business R&D expenditures	All R&D expenditures in the business sector	Gross Domestic Product

[2] Data collected refer to coastal shipping and international journeys

Non-R&D innovation expenditures	Aggregate amount of innovation expenditure for enterprises (thousands of Euros)	Total enterprises' turnover
Employment in medium/hi-tech manufacturing	Total number of employees in medium and high-tech manufacturing	Total employment
Employment in knowledge-intensive activities	Total number of employees in knowledge-intensive activities	Total employment
Employment in high-tech sector	Persons with tertiary education (ISCED) and/or employed in science and technology	Total employment
Employed people with ICT education	Total male and female in thousands	
R&D researchers	Sum of scientists and researchers recruited in R&D activities	Total people employed
SMEs innovating in-house	Number of SMEs with in-house innovations processes and activities	Total number of SMEs
Innovative SMEs collaborating with others	Number of SMEs with cooperation agreements with other enterprises on innovation activities	Total number of SMEs
SMEs with product or process innovations	Number of SMEs introducing a new product or process innovation to one market	Total number of SMEs
Charges for the use of intellectual property	Payments and receipts between residents and non-residents for the authorized use of proprietary rights	Gross Domestic Product in Purchase Power Parity
Fixed broadband subscriptions	Fixed subscriptions to high-speed access to the public Internet	100 people
Net investment in nonfinancial assets	Non-financial assets include fixed assets, inventories, valuables, and non-produced assets	Gross Domestic Product

Table 4: Indicators of productive capabilities

The second group of indicators refers to trade-based indicators which actually constitute a product complexity ranking. Comparing to the traditional indicators of group 1 which are based on input data (extracted from input-output figures) and technological intensity (referring to R&D expenditures), the trade-based indicators use the information on a product's exports to the per capita incomes of countries which export it. As a result, these indicators help researchers to classify the exports (sophistication of exports) and rank the countries according to their export basket.

In this model we calculate the PRODY and EXPY indexes of two specific categories of exported products, namely machinery and transportation equipment. These two categories are part of the manufactured goods and are referring to medium and high-tech products. These indexes were chosen under the notion that "a country becomes what it produces" as this was explained by Hausmann et al. (Andreoni, 2011) after they deployed this index. Consequently, it can be said that economic development constitutes a process of gaining knowledge on how to produce and export increasingly sophisticated products. This is how a country could build and accumulate its productive capabilities.

PRODY index comprises a quantitative index which can rank the traded goods in alignment to the income levels of the countries which export them. PRODY of product *k* is calculated as a weighted average of the GDP per capita of those countries which export the product. Considering that country *j* has a GDP per capita which equals to Y_j and its total export equals to the total of products *l* in the overall export basket, namely $X_J = \Sigma_j x_{jl}$. In order to calculate the PRODY, it is also needed to estimate the index of revealed competitive advantage (RCA) which constitutes the weight of the PRODY index. RCA is defined as the ratio of the value share of the product considering a country's export basket to the total of all value shares of all the countries which export that product. The PRODY formula is the following:

$$PRODY_k = \sum_j \underbrace{\frac{\left({}^{x_{jk}}/_{X_J}\right)}{\sum_J \left({}^{x_{jk}}/_{X_J}\right)}}_{\text{RCA}} Y_J$$

In addition, EXPY constitutes a weighted average of product's sophistication exported by the country, namely a weighted PRODY index. This weight is the share of the product to the country's total export basket. Thus, the EXPY formula is:

$$EXPY_i = \sum_l \left(\frac{x_{il}}{X_i}\right) PRODY_l$$

A final remark concerns the last set of indicators that we considered in our model and are related to the institutional framework of each country. In particular, we include in our analysis indexes related to the political framework of the countries such as the "Rule of Law", the "Government Effectiveness", the "Regulatory Quality" and the "Political Stability". Rule of Law defines the extent to which agents have the confidence in and abide by the rules of society. Government Effectiveness index provides evidence for the quality of the public services, the quality of policy formulation and implementation and government's credibility to apply its policy. Regulatory Quality index will provide substantial indication of the government's ability in a country to formulate and implement sound policies and regulations which would facilitate and promote private sector deployment. Finally, the Political Stability index will be used on the model in order to estimate how political conflicts and imbalances affect international competitiveness.

As already mentioned in section 1.9 on our methodology, we will also include RULC in our estimation model as part of the independent variables. Finally, considering also the dependent variables of our model, namely the international competitiveness either defined in terms of the share of country n's exports in total EU exports (EMS) or in terms of the annual rate of growth of exports of country n (EGR) we sum 43 variables. Each variable contains information for the performance of a country on the relevant activity for 2001-2018 period. Thus, every variable contains 18 observations for every country which aggregate to 216 observations for all 12 countries. For this study there are collected 8629 observations for the 43 variables while 659 are missing (see table in

Appendix D). It can be seen that no variable suffers important omissions. The only exceptions are non-R&D expenditures and SMEs introducing product or process innovation variables. However, we will include them as well since they could provide significant evidence for the productive capabilities' measurement.

3.7. Chapter Conclusion

Countries of EMU were not equally competitive with their exports and consequently they followed diverging paths in their economic development. Trying to determine how to increase the competitiveness of those countries of EMU which were left behind some economists argued that the RULC of these countries was too high, while a different school of economists blamed their lack of non-price technological competitiveness, insisting that the restructuring of an economy could be achieved through the renewal of the economy's productive capabilities.

In this Chapter it was defined a sample of 12 EMU countries and after collecting relevant data for the 2001-2018 period, there were elaborated their cost/price and non-price technological competitiveness indicators in order to examine their diverging or converging trajectories. Initially it was found that RULC fluctuations tend to diminish especially after the financial crisis, while countries of periphery which were accused for high RULC performance did not actually exceed the EU average. In general, it could be argued that the countries of the sample demonstrated a relative convergence on their RULC performance. On the other hand, while examining data related to the productive capabilities of these countries it was identified a diverging trend. In particular, countries of the core of EMU, like Germany, the Netherlands an Austria demonstrated higher performance on fields related to medium and high-tech products and innovation comparing to those of periphery like Greece, Italy and Portugal which gain more value added from construction, real estate and tourism sectors. The differences in their economic growth paths was translated also into different export performance. The indicators described in the Chapter together with more variables related to productive capabilities as these are defined in the last Section will comprise the independent variables of the econometric model of this study and are expected to help us examine the roots of the existing divergence and their influence on the economic performance and international competitiveness of the countries.

Chapter 4. Econometric model

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete"

Buckminster Fuller

In Chapter 3 we concluded that according to the evidence provided, the 12 Eurozone countries of the sample have followed different paths throughout the period 2001-2018. One group of EMU countries focused on their industry and manufacturing sectors and improved their technological competencies and another groups of EMU countries focused less on innovation but developed sectors such as tourism and real estate. In this Chapter we procced with the empirical investigation of how the different strategies have influenced the international competitiveness of each country and their trade balances. Particularly, we firstly present the econometric determining the operationalization of the international competitiveness for the countries of the sample. Then, we proceed with the elaboration of the first econometric results from the model which are related to the existing correlations reporting the first significant interconnections between the included variables. Finally, in this Chapter it is explained the conducted factor analysis which intends to examine how the considered productive capabilities' variables could load to each other and interact. This final step provides the productive capabilities' factors which will be used in our regression analyses.

4.1. Presentation of the econometric model

The model attempts to define the extent to which the international competitiveness of firms which operate in the 12 EMU countries of the sample rely on relative cost and price competitiveness and/or on relative technological and productive capabilities. In order to be able to empirically investigate this issue we will first identify key determinants of a country's international competitiveness and put forward our measure of relative cost competitiveness and a new measure of technological / non-price competitiveness. We hypothesize that a country's international competitiveness constitutes a function of the abovementioned key drivers.

The literature review in Chapter 2 demonstrated that there is no specific definition or formula for the measurement of international competitiveness (our dependent variable). Considering the conducted analysis, we operationalized international competitiveness of a country in two different ways. According to the first one

$$EMS_n = {}^{Ex_n}/_{Ex_{EU}}$$

where international competitiveness of country n (n=1, …,12) equals to the ratio of the share of country n's exports to the total EU exports. The secondary definition that will be used and will be tested through this model

as well, equals international competitiveness of a country n with the annual rate of growth of exports in this country, namely

$$EGR_n = \widehat{EX}$$

As already stated above, we consider international competitiveness as a function of cost/price and technological competitiveness. We define cost/price competitiveness as the ratio of the ULC of a country n to the average ULC of Eurozone (or RULC), namely:

$$RULC_n = \frac{ULC_n}{ULC_{Eurozone}}$$

ULC is considered as the broad measure of international price/cost competitiveness according to OECD and provides an estimation of the average cost of labour per unit of output produced. Officially expressed, ULC is the ratio of total labour compensation per hour worked to the total output per hour worked also known as labour productivity, namely:

$$ULC_n = {}^{W_h}/_{X_h}$$

Technological/non-price competitiveness on the other hand constitutes a multi-dimensional concept as it depends on the productive capabilities and the innovation system of a country. In Chapter 3 we referred extensively to the variables related to technological competencies which we are going to use in the factor analysis in order obtain particular results for the countries of the sample which will be based on the correlations between the dimensions of technological capabilities. We also take into consideration the existing infrastructure in the countries of the sample, while we also include the notion of product sophistication, adding an extra dimension in the definition of productive capabilities. Consequently, we will be able to provide a ranking for the 12 countries of the sample fully aligned to their technological/non-price competitiveness. Using 32 variables related to non-price/technological competitiveness, factor analysis leads to 7 factors which are denoted by F_{1n}, F_{2n}, …, F_{7n} with n referring to each country of the sample.

Furthermore, we intend to record how much international competitiveness is affected from the institutional framework of each country and its functionality. Hence, we include some variables related to a country's institutional framework. In particular, we conduct a factor analysis for "rule of law", "government effectiveness" and "regulatory quality" variables from which we obtain 1 factor, called IF_n, and we examine its contribution to international competitiveness and its interaction with the rest of the independent variables of the analysis.

We also include country dummy variables, denoted as D_n (n = 1, … 12) in order to control the so called "fixed effects" of each country, which protects our model from any "cross-sectional" variation and ensures its integrity against the ommitted variable bias. For this purpose, we use in our case, Germany as a reference country, considering its export performance which is the best within EU. In addition, we estimate a crisis dummy (CDn)

in order to capture the negative impact of the crisis in EU. This dummy derives from the periods of negative GDP growth that the 12 countries of the sample present. In some cases, crisis period lasts for 2 years and in others way more.

This leads us to the following econometric model which will be estimated for the 12 EMU countries of the sample during the 2001-2018 period:

$$(1)\quad EMS_n\ (or\ ERG_n) = constant + \alpha\ RULC_n + \beta F_{1n} + \gamma F_{2n} + \cdots + \zeta F_{7n} + \pi IF_n + +\varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + error\ term$$

As can be seen, we also incorporated in our econometric model the average growth of income performance of the Eurozone countries in order to estimate how much the increase of the average GDP growth would affect export share or export growth of each individual country.

We hypothesize that RULC is negatively correlated to EMS_n or EGR_n, namely higher RULC are associated with lower export market share or lower export growth. Consequently, according to our hypothesis coefficient $\alpha < 0$. In addition, we consider that stronger technological competencies lead to higher export market shares or export growth and as a result coefficients $\beta>0$, $\gamma>0$, $\delta>0$, $\eta>0$, $\theta>0$, $\iota>0$ and $\zeta>0$, while the more functional institutions are, the more competitive a country will be ($\pi > 0$). Coefficient ε is the income elasticity of export demand of country *n*. Coefficient μ will capture country-specific influences. Coefficients μ and κ capture country-specific and crisis influence respectively.

The empirical results of the econometric model will help us statistically identify the (relative) importance of (i) RULC; and (ii) technological/ non-price capabilities for each country of the sample. Furthermore, we will be able to draw certain conclusions in regards to the performance of the countries and their next steps which will be aligned to these results and will aim to measures and policies for economic improvement.

Finally, we will extend the basic econometric model of equation (1) to specifically take into account the political stability in each country (consequence of crisis). We define a new variable – political stability denoted as PS_n based on OECD indexes – and we include this variable PSn in the regression in two ways:

$$(2)\quad EMS_n\ (or\ ERG_n) = constant + \alpha\ RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{n1}) + \xi_{n2}(PS_n \times F_{n2}) + \cdots + \xi_{n7}(PS_n \times F_{n7})\ + error\ term$$

We hypothesize that greater political stability leads to higher export market shares or higher export growth and consequently coefficient $\lambda_n > 0$. We interact the variable PSn with the "factors" we obtained from the relevant analysis and measure non-price competitiveness Fn1 and Fn2 in order to check whether political stability improves competitiveness via strengthening of technological capabilities (or national innovation systems).

4.2. Correlation Analysis

Beginning the analysis of our sample we examine the correlations of our variables to each other with a main focus to their relationship with our dependent variables and their statistical significance.

At first, we included 216 RULC observations obtained from the 12 EMU countries of the sample during 2001-2018 period in order to examine their relationship to export market share EMS (M=0.056, SD=0.055) and export growth rate EGR (M=0.04, SD=0.061). The results of the Pearson's Correlation Coefficient test demonstrate that there is no significant (positive) correlation between RULC and EMS (r= 0.013, p=0.852) and a no significant negative correlation between RULC and EGR (r=-0.40, p=0.557). These simple correlations seem to suggest that RULC is not strongly connected with competitiveness and trade. Further, we find that RULC is significantly correlated with only six of the variables of the sample and in fact all of them are negative. Pearson's Correlation Coefficient test shows a significant negative correlation between RULC and lifelong learning (r=-0.169, p=0.038), R&D intensity (r=-0.134, p=0.049), Business R&D expenditures (r=-0.137, p=0.046), employment in knowledge intensive activities (r=-0.148, p=0.034), political stability (r=-0.267, p=0.000) and EXPY (r=-0.140, p=0.046). It is important to mention that according to the results we obtained related to RULC, the correlation of RULC with political stability is the most statistically significant but it cannot be defined as highly correlated.

Pearson's Correlation Coefficient test also showed that export market share EMS is correlated in a significant and positive way with ICT manufacturing industries (r=0.780, p=0.000) and ICT service industries (r=0.615, p=0.000), the infrastructure indicators, namely port container traffic (r=0.754, p=0.000) and air transport registered carriers (r=0.914, p=0.000). EMS is also highly correlated with patent applications both for residents (r=0.917, p=0.000) and non-residents (r=0.857, p=0.000), the publication of scientific and technical journal articles (r=0.911, p=0.000) and the number of people that are employed and have an ICT education (r=0.852, p=0.000). It is important to mention that these specific indicators show no significant and close to zero correlation with EGR. In particular, EGR is correlated significantly only with exports of goods and services (% of GDP) in a positive way (r=0.219, p=0.001), trade openness in a positive way (r=0.226, p=0.001), population with tertiary education in a negative way (r=-0.143, p=0.036), venture capital in a negative way (r=-0.254, p=0.001), public R&D expenditures in a negative way (r=-0.243, p=0.000) and finally with SMEs innovating in-house in a negative way (r=-0.194, p=0.005). EMS on the contrary is correlated in a significant and positive way with the SMEs innovating in-house (r=0.398, p=0.000). The first examination of the pairwise correlations with our dependent variables provides albeit preliminary, but nevertheless insightful insights. In particular, we observe that EMS and EGR are not correlated similarly with the independent variables that were considered as determinants of the productive capabilities of a country. These initial results provide evidence that the way in which a country can maintain a relatively large export share within the EU is not necessarily connected to its exports growth. In fact, we could recall the analysis in section 3.5, regarding export growth, where we obtained that Slovak Republic and Slovenia were those countries which maintained the highest export growth throughout

the whole 2001-2018 period. However, these two countries have very small shares in total EU exports, comparing to Germany which although it had a moderate export growth during the examined period, it maintains the biggest export share within EU.

We also monitor the relationship of tourism with the variables related to productive capabilities since Chapter 3 provided evidence that countries which earn more from tourism-related activities have a weaker performance on trade. The conducted correlation test shows a significant negative correlation between the share of tourism in exports indicator and EMS (r=-0.174, p=0.012), namely an increase in the share of tourism exports could lead to a slight reduction of a country's export share. We also find that the share of tourism exports indicator has a significant negative correlation with most of the productive capabilities variables such as ICT manufacturing industries (r=-0.211, p=0.002) or infrastructure counting variables like port container traffic (r=-0.179, p=0.01) and air transport registered carriers (r=-0.262, p=0.000). Tourism indicator is also correlated in a significant negative way with patent applications (r=-0.274, p=0.000) and we obtain a very strong and significant relationship with the "charges for the use of intellectual property" indicator (r=0.635, p=0.000). Tourism is found to have a significant and positive correlation with all four political-framework indicators, namely rule of law (r=.410, p=.000), government effectiveness (r=0.397, p=0.000), regulatory quality (r=0.367, p=0.000) and political stability (r=0.422, p=0.000). A final observation is that an increase of the share of tourism in exports affects positively also the foreign direct investments in a country (r=0.348, p=0.000) which provides additional evidence for the economic performance of countries like Greece, Portugal, Spain and Italy which as demonstrated in Chapter 3 add substantial value from tourism-sector.

Moreover, the conducted pairwise correlations provide an indication for the relationship of high-tech exports and employment shares. In particular, it is found that a significant positive linear correlation between medium and high-tech exports and employment in high and medium-tech manufacturing (r=0.811, p=0.000) and a similar relationship between the latter one and the share of manufacturing exports in total exports (r=0.789, p=0.000). Additionally, it is found that R&D indicators like R&D intensity, public R&D expenditures and business R&D expenditures are strongly correlated to the ICT service exports. Pearson's correlation test depicts also a strong connection of ICT service exports to the employment share of R&D researchers (r=0.769, p=0.000) and the employment share in high-tech manufacturing (r=0.538, p=0.000). The existence of ICT manufacturing and service industries seems to determine in a substantial degree the creation of patents as well while both are affected positively with the existence of air transport registered carriers (r=0.797, p=0.000), (r=0.725, p=0.000). Finally, all investment related activities like venture capital or R&D expenditures are always found to be significantly and positively correlated to the institutional variables like rule of law etc.

4.3. Factor Analysis of productive capabilities' variables

We conduct a factor analysis on the 36 variables that we considered as those which define the productive capabilities in order to determine their factor loadings and understand how well they are correlated and load on the same construct. Since the instrument was not designed with a specific factor loading model from the beginning but has an exploratory nature the factor analysis would help us identify if the indicators used can load together into specific constructs.

Our first step was to examine the factorability of the 36 productive capabilities' variables. Several well-recognized criteria for the factorability of a correlation were used. However, in this first analysis we did not obtain any Kaiser-Meyer-Olkin results assuming that we have included variables that derive from each other. Considering the Pattern and Structure matrix of the analysis and the very low results of "Lifelong learning" variable we decided to conduct a second factor analysis excluding it. The second factor analysis that was conducted revealed similar issues for the variable of the "population with tertiary education" which caused difficulties in interpreting the factors that included this variable. As a result, we decided to proceed without this variable as well. In the third conducted factor analysis we faced also issues with two more variables, namely "Non-R&D expenditures" and "SMEs introducing product or process innovations" which could also occur due to the number of missing observations for these two variables. Aiming to maintain the integrity and secure the correct elaboration of our factors we decided to omit these variables as well.

Our Factor analysis contained finally 32 variables which were correlated with a minimum of .3 with at least one other item, suggesting reasonable factorability. Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.736, above the commonly recommended value of 0.6, and Bartlett's test of sphericity was significant (chi square = 6881.958, p = 0.000). Lastly, the communalities were all above 0.3 (see table in Appendix D), further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was deemed to be suitable with all 32 items.

Principal components analysis was used, because the primary purpose was to identify and compute composite scores for the factors underlying productive capabilities. For this analysis we used oblimin rotation, assuming before the analysis that the variables are correlated to each other being part of the productive capabilities' total. Our factor analysis indicated 7 factors and the eigen values showed that the first three factors explained 30%, 19%, and 11% of the variance respectively, while the fourth, fifth, sixth and seventh factors explained 9.5%, 5%, 5% and 4% of the variance respectively. The 7 factors which were derived from the factor analysis of the 32 variables will be able to explain 84.7% of the total variance of the sample. The way factors are loaded is shown in Table 5 below, where we use the pattern matrix which is most often used for the interpretation of oblique rotation.

Pattern Matrix[a]

	Component						
	1	2	3	4	5	6	7
Air Transport Registered Carriers	0.977			-0.106			
Scientific & Technical Journal Articles	0.941				-0.148	0.108	
Employed with ICT Education	0.929				-0.192		-0.122
ICT Manufacturing Industries	0.879	0.259	-0.119	-0.117	0.272		0.154
Patent Applications Residents	0.879	-0.147			0.112	0.174	0.216
ICT Service Industries	0.803	0.360		-0.160		-0.190	-0.276
Patent Applications non-Residents	0.801	-0.181				0.183	0.281
Port Container Traffic	0.716	-0.225	0.230	0.232	-0.393		0.141
Employment in High & Medium Technology Manufacturing	0.448	0.119	-0.370	0.367	0.220	0.439	
Venture capital	0.115	0.804			-0.217	-0.301	
RnD Researchers	-0.119	0.802			0.115	0.162	0.255
Employed in High-Tech Manufacturing	-0.109	0.792	-0.140	0.193	0.149	0.209	-0.196
ICT Service Exports	-0.282	0.713	0.162	0.110			0.249
RnD Intensity	0.140	0.614				0.381	0.333
Business RnD Expenditures	0.105	0.590				0.400	0.343
Public RnD Expenditures	0.150	0.522	0.292	-0.153	-0.221	0.174	0.170
Fixed Broadband Subscriptions	0.267	0.452	0.399	0.141	-0.431		
Charges for the use of Intellectual Property			0.953	0.107			
Share of Tourism in Exports	-0.216	0.193	0.853	-0.136		0.281	-0.124
Foreign Direct Investment		-0.117	0.719	0.268		-0.196	0.110
Employment in Knowledge Intensive Activities	0.340	0.179	0.482	0.114		0.160	0.347
Exports of Goods & Services (% of GDP)	-0.285		0.203	0.869			
Trade Openness to GDP	-0.329		0.158	0.866			
Medium & High-Tech Exports	0.541	0.127		0.543	0.172	0.348	-0.240

Net Investment in Nonfinancial Assets to GDP	-0.365	-0.112	0.129	-0.482	0.470		-0.184
Share of Manufacturing Exports (% of Total Exports)	0.159	0.156	-0.451	0.475		0.442	-0.239
ICT Goods Exports (% of total goods Exports)			0.426	0.337	0.664		-0.211
EXPY					0.113	0.934	
PRODY					-0.133	0.928	
Trademark Application	-0.162	0.133	0.125		-0.640	0.661	
SMEs Innovating in House	0.154				-0.160		0.740
SMEs Collaborating with Others	-0.177	0.312		0.133			0.619

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 28 iterations.

Table 5: Pattern Matrix from Factor Analysis

It can be seen that there are some strong loading relationships among the variables in each factor. It is also important to mention that there are no significant correlations among the factors as the Component Correlation Matrix of the analysis has shown, avoiding any multicollinearity issues.

According to the factor analysis the variables of "air transport registered carriers", "port container traffic", "employed with ICT education", "scientific and technical journal articles", patent applications for residents and non-residents, ICT manufacturing and service industries and "employment in high and medium technology manufacturing" belong to factor 1. The latter variable was the one with the smallest, comparing to the others, loading (0.448) and it can be seen that this variable could be also loaded in factor 6 but considering its slightly smaller value there it was remained it in Factor 1. The second group is comprised from "R&D researchers", "R&D intensity", business and public R&D expenditures, "ICT service exports", "employed in high-tech manufacturing", "venture capital" and "fixed broadband which also has the smallest loading in the factor, reaching 0.452. This specific variable is also loaded with factor 5 but in a way smaller degree (0.431). The rest of the variables in this group do not present any significant loading in other factors. The third group contains "Charges for the use of intellectual properties", the "share of tourism in exports", the "foreign direct investments" and the employment in knowledge intensive activities".

"ICT goods exports (% of total exports)", "share of tourism in exports", "charges for the use of intellectual property", "foreign direct investments" and "employment in knowledge intensive firms" which are loaded with more than 0.7 on average. The majority of the variables that are loaded in this factor do not demonstrate

significant relationship with other factors. The only exception is the "employment in knowledge intensive activities" which is also loaded in Factor 4 with 0.479, but this is substantially smaller than the degree with which this variable is loaded to Factor 3. Proceeding, Factor 4 is constituted from the variables of "net investment in non-financial assets (% of GDP)", "exports of goods and services (% of GDP), "trade openness (% of GDP)" and "medium and high-tech exports". In the case of Factor 5 it can be seen that only one variable is significantly loaded, namely "ICT goods exports". Factor 6 contains three variables, namely "PRODY", "EXPY", and "trademark applications". These variables are strongly loaded to the factor (>0.6). "Trademark applications" is the only variable which is also loaded well to Factor 5 (-0.640) however since it presents a higher score in Factor 6 (0.661) we consider it in this group. Factor 7 lastly, contains "SMEs innovating in house" and "SMEs collaborating with others".

4.4. Factor Analysis of Institutional Variables

Following the same process as previously, we conduct a factor analysis for the variables related to the function of institutions within countries as these were defined in section 3.6, considering the variables of "rule of law", "regulatory quality" and "government effectiveness". The correlation analysis demonstrates (Table 6) that these variables are highly, positively correlated to each other and the p-value proves their statistically significant relationship.

Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy was .761, above the commonly recommended value of 0.6, and Bartlett's test of sphericity was significant (chi square = 701.593, p = 0.000). Lastly, the communalities were all above 0.3 (see table in Appendix D), further confirming that each item shared some common variance with other items. Given these overall indicators, factor analysis was deemed to be suitable with all 3 items.

Principal components analysis was used in this case as well since the primary purpose was to identify and compute composite scores for the factors underlying institutional function. We used oblimin rotation assuming before the analysis that the variables are correlated to each other being part of the productive capabilities' total. Our factor analysis indicated 1 factor which can explain 92.5% of the variance of the sample. Finally, the Component Matrix (Table 7) provided below depicts how strongly the variables are loaded to Factor 1. In particular, it can be seen that these three variables fit really well with each other with results above 0.9.

Correlation Matrix[a]

		Rule of law	Government effectiveness	Regulatory quality
Correlation	Rule of law	1.000		
	Government effectiveness	0.928	1.000	
	Regulatory quality	0.873	0.859	1.000
Sig. (1-tailed)	Rule of law		0.000	0.000
	Government effectiveness	0.000		0.000
	Regulatory quality	0.000	0.000	

a. Determinant = .031

Table 6: Correlation Matrix for institutional variables

Component Matrix[a]

	Component
	1
Rule of law	0.972
Government effectiveness	0.966
Regulatory quality	0.946

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Table 7: Institutional frame component matrix

4.5. Factors' analysis

We conducted factor analysis in order to group the variables that we considered inter-related and similar in explaining the productive capabilities of a country into dimensions, by recognizing latent variables or constructs. Our purpose was to reduce and simplify the 32 individual items into fewer number of dimensions and make it easier to handle them in the regression analysis. However, simplification was not our major concern when implementing this factor analysis. In particular, by discovering the underlying variables, the so-called factors, we would be able to observe and elaborate interrelationships among the variables which we examined.

Initially, our factor analysis contained 36 variables which we contemplated as explanatory to the productive capabilities of a country. After running four times our factor analysis and rejecting those variables that were not loaded good enough to the factors, we came up with 7 different factors where each of them contained more than 2 variables, using in total 32 variables related to productive capabilities. We followed the same process for the 3 variables related to the institutional framework which however loaded well all together providing one statistically important factor. In this section we intend to identify common features that the variables which were joined together in the same factors have, aiming to draw some assumptions about the way they interrelate to each other.

Factor 1 of the analysis contains "air transport registered carriers", "port container traffic", "employed with ICT education", "scientific and technical journal articles", patent applications both for residents and non-residents, ICT manufacturing and service industries and "employment in high and medium technology manufacturing", namely 9 variables. What we recognize in this factor is the co-existence of 4 "infrastructure" variables, namely "air transport registered carriers", "port container traffic" and ICT manufacturing and service industries. These four variables are related to the existing infrastructure of a country and it is very important that the factor analysis

brought them together. Infrastructure is completed with the "scientific and technical journal articles" and "employed with ICT education" variables as they both provide additional features of this framework. Apparently, pattern creation regardless if it is from residents or non-residents depends on the infrastructures per se which was also depicted by how well these variables load to the rest. A country with high-tech infrastructures and focus on patents needs also employees that are familiar with high-tech sector. The fact that the variable of "employment in high and medium technology manufacturing" loads well in this factor completes the notion of our "**high-tech infrastructure" factor**.

In the second factor of our analysis there are grouped together "R&D researchers", "R&D intensity", business and public R&D expenditures, "ICT service exports", "employed in high-tech manufacturing", "venture capital" and fixed broadband subscriptions. On the first sight, we could observe two groups of variables that we expected to load together. Particularly, we can distinguish the investment related group which contains "R&D intensity", business and public R&D expenditures and "venture capital" and an employment related group with "R&D researchers" and "employed in high-tech manufacturing". The investment related group can be said that contains all the funding attempts which are R&D oriented, regardless if it is from public or private sector and it is rational that they load so well together. If investment in R&D field increases, then employment in this field could increase respectively since more R&D related activities would be initiated and the opposite. Consequently, this investment related group is also closely related to employment and in fact with employment in R&D relate activities as the second identified group of variables demonstrates. However, these 6 variables do not load well only with each other, but they are also interrelated with the "ICT service exports" and "fixed broadband subscriptions". Considering that ICT field is deploying the last decades with big investments in high-tech and technical staff it is understandable how the combination of the two groups dovetails also the ICT related variables. Increase of broadband subscriptions implies investment on their development and this also affects exports on their service exports. Thinking that this factor contains all the R&D investment related activities' variables which we used in our analysis and contemplating that investment stimulates the rest of the variables as we discussed, these 7 variables could comprise the **R&D investment factor**.

The third factor contains 4 variables, namely "share of tourism in exports", "charges for the use of intellectual property", "foreign direct investments" and "employment in knowledge intensive activities firms". On the first sight, these variables were not expected to be related to each other and it might be difficult to understand their connection. However, if we isolate foreign direct investments (FDI), we could probably see clearer the existing connections. FDI constitute a net inflow to an economy from foreign investors and takes place when investor establishes foreign business operations in a foreign company. Hence, it is reasonable that FDI is connected to the tourism. Since FDI is connected to the establishment or acquirement of a new business operation it makes also sense that the foreign investor transfers to the new business intellectual property from abroad. As a result, charges for intellectual properties will be affected as well. In addition, FDIs contribute to the opening of new positions and as our factor analysis show these positions are related to knowledge intensive activities firms. So far, we have used FDI as the connecting link among the variables that co-exist in this factor. However, we can

also assume that the increase or decrease in the charges for the use of intellectual properties is aligned to the employees working to knowledge intensive activities, as the more intellectual property firms from a specific country sell, the more employees in relevant business they have. Furthermore, knowledge intensive activities are not referring to engagement in tourism activities. Thus, high rates of employment in knowledge intensive activities could be translated to worse performance in the field of tourism. When conducting our factor analysis without FDI, we observe that these variables load more in other factors. We conclude that FDI is the connecting variable for factor 3 which we name **FDI-centric factor**.

Factor 4 is comprised of "net investment in non-financial assets (% of GDP)", "exports of goods and services (% of GDP) and "trade openness (% of GDP)" and "medium and high-tech exports". Non-financial assets include the fixed assets, inventories, valuables and non-produced assets while trade openness indicated the total of exports and imports of goods and services. These variables provide an indication for the trade framework in general. Trade openness and exports of goods and services are strongly connected by definition. It is interesting that part of this factor are also the exports related to medium and high-tech products. This provides evidence that the ability of a country to maintain high exports is also related to its ability to have medium and high-tech products. Moreover, since non-financial assets constitute stores of value and are useful either through the production of goods and services or as part of holding gains, it is reasonable to be connected to three variables which demonstrate a country's trade performance. The sign could indicate that although investment in non-financial assets is essential, it does not contribute to the improvement of the trade performance of a country. We name this factor as **"trade" factor** since it contains the most trade variables that we used in our model.

Factor 5 contains only one variable and specifically ICT goods exports (% of total exports) and is named after this. This variable was also loaded in factor 3 but not in a very significant way. Factor 6 on the other hand contains three variables, namely "PRODY", "EXPY" and "trademark applications". As it has been explained in Chapter 3, PRODY and EXPY constitute indexes that are able to measure the sophistication of products. By product sophistication we refer to more than technical features including product differentiation and fragmentation and resource availability. These variables were calculated for specific categories of medium and high-tech products. Their connection to "trademark applications" seems reasonable since are mostly registered from new innovative firms. Hence, we could name these variables together as the **sophistication factor**.

Finally, Factor 7 contains "SMEs innovating in house" and "SMEs collaborating with others". These are the only two variables that we included in our analysis and are related to SMEs and we observe that they best fit together. In fact, the structure matrix in table 5 shows clearly that although they might load to other actors too, their connection is considerably smaller than the one presented in factor 7. Besides, these two variables constitute the two sides of the same coin as an SME would either develop the ability to innovate in-house or otherwise it would have partnerships with other SMEs in order to produce innovative products or services. Hence, we end up defining factor 7 of our analysis as the **SME factor**.

4.6. Chapter Conclusion

The data collected demonstrated that the 12 Eurozone countries of the sample have followed different paths throughout the period 2001-2018. The one group of countries which included those of the core of EMU like Germany, the Netherlands and Austria have focused on their industry and manufacturing sectors and improved their technological competencies while the group with countries from periphery like Greece, Italy and Portugal on tourism and real estate. In this Chapter we started our empirical investigation in order to determine which scheme affected mostly the international competitiveness of each country and consequently its trade balance.

We began with the presentation of the econometric model where international competitiveness is operationalized either as a country's export growth (EGR) or as a country's export market share in EU exports (EMS). The first results, of our empirical analyses from the correlation analyses conducted, demonstrated that EMS and EGR are affected differently from the variables that are included in the model indicating that these two definitions will lead to different assumptions while proceeding. Furthermore, it was found that none of them is correlated with RULC, namely the cost/price competitiveness indicator. On the other hand, especially EMS depicted a significant interconnection with the majority of the productive capabilities' variables. These variables were then used in the factor analysis conducted and were loaded into seven different factors which we named after the variables they contain to "high-tech infrastructure", "R&D investment", "FDI-centric", "trade", "ICT-exports", "sophistication" and "SMEs" factor. Finally, we repeated this process for variables related to the function of institutions within countries in order to examine their contribution to the international competitiveness of a country and we obtained a single factor.

Chapter 5. Econometric findings

"To understand the actual world as it is, not as we should wish it to be, is the beginning of wisdom"

Bertrand Russel

This chapter presents the results of our econometric analysis for the determinants of international competitiveness in the Eurozone. We use the results of the factor analysis (in Chapter 4). We define international competitiveness (the dependent variable) in two different manners, namely as either the share of a country's exports in total EU exports (EMS) or as a country's annual growth rate of exports (EGR). Hence, in this Chapter we will examine initially the statistical association between our independent variables (cost and technological factors) and the EMS and EGR as per our basic econometric model. Next, we will elaborate the extension of this basic model taking into account the political stability (PS) in each country and how it dovetails (or interacts) with our independent variables and affects the dependent one. After understanding how EMS and EGR perform in the extended model we will be able to draw some conclusions regarding their relationship at the end of the Chapter.

5.1. Basic Econometric model with EMS

The basic econometric model which defines international competitiveness as a country n's share of exports in the total EU exports, is expressed as follows:

$$EMS_n = constant + aRULC_n + \beta F_{1n(High-tech\ infrastructure)} + \gamma F_{2n(R\&D\ investment)} + \delta F_{3n(FDI\ centric)} + \zeta F_{4n(Trade)} + \eta F_{5n(One\ variable)} + \theta F_{6n(Sophistication)} + \iota F_{7n(SMEs)} + \varepsilon_n GDP_{EUROZONE} + \pi IF_n + \mu_n D_n + \kappa_n CD_n + error\ term$$

Factor analysis explained in the previous chapter provided 7 different productive capabilities' factors. We examine the performance of each country of the sample and we present the outcome of Greece and Germany in order to assess the existing differences, if any, according to the obtained coefficients. As already stated throughout this study, Germany could be considered as the most powerful country within EMU from an economic and trade perspective while Greece, as the "laggard" of the Union especially after the asymmetries revealed from the 2008 financial crisis onwards. The performance of the rest of the countries is available in Appendix E. The outcome of this model is expected to provide substantial insights for answering the research question of this study and increase our knowledge and understanding for the determinants of a country's international competitiveness. We begin our analysis with the "high-tech infrastructures" factor and we examine its results for every country separately. We proceed with adding gradually to our regression analyses the rest of the factors while scrutinizing the changes in the magnitude, sign, or statistical significance of their coefficients. We finally elaborate how the coexistence of all the independent variables affect the performance of EMS.

As demonstrated in Table 8, there are found 7 significant regression equations when analyzing Greece ($F = 377$[3], $p = 0.000$[4]), while $R^2 = 0.961$ when only the "high-tech infrastructures" factor is included and reaches 0.986 when all seven productive capabilities' factors are considered. R^2 shows that the model works well for all 7 regression equations having a high explanatory power, as it helps us elaborate more than 97% of EMS variance on average. It is also observed that R^2 is very high in the first equation provided and then it increases slightly with no substantial fluctuations. We investigate the importance of the addition of the productive capabilities' factors to the explanation of the dependent variable's variance using the f-test. In particular, it is found that the "high-tech infrastructures" factor contributes the most and in a statistically significant manner to the explanation of EMS variance while the rest indicate a low R^2. Although the contribution of the other variables to the R^2 is small it is depicted that they provide statistically important results (see Appendix G) and therefore we consider them in our analysis. The outcome is similar also in the case of Germany (Table 9) where we obtain 7 significant regression equations as well ($F = 449$[5], $p = 0.000$[6]). $R^2 = 0.945$ when only the first productive capabilities' factor is included and reaches $R^2 = 0.987$ when all seven factors are considered. The relevant Table in Appendix E reveals that this model works same wise for all the countries of the sample.

Additionally, before we proceed to the elaboration of the obtained coefficients, we also examine our regression analyses for autocorrelation issues since they involve time series data. In particular, we report the Darbin-Watson (DW) outcome for all 7 different regression equations which are obtained for the 12 countries of the sample after the analysis of data from the 2001-2018 period (Observations = 18). For Greece and Germany it is observed that although the first regression equations which contain 6 independent variables (regressors) indicate the existence of positive autocorrelation after scrutinizing the Savin and White tables (1977), all the rest equations maintain a DW value within the range of "inconclusive" results. This means that DW value lies between the lower acceptable bound (dL) and the higher one (dU) and consequently we do not reject the initial null hypothesis (there is not autocorrelation) (Savin & White, 1977). This outcome is also exhibited in the rest countries of the sample preventing us from assuming an autocorrelation problem (see Appendix E). It could be claimed that the fact that in these analyses the dependent variable refers to export market shares (not level of exports) which are unlikely to show steady time trends (rising or declining) enhance our confidence that any autocorrelation in the residuals does not comprise a serious problem.

In general, the results of our analyses provide evidence that EMS relies in a statistically significant way on the productive capabilities' factors in all 7 equations for both countries. The "high-tech infrastructures" factor seems to have the biggest contribution to the performance of EMS in all cases and it leads the dependent variable to a sizeable increase. In particular, it is observed that with a small development of the "high-tech infrastructures" factor of *0.1*, our dependent variable namely EMS increases $\beta = 0.5556$ in the case of Greece and $\beta = 0.4483$ for

[3] F-value range: [223, 594]
[4] For all seven regression equations
[5] F-value range: [316, 672]
[6] For all seven regression equations

Germany. Similar coefficients' values are obtained also for the rest of the countries of the sample (see Appendix E). It is important to mention that the differences among countries in the value of this factor are small. The results from the regression analyses and specifically the 95% confidence interval for Beta demonstrates a small range between their lower and upper bounds (max 0.5 units). Finally, this first factor does not present important fluctuations irrespective of the inclusion of other productive capabilities' factors in our regression analyses.

The "R&D investment" factor on the other hand seems to have a negative contribution to EMS. It is important to mention that the impact of this particular factor, when examined alone, is found to reduce our dependent variable even more as its coefficient $\gamma = -2{,}583$ on average (see Appendix F). Its coexistence with the rest of the independent variables reduces its negative impact (in absolute terms). It can be seen that the more productive capabilities' factors are included in the regression, the less negative the performance of "R&D investment" factor becomes. This factor on the other hand, although it does not seem to have a direct positive contribution to EMS of its own, is found to affect positively the performance of the rest of factors (increasing the magnitude of their coefficients). Pearson's Correlation Coefficient test shows a significant positive correlation between the "R&D investment" factor and the "Sophistication" factor (r=0.265, p=0.004) but also with the "SME" factor (r=0.219, p=0.018) .

On the contrary, the "FDI-centric" factor affects in a positive way a country's export share. This factor did not have a statistically significant impact on EMS when examined in isolation (from the other factors) in the regression analysis (see Appendix F). However, its coexistence with the other two factors seems to affect its statistical importance. When all the productive capabilities' factors are included in the regression analyses it was obtained that a 10% increase in the performance of this factor could improve the performance of either Greece or Germany by 0.8%. Proceeding in our analyses the "trade" factor contributes also positively to the increase of a country's export shares as shown in the cases of Greece and Germany but also from the analyses of the rest of the countries (see Appendix E). Both countries have similar coefficients' values, namely a 10% increase on the performance of the factor leads them to the enlargement of their export share by almost 0.6%. On the other hand, "ICT exports" factor which was the only one that contained a single indicator, seems to affect negatively EMS, since a one-unit increase in the factor, leads to an approximately 0.350 decrease of the dependent variable for both Germany and Greece. When examined solely, its coefficient η had an average value of -1 across the EMU countries (see Appendix F). However, when all the productive capabilities' factors were included its coefficient tends to zero showing that it influences EMS less than any other factor. Finally, the "sophistication" and "SME" factor have both a positive contribution to the export share of Germany and Greece. As already mentioned above their existence improves the performance of the "R&D investment" factor and it is also found that the "Sophistication" factor is positively and significantly interconnected with the "High-tech infrastructure" factor (r=0.197, p=0.033).

This model also brings out the important contribution of the IF_n factor which is related to the operation of the institutions within a country. The results obtained from Greece and Germany (also from the rest of the sample's

countries) showed that this factor has consistently a statistically significant value which was only not depicted` when the "SME" factor was included. However, its performance in the rest of the 6 equations, demonstrates a substantial contribution to a country's export share. The existence of the "R&D investment" factor had the most sizeable influence on $IF_{n,}$ and as Pearson's Correlation Coefficient test showed the institution's factor and the "R&D investment" factor are correlated in a significant and positive way (r=0.668, p=0.000). In fact, the institutions function has a statistically significant and positive correlation with all the productive capabilities' factors except the "ICT exports" factor. Considering this outcome, it could be supported that the technological competitiveness of a country is highly related and dependent on the operation of the institutions.

RULC on the other hand provides ambiguous results in this basic econometric model which considers EMS as the dependent variable. Particularly, RULC demonstrates statistically significant results only in two equations out of the 7 in the regression analyses conducted for Greece and none in the case of Germany. This is also valid for the other countries of the sample as it can be seen in the Appendix E. In the majority of the cases the p-value is considerably above the accepted threshold of *p-value<0.05*, implying that it does not affect a country's export share in a statistically significant manner. Considering that this is the case for the majority of our equations, it could be argued that these results provide additional arguments for those economists who insist that RULC should not be the main determinant of international competitiveness of a country. Similar to RULC, $GDP_{EUROZONE}$ growth variable does not present a statistically significant relationship with EMS, showing that a country's export share is not affected by economic growth in the EMU area.

Dependent Variable: Country's Export Share – EMS – Greece							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Constant)	7.861*	12.573**	13.993**	11.279**	12.330**	6.156*	3.784**
$GDP_{EUROZONE}$ Growth	0.059	-0.061	-0.071	-0.098	-0.084	-0.114	-0.097
RULCn	-2.061	-6.442*	-7.753	-5.131*	-6.262	-0.192	2.387
Crisis Dummy	-0.627	-0.205	-0.119	-0.083	-0.208	-0.181	-0.053
IF_{GR}	0.333*	1.160**	0.720**	0.686**	0.833**	0.624**	-0.083
$F_{1(High\text{-}tech\ infr.)}$	5.556**	5.330**	5.458**	5.554**	5.465**	5.547**	5.636**
$F_{2(R\&D\ investment)}$		-1.528**	-1.396**	-1.217**	-1.309**	-1.129**	-0.995**
$F_{3(FDI\text{-}centric)}$			0.576**	0.503**	0.403**	0.532**	0.776**
$F_{4(Trade)}$				0.552**	0.594**	0.783**	0.581**
$F_{5(ICT\ exports)}$					-0.374**	-0.371**	-0.097
$F_{6(sophistication)}$						0.665**	0.604**
$F_{7(SME)}$							0.789**
CD_{GR}	-0.170	-1.229	-1.597	-0.057	0.110	1.724	-0.057
$\bar{R}^2$	0.961	0.978	0.962	0.967	0.970	0.977	0.986
F (prob.>0)	223(0.000)	335(0.000)	342(0.000)	347(0.000)	392(0.000)	409(0.000)	594(0.000)
DW Test	0.226	0.386	0.441	0.481	0.551	0.671	1.029
Standard error	1.67	1.28	1.19	1.12	1.06	0.93	0.74
Observations	18	18	18	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 8: Results of Regression Analysis of the Basic Econometric model with EMS as the Dependent Variable

Dependent Variable: Country's Export Share – EMS – Germany							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Constant)	4.736	8.500**	8.639**	8.272**	9.581**	7.899**	4.373*
$GDP_{EUROZONE}$ Growth	0.041	-0.068	-0.077	-0.073	-0.058	-0.058	-0.075
RULCn	0.603	-2.741	-2.929	-2.562	-3.939*	-2.234	1.529
Crisis Dummy	0.596	0.160	0.085	0.172	0.293	0.346	0.205
IF_{DE}	0.282*	1.007**	0.339*	0.213*	0.343*	0.244*	-0.078
$F_{1(High\text{-}tech\ infr.)}$	4.483**	4.763**	4.686**	4.773**	4.663**	4.756*	5.209**
$F_{2(R\&D\ investment)}$		-1.139**	-0.784**	-0.734**	-0.836**	-0.857**	-0.841**
$F_{3(FDI\text{-}centric)}$			0.789**	0.763**	0.673**	0.748**	0.812**
$F_{4(Trade)}$				0.495**	0.515**	0.505**	0.555**
$F_{5(ICT\ exports)}$					-0.382**	-0.369**	-0.181*
$F_{6(sophistication)}$						0.346**	0.498**
$F_{7(SME)}$							0.568**
CD_{DE}	4.648**	2.886**	4.165**	3.870**	3.918**	3.468**	1.855*
$\bar{R}^2$	0.945	0.960	0.971	0.978	0.981	0.984	0.987
F (prob.>0)	316(0.000)	377(0.000)	458(0.000)	522(0.000)	224(0.000)	573(0.000)	672(0.000)
DW Test	0.276	0.381	0.516	0.592	0.742	0.845	1.044
Standard error	1.42	1.21	1.03	0.91	0.84	0.80	0.70
Observations	18	18	18	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 9: Results of Regression Analysis of the Basic Econometric model with EMS as the Dependent Variable

After scrutinizing the interconnection of the independent variables of the model with EMS and presenting the results of the regression analyses, we proceed with the estimation of the "average" effect of the statistically significant variables on the EMS of every country. In particular, we firstly calculate the contribution of every statistically significant independent variable to EMS by using the mean value of those variables as this derives from the collected data of the 2001-2018 period for the 12 countries of the sample and multiply it with the coefficient we obtain from the econometric model and the analysis we conduct for every country. The result constitutes the contribution of the (statistically significant) independent variable to EMS. Then we divide this outcome with the mean value of EMS as this is calculated from our dataset and we provide the "average effect" of the independent variables to the EMS for each country of the sample.

Table 10 below provides substantial insights for the contribution of the productive capabilities' and institutions' factors on EMS taking into consideration their performance throughout the 2001-2018 period. According to these results, the countries of the sample could experience a huge improvement of their export share in case they manage to develop their "high-tech infrastructure" factor. The countries with the smallest export share like Greece, Slovenia and Slovak Republic, Portugal and Finland have higher "average" effect on their export shares

from this factor comparing to other countries with bigger EMS like France or the Netherlands. This outcome implies that the export share of these countries nowadays is affected by more than 2% from the variables that comprise the "high-tech infrastructures" factor. Considering the econometric model and the "average" effect of this factor to EMS it could be argued that it has the most substantial contribution to a country's export share.

Proceeding with the rest of the significant variables, one additional remark is related to the "R&D investment" factor. In particular, it can be recalled that this factor demonstrated negative coefficients, namely its increase leads to the reduction of EMS. This is also validated from the "average" effect of this factor as countries, like Greece or Portugal and Finland record a negative influence from this factor due to their small export share comparing to the rest. The same negative effect is also obtained from the "ICT exports" factor. However, it is observed that the value of the effects is close to zero and this factor has the smallest contribution to EMS. In addition, results from Table 10 help us clarify the significance of the "trade", "sophistication" and "SME" factors for the EMS. Especially for countries with small export shares, the improvement of these factors could have a sizeable contribution on their performance. Greece for example which is considerably below the others as far as its complexity ranking is concerned (Figure 4, Chapter 2, Section 2.3.1, pg. 37) and gains less than the rest of the countries from medium/high-tech sectors (Table 3, Chapter 2, Section 2.3.1, pg. 38) could ensure significant improvements if it manages to increase the level of its product sophistication. Nowadays, the country's export share depends on the sophistication of products by almost 1% according to the table below. A final remark concerns the IF factor, which is related to the operation of a country's institutions. It is obtained that its influence is substantial for many countries. For Germany which maintains the biggest export share among the EMU countries the institutions' factor does not contribute more than 0.05% on average throughout the 2001-2018 period. However, for Greece or Slovenia which have approximately 1% each of the EU export share this factor contributes almost 1% to their EMS performance. It could be argued that the optimization of the operation of the institutions should be one of the first steps that a country with lower export share should make in order to strengthen it international competitiveness and escalate its export share.

	B_{AT}	B_{BE}	B_{DE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$EMS_{AVERAGE}$	2.8	5	20.48	6.5	1.1	10.2	1.1	8.6	8	1.4	1.4	0.9
IF_n	0.28	0.07	0.018	0.05	1.04	0.02	0.85	0.15	0.11	0.34	0.52	0.83
$F_{1(\text{High-tech infr.})}$	1.43	0.39	0.465	0.32	2.91	0.71	4.11	0.14	0.07	2.71	2.98	6.18
$F_{2(\text{R\&D investment})}$	-0.04	-0.08	-0.009	-0.06	-2.57	-0.08	-1.71	-0.14	0.003	-0.46	-0.70	-0.17
$F_{3(\text{FDI-centric})}$	0.036	0.033	0.018	0.028	0.098	0.022	0.034	0.029	-0.165	0.215	0.249	0.150
$F_{4(\text{Trade})}$	0.012	0.124	0.009	0.026	0.338	0.029	1.088	0.032	0.037	0.319	0.879	0.367
$F_{5(\text{ICT exports})}$	-0.001	-0.027	-0.0002	-0.105	-0.192	-0.004	-0.080	-0.014	-0.007	-0.036	-0.219	-0.017
$F_{6(\text{sophistication})}$	0.495	0.148	0.022	0.046	0.377	0.023	0.875	0.044	0.032	0.297	0.079	0.460
$F_{7(\text{SME})}$	0.159	0.188	0.031	0.135	0.506	0.067	0.247	0.049	0.004	0.190	0.993	0.438

Notes: *(i)* All the estimations are in percentage points

Table 10 Average Effect of Statistically Significant, Independent Variables on EMS, for all the countries of the sample

5.2. Basic Econometric model with EGR

After examining our econometric model considering EMS as the dependent variable, we proceed with EGR, namely the annual rate of growth of exports in its place while we maintain our independent variables as previously. This "second" basic econometric model is expected to help us draw more robust conclusions regarding the notion of international competitiveness of a country per se as we will be able to compare the results of the two tests and elaborate the existing differences. The model for EGR is expressed as

$$EGR_n = constant + aRULC_n + \beta F_{1n(High-tech\ infrastructure)} + \gamma F_{2n(R\&D\ investment)} + \delta F_{3n(FDI\ centric)} + \zeta F_{4n(Trade)} + \eta F_{5n(One\ variable)} + \theta F_{6n(Sophistication)} + \iota F_{7n(SMEs)} + \varepsilon_n GDP_{EUROZONE} + \pi IF_n + \mu_n D_n + \kappa_n CD_n + error\ term$$

We follow the same process as in the previous section, adding gradually the productive capabilities' factors in order to determine how they interact with each other and EGR. Through this process we will be able to monitor and report any substantial changes of the magnitude, sign, or statistical significance of the independent variables' coefficients.

We examine the performance of each country of the sample separately and we present the outcome of Greece and Germany in order to provide an indication of the derived coefficients. As already stated, the choice of Greece, representing countries of the EMU periphery and Germany which represents the countries of the EMU core will help as assess the performance of two countries which differ significantly in their trade performance. The performance of the rest of the countries is available in Appendix H. The outcome will provide substantial insights for understanding the international competitiveness of a country when this is operationalized as its export growth rate and it will help us answer our research question. As in the case of EMS, we start our analysis with the "high-tech infrastructures" factor, examining the results for every country separately and we proceed with the gradual addition of the rest of the factors to our regression analyses.

They derive 7 significant regression equations for each country of the sample for the 2001-2018 period. In the case of Greece (F_{GR} =28[7], p= 0.000[8]) it is observed an average R^2 =0.689[9] with no substantial fluctuations (Table 11)**.** It could be also seen that the explanatory power of the sample does not alter significantly when the factors are added. Table 12 which refers to Germany, provides similar results to Greece (F_{DE} =28[10], p= 0.000[11]) with R^2=0.690[12] on average in the 7 regression equations. It is arguable that the same independent variables can help us elaborate much less of the variance of EGR than they did with EMS. Furthermore, in contrast to the results we have obtained when we used EMS as the dependent variable of the model, in this case the majority of the independent variables do not provide statistically significant results for any of the 7 regression equations neither

[7] F-value range: [20,40]
[8] For all seven regression equations
[9] R^2 value range: [0.685,0.693]
[10] F-value range: [20, 40]
[11] For all seven regression equations
[12] R^2 value range: [0.683,0.702]

in the case of Greece nor in Germany, namely their interaction with EGR provides mostly random results. This is validated also from the performance of the rest of the countries of the sample (see Appendix H) In fact, 6 out of 7 productive capabilities' factors provide random results with *p-value>0.05* for every country of the analyses. The only exception among them was the "trade" factor. We recall that this particular factor contains indicators such as trade openness, net exports, medium and high-tech exports and the share of manufacturing (% of total exports). It can be argued that the increase of net exports or trade openness would affect in any case the export growth of a country and it is rational to affect EGR positively. However, it is interesting to highlight that the export growth is also related to the manufacturing and medium/high-tech exports indicators, namely their contribution is also considered important to the development of the factor and its influence on EGR. According to these results a one-unit increase of the "trade" factor would Greece or Germany to a rise of its annual rate of export growth of approximately 0.6 units.

Before we dive into the extensive presentation of the econometric outcome of this model we also report as in the previous section the results obtained from the DW tests regarding the existence of autocorrelation. In the cases of Greece and Germany which are depicted in Tables 11 and 12 below it is observed that the values of the DW test lie within the lower (dL) and upper (dU) bounds of the Savin and White tables (1977) for all 7 regression equations. In particular the DW > 1.6 for all cases and consequently we obtain inconclusive results (Savin & White, 1977). Thus, it can be argued that also in this econometric model we do not face an autocorrelation problem. Additionally, the dependent variable in these analyses refer to export growth rates which are unlikely to show steady time trends indicating that any case of autocorrelation in the residuals would not constitute a substantial issue. This argument is further strengthened by the fact that all the countries of the sample indicated similar DW values (see Appendix H).

Proceeding, we see that there are not only the productive capabilities' factors which do not substantially affect a country's export growth but also RULC. Particularly, this price/cost competitiveness indicator is found to have no statistically significant effects on EGR in all the regression analyses it is included, which indicates that any coefficient we obtained and defines its relationship with EGR is not different from zero in a statistical sense. Since the results of the significance tests differ so much from the acceptable of *p-value< 0.05* for both Greece and Germany (the same is valid also for the rest of the countries of the sample; see Appendix H) we argue that RULC does not have a statistically significant contribution to EGR and its fluctuation does not actually contribute, neither positively or negatively and regardless its coexistence with productive capabilities' factors, to the annual export growth of a country. The same is also valid for the factor related to the operation of institutions within a country. Although this factor records an important contribution to EMS, in this case it has no statistically significant results and it is argued that its (statistical) influence on EGR is non-existent.

Furthermore, it can be observed that the rest of the independent variables maintain the same p-value, namely RULC and all the factors related to productive capabilities are statistically insignificant with only exception the "trade" factor. We conducted several regression analyses with each productive capabilities' factor separately or

with different pairs aiming to assess the interaction of the variables and double-check the coefficients, but the results provided were not altered. As it is demonstrated in Table 11 and 12, the only productive capabilities' factor which affects the EGR of Greece and Germany in a statistically significant way (the same is valid also for the rest of the countries of the sample; see Appendix H & I) is the "trade" factor. In particular, the "trade" factor has a positive contribution to a country's export growth rate as a one-unit increase on it leads to a raise of EGR for approximately 0.5 units.

Dependent Variable: Country's Export Share – EGR – Greece							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Constant)	-1.984	-0.688	-0.920	-3.607	-3.176	-1.090	-0.703
$GDP_{EUROZONE}$ Growth	2.662**	2.629**	2.630**	2.607**	2.611**	2.618**	2.614**
RULCn	2.666	1.463	1.679	4.262	3.802	1.766	1.348
Crisis Dummy	0.933	0.807	0.818	0.811	0.855	0.834	0.850
IF_n	-0.308	-0.077	-0.005	-0.035	0.023	0.091	0.206
$F_{1(High\text{-}tech\ infr.)}$	0.090	0.030	0.009	0.103	0.066	0.040	0.026
$F_{2(R\&D\ investment)}$		-0.424	-0.446	-0.267	-0.304	-0.367	-0.389
$F_{3(FDI\text{-}centric)}$			-0.095	-0.168	-0.208	-0.249	-0.289
$F_{4(Trade)}$				0.543*	0.561*	0.497*	0.531*
$F_{5(ICT\ exports)}$					-0.152	-0.151	-0.196
$F_{6(sophistication)}$						-0.224	-0.213
$F_{7(SME)}$							-0.130
Country Dummy (CDn)	-2.473	-2.755	-2.694	-1.185	-1.116	-1.651	-1.355
$\bar{R}^2$	0.685	0.687	0.687	0.692	0.692	0.693	0.693
F (prob.>0)	40(0.000)	34(0.000)	30(0.000)	27(0.000)	24(0.000)	22(0.000)	20(0.000)
DW Test	1.583	1.602	1.601	1.629	1.632	1.629	1.639
Standard error	3.50	3.51	3.52	3.51	3.53	3.54	3.55
Number of observations	18	18	18	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 11: Results of Regression Analysis of the Basic Econometric model with EGR as the Dependent Variable for Greece

Dependent Variable: Country's Export Share – EGR – Germany							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Constant)	-6.408	-6.578	-6.584	-7.083	-6.477	-5.595	-0.735
$GDP_{EUROZONE}$ Growth	2.592**	2.597**	2.598**	2.603**	2.609**	2.609**	2.633**
RULCn	6.758	6.909	6.918	7.415	6.778	5.884	0.697
Crisis Dummy	0.685	0.705	0.708	0.827	0.883	0.855	1.049
IF_n	-0.068	-0.101	-0.069	-0.241	-0.180	-0.128	0.315
$F_{1(High\text{-}tech\ infr.)}$	-0.391	-0.404	-0.400	-0.283	-0.334	-0.383	-1.007
$F_{2(R\&D\ investment)}$		0.051	0.034	0.101	0.054	0.065	0.044
$F_{3(FDI\text{-}centric)}$			-0.038	-0.074	-0.115	-0.154	-0.242
$F_{4(Trade)}$				0.671*	0.681*	0.686*	0.617*
$F_{5(ICT\ exports)}$					-0.177	-0.183	-0.443
$F_{6(sophistication)}$						-0.182	-0.391
$F_{7(SME)}$							-0.783
Country Dummy (CDn)	2.583	2.662	2.601	2.200	2.222	2.458	4.680
$\bar{R}^2$	0.683	0.683	0.683	0.694	0.695	0.695	0.702
F (prob.>0)	40(0.000)	34(0.000)	29(0.000)	27(0.000)	24(0.000)	22(0.000)	20(0.000)
DW Test	1.622	1.620	1.619	1.654	1.656	1.659	1.738
Standard error	3.51	3.53	3.55	3.50	3.51	3.53	3.50
Number of observations	18	18	18	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 12: Results of Regression Analysis of the Basic Econometric model with EGR as the Dependent Variable for Germany

However, we see that the model has considerable explanatory power as R^2= 0.689 for both Greece and Germany. The variance of EGR cannot be explained by the abovementioned variables. The independent variable that contributes the most to EGR in every regression analysis that we conduct is the $GDP_{EUROZONE}$ growth. The coefficients on this independent variable have a *p-value<.001* in all regression analyses, as can be seen in Table 11 and 12. According to that, an increase of $GDP_{EUROZONE}$ growth by a unit leads EGR of Greece and Germany to a growth of more than 2.6 units on average. This result is important for the understanding of the way we interpret trade performance. If we recall our analysis in section 3.5 (pg. 58) related to the export growth of the countries of the sample, we will see that Slovak Republic for example had the highest export growth average throughout the 2001-2018 period comparing to the rest of the 11 countries. However, since the $GDP_{EUROZONE}$ was growing in the pre-crisis and post-crisis period the results of Slovak Republic are doubled because of the growth rate of real GDP of the Eurozone rather than any improvement in their products, institutions and processes. Germany for example had one of the lowest averages in export growth for the same periods but maintains the biggest share of exports in the whole of EU. Thinking of countries of the Eurozone periphery and especially Greece which was severely damaged by the financial crisis we have seen that its export growth in the post crisis period is higher than that of Germany. If we consider the increase of $GDP_{EUROZONE}$ growth Greece was mostly affected from the recovery of the Eurozone countries as a total rather than improving its internal

issues. In simple terms, thinking of the results above we could argue that a country's exports' growth could increase even if a country does nothing to improve it but the $GDP_{EUROZONE}$ growth increases.

We proceed our analysis as with EMS, monitoring how all the independent variables interact together. An important remark is that even when we include all the factors together, the explanatory power of the model for the variance of EGR is not substantially increased. Our model now is explaining approximately 70% of the total EGR variance for Greece and Germany, which is a relatively high percentage, but it does not differ from what we obtained when we examined each factor separately. Thus, adding more factors did not improve our model. We investigate the importance of the factors for the explanation of the EGR variance using the F-test and assessing the R^2 provided by the Model Summary (see Appendix J)**.** It is found that the productive capabilities' factors together with RULC have an $R^2 < 0.1$ and no significant results (*p-value>0.05*). On the contrary when the variable of $GDP_{EUROZONE}$ growth was added in the model the $R^2=0.690$ and the ANOVA designate *a p-value<0.000*. Consequently, the addition of more factors does not improve the explanatory capacity of our model. It could be argued that the additional variables could be dropped for reasons of parsimony since the do not contribute substantially to the explanation of a country's export growth rate.

These regression analyses imply that from those independent variables which we examined, the one with the highest contribution to EGR is the $GDP_{EUROZONE}$ growth. This variable maintains in all cases a *p-value<0.001* and it's the one which characterizes the explanatory power of the whole model as indicated from the F-test. In addition, a one unit raise on it could lead to at least a 2.6 units escalation of EGR contributing the most to the dependent variable. Table 13 below provides as additional evidence the "average" effect of these two statistically significant variables to EGR. We follow the same process as described in the previous section by first estimating the contribution of every statistically significant independent variable to EGR, namely the $GDP_{EUROZONE}$ growth and the "trade" factor. Particularly, we use the means of those variables as calculated from the data collected for the 2001-2018 period of research for the 12 countries of the sample and we multiply it with the coefficient of each country as it derives from the econometric model's findings. Then, we obtain their "average" effect on EGR by dividing the outcome with the mean of EGR for every country of the sample.

According to these results Slovak Republic and Slovenia are the countries mostly affected from the performance of the $GDP_{EUROZONE}$ growth. This explains the big fluctuation which these countries experienced in their export growth performance as this is depicted in section 3.5 (pg. 58) of this study. In particular, since all the countries were affected from the financial crisis and their GDP decreased throughout that period it was reasonable that their export growth rates were reduced this much. When the $GDP_{EUROZONE}$ growth rate started rising in the post-crisis period because of the countries' attempt to recover so did the export growth rate. This seems to illustrate a reaction of "economic reflex" more than a specific plan to improve international competitiveness by specifying the roots of the problem. If the increase of export growth was the target, then the focus on RULC was not the right direction. It is interesting to mention that in the case of Greece it is observed (Table 13) that the country was benefited on average more from the improvement of the "trade" factor than by the increase of the

$GDP_{EUROZONE}$ growth. As we have seen in section 3.5 (pg. 58) the country is behind the rest in its export growth performance but most importantly in its trade performance. Considering section 3.3 (pg.43) related to the data on technological and productive capabilities and section 3.4 (pg.51) which describes the value added per sector, Greece is behind the rest of the countries of the sample in the indicators which are loaded the "trade" factor. In that case it makes sense that this factor affects the country more than the rest.

Average Effect of Statistically Significant Independent Variables on EGR												
	B_{AT}	B_{BE}	B_{DE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$EGR_{AVERAGE}$	3,88	3,09	4,73	3,35	2,68	2,71	2,60	2,08	3,77	4,24	9,07	6,30
$GDP_{EUROZONE}$ Growth	1,04	1,35	0,73	1,29	1,42	1,23	0,13	0,26	0,98	0,39	1,17	0,98
$F_{4(Trade)}$	0,01	0,67	0,05	0,06	0,13	0,16	0,40	0,16	0,08	0,15	0,08	0,06

Notes: *(i)*. All the estimations are in percentage points

Table 13: Average Effect of Statistically Significant, Independent Variables on EGR, for all the countries of the sample

While examining outcome of the basic econometric models we had a clear indication that EMS and EGR do not rely on the same actors. The first variable is aligned much more to what was initially established as price/cost and non-price/technological competitiveness' factors whereas the latter one is not significantly affected from them. At the end of this Chapter and while drawing the conclusions of our analysis we will be able to extrapolate which of these dependent variables are actually mostly related to term of international competitiveness and can characterize most accurately this notion.

5.3. Extended Econometric model with EMS

Our intention, so far, was to gain through our econometric model, insights into which factors affect international competitiveness, which was defined either as EMS or EGR, in a statistically significant manner. In this section we want to extend this model including the notion of political stability. We refer to political stability index (source: World Bank Data) which measures the likelihood of the destabilization of a government including the cases of unconstitutional or violent political takeover. This particular index comprises an average of indexes from the World Economic Forum, the Political Risk Services and the Economist Intelligence Unit. These indexes include the likelihood of anything related to the disorderly transfer of government power, social unrest and international tensions. Taking this into consideration we will obtain insights for the societal issues that existed during financial crisis. We will have the chance to determine for example how the unstable political framework of Greece after 2008 affected the productive capabilities of the country and consequently its share of exports or export growth. The political stability index contains values from -2.5 (weak) to 2.5 (strong). The model examined has the following form:

$$EMS_n = constant + \alpha\, RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{n1}) + \xi_{n2}(PS_n \times F_{n2}) + \cdots + \xi_{n7}(PS_n \times F_{n7}) + error\ term$$

We examine the results of our econometric model when we include al the adjusted from the political stability productive capabilities' factors and then we conduct again a regression analysis considering political stability in the model. We then will be able to report any noticeable change in the magnitude of the coefficients, signs or alternation in the statistical significance that could be caused due to this variable. As in the previous sections we provide the outcome of Greece and Germany while we include the results of the rest of the sample's countries in the Appendix K

As demonstrated in Table 14 there are obtained 2 different statistically significant regression equations for each of the two countries. Particularly in the case of Greece both equations (with or without the political stability variable) emerge as statistically significant and in both cases R^2=0.971, namely this model has a sizable explanatory power, describing 97.1% of the EMS variance. Germany presents a similar outcome and its R^2=0.945, indicating that the model explains 94.5% of the EMS variance. We obtain alike results also in the rest of the cases examined (see Appendix K & L) and it is put forward that, as in the basic econometric model these independent variables could guarantee the function of the model. Aiming to understand how the consideration of the political stability variable affects the model we also conduct an f-test. Although there is no change in the explanatory power of the model, the F-test indicates that the existence of the political stability variable provides small but statistically significant results for the variance of EMS (see Appendix M).

In addition, as mentioned in the two previous sections we also examine the existence of an autocorrelation problem since our analysis involves time series data which might "bias" our findings. Table 14 below indicates that Greece and Germany maintain a DW> 0.123 (when considering 12 regressors) which following the Savin and White tables (1977) are the lowest bound (dL) while they do not exceed the upper bound (dU=3.441) either. This result does not change either when the political stability variable is included. Consequently, as specified in the previous sections the results are characterized as inconclusive, namely it cannot be assumed the existence of autocorrelation (Savin & White, 1977). This is also validated from the results of the rest of the sample's countries as it can be seen in the relevant tables of Appendix K.

Proceeding with our analysis we compare the outcome of Table 14 with those of Table 8 and in order to define if there is any statistically important difference in the performance of the productive capabilities' factors when these are adjusted with the political stability variable. Throughout this comparison**,** it is observed that some coefficients have been increased. In particular, the "high-tech infrastructure" factor, which was adjusted from the political stability variable, demonstrates now a bigger contribution to EMS comparing to the previous setting. However, it should be tested if this difference is statistically significant for our findings and in order to examine further this outcome we conduct a paired samples t-test using the values obtained for all the countries of the sample when the "high-tech infrastructures" factor is free from the political stability effect and then when it is adjusted (N=84). The outcome of the test (see Appendix N) indicates that the means of this independent variable are statistically significantly different as the *p-value<0.000* and the 95% confidence interval of the difference does not include 0. Since the means differ in a statistically important way and the obtained

coefficients for this factor are increased, it could be argued that the political stability variable influences positively the "high-tech infrastructure" factor and enhances its contribution to the EMS.

Following the same process, we examine the performance of the productive capabilities' factors coefficients after the adjustment with the political stability variable. The t-test indicated that the "R&D investment" factor and the "FDI-centric" factor are also influenced significantly and positively from the existence of political stability. We could finally observe that the institutions' factor has also a higher coefficient in this case. We examine also the difference of the means of this variable in the basic and extended econometric model using the paired samples t-test. The outcome provides evidence that there is a significant change in the mean value of this variable implying that it is influenced positively from the existence of the political stability (*r=0.485, p =0.000)*.

Proceeding our analysis, it is observed that the coefficient of political stability is high for Germany and statistically insignificant for Greece. We also examine the rest of the countries of the sample where most of them demonstrate similar results with Germany (see Appendix K). Thus, it could be argued that this variable can affect sizably a country's export share and its endurance should be considered essential.

On the other hand, RULC does not present any statistically significant influence in this case as well. The existence of the political stability variable does not change anything in the performance of RULC since following the econometric results its contribution to EMS is zero. In fact, this variable has a *p-value>0.05* in all regression equations provided and even while examining every country separately there is not found an important connection. Hence, it could be supported that RULC does not affect EMS in any case also when considering the extended econometric model. Finally, the same is also valid for the $GDP_{EUROZONE}$ growth variable which on the contrary of what we observe during its interaction with EGR, in this case has a zero contribution to EMS for every regression equation.

Dependent Variable: Country's Export Share – EMS				
	B_{GR}		B_{DE}	
Regression Equations	(1)	(2)	(1)	(2)
(Constant)	10.951**	10.098**	6.326	0.870
$GDP_{EUROZONE}$ Growth	-0.048	-0.044	-0.156	-0.134
RULCn	-4.108	-3.513	0.197	4.259
Crisis Dummy	0.199	0.226	-0.032	0.071
IF_n	0.499*	0.424*	1.493**	0.968*
$F_{1(\text{High-tech infr.})}$	6.276**	6.341**	5.940**	6.969**
$F_{2(\text{R\&D investment})}$	-0.797**	-0.771**	-0.820**	-0.733**
$F_{3(\text{FDI-centric})}$	0.509**	0.517**	0.123	0.125
$F_{4(\text{Trade})}$	0.092	0.091	0.422*	0.455*
$F_{5(\text{ICT exports})}$	-0.140	-0.171	-0.350*	-0.457*
$F_{6(\text{sophistication})}$	0.584**	0.573**	0.551*	0.641*
$F_{7(\text{SME})}$	0.171	0.163	-0.338	-0.223
Country Dummy	-4.789**	-4.680**	0.981	-1.131
Political Stability		0.316		2.066*
$\bar{R}^2$	0.971	0.971	0.945	0.949
F (prob.>0)	293(0.000)	270(0.000)	147(0.000)	146(0.000)
DW Test	0.909	0.911	0.730	0.843
Standard error	1.05	1.05	1.47	1.42
Observations	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 14: Results of Regression Analysis of the Extended Econometric model with EMS as the Dependent Variable

By extending our econometric model we intended to examine how political stability interconnects with either price/cost or non-price/technological competitiveness of a country. Therefore, we did not only add the political stability variable in the regression analyses, but we also tried to integrate it with our productive capabilities' factors. Even if in some cases the adjusted factors do not maintain their statistical significance, it is found that political stability affects a country's EMS in various ways. The value of some productive capabilities' factors is noticeably altered and increases while the t-tests indicate that this change is statistically significant. In particular, it seems that political stability is importantly interconnected with the "high-tech" infrastructure factor as its coefficients soar 18% on average. The institutions' factor depicts a similar raise in its coefficients while the "R&D investment" factor also affects less negatively EMS. The "FDI-centric" factor finally, seems to be also positively affected from the integration of the political stability in the model while the rest do not present any noteworthy change. Yet, political stability variable does not "shape" only indirectly EMS through the productive capabilities' factors performance but also directly as supported by the regression analyses.

5.4. Extended Econometric Model with EGR

Following the same process as previously we are going to proceed our research, using EGR as the dependent variable of our analyses, namely the annual rate of growth of exports and we maintain our independent variables as in the last section. We want to examine if the existence of the political stability factor changes the influence of the variables to EGR, both from a significance and coefficient's magnitude perspective and compare them with the results of the basic econometric model. The model now is as illustrated below

$$EGR_n = constant + \alpha\, RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{n1}) + \xi_{n2}(PS_n \times F_{n2}) + \cdots + \xi_{n7}(PS_n \times F_{n7}) + error\ term$$

We elaborate the results of the econometric model with all the adjusted from the political stability productive capabilities' factors and then we repeat the regression analysis including the political stability variable to examine how it interconnects with the rest of the independent variables and report any changes in the sign, magnitude or statistical significance of their coefficients. As in the previous sections, we provide the outcome of Greece and Germany while we include the results of the rest of the sample's countries in the Appendix O.

Table 15 depicts the 2 different regression equations which were obtained for the two countries. After all, in both cases we find statistically significant equations with the same explanatory power, namely R^2 =0.700. The model seems to work sufficiently, explaining on average 70% of EGR's variance. We recall that also in the case of the basic econometric model, the model could explain on average 68% of the variance of EGR, namely the explanatory power of the model is not increased with the inclusion of political stability variable in the analysis.

Furthermore, the DW tests for Greece and Germany demonstrate also in this econometric model, values between the range that Savin and White (1977) mention as inconclusive. This particular outcome helps us imply that there is no positive or negative autocorrelation and thus our econometric results are not biased. Both countries present a DW> 1.6 namely higher than the lower bound (dL) and lower than the upper one (dU), leading us to the assumption that we cannot define the existence of autocorrelation (Savin & White, 1977). This attitude is further enhanced when considering also the results obtained from the rest of the sample's countries (see Appendix O).

For the better interpretation of our findings we examine the F-test also in this case and it derives that as in the case of the basic econometric model which considered EGR as the dependent variable, the independent variable which is responsible for the explanation of the EGR's variance is the $GDP_{EUROZONE}$ growth (see Appendix Q)**.** Consequently, the addition of the political stability variable or the adjustment of the productive capabilities' factors do not alter the model. Besides, the results obtained do not differ from those of the basic econometric model. In particular, RULC and the productive capabilities' factors do not depict any statistically significant results in all cases. Additionally, the "trade" factor which provided statistically significant results in the basic econometric model, demonstrates in this case a p-value>.05.

The institutions' factor remains statistically insignificant in this analysis as well. Although in the extended econometric model with EMS as independent variable we monitored an improvement of this factor due to the co-existence with the political stability variable this is not repeated in this analysis. This factor maintains a *p-value>0.05* in all analyses conducted and does not affect the performance of EGR. The same is valid also for the political stability variable per se. In section 5.3 it was demonstrated that political stability plays a substantial role for the expansion of a country's export share. However, this variable does not affect the export growth rate of a country and it does not have a significant contribution to its performance.

As noted also in the basic econometric model, the independent variable which seems to contribute the most to EGR in every regression analysis is the $GDP_{EUROZONE}$ growth, having a *p-value<0.001* in every case. It is important to mention that the performance of this variable is not influenced from its coexistence with the political stability variable. As explained in the previous section, there are cases that the existence of political stability affects the coefficients either positively or negatively. $GDP_{EUROZONE}$ growth does not record any alternation on its performance and contribution to EGR. According to the results, an increase of $GDP_{EUROZONE}$ growth by a unit leads EGR to a growth of more than 2.6 units on average for both Greece and Germany.

The extended econometric model "re-confirms" the results obtained from the basic econometric models of our research indicating that EMS and EGR do not rely on the same actors. The first variable is connected to non-price/technological competitiveness' factors whereas the latter one is not significantly affected from them. EMS is also affected from the operation of institutions and the political stability of a country whereas EGR only from $GDP_{EUROZONE}$ growth.

Dependent Variable: Country's Export Share – EGR				
	B_{GR}		B_{DE}	
Regression Equations	(1)	(2)	(1)	(2)
(Constant)	-3.755	-8.444	-4.164	-7.142
$GDP_{EUROZONE}$ Growth	2.592**	2.614**	2.596**	2.608**
RULCn	4.409	7.677	4.244	6.461
Crisis Dummy	0.711	0.858	0.841	0.897
IF_n	0.117	-0.294	0.221	-0.065
$F_{1(\text{High-tech infr.})}$	0.079	0.433	-1.091	-0.529
$F_{2(\text{R\&D investment})}$	-0.280	-0.137	-0.121	-0.074
$F_{3(\text{FDI-centric})}$	-0.198	-0.156	-0.121	-0.120
$F_{4(\text{Trade})}$	0.798	0.793	0.737	0.755
$F_{5(\text{ICT exports})}$	0.035	-0.132	-0.147	-0.206
$F_{6(\text{sophistication})}$	0.080	0.021	-0.226	-0.177
$F_{7(\text{SME})}$	-0.088	-0.130	-0.419	-0.357
Country Dummy	-1.534	-0.937	4.055	2.902
Political Stability		1.736		1.127
$\bar{R}^2$	0.697	0.701	0.701	0.702
F (prob.>0)	20(0.000)	19(0.000)	20(0.000)	19(0.000)
DW Test	1.663	1.682	1.708	1.708
Standard error	3.53	3.53	3.51	3.52
Observations	18	18	18	18

Notes: *(i)*. Robust *p-statistics* appear in parentheses. (ii) * and ** denote significance at the 5% and 1% level, respectively.

Table 15: Results of Regression Analysis of the Extended Econometric model with EGR as the Dependent Variable

5.5. Concluding Remarks concerning the Econometric Models

This chapter has used various econometric models to statistically evaluate which factors (price/cost versus technological drivers) matter most for a country's international competitiveness. Taking into consideration the existing literature we distinguished *price/cost competitiveness* (which we estimated through RULC) and non-*price/technological competitiveness*, which we defined as a total of productive capabilities' indicators. Our models contained also factors aligned to the institutional and political framework of each country. We conducted 4 different regression analyses, namely 2 based on what was called "basic" econometric model and examined exclusively the influence of RULC, productive capabilities and institutions' function on EMS and EGR and 2 more which referred to the "extended" econometric model which included the notion of political stability aiming to identify the changes that the political framework could cause to EMS and EGR.

This first and straightforward indication from both models is that our dependent variables, namely EMS and EGR do not rely on the same determinants. In fact, it was found that EMS is highly connected with the non-price/technological competitiveness' factors as any change in them directly affects a country's export share. The function of institutions also maintains a substantial role for a country's export share's performance and their optimization is argued to be essential in order to enlarge its EMS. On the contrary, EGR was found to have no statistically significant connection with the abovementioned independent variables. The only exception was related to the "trade" factor of productive capabilities' which contained indicators related to trade, namely trade openness, exports of goods and services (% of GDP) and exports of medium and high-tech products. However, it was found that even this factor did not have a substantive impact on the EGR. The independent variable that showed the most powerful connection with a country's export growth rate was the $GDP_{EUROZONE}$ growth. It follows that when the economies of the EU countries improve, this has a direct effect on their export growth, even if this means that they do not proceed to any structural change. This is important since the arguments for an improved trade performance which is based on a country's export growth rate and are bestowed to the different policies implemented are not valid. Export growth rate will not be affected either because of the deployment of the infrastructures or the increase of innovative SMEs.

The models provided also substantial insights for the contribution of price/cost competitiveness to what was defined as international competitiveness considering RULC as the sufficient measure. However, RULC had different impacts than one would have expected based on the literature. In particular, as an independent variable in all of the models it did not have statistically significant effects either on the strengthening of a country's export shares or the increase of its export growth rate. Our findings falsify the hypothesis of those arguing that RULC could be the main determinant of international competitiveness. Thus, from our empirical analysis, we can conclude that RULC does not have a statistically significant contribution to the performance of EMS or EGR and therefore it is argued that it is not a determinant of what was defined in this research as international competitiveness.

Finally, a large part of this study is devoted to the assessment of the importance of political stability to the international competitiveness of a country. This variable affected only EMS with its presence as it demonstrated no statistically significant results throughout its interaction with EGR. It was observed that the consideration of this variable affected our model twofold. Particularly, this variable had a stand-alone significance for EMS since it depicted statistically significant results and its development could directly increase a country's export share. In addition, it was found that its existence and interaction with the rest of the variables affect them positively. Specifically, it was found that political stability affects substantially the contribution of the productive capabilities' factors to EMS. Coefficient ξ_{n1} which derived from the extended econometric model and is related to "high-infrastructure" factor has increased approximately 20% after its adjustment with the political stability variable and comparing to its results from the basic econometric model. The factor related to the institutions' function demonstrated a similar upward reaction when the political stability variable was considered in the model. Consequently, it is argued that if a country intends to increase its export share it has to ensure and sustain a politically stable framework where it could proceed with the structural changes needed. On the other hand, the political framework will not affect the country's export growth as shown in the relevant extended econometric model. However, its interaction with the "trade" factor increases its impact. Even if it does not have a direct contribution to EGR, it records an indirect influence via the interaction with the productive capabilities' factor. Thus, even in the case of EGR it could be argued that political stability plays a small, "indirect" role.

Chapter 6. Increasing International Competitiveness: The case of Greece

"The difficulty lies not so much in developing new ideas as in escaping from old ones"

John Meynard Keynes

In Chapter 5 we presented the results of our econometric investigation into the determinants of the international competitiveness of EMU member countries. The econometric findings provide us a clearer understanding of the contributions to international competitiveness of (unit labour) costs and non-cost technological and infrastructural factors. In Chapter 6 we will assess the implications of our thinking and the potential lessons for economic policymaking which our econometric findings may have for the countries of EMU. This analysis obtains additional value considering that the econometric results indicated that price/cost competitiveness measures (RULC) do not significantly affect a country's international competitiveness. Hence, the policies that will be recommended are not towards the direction of the implemented measures (internal devaluation and austerity measures) but in alignment to the outcome of the research, namely towards the strengthening of a country's technological competencies. We will specifically elaborate the case of Greece which suffered sizably and for a long time from the financial crisis of 2008-2009 and see how our findings could be used to rethink of ways the country could be restructured. We firstly describe and assess the effects and the policy measures that were taken after the outbreak of the financial crisis and which according to our findings did not "flourish" and then, following our results we indicate some specific terrains where new policies could be deployed. The different policies discussed could become a guideline for structural improvements to the Greek economy and provide a path towards convergence with the other EMU countries. We would like to make a caveat right at the beginning of this Chapter. In a methodological sense, the step from interpreting the (main) econometric findings to the formulation of specific policy measures in the context of the Greek economy is a big one, and we have to be careful in interpreting our statistical findings and in putting them into their proper context. Our findings, many of which concern the "structure" of the economy, do not offer direct (usable) guidelines for policy, but they do offer credible grounds for rethinking and reconsidering (Greek) economic policy-making as it concerns improving the international competitiveness of the economy, as well as for a theoretical reconsideration of the economic notion of "competitiveness" itself.

6.1. Redefining international competitiveness

One of the first issues that this study tried to address was the exact definition of the term of international competitiveness. We have come across different definitions throughout our literature review and we could find even more conceptualizations. For example, Jean-Claude Trichet, former president of the ECB has defined competitiveness in his speech at the university of Liege (2011) as the ability of a country to improve in a

sustainable and significant way its economic living standards and job opportunities for its citizens within the frame of an open economy. On the one hand, it could be argued that competitiveness is about developing our economic living standards but on the other within a Monetary Union it is also about strengthening its cohesion and integrity. Thus, sound economic and fiscal policies are essential for the Union in order to avoid large and sustained divergences. Continuing his speech, Jean-Claude Trichet argues that misguided national economic policies that could lead to the creation of excessive competitive gaps should be avoided. Otherwise, countries will ail from current account deficits and accumulated differences in their price competitiveness. In fact, price and cost competitiveness is highlighted throughout his whole statement and measures such as ULC are used by the ECB to determine the level of international competitiveness of each EMU member country. International competitiveness is still most often defined in terms of international (unit labour) cost and price differences, quite as the ECB is doing it.

Taking into account the results of our econometric analysis of Chapter 5, we argue that this view has to change. We find that the international competitiveness of EMU Member States is not affected in a significant way by (conventional) price/cost competitiveness measures (including RULC), but rather it is mostly dependent on structural technological/ non-price competitiveness indicators. Consequently, ULC is not the most important determinant of an economy's international competitiveness and its increase or decrease will not lead to effective results for it. On the contrary, improvements on productive capabilities could bring about substantial changes and improvements for all the countries. Refining a country's technological capabilities is, clearly, a difficult and long-term challenge, as it requires the structural transformation (and upgrading) of the economy and the national innovation system of a country.

However, before we examine the contextualization of our results for the EMU countries, we should consider the question how international competitiveness can best be measured. In Chapter 5, we operationalized a country's international competitiveness using two (widely used) approaches: (a) we defined competitiveness in terms of a country's export growth; and (b) we defined competitiveness in terms of a country's export market share in EU exports. The two approaches lead to different results and different insights. We have seen that Slovenia and the Slovak Republic have on average the highest annual export growth among the 12 EMU countries of the sample. However, these countries maintain a very small piece of the EU export share. Germany on the other hand, has the biggest share of EU exports while its annual export growth is equal to the EU average. It is clear that it is 'easier' for small exporters such as Slovenia and the Slovak Republic to achieve relatively high rates of export growth (starting off from a low initial level) than for large exporters such as Germany (which is exporting at a very large scale). While the (relatively) high export growth of Slovenia and the Slovak Republic can be interpreted as a sign of their (superior) international competitiveness, it would be wrong to interpret the (average) export growth performance of Germany as being a sign of average 'international competitiveness' of German firms, which are known to be highly competitive. This means that export growth is not the best possible indicator of international competitiveness. The more meaningful indicator of international competitiveness is the (change in) export market share of a country. In the case of Slovenia and

the Slovak Republic, their export market shares are small but growing (since both countries feature above-average export growth). In the case of Germany, the export market share is high and (somewhat) increasing; this suggests a persistently high international competitiveness. Export market shares were found to be declining for Italy and Greece, which indicates that these countries were losing ground, as their international competitiveness was weakened (relative to the other EU countries).

Contemplating the abovementioned stance of the ECB, it could be argued that what the other EMU countries (besides Germany) could do is to lower their RULC and by enhancing their price /cost competitiveness claim bigger shares in EU exports. Our econometric findings of Chapter 5 notify that a strategy for improving unit-labour-cost competitiveness will not bring about the desired results (i.e. a higher export market share). In addition to what our findings recommend, if all EMU countries would lower wages and unit-labour cost at the same time and to the same degree, RULC would remain (largely) unchanged – and no country would 'gain' relative to the others. Keynes called this the 'fallacy of composition': what could work if done by one EMU member state, will not work if it is done by all members at the same time.

Lowering wages and ULC in all member states will not contribute to economic recovery in the Eurozone. As our statistical findings indicate, the only effective way to improve a country's international competitiveness is to strengthen, improve and better utilize the country's productive and technological capabilities. Achieving this is a long-term grand challenge, because it requires the structural transformation of the economy and the national innovation system – in many dimensions – and this requires (policy) commitment, a strategic policy orientation and long-term finance. We will elaborate our results by focusing throughout the following sections on what our empirical findings might mean for the implementation of such policies in Greece which followed the indications of the EU institutions, but still tries to recover from the ashes that financial crisis left behind.

6.2. Greek economy after the implementation of three Economic Adjustment Programs

It was the 3rd of May 2010 when the Greek government under the Prime Minister, Giorgos Papandreou signed with Eurogroup, ECB and IMF on behalf of the EU Commission the first Economic Adjustment Program (EAP), also known as first bailout package or the first memorandum of Greece. This bailout package constituted a loan to the Hellenic Republic as financial assistance in order to cope with its government-debt crisis. The so-called Troika, consisting of the European Commission, the ECB and the IMF, as the institutions which participated in this agreement were commonly called, provided this financial aid in exchange for the implementation of a fiscal consolidation policy and structural (labour market and social security) reform. Since then, successive Greek governments have signed two more EAPs which are in principle one that is continuously amended and recalibrated. It is worth to mention that until today Greece has received around 300 billion euros for bailout. However, most of this money was used for the repayment of the debt and the recapitalization of the banks and not as a fiscal stimulus to structural changes (Bortz, 2015).

The three EAPs had in common two basic targets, namely to restore confidence (of global bond markets) and financial stability through fiscal consolidation and the stabilization of economic sector in the short-term, while in the medium term to enhance competitiveness and create an investment-friendly and export-led economy. It could be argued that the targets of the EAPs have been (largely) achieved. In fact, if we consider the export growth rate of Greece in the post-crisis period (see Chapter 3, Section 3.5, pg. 58), we find the average annual export growth since 2001, close to 5% (during 2010-18). It is noticeable that this rate is even higher than that of Germany. Portugal which was also hit by the crisis and signed similar EAPs shows a close to 6% export growth (during 2010-18). Considering the findings of the econometric model the export growth is mostly related to $GDP_{EUROZONE}$ growth. With a closer look in EU statistics it is observed that the $GDP_{EUROZONE}$ was growing on average from 2010 till 2018 by 1.4% per year. The results of the econometric model indicate that the income elasticity of demand for Greek exports is around 2.6. This means that a 1% increase of $GDP_{EUROZONE}$ leads Greece to increase its annual export growth by 2.6 percentage points. Economic growth of 1.4% in the Eurozone has caused Greek exports to grow by 3.6%. Taking into account that Greece had an annual average of 5% export growth it is argued that most of it derives from the attempt of all the EMU countries to recover from the crisis and managed to increase -after the 2 years of losses- their GDP.

The improvement of the annual export growth of Greece is not only aligned to the $GDP_{EUROZONE}$ as insinuated by our model. In fact, it was demonstrated that variables related to trade like trade openness, exports of goods and services (% of GDP) and exports of medium and high-tech products (% of manufacturing goods) -loaded together into one factor- contribute positively to the increase of the annual export growth. Data from Eurostat and reports from working papers of the Bank of Greece highlight an increase in the exports of goods and services (% of GDP) and trade openness during the first two EAP periods. These results could have contributed to a quick recovery for the Greek economy, but because of drastic declines in domestic demand, Greek GDP declined by 24% (in cumulative terms) throughout the crisis period (2010-2018). In reality, Greece still has not reached the value of net exports that it had before the crisis. Furthermore, data from the World Bank and OECD show that the share of the exported medium and high-tech products in manufactured products decreased after the crisis. Thus, the contribution of this factor and the variables it contains is small and masked from the reduction of the country's GDP. At the same time and led by the conditionalities imposed by the Troika, the Greek government, imposed austerity measures and internal devaluation in Greece in order to maintain financial stability and the ULC in the country was reduced. In the meantime, unemployment rates reached record levels of 24% and young educated people left the country for better opportunities abroad, which is a brain drain that reduced the average skill-level of the labour force structure. However, the Troika's assessment-reports that followed presented the situation of the country as an improvement, since these policies have brought about the development of exports and apparently turned Greece into a more internationally competitive country.

If the analysis for the rehabilitation of the Greek economy would have stopped at this point, then the economic and societal signs would have been positive, since the EAPs would have reached their targets, even partially. Although the measures implemented have caused unemployment, reduction in wages and huge social unrest as

explained throughout the literate review, the sacrifices of the Greek people were expected to lead to the recovery of the economy, since Greece became more competitive and had a high export growth rate according to the Troika's reports. Nevertheless, the reality experienced shows that these increases are notional and do not depict a real advancement of the competitiveness and trade performance of the country. As a matter of fact, if the export growth rate changed something importantly then Greece would not have proceeded to a third EAP. Our econometric findings underscore that the technological competitiveness of Greece did not structurally improve in the aftermath of the crisis.

We argue that focusing exclusively on the interpretation of the increase of annual export growth of Greece or any other EMU country will not lead to meaningful and correct conclusions. In fact, the focus on export growth gives less information for the real changes that have been implemented within the country. According to our model, the rate of export growth does not provide a straightforward indication of the competitiveness of a country and is less affected from the changes inside the country. On the other hand, the consideration of a country's export share to the total EU exports depict clearer the performance of that country on exports. As already stated, Greece had an average annual increase of 5% in its exports in the post-crisis period. However, a closer look to the export share of the country to the total of the EU exports reveals that the Greek export market share declined during the crisis period. As a matter of fact, the country had an average of 1.27% of the total EU exports before the crisis of 2008, which fell to 1.07% from 2010 and the first EAP onwards. On the contrary, Germany which had a smaller rate of export growth in the post crisis period managed to increase its share on the EU exports from 19.91% to 21.05%. The export market decline is closer to the economic reality of Greece and of its deteriorating international competitiveness, following the EAPs. Our research indicates that the focus should not have been on the confinement of RULC but on the strengthening of what we defined as productive capabilities.

6.3. Business Environment of Greece and the need for change

The internal devaluation measures taken and the implemented (fiscal stabilization) policies did not lead Greece to the expected recovery. In fact, according to the data provided, the export share of the country declined. Instead of fiscal consolidation and reduction of wages we argue that the country should have responded differently and the Troika should have had promoted policies to another direction. Based on the econometric findings of Chapter 5, it is proposed that instead of decreasing ULC the first priority of the country should have been to improve its productive capabilities starting from its medium and high-tech infrastructures which were loaded into the factor with the highest positive contribution on the country's export share.

One of the main indicators which was highly loaded in the "high-tech infrastructures" factor of the conducted research refers to air transport registered carriers and consequently to the capacity of the airports to handle freight. Although the development of the airport system per se does not guarantee the increase of the traffic and trade since geographical location plays an important role it could be argued that the upgrade of the airport

systems could provide an important competitive advantage. Kenneth Button (2004) has highlighted in his book the importance of the continuous update of the air transport industry since it could comprise a substantial stimuli for economic development, functioning as a "key lubricant" for the economic system. For Greece, which is a country characterized for its mountainous terrains and its island complexes, air transport constitutes an essential way of communication. According to Civil Aviation Authority of Greece, the country has a substantially large number of airports in relation to its population (44 reported airports) where 15 out of them are international. Greek airports are mostly known for their capacity to respond to the seasonal demand which derives from the tourists' traffic (Psaraki-Kalouptsidi & Kalakou, 2011). However, Theodore Tsekeris (2011) in his study for the efficiency measurement and determinant's analysis for the Greek airports, examines among others the cargo and carrier capacity of the airports reporting that their deployment leads to increasing returns of scale and consequently they must always be considered for developments. Relevant data from the Hellenic Federation of Enterprises (HFE) indicate that Greek airports did not proceed to the upgrade of their cargo facilities. Besides, the data collected for this study suggested that the air transport registered carriers rank the country in the last places among those used in the sample (see Table in Appendix R). Especially, during the financial crisis Greek airports faced important decreases on the registered carriers. Nowadays, the Athens International Airport's (AIA's) Cargo Development service reports its intention to promote more "air-cargo" as an alternative for transportations proceeding to improvements of their services in order to support Greek exports. Greek airports have to find a way to balance between the high seasonal touristic traffic which also affects positively the country's international competitiveness (as insinuated from the econometric findings) and their intention to expand their commercial/cargo capabilities. In that direction and aiming to strengthen the airports' capacity, the Greek government proceeded to the renovation of 14 peripheral airports of the country as part of a four-year investment plan of €415 million (Papatheodorou et al., 2019). Considering the existing procedures and the results of our econometric model which suggested that the capacity of an airport to handle cargo is very important for its international competitiveness and trade performance, it could be argued that the current situation constitutes a great chance for the Greek airports to create structures for making a better environment for the rise of registered carriers and ensure a high quality assistance to the tourists.

Air transfers and facilities are not the only part of the infrastructures that need a considerable restructure. Shipping industry has also evolved tremendously. Competition is becoming more intense, especially after the financial crisis, and shipping services need to be reassessed, reorganized and defined as stated from the Greek Ministry of Shipping and Island Policy. Geographical location of the port does not suffice anymore to attract new markets and maintain the existing ones. Nowadays, it is essential for ports to deploy and provide qualitative, innovative services in order to attract investors and more users. The term "smart port" though recently defined for the global market, signifies the future for the ports. The new technologies and systems could increase tremendously the efficiency of the ports and enhance their capacity for cargo handling (Yang et al., 2018). HFE elaborated extensively the contribution of the transformation program called "Industry 4.0" and IoT to business including also maritime sector (HFE, 2018). For Greece which is in a very important position geographically

and constitutes the "boarders" of Europe with Asia, maritime sector was always sizeable. However, the container traffic is reduced, and recent reports show that Greek ports have not adopted the new digitalized framework but remain on an old-fashioned business model (Pallis & Vaggelas, 2017). It is high time for Greek ports to create the new business plans which will lead the way towards the new digital era and optimize their capacity to handle and transfer cargo. As our econometric model suggests, ports and the container traffic play together with airports a substantial role to the strengthening of competitiveness of a country. Furthermore, ports were found to have a positive correlation with the tourism performance of the country which was indicated from our findings that contributes to a country's export share as well. Thus, it could be claimed that their improvement will not only facilitate the handling of cargo but also ameliorate the assistance to the hundreds of tourists who use the Greek ports (Pallis & Vaggelas, 2017).

Part of the new digital era that will enhance the deployment of the infrastructures and was discussed above, but also a significant ingredient for the improvement of the country's international competitiveness as observed in our econometric outcome are also the ICT manufacturing and service firms. According to data used in this analysis, Greece has very few companies related to ICT manufacturing or services comparing to the rest EMU countries of the sample (see Appendix R). In fact, the country imports most of the ICT services and products (Tsakanikas, Danchev, Giotopoulos, Korra, & Pavlou, 2014). Our results propose that ICT sector maintains a very significant role for the increase of a country's export share. If we consider its contribution to the infrastructures per se (as designated from the correlation analysis of the model) it is understandable that it enhances the new innovative framework that is essential for a country in order to increase its export share following the indications of the model. Although these activities could lead to substantial improvements to the country's export share as derives from our analysis, their development faces many rigidities in Greece (Tsakanikas et al., 2014). Particularly, high taxation and bureaucracy in Greece do not facilitate processes of creating such enterprises (Giotopoulos, Kontolaimou, Korra, & Tsakanikas, 2017). According to the World Bank Data statistics the time required to start a business in Greece is above the EU average and is estimated to 13 days in the post crisis period whereas in Germany it is 8. This measurement considers that if a procedure can be speeded up at additional cost, the fastest procedure, independent of cost, is chosen. This means that this number of days refers to the best-case scenario which is not the most affordable. Similar data from the same source put forward that Greek bureaucracy includes many different stages of processes in order to register a business (on average 6 procedures in the post crisis periods). This should be also improved if Greece wants to attract more investors in the country. Slovenia for example managed to limit these processes to only two days. The process of starting-up an ICT industry does not differ substantially from any other knowledge-intensive firm and needs to gain ground in Greek economy in order to be deployed more (Giotopoulos et al., 2017). It will also help Greece align to key technology trends such as the development of social business and mobility, the utilization of analytics and the advent of industrial and cloud technologies which are essential for airport and port upgrade (Catinat, 2013). Furthermore, the econometric findings of Chapter 5 provided evidence that the increase of ICT manufacturing and service industries contributes a lot to the development of a country's

export shares. These indicators are both loaded in the "high-tech infrastructures" factor which was used in our regression analyses and recorded the highest contribution to the international competitiveness of the country. Thus, following our econometric findings, and considering the existing rigidities which were named above, it is proposed that the Greek government has to develop a friendly environment for ICT initiatives and firms, helping this sector to be deployed as ICT firms could contribute both directly to the enlargement of a countries export share and indirectly through the upgrade of the existing infrastructures.

The econometric model utilized in this research together with our literature review indicate the prevailing position of innovation and knowledge creation for the contemporary economic environment. Both constitute sources of economic growth and industrial development. Though the measurement of innovation and knowledge creation is a complex task, empirical researches use R&D indicators and patent data. Patents are introduced from firms which desire a substantial competitive advantage and profits and they refer to product and processes that are newly introduced to the market (Hadzima, 2008). The results of Greek firms regarding their participation in patenting are rather discouraging as it was also elaborated in section 3.3.2 (pg. 45). The patents in Greece do not follow the international patterns but have a traditional technology orientation due to the existing industrial structure as it was seen in section 3.4 (pg. 51) whereas a big share of patents is related to the construction and agricultural sector (Markatou, 2011). However, this orientation did not provide the expected outcome. Greece has a very small patent average (see Figure 9, Section 3.3.2, pg.45), and this affects tremendously its export performance as it is indicated by the econometric model. Taking into account the importance of productive capabilities which the models of this study propose, Greek firms should readjust their patent creation trend and enhance more technology-oriented sectors and pay attention also to other sectors such as performing operations-transforming or mechanical engineering (Markatou, 2011). The examples of other countries showed that their focus on such sectors brought about better patent performance (Daude, Nagengast, & Perea, 2016; Guarascio, Pianta, Lucchese, & Bogliacino, 2015) and contemplating our model this could have a direct positive contribution to a country's exports share. For Greece which as explained is a country which does not prioritize the strengthening of the industrial and manufacturing sector (see Figures 18 & 19, Section 3.4, pg.53,54) in its value chain this necessitates an important "reversal". Although this mandates a long-term plan which would lead to structural alternations, it is argued that this change is promising and could help Greek economy stabilize and create stronger foundations.

Following our analysis so far it is suggested that patents' increase in general and especially in medium and high-tech sectors are steps to the right direction for the Greek economy (in order to raise its export share) and highlight a path towards innovation which should be accompanied from the spread of the knowledge created. Scientific and technical journals strengthen the importance of patents as they expand their influence (Bregonje, 2005). Technical publications comprise significant information available to people which could afterwards innovate themselves (Gynnild, 2014). This creates a framework closer to innovation and with better understanding of technology which is essential for Greece as well. Besides, the econometric model proposes that the scientific and technical journal articles are considered part of the "high-tech infrastructures" and contribute sizably to a

country's export share performance. This could comprise an additional step towards reversing the current industry status and lead the country towards the international and successful technological trends. Data related to the scientific and technical publications from the World Bank showed that Greece was in the last positions of the ranking comparing to the rest counties of the sample (see Appendix R).

It could be argued that the discussed steps introduce a new path for the Greek economy. This path could lead to economic prosperity through the increase of the country's export share as it is suggested by the results of the econometric model. The infrastructural changes discussed imply the existence of the relevant labour force and of employees who are familiar with the technological features. This affects either the hiring characteristics or the sectors of employment. Within a business world which undergoes continuous changes there is the need for employees who have or could acquire new knowledge and skills. An increased share of intellectual capital employees would have substantial effects on the deployment of service and product innovation (Antlová, 2009). Following the findings of our econometric model which included also variables related to the employment shares, it could be argued that the proliferation of the intellectual capital employees would be essential for the enlargement of a country's export share. In particular, the abovementioned changes referring to ICT industries or high-tech business initiatives necessitate that Greek firms need employees with ICT knowledge who are available to tackle relevant issues. In addition, the more innovative the firms are becoming the more employees will be needed in medium and high-tech manufacturing sector (Kanellos, Mouritsen, & Larsen, 2013). As it was described in Chapter 3 (Section 3.3.4, pg. 49) Greece is behind the EU averages regarding the employment in medium and high-tech manufacturing. The framework which is suggested in this study and brings innovation and innovative busines in the foreground mandate the existence of skilled people who will be engaged in relevant newly-opened positions (Antlová, 2009; Leiponen, 2005). The results of this model suggest a significant connection of the employment shares and human capital abilities with the capacity of a country to increase its export share and consequently its international competitiveness.

Throughout this study we highlight the role of technology and innovation which become a very important ingredient for corporate success and have a substantial impact on economic growth. In alignment to the econometric outcome we recommend that Greece has to proceed with infrastructural changes which will not only help the country to improve its facilities, monitoring the direct effects of such activities to its trade performance but also to attract new investors (Liargovas & Repousis, 2015). HFE (2018) stresses that after 2009, Greek economy faces an investment "gap" comparing to the rest of the EU countries which is estimated above €100 billion (accumulated total from 2009-2017). According to data from the World Economic Forum the performance of Greece in optimizing its investment environment remains relatively low comparing to the rest of the EU countries although Greek governments and Troika tried to reverse that with relevant policies. However, this was not achieved, and Greece remains far behind the EU averages in many indicators (Massourakis, 2020). HFE, propose that Greece needs initially to "innovate and differentiate" by developing innovative products and services of high value-added which can compete in the European and global framework and sustain their comparative advantage. It also attempts to delineate (2018) what investors face and what

motivates them to proceed throughout the different steps of the route to investment. Insufficient infrastructures, disabled institutions and political instability, the digital framework and the inexistence of skilled employees who can respond to technical matters could be named as the main obstacles that investors need to surpass before they proceed with their plan. All these constitute substantial ingredients for the increase of the country's export share as it is suggested by the econometric outcome.

Proceeding, the econometric model of this research indicates that the existence of operational institutions and political stability is vital if the country aspires to improve its economic performance. However, the aftermath of the financial crisis found Greek society in unrest. EAPs led to austerity and fiscal consolidation of the public finances, which however deteriorated the incomes of most households in Greece (Magoulios & Stergios, 2013). This situation led to the increase of populists which tried to leverage from the existing turmoil as in the rest of EU (Katsampekis, 2018). At the same time the insistence of the Troika to austerity measures damaged the trust of many Greek people in the EU vision and they expressed the sense of unfairness via the conducted referendum of 2015 (Boukala & Dimitrakopoulou, 2017). This brought about a new round of strong turbulence for Greek economy and society in general. In addition, more than 500,000 people between 25-44 years old have left the country from 2009 till 2017 (Moris, Karachaliou, & Kontos, 2017). The so-called "brain drain" aggravated further the rate of economic growth and productivity of the country and led to further reduction of the consumption and income since the young people leaving comprise the productive tissue of the Greek economy (Lianos, 2007; Theodoropoulos, Kyridis, Zagkos, & Konstantinidou, 2014). These circumstances did not facilitate the emergence of "fertile ground" for investments.

In the aftermath of the financial crisis the problems of Greece were not restricted only in the financial sector but were expanded to the whole society (Arampatzi, 2017). Political instability and issues in the operation of institutions were the repercussions of the abovementioned malfunctions. However, both comprise an essential precondition for the improvement of the country's international competitiveness as it is supported from our findings. Particularly, political stability and fully-functional institutions could lead to the growth of FDI (existing correlations emerged in the model) but also to the utilization of infrastructures and the update of business models (Haksoon, 2010). Hackson (2010) also mentions that this two factors could ensure the framework within which substantial policy decisions could be made while maintaining social coherence. A government of mass acceptance which could also ensure the optimization of the institutions' operation could boost the economic and trade performance of Greece (N. Christodoulakis, 2019). Such framework will facilitate the stimulus for increase of FDI, which the econometric results suggested that is essential for the upswing of a country's export performance. Indirectly, higher FDI steers to the improvement of the economic performance of a country and also leads to the reduction of unemployment (Satrovic & Muslija, 2018). It could be argued that the implementation of the "conditions" discussed above could make Greece attractive again for the young people which are in search of new opportunities. It could be supported that this would be a good chance for Greece to turn "brain drain" into "brain gain" which as discussed previously will have important effects to its economy and trade. Specifically, the creation of opportunities in medium and high-tech sectors would attract

many young scientists that left Greece searching for better opportunities abroad (Theodoropoulos et al., 2014). It is underpinned that their repatriation would affect substantially the employment shares and as discussed previously the employment in knowledge intensive activities or high-tech sectors will contribute positively to the increase of the country's export share as derived from the model.

In this research it is also elaborated and underlined the role of the SMEs in the economic performance of the country. The existing companies in Greece and especially SMEs were highly affected from the crisis and many of them never managed to recover and defaulted, but now need a chance to thrive (Nassr, Robano, & Wehinger, 2016). Even by maintaining political stability and fully functional institutions, Greece has to provide additional stimulus to SMEs to innovate either in house or collaborate with others inside Greece or from abroad. It could be also supported that the innovative products which could derive from these SMEs would increase the share of medium and high-tech products which are exported from the country (González-Loureiro & Pita-Castelo, 2012). As it is advocated from our econometric findings, innovating SMEs and the share of medium and high-tech products to exports affect the country's export share significantly and any attempt to improve the international competitiveness of the country is influenced from their performance. It is argued that policy makers and politicians have to understand their importance at first and then create a suitable framework for them to operate. This includes regulation which facilitates their financing while allows the owners to develop their plans without losing their creditworthiness (Balios, Daskalakis, Eriotis, Vasiliou, & McMillan, 2016). In particular, since the eruption of the financial crisis, the ability of the SMEs in Greece to meet their liabilities to banks which financed their activities has been impaired and consequently many SMEs defaulted as the state was unable to protect them (Vettas, Stavraki, & Vassiliadis, 2017). Considering the influence of SMEs to the international competitiveness of a country, it is argued that there should be developed a framework within which the business activities will be secured and supported. In addition, taxation in Greece should not be prohibitive for such openings otherwise no one is going to invest the necessary capital (Vettas et al., 2017). After all, an innovative product might need time and continuous developments before it reaches the market. In that case the Greek state needs to protect SMEs and such projects with potential and provide state aid while, the bureaucratic processes need to become more flexible (Dimitropoulos, Koronios, Thrassou, & Vrontis, 2019). Measures towards that direction are stressed to be essential since the increase in the numbers of SMEs with the capacity to innovate either in-house or in collaboration with others could lead to an important escalation of the country's export share as the econometric model of this research has described.

It is put forward that the creation of the framework discussed above could have a direct effect on the exports of the country. The intention is to provide opportunities towards different than construction and real estate sectors and this could be achieved by developing the basis upon which technology and innovation could be utilized. This would have a direct effect also to the composition of the Greek exports. In fact, the country would have the chance to increase its specialization in manufactured, medium and high-tech products and services alternating its export orientation. According to the econometric outcome this would lead to better performance in trade per se and improves the country's trade openness. Furthermore, the more advanced technology Greece

would utilize to progress, the bigger product sophistication the country could attain (Piergiuseppe Fortunato and Carlos Razo, 2014). Highly sophisticated products provide to exporters better chances to compete with others successfully (Lall, Weiss, & Zhang, 2005). The econometric model of this research demonstrated that by improving the country's trade performance and especially by focusing on medium and high-tech products and consequently escalate their sophistication, would help the country achieve a substantial enlargement of its export share and become more competitive.

Finally, this study has provided evidence for the direction of the Greek economy which was towards using constructions, real estate and tourism sectors as the main source of income (Chapter 3, section 3.4, page 49). However, the economic performance of the other countries which focused on industry and manufacturing sectors and the econometric results of this study indicate that the country should be redirected if it intends to strengthen its international competitiveness. It needs to define the framework within which productive structures would be the core and then promote innovation and medium/high tech products. Our times necessitate bold initiatives from a country that wants to exit from its vicious economic cycle and enter to the EU and global market with competitive terms (Magoulios & Stergios, 2013). In this renewed framework the share of tourism in exports should not be the only target though, following our results, it helps the country maintain a competitive profile and contributes positively to its export performance.

6.4. Policy orientation to enhance the determinants of international competitiveness and increase the export performance of Greece

In the previous section we explain the importance of focusing policy attention on improving certain structural dimensions of the Greek economy, based on the results of our econometric model. While discussing the substantial changes that their strengthening could bring about for the country and its export share, we also referred to certain types of structural barriers which Greece needs to overcome. Such barriers are mostly related to infrastructures, financing, export formalities, business climate or regulatory and legal restrictions. In this section we will discuss in more detail relevant policy recommendations aiming to provide a guideline to overcome the existing constraints.

It could be argued that the first step towards the enhancement of the competitiveness and consequently the export share of Greece is through the development of the existing business environment of the country. Despite all the reforms in the post-crisis period there are still barriers which influence negatively what was characterized from the model and analyzed in the previous section as important determinants of a country's international competitiveness. In the previous section it was highlighted the significance of the development of the country's facilities for the increase of air transportation carriers and the container traffic in ports. Although we referred to a particular structural update which is related to logistic systems which could accelerate the processes and the effectiveness of the facilities (Tsekeris, 2011; Yang et al., 2018), it is also important to mention the bureaucratic rigidities that affect negatively the attractiveness of the airports and the ports for commercial uses. In particular,

OECD reports (2016) showed that the time and costs that are considered at the customs and pre-customs stages throughout the export processes were very high. Relevant statistics from the World Bank Data reveal that this did not change significantly till 2018. In particular, while the average border compliance formalities for the OECD countries is 15 hours, Greece has an average of 24 hours and has almost double costs (de la Maisonneuve, 2016). It is stressed that this framework make the ports and airports less attractive for those who use them for cargo transportation since they cause substantial delays (Lawrence, 2017). Consequently, it is argued that the country should proceed with some amendments related to the bureaucratic frame in order to enhance the attractiveness of their ports and airports whose contribution to the increase of its export share is sizeable as advocated from the econometric findings.

Furthermore, we have referred to the importance of the ICT manufacturing and service industries as well as to the existence of the innovative SMEs for the strengthening of a countries international competitiveness. However their initiation is a complex and difficult process which faces a lot of constraints since, as the Product Market Regulation indicators (PMR) of OECD demonstrate, Greece has more rigidities than most of the OECD countries as far as the barriers in entrepreneurship are concerned (Vitale, Bitetti, Wanner, Danitz, & Moiso, 2020). These are the repercussions of the very complex regulatory processes and the administrative restrictions which new businesses or start-ups face in order to issue licenses and permits to operate. Nevertheless, ICT companies and SMEs have to handle and then overcome these rigidities in order to thrive and in many cases this hampers the desired initiatives (Leiponen, 2005; Nassr et al., 2016). Thus, it could be argued that Greece needs to reduce and simplify the administrative processes that hinder such initiatives and ensure a framework where new ICT companies and innovative SMEs could safely function. Considering the results of the econometric model the strengthening of both is essential to the deployment of the country's international competitiveness.

We proceed the analysis of this section, which is based on the elaboration of the existing restrictions which affect negatively the factors that were characterized from the econometric findings of this study as substantial determinants of a country's international competitiveness and should be resolved, with the description of the current "trade" framework. This contains the conditions under which indicators like trade openness and all the export procedures are implemented. Particularly, OECD (2016) reports that Greek firms suffer from the lack of information which is related to the tastes and needs of foreign consumers, the quality and the standards of the products and services demanded, the emerging business opportunities and the prevailing regulation. Information and export promotion is very significant for the improvement of the trade performance of a country, since it affects trade openness, exports of goods and export shares (Freixanet, 2012). In addition, their existence is also very important for the SMEs which produce innovative products and require a clear orientation for the market needs in order to focus on the right products and services (Kanellopoulos & Skintzi, 2016). Besides if they manage to do that successfully, an SME would be able to obtain a competitive advantage ensuring its existence and continuing its innovative processes (Nassr et al., 2016). It is advocated that the country needs to create and support relevant agencies which will be responsible for the export promotion and information provision since

according to the literature, these actions will enhance their performance on indicators which are important determinants of their international competitiveness. “Enterprise Greece” is a recently created agency which aims to initiate export and investment promotion by facilitating the development of the international and domestic networking, the branding and organization conferences but needs more support from the state (de la Maisonneuve, 2016).

Following the findings of the econometric model, the function of institutions maintains a substantial role for the increase of a country’s export share. Regulatory quality prevails among the other indicators that were loaded in the factor which was used in the econometric model and its contribution together with government effectiveness and rule of law to the international competitiveness of a country is indicated to be essential. However, OECD (2016) reports that according to its relevant indexes Greece has a lot of “regulatory burdens” and these are affecting negatively the country’s airports and ports due to their complexity. Particularly, the maritime service sector is limited to accept less than 50% of foreign equity participation whereas cabotage in not allowed for non-EU registered ships. As far as air-transports are concerned, the investment regime imposes similar to the maritime sector restrictions, namely less than 50% foreign equity participation (de la Maisonneuve, 2016). It is also stressed that there are still existing competition barriers, as airport take-off and landing positions are defined on the basis of historical rights and any commercial exchange of these slots is prohibited. These barriers play an important role to the cargo capacity of the airports and the ports which is enhanced from the heterogeneous existing regulations among EU countries (Daude, 2016) These restrictions affect seriously FDI since they involve more costs (antitrust exceptions, network restrictions, service provision constraints) (Satrovic & Muslija, 2018). It is argued that the simplification of such processes and the implementation of a common framework in different sectors among countries of EU would solve the abovementioned issues and decrease substantially the existing restrictions. Such initiative mandates a reform package which will alleviate the differences in regulations and will create the foundations towards a unified framework. Changes on that direction are necessary in order to reduce the constraints that hamper the development of airports and ports and make the country less attractive for FDIs (Kontogeorga, 2017).

Another direction for the recommended reforms which aim to refine a country’s international competitiveness in alignment to the econometric findings of this model is related to technical updates. We have referred in the previous section to the notion of “smart ports” and developed ICT systems which could enhance the performance of the existing infrastructures. The upgrade of logistics should also be considered as a substantial ingredient of the effective performance of infrastructures and deployment of trade (Bensassi, Márquez-Ramos, Martínez-Zarzoso, & Suárez-Burguet, 2015). In particular, the utilization of logistics could make airports and ports more effective with the management of cargo and consequently more attractive to customers (Puertas, Martí, & García, 2014) while their update contributes significantly to the enhancement of activities related to exports of goods and services and also high-tech, manufactured products (Trappey, Trappey, Lin, Lee, & Yang, 2013). According to the econometric findings of this research, these activities need to be developed in order to increase a country’s export share. Although Greece is facing structural rigidities aligned to the limited fiscal

space and weak credit that financial crisis left behind, the country could create such framework to amplify investment in logistics and IT firms and infrastructures by taking advantage of public land through concessions or privatizations. The partial privatization of Piraeus port with the Chinese company COSCO was characterized as a successful choice as it boosted the performance of the port which is gradually updated while it utilizes high-tech logistics (Manios, Kim, & Seo, 2017). In addition, as already stated in the previous section, the Greek government has proceeded to the renovation of 14 airports of the country aiming to achieve an increase of the tourism receipts as well as with the inclusion of new technologies that would improve its efficiency for freight-management/ commercial purposes (Papatheodorou et al., 2019). It is argued that in alignment to the econometric outcome provided, these are moves to the right direction if the country intends to raise its international competitiveness and claim a bigger export share.

This path towards the strengthening of productive capabilities' is expected to lead to higher export shares of manufacturing and high-tech goods as they play a substantial role for the country's international competitiveness considering our econometric findings. The exportation of such products and services implies their generation via patent-creation (Markatou, 2011). Additionally, throughout the literature review it was seen that these goods are followed by higher sophistication (Piergiuseppe Fortunato and Carlos Razo, 2014). In this study it was found that all these indicators are interrelated and have a significant positive contribution to a country's export performance. These findings are particularly important for Greece which could benefited from the utilization of its infrastructures. Specifically, big firms of the country like Hellenic Vehicle Industry (ELVO), Hellenic Aerospace Industry (HAI), the Public Power Corporation (PPC/ DEH) or the Hellenic Organization of Railways (HOR/ OSE) which are responsible for the production of energy and medium/high-tech products and services and were hit from the crisis need the chance to be restructured. These companies always provided new patents to the Greek and European market and their rebuilding comprises an essential step for the revitalization of the industrial and manufacturing sectors of the country (G. Christodoulakis, 2015). The same source stresses that the optimization of their operation will have substantial impact to the products produced, increasing their sophistication and enhancing the manufacturing and high-tech products/services share on the total of its exports. Considering the econometric findings this would lead to a raise of the country's export share. However, these companies have been damaged from the financial crisis and the ineffective handling from consecutive Greek governments (Kallianiotis, 2013; Melpomeni, Georgios, & Theodore, 2019). Reports from OECD (2016) emphasize this situation and put forward that Greece should also take advantage and improve the coordination of public-private partnerships (PPP) which could lead to an augmentation of investments and higher operational efficiency which is essential for these companies. Through PPP the risk of the projects will be allocated between public and private sectors giving more space for firms to evolve. The abovementioned cases of Piraeus port and peripheral airports designate that this direction have brought substantial benefits for the Greek economy and towards the direction, which is aligned to the target of the increase of the country's export share. These companies run big deficits while they are highly inefficient and need to be upgraded in order to be able to provide again to the country with their products (Costas Meghir, Dimitri Vayanos, 2010). PPP agreements for

them would be a relief for the government in terms of debts but also would attract more FDIs and stimulate innovation(G. Christodoulakis, 2015). As a result, many of the determinants of a country's international competitiveness as this was defined in this study could be enhanced.

The establishment of new companies, related to technological products and ICT, or the development of innovative projects between SMEs and their ability to export ICT or high-tech products that we have discussed in this section imply also the existence of a financing framework (de la Maisonneuve, 2016). Besides, exporting firms are strongly connected to external financing considering the existing riskiness of exports' activities as well as the payment difficulties (Muûls, 2012). Berman et al (2010) argued that credit constraints are very important for the firms and affect their decision to enter the export markets even by preventing them to get involved with exports. It is argued that such barriers could affect also negatively the trade openness, the export of goods and the exports of medium and high-tech products (Ioanna C. Bardakas, 2014; Manova, 2012) Furthermore, according to OECD (2016) the financial crisis has led to the decrease of the credit for the total business and SMEs and this has affected their innovation processes. ECB reported that during April-September 2015, 30% of Greek SMEs has named the access to finance as their main issue to tackle (ECB, 2015). Capital controls in Greek banks in June 2015 deteriorated the situation even more and according to the same study SMEs of the country faced more rigidities that the rest of the euro area countries. Since financing comprises a very important problem for Greek SMEs influencing negatively their innovative processes and corporations and also their export performance, there should be found alternatives which guarantee sustainable solutions. Besides, these factors are contributing to a country's international competitiveness and are part of the productive capabilities as derived from our econometric model. Thus, following our findings, their strengthening and function is necessary in order to maintain or even increase a country's export share. In that direction it could be argued that SMEs should be able to benefit from official supporting programs at local and international level. Greek government could offer support programs to local SMEs, cooperating with EU institutions and ensure the increase of awareness of the firms for the existence or emergence of such schemes. The establishment of an institution responsible for the SME funding and the provision of instructions could help new firms create strong foundations and turn to exports (Daude, 2016). Innovative SMEs will have then a substantial chance to export their products boosting their activities and the rest of the country's firms will have the necessary motives to enhance their exporting performance as well as with the country's export share and international competitiveness.

An additional feature of the country's framework that affects significantly its activities and is argued to require an adjustment aligned to the country's needs refers to the tax system (Oltheten, Sougiannis, Travlos, & Zarkos, 2013). Firstly, the absence of an efficient tax system creates substantial barriers for the firms of Greece (Richter, Kaspar; Giudice, Gabriele; Cozzi, 2015). Additionally, according to the literature an inefficient tax system influences negatively a lot of productive capabilities' determinants (as these derive from the econometric outcome) of a country's international competitiveness such as exports of goods and services, medium and high-tech exports, trade openness, patent creation (higher administrative costs), ICT manufacturing or service firms

initiation and FDIs (Costas Meghir, Dimitri Vayanos, 2010; Daude, 2016; Oltheten et al., 2013; Richter, Kaspar; Giudice, Gabriele; Cozzi, 2015). EAPs, which were elaborated in the beginning of the Chapter, make the possibility of reducing taxes very difficult, but despite the rigid fiscal situation of Greece there could be found room for maneuver in order to ensure an export supportive tax system which ameliorates tax administration and fights effectively tax evasion (de la Maisonneuve, 2016). Tax administration improvement will also help the Greek government solve VAT-refund delay issues for which many SMEs still complain about since it affects negatively their innovating processes (Kaplanoglou, Rapanos, & Daskalakis, 2016). It is supported that tax administrations should have transparent processes and remain independent while utilizing compliance assessment and exploiting risk management. We argue that these measures could support the abovementioned productive capabilities' determinants whose strengthening is necessary, after our econometric findings, for the country in order to claim a bigger export share and become more competitive.

Following the findings of our research it is also proposed that the increase of the international competitiveness of Greece implies also an assessment and consequently a reform of its judicial system. The function of institutions has a straightforward contribution to the performance of the country as this is already discussed and demonstrated in Chapter 5 and our econometric results. "Rule of Law" was considered in the institutions' factor and as obtained from our findings it has a substantial contribution to the country's export share performance and the increase of its international competitiveness. OECD (2016) highlights that judicial processes in Greece are characterized by high complexity and need a long period to be resolved. For the better operation of the institutions in Greece it is essential to enhance judicial efficiency, accelerate the proceeding and tackle avoidable shortcomings in the function of courts by improving court management (Costas Meghir, Dimitri Vayanos, 2010). It is argued that judiciary efficiency guarantees a business environment with reduced uncertainties and transaction costs which provides more opportunities for exploitation (Richter, Kaspar; Giudice, Gabriele; Cozzi, 2015).

A final remark in this section which is related to the policies which could derive after the findings of this research is connected to the tourism which is a major source of growth for the Greek economy and it did not suffer much from the crisis (Thompson, 2017). The econometric data implied that the share of tourism in exports affects positively the country's export shares. Thus, it is important for Greece to strengthen tourism even more. The deployment of the country's infrastructures which support the existing travel activities (ports and airports) could be considered substantial and have been already discussed. Logistics mentioned above, would also accelerate many processes in this case and ensure high quality assistance to the tourists (Puertas et al., 2014). Furthermore, we propose that the national strategy for the development of tourism sector should include the upgrade of tourism products and services, the extension of tourism season, an environment which would attract investors to fund tourism activities and the promotion of undiscovered destinations. Processes for the opening of tourism enterprises should be simplified as well. Following and expanding this strategy could have sizeable effects for the tourism export share of the country (Sardianou et al., 2016) which is very important for its attempt to become more competitive and claim bigger export shares in EU. However, all these measures should not jeopardize the

cultural diversity and integrity of the inhabitants and such licenses should guarantee the protection of the country's natural sources (Kakoudakis & McCabe, 2018). Although the last argument might complicate the processes that need to be considered for the development of the sector, it is essential to take into account that the country and its islands which attract millions of tourists every year should maintain their identity and uniqueness.

6.5. Chapter Conclusion

Following the results of the econometric model in this Chapter we firstly defined the main determinants of the international competitiveness, namely it was clarified that it is not affected in a significant way by (conventional) price/cost competitiveness measures (including RULC), but rather it is mostly dependent on structural technological/ non-price competitiveness indicators. These results articulate that on the contrary of what is believed from many economists, cost/price competitiveness is not the most important determinant of a country's international competitiveness and its improvement does not lead to the enlargement of a country's export share. On the other hand, the development of the productive capabilities, although it comprises a difficult and long-term challenge and require substantial structural transformation of the economy and the national innovation system of a country, it is advocated that it could bring about sizeable improvements.

Trying to elaborate international competitiveness, we operationalized this notion using two approaches: (a) we defined competitiveness in terms of a country's export growth; and (b) we defined competitiveness in terms of a country's export market share in EU exports. The two approaches lead to different results and different insights. In this Chapter it was argued that export growth is not the best possible indicator of international competitiveness while the export market share of a country is a more meaningful one and provides more substantial results.

After contextualizing these important notions in alignment to the obtained econometric results we scrutinized the case of Greece and examined the importance of these findings for the country. It is mentioned that since 2010 Greece is under the economic assistance of Troika which bailed out the Greek economy which was about to default. Troika offered this financial aid in exchange for the implementation of a fiscal consolidation policy and structural (labour market and social security) reform and Greece proceeded thereafter with three EAPs. Considering our econometric findings, we explained that the three EAPs did not bring about the desired results. In fact, the drastic decline in domestic demand have masked the real consequences of these policies, while the country experienced its value of net exports decreasing more. The consequences of these policies helped us explain that the interpretation of the increase of annual export growth of Greece or any other EMU country will not lead to meaningful and correct conclusions. In fact, the focus on export growth gives less information for the real changes that have been implemented within the country. This constituted an additional argument which supports our perspective that the consideration of a country's export share to the total EU exports depict clearer the performance of that country regarding its international competitiveness.

We proceeded our analysis in the Chapter with the delineation of the existing business framework in Greece and how this affects the country's export share which we considered as the most rightful way to define international competitiveness. We particularly referred to the existing situation of the country and how the productive capabilities' determinants, as they derived from our econometric model were influenced from it. Then we continued with specific suggestions that could facilitate their operation and lead to the improvement of their performance on the basis of our econometric findings and the existing literature. We initially referred to the broader policy recommendations which derive from the understanding of the current business environment in the country while after this we scrutinized specific issues that need to be resolved so that Greece would have a better chance to claim a bigger export share and increase its international competitiveness.

Chapter 7. Conclusion

"Every man of action has a strong dose of egoism, pride, hardness and cunning. But all those things will be regarded as high qualities if he can make them the means to achieve great ends"

Giorgos Seferis

7.1. Conclusion and Discussion

It could be argued that the prospect of EMU signified the beginning of a new era for the European countries and although the Maastricht Treaty (1992) brought together into the big alliance countries which differed significantly in terms of economic structure, the high expectations made the existing obstacles appear relatively small. EMU would provide substantial benefits to the Member States and lead their way towards opportunities which would enhance their economic performance. Taking this into account, the architects of EMU imposed rules and conditions on macro-economic policy to ensure that Member States would follow converging paths within the Eurozone in order to improve their economies and guarantee social cohesion and solidarity.

The economic expansion after the introduction of Euro managed to mask the diverging paths that different EMU Member States followed. On the one hand, countries of the core of EMU such as Germany, Austria and the Netherlands invested in manufacturing (high-tech) activities, whereas periphery countries like Greece, Italy, Portugal and Spain used their resources to focus more on the non-traded low-tech sectors including real estate and tourism. As a result, the countries of the Eurozone periphery began to face serious issues with their BoP deficits, which increased with the onset of 2008-2009 financial crisis when they almost defaulted on their sovereign debt. Economists stressed that the existing asymmetries among the countries (the core countries all have large trade surpluses, while the periphery countries all have substantial deficits on their balance of trade) constitute the main cause of the crisis and they identified difference in the international competitiveness as the factor which did cause the diverging trajectories of core versus periphery EMU members.

In the view of many economists, improvements in international competitiveness is a necessary condition for reducing BoP problems and bringing (trade-deficit) countries back to economic prosperity (Alexiou & Nellis, 2013; O. Blanchard, 2007; O. J. Blanchard et al., 1993; Passas & Pierros, 2017; Uxó, 2014). Consequently, in the aftermath of the financial crisis, countries proceeded with policy measures which intended to strengthen their trade performance and made their firms more competitive. As explained in Chapter 2 of this study, economists and policy makers initially tried to define how to approach the notion of international competitiveness in order to determine the measures which should be taken. However, the difficulty to define

this concept (what exactly is 'international competitiveness') and its determinants, but most importantly the inability to obtain quantitative (measurable) estimations of them made many economists focus mostly on price/cost competitiveness and consider non-price/ technological competitiveness less. Countries such as Greece and Portugal which faced issues with their BoP performance and consequently their competitiveness, proceeded after the indication of the EU institutions to the implementation of an internal devaluation policy; internal devaluation means that wage growth is lowered below labour productivity growth in order to reduce unit labour costs and (export) prices. Since these countries were both part of the EMU, they could not simply devaluate their currency, namely they had to proceed with wage reductions. The main idea was that with internal devaluation policies, countries could moderate excessive RULC which affects price competitiveness and lead to the improvement of their export performance.

On the other hand, a different school of economists argues that international competitiveness is not influenced from the price competitiveness, but it is highly dependent on a country's productive capabilities (Jorge et al., 2011; Kaldor, 1981; Milberg & Houston, 2005; Passas & Pierros, 2017; Schumpeter, 1942; Storm & Naastepad, 2015). They put forward that the export performance of a country is aligned to its ability to produce medium and high-tech products by cultivating its innovation and technological competencies.

Greece was one of those countries of EMU periphery which suffered from large and persistent trade deficits and financed its responsibilities through (external) debts. Its economy was built on unstable foundations since the country had to face the challenge of both government budget deficits and deficits on the trade balance of the BoP. Greek governments together with their institutional partners tried to define the recovery policies in order to remedy the crisis-struck Greek economy. The reform policies, namely fiscal adjustments and internal devaluation intended to reorganize the country and ensure the stabilization of its damaged economy through export-led growth. However, Greece did not actually manage to recover as fast as other countries and in fact its income performance has not reached yet its pre-crisis performance. The fact that Greece, as other countries of EMU periphery, has followed a completely different export pattern and specialization path comparing to EMU countries of the core in the pre-crisis period, as shown in Chapter 2, limited its recovery even more due to the absence or, when present, poor quality of the essential infrastructure. The findings of the literature review put forward that the country was diving into stagnation, focusing mostly on non-tradeable sectors in the pre-crisis period (2001-2007) and having little scope for exports and innovation. These symptoms were in alignment to those economists who argued that technological competitiveness is the main driver of a country's export performance.

The existing discordance between the two schools of economists for the main determinants of international competitiveness of a country and the ambiguous results of the implemented policies in Greece, as far as their effectiveness is concerned, led us to articulate the research question of this study, namely "to what extent does the international competitiveness of firms in Greece and other Eurozone countries depend on (a) relative cost and price competitiveness, or on (b) relative technological and productive capabilities?"

Attempting to address our research question we start by scrutinizing the extent of the divergence between EMU countries in terms of cost/price and non-price/technological competitiveness. In Chapter 3, after defining our research sample which is comprised from 12 EMU countries including both countries of the core (Germany, the Netherlands, Austria) and periphery (Greece, Italy, Portugal), we present the fluctuations of a country's RULC since the adoption of the common currency. RULC is considered as the main indicator which characterizes the cost/price competitiveness of a country. The relevant data show that the divergence of the EMU countries in terms of RULC is not as sizeable as expected and the differences have become smaller during the crisis-period. On the contrary, significant indicators that function as determinants of a country's technological competitiveness, demonstrate the existence of different patterns of productive structures and capabilities between the countries. In particular, the statistical results justify that countries of the Eurozone core are more engaged in manufacturing and innovation related activities than those of the Eurozone periphery. The diverging paths that were followed are also clarified when we elaborate the gains of value added per sector of each country. In fact, at the end of Chapter 3 it is argued that the different trajectories followed by the EMU countries are what defined the existing export regime within EU.

After recognizing that one group of EMU countries focused more on the industry and manufacturing sectors, utilizing the technological competencies, and the other group focused less on innovation but developed sectors such as tourism and real estate we proceed in Chapters 4 and 5 with the empirical investigation of how the diverging strategies have influenced the international competitiveness of each country and their trade balances. We firstly scrutinize the existing correlations among the dependent and independent variables, identifying significant connections between indicators related to productive capabilities with a country's export share performance. On the other hand, it is demonstrated that neither export share nor export growth are significantly affected by RULC, namely in the 12 EMU economies, cost/price competitiveness does not have a statistically significant contribution to what was defined as international competitiveness (during the period of analysis 2001-2018).

Using factor analysis, the indicators that were considered as productive capabilities' determinants were loaded into seven factors, which were named after their content, namely "high-tech infrastructure" factor, R&D investment factor, FDI-centric factor, "trade" factor, "ICT-exports" factor, "sophistication" factor and "SME" factor. Additionally, our institutional variables were loaded into one factor demonstrating a strong interconnection with each other. Proceeding with our model, we operationalized international competitiveness (our dependent variable) either as a country's export share to the EU exports or its annual rate of export growth and we examined its interaction with both price/cost competitiveness and no-price/technological competitiveness variables. We finally examined the role of political stability and institutions factor.

The results of the regression analyses demonstrated a significant statistical association between an EMU country's export share and its productive capabilities' factors. In particular, an increase in productive capabilities leads to a substantial increase of that country's export share in total EU exports. It was also found

that the contribution of productive capabilities is enhanced when the country has well-functioning institutions and political stability. On the contrary, RULC did not present any statistically significant results. Furthermore, the results of this model provided evidence that the export growth of a country is affected by different factors than its export share. Particularly, a country's export growth was not influenced by either RULC or the productive capabilities' factors, but mostly by GDP growth in the whole Eurozone. It was also indcated that export growth is affected by the "trade-factor", which was to be expected since it contained variables aligned to specific products export rate. Finally, the econometric findings suggested that the political stability and function of institutions within a country do not affect export growth rates.

The results of our econometric model suggest a different basis upon which a country could increase its international competitiveness and its export shares. In Chapter 6 we interpret these results and translate them into policies. We focus on the case of Greece which went through a deep recession throughout this period and adhered to the suggestions of the EU institutions to improve international cost competitiveness by internal devaluation. We refer to the policies implemented throughout the three EAPs, but which did not bring about the desired effects. Based on our econometric findings, we propose an orientation for an alternative path that the country could follow in the future in order to recover and proceed with structural improvements that could lead it to prosperity. Chapter 6 provides the policy orientation which takes into consideration the country's main problems and intends to change them in a way that the factors which were observed to contribute the most in the country's export performance will be strengthened. Besides, as Pier Moscovici (2016) has claimed, the present times, where globalization influences the economic and trade performance of every country, necessitate the emergence of a long-term, bold plan which puts in the foreground structural changes and modern business models based on technology and innovation in order to help the country espouse to this progressive framework. The policy directions provided could help to formulate a roadmap for the structural improvements that are essential for Greece and the rest of the EU countries which have mostly engaged in the non-traded low-tech sectors and have experienced similar issues. We argue that this long-term re-orientation of policy focus could arguably lead to the necessary convergence of the EMU countries.

7.2. Reflections and Considerations for Future Research

Our most important finding is that an EMU Member State which attempts to strengthen its international competitiveness, should focus more on the development of its non-price technological competencies rather than on the increase of its relative cost/price competitiveness. This indicates that policies of internal devaluation are unlikely to succeed on their target for improving a country's trade performance. The vicious cycle of a debt-financed country could be overcome if a long-term strategy aligned to the development of an effective export-oriented framework and based on the update of a country's productive capabilities is implemented. Specific policy recommendations were given in respect of this framework for the case of Greece.

Throughout the conducted literature review we have encountered many different definitions for the international competitiveness since this notion does not have a universally accepted definition in the economic literature. It could be argued that this does not facilitate the understanding of this notion and makes its interpretation more difficult. In this study, we operationalized a country's international competitiveness using two (widely used) approaches in order to provide an indication on how to handle this notion. Particularly, we defined international competitiveness in terms of a country's export growth and in terms of a country's export market share in EU exports. The econometric findings of our model provided different results for each of these two approaches. Particularly, we have seen countries of our sample which have very high annual export growth but maintain a very small piece of the EU export share (Slovenia, Slovak Republic). On the other hand, there are countries with "smaller" export growth rate (Germany, the Netherlands) which maintain a big export share while having an export growth equal to the EU average. It is argued that small exporters could reach "easier" high rates of export growth comparing to large exporters such as Germany. However, it would be wrong to interpret the (average) export growth performance of Germany as being a sign of average 'international competitiveness' of German firms, which are known to be highly competitive. Consequently, export growth is not characterized as the best possible indicator of international competitiveness, while the export market share of a country comprises a more meaningful one and provides more substantial results. Therefore, in our policy recommendations we are referring to ways to increase a country's export when we consider the improvement of its international competitiveness. Together with answering the research question of this study we acknowledge that this finding provides also important insights on how the international competitiveness should be studied and confronted in future researches.

Throughout this research we faced several limitations whose incorporation in future researches related to the same field of study could provide more justified results. To begin with, this dataset includes information for specific 12 countries of the EMU, excluding countries with relatively strong economic performance outside the Monetary Union like the United Kingdom or Poland which play a very important role in European trade. These countries are not integrated in the EMU and still use their own national currency. Under these circumstances they could proceed with a nominal currency devaluation in order to regain their lost competitiveness. It would be interesting to examine the performance of RULC in this case and examine if an internal devaluation policy would affect their international competitiveness more than their productive capabilities. The consideration of these countries could provide additional insights for the importance of the RULC in the international competitiveness of a country as its statistical significance of RULC could be altered and the model might provide statistically important results.

A further limitation could be identified in regard to our econometric model. In particular, we connected international competitiveness to either productive capabilities or RULC ignoring a very important part of a country's economy, namely banking sector. It could be argued that the banking sector was not included in the model due to time limitations and the complexity of building up a banking sector factor. Taking into consideration that banking sector maintained a very important role for most countries' economic performance

especially in the pre-crisis period, while they national balance sheets of most of the countries of the sample and particularly those of periphery were "fueled" from loans, it could be claimed that it affects importantly a country's international competitiveness. It is put forward that the banking sector is "represented" from variables related to investments. The inclusion of more variables related to this sector could show further interconnections with the investment variables and provide a better understanding for the importance of the investing framework of a country in order to enhance its international competitiveness. Since the econometric findings indicated a negative contribution of the R&D investments to the expansion of a country's export share the consideration of the banking sector would help us obtain more robust results for the performance of this factor. Besides, a "healthy" banking sector is considered essential for the economic performance of the country and its insertion in our model would deepen our knowledge for its contribution on trade while its function is expected to enhance the performance of the productive capabilities' factors.

An additional concern aligned to the policy proposals which we suggested in Chapter 6 is related to the environment in which our recommendations could be implemented. In particular, it should be recognized that Greece or any other country of the sample are part of the European Union which defines to a large extent their economic and technological environment and determines substantially the success or failures of the policies and strategies. "Fallacy of composition" as this was called from Keynes and is already mentioned could describe sufficiently what the implementation of a policy could mean for the countries of the Union. For the case of Greece this could be proved an extra burden since as it was explained the country has to follow to a large extent the directions that derive from the EAPs which has agreed with its institutional partners. Consequently, bold fiscal initiatives from the Greek governments could be confronted with disbelief and be hampered or rejected. Especially when considering the austerity directions advocated by various proponents in several Member States, we should be conscious of the difficulties that could arise when the Greek government would try to proceed with big structural improvements. However, even the most rigid EU creditors and partners could be overcome and convinced if the Greek government demonstrates eagerness to pursuit the highly necessary reforms that could lead the Greek state to the convergence with the rest of the advanced EU Member States.

An additional, important remark concerns the way the econometric findings of our study were interpreted to reach the recommendation of specific policy measures in the context of the Greek economy. In particular, our findings, many of which as discussed were related to the "structure" of the economy per se, did not provide direct, usable instructions in regard to policy guidelines and recommendations. As a result, we proceeded with the proposal of the policy orientation based on the credible grounds for rethinking and reconsidering (Greek) economic policy-making as it concerns improving the international competitiveness of the economy, as well as for a theoretical reconsideration of the economic notion of "competitiveness" itself, that our findings provided.

Furthermore, in this study we attempted to create a framework which incorporates the technological competencies of a country in a measurable manner, even though they are attributed to have a qualitative nature to a large extent. This has brought about many challenges throughout the implementation of this research,

especially as far as the adequate capturing of the qualitative dimensions of the international competitiveness notion from the quantitative indicators used is concerned. Therefore, we attempted to integrate many different indicators which were identified in similar quantitative researches elaborating competitiveness, as explained in Section 3.6 (pg.63) regarding the definition of the model's variables. Particularly, we did not adhere our research only to variables related to infrastructures and corporate environment, but we estimated also factors which is supported to capture better the qualitative nature of productive capabilities. In particular, we have collected data and then estimated the PRODY and EXPY indexes which are related to the sophistication of the products. We also investigated the role of education and employment share to their understanding trying to cover different aspects of this notion. However, it could be argued that the qualitative nature of productive capabilities is still difficult to be elaborated and require additional variables to explain it.

In this research, we proceeded with the analysis of 36 variables which we considered that they are related to productive capabilities of a country ending with 32 of them which were grouped into the productive capabilities' factors. By using this large number of variables, we intended to examine as many interconnections with the dependent variables as possible. However, the addition of more variables leads to the loss of degrees of freedom which are important for the statistical inferences. Factor analysis facilitated this process by reducing the large number of independent variables, leaving seven factors related to productive capabilities and one related to the function of institutions. Although very useful, this analysis still left many variables to handle. An alternative way to tackle this issue would have been to use a panel data regression, maintaining the same number of variables. Nevertheless, we preferred to use the time series analysis since it was considered more direct in understanding a country's specificities. Besides the fact that in all 12 cases we find similar results and meaningless differences in the coefficients enhances our confidence for the robustness of the results. Finally, it could be supported that the alternative way to handle the issue regarding the degrees of freedom, would have been by reducing the number of variables and proceeding to a factor analysis expecting much less factors.

It is argued that the existing limitations do not decrease the robustness of the findings of this study. In fact, the econometric results provided a clear direction for the improvement of a country's international competitiveness since it was indicated that RULC does not have any statistically significant influence in any of the models included whereas the productive capabilities' factors seem to maintain a meaningful role in the enlargement of a country's export share. This econometric outcome brings into question the implemented policies so far (internal devaluation and austerity measures) but creates also further inquiries and concerns regarding the future developments. The policy orientation suggested, could be characterized too ambitious since it incorporates sizable structural reforms which imply big capital expenses and changes for a country. In the aftermath of a financial crisis the "weak" countries are not able to proceed with such long-term, structural changes but need an immediate solution. It could be claimed that internal devaluation and austerity measures comprised policies in that direction in the case of Greece and the rest of the periphery countries of the Eurozone. In section 2.1.2 it is provided an extensive critical review on internal devaluation policies even in the case of "emergency". Particularly, many economists support that such kind of policies lead in fact to the weakening of domestic

demand affecting the trade deficit by reducing imports and not enhancing exports (Jörg Bibow, 2013; Lavoie & Stockhammer, 2013; Storm & Naastepad, 2015; Villanueva, Cárdenas, Uxó, & Álvarez, 2020). Consequently, a country does not become more competitive but "suppressed" since disposable incomes and spending of households decrease (Nikiforos et al., 2015; Polychroniou, 2014). It could be also argued that internal devaluation hurts competitiveness since it makes the actions to improve a country's productive capabilities more difficult. It is indicated that the implemented policies should be reconsidered and probably replaced with an abiding plan of structural reform, which has productive capabilities and technological competence as a focal point and is capable to lead to the creation of concrete economic foundations for a prosperous performance in the future.

An additional important learning from this research is related to the suggestion that infrastructures need to be updated in a way that they contribute substantially to a country's international competitiveness. As it was stated above this would require important capital expenses which however, in the existing framework of fiscal austerity policies, would not be embraced with relative ease in order to expand the fiscal policy space. Besides, as it was stated throughout the literature review, Greece has not fully recovered from the financial crisis hit yet. Consequently, the European partners and lenders of the Greek bailout programs are still cautious regarding the future performance of the country and a potential negotiation with them for an increase in fiscal expenditures would probably not be accepted. Hence, the country needs to examine different alternatives in order to move forward. A possible solution would be the development of an "FDI-attractive" framework as it was suggested throughout the policy orientation Chapter. The examples of Fraport company which invests approximately a considerable amount of money in order to enhance the facilities of the Greek peripheral airports and that of the Piraeus port and COSCO validate on the one hand the need for capital but on the other hand suggest that Greece could find it also from "external" resources (FDI). Although such investments would be prohibitive for the state due to the existing fiscal constraints, Greece should not overlook the importance of the infrastructures looking for ways, to increase their attractiveness to foreign investors aiming for upgrades that would boost their performance.

As already discussed, the countries within a union must define the ways which will allow them to "co-exist" regardless the emergence of any structural differences. The initial aspiration for EU was the creation of a framework that contains three main pillars, namely political (State), economic (Market) and monetary (Currency) integration (Issing, 2001). In his paper for the European Society for the History of Economic Thought, Otmar Issing (2001) compares these three pillars for a "successful" union prioritizing on the top political integration. He is implying that a common European market and currency are steps towards the right direction, but the "unification" will be accomplished when political integration will proceed further. In fact, EMU is a political project. The historical evidence provided throughout this study reported that none of the previous monetary unions which did not embed a political union, managed to thrive. Although the financial crisis experienced, brought into question many of the aspects of this project and triggered discussions on the architecture of EMU per se, it has also led to the development of proposals that could strengthen the institutional

cooperation and political "co-existence" (Issing, 2016). Following the knowledge gained from this study it is argued that an economic union could drive its Member States towards the structural reform that could "protect" them from global competition but the more fundamental steps and policies emerge only through the deeper political integration. This implies that EMU Member States need to create a more collective, "European" agenda referring to political and fiscal matters and do not appear "hesitant" in front of sovereign matters. Besides, Otmar Issing (2016) highlights that unless the political integration becomes something more than a vision, the whole "European structure" is at stake. Further political integration seems to be also a sound answer to the emerging euro-skepticism which was brought about after the "failure" of the implemented economic policies to respond to the financial crisis, providing to the Union more concrete foundations. The recent decision from the European Council for the rescue package against the economic consequences from covid19 comprised a significant step towards the desired direction. The outcome of the summit derived from a political process where the EU leaders proved that what connects the EU countries exceeds what separates them and signifies a historical moment for the Union. It is argued that this agreement should constitute the basis for further political integration in the EU enhancing the solidarity between the Member States.

From the initial conception to its implementation, this study attempts not only to highlight the wrong doings of the past but mostly to indicate the path to a prosperous future for a country. This does not occur only from the capacity to answer the research question but also from an "optimistic" aspiration that explaining the world is a straightforward process and its interpretation is based on the understanding of its constituents. Our optimism is depicted in the beginning of each Chapter from the phrases which introduce to the reader our thoughts and beliefs for the analysis that follows. This led us from the ultimate vision of the "United States of Europe" as Victor Hugo liked to call them (Introduction of Chapter 1) to the need for change with a new model using the words of Buckminster Fuller (Introduction of Chapter 4) and the importance of understanding the existing reality as Bertrand Russel stresses (Introduction of Chapter 5). For this study, the reality interpretation is connected with the statistics and the development of a model which tries to capture as many aspects of it as possible. The statistical significance of the results designated the policy orientation which is put forward in Chapter 6 but also brings into question the "practical" significance of our findings, namely how our coefficients could be translated from statistical to causal correlations. These findings are hardly considered as a proof for analyzing the highly complex reality but mostly as an indication. It could be argued that these numbers predict the failure of certain, easy-to-implement policies suggesting an alternative route. The model recommended that wage reduction (internal devaluation) policies do not affect a country's international competitiveness and judging from the reality experienced in the aftermath of the financial crisis this seems to be validated. Same wise the strengthening of a country's productive capabilities could lead to the improvement of its international competitiveness following the statistical findings. Paul Velleman (2008) called this process "judgment", highlighting the importance of being careful with the choice of data and statistical extrapolations (see Appendix A). Though statistical inferences comprise a "magical wand" for the elaboration of the real world they should be handled with cautiousness otherwise their integrity is jeopardized (Velleman, 2008). In alignment to this

realization, we tried to be "frugal" with our suggestions, mentioning however the inability of the existing policies to tackle the competitiveness issue and the consequent need for changes which is also deduced from the introductory phrase of each Chapter.

Proceeding with the reflections, it could be recalled that in this study it is stated that nowadays the economic and trade performance of a country needs to be based on a long-term, bold plan of structural reform which would take advantage of the prevailing role of innovation and technology and ensure progressive business models. This is considered necessary in order to embrace to the dynamic trade balances which continuously change due to the globalization. Although our model operationalized international competitiveness in terms of a country's export share or export growth within the EMU frontiers and seems to neglect the existing global trade interconnections, it is not expected that the consideration of "global trade framework" would have substantially altered the econometric outcome. It is acknowledged that the EMU countries have lost important global export market share since the rise of China as an "export giant". This issue is located mostly in countries such as Greece, Portugal, Italy and Spain which face greater competition from Chinese firms than Germany. We recall that the group of the abovementioned countries from the periphery of Eurozone has mostly engaged in the non-traded low-tech sector comparing to Germany. Storm and Naastepad (2015) underpinned that this was the main difference between these countries and Germany in the way they confronted the entrance of China to the global trade. Particularly, they stress that it was the capacity of Germany to produce medium/high-tech products which helped the country maintain its export share and compete with China in equal terms and not RULC. Besides, EMU countries are not able to reduce their wages to the level of China due to the existing social policies within the EU which reflects on the national laws and maintains the living standards of citizens to a certain level through the protection of human rights (Dadush, Domínguez-jiménez, & Gao, 2019; Marques, 2019). By way of illustration this has been also proved recently by the anti-covid19 measures as already discussed. Furthermore, Germany, as elaborated in section 3.2 (pg. 41) did not decrease significantly its RULC throughout the 2001-2018 period, during the penetration of Chinese goods in the EU markets. This strengthens the claim that RULC adjustment is not the way for countries of periphery to improve their performance relative to China. Summarizing, it could be claimed that EMU countries would rather focus on the development of their productive and technological competencies in order to claim a bigger export share both within EU and globally.

This study is conducted amidst the covid19 pandemic crisis which is expected to bring about another economic recession period globally with worse repercussions than those of the 2008 financial crisis. This unforeseen circumstance is anticipated to cause a sizeable economic "lurch" to the global economy bringing into question the progress of the countries after the financial crisis and the economic models they embraced. As already stated, European Commission has already proceeded with a significant decision regarding the financial assistance of the EU countries in order to bail them out and ensure their gradual recovery. The disbursement of this capital is expected to help the countries of the Union and especially those mostly damaged (Italy, Spain, Greece) rebuild their negatively affected by the pandemic economies. This study, which proposes a guideline towards the direction which countries that face significant losses in their economic performance and competitiveness should

turn to, could be proved helpful for the future days ("days of restructuring") of the Eurozone countries. Furthermore, the outbreak of the pandemic revealed issues in meeting the domestic demand in many countries of the EU. Under these circumstances, commodity chains might become less globalized and some production might be re-shored (brought back to the EMU countries) in order to avoid similar issues in the future. For example Greece has purchased two fully functional and up-to-date mask production lines in order to support its market due to the current demand (Bamias et al., 2020). The expected changes will probably alter the existing framework and provide the opportunity to countries such as Greece to re-define their attitude and proceed towards the restructuring of their economies. Thus, this study could become more relevant, since policy makers will be asked to define the future orientation of their countries and take the consequent measures.

Finally, it could be put forward that technology and innovation maintain a prevailing role in this study, as far as the restructuring of a national economy is concerned. It is indicated that the orientation towards technological improvements could lead to the developments of a country's economic performance through the strengthening of its international competitiveness. It is supported that technology and innovation will have a central role to future's productivity which in fact is in alignment to the principles taught throughout the Management of Technology Master Program. In its courses it was explored the role of technology in the micro-environment of a firm and the development of new products providing a substantial competitive advantage to those who could foresee the right way to evolve. The assimilation of these learnings and the utilization of the economic knowledge obtained in this program comprised the main driver of this attempt to delineate the technological prospect on a macro level, by investigating its influence on a country's economic performance and specifically its international competitiveness.

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Appendix A. Robustness of Econometric Findings

The quality of this research is based on a large extent to the validity of the data used. Consequently, it has been decided the usage of only widely acceptable resources for the collection of the necessary datasets. In particular the data collected for this study and are utilized in the econometric analysis were obtained from the World Bank, the OECD and the Eurostat. All these institutions highlight how essential the existence of high-quality and reliable statistics could be for the development of (national) strategies and they all strive to ensure the most valid datasets. They achieve this by close cooperation with international or national institutions of each country evaluating every time how well the national systems perform. Taking into consideration the statement from the World Bank that comprehensive national data could lead to the implementation of more effective policies which is same wise adapted from the other institutions mentioned, it can be argued that the data used in this study are reliable and accurate.

It could be argued that the decision to use only these resources in order to collect the necessary data for the development of the econometric model is rigid, but also increases the robustness of our analysis. However, this does not depend only on the quality of the resources and consequently there were taken more measures. As a result, we decided to focus on more than two EMU countries and we analyzed in total 12, for an 18-year period (2001-2018). The comparison of the results obtained from each were expected to designate important "discrepancies" in our findings. However, we obtained similar coefficients, as far as their magnitude, sign and statistical importance is concerned, for all 12 countries of the sample. It can be stated that this outcome adds substantial value to our findings and our further recommendations since it increases their reliability.

To shed more light on the reliability issues which concern this study, we refer to specific results which are obtained from the econometric model. Particularly, in many cases the findings indicated no statistically significant results in any of the regression analyses which were considered. The contribution of many independent variables remained unchanged regardless the way the international competitiveness of a country was operationalized (EMS/ EGR) or the inclusion of more productive capabilities' factors. In addition, the regression analyses highlighted the prevailing role that the "high-tech infrastructures" Factor had when EMS was considered as the dependent variable of the model, in all cases examined for the 12 countries of the sample. It could be argued that this factor has the most prevailing role in our analysis and the fact that its coefficients remain almost unchanged regardless the addition of more variables or the examination of other countries strengthens its statistical importance. Besides, this factor remains statistically significant for our model even when no other productive capabilities' factors are included in the regression analysis. On the contrary, the rest of the productive capabilities' factors present a $p\text{-}value<0.005$ only when they interact with the rest. By building our model gradually we managed to examine the "coherence" of our findings by examining case after case, aiming to increase the robustness of our conclusions. It is argued that the fact that all the countries of the sample present similar results throughout these analyses makes the statistical inferences more reliable.

Appendix B. Sample Eligibility

This study will examine relevant indicators for EMU countries throughout the period 2001-2018, creating a panel data set of 216 (= 12 countries x 18 years) observations. A country was eligible for our sample when:

I. It constitutes an EU member
II. It constitutes an EMU member (having entered before 2004)
III. It has one of the highest GDP among the rest of the EMU countries
IV. It has one of the highest deficits among the rest of the EMU countries
V. It was affected by 2008-2009 financial crisis

EU Member States	GDP Current	GDP Growth	Current Account Balance	Currency
Austria	3.67E+11	1.55	2.49	Euro
Belgium	4.43E+11	1.59	1.22	Euro
Bulgaria	4.40E+10	3.61	-5.04	Bulgarian lev
Cyprus	2.13E+10	2.26	-5.01	Euro
Czech Republic	1.77E+11	2.81	-2.06	Czech koruna
Germany	3.25E+12	1.33	5.65	Euro
Denmark	2.97E+11	1.23	5.15	Danish krone
Euro area	1.17E+13	1.25		
Spain	1.24E+12	1.65	-2.72	Euro
Estonia	1.98E+10	3.72	-4.17	Euro
European Union	1.34E+13	1.48	1.91	
Finland	2.33E+11	1.45	1.91	Euro
France	2.43E+12	1.27	-0.31	Euro
United Kingdom	2.58E+12	1.78	-3.27	
Greece	2.43E+11	0.12	-6.44	Euro
Croatia	5.15E+10	1.90	-3.15	Croatian kuna
Hungary	1.22E+11	2.40	-2.57	Hungarian forint
Ireland	2.40E+11	4.72	1.69	Euro
Italy	1.94E+12	0.21	-0.23	Euro
Lithuania	3.63E+10	4.18	-3.87	Euro
Luxembourg	4.99E+10	2.86	7.20	Euro
Latvia	2.42E+10	3.83	-5.44	Euro
Netherlands	7.71E+11	1.40	7.08	Euro
Poland	4.20E+11	3.76	-3.19	Polish zloty
Portugal	2.10E+11	0.63	-5.45	Euro
Romania	1.52E+11	4.13	-5.42	Romanian leu
Serbia	3.78E+10	3.62	-8.28	Serbian dinar
Slovak Republic	8.01E+10	4.03	-3.63	Euro
Slovenia	4.29E+10	2.34	0.69	Euro
Sweden	4.65E+11	2.26	5.46	Swedish krona
Ukraine	1.14E+11	2.39	-0.98	Ukranian hryvnia

Appendix C. Data Analysis

The cost competitiveness of a country will be operationalized in terms of the relative unit labour cost of country n (relative to weighted average unit labour cost in the other Eurozone countries). This variable ($RULC_n$) is defined as:

$$RULC_n = \frac{ULC_n}{ULC_{Eurozone}}$$

ULC is defined following standard definitions by Eurostat as the ratio of the wage per hour and labour productivity per hour of work. In many cases countries experienced increases in their RULC during the crisis period, while the ULC in Eurozone was increasing (OECD, 2020).

ULC Performance	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	89.1	86.4	90.6	90.6	91.1	94	96.4	98.4	99.025	101.6	102.2	104.6
Belgium	87.6	92.1	94.8	94.2	96.8	99.5	101.2	101	99.92	100.3	101.8	103.6
Germany	84	86.5	92.1	91.1	91.3	94.2	96.3	97.8	97.75	101.4	102.6	105.3
Spain	99.35	105.2	106.5	105.5	103.7	101.1	100.2	100	99.85	99	99.5	100.6
Finland	79.9	84.5	91.4	89.9	92.1	96.8	98.3	99.1	99.35	98.6	95.6	97.7
France	88.1	90.8	93.8	94.8	95.6	97.6	99.04	99.7	98.75	100.7	101.2	102.5
Greece	100.6	119.35	113.1	114.6	113.1	110.6	102.9	100.9	100.82	99.83	100.3	101.3
Italy	88.5	92.1	86.1	96.1	96.5	98	98.9	99.1	101.17	100.3	100.2	102.4
Netherlands	89.58	92.67	97.73	96.53	97.65	100.3	101.1	101.2	99.02	100.9	101.1	103
Portugal	100.8	103.5	106.4	105.2	103.404	99.8	101.3	100	99.75	100.7	102.8	105.1
Slovak Republic	88	91.8	97.7	95.9	96.7	97.3	98.4	99	97.2	102.4	107.1	108.9
Slovenia	86.4	92	100	100.2	99.1	99.85	100	99.15	98.6	101.7	102.7	105.7
Eu Average	88.58	92	96.05	95.5	95.87	97.79	99	99.61	98.8	100.7	101.3	103.1

Patents	Average	Share
Austria	2172	2%
Belgium	690	0.7%
Germany	47867	45.2%
Spain	2950	2.8%
Finland	1723	1.6%
France	14303	13.5%
Greece	552	0.5%
Italy	8735	8.2%
Netherlands	2284	2.2%
Portugal	447	0.4%
Slovak Republic	207	0.2%
Slovenia	338	0.3%

It is obvious that Germany prevails in creating patents with a big distance from the rest of the countries. It actually provides 58% of the total patents created from the whole sample and it has the biggest share within EU with more than 45%.

Group	Country	2001-2018 Average
Big Exporter	Germany	20.48%
Moderately Big Exporter	France	10.16%
	Italy	8.61%
	Netherlands	8.03%
Moderately Low Exporter	Spain	6.53%
	Belgium	5.02%
	Austria	2.89%
	Slovak Republic	1.44%
Small Exporter	Portugal	1.41%
	Greece	1.12%
	Finland	1.11%
	Slovenia	0.89%

The 12 countries of the sample together account for more than 65% of EU exports on average throughout the 2001-2018 period as it shown from OECD data. Germany is by far the biggest exporter, accounting for more than 20% of the total EU exports on average during 2001-2018.

Appendix D. Descriptive Statistics & Factor Analysis

Each variable contains information for the performance of a country on the relevant activity for 2001-2018 period. Thus, every variable contains 18 observations for every country which aggregate to 216 observations for all 12 countries. For this study there are collected 8629 observations for the 43 variables while 659 are missing. It can be seen that no variable suffers important omissions. The only exceptions are non-R&D expenditures and SMEs introducing product or process innovation variables.

Variables	Valid	Missing
EMSn	216	0
EGRn	216	0
RULCn	216	0
Medium_and_High_Tech_Exports	204	12
Share_of_Tourism_in_Exports	211	5
Share_of_manufacturing_exports_in_total_exports	216	0
Exports_of_goods_and_services_percentage_of_GDP	216	0
ICT_service_exports	181	35
Trade_Openness_to_GDP	216	0
ICT_goods_exports_percentage_of_total_goods_Exports	204	12
ICT_manufacturing_industries	216	0
ICT_service_industries	216	0
Foreign_Direct_Investment	216	0
Port_container_traffic	185	31
Air_transport_registered_carriers	215	1
Patent_applications_residents	203	13
Patent_applications_non_residents	203	13
Trademark_application	168	48
Scientific_and_technical_journal_articles	216	0
Population_completed_tertiary_education	216	0
Lifelong_learning	152	64
Venture_capital	178	38
RnD_intensity	215	1
Public_RnD_expenditures	216	0
Business_RnD_expenditures	214	2
Non_RnD_expenditures	128	88
Charges_for_the_use_of_intellectual_property	193	23
Net_investment_in_nonfinancial_assets_to_GDP	192	24
Fixed_broadband_subscriptions	213	3
RnD_researchers	192	24
Employment_in_High_and_medium_technology_manufacturing	215	1
Employment_in_knowledge_intensive_activities	204	12
Empoyed_with_ICT_education	178	38
Employed_in_high_tech_manufacturing	215	1
SMEs_innovating_in_house	206	10
SMEs_collaborating_with_others	212	4
SMEs_introducing_product_or_process_innovation	132	84
Rule_of_law	204	12
Government_effectiveness	204	12
Regulatory_quality	204	12
Political_stability	204	12
PRODY	204	12
EXPY	204	12

The Kaiser-Meyer-Olkin measure of sampling adequacy was .736, above the commonly recommended value of .6, and Bartlett's test of sphericity was significant (chi square = 6881,958, p = .000). Lastly, the communalities were all above .3 for the Factor Analysis of the productive capabilities' variables

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.728
Bartlett's Test of Sphericity	Approx. Chi-Square	6334.612
	df	496
	Sig.	0.000

Communalities

	Initial	Extraction
Medium & High-Tech Exports	1.000	.899
Share of Tourism in Exports	1.000	.931
Share of manufacturing exports in total exports	1.000	.813
Exports of goods and services (GDP %)	1.000	.949
ICT service exports	1.000	.849
Trade Openness to GDP	1.000	.939
ICT goods exports percentage of total goods Exports	1.000	.822
ICT manufacturing industries	1.000	.974
ICT service industries	1.000	.787
Foreign Direct Investment	1.000	.730
Port container traffic	1.000	.858
Air transport registered carriers	1.000	.958
Patent applications resident	1.000	.968
Patent applications non-residents	1.000	.924
Trademark application	1.000	.894
Scientific and technical journal articles	1.000	.967
Venture capital	1.000	.715
RnD intensity	1.000	.956
Public RnD expenditures	1.000	.741
Business RnD expenditures	1.000	.948
Charges for the use of intellectual property	1.000	.922
Net investment in nonfinancial assets to GDP	1.000	.857
Fixed broadband subscriptions	1.000	.891
RnD researchers	1.000	.913
Employment in High and medium technology manufacturing	1.000	.972
Employment in knowledge intensive activities	1.000	.754
Empoyed with ICT education	1.000	.951
Employed in high tech manufacturing	1.000	.862
SMEs innovating in house	1.000	.596
SMEs collaborating with others	1.000	.528
PRODY	1.000	.945
EXPY	1.000	.944

Extraction Method: Principal Component Analysis.

The Kaiser-Meyer-Olkin measure of sampling adequacy was .761, above the commonly recommended value of .6, and Bartlett's test of sphericity was significant (chi square = 701.593, p = .000). Lastly, the communalities were all above .3 for the Factor Analysis of the Institutional Variables

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.761
Bartlett's Test of Sphericity	Approx. Chi-Square	701.593
	df	3
	Sig.	0.000

Communalities

	Initial	Extraction
Rule_of_law	1.000	0.944
Government_effectiveness	1.000	0.934
Regulatory_quality	1.000	0.896

Extraction Method: Principal Component Analysis.

Appendix E. Basic Econometric model with EMS

The basic econometric model which defines international competitiveness as a country n's share of exports in the total EU exports, is expressed as follows:

$$EMS_n = constant + aRULC_n + \beta F_{1n(High-tech\ infrastructure)} + \gamma F_{2n(R\&D\ investment)} + \delta F_{3n(FDI\ centric)} + \zeta F_{4n(Trade)} + \eta F_{5n(One\ variable)} + \theta F_{6n(Sophistication)} + \iota F_{7n(SMEs)} + \varepsilon_n GDP_{EUROZONE} + \pi IF_n + \mu_n D_n + \kappa_n CD_n + error\ term$$

All the countries of the sample provided statistically significant results with high explanatory power ($\bar{R}^2$ >.900) in all cases. The outcome of this simple econometric model demonstrated that a country's export share is highly affected from a country's productive capabilities and not from the cost/price competitiveness variables (in a statistically significant manner). Finally, it is also indicated that a country's export share is also affected in a statistically important and positive manner by the operation of institutions.

Dependent Variable: Country's Export Share – EGR – Austria							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.042	-0.099	-0.110	-0.103	-0.090	-0.078	-0.087
RULCn	-1.262	-5.832	-5.673	-4.550	-6.404	-4.578	1.403
IFn	0.290*	1.335**	0.865**	0.583*	0.813**	0.944**	0.200
F1(High-tech infr.)	5.610**	5.324**	5.530**	5.615**	5.462**	5.188**	5.443**
F2(R&D investment)		-1.521**	-1.311**	-1.157**	-1.317**	-1.521**	-1.168**
F3(FDI-centric)			0.512**	0.549**	0.414**	0.424**	0.664**
F4(Trade)				0.575**	0.580**	0.479**	0.540**
F5(ICT exports)					-0.367*	-0.454*	-0.187*
F6(sophistication)						0.773**	0.780**
F7(SME)							0.733**
$\bar{R}^2$	0.925	0.954	0.959	0.967	0.970	0.978	0.987
DW Test	0.225	0.390	0.393	0.474	0.552	0.813	1.117
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EMS – Belgium							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.046	-0.098	-0.114	-0.106	-0.089	-0.100	-0.093
RULCn	-1.609	-4.670	-5.469	-5.063	-6.455	0.091	2.746
IFn	0.309*	0.309*	1.212	0.780**	0.675*	0.821*	0.251
F1(High-tech infr.)	5.601**	5.444**	5.610**	5.587**	5.453**	5.672**	5.660**
F2(R&D investment)		-1.469	-1.310**	-1.229**	-1.320**	-1.197**	-0.989**
F3(FDI-centric)			0.593**	0.539**	0.406*	0.923**	0.821**
F4(Trade)				0.474**	0.592**	0.158	0.519**
F5(ICT exports)					-0.378**	-0.040	-0.064*
F6(sophistication)						0.942**	0.683**
F7(SME)							0.733**
$\bar{R}^2$	0.926	0.956	0.963	0.967	0.970	0.980	0.986
DW Test	0.241	0.401	0.480	0.510	0.551	0.879	1.033
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EMS – Spain							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.049	-0.088	-0.102	-0.095	-0.069	-0.063	-0.079
RULCn	2.034	-1.934*	-2.816	-2.236	-2.569	0.287	3.484
IFn	-0.093	0.305*	1.177*	0.824*	0.641*	0.813*	0.590*
F1(High-tech infr.)	5.650**	5.471**	5.594**	5.623**	5.517**	5.519**	5.634**
F2(R&D investment)		-1.397**	-1.264**	-1.167**	-1.295**	-1.245**	-1.021**
F3(FDI-centric)			0.495**	0.488**	0.343*	0.497**	0.697**
F4(Trade)				0.556**	0.585**	0.559**	0.587**
F5(ICT exports)					-0.560*	-0.542*	-0.250*
F6(sophistication)						0.503**	0.592**
F7(SME)							0.645**
$\bar{R}^2$	0.930	0.957	0.961	0.970	0.976	0.981	0.987
DW Test	0.265	0.391	0.417	0.522	0.682	0.886	1.119
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EMS – Finland							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.036	-0.074	-0.092	-0.107	-0.105	-0.094	-0.093
RULCn	-5.962	-5.945	-6.404	-4.891	-5.822	-3.168	2.506
IFn	0.042	0.807	1.251	0.906	0.671	0.774	0.567
F1(High-tech infr.)	5.214**	5.294**	5.441**	5.576**	5.538**	5.519**	5.640**
F2(R&D investment)		-1.187**	-1.122**	-1.254**	-1.530**	-1.420**	-1.006**
F3(FDI-centric)			0.476**	0.510**	0.432**	0.576**	0.771**
F4(Trade)				0.577**	0.668**	0.617**	0.600**
F5(ICT exports)					-0.437*	-0.402*	-0.111*
F6(sophistication)						0.492**	0.611**
F7(SME)							0.778**
$\bar{R}^2$	0.943	0.955	0.960	0.967	0.971	0.976	0.986
DW Test	0.262	0.323	0.369	0.491	0.619	0.701	1.034
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EMS – France							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.016	-0.071	-0.085	-0.083	-0.078	-0.076	-0.087
RULCn	-2.098	-4.088*	-4.867	-4.483	-5.147	-3.545	1.715
IFn	-0.075	0.253	0.877*	0.480*	0.385*	0.470*	0.392*
F1(High-tech infr.)	6.044**	5.801**	5.950**	5.923**	5.848**	5.779**	5.745**
F2(R&D investment)		-0.972**	-0.812**	-0.797**	-0.879**	-0.928**	-0.877**
F3(FDI-centric)			0.541**	0.532**	0.489**	0.572**	0.747**
F4(Trade)				0.424**	0.445*	0.453**	0.544**
F5(ICT exports)					-0.167*	-0.194	-0.069*
F6(sophistication)						0.320**	0.521**
F7(SME)							0.683**
$\bar{R}^2$	0.957	0.967	0.973	0.978	0.978	0.980	0.986
DW Test	0.356	0.461	0.567	0.626	0.663	0.719	1.007
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EMS – Italy							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.044	-0.101	-0.112	-0.105	-0.094	-0.087	-0.094
RULCn	-0.194	-3.115*	-3.984	-3.279	-4.604	-3.220*	2.682
IFn	-0.074	0.569**	1.514	1.164*	0.985*	1.059*	0.763*
F1(High-tech infr.)	5.480**	5.306**	5.430**	5.458**	5.389**	5.427**	5.601**
F2(R&D investment)		-1.484**	-1.359**	-1.261**	-1.341**	-1.291**	-1.006**
F3(FDI-centric)			0.441**	0.431**	0.366**	0.509**	0.719**
F4(Trade)				0.570**	0.585*	0.562**	0.598**
F5(ICT exports)					-0.305*	-0.323*	-0.081*
F6(sophistication)						0.396**	0.516**
F7(SME)							0.776**
$\bar{R}^2$	0.929	0.959	0.963	0.972	0.974	0.976	0.986
DW Test	0.246	0.429	0.434	0.555	0.602	0.655	1.028
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS – Netherlands							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.014	-0.091	-0.069	-0.085	-0.061	-0.052	-0.023
RULCn	-5.761	-6.891	-7.941	-6.123	-8.093	-5.279	-0.065
Crisis Dummy							
IFn	0.080	-0.123	0.778*	0.763*	0.651**	0.777*	0.543*
F1(High-tech infr.)	5.673**	5.499**	5.444**	5.517**	5.393**	5.390**	5.510**
F2(R&D investment)		-1.193**	-1.100**	-1.127**	-1.197**	-1.134**	-0.604**
F3(FDI-centric)			-0.626	-0.009	-0.347	-0.263	-1.078
F4(Trade)				0.516**	0.517**	0.484**	0.441**
F5(ICT exports)					-0.398*	-0.385*	-0.118*
F6(sophistication)						0.518**	0.662**
F7(SME)							0.981**
$\bar{R}^2$	0.943	0.960	0.961	0.967	0.971	0.977	0.991
DW Test	0.231	0.336	0.297	0.405	0.465	0.521	1.048
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS – Portugal							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.033	-0.120	-0.124	-0.103	-0.090	-0.077	-0.086
RULCn	-0.255	-2.350	-4.015	-5.101	-6.309	-4.125	1.941
IFn	-0.350	0.317*	1.223**	0.898*	0.683*	0.819*	0.563**
F1(High-tech infr.)	5.533**	5.352**	5.487**	5.558**	5.457**	5.483**	5.650**
F2(R&D investment)		-1.490**	-1.350**	-1.214**	-1.322**	-1.246**	-0.966**
F3(FDI-centric)			0.460**	0.504**	0.410**	0.594**	0.793**
F4(Trade)				0.561**	0.577**	0.574**	0.609**
F5(ICT exports)					-0.368*	-0.348*	-0.101*
F6(sophistication)						0.522**	0.625**
F7(SME)							0.781**
$\bar{R}^2$	0.925	0.955	0.959	0.967	0.970	0.975	0.986
DW Test	0.208	0.367	0.393	0.481	0.550	0.673	1.057
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS – Slovak Republic							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.046	-0.099	-0.110	-0.117	-0.107	-0.101	-0.085
RULCn	-1.841	-5.033*	-5.700	-5.324	-5.879	-2.969*	2.707
IFn	-0.096	0.347*	1.226	0.870**	0.561*	0.651*	0.427
F1(High-tech infr.)	5.562**	5.384**	5.526**	5.460**	5.439**	5.443**	5.652**
F2(R&D investment)		-1.461**	-1.314**	-1.250**	-1.289**	-1.239**	-0.975**
F3(FDI-centric)			0.510**	0.416**	0.396*	0.550**	0.790**
F4(Trade)				0.865**	0.800**	0.772**	0.518**
F5(ICT exports)					-0.168*	-0.153*	-0.155*
F6(sophistication)						0.507**	0.621**
F7(SME)							0.834**
$\bar{R}^2$	0.924	0.954	0.959	0.971	0.972	0.977	0.986
DW Test	0.220	0.365	0.394	0.587	0.588	0.691	1.046
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS – Slovenia							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	0.052	-0.087	-0.101	-0.099	-0.083	-0.082	-0.093
RULCn	-1.715	-4.679*	-5.420	-4.959	-6.351	-3.538	2.754
IFn	-0.063	0.366*	1.358	0.999*	0.765*	0.922*	0.607
F1(High-tech infr.)	5.578**	5.443**	5.560**	5.572**	5.475**	5.465**	5.630**
F2(R&D investment)		-1.534**	-1.392**	-1.263**	-1.384**	-1.277**	-0.946**
F3(FDI-centric)			0.479**	0.487**	0.389**	0.562**	0.795*
F4(Trade)				0.522**	0.534**	0.548**	0.611**
F5(ICT exports)					-0.385*	-0.354*	-0.090*
F6(sophistication)						0.500**	0.648**
F7(SME)							0.796**
$\bar{R}^2$	0.924	0.956	0.961	0.967	0.971	0.975	0.986
DW Test	0.227	0.412	0.437	0.488	0.573	0.650	1.046
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Appendix F. Basic Econometric Model with EMS| Individual Variables

F_1 Coefficients

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.052	0.057	0.058	0.043	0.023	0.059	0.055	0.022	0.041	0.056	0.056
RULCn	-1.245	-1.593	2.031	-5.942	-2.091	-2.061	-0.174	-5.738	-0.360	-1.824	-1.776
F_1	5.617**	5.610**	5.658**	5.222**	6.047**	5.556**	5.485**	5.675**	5.541**	5.571**	5.578**
Institutional Factor	0.304*	0.324*	0.319*	0.816*	0.264*	0.333*	0.586*	-0.111	0.329*	0.363*	0.365*

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_2

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	-0.080	-0.038	-0.056	0.118	-0.100	0.084	-0.045	-0.042	-0.151	-0.081	-0.030
$RULC_n$	-30.494	-22.532	-28.606	-27.608	-21.295	-29.059	-15.920	-20.066	-11.075	-23.179	-22.437
Institutional Factor	4.084	3.184	3.248	3.020	3.677	2.641*	3.914	3.60*	3.039	2.965*	2.988
F_2	-3.225	-2.538*	-2.660*	-0.382*	-3.490*	-2.941*	-2.592*	-2.814*	-2.686*	-2.666*	-2.419

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_3

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.299	0.257	0.249	0.209	0.266	0.349	0.260	0.387	0.166	0.231	0.241
$RULC_n$	-20.712	-15.845	-20.296	-24.789	-14.819	-20.412	-8.712	-31.619	-3.574	-16.186	-16.566
Institutional Factor	2.680	2.123	2.016	3.532	1.922*	1.414*	2.854	2.069	1.939	1.826*	1.827*
F_3	-1.144	-0.849	-0.685	-1.201	-0.569	-0.495	-0.887	-8.464	-0.974	-0.817	-0.690

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_4

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.235	0.199	0.207	0.155	0.231	0.349	0.209	0.214	0.135	0.144	0.194
$RULC_n$	-22.926	-17.729	-22.508	-28.639	-15.530	-22.734	-10.999	-17.785	-8.297	-18.042	-18.142
Institutional Factor	1.986	1.498	1.562	3.102	1.452	1.100	2.266	1.527	1.439	0.863	1.274
F_4	0.307	0.955	0.486	-0.614	0.775	-0.185	0.518	0.454	0.228	1.438	0.711

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_5

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.305	0.287	0.276	0.187	0.309	0.387	0.264	0.281	0.196	0.267	0.266
$RULC_n$	-27.193	-22.785	-22.876	-28.940	-20.117	-25.354	-15.100	-21.621	-11.916	-21.160	-21.898
Institutional Factor	2.112	1.760	1.698	2.832	1.672	1.178	2.304	1.673	1.526	1.624	1.520
F_5	-1.227*	-1.435	-1.073*	-0.593*	-1.296	-1.096	-0.896*	-1.154	-1.109*	-1.022*	-1.113*

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_6

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.223	0.219	0.158	0.158	0.251	0.322	0.217	0.216	0.143	0.197	0.209
$RULC_n$	-13.538	-17.377	-21.583	-21.583	-7.977	-19.008	-10.572	-13.620	-3.767	-12.914	-10.888
Institutional Factor	1.496	1.462	2.634	2.634	1.306	1.089*	2.288	1.237	1.299	1.199	1.081*
F_6	0.703	0.824	0.965	0.965	1.255	0.403	0.189	0.941	0.749	0.870	1.246

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Coefficients F_7

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
$GDP_{EUROZONE}$ Growth	0.232	0.198	0.202	0.148	0.224	0.349	0.209	0.210	0.118	0.192	0.201
$RULC_n$	-21.284	-14.232	-20.857	-26.256	-10.173	-18.895	-9.588	-16.877	-4.843	-19.054	-16.993
Institutional Factor	1.913	1.396	1.465*	2.768	1.192	0.631*	2.239	1.441	1.282	1.469	1.360
F_7	0.374	0.769	0.518	0.238	1.062	0.840	0.342	0.330	0.462	-0.127	0.280

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Appendix G. Basic Econometric Model with EMS| F-Test

Model Summary[i]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0.369[a]	0.136	0.105	5.58418	0.136	4.403	4	112	0.002	
2	0.516[b]	0.266	0.233	5.17012	0.130	19.658	1	111	0.000	
3	0.529[c]	0.280	0.241	5.14331	0.014	2.160	1	110	0.144	
4	0.538[d]	0.290	0.244	5.13243	0.010	1.467	1	109	0.229	
5	0.585[e]	0.342	0.293	4.96248	0.052	8.594	1	108	0.004	
6	0.585[f]	0.343	0.287	4.98253	0.001	0.133	1	107	0.716	
7	0.586[g]	0.343	0.281	5.00558	0.000	0.017	1	106	0.897	
8	0.993[h]	0.986	0.984	0.74425	0.643	4689.843	1	105	0.000	1.047

i. Dependent Variable: EMS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	549.220	4	137.305	4.403	0.002[b]
	Residual	3492.499	112	31.183		
	Total	4041.719	116			
2	Regression	1074.677	5	214.935	8.041	0.000[c]
	Residual	2967.042	111	26.730		
	Total	4041.719	116			
3	Regression	1131.824	6	188.637	7.131	0.000[d]
	Residual	2909.895	110	26.454		
	Total	4041.719	116			
4	Regression	1170.457	7	167.208	6.348	0.000[e]
	Residual	2871.262	109	26.342		
	Total	4041.719	116			
5	Regression	1382.084	8	172.761	7.015	0.000[f]
	Residual	2659.635	108	24.626		
	Total	4041.719	116			
6	Regression	1385.383	9	153.931	6.201	0.000[g]
	Residual	2656.336	107	24.826		

	Total	4041.719	116			
7	Regression	1385.804	10	138.580	5.531	0.000[h]
	Residual	2655.915	106	25.056		
	Total	4041.719	116			
8	Regression	3983.558	11	362.142	653.791	0.000[i]
	Residual	58.161	105	.554		
	Total	4041.719	116			

a. Dependent Variable: EMS

b. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece

c. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2

d. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3

e. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4

f. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5

g. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6

h. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6, SMEs_factor_7

i. Predictors: (Constant), FA_of_Institutions, GDP_Eurozone_Growth, RULCn, D_Greece, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6, SMEs_factor_7, High_tech_infrastructure_factor_1

Appendix H. Basic Econometric Model with EGR

The basic econometric model which defines international competitiveness as a country n's annual rate of export growth, is expressed as follows:

$$EGR_n = constant + aRULC_n + \beta F_{1n(High-tech\ infrastructure)} + \gamma F_{2n(R\&D\ investment)} + \delta F_{3n(FDI\ centric)} + \zeta F_{4n(Trade)} + \eta F_{5n(One\ variable)} + \theta F_{6n(Sophistication)} + \iota F_{7n(SMEs)} + \varepsilon_n GDP_{EUROZONE} + \pi IF_n + \mu_n D_n + \kappa_n CD_n + error\ term$$

All the countries of the sample provided statistically significant results with important explanatory power ($\bar{R}^2$ >.650) in all cases. The outcome of this simple econometric model demonstrated that a country's annual rate of export growth is highly affected from the $GDP_{EUROZONE}$ growth and the "trade" factor while the rest of the productive capabilities' factors and RULC did not provide statistically significant results. The same is valid for the institutions' factor.

Dependent Variable: Country's Export Share – EGR – Austria							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.593**	2.571**	2.577**	2.586**	2.592**	2.590**	2.593**
RULCn	5.646	4.946	4.871	6.269	5.430	5.169	3.211
IFn	-0.058	0.102	0.324	-0.027	0.077	0.058	0.302
F1(High-tech infr.)	0.228	0.185	0.088	0.194	0.125	0.164	0.080
F2(R&D investment)		-0.233	-0.332	-0.141	-0.214	-0.184	-0.300
F3(FDI-centric)			-0.242	-0.197	-0.257	-0.259	-0.337
F4(Trade)				0.716*	0.719*	0.733**	0.713*
F5(ICT exports)					-0.166	-0.153	-0.241
F6(sophistication)						-0.110	-0.113
F7(SME)							-0.240
$\bar{R}^2$	0.677	0.678	0.678	0.691	0.691	0.692	0.692
DW Test	1.586	1.596	1.591	1.639	1.639	1.642	1.655
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – Belgium							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.594**	2.571**	2.578**	2.594**	2.618**	2.631**	2.636**
RULCn	5.324	4.832	5.141	5.993	4.072	-3.613	-1.360
IFn	-0.031	0.114	0.281	0.060	0.261	0.930	0.638
F1(High-tech infr.)	0.197	0.172	0.107	0.059	-0.126	-0.383	-0.394
F2(R&D investment)		-0.236	-0.297	-0.127	-0.253	-0.396	-0.220
F3(FDI-centric)			-0.229	-0.344	-0.527	-1.135	-1.222
F4(Trade)				0.996*	1.159	1.669	1.976
F5(ICT exports)					-0.521	-0.918	-0.939
F6(sophistication)						-1.106	-1.326
F7(SME)							0.622
$\bar{R}^2$	0.677	0.678	0.679	0.697	0.702	0.714	0.718
DW Test	1.584	1.596	1.594	1.663	1.689	1.760	1.774
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – Spain							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.593**	2.565**	2.571**	2.580**	2.584**	2.583**	2.587**
RULCn	3.599	2.811	3.171	3.912	3.857	3.491	2.624
IFn	-0.022	0.151	0.295	0.060	0.088	0.117	0.266
F1(High-tech infr.)	0.163	0.127	0.077	0.114	0.096	0.096	0.065
F2(R&D investment)		-0.277	-0.332	-0.208	-0.229	-0.236	-0.296
F3(FDI-centric)			-0.202	-0.211	-0.235	-0.254	-0.309
F4(Trade)				0.711*	0.715*	0.719*	0.711*
F5(ICT exports)					-0.093	-0.095	-0.174
F6(sophistication)						-0.064	-0.089
F7(SME)							-0.175
$\bar{R}^2$	0.678	0.679	0.680	0.692	0.692	0.692	0.693
DW Test	1.588	1.604	1.601	1.644	1.644	1.645	1.654
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – Finland							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.588**	2.619**	2.631**	2.616**	2.617**	2.616**	2.616**
RULCn	2.760	2.756	3.060	4.539	4.419	4.263	2.887
IFn	0.264	0.142	0.371	0.141	0.154	0.166	0.322
F1(High-tech infr.)	-0.015	-0.037	-0.134	-0.002	-0.007	-0.006	-0.035
F2(R&D investment)		0.327	0.283	0.154	0.118	0.112	0.011
F3(FDI-centric)			-0.316	-0.282	-0.292	-0.301	-0.348
F4(Trade)				0.564*	0.576*	0.579*	0.583*
F5(ICT exports)					-0.057	-0.059	-0.129
F6(sophistication)						-0.029	-0.058
F7(SME)							-0.189
$\bar{R}^2$	0.684	0.685	0.687	0.693	0.693	0.693	0.694
DW Test	1.626	1.622	1.619	1.643	1.643	1.643	1.655
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – France							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.588**	2.577**	2.582**	2.586**	2.591**	2.591**	2.596**
RULCn	5.332	5.080	5.375	6.012	5.293	4.992	2.724
IFn	-0.055	0.024	0.175	0.018	0.109	0.124	0.325
F1(High-tech infr.)	0.307	0.276	0.220	0.175	0.094	0.107	0.122
F2(R&D investment)		-0.123	-0.184	-0.159	-0.247	-0.238	-0.260
F3(FDI-centric)			-0.205	-0.220	-0.267	-0.283	-0.358
F4(Trade)				0.704*	0.726*	0.724*	0.685*
F5(ICT exports)					-0.181	-0.176	-0.230
F6(sophistication)						-0.060	-0.147
F7(SME)							-0.295
$\bar{R}^2$	0.678	0.678	0.679	0.691	0.691	0.692	0.693
DW Test	1.597	1.601	1.599	1.636	1.638	1.638	1.659
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – Italy							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.596**	2.576**	2.579**	2.588**	2.598**	2.604**	2.606**
RULCn	3.134	2.734	2.978	3.839	2.703	3.950	2.297
IFn	-0.343	-0.214	-0.116	-0.335	-0.271	-0.538	-0.346
F1(High-tech infr.)	0.307	0.283	0.248	0.282	0.223	0.256	0.208
F2(R&D investment)		-0.203	-0.238	-0.118	-0.187	-0.141	-0.221
F3(FDI-centric)			-0.124	-0.136	-0.192	-0.063	-0.121
F4(Trade)				0.696*	0.709*	0.688*	0.678*
F5(ICT exports)					-0.261	-0.278	-0.345
F6(sophistication)						0.357	0.323
F7(SME)							-0.217
$\bar{R}^2$	0.684	0.685	0.685	0.697	0.699	0.701	0.701
DW Test	1.645	1.655	1.651	1.693	1.704	1.724	1.737
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Dependent Variable: Country's Export Share – EGR – Netherlands							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.591**	2.572**	2.680**	2.663**	2.679**	2.678**	2.678**
RULCn	4.916	4.711	-0.366	1.467	0.156	-0.061	-0.046
IFn	-0.092	0.072	-0.004	-0.117	-0.033	-0.015	-0.017
F1(High-tech infr.)	0.219	0.188	-0.081	-0.007	-0.089	-0.089	-0.089
F2(R&D investment)		-0.217	0.233	0.206	0.159	0.154	0.156
F3(FDI-centric)			-3.027	-2.405	-2.630	-2.636	-2.639
F4(Trade)				0.520*	0.521**	0.523*	0.523*
F5(ICT exports)					-0.265	-0.266	-0.265
F6(sophistication)						-0.040	-0.040
F7(SME)							0.003
$\bar{R}^2$	0.677	0.678	0.692	0.698	0.700	0.700	0.700
DW Test	1.586	1.596	1.609	1.630	1.639	1.639	1.639
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EGR – Portugal							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.613**	2.591**	2.592**	2.623**	2.628**	2.629**	2.632**
RULCn	2.988	2.695	3.257	1.636	1.137	1.198	-0.756
IFn	-0.005	0.121	0.231	-0.090	-0.034	-0.041	0.172
F1(High-tech infr.)	0.240	0.215	0.170	0.275	0.234	0.235	0.181
F2(R&D investment)		-0.208	-0.255	-0.053	-0.097	-0.095	-0.185
F3(FDI-centric)			-0.155	-0.090	-0.129	-0.123	-0.188
F4(Trade)				0.837*	0.844*	0.844*	0.832*
F5(ICT exports)					-0.152	-0.151	-0.231
F6(sophistication)						0.014	-0.019
F7(SME)							-0.252
$\bar{R}^2$	0.678	0.679	0.679	0.695	0.696	0.696	0.697
DW Test	1.588	1.599	1.596	1.655	1.658	1.659	1.676
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EGR – Slovak Republic							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.610**	2.594**	2.597**	2.592**	2.620**	2.619**	2.619**
RULCn	6.080	5.726	5.881	6.123	4.517	4.147	4.119
IFn	0.108	0.205	0.288	0.089	0.349	0.378	0.380
F1(High-tech infr.)	0.306	0.286	0.254	0.211	0.151	0.151	0.150
F2(R&D investment)		-0.162	-0.196	-0.155	-0.267	-0.273	-0.275
F3(FDI-centric)			-0.118	-0.178	-0.235	-0.255	-0.256
F4(Trade)				0.556*	0.367*	0.371*	0.372*
F5(ICT exports)					-0.486	-0.487	-0.487
F6(sophistication)						-0.064	-0.065
F7(SME)							-0.004
$\bar{R}^2$	0.686	0.687	0.687	0.692	0.695	0.695	0.695
DW Test	1.645	1.652	1.649	1.652	1.685	1.685	1.685
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EGR – Slovenia							
Estimated Equation:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDP_{EUROZONE}$ Growth	2.612**	2.582**	2.590**	2.592**	2.600**	2.600**	2.604**
RULCn	5.832	5.189	5.585	6.159	5.463	4.397	1.999
IFn	0.039	0.254	0.446	0.155	0.234	0.353	0.641
F1(High-tech infr.)	0.265	0.235	0.173	0.188	0.139	0.143	0.080
F2(R&D investment)		-0.333	-0.408	-0.248	-0.308	-0.349	-0.475
F3(FDI-centric)			-0.256	-0.246	-0.295	-0.361	-0.449
F4(Trade)				0.649*	0.654*	0.649*	0.625*
F5(ICT exports)					-0.192	-0.204	-0.305
F6(sophistication)						-0.189	-0.246
F7(SME)							-0.303
$\bar{R}^2$	0.680	0.681	0.682	0.692	0.693	0.694	0.695
DW Test	1.574	1.590	1.587	1.626	1.628	1.626	1.645
Observations	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Appendix I. Basic Econometric Model with EGR| Individual Variables

Coefficients & Sig. of Trade Factor 4

	AT	BE	ESP	FI	FR	GR	IT	NL	PT	SK	SI
B	0.700	0.952	0.706	0.565	0.707	0.523	0.678	0.702	0.814	0.543	0.677
Sig0.	0.039	0.013	0.036	0.115	0.042	0.193	0.021	0.040	0.019	0.189	0.051

a0. DV: EGR

Coefficients Sig0.

	$Sig0._{AT}$	$Sig0._{BE}$	$Sig0._{ESP}$	$Sig0._{FI}$	$Sig0._{FR}$	$Sig0._{GR}$	$Sig0._{IT}$	$Sig0._{NL}$	$Sig0._{PT}$	$Sig0._{SK}$	$Sig0._{SI}$
RULC with Factor 1	0.424	0.439	0.624	0.689	0.438	0.702	0.650	0.480	0.736	0.371	0.405
RULC with Factor 2	0.556	0.531	0.756	0.670	0.532	0.847	0.765	0.537	0.799	0.479	0.523
RULC with Factor 3	0.452	0.437	0.628	0.607	0.448	0.717	0.664	0.967	0.701	0.408	0.416
RULC with Factor 4	0.431	0.444	0.660	0.570	0.433	0.581	0.655	0.434	0.938	0.430	0.434
RULC with Factor 5	0.531	0.536	0.690	0.678	0.530	0.761	0.821	0.553	0.817	0.610	0.506
RULC with Factor 6	0.479	0.505	0.676	0.647	0.516	0.999	0.563	0.505	0.738	0.453	0.509
RULC with Factor 7	0.585	0.579	0.727	0.787	0.668	0.703	0.825	0.599	0.907	0.399	0.559

a. DV: EGR

Coefficients of $GDP_{EUROONE}$ growth

	AT	BE	ESP	FI	FR	GR	IT	NL	PT	SK	SI
GDP_Eurozone_Growth with Factor 1	2.623	2.624	2.623	2.617	2.618	2.690	2.624	2.621	2.649	2.644	2.628
GDP_Eurozone_Growth with Factor 2	2.604	2.605	2.599	2.647	2.607	2.659	2.608	2.605	2.629	2.631	2.600
GDP_Eurozone_Growth with Factor 3	2.643	2.641	2.637	2.631	2.641	2.697	2.642	2.683	2.660	2.660	2.647
GDP_Eurozone_Growth with Factor 4	2.622	2.613	2.618	2.615	2.623	2.658	2.624	2.624	2.663	2.633	2.624
GDP_Eurozone_Growth with Factor 5	2.636	2.637	2.628	2.616	2.634	2.698	2.645	2.634	2.660	2.698	2.641
GDP_Eurozone_Growth with Factor 6	2.632	2.630	2.628	2.617	2.629	2.706	2.636	2.629	2.655	2.652	2.635
GDP_Eurozone_Growth with Factor 7	2.634	2.633	2.629	2.620	2.632	2.697	2.636	2.632	2.659	2.651	2.637

a. DV: EGR

b. All coefficients have a p-value<0.000

Appendix J. Basic Econometric Model with EGR| F-Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the
1	0.060[a]	0.004	-0.023	6.15403
2	0.201[b]	0.041	0.006	6.06582
3	0.202[c]	0.041	-0.003	6.09299
4	0.231[d]	0.053	0.002	6.07943
5	0.235[e]	0.055	-0.005	6.10161
6	0.236[f]	0.056	-0.014	6.12796
7	0.267[g]	0.071	-0.007	6.10653
8	0.297[h]	0.088	0.002	6.07821
9	0.831[i]	0.690	0.658	3.56063

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	15.668	3	5.223	0.138	0.937[b]
1	Residual	4279.551	113	37.872		
	Total	4295.219	116			
	Regression	174.275	4	43.569	1.184	0.322[c]
2	Residual	4120.943	112	36.794		
	Total	4295.219	116			
	Regression	174.396	5	34.879	0.940	0.458[d]
3	Residual	4120.823	111	37.125		
	Total	4295.219	116			
	Regression	229.683	6	38.281	1.036	0.406[e]
4	Residual	4065.535	110	36.959		
	Total	4295.219	116			
	Regression	237.187	7	33.884	0.910	0.502[f]
5	Residual	4058.032	109	37.230		
	Total	4295.219	116			
	Regression	239.610	8	29.951	0.798	0.606[g]
6	Residual	4055.608	108	37.552		
	Total	4295.219	116			
	Regression	305.226	9	33.914	0.909	0.520[h]
7	Residual	3989.993	107	37.290		
	Total	4295.219	116			
	Regression	379.091	10	37.909	1.026	0.427[i]
8	Residual	3916.127	106	36.945		
	Total	4295.219	116			

	Regression	2964.016	11	269.456	21.254	0.000[j]
9	Residual	1331.202	105	12.678		
	Total	4295.219	116			

a. Dependent Variable: EGR

b. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions

c. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2

d. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3

e. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4

f. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5

g. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6

h. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6, SMEs_factor_7

i. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6, SMEs_factor_7, RULCn

j. Predictors: (Constant), High_tech_infrastructure_factor_1, D_Greece, FA_of_Institutions, RnD_investment_factor_2, FDI_centric_factor_3, Trade_factor_4, One_variable_factor_5, Sophistication_factor_6, SMEs_factor_7, RULCn, GDP_Eurozone_Growth

Appendix K. Extended Econometric Model with EMS

The extended econometric model which defines international competitiveness as a country n's share of exports in the total EU exports, is expressed as follows:

$$EMS_n = constant + \alpha\, RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{n1}) + \xi_{n2}(PS_n \times F_{n2}) + \cdots + \xi_{n7}(PS_n \times F_{n7}) + error\ term$$

All the countries of the sample provided statistically significant results with high explanatory power ($\bar{R}^2$ >.900) in all cases. The outcome of this extended econometric model demonstrated that a country's export share is highly affected from most of a country's productive capabilities and not from the cost/price competitiveness variables (in a statistically significant manner). Political Stability variables contributes also substantially to the increase of a country's EMS. Finally, it is also indicated that a country's export share is also affected in a statistically important and positive manner by the operation of institutions.

Dependent Variable: Country's Export Share – EMS								
	B_{AT}		B_{BE}		B_{ESP}		B_{FI}	
Regression Equations	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	-0.154	-0.131	-0.163	-0.132	-0.168	-0.123	-0.173	-0.126
RULCn	-1.369	0.984	0.394	3.672	-0.145	1.072	0.701	3.263
IF_n	1.967**	1.486**	1.565**	0.962**	1.558**	0.850**	1.537**	1.006**
$F_{1(\text{High-tech infr.})}$	5.639**	6.034**	6.182**	6.643**	6.204**	6.647**	6.239**	6.573**
$F_{2(\text{R\&D investment})}$	-1.384**	-1.150**	-0.855**	-0.716**	-0.877**	-0.718**	-0.977**	-0.650**
$F_{3(\text{FDI-centric})}$	-0.069	0.033	0.023	0.234	0.072	0.210	0.076	0.165
$F_{4(\text{Trade})}$	0.363*	0.353*	0.536*	0.319*	0.463*	0.383*	0.504*	0.394*
$F_{5(\text{ICT exports})}$	-0.476*	-0.538*	-0.354*	-0.425*	-0.313*	-0.489*	-0.363*	-0.444*
$F_{6(\text{sophistication})}$	1.319	1.102	0.561**	0.652**	0.619**	0.498**	0.636**	0.559**
$F_{7(\text{SME})}$	-0.224	-0.230	-0.233	-0.357	-0.292	-0.264	-0.298	-0.274
Political Stability		1.207**		1.807**		2.357**		1.757**
$\bar{R}^2$	0.949	0.950	0.944	0.948	0.944	0.950	0.944	0.948
DW Test	0.816	0.838	0.720	0.846	0.740	0.866	0.759	0.804
Observations	18	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS								
	B_{FR}		B_{IT}		B_{NL}		B_{PT}	
Regression Equations	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	-0.167	-0.123	-0.171	-0.162	-0.136	-0.122	-0.181	-0.139
RULCn	0.702	4.703	5.651	6.167	0.627	3.041	2.304	9.519
IF_n	1.537**	0.787**	2.354	2.201*	1.381**	0.997**	1.586	0.695**
$F_{1(\text{High-tech infr.})}$	6.206**	6.558**	6.116**	6.207**	6.217**	6.545**	6.126**	6.618**
$F_{2(\text{R\&D investment})}$	-0.870**	-0.735**	-0.784**	-0.749**	-0.630**	-0.642**	-0.952**	-0.822**
$F_{3(\text{FDI-centric})}$	0.079	0.261	-0.250	-0.218	-0.996	-0.224	-0.014	0.029
$F_{4(\text{Trade})}$	0.475*	0.478*	0.841	0.819*	0.437*	0.409*	0.281	-0.084
$F_{5(\text{ICT exports})}$	-0.317*	-0.470*	-0.210	-0.248	-0.348*	-0.461*	-0.331*	-0.599
$F_{6(\text{sophistication})}$	0.639**	0.638**	0.405**	0.395**	0.685**	0.590**	0.515**	0.232
$F_{7(\text{SME})}$	-0.271	-0.090	-0.417	-0.410	-0.195	-0.243	-0.273	-0.213
Political Stability		2.121**		0.421		1.574**		3.028**
$\bar{R}^2$	0.944	0.949	0.973	0.973	0.946	0.948	0.946	0.955
DW Test	0.729	0.770	1.184	1.196	0.706	0.790	0.756	1.031
Observations	18	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EMS				
	B_{SK}		B_{SI}	
Regression Equations	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	-0.153	-0.126	-0.160	-0.129
RULCn	0.760	3.247	0.442	3.178
IF_n	1.498	1.007**	1.590	1.030**
$F_{1(High\text{-}tech\ infr.)}$	6.257**	6.581**	6.232**	6.575**
$F_{2(R\&D\ investment)}$	-0.861**	-0.716**	-0.878**	-0.719**
$F_{3(FDI\text{-}centric)}$	0.142	0.189	0.059	0.162
$F_{4(Trade)}$	0.296	0.357*	0.428*	0.405*
$F_{5(ICT\ exports)}$	-0.398	-0.487*	-0.320	-0.461*
$F_{6(sophistication)}$	0.628**	0.566**	0.592**	0.555**
$F_{7(SME)}$	-0.135	-0.222	-0.290	-0.276
Political Stability		1.677**		1.697**
$\bar{R}^2$	0.945	0.948	0.944	0.948
DW Test	0.736	0.811	0.734	0.812
Observations	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Appendix L. Extended Econometric Model with EMS| Individual Variables

Coefficients PS_F1

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	7.492	5.792	4.030	1.510	5.579	-1.532	8.717	4.037	13.620	5.486	5.696
GDP_Eurozone_Growth	-.084	-.069	-.066	-.073	-.071	.029	-.074	-.083	-.116	-.069	-.070
Institutional Factor	.466*	.557**	.456*	.980*	.582**	.402*	1.134	.347**	.239**	.669*	.624*
PS_n	2.146**	2.220**	2.686*	2.084*	2.137*	.600	1.770*	2.288	3.065	1.947*	2.074*
PS_F1	7.079*	6.909*	6.952*	6.496	6.895	6.600*	6.722*	6.933	6.982	6.887	6.908*

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Coefficients

PS_F_2

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-45.352	-40.092	-37.666	-38.486	-38.287	-47.022	-32.280	-36.470	-36.345	-39.014	-39.179
GDP Eurozone Growth	-.181	-.211	-.192	-.154	-.179	-.022	-.206	-.184	-.208	-.195	-.192
Institutional Factor	5.291	5.089	4.993	4.849	4.853	4.345	5.833	5.432	4.838	4.839	5.003
PS_n	-7.029	-8.674	-8.642	-7.948	-7.991	-10.105	-8.638	-8.485	-8.076	-8.083	-8.469
PS_F_2	-3.469*	-3.052*	-2.986	-2.488	-3.012	-2.727*	-3.040	-3.211	-3.020	-3.040*	-3.026

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Coefficients PS_F_3

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-26.531	-24.471	-20.089	-30.365	-23.977	-35.883	-15.641	-36.781	-21.136	-24.411	-24.120
GDP Eurozone Growth	.140	.081	.086	.070	.094	.251	.090	.130	.077	.094	.092
Institutional Factor	4.345	4.293	4.282	4.964	4.028	3.296	5.200	4.775	3.970	4.213	3.971
PS_n	-7.382	-8.711	-9.183	-6.909	-8.224	-10.262	-8.752	-10.851	-8.039	-8.688	-8.145
PS_F_3	-1.324	-1.172	-1.070	-1.274	-.976	-.610	-1.326	-9.743	-1.034	-.975	-.969

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Coefficients PS_F_4

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-28.778	-26.575	-22.914	-34.300	-24.834	-37.056	-17.283	-24.752	-30.964	-25.461	-25.810
GDP_Eurozone_Growth	.043	-.070	-.002	.044	.017	.201	-.040	.009	.023	-.008	.002
Institutional Factor	3.683	3.968	3.777	4.191	3.518	3.025	4.745	3.774	3.867	3.454	3.478
PS_n	-7.356	-9.086	-8.932	-6.263	-7.783	-10.190	-8.780	-8.312	-8.855	-7.842	-7.929
PS_F_4	.938	2.099	1.128	-.340	1.198	.607	1.752	1.212	1.382	1.355	1.199

a. DV: EMS

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Coefficients PS_F_5

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-30.376	-28.175	-24.289	-33.784	-26.271	-38.115	-20.201	-26.947	-25.327	-27.905	-27.083
GDP_Eurozone_Growth	.140	.091	.077	-.008	.106	.248	.046	.090	.079	.113	.090
Institutional Factor	3.414	3.452	3.536	4.360	3.269	2.887	4.340	3.411	3.310	3.694	3.261
PS_n	-6.158	-7.433	-8.119	-6.931	-6.936	-9.914	-8.181	-7.432	-7.215	-7.973	-7.142
PS_F_5	-.661	-.682	-.350	.495	-.472	-.152	.013	-.406	-.429	-.695	-.430

a. DV: EMS

Notes: (i) * and ** denote significance at the 5% and 1% level. respectively.

Coefficients PS_F_6

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-21.189	-29.992	-22.305	-31.155	-25.204	-37.060	-20.921	-26.378	-25.613	-26.217	-25.781
GDP_Eurozone_Growth	.078	.050	.047	.019	.067	.235	.050	.055	.053	.058	.056
Institutional Factor	3.515	3.640	3.629	4.184	3.394	2.907	4.351	3.453	3.451	3.683	3.356
PS_n	-7.082	-8.046	-8.724	-6.614	-7.636	-10.191	-8.110	-7.945	-7.860	-8.456	-7.723
PS_F_6	1.882	-.382	.230	.459	.170	.186	-.131	.132	.095	.178	.183

a. DV: EMS

Notes: (i) * and ** denote significance at the 5% and 1% level. respectively.

Coefficients PS_F_7

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
RULCn	-28.546	-25.454	-23.396	-32.143	-24.754	-36.336	-20.683	-26.572	-25.187	-25.615	-26.345
GDP_Eurozone_Growth	.097	.051	.054	.035	.078	.254	.045	.060	.055	.070	.062
Institutional Factor	3.355	3.231	3.550	3.939	3.180	2.537	4.430	3.365	3.348	3.513	3.297
PS_n	-6.802	-7.931	-8.506	-6.213	-7.302	-9.911	-8.234	-7.814	-7.705	-8.427	-7.605
PS_F_7	.389	.703	.146	.487	.355	.650	-.156	.171	.167	.541	.151

a. DV: EMS

Notes: (i) * and ** denote significance at the 5% and 1% level. respectively.

Appendix M. Extended Econometric Model with EMS| F-Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.862[a]	0.743	0.738	3.02008
2	0.974[b]	0.949	0.942	1.42098

a. Predictors: (Constant), Political_stability, Germany

b. Predictors: (Constant), Political_stability, Germany, PS_F4, GDP_Eurozone_Growth, PS_F3, PS_F5, RULCn, PS_F6, CDn, PS_F7, PS_F2, FA_of_Institutions, PS_F1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3001.939	2	1500.969	164.564	0.000[b]
	Residual	1039.780	114	9.121		
	Total	4041.719	116			
2	Regression	3833.743	13	294.903	146.051	0.000[c]
	Residual	207.976	103	2.019		
	Total	4041.719	116			

a. Dependent Variable: EMS

b. Predictors: (Constant), Political_stability, Germany

c. Predictors: (Constant), Political_stability, Germany, PS_F4, GDP_Eurozone_Growth, PS_F3, PS_F5, RULCn, PS_F6, CDn, PS_F7, PS_F2, FA_of_Institutions, PS_F1

Appendix N. Extended Econometric Model with EMS| Paired Sample T-Test

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	F1 & PSF1	84	0.679	0.000
Pair 2	F2 & PSF2	60	0.400	0.002
Pair 3	IF & PSIF	70	0.485	0.000
Pair 4	F3 & PSF3	50	0.832	0.000
Pair 5	F4 & PSF4	40	-0.201	0.214
Pair 6	F5 & PSF5	30	-0.284	0.128
Pair 7	F6 & PSF6	20	0.410	0.073
Pair 8	F7 & PSF7	10	0.363	0.303

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	F1 - PSF1	-0.67883	0.19662	0.02145	-0.72150	-0.63616	-31.643	83	0.000
Pair 2	F2 - PSF2	-0.29268	0.19482	0.02515	-0.34301	-0.24236	-11.637	59	0.000
Pair 3	IF - PSIF	-0.92371	0.36149	0.04321	-1.00991	-0.83752	-21.379	69	0.000
Pair 4	F3 - PSF3	0.51520	0.19732	0.02790	0.45912	0.57128	18.463	49	0.000
Pair 5	F4 - PSF4	0.13537	0.23228	0.03673	0.06109	0.20966	3.686	39	0.001
Pair 6	F5 - PSF5	0.03737	0.19849	0.03624	-0.03675	0.11148	1.031	29	0.311
Pair 7	F6 - PSF6	-0.06180	0.22764	0.05090	-0.16834	0.04474	-1.214	19	0.240
Pair 8	F7 - PSF7	1.03680	0.09476	0.02997	0.96901	1.10459	34.598	9	0.000

Appendix O. Extended Econometric Model with EGR

The extended econometric model which defines international competitiveness as a country n's annual rate of export growth, is expressed as follows:

$$EGR_n = constant + \alpha\, RULC_n + \pi IF_n + \varepsilon_n GDP_{Eurozone} + \mu_n D_n + \kappa_n CD_n + \lambda_n PS_n + \xi_{n1}(PS_n \times F_{n1}) + \xi_{n2}(PS_n \times F_{n2}) + \cdots + \xi_{n7}(PS_n \times F_{n7}) + error\ term$$

All the countries of the sample provided statistically significant results with important explanatory power ($\bar{R}^2$ >.650) in all cases. The outcome of this extended econometric model demonstrated that a country's annual rate of export growth is highly affected from the $GDP_{EUROZONE}$ growth while the productive capabilities' factors and RULC did not provide statistically significant results. The same is valid for the institutions' factor. Political Stability variable which was considered in this model did not influence (statistically) the outcome.

Dependent Variable: Country's Export Share – EGR								
	B_{AT}		B_{BE}		B_{ESP}		B_{FI}	
Regression Equations	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	2.560**	2.596**	2.599**	2.619**	2.547**	2.609**	2.571**	2.635**
RULCn	4.939	8.748	2.892	4.986	2.892	4.601	5.653	9.084
IF_n	0.661	-0.117	0.691	0.306	0.490	-0.504	0.485	-0.227
$F_{1(\text{High-tech infr.})}$	-0.227	0.412	-0.469	-0.174	0.001	0.624	0.004	0.450
$F_{2(\text{R\&D investment})}$	-0.560	-0.180	-0.183	-0.095	-0.359	-0.135	0.003	0.441
$F_{3(\text{FDI-centric})}$	-0.408	-0.243	-1.021	-0.887	-0.331	-0.138	-0.355	-0.236
$F_{4(\text{Trade})}$	0.866	0.850	1.938	1.799	0.904	0.792	0.816	0.670
$F_{5(\text{ICT exports})}$	-0.100	-0.200	-0.518	-0.564	0.004	-0.243	0.093	-0.015
$F_{6(\text{sophistication})}$	0.437	0.087	-0.885	-0.828	0.054	-0.116	0.075	-0.028
$F_{7(\text{SME})}$	-0.203	-0.212	0.642	0.563	-0.230	-0.191	-0.225	-0.193
Political Stability		1.953		1.155		3.311		2.353
$\bar{R}^2$	0.696	0.700	0.709	0.710	0.697	0.708	0.695	0.702
DW Test	1.664	1.692	1.721	1.723	1.691	1.738	1.681	1.704
Observations	18	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EGR								
	B_{FR}		B_{IT}		B_{NL}		B_{PT}	
Regression Equations	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	2.554**	2.600**	2.555**	2.612**	2.593**	2.609**	2.588**	2.603**
RULCn	5.628	9.874	4.417	7.646	5.950	8.684	1.987	4.569
IF_n	0.489	-0.308	0.215	-0.743	0.234	-0.201	0.368	0.049
$F_{1(\text{High-tech infr.})}$	0.095	0.470	0.090	0.656	0.058	0.430	0.273	0.450
$F_{2(\text{R\&D investment})}$	-0.281	-0.138	-0.325	-0.108	0.003	-0.011	-0.095	-0.048
$F_{3(\text{FDI-centric})}$	-0.364	-0.171	-0.244	-0.043	-1.731	-0.858	-0.144	-0.129
$F_{4(\text{Trade})}$	0.891	0.894	0.806	0.666	0.879	0.848	1.344	1.214
$F_{5(\text{ICT exports})}$	-0.032	-0.194	-0.055	-0.293	-0.059	-0.187	0.003	-0.094
$F_{6(\text{sophistication})}$	0.064	0.062	0.161	0.101	0.169	0.061	0.358	0.257
$F_{7(\text{SME})}$	-0.301	-0.109	-0.201	-0.155	-0.109	-0.163	-0.285	-0.263
Political Stability		2.251		2.635		1.782		1.084
$\bar{R}^2$	0.695	0.700	0.697	0.705	0.697	0.700	0.702	0.703
DW Test	1.685	1.689	1.706	1.749	1.664	1.686	1.727	1.722
Observations	18	18	18	18	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level. respectively.

Dependent Variable: Country's Export Share – EGR				
	B_{SK}		B_{SK}	
Regression Equations	(1)	(2)	(1)	(2)
$GDP_{EUROZONE}$ Growth	2.561**	2.593**	2.568**	2.603**
RULCn	5.999	9.040	5.558	8.628
IF_n	0.427	-0.173	0.545	-0.083
$F_{1(High\text{-}tech\ infr.)}$	0.080	0.476	0.091	0.476
$F_{2(R\&D\ investment)}$	-0.300	-0.123	-0.334	-0.156
$F_{3(FDI\text{-}centric)}$	-0.302	-0.245	-0.365	-0.249
$F_{4(Trade)}$	0.829	0.905	0.833	0.807
$F_{5(ICT\ exports)}$	-0.063	-0.171	-0.022	-0.181
$F_{6(sophistication)}$	0.095	0.019	0.011	-0.030
$F_{7(SME)}$	-0.155	-0.262	-0.230	-0.214
Political Stability		2.051		1.904
$\bar{R}^2$	0.695	0.700	0.696	0.700
DW Test	1.679	1.696	1.664	1.685
Observations	18	18	18	18

Notes: *(i)* * and ** denote significance at the 5% and 1% level, respectively.

Appendix P. Extended Econometric Model with EGR| Individual Variables

Coefficients
Sig.

	$Sig._{AT}$	$Sig._{BE}$	$Sig._{ESP}$	$Sig._{FI}$	$Sig._{FR}$	$Sig._{GR}$	$Sig._{IT}$	$Sig._{NL}$	$Sig._{PT}$	$Sig._{SK}$	$Sig._{SI}$
PS_F1	0.172	0.154	0.095	0.433	0.160	0.244	0.096	0.151	0.656	0.165	0.148
PS_F2	0.115	0.145	0.105	0.653	0.145	0.206	0.150	0.149	0.149	0.202	0.129
PS_F3	0.714	0.765	0.915	0.627	0.806	0.959	0.979	0.116	0.803	0.816	0.751
PS_F5	0.718	0.750	0.656	0.741	0.728	0.886	0.498	0.795	0.799	0.338	0.794
PS_F6	0.785	0.597	0.447	0.818	0.678	0.679	0.797	0.691	0.682	0.803	0.595
PS_F7	0.710	0.672	0.677	0.812	0.724	0.847	0.830	0.716	0.651	0.771	0.675

a. DV: EGR

Coefficients & Sig. of PS_F4

	AT	BE	ESP	FI	FR	GR	IT	NL	PT	SK	SI
B	0.879	10.156	0.883	0.618	0.924	0.792	0.758	0.927	10.197	0.861	0.883
Sig.	0.048	0.021	0.044	0.203	0.039	0.078	0.094	0.043	0.016	0.109	0.048

a. DV: EGR

Coefficients Sig.

	$Sig._{AT}$	$Sig._{BE}$	$Sig._{ESP}$	$Sig._{FI}$	$Sig._{FR}$	$Sig._{GR}$	$Sig._{IT}$	$Sig._{NL}$	$Sig._{PT}$	$Sig._{SK}$	$Sig._{SI}$
RULC with Factor 1	0.183	0.174	0.385	0.354	0.175	0.353	0.288	0.210	90.280	0.199	0.176
RULC with Factor 2	0.619	0.541	0.953	0.447	0.516	0.742	0.762	0.525	0.647	0.543	0.552
RULC with Factor 3	0.345	0.327	0.644	0.453	0.319	0.581	0.544	0.552	0.465	0.359	0.325
RULC with Factor 4	0.294	0.291	0.573	0.399	0.251	0.453	0.425	0.262	0.875	0.289	0.284
RULC with Factor 5	0.378	0.352	0.673	0.495	0.331	0.580	0.577	0.383	0.479	0.404	0.349
RULC with Factor 6	0.449	0.497	0.892	0.563	0.445	0.691	0.612	0.462	0.542	0.446	0.477
RULC with Factor 7	0.426	0.413	0.729	0.538	0.418	0.612	0.579	0.424	0.585	0.349	0.412

a. DV: EGR

Coefficients of $GDP_{EUROONE}$ growth

	AT	BE	ESP	FI	FR	GR	IT	NL	PT	SK	SI
GDP_Eurozone_Growth with Factor 1	2.649	2.651	2.657	2.648	2.652	2.687	2.653	2.646	2.652	2.653	2.650
GDP_Eurozone_Growth with Factor 2	2.618	2.616	2.621	2.678	2.620	2.659	2.622	2.617	2.621	2.625	2.614
GDP_Eurozone_Growth with Factor 3	2.671	2.666	2.672	2.660	2.669	2.705	2.667	2.674	2.671	2.669	2.667
GDP_Eurozone_Growth with Factor 4	2.621	2.599	2.628	2.627	2.626	2.656	2.629	2.622	2.642	2.621	2.620
GDP_Eurozone_Growth with Factor 5	2.677	2.671	2.683	2.644	2.677	2.709	2.686	2.668	2.674	2.697	2.670
GDP_Eurozone_Growth with Factor 6	2.667	2.666	2.678	2.656	2.668	2.708	2.669	2.665	2.669	2.668	2.667
GDP_Eurozone_Growth with Factor 7	2.667	2.666	2.678	2.656	2.668	2.708	2.669	2.665	2.669	2.668	2.667

a. DV: EGR

Coefficients PS_n

	B_{AT}	B_{BE}	B_{ESP}	B_{FI}	B_{FR}	B_{GR}	B_{IT}	B_{NL}	B_{PT}	B_{SK}	B_{SI}
PS1	2.537	2.585	3.581	2.474	2.608	1.944	2.815	2.572	2.499	1.896	2.427
PS2	1.645	1.458	2.285	2.155	1.593	1.034	1.566	1.464	1.409	.958	1.302
PS3	1.608	1.494	2.275	1.890	1.601	1.029	1.646	.976	1.437	.884	1.393
PS4	1.311	1.045	2.016	1.640	1.524	.924	1.385	1.248	.542	1.233	1.265
PS5	1.833	1.689	2.522	1.828	1.861	1.104	1.970	1.685	1.597	1.136	1.581
PS6	1.659	1.628	2.516	1.997	1.704	1.114	1.695	1.639	1.580	.986	1.521
PS7	1.560	1.472	2.212	1.906	1.502	1.005	1.603	1.481	1.338	.888	1.366

a. DV: EGR

Appendix Q. Extended Econometric Model| F-Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.283[a]	0.080	-0.017	6.13525
2	0.838[b]	0.702	0.665	3.52431

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	342.887	11	31.172	0.828	0.612[b]
	Residual	3952.332	105	37.641		
	Total	4295.219	116			
2	Regression	3015.879	13	231.991	18.678	0.000[c]
	Residual	1279.340	103	12.421		
	Total	4295.219	116			

a. Dependent Variable: EGR

b. Predictors: (Constant), Germany, PS_F5, PS_F4, RULCn, PS_F3, Political_stability, PS_F6, PS_F7, PS_F2, FA_of_Institutions, PS_F1

c. Predictors: (Constant), Germany, PS_F5, PS_F4, RULCn, PS_F3, Political_stability, PS_F6, PS_F7, PS_F2, FA_of_Institutions, PS_F1, GDP_Eurozone_Growth, CDn

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.296[a]	0.088	-0.008	6.10842
2	0.837[b]	0.701	0.663	3.53225

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	377.371	11	34.306	0.919	0.525[b]
	Residual	3917.848	105	37.313		
	Total	4295.219	116			
2	Regression	3010.107	13	231.547	18.558	0.000[c]
	Residual	1285.111	103	12.477		
	Total	4295.219	116			

a. Dependent Variable: EGR

b. Predictors: (Constant), D_Greece, PS_F1, PS_F3, PS_F4, RULCn, PS_F5, PS_F7, PS_F6, PS_F2, Political_stability, FA_of_Institutions

c. Predictors: (Constant), D_Greece, PS_F1, PS_F3, PS_F4, RULCn, PS_F5, PS_F7, PS_F6, PS_F2, Political_stability, FA_of_Institutions, GDP_Eurozone_Growth, CDn

Appendix R. Used Variables

The table below depicts the air transport registered carriers rank by country. The source used to retrieve this data was the Worldbank and International Civil Aviation Organization, Civil Aviation Statistics of the World and ICAO staff estimates.

Countries	County Average in Air-Transport Registered Carriers
Germany	972211
France	707551
Spain	551025
Italy	341553
Netherlands	282253
Belgium	152279
Austria	149410
Portugal	138785
Greece	126454
Finland	126072
Slovenia	18907
Slovak Republic	8348

Greece has very few companies related to ICT manufacturing or services comparing to the other EMU countries of the sample.

	ICT Manufacturing Firms		ICT Service Firms	
Countries	Average	Share	Average	Share
AT	2590.389	4.04%	2128.111	2.15%
BE	2169.833	3.38%	2848.556	2.87%
FI	7783.889	12.14%	2928.389	2.95%
FR	14943.72	23.31%	22236.72	22.42%
DE	19976	31.16%	11921	12.02%
GR	395.9444	0.62%	1289.222	1.30%
IT	3370.5	5.26%	4533.611	4.57%
NL	1092.833	1.70%	5748.833	5.80%
PT	439.6667	0.69%	2183.333	2.20%
SK	37.44444	0.06%	201.3889	0.20%
SI	188.2778	0.29%	287.6667	0.29%
ES	1357.389	2.12%	5572.167	5.62%
EU	64113.61		99201.78	

Greece is behind most of the countries of the sample regarding the scientific and technical journal articles published.

Country	Average (2001-2018)
Germany	93365
France	64797
Italy	57453
Spain	45153
Netherlands	27024
Belgium	14385
Austria	10590
Greece	10306
Portugal	9916
Finland	9795
Slovak Republic	3648
Slovenia	2875