The London School of Economics and Political Science

The effects of trade integration and outward foreign direct investment: a regional and industry-level empirical investigation

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Declaration

I declare that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political science is solely my own work.

I declare that my thesis consists of 49.167 words (excluding appendices and literature references).

Alexandra Sotiriou, September 2019

Devoted to my father

ABSTRACT

The global economic system has undergone fundamental changes in the last two decades due to the proliferation of free trade agreements, the deepening of the European Union (EU) integration process and increased foreign direct investments (FDI) altering the economic landscape across and within countries. This thesis aims to improve our understanding of the effects of trade and outward FDI across three dimensions. By examining the effects on the domestic industry, and by-detecting the regional footprint in terms of growth and the skill composition of labour markets, the empirical findings offer a multi-faceted and multi-level analysis with evidence from South America and the EU. This thesis is structured into an introductory chapter and three analytical papers.

The first paper explores the effects of import competition on the manufacturing sector in Chile following the implementation of the country's two most important Free Trade Agreements with the USA and China. The findings reveal that increased import penetration from China and USA has highly heterogeneous effects with Chinese trade creating more pronounced substitution effects for the domestic industry than trade with USA. The analysis sheds new light on the importance of foreign investment and export intensity – in reversing the negative import substitution effect - due to the opportunities offered from the participation in Global Value Chains.

The second paper examines the link between trade and economic growth across the regional income distribution in Greece, during the period after the country joined the European Monetary Union (EMU) incorporating the global economic crisis period. The aim of the analysis is to identify heterogeneous trade effects across the regional income hierarchy. Among the original contributions of this study is that contrary to the prevailing view, EU trade appears negative for the more economically advanced regions and has insignificant effects on lower income regions; while global trade and EU trade differ significantly in their respective growth returns across the income distribution.

Finally, the third paper empirically investigates the association between increased outward foreign direct investment (OFDI) and the evolution of the occupational composition at the regional level for Greece, a small peripheral EU economy. The emergence of Greece as an international investor in the Balkan region constitutes an interesting setting of a peripheral

EU country investing in peripheral new EU member states and reveals the strong spatial footprint on the occupational structure of home regions, offering valuable policy implications for countries in pre-EU accession phases.

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INTRODUCTION

I. Overview

Since the 1990s, the global economic system has undergone significant transformations owing to the proliferation of trade agreements, the deepening of the European Union (EU) integration process, and the increased pace of the internationalization of firms and production. Hotly debated topics for over three decades are being revisited as the surge of trade across continents and the substantial increases in Foreign Direct Investment (FDI) across countries have altered the dynamics at both the national industry level and the sub-national (regional) level. The performance of the domestic industry as a result of the increased trade exposure, the regional growth effects stemming from deeper trade integration and the employment responses in local labour markets constitute critical dimensions of analysis as they form a transmission channel of global economic events to the real economy. Increased exposure to a multitude of simultaneous external shocks ranging from import competition pressures to the reallocation of firms creates a complex interplay between opportunities offered and threats posed by the economic globalization process with implications for the industry and regional level.

The multi-polar nature of global trade creates a complex geography, which requires an examination of various contexts that essentially will broaden the insights offered by research in different continents. The thesis explores the effects of trade and outward foreign direct investments across industries and regions by examining the cases of Chile and Greece. More specifically the effects of increased trade with China and the USA are detected in the case of Chile and of the EU integration processes in the case of Greece. The increases in EU trade as a result of the creation of the Eurozone fueled a phenomenal rise in trade within the EU. Intra-EU trade (EU-28) almost doubled after the circulation of the common currency (2002-2018) unleashing a new set of forces across and within countries (Eurostat, 2018). For Greece this meant an increase of 234 per cent in imports from the EU from the mid 1990's before Eurozone accession and up until the year before the crisis. In the exact same time period, outward FDI from Greece grew by 600% (UNCTAD data) targeting primarily the Balkan macro-region.

China accounts for almost 14 percent of global merchandise exports growing from less than 2 percent in 1990 (UNCTAD, 2016). Chile experienced a substantial growth in imports from China (800%) and the USA (222%) following the Free Trade Agreements (FTA) signed with both countries in 2003 and 2006, respectively. In the same period Chile's domestic manufacturing sector's GVA as a percentage of GDP contracted from almost 20% to 12% (World Bank data) which poses questions regarding the underlying relationships of these contemporaneous phenomena. While China's resurgence has been stresses to address poverty it has also come at the expense of manufacturing output for its trading partners (Jenkins, 2008; Autor et al., 2013; Alvarez and Claro, 2009). Moreover, the deepening of the EU integration has on the one hand increased opportunities for trade but also raised concerns regarding the equal distribution of trade benefits within countries and across core and peripheral economies (Brülhart and Traeger, 2003; Midelfart-Knarvik and Overman, 2002; Petrakos et al., 2012; Kallioras and Pinna, 2015; Monastiriotis et al., 2016). The ramifications of these macro-level events are expected to vary substantially across countries and continents and most importantly are deemed to produce an uneven geography of benefits and losses.

The theoretical and conceptual background throughout the thesis cross-fertilizes elements of various strands of the theoretical literature including Economic Geography, Regional Economics, International Economics and International Business. The complex interplay of geography and the economic phenomena that shape it require an all-encompassing approach that will form the workhorse guiding the empirical examination of the interactions between trade, outward FDI and growth, particularly with reference to emerging economies and peripheral countries. Overall, this Thesis explores the effects of global economic events and reveals that only certain industrial sectors and regions benefit from the process which gives rise to policy implications centred on the critical issue of ensuring that local contexts (domestic industries and regions) are well prepared for the deepening of integration into the world economy.

Key Themes of the Thesis:

Effects of what?

The three elements of globalization identified in the thesis are within-industry import competition, the deepening of EU trade integration and the internationalization of firms

and production that impact on the domestic economy separately as transmission channels. As far as the first element is concerned, import competition is expected to affect the performance of the incumbent industry-level and is proxied using sectoral import penetration variables to examine the case of Chile. The second element, which is the growth-trade nexus concerning the deepening of the EU integration process, is examined across the regional income distribution in Greece with the aim of detecting the heterogeneous effects of different types of trade integration (EU versus global trade) on regional growth. Third, regarding the internationalization of production, the home employment effects at the regional level are unveiled as a result of increases in outward foreign direct investment (OFDI) and shed light on the occupational structure outcome in Greek regions. The aforementioned topics constitute the backbone of the thesis and are explored separately in three distinct analytical papers.

Effects on what?

The first chapter examines the case of Chile and the effects of import competition on the domestic industry and specifically unveils the industry level characteristics that condition the effects of trade. The second chapter focuses on identifying the heterogeneous effects on regional growth of both EU trade and global trade and detect the varying effects across the regional income distribution in Greece, whilst the third chapter detects the occupational transformation process of labor markets at the regional level stemming from the reallocation of production abroad (mainly to the Balkan macro region) captured by the increased trends in OFDI.

The thesis explores the implications of the fundamental changes outlined above regarding the spatial outcomes from trade integration, cross border investments and the dynamic effects of within-industry import competition. The three themes correspond to the areas to which this thesis seeks to make a contribution by advancing the existing research highlighting elements pertaining to the conditional effects of trade and OFDI. The three topics of within industry import competition; EU trade and OFDI are related and, to varying degrees, appear as crosscutting themes throughout the thesis.

Effects at what level?

The empirical analysis explores economic phenomena at both the *micro* and *meso* level by detecting industry level and regional scale responses, respectively. While the micro level analysis unravels the effects of trade and FDI employing firm level data or employee level data (e.g. Mion and Zhu, 2013; Bloom et al., 2016), macro level analysis usually employs national-level data to detect aggregate effects (e.g. Dufrenot et al., 2010; Tsitouras, 2016). The evidence on the heterogeneity of the effects at the *meso* (sub-national) level remains sparse despite the huge differences detected in the effects of FDI and trade across subnational regions within countries (Monastiriotis and Jordan, 2011; Rodriguez-Pose, 2012) Thus, the contribution to the scarse *meso* level empirical evidence forms part of the proposed novelties of this Thesis.

Effects where?

Rather than focusing on one specific country, this PhD thesis combines empirical analyses drawing on data from two countries that share common challenges in an increasingly globalized world. Greece and Chile represent two countries that were exposed to competition pressures from economic superpowers in two different but very comparable contexts. The integration of Chile in the world economy through the participation in free trade agreements with the USA and China unleashed a similar set of forces to that of the deepening of the EU trade integration in Greece, which is considered a peripheral and relatively small economy compared to its core EU counterparts. The exposure of Greece to strong competition pressures from economically more advanced EU countries and to the lower cost inputs from countries of the EU periphery and to trade with South East Asian countries led to intensified competition pressures in terms of both quality and cost; similar to the competition faced in Chile, in terms of quality from the USA and of cost from China. Both Greece and Chile are considered relatively small economies within their respective trade relations and the competition pressures are expected to have implications in a highly heterogeneous manner both for their incumbent industries and their regional growth trajectories.

By drawing parallels, the thesis seeks to merge complementary policy insights from the examination of factors that shape the geography of development and the heterogeneous

responses at the industry level. The thesis' structure does not follow the logic of a comparative study as the research questions differ in the various contexts. Therefore, the approach followed here is not based on an analytical comparison of the role of a specific factor in different countries. Instead, it explores related questions in countries located in two different continents to provide an insightful view of the challenges and dynamic trends to be considered by scholars and policy-makers when trying to understand changes in spatial patterns of development and industrial performance in different parts of an increasingly globalized world.

The rationale forming the foundations of the research questions draws on the debates, which have triggered a plethora of theoretical and empirical studies and can be divided into two opposing camps. On the one hand, the theoretical and empirical evidence on trade and FDI stresses the role of productivity gains; larger market access, knowledge and technology transfer (e.g. Xu and Wang, 2000) as a result of strengthened trade relations (which is linked to the first and second chapters of the Thesis). On the other hand, trade is found to induce substitution effects for domestic producers (Edwards and Jenkins, 2015) leading, in some cases, to the de-industrialization of regions due to the high exposure to economically more advanced or competitive trade partners (Autor et al., 2013; Edwards and Jenkins, 2015). Literature on the effects of the EU integration has provided evidence on how increases in trade between countries are an important driver of the differentiated evolution of regional trajectories (e.g. Rodriguez-Pose, 2012; Petrakos et al., 2012; Paluzie, 2001). Cross border investments, on the other hand, are expected to alter the dynamics at the local labour market level affecting significantly the occupational structure of those regions which are more exposed to the reallocation of firms. The dynamic effects of trade and investment at the industry and regional level constitute the core themes of the PhD thesis, whose conceptual foundations are analysed in the subsequent sections.

II. Themes of the Thesis

1. Trade and domestic industry

The surge of intra-industry and intra-firm trade in the past two decades is evident by observing the substantial increases in the implementation of free trade agreements, both at a bilateral and multilateral basis, which also gave rise to the creation of global value chains (GVCs) and global production networks. Free trade agreements (FTAs), Regional Trade Agreements (RTAs) and economic integration agreements (EIA) are major trade policy instruments, which impact on growth and employment. As identified in the literature, opportunities and threats posed by deeper trade integration across continents are expected to manifest across several margins. At the firm and industry level the most prominent margins of adjustment include sales, exports growth, productivity, defensive innovation, employment and wages (Autor et al., 2013; Alvarez and Claro 2009; Bernard et al., 2006; Pavcnik, 2002). In the attempt to disentangle the sources of benefits and threats it is essential to assess the decisive role played by the type of integration. That is the role played by the income level of the trade partner, which determines both the levels of competition intensity and the opportunities offered for knowledge and technology diffusion across industrial sectors. The latter forms the main contribution of the first chapter of the Thesis as it seeks to unravel the heterogeneous effect of the simultaneous integration of Chile with trade partners of different income levels, a research theme so far overlooked by the existing literature.

The bulk of the related evidence focuses either on the effect of Chinese trade or on global indices of trade without an explicit examination of the different dynamics produced by the exposure to different trade partners (Alvarez and Claro, 2009; Autor et al., 2013; Mion and Zhu, 2013). Further, the related literature has focused on examining the cases of developed countries and especially on the USA, as economists have sought to understand the forces behind rising USA wage inequality (e.g. Autor et al., 2013), while lower income or developing countries remain understudied.

The heterogeneous effects stemming from intensified trade across industries call for a clear assessment of the varying degrees of exposure and the conditional effect of industry-specific characteristics. To this end, increasingly relevant questions to be answered are

what types of industries have gained and what types of industries have suffered the most. Which industries became more competitive by reaping the benefits from trade and foreign investment? What are the decisive factors that shield an industry from competition pressures and allow for productivity effects to materialize? What is the role-played by the type of trade integration? These are research questions that are empirically investigated studying the case of Chile, which is selected as one of the most outward-looking economies in Latin America. The identification of the industry-specific characteristics that act as catalysts for the trade benefits to diffuse, are explored with the objective of revealing the opportunities offered from participation in GVCs and are discussed in light of the country's most recent political agenda. The case of Chile offers a unique source of insight for other countries in Latin America and peripheral countries in free trade areas and as such may be compared to the EU trade integration experience of peripheral economies.

Chile: A general context

The research question of the first chapter was formed after observing the unraveling trends in global trade volumes which are reaching new peaks with WTO members' merchandise exports summing up to US$ 17.43 trillion in 2017 from US$ 2.03 trillion in early 1990s (WTO data). Latin American Countries (LAC) experienced a growing rate of exports and imports, with Chile and Mexico stand on the top ranks (with respect to trade growth) within the LAC region. Following the predictions of traditional trade theory, the type of trade integration determines in the long run, the specialization patterns of each country (Caporale et al., 2015; Timmer et al., 2019). With regard to the main trading partners of Latin America and the Caribbean, "exports to China made up almost entirely of raw materials and natural resource-based manufactured goods and are seen notching the highest increase (28%) in 2018" (ECLAC, 2018). The latter signifies the heavy reliance of LAC economies and particularly of Chile on the extractive industry. With regard to imports, the highest increases are from China, which is ranked second in terms of imports' origin after the United States in the region and are composed primarily of manufactured goods that compete with domestic production in multiple (mainly low and medium tech) sectors (Alvarez and Claro, 2009).

The shifting shares of manufacturing exports are often perceived as an indication of market losses to China in the world markets (Alvarez and Claro, 2009). Already in the mid 2000s

the most significant loss in LAC and Chile was detected in low-and medium-tech sectors and labour-intensive products, which accounted for almost 30% of total losses[1] across all sectors (Moreira, 2007). The observed losses across manufacturing sectors have led scholars to stress the salient issue of preparing for competition from China on the whole factor-intensity spectrum from high-tech to resource-based manufacturing sectors, before exposure to Chinese imports intensified (ibid).

The upward and growing trend of imports from China and the USA following the FTAs with USA (in 2004 and 2006 respectively) skyrocketed in 2012 reaching a growth of 650% (2003-2012) in the case of Chinese imports (UN Comtrade data). The manufacturing sector's GVA recorded a decline by contracting from 20% of GVA in 1999 to almost 11% in 2014 (World Bank data). The increase in imports and the decrease in manufacturing are two simultaneous trends with a negative association, which is empirically explored in the first theme of the Thesis.

The heterogeneous effects of trade from exposure to trade partners of a different income level and the contraction of manufacturing in Chile forms the basis of the research question of the first chapter of the PhD Thesis which is, to what extent Chinese and US import competition affects the manufacturing sector in Chile. The key contributions of the first PhD chapter are twofold: first the simultaneous integration with two very different economic superpowers has not been studied before for Chile. Second, the conditional effects of two different types of trade at the finest industrial disaggregation level with an emphasis on the opportunities posed by participation in GVCs (as a result of increased trade) are explored empirically for the first time.

Conceptual background

When selecting the theoretical framework for research questions pertaining to import competition the need to combine various trade theories is critical. In the case of trade relations between Chile and China, the ascent of China in world markets and especially the surge of Chinese imports into Latin America reflect elements of a broad range of theories. The emergence of China to the world's leading manufacturing exporter can be grounded

[1] Moreira (2007 p.366) notes that, the losses in "the low- tech category were likely to be much higher if it were not for distortions such as the Agreement on Textiles and Clothing (ATC) and LAC's protection of its

on Heckscher-Ohlin, Ricardian and Krugman's theoretical reasoning and can be analysed jointly from the factor endowment, productivity, and scale and government intervention perspectives, all these theories work together to support China's expansion in the world's manufacturing markets (Moreira, 2007).

In terms of endowments, with a population of 1.3 billion and a 640 million labour force, China has a massive comparative advantage in the production and export of labour-intensive goods. With China's wages well below the LAC levels this translates into enormous cost and price advantages for China when trading with countries such as Chile. Indicatively, on average Latin American and Chilean wages topped China's by a factor of 5 (Moreira, 2007). Imports in Chile from China rose by 800% following the bilateral FTA in 2004 (UN Comtrade data) which signals the growing trends in the position that China holds in LAC and in Chile specifically, both in terms of volume of imports and cost advantages. The second reasoning is grounded on Ricardo's explanation which is related to productivity and technology. The productivity differences between China and LAC countries are lower than the wage differences while the growth in labour productivity in China is growing much faster than in LAC. Although the trend can be a result of capital deepening, total factor productivity growth has also increased to estimates of 3% and above (Young, 2003). Chile is one of the best performers in the region with an average of 2% TFP growth which compared to the highest estimates of 3.4% for China signifies the high divergence in TFP trends between the two trade partners. The strong differences in productivity intensify the import competition effect.

The third theoretical block, which explains the surge of trade with China, is scale. With the largest population and area and also with an economy valued at 12.2 trillion US$ above the equivalent of the entire Latin American economy, the labour supply and production costs between China and Chile are expected to diverge. China's sheer scale provides a significant advantage in capital and technology intensive industries, which is evident by the surge of Chinese exports in low and medium technology goods. China is also benefiting from increasing returns associated with learning, knowledge creation and new technologies through FDI, which in turn further induces technology transfer and reduces entry barriers in technologically sophisticated industries. Finally, the Chinese

government's intervention[2] to promote industrialization and exports has been decisive, at a time when, as Moreira (2007) stresses, LAC countries "were busy dismantling the interventionist apparatus of the import substitution (ISI) era" (Moreira, 2007 p. 364). The above reasons that touch upon the three respective theoretical frameworks are potential explanations of the growing concerns regarding the challenge posed by Chinese trade for Chile's incumbent manufacturing industry.

A bird's eye view of the related literature

A review of the related empirical evidence has revealed the existence of two opposing camps. On the one hand, proponents of increased trade stress firstly the importance of increases in aggregate industrial productivity that stem from lower productivity firms exiting the market in light of competition pressures (Pavcnik, 2002). Second, they underline the innovation diffusion effects from the use of sophisticated imports that embody new knowledge and technology that raise domestic industrial competitiveness (Grossman and Helpman, 1991; Eaton and Kortum, 2002). On the opposite side of the spectrum the negative effects related to the contraction of domestic manufacturing output, employment, wage differentials as well as firm shrinkage or closure are attributed to import competition pressures and detected in both developing and developed countries.

Proponents of free trade have argued that import competition leads to adjustments across several dimensions. Within firms, reshuffling of resources and changes in product mix are found to adjust in response to increasing competition (Pavcnik, 2002; Bernard 2006). Within industries, firms exit from the market, follow defensive M&A strategies or promote product upgrading, as a consequence of intensified competition, which leads to higher industry-wide productivity levels. Across industries, shifts according to countries' comparative advantage are also detected with firms moving away from comparative disadvantage activities and towards comparative advantage industries (e.g. Bernard et al., 2006).

[2] Among these policies are "unlimited" supply of credit provided by state banks, a public funded national innovation system and other regulatory, financial and fiscal incentives to private firms and state-owned enterprises (SOEs) (Moreira, 2007).

The conundrum surrounding the import penetration literature, reaches out to the Latin American context, where contradictory outcomes are confirmed particularly in the case of Chile. Other studies conclude that import competition induces a positive aggregate productivity effect, product upgrading and positive effects on wages (Pavcnik, 2000). In contrast, studies using the exact same datasets but referring to different time periods, posit the negative association between import penetration and domestic firm survival, employment and productivity growth (Almeida and Fernandez, 2013; Pavcnik, 2002; Alvarez and Claro, 2009).

The lack of consensus regarding the actual benefits and losses in the performance of the competing industries raises concerns about the policy implications derived from research which are becoming increasingly 'politically dangerous to ignore' (Economist, 2018) especially when competition pressures translate into employment losses. In Chile the promotion and continuation of a prolonged period of free trade and investment agreements is central in the country's trade policy priorities and the implication in terms of the survival of the manufacturing sector and in terms of the challenges and opportunities offered in diversifying into more high value added activities, should be prioritized in light of the opening up to new trade linkages worldwide. Heterogeneity in the performance across industries from import competition pressures of two different trade partners is the link explored in the first theme of the Thesis.

2. Trade and regional growth

It is widely asserted in the theoretical debates that openness to trade and integration unleashes dynamics that will benefit regions in the long run. By acting as a conduit of productivity and efficiency gains via knowledge and technology transfer channels and by offering larger market access prospects, the growth returns from trade have received widespread attention in the literature and take center stage in the EU's political agenda (Krugman and Elizondo, 1996; Mankiw et al., 1992; Frankel and Romer, 1999).

The second theme of the thesis deals with detecting the regional footprint of deeper trade integration in Greece, and aims to uncover the decisive role played by the type of trade integration in shaping the growth trajectories of regions. By exploiting information on the economic development level of the region driving the asymmetries in growth returns, the

contribution aims to fill a conceptual gap in the literature pertaining to the uneven growth returns of trade across the regional income distribution.

A plethora of reports from the World Bank and the European Commission emphasize that trade acts as an engine of growth that creates jobs, reduces poverty, increases economic opportunity and leads to regional economic restructuring (World Bank, 2017; EC, 2015). Although the aggregate national trends seem to confirm these views, the sub-national distribution of benefits reveals a much more complex picture and has led to contradicting empirical conclusions.

Theoretical and empirical evidence on trade and growth

Within the European Union (EU) disparities in GDP per capita across member states declined from the 1990s onwards while, at the same time, regional disparities within member states (measured by the standard deviation of GDP per capital) continued to increase (Farole et al., 2011). The national aggregate trends seem to align with the dispersion forces of the neoclassical theories of convergence while the subnational regional outcomes seem to conform to the New Economic Geography (NEG) framework of core – periphery type of divergence patterns.

As Farole (2013, p.20) synthesizes, "regions further outside the core (that is, the periphery), are not only less able to take advantage of spillovers, but also more likely to be far removed from key infrastructural, institutional, and interpersonal links to regional and international markets". Therefore, the geographical pattern of core and peripheral regions is manifest in an economic pattern of "leading" and "lagging" regions (Farole, 2013). In an EU wide context more peripheral regions in the South of the EU (i.e. Greece) are expected to face considerable challenges pertaining to geography, scale and competitiveness as a result of strengthened trade relations with relatively more advanced economic partners of the EU core (Petrakos et al., 2012). From a macro efficiency perspective, even though aggregate growth may be enhanced and correlated with increased opportunities for agglomeration and innovation (Nello, 2012), the inter-regional disparities in output and income may mask economic stagnation that lead to polarization and threaten convergence processes as well as political and social cohesion.

Spatially-blind policies stress that trade and migration have been the main catalysts of economic progress supporting the aggregate efficiency argument within the efficiency versus equity trade off context. Expanding the scope to the regional growth predictions of theory, neoclassical perspectives predict a dispersion of economic activity through trade that leads to regional convergence (Senior Nello, 2012). The foundations of this theory explain that trade in goods between regions with different endowments of production inputs (e.g. skilled and unskilled labour, capital) equalises the relative wages and rates of return to capital. With and without factor mobility the theoretical predictions based on diminishing returns explain that trade will lead to factor inputs convergence and in turn to the equalization of factors' remunerations across regions and thus convergence in development levels (Senior Nello, 2012). From a neoclassical perspective we should therefore expect that trade will lead to enhanced channels of opportunity for peripheral regions which would lead to bridging the income gaps with the EU average. However, the empirical evidence does not seem to confirm the predictions of theory and point to uneven patterns of growth across EU regions and divergent development trends (see Monastiriotis et al., 2017; Petrakos et al., 2012; Rodriguez Pose, 2012).

To this end, newer trade theories are more aligned with the observed trends at the sub-national level. Relaxing the assumption of constant returns to scale and introducing the concept of increasing returns to scale, the endogenous growth theory and the NEG theory provide the foundations to explain the agglomeration of economic activity in certain regions and the intensification of core-periphery patterns across space even in the presence of trade and factor mobility (Iammarino et al., 2018). The prevalence of increasing returns to scale in investments in human capital and R&D produces virtuous cycles of productivity and growth. To the extent that regional growth depends on prior levels of investment, R&D expenditure and stocks of human capital, as the initial conditions matter, then the process of economic integration will lead to the concentration of technological innovation in core areas to the detriment of the periphery (Krugman, 1991). These predictions are more aligned with the observed realities and appear more powerful in explaining the lack of regional convergence in the EU.

The NEG theory goes a step further and explains that trade and factor mobility will lead to the clustering of economic activity in space due to the prevalence of economies of scale (internal and external) which, coupled with high specialized labour turnover in core

metropolitan areas and falling transport costs, will lead to regional divergence and the geographical polarization of growth and innovation (Krugman, 1991). In other words, trade integration gives rise to significantly differentiated effects at the regional level, as the trade diversion and market size effects that it entails can alter significantly existing (regional) comparative advantages and create new productivity or agglomeration advantages that may be distributed unevenly across space (Rodríguez-Pose and Gill, 2006). As per the predictions of the traditional H-O based models, increases in trade may lead to declining disparities if capital and investment are attracted to areas with a lower cost base and if labour migrates to higher salary regions (e.g. Rodriguez-Pose and Gill, 2012). To this end, Paluzie (2001) provides evidence that the opening of a closed economy brings regional polarization due to "labour mobility acting as a force working in favor of industrial agglomeration" (Paluzie, 2001 p.82). This force is responsible for generating the unequal geography within a country and argues that trade liberalization actually reinforces an internal core-periphery pattern.

It is therefore not surprising, that economists generally perceive integration-induced trade effects to be one of the main determinants of industrial adjustment in the EU. Brülhart and Elliot, (1998) state that, against early predictions, the implementation of the single market did not entail an increase in inter-industry adjustment. In the first stages of the single market programme in 1992, prominent economists anticipated that the pressures for industrial re-structuring among EU countries would be considerably stronger than during previous episodes of European integration. Krugman (1987, p. 364) analysing those developments had emphasized: "The question now is whether the further expansion of trade in progress will be equally easy to cope with. The unfortunate answer is, probably not".

Greece: A general context

The accession of Greece to the EU (then EEC) in 1981 amidst economic recession raised concerns regarding the (in) ability of the Greek economy to compete successfully in the common market and generated skepticism regarding the impact of EU membership (Petrakos et al., 2012). The competitive pressures in import competing sectors combined with the removal of protectionism and the peripheral geographical position of the country

did not allow the development of economies of scale that would increase competitiveness of Greek firms and led to the loss of competitive advantages (Petrakos et al., 2012).

The deepening of the EU integration process following Greece's accession into the Eurozone revealed the catalyst role played by the reduction of the transaction costs in expanding trade with the EU (Petrakos and Psycharis, 2016). The strengthened trade relations with the EU facilitated an upsurge of imports (from 19 billion US dollars in late 1990s to 34 billion in 2008[3]) leading to a widening of the trade deficit with substantial implications for the performance of regional industries, employment and growth prospects. At the same time, trade with non-EU counties and overall openness was also increasing (Tsiapa, 2019) and is expected to have a heterogeneous effect on different income level regions

The theoretical postulations are validated by empirical evaluation producing an array of studies that detect the regional footprint of increases in trade. The effects of both global trade and EU trade have led scholars to examine the direct links which appear to be highly conditional upon region-specific characteristics, geography, the sectoral composition of trade flows and highly influenced by the stages of the economic and business cycle of the country in question (e.g. Rodríguez-Pose, 2012; Monastiriotis et al., 2017; Petrakos et al., 2012; Petrakos and Psycharis 2015).

The sub-national investigation of the distribution of benefits and losses from trade has 'fueled' empirical research detecting the interplay between trade and the spatial patterns of regional GDP growth and regional inequalities (Rodriguez-Pose, 2012; Petrakos et al., 2012; Monastiriotis et al., 2017; Ezcurra and Rodriguez-Pose, 2014). Although studies find that economic convergence among economically advanced countries can be a result of strengthened trade relations (e.g. Ben-David and Lowey, 1998) the convergence with poorer countries is not confirmed, while the subnational regional income convergence is questionable and understudied.

The direct causal link between trade and regional growth seems hard to find in the literature and the lack of consensus underlines the difficulties in disentangling the true

[3] Data provided by Eurostat (International Trade database) https://ec.europa.eu/eurostat/web/euro-indicators/international-trade

effects of trade from other concurrent factors, which are acting at the same time. Empirical evidence has emphasized that the effects of economic integration are spatially inequitable (Monastiriotis et al., 2017; Rodríguez-Pose, 2006). The hypothesis leading to such empirical investigations incorporates elements from theory i.e. new economic geography and the observed trends in economic divergence at the EU subnational level. Considering that there are almost as many studies which highlight that increases in trade bring about regional economic convergence as those that point to the opposite direction (e.g. Brülhart, 2011), the debate remains unresolved and increasingly more relevant in a world of rising anti-globalization political narratives (Rodríguez-Pose, 2018).

Studies on the effects of deepening EU integration suggest that economic restructuring was growth-inducing but further integration reflecting high exposure into a competitive market did not promote growth for disadvantaged regions in CEECs (Monastiriotis et al., 2017). The uneven distribution of benefits from EU integration in favour of more central, service based and denser regions coincided with a significant widening of regional disparities and persistent polarization in EU New Member States (NMS) (Monastiriotis et al., 2017). Evidence challenging the neoclassical predictions for growth has shown that, the deeper integration of the industrial sector into the EU economy coincided with a severe contraction of manufacturing activity in Greece (Petrakos et al., 2012).

Peripheral EU regions (with a weaker industrial structure compared to the EU core) suffer disproportionately from the process of EU integration due to competition pressures (Petrakos et al., 2012). Scale economies do not seem to shield peripheral regions, not even in the case of regions positioned on the top ranks of the income distribution in Greece, which is empirically explored in the second chapter of the thesis. The latter is in line with the assumptions that peripheral and less-advanced EU regions are unable to compete (successfully) with their more advanced counterparts in capital-intensive and knowledge-intensive economic activities (Brülhart and Elliott, 1998). In order to clarify what is meant by periphery and core in the context of the Thesis it is essential to establish that a core region in a peripheral country such as Greece is still considered peripheral within the EU wide context.

Therefore, the dynamics unleashed from the surge of EU trade will have an impact on Greek regional economies following the rationale of peripheral economies exposed to trade

with industrially more advanced economies of the EU core. De-industrialization phenomena are more evident in the industrially more advanced regions in the EU periphery i.e., the regions that produce the greatest part of the national industrial gross domestic product (GDP) (Kallioras and Petrakos, 2010). The latter, is in line with the hypothesis of the second chapter of this Thesis concerning the stronger impact of EU trade integration on high-income regions in Greece, which are assumed to be exposed to import competition effects more than poorer regions.

Seeking to answer the question of whether trade integration leads to output synchronization and in turn to assess whether EMU is an optimum currency area, Caporale et al., (2015) conclude that more intense intra-EMU trade flows do not guarantee more convergence among countries in the Euro area and lead to intensified core periphery patterns raising concerns of financial stability. Partly attributed to difficulties in measuring trade at the sub-national level and due to an emphasis on the aggregate outcomes in many recent contributions in the mainstream trade literature (Caporale et al., 2015; Arghyrou and Bazina 2003; Mion and Zhu, 2013) the regional aspect has been overlooked. The heterogeneous effects of EU trade integration versus global trade at the EU sub-national level remain imperfectly understood – this is the gap addressed by the second chapter of this thesis. The opaque picture resulting from seemingly divergent interpretations of the phenomenon of expanded trade is a challenging field for both the existing empirical investigations and the future design of the EU Regional Policy agenda.

The main contribution forming the novelty of the second chapter of this Thesis is the empirical investigation into the asymmetric trade effects of three types of trade integration (EU trade, non-EU trade and global trade) across the regional income distribution in Greece which to the best of our knowledge has not been studied before. The findings shed new light on how the development level of the region determines the level of benefits or losses from trade integration and which type of trade integration is more conducive to growth for each type[4] of region. The latter findings give rise to policy implications that may inform future trade policy agendas at the EU and national level in order to mitigate negative competitive pressures from trade and enhance the growth-inducing impact of trade for peripheral regional economies.

[4] The 'type' of region in this case refers to the income level of the region, which is employed in the quantile regression analysis.

3. Outward investment and the occupational structure of regional labour markets

The third chapter analyses the next critical element of the EU integration process, which is the cross-border internationalization of firms linked to the upward trends in outward foreign direct investment (OFDI) and aims to detect the geographical footprint in terms of employment responses for the home economy. In Greece, the upsurge of OFDI reflects the catalyst effect of the *widening* of the EU integration process (EU enlargements in 2004 and 2007) and the *deepening* in terms of the completion of the monetary union and Greece's accession to the Eurozone (Labrianidis, 2001; Tsitouras, 2016). The interplay between OFDI and regional labour markets is the focus of the third chapter of this Thesis. The occupational structure at the regional level is assumed to be affected by shifts in the demand for specific types of skills as a result of the internationalization of firms in the "sending" regions, which shapes the regional transformation processes in terms of the skill composition.

FDI defined

It is important to clarify the definition of FDI before discussing in detail the research questions and the key variables of interest. Dated back to the seminar work of Hymer (1960), international investment falls under two categories: international portfolio investment and foreign direct investments. While international financial investment (or international portfolio investment) is investment undertaken for purely financial reasons (such as the acquisition of shares in the foreign company) this type of investment does not give control or a lasting interest in the management of the company (Ietto-Gillies, 2012). However, when the investment is large enough to give a controlling and long-term interest in the acquired company then it is considered foreign direct investment (Ietto-Gillies, 2012). This is the definition followed by UNCTAD[5], OECD and the Bank of Greece in measuring and publishing OFDI flows and stocks which is based on the 10% ownership of the affiliated/subsidiary firm in a country abroad. FDI is thus the mode by which companies acquire assets abroad and defines the modality of the Multinational Enterprises (MNEs). The modes of OFDI can take the form of cross border mergers and acquisitions (M&A) of an existing company in a foreign country or by establishing an entire new entity

[5] *World Investment Report 2019*

which is termed greenfield investment and is the result of what Ietto-Gillies (2012) refers to as the organic growth of the company.

OFDI data in Greece are reported in flows and stocks. The flows refers to the yearly value of investments based on balance of payment statistics (Bank of Greece, 2019) and includes: the net capital contribution by the direct investor in the form of purchases of corporate entity, new equity issues or the creation of companies, the net lending by the parent company to the subsidiary and the reinvested earnings.

Theoretical and empirical evidence of OFDI in host economies

The academic literature has generally focused on the FDI outcomes for the host countries. However, a large and flourishing volume of literature is devoted to the intricate issue pertaining to the effects in the home country and investigate how domestic economies respond to the fact that national firms become increasingly multinational (Navaretti and Venables, 2005; Elia et al., 2009; Mariotti et al., 2004). The national level analysis on the occupational outcomes grew rapidly, however, the subnational and regional level analysis not only remains scarce but is limited to three studies worldwide (Elia et al., 2009; Mariotti et al., 2004; Gagliardi et al., 2015). The concern is to what extent OFDI relocates production and employment from the home country abroad, reducing home activity (Navaretti and Venables, 2005). There is consensus that the immediate impact is generally true (Gagliardi et al. 2015; Elia et al., 2009) but the longer term effects at the firm level and the home economy remain opaque and are the complex object of empirical research.

The empirical evidence on the impact of outward FDI on domestic employment explores the extent to which foreign activities on the one hand may substitute the parent's domestic employment or on the other hand complement it (e.g. Mariotti et al., 2003; Castellani et al., 2008). The theoretical underpinnings pertaining to the decisive role played by the typology of OFDI driving the employment outcomes are grounded on the following reasoning. The assumption is that when a MNE undertakes a cost-efficiency FDI, the labour-intensive activities are likely to be transferred to lower cost countries; this shifts the demand for specific skills (i.e. routine occupations) affecting regional labour markets and industrial sectors that are more exposed to OFDI (Gagliardi et al., 2015).

A review of the related literature reveals that not all types of OFDI will equally influence the domestic skill composition, stressing the decisive role played by the destination of OFDI. This in turn, will heterogeneously impact on the dichotomy of low versus high skilled workforce with the former being more likely negatively affected (Castellani et al., 2008; Elia et al., 2009; Gagliardi et al., 2015). Although the evidence does not converge into one commonly agreed finding across countries, the vast majority of the related studies suggests that the geographical fragmentation of production within the Multinational Enterprise (MNE) reduces the demand for the unskilled labour, when OFDI targets low cost economies or developing countries (Blomström et al., 1997; Mariotti et al., 2003; Castellani et al., 2008 for Italy; Ekholm and Hakkala, 2006 for Sweden). The demand for skilled labour can either increase or decrease depending on the host country. The benefits are described in terms of cost efficiency strategies creating adjustment margins of higher productivity of offshoring firms and regions leading to skill upgrading when investments target specific blocks of countries such as the CEECs (Castellani et al., 2008). More recent studies also stress the skill premium increases from investments towards developing and emerging markets (Mion and Zhu, 2013; Gagliardi et al., 2015) attributed to 'the capitalization of efficiency gains' by retaining the most productive activities at home thus producing virtuous cycles of productivity and domestic employment (Gagliardi et al., 2015 p. 16).

The debate on the employment outcomes for the home economy dates back to the '80s when increasing concerns stemming from the newly established free trade and investment agreements (such as NAFTA), the upsurge of outsourcing towards the CEECs from firms of the EU core (Agarwal, 1997) and China's phenomenal rise in attracting global investments in manufacturing (Hsiao and Hsiao, 2004) fueled a public, political and academic debate on the unemployment in specific industrial sectors that were rapidly internationalized (Campbell and Mc Elrath, 1990). This is expected to have a strong and spatially uneven footprint for regions with high concentrations of investing industries being more exposed to the offshoring trends.

Greece: A general context

Greek investments have targeted the wider area of the CEECs, but the vast majority of them are located in the Balkan countries (Bitzenis and Vlachos, 2013). The upsurge of

outward investments is evident from the sharp climb from 7 billion US dollars in 2001 to 47 billion in 2010[6]. The surge of outward investments to the Balkans intensified in anticipation of, and following the accession of, Bulgaria and Romania to the EU (in 2007), signifying the importance of the opening up of the markets in the Balkan macro-region and the enlargement waves towards CEECs (Bitzenis and Vlachos, 2013). While before 1998, the manufacturing industry was dominating, after 2000 a dynamic increase in telecommunications and financial sectors was recorded. The MNEs originate mainly from public sector enterprises (telecommunications, banks) and secondly in the food and beverages sectors, followed by construction, textiles and apparel, high technology, petroleum and metals (Labrianidis, 2008; Kapitsinis, 2017).

In the aftermath of the 2007 global economic crisis (from 2011 onwards) the drop is attributed to the large disinvestments with Greek MNEs selling their foreign affiliates to cover costs of the parent company (Bitzenis and Vlachos, 2013). The large relocation is expected to affect employment and specifically certain types of occupations, which forms the basis of the core research question of the third chapter.

By unveiling the drivers and incentives of the internationalization strategies of Greek OFDI, the analysis of the third chapter of the PhD aims to shed light on how the outward foreign direct investments determines the employment outcomes in the regions most exposed to the OFDI rising trends. In order to unleash the employment- reduction effect of the foregone investment and the spatial footprint of the relocation of firms, the resource-seeking versus market-seeking types of OFDI are expected to produce heterogeneous effects on the demand for workers and specifically on certain types of occupations affecting the skill composition of regional markets. The empirical investigation into the skill composition effects of increases in OFDI at the regional level, is to the best of our knowledge, assessed for the first time in the case of Greece and forms the key contribution of the third chapter.

[6] UNCTAD (https://unctad.org/en/Pages/DIAE/FDI%20Statistics/FDI-Statistics.aspx)

III. Structure of the thesis

In the following, I provide brief summaries of each paper's context, contribution, method, and results. This thesis consists of three papers.

Paper 1. The impact of Chinese and US import competition on domestic manufacturing; Evidence from Chile

This paper explores the effects of import competition on the manufacturing sector in Chile following the implementation of the country's two most important Free Trade Agreements (with the USA and China). Exploiting cross-industry variation in import exposure, the empirical analysis detects the effects of import competition across three dimensions namely manufacturing sales, manufacturing employment growth and labour productivity. The analysis is conducted at the finest level of industrial classification (4 digit ISIC level) and finds, first, an overall negative effect of increased Chinese import penetration, owing to substitution effects from low- and medium-tech imports and a less pronounced effect from USA imports. By introducing interaction effects to assess the importance of specific industry characteristics I find that the levels of foreign investment and the export intensity of the domestic industries reverse the negative effect due to the opportunities offered via participation in global value chains. The assumption that certain characteristics 'shield' industries from competition and offer opportunities via integration in the global economy is confirmed. An instrumental variable strategy is applied to address standard endogeneity concerns and confirm the robustness of the estimates.

Paper 2: The heterogeneous effects of trade integration across the regional income distribution: evidence from Greece

There is growing scepticism regarding the ability of peripheral regions to adjust to increased trade competition in an ever more globalised economic landscape. The potential geographical unevenness in the distribution of benefits and losses from trade may significantly undermine the growth prospects of specific regions, increase vulnerability in periods of crisis and interrupt the regional convergence process within the EU. This paper examines the link between increased trade and regional GDP growth across the regional income distribution in Greece during the post-EMU period incorporating the crisis period (2000–2013). With the use of quantile regression techniques, panel fixed effects and

system generalized method of moments (GMM), I disentangle the effects of EU trade versus global trade at several points of the regional income distribution to identify differences in trade elasticities. The analysis aims to overcome the limitations of existing empirical literature that underscore the differences in growth returns of high and low income regions. The analysis confirms the hypothesis that the impact of EU trade is highly heterogeneous and contrary to the prevailing view appears negative for the more economically advanced regions. In contrast, the effects of EU trade display insignificant results for the lower income regions, attributed to the absence of direct substitution effects while non-EU trade appears beneficial for medium income regions. A rich vector of growth determinants offers additional robustness to the results and insight for policy recommendations.

Paper 3: When the periphery invests in the periphery: Outward FDI and the regional skill composition in Greece

The third paper empirically investigates the link between increased outward foreign direct investment (OFDI) and the evolution of the occupational composition at the regional level for Greece. In recent years Greece has become a prominent international investor in the Balkan macro region and represents a manifest example of a peripheral European economy investing heavily in other EU peripheries. Using a fine-grained regional dataset for the period 2003-2015, the study reveals how the increased OFDI conducted by Greek firms has been connected to important declines in routine jobs, particularly in certain Greek regions. By contrast, Greek OFDI in neighbouring countries has had a positive and significant effect on non-routine occupations. This implies that Greek OFDI may be unleashing greater job polarization in the country by heterogeneously affecting certain types of occupations. As these occupations are unevenly distributed within Greece, the consequence is also a greater territorial polarisation in terms of skills. The study concludes by offering insight into the design of future regional public investment programmes targeting the most affected regions.

IV. Overall Conclusion and Policy Implications

This thesis explored the interrelated themes of trade and cross border investments in separate analytical papers unveiling the corresponding industry level and spatial implications and presents the empirical explorations of the relationships.

The key findings across the thesis cast new light on the strong relationship between economic globalization phenomena of trade and investment and the within country distribution of benefits and losses. The associations presented suggest that there is a considerable heterogeneity in the responses to trade and investment in terms of industrial performance, regional growth and local labor markets.

Free trade agreements have major implications conditional on the ability of the domestic industry to exploit opportunities from the participation in global value chains. The analysis proposes that foreign investment and the export orientation of the industry may act as conduits of benefits from trade. These characteristics play a role in both shielding and expanding the industrial capacity in light of deeper trade with economic superpowers such as China and the USA.

The policy implications derived after considering the significant positive impact of import penetration on industries more integrated in global value chains. Industrial and trade policies in Chile that support and promote firm exporting strategies should have a focus on incentivizing domestic enterprises to diversify into higher value added manufacturing, and also aim to strengthen the highly exposed competing industries in medium-tech sectors. These sectors face more fierce competition from trade with low cost production countries that exhibit large scale economies such as China. The need to reverse the negative effects on output and employment should be prioritized. In the case of Chile policies promoting higher skilled-industries must be promoted, which in turn will attract FDI in more skill-intensive sectors, which could ensure participation in the higher value-added fraction of global value chains.

Globalization and the asymmetric effects on specific type of industries need to be the backbone of future policies, as the uneven distribution of gains and losses gives rise to inequalities and questions the merits of globalization. The extent of the unevenness has led

to the debate of whether it is globalization or the reforms that have failed (Stiglitz, 2011). Global trade and the process of economic globalization pose severe challenges by intensifying competition in the global market place. Prominent scholars explain that inequalities between developed and less developed countries are not only a result of disparities in capital and other resources, but mainly reflect gaps in knowledge (Stiglitz, 2002; Persaud, 2001). Public policy in affected countries should seek to design strategies on how to bridge the gaps and to "promote technology, enhance their competitiveness, increase their exports and their ability to compete with foreign imports" (Stiglitz, 2002 p.15).

With market failures in information and knowledge manifesting worldwide the need for industrial policy intervention is becoming essential to enhance the efficiency of markets. The information imperfections have shown that the invisible hand "is becoming even more invisible as if it was never there" (Greenwald and Stiglitz 1986). Therefore, targeted industrial policies to promote investments in knowledge, the development of new modes of production and new products with a strategic focus on the economies of innovation should be the center of growth and development strategies.

With innovation generating enormous externalities, the large uncertainties associated with innovation technology should be mitigated with the support of the financial and insurance sector in incentivizing national industrial upgrade schemes. As Schumpeter emphasized "the importance of capital market imperfections is non negligible, since investments in research are typically not collateralizable" (Stiglitz, 2002 p.16). Therefore, modern economic theory has created a strong presumption for the role of government, which needs to prepare countries for the deeper trade integration into the world economy (Rodrik, 1997; Stiglitz, 2002). Chile represents an example of a country that requires a clear targeted public policy, which that should have prepared the domestic industry for the accession to free trade agreements. With trade acting as a conduit of information and knowledge that could generate innovation, the appropriate public policies could level the playing field (before entering into agreements) and mitigate the substitution effects, which seem to outweigh the benefits from trade. Government intervention should identify the areas that need to be promoted such as human capital in order to increase the returns from investment in education and research and re-direct inward FDI into high value-added and high skill functions to enhance competitiveness. Research on Chile specifically concludes that the

scarcity of human capital impeded product upgrading -which could have otherwise occurred from the exploitation of cheaper and more advanced imports- (Alvarez and Claro, 2009) signifying the need for public policies in the direction of education and research.

As stressed in the related literature the aggregate gains from trade may be positive but the costs of the distributional consequences from trade and the medium-run equity concerns, call for immediate attention as the adverse effects on employment, wages and production may "contribute to public ambivalence toward globalization" (Autor et al., 2013) which in some cases could threaten political and social stability. It is of critical importance that policy makers establish that globalization is not panacea for socially equitable growth, and policies are required to address the inefficiencies and uneven distribution of benefits across sectors of the economy and cohorts of the population. The potential competition effects stemming from exposure to trade partners of different degrees of scale, technological sophistication and productivity, are linked to the trade-off between efficiency and inter-territorial equity that may contribute to sub-national growth inequalities (Farole et al., 2011).

The empirical analysis has also detected within country heterogeneous effects from trade across regions examining the case of Greece. The main findings point to a significant unevenness of different types of trade integration for high, medium and low-income regions in promoting growth. The main contribution to the empirical literature is that more economically advanced regions seem to suffer the most from the deepening of EU trade integration. In terms of the policy implications, considering that the more advanced regions in Greece are expected to compete with the advanced EU imports to a greater extent than the poorer (sheltered) regions, they require tailored policy intervention and should be placed high in the political agenda of the future public investment programs. However, it is of outmost importance that the less developed regions must not be ignored to ensure a balanced, integrated spatial development policy and to achieve better outcomes in terms of regional convergence.

The heavily discussed re-structuring of the Greek industry should finally come into concrete action with specific measures to diversify the domestic industry into the production of higher value added products and be strengthened by scale effects in order to increase competitiveness and branch out into European and global value chains via long

term and targeted policy interventions. This could offer a new opportunity for upgrade and establish: firstly, new corridors of technology and knowledge diffusion and secondly offer new market potential for more competitive Greek exports, rendering the trade effect more growth inducing than growth impeding.

By combining elements of geographical economics, institutionalist social science and endogenous growth theory (Farole et al., 2011), the aim of regional policies and the public investment program in particular should be a tailor made strategy designed on the basis of the typology of regions by taking into account the asymmetric effects of trade as proposed in this study. The agglomeration of economic activity in the upper quantiles of the regional income distribution in Greece determines the magnitude of the tradable sector and in turn the heterogeneity of the exposure to trade, which affects the long term growth performance. The proposed 'place-sensitive distributed development policy' (Iammarino et al., 2018) should 'strengthen Europe's strongest regions and develop new approaches to promote opportunity in industrial declining and less-developed regions to promote the convergence process between regional trajectories' (Iammarino et al., 2018 p.1).

Another critical dimension of the EU integration experience is the detection of changes in the occupational composition at the regional level as a result of increased OFDI activity in Greece. The conclusion that regions more exposed to increased investment abroad have a significant and negative effect on routine occupations uncovers a destruction outcome on certain types of occupations. The findings also revealed a positive effect on non-routine occupations owing to potential efficiency-enhancing gains of investing firms related to the internationalization process. The latter suggests that OFDI has a significant spatial footptint in generating asymmetric effects on the typology of workers in regional labour markets.

The disadvantages for a specific typology of workers may lead to distributional consequences that affect the offshoring regions disproportionately (Gagliardi et al., 2015). The internationalization of production and technology diffusion that spurs convergence at a cross country level may lead to job polarization and divergent trends sub-nationally (Iammarino and McCann, 2013). In the case of Greece, the large investments abroad originating mainly from the Northern border regions to the Balkans led to the reduction for the demand of low skilled workers that require renewed policy attention. Actions such as

training and re-training employment schemes as well as income support schemes for the most affected regions and cohorts of the population, should become a priority. Most importantly as this employment and skill composition effect is linked to the offshoring of the routine fraction of the production due to fiscal and financial incentives offered in neighbouring countries, specific motives to increase competitiveness and a more stable corporate tax, regulatory and national insurance policy in Greece should be promoted to create incentives for the expansion of production in home regions. The latter should be accompanied by policies that will enhance the whole socio-economic environment by stimulating domestic demand, by improving levels of social trust, by addressing the high level of bureaucracy, and the huge difficulties in accessing external finance to ensure a required level of economic stability. The aim should be to enable investing industries to internalize productivity gains stemming from the geographical rationalization of their production (Gagliardi et al., 2015) and produce virtuous cycles of employment generation and investments in scale economies and higher value-added activities.

Overall, the main outcomes of the Thesis highlight the need to complement trade integration policies with domestic industrial and region-specific restructuring policies. The industrial and regional policies should be implemented before the enforcement of free trade policies or the deepening of the integration processes in order to prepare the most affected domestic industrial sectors and the most exposed regions for the upcoming competition and allow for knowledge and market potential benefits to manifest. The timing and sequence of such policies is critical in preventing negative substitution effects from trade to prevail. Finally, the study of the Greek case reveals the strong interplay of how trade and the internationalization of production affect regional growth and the evolution of regional labour markets with respect to occupations. The globalization processes are opportunities for growth, technology and knowledge diffusion and these positive effects should not be offset by the negative effects that manifest in 'unprepared' regional contexts. By producing an uneven spatial distribution of the benefits and an unfair distribution of costs, the convergence processes (if any) are first at risk and secondly can prove to be economically, socially and politically dangerous to ignore (Economist, 2018).

V. Limitations to the research

Data related: A number of limitations in the research pertaining to data availability form some of the caveats of the research. Firstly a more detailed analysis at the firm level (instead of the industry-level analysis) would add more precision to the estimates. Secondly, although the import penetration variables and the dependent variable are at the finest level of industrial disaggregation (the 4 digit ISIC classification), a firm level analysis would address more detailed levels of heterogeneity and capture the import penetration effects for specific types of firms; it would also allow for a detection of firm entry and exit from the market and general industrial dynamics. However, the data available from the Statistical Office of Chile and the firm census (ENIA[7]) do not allow an annual observation at the firm level as the survey deliberately alters the firm unique identifier from year to year so that the same firm cannot be tracked for confidentiality reasons. Therefore, a panel analysis was not feasible and I resorted to aggregating firm level data at the finest level of industrial disaggregation. Moreover, raw OFDI data at the regional level were not available as there is no dataset at the sub-national level with data on OFDI flows or stocks in Greece. Further, a firm level analysis was not feasible due to limitations and missing consistent annual values on financial and sectoral level data of the investing firms from Orbis and Amadeus.

Import proxies: A considerable improvement to the current analysis would be a clear distinction of the effect of increases in import penetration in intermediate inputs. Since studies have shown that access to cheaper imported inputs can raise productivity via learning, variety and quality effects (Kasahara and Lapham, 2013; Grossman and Helpman, 1991), ideally the analysis should assess this effect separately. An even more accurate method would be the use of input-output tables by industry; however, the latter is not available by the National Statistical Office of Chile, while values in intermediate inputs were not consistently reported by product category in the UN Comtrade database. Consequently, jointly exploiting the variation in trade integration by industry and the sectoral level performance indicators at the same industrial category is the best alternative proxy considering the availability of data.

[7] Encuesta Nacional Industrial Anual (ENIA) is the firm census provided by the National Statistical Office of Chile.

Econometric estimations: Issues pertaining to endogeneity and reverse causality have been to an extent addressed by the employment of IV estimations strategies, however, threats to internal validity may still be present. The empirical investigations thus aim to uncover associations and not causations which would require experimental or quasi-experimental methods that often require data at fine levels of disaggregation that are not always available (i.e. very disaggregated spatial scales such as electoral wards ext.). Moreover, although the parameter heterogeneity across the income distribution is detected with the use of quantile regression techniques which adds robustness to the estimates, the relationship described is still an association and does not follow strict causal inference methodologies.

Unit of analysis: The observation of key variables in multiple spatial scales is a challenge in empirical studies conducted at the sub-national level. Although a rich set of controls was used in the econometric estimations, additional socio-economic variables could contribute to the robustness of the estimates but are not always recorded at the NUTS III level by Eurostat or national statistical offices. Lastly, the data used for the empirical analyses refer to administrative regions and the corresponding data are shaped by the administrative boundaries defined by statistical and administrative authorities. However, the NUTS II and III as spatial units of analysis is meaningful as they constitute the geographical level at which regional development policies are designed and implemented.

OFDI proxy variables: Although the study on regional OFDI is conducted using the actual amounts of outward FDI flows at the two-digit industry level, the data structure in the third paper does not allow us to distinguish between greenfield projects and Mergers and Acquisitions (M&A). The latter could potentially offer useful insight in disentangling the different effects on the demand for certain types of occupations in the home sending regions, stemming from different types/motives of investment strategies.

Future research:

Future research in the field of import competition should look further into the evolution of the competitiveness of exports as a result of the deepening of integration. If the firm census data are enriched with information on i.e. R&D expenditure data by firm it would allow us

to detect knowledge or technological diffusion channels from technologically advanced imports. Research questions related to how high-technology exports have responded to increased import penetration would extend the current analysis and may be complemented with an assessment of the role played by the local and regional environment and the assessment of public investment policies in promoting trade-related actions in order to allow industries and regional economies to upgrade and capitalize on deeper economic integration.

Further research should explore the way trade-induced industry-specific shocks and regional employment interact and what is the compositional nature of employment responses (i.e. low- versus high-skilled labour) in transforming regional labor markets. Moreover, a meaningful task for future empirical contribution would be the replication of the econometric investigation in different contexts to assess the validity of the current study and to derive evidence for cross-country and cross-regional comparisons of the EU trade integration experience.

Furthermore, quasi-experimental settings would enable future research to address issues of causality more directly. Future research employing micro-level data in combination with qualitative approaches could offer a new avenue of empirical investigations and shed light into dimensions of heterogeneity that will better explain the interplay between firms, regions and households to inform future regional policies aiming to tackle the most affected regions.

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1. The asymmetric effects of Chinese and US import competition on domestic manufacturing: Evidence from Chile

1.1 Introduction

The global trade landscape has undergone significant transformations in the past decade, owing to the proliferation of free trade agreements (FTA) that accelerated the economic integration process across continents. The trade policy reforms in Latin America, China's WTO accession in the early 2000s and the expansion of transportation links connecting the South Pacific coast with Asian countries have played a catalyst role in fuelling trade flows (Rosales and Kuwayama, 2012). The topic of Chinese trade has produced an unprecedented number of studies on the potential effects regarding the deindustrialization of other countries (Wood and Mayer, 2009). The current study is not another analysis solely on the effects of Chinese trade but aims to go a step further to detect and thus propose ways of shielding domestic industries from potential import competition threats.

Intensified competition is expected to alter the dynamics for the incumbent industries and raises concerns regarding the long-term performance of the domestic manufacturing sector (Autor et al., 2013). The economic impacts from free trade, which have been hotly debated for decades, are receiving revived attention in the literature, due to the emergence of mega regional trade deals such as the TPP[8], TTIP[9], TiSA[10] and the new strategic bilateral FTAs worldwide (i.e. EU-Japan FTA signed in 2019). These trade agreements often span over several continents and jointly account for over 80% of global trade (WTO data). The rapid expansion of China's trade and transport corridors through a series of infrastructure investments known as the Belt and Road Initiative[11] and the rise of e-commerce has fuelled a phenomenal increase in global trade flows. The expansion of trade relations between economic superpowers such as China and the USA with much smaller countries that only recently accessed the OECD (such as Chile) offers a new avenue for the empirical investigation into the incumbent industry's' responses to increased trade exposure.

[8] Trans-Pacific Partnership,
[9] Trans-Atlantic Trade and Investment Partnership
[10] Trade in services Agreement
[11] B&R initiative is China's ongoing infrastructure strategic plan of a web of airports, deep-water ports, transnational links connecting ports with railways; fiber-optic networks, highways, and oil and gas pipelines that will create trade corridors to connect South Africa with the EU and the Pacific with Asian countries.

Chile presents an informative setting in examining import penetration dynamics as it is considered one of the most outward-looking economies in the world, having signed 26 FTAs with over 60 countries globally and is regarded as the most integrated country among the Latin American countries (ECLAC, 2018). The analysis of the dynamic effects of trade in Chile serves also as a showcase for other Latin American countries embarking on similar policies. The vast majority of the existing research has focused predominantly on the effects of import competition in advanced economies such as USA, Belgium, Canada and other EU countries (Autor et al., 2013, Mion and Zhu, 2013; Nitsh and Sturm, 2005) while a much smaller fraction is devoted to developing[12] countries. The scarcity of evidence in the Latin American context reveals that import competition concerns are receiving a heavier political weight in the developed world compared to lower income countries at a time when trade in emerging countries is rapidly altering the dynamics for the domestic industry.

With the aim to fill the empirical and conceptual gap, the selection of the study period focuses on the years following the two most important FTAs in terms of market share and trade volumes. Furthermore, the existing studies on the Chilean experience analyse the period up to 2000 (Pavcnik, 2000; Alvarez and Claro, 2009), before the large wave of imports attributed to the FTAs, took place. The FTA between Chile and China entered into force in October 2006 and extended zero duty treatment phase by phase covering 97% of products (Office of the US Trade representative, 2016). Regarding the composition of trade, Chile imports heavily in the manufacturing sector from China (i.e. electrical equipment, electronics and textiles/apparel) and exports products of the extractive industry. The sectoral composition of Chilean exports relies heavily on the extractive industry, which has raised concerns regarding the increased 'primarization' of the country's exports (Edwards and Jenkins, 2015).

Apart from China's economic expansion into new markets in Latin America, the USA has actively engaged into free trade agreements especially with Chile and Peru. The United States-Chile FTA entered into force in 2004 and eliminated tariffs and reduced barriers for

[12] Chile was the first South American country to become a member of OECD in 2010. Chile was considered developing during the largest part of our period of analysis.

trade in services reaching a 100% duty-free entry of U.S. exports[13] fuelling a significant rise of imports in Chile (Office of the US Trade representative, 2016). The strong trade relations of Chile with economic superpowers outside the LAC region (mainly USA and China) is evident by looking indicatively at a snapshot for year 2013. In that year Chile sent around 45% of its exports to Asia, 14% to the European Union and 21% to NAFTA countries (mainly the USA), while the rest targeted Latin America (DIRECON[14], 2015). Within the analysis period imports from China increased by 800% and by 222% from USA signifying the catalyst effect of the implementation of the FTAs in the escalation of trade volumes.

This study aims to detect the heterogeneous effects of import penetration from China and the USA, on the domestic manufacturing sector in Chile. By examining the period following the substantial increases in trade, the analysis uses cross-industry variation in import volumes to detect the effects on domestic sales, employment and labour productivity. The focus on manufacturing is perceived in empirical studies (i.e. Autor et al., 2013; Bernard et al., 2006; Mion and Zhu, 2013) as the diffusion channel of the trade integration dynamics to the real economy. The focus on the manufacturing sector is justified on the grounds of the strong employment effects it entails, the displaceable nature of its activities, the 'tradable character of its products and the multiple linkages it retains with the other sectors of production' (Petrakos et al., 2012 p.347).

With the empirical evidence standing far from a consensus, the challenge for a clear assessment of the benefits versus losses should emanate from the identification of the actual sources of opportunities and threats. Departing from this claim, our analysis goes a step further and contributes to the existing literature by exploring the potential benefits stemming from the participation of Chile in Global Value Chains (GVC) that are underscored in the existing literature. By using the within industry variation in export intensity and foreign investment which we use as a proxy for GVC impact channels, we aim to capture the uneven effects of import competition assuming that industries more integrated in international trade will behave differently when exposed to trade.

[13] Key U.S. exports refer to agricultural and construction equipment, autos and auto parts, computers and other information technology products, medical equipment, and paper products. Luxury tax which discriminated against U.S. automobiles has been phased out. The top U.S. exports to Chile are mineral fuel, machinery, vehicles, electrical machinery, and aircraft (UN, COMTRADE).
[14] General Directorate of International Economic Relations of Chile - DIRECON

The key contribution of the paper aims to address the gap of the simultaneous trade exposure to partners of different income, technological development and skill levels and conduct the analysis at a fine level of industrial disaggregation *within* the actual period of the enforcement of the two largest free trade agreements. Considering the positive relationship between reductions in trade barriers and increased participation in global production networks, Chile presents an informative setting to analyse the potential dynamics from increased exposure to international trade. The latter will be assessed by controlling for the export orientation and of the shares of foreign ownership by industrial sector which is found to increase as a country integrates in backward and forward linkages. The interplay between import penetration and the "returns" from GVC participation has been overlooked by the related literature as to the best of our knowledge, there is no study testing this relationship on Chile. Considering that GVCs are classified as a policy priority for the country and the FTAs are proliferating, this study is positioned among the most recent policy agenda.

The remainder of the paper is structured as follows: the second section presents the theoretical underpinnings and the existing empirical evidence on import competition, as well as descriptive evidence from Chile. The third section provides an analysis of the data and the methodology; the fourth section is devoted to the empirical results followed by robustness checks and the last section concludes and offers a summary of the findings along with related policy implications.

1.2 Theoretical and conceptual framework

The theoretical foundations of our empirical analysis, touch upon, both standard international trade theories and the new trade theory (NTT). The factor proportion framework (Heckscher–Ohlin model), partly explains our analysis as it is based on the comparative advantage principle. The key implication of the model is that the set of industries produced by a country is a function of its relative endowments (Brülhart, 1995). In an open world trading system, relatively capital- and skill-abundant countries like the United States are expected to manufacture a more capital- and skill-intensive mix of products than relatively labour abundant countries like China. However, in the case of

China there is increasing evidence that although considered a labour abundant country it does not specialize solely in labour-intensive products but is instead moving up the value chain ladder[15], by exporting more capital-intensive products giving rise to intra-industry trade (Rodrik, 2006). The latter is evident in the growing competition between China and the USA within the Chilean market. Chinese export prices are found to be lower relative to countries with similar income per capita accentuating the impact on sectors producing close substitutes to Chinese products (Rodrik, 2006; Moreira, 2007). This is expected to be more intensely felt in specific lower or medium tech sectors and labour intensive sectors.

As mentioned in the introduction, the two opposing features regarding import competition are first, the deindustrialization and crowding out effects due to falling profit margins and reduced market shares (Jenkins and Barbosa, 2012). Second is the productivity enhancing effect through "defensive innovation" in product/process upgrading and the diffusion of new technologies and knowledge embodied in imports. Another feature of the free trade agreements is the regulations regarding foreign investment. To the extent that FTAs cover trade-related investment measures and other performance requirements for foreign investors it may improve the opportunities for local firms to engage in GVCs and increase value capture in the domestic economy (IBRD, 2017). As an example, local content requirements set targets on the amount or share of inputs that have to be sourced locally, thereby acting as a channel for domestic industrial growth. Through GVCs, firms draw on the international, instead of national knowledge resources and production factor base which allows further specialisation and realisation of greater economies of scale. 'This has made economic activity more specialised, interconnected and sensitive to trade' (OECD, 2015 p.8).

Empirical evidence based on the predictions of the new trade theory provide a number of stylized facts on import competition and the links to GVC. According to Tybout (2001), foreign competition induces adjustments related to domestic industry productivity, market share reallocations, export performance and technical efficiency. At the domestic firm level, 'mark-ups generally tend to fall with import competition and import-competing firms cut back their production levels when foreign competition intensifies' (ibid p.2). On the other hand, exposure to foreign competition improves plant efficiency and is found to

[15] The relevance of H-O is also contested by Rodrik (2006), who finds China's exports to be more sophisticated than expected for its level of development.

increase aggregate productivity by forcing less competitive firms to exit (Pavcnik, 2002). Conceptually, eliminating administrative and regulatory barriers reduces costs of producing and distributing goods and gives incentives to firms to internationalize their production and increase their rate of participation in GVCs. However, there is uncertainty to what extent high skilled functions are outsourced to countries of a lower income level such as Chile and to what extent the GVC participation includes skill and technological upgrading of the local industries. Therefore, backward GVC participation is considered one of the main channels to reap the benefits offered from the FTAs with China and the USA and a promising way to reverse the negative substitution effect which seems to prevail. The interplay between the threats related to substitution effects, on the one hand, and the opportunities posed through integration in GPN on the other hand, will determine the final outcome of the effects of the FTAs.

1.3 General empirical evidence

The review of the related empirical literature on import competition revealed two opposing views. On the one hand, proponents of increased trade stress first, the importance of increases in aggregate productivity that stem from lower productivity firms exiting the market and secondly posit that technology diffusion effects, increase domestic industrial competitiveness. Conversely, on the opposite spectrum at the centre of stage are the negative effects related to contraction of domestic manufacturing output, manufacturing employment, wage differentials across sectors and firm shrinkage or closure.

The import competition literature stresses two major channels explaining how exposure to imports affects the incumbent industry-level outcomes, including output, employment and productivity. Increased competition is found to lead to adjustments across several dimensions. Within firms, reshuffling of resources and changes in product mix are found to adjust in response to increasing competition (Pavcnik, 2002; Bernard 2006). Within industries, firms exit from the market, follow defensive mergers and acquisitions strategies or promote product upgrading, as a consequence of intensified competition, which leads to higher industry-wide productivity levels. Across industries, shifts according to countries' comparative advantage are also detected with firms moving away from comparative

*dis*advantage activities and towards comparative advantage industries (e.g. Bernard et al., 2006).

The empirical evidence on the impact of free trade at the micro level, has been to a large extent contradictory, with studies detecting negative associations between import competition, firm survival and domestic employment growth (i.e. Alvarez and Claro, 2009; Edward and Jenkins, 2015), while others stress the positive associations between foreign competition and aggregate productivity from the reallocation of resources (Pavcnik, 2002). The empirical evidence is divided into two strands of literature, one which focuses on the industry or firm level outcomes (sales, employment and productivity) and the second on the local labour markets effects (skill composition and wage structure). Our analysis is in line with the first strand as we assess output responses proxied by sales, labour productivity and employment change.

Threats pertaining to employment losses, the contraction of manufacturing output, plant closure, plant decline and downward pressure on wages are among the principal effects of drastic import competition pressures as identified in the literature (Topalova, 2007; Autor et al. 2013; Alvarez and Claro, 2009; Bernard et al., 2006; Pessoa et al., 2014). On the opposite spectrum benefits are expected to emerge from expanded access to multiple markets, increases in aggregate industrial productivity, efficiency enhancing effects from lower cost intermediate imports and technology diffusion from exposure to more technologically advanced imports that embody new knowledge and technology (Pavcnik, 2002; Bernard et al., 2006).

Although the opportunities posed by increased import exposure in terms of plant product-mix changes and global value chain participation (GVC) have been stressed in the literature, the evidence on an inherent link between free trade and GVCs remains scarce. Given that trade liberalization is one of the main sources triggering GVCs and to the extent that they constitute a channel for domestic firm upgrading (Giuliani et al., 2005), we assume that being part of global production networks may provide to domestic industries a form of immunity to the substitution effects and offer growth opportunities. Such dynamics could have further multiplier effects, as "success in firm-level upgrading, enables the dynamic acquisition of competitiveness in new market niches, sectors or phases of the productive chain" (Pietrobelli, 1997).

Negative effects from trade

The related literature has focused both on developed and developing countries. In the context of developed countries Mion and Zhu (2013), find that import competition from China reduced firm employment growth and wages for unskilled workers in Belgium. Similarly, exposure to Chinese import competition in the US, was found to adversely affect manufacturing employment, triggered a decline in wages and decreased household income between 1990 and 2007 (Autor et al., 2013). Evidence of these mechanisms at work bred the perception that free trade may crowd out domestic competing industries and put a downward pressure on wages and employment growth. In line with these results, import penetration from low wage economies in the USA, negatively affected employment growth but the effect was found to be lower for capital-intensive industries (Bernard et al., 2006).

In the context of emerging economies, for South Africa, the impact of Chinese trade on manufacturing production and employment decreased as a result of import penetration from China and caused manufacturing output to be 5% lower in 2010 than it otherwise would have been (Edward and Jenkins, 2015). Along the same lines of research, in a multi-country study on the impact of import competition on local labour markets, Pessoa et al., (2014), conclude that import-competing sectors experience lower wages and employment losses, while low-paid workers saw a disproportionate reduction to their wages. In the same vein, a multi-country comparative analysis showed that labour-intensive manufacturing was found lower in 33 countries owing to increased exposure to Chinese imports while the effect was accentuated in developing economies that produced goods similar to those produced in China (Wood and Mayer, 2011).

The conundrum surrounding the import penetration literature, reaches out to the Latin American context, where contradictory outcomes are confirmed particularly in the case of Chile. A number of studies concludes that import competition induces a positive aggregate productivity effect, product upgrading and positive effects on wages while other studies using (often) the exact same datasets, posit the negative association between import penetration and domestic firm survival, employment and productivity growth (Almeida and Fernandez, 2013; Levinsohn, 1999; Pavcnik, 2000; Alvarez and Claro, 2009).

Specifically, Alvarez and Claro (2009), evaluate China's import penetration on manufacturing plants in Chile using annual data for the period 1990-2000 and show that increases in China's market share, negatively affect employment growth, the probability of survival of manufacturing plants and find no evidence of output upgrading or the probability of exporting. They conclude that the ability of firms to elude China's competition has been limited, and attributed to the low levels of capital and skilled labour that impede product upgrading (ibid). Studies on Mexico such as Lacovone et al., (2013), use plant level and product level data for the period 1994-2004 concluding that the surge of exports from China challenged Mexican firms and led to plant exit, product exit and sales contraction especially for larger plants. These results are partly in line with the findings by Utar and Ruiz (2013), who also find a negative effect of Chinese import competition on employment and plant growth in the Mexican maquiladoras, especially for unskilled labour-intensive sectors but conclude that there is also industrial upgrading among maquiladoras in response to competition with China.

A theoretical assessment of the overall exposure of the Latin American region to Chinese competition is provided by Jenkins et al., (2008), who conclude that increased import competition has created winners and losers. Among the "winners" are extractive industries while among the losers are mostly manufacturing plants, producers on commodity chains and the wages of unskilled workers.

Positive or mixed effects from trade

On the positive effects, import competition from China led to skill upgrading in low-tech manufacturing industries in Belgium, and an increase in the demand of non-production workers in low-tech manufacturing sectors (Mion and Zhu, 2013). Further positive effects from Chinese import penetration were detected in the form of firms eluding competition by switching industries and by moving towards sectors with less import penetration from low-wage countries. These industries were more capital- and skill-intensive revealing a new margin of adjustment via changes in product mix (Bernard et al., 2006). However, higher productivity was not shown to shield firms from competition pressures unlike skill intensity (which was found significant in reducing the negative effect of import competition).

In sharp contrast to the above findings, empirical evidence concludes that the import-competing sector experienced plant productivity improvements (Pavcnik, 2002). The study concludes that industry-wide productivity improvements stem from the reshuffling of resources and output from less to more efficient producers. As an extension to this research line, evidence on product quality upgrading for Chilean firms, using unit-value increases as a proxy for product upgrading, reveal a positive effect of import competition on upgrading (Fernandez and Paunov, 2013). Further, strong positive impacts of tariff liberalization on plant productivity and productivity gains of manufacturing firms were detected for Columbia (Fernandez, 2006).

The most prominent channels of benefits are the technology diffusion and efficiency-enhancing role played by trade in intermediates (Kasahara and Lapham, 2013; Grossman and Helpman, 1991). Access to intermediate imports on the one hand embody new knowledge and technologies that may contribute to higher innovation rates for domestic industries through imitation or reverse engineering. Intermediate imports may also increase competitiveness due to efficiency-enhancing technologies embodied in imports and the lower cost effect on the domestic production process (Kasahara and Lapham, 2013). The latter can prove also to be detrimental by crowding out domestic suppliers of similar inputs rendering the overall net effect ambiguous. Further, due to importing and exporting complementarities, evidence shows that access to foreign-made inputs affects performance showing that Chilean firms which import intermediates and export their output, tend to be larger and more productive (Kasahara and Lapham, 2013). The latter is in line with our findings that industries, which are more, integrated in global trade linkages record a positive effect from import penetration.

The opportunities posed by increased import exposure in terms of global value chain participation has been stressed in the literature however the inherent link between free trade, GVC participation and domestic industrial adjustment has not been examined explicitly in the case of Chile. Given that trade liberalization is one of the main sources triggering GVCs and a potential channel for domestic firm upgrading (Giuliani et al., 2005), then we assume that to the extent that domestic industries integrate into global production networks this may provide a form of immunity to the import substitution effects.

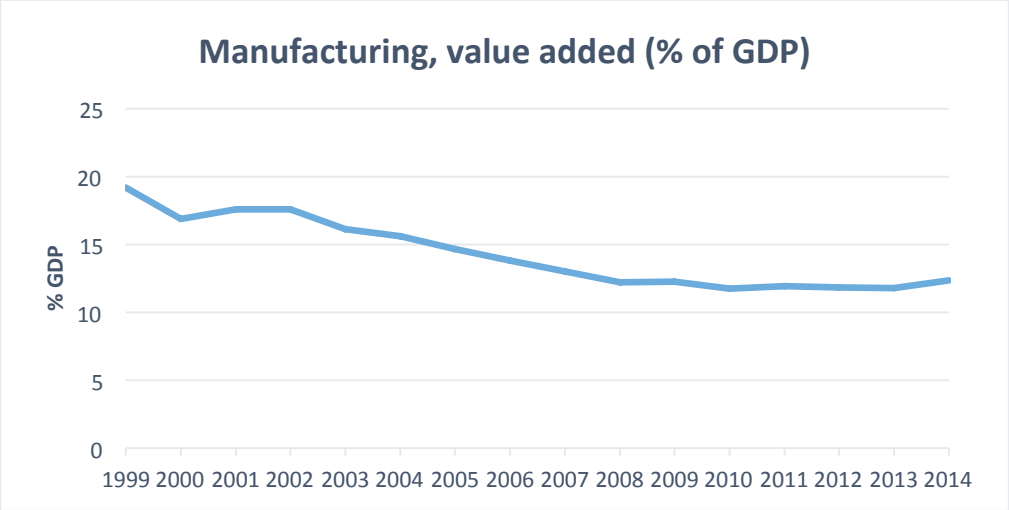
Our study goes a step further to explore the opportunities offered by deeper integration in global trade linkages. As mentioned this is tested by examining the interaction of the proxy for industrial GVC participation with the import penetration variables, which captures the conditional effect of the integration of the incumbent industry into GPN. The latter is expected to act as a cost efficiency channel and a technology transfer platform, which contributes, to the upgrading of the local production processes. Trade integration has facilitated Chile's presence in global value chains revealing dynamics that could, in the long run, transform industrial structures and create new sources of specialization. In this context, exporting industries and the shares of foreign ownership are expected to play a decisive role in the adjustment process of the manufacturing sector when exposed to high import competition from abroad. Therefore the hypotheses to be tested are the following:

H_1: Increased penetration from low and medium-tech imports from China is expected to have a substitution effect on the domestic industry compared to high skilled imports from USA. Based on the nexus of *import-competing* versus *import-using* industries.
H_2: Industries that are more integrated in global value chains will reap the benefits from increased import exposure.
H_3: Industries with higher shares of foreign ownership are able to escape foreign competition, translate increased trade into efficiency gains and allow for deeper integration in GVCs.

1.4 Background context

The temporal evolution of the manufacturing GVA in Chile is presented for the period preceding and following the FTAs in Fig 1.1 below. The share of the manufacturing sector's Gross Value Added (GVA) as a percentage of the GDP gradually declined from almost 20% in 1999 to 12% 2014 (Figure 1.1). The high contraction of manufacturing within the period of our analysis captures the period from 2000 to 2013 incorporating the effects of import penetration before and after the agreements went fully into force, China's WTO accession and the eruption of the global financial crisis.

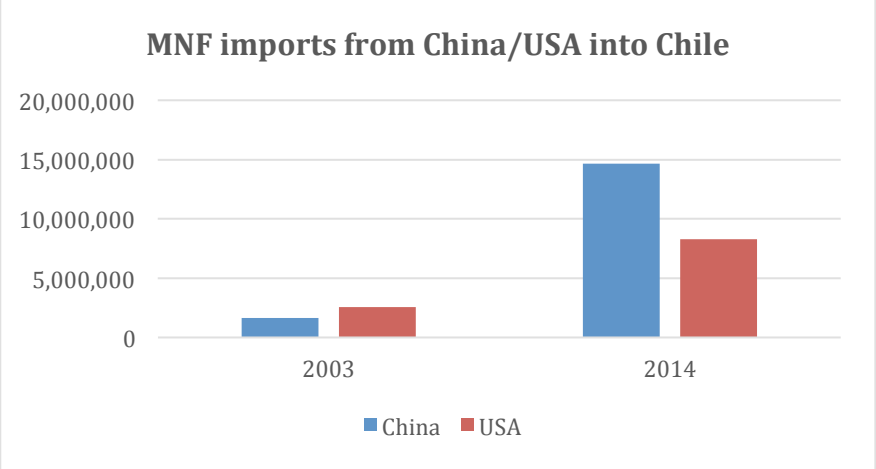
Figure 1. 1 Evolution of Manufacturing GVA in Chile (1999-2014)



Source: Own elaboration using data from World Bank

Figure 1.2, offers two snapshots of manufacturing imports from China and the USA into Chile before and after the implementation of the FTAs. It is evident from the graph that although both increased substantially, the increase in Chinese imports is much higher compared to imports from the USA.

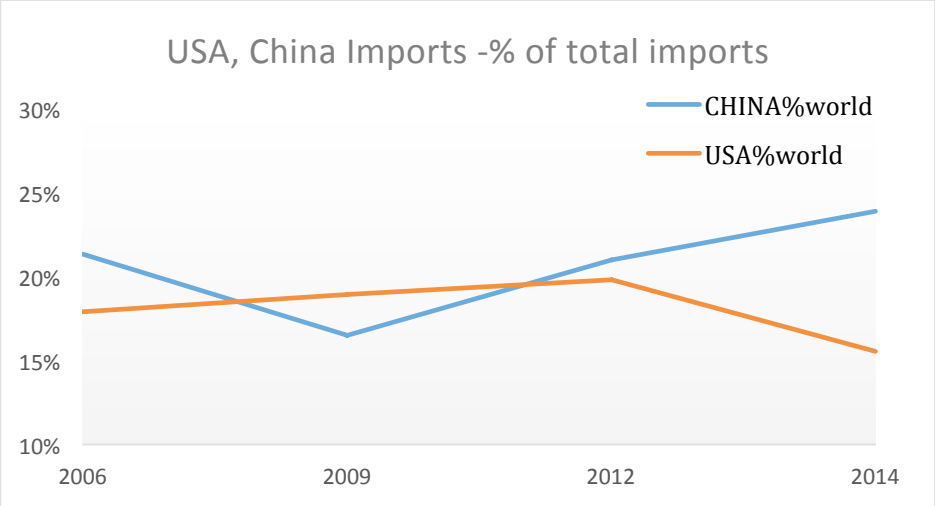
Figure 1.2 Total Manufacturing imports from China, USA into Chile



Source: Own elaboration using data from UNComtrade. Note: values are in thousands USD (current prices)

Specifically, the share of Chinese imports is steadily increasing and surpassing USA's share of imports from 2012-2014 suggesting a direct competition between the two partners within the Chilean market (Figure 1.3).

Figure 1.3 Evolution of Chinese and USA imports share



Source: Own elaboration using data from UNComtrade

Tables 1.1 and 1.2 (below), portray the annual growth rate of imports from China and USA for each two digit industrial sector, the weight each sector accounts for and the percentage change from the beginning to the end of the study period (2003-2013). The first observation is that the increase in imports from both countries is not evenly distributed across industries. The most exposed sectors in terms of import competition from China (in weight and percentage change) are *textiles (17) and wearing (18), metals (27), chemicals (24), TV and communication equipment (32)*, *machinery (29)* and *electrical machinery (31)*. These are mainly labor-intensive and lower to medium tech industrial sectors and constitute of both intermediate and final products.

Table 1. 1 Imports from China by sector

		Weight	Growth rate	% Δ '03-'13
ISIC	**Total**	**100%**	**22%**	**794%**
15	Food, beverages	1%	37%	3207%
17	Textiles	10%	20%	657%
18	Wearing	11%	16%	408%
19	Leather	7%	16%	420%
20	Wood	1%	24%	922%
21	Paper	0%	36%	2913%
24	Chemicals	6%	26%	1141%
27	Metals	7%	52%	10265%
28	Fabricated metal	5%	24%	985%
29	Machinery	9%	26%	1191%
30	Computing machinery	6%	23%	893%
31	Electrical machinery	5%	26%	1165%
32	TV & comm. equip	14%	24%	991%
33	Prof. scientific equip.	1%	16%	424%
34	Automobiles	4%	51%	9411%
35	Transport equip.	1%	22%	752%

Source: own calculation using data from INE (National Statistical Office of Chile) and UNcomtrade database

On the contrary and as expected, import penetration from USA (Table 1.2) is more concentrated in high-skilled, capital-intensive and high technology industries such as *machinery* (29), *professional and scientific equipment* (33) and *automobiles* (34). Therefore, the sectoral competition and substitution effects from USA are expected to be less fierce compared to Chinese imports due to the more sophisticated technological level of the USA imports that do not directly compete with domestic manufacturing to the degree that Chinese imports do.

Table 1. 2 Imports from USA by sector

		Weight	Growth rate	% Δ '03-'13
ISIC	**Total**	**100%**	**11%**	**222%**
15	Food, beverages	4%	20%	677%
24	Chemicals	22%	13%	281%
27	Metals	1%	7%	111%
28	Fabricated metal	3%	9%	160%
29	Machinery	20%	10%	181%
30	Computing machinery	3%	-1%	-13%
31	Electrical machinery	4%	7%	118%
32	TV and comm. equip.	3%	5%	67%
33	Prof. scientific equip.	15%	16%	412%
34	Automobiles	4%	16%	420%
35	Transport equip.	1%	7%	119%

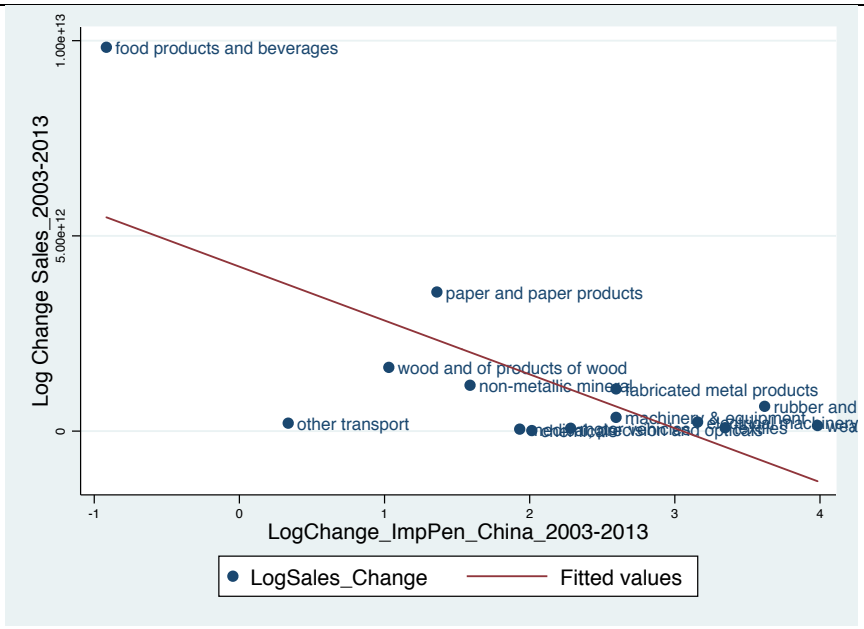
Source: own calculation using data from INE (National Statistical Office of Chile) and UNcomtrade database

Considering the patterns observed, the exposure of Chile to China is more prevalent in low-tech, low-skilled products, while the competition effects from USA are more pronounced in knowledge-intensive sectors and correspond more to final products suggesting that the technological development of the trade partners explains the heterogeneity in the competition level across domestic industries. An expected implication of these patterns of import penetration is a shift in factor utilization out of labour-intensive sectors, and a loss of market share. This would be in line with the endowment-based trade model as a consequence of the fall in the relative price of imported labour-intensive products.

The main take-away of the descriptive analysis on the sectoral composition of imports is to provide insight regarding the varying levels of exposure across industries. This essentially mirrors the import substitution versus efficiency-enhancing dualistic nature of the benefits and losses across import- *competing* versus import-*using* industries.

The scatterplot below (Figure 1.4) shows *sales change* by industrial sector against Chinese *import penetration*. The negative slope of the line provides evidence that higher values of import penetration are negatively associated with sales. Labour and capital intensive industries also experienced high loses in sales, which suggests price and cost competition effects from Chinese imports.

Figure 1.4 Change in Sales against change in Chinese Import Penetration



Coef. -1.38e+12 SE: 4.02e+11 t-stat: -3.43 p-value:0.005

1.5 Methodology and data

1.5.1 Data and sources: descriptive analysis and variable construction

The modeling of the tested relationships is based on extensions of Krugman's NTT proposed by Melitz (2003) introducing firm heterogeneity to identify the cross-sector effects from trade. Although the analysis is performed at the industry level, the aggregation is made at the finest level of industrial disaggregation (4-digit ISIC classification) capturing the greatest degree of heterogeneity possible given the availability of data. The analysis is thus based on a version of the traditional Heckscher-Ohlin model that focuses on industry-level adjustments as a response to changes in market and trade relations.

The dataset combines data from two different sources: the global trade database provided by UN Comtrade and the Annual National Industrial Survey (ENIA) provided by the National Statistical Office of Chile. The main variable of interest is import penetration normalized on apparent consumption. A number of proxies on import penetration have been proposed in the literature. Bloom et al., (2016), use the value of imports originating from China as a share of total world imports, following the "value share" approach. More customary in the related trade literature is the use of imports normalized on apparent

consumption; the latter which refers to the denominator of the index is calculated as domestic production plus imports minus exports (following Bernard et al., 2006, Pessoa, 2016; Alvarez and Claro, 2009). The variable captures the sectoral import penetration from China and the USA into Chile (formulas 1 and 2).

$$ImPen\ CH_{j,t} = \frac{M_{j,t}^{CH}}{M_{j,t}^{Total} + Q_{j,t} - X_{j,t}^{Total}} \quad (1)$$

$$ImPen\ USA_{j,t} = \frac{M_{j,t}^{USA}}{M_{j,t}^{Total} + Q_{j,t} - X_{j,t}^{Total}} \quad (2)$$

The above variables are constructed as follows: *ImPen* denotes the import penetration variable, *M* denotes imports, *Q* represents domestic production *X* will present exports, while *j* and *t* correspond to industry and year, respectively. Import penetration will capture the share of imports in the four-digit sector from each import partner (China and the USA) divided by the total value of imports in the four-digit sector plus domestic production minus exports in the same sector. Bilateral annual sectoral trade flows are provided by BACI, which is the World trade database developed by the CEPII at a high level of product disaggregation using original data provided by the United Nations Statistical Division (UN COMTRADE database).

Firm level sectoral data are provided by the Annual National Industrial Survey (ENIA) which is administered by the National Institute of Statistics of Chile (INE). The survey covers the universe of Chilean manufacturing firms with 10 employees and above. Firm level data are classified according to the International Standard Industrial Classification (ISIC) Rev. 3, at the 4-digit level. The firm level variables for sales, employment, fixed assets, exports and foreign ownership are aggregated at the 4-digit level. The sectoral identifier was used to match domestic sales, employment and all other variables of interest with the values of sectoral imports and exports, which are categorized according to the Harmonized System (HS)[16] 6-digit product disaggregation and converted to ISIC Rev.3 (using the corresponding tables provided by UN Comtrade) to construct an industry-year panel data set. The survey is used to construct an unbalanced panel dataset of 110 industry

[16] Harmonized System (HS) is the international nomenclature for the classification of products.

categories. Given that some firms may enter or exit the market in various points within the study period, their corresponding sectors may have missing values for some of the years of the study period giving rise to a slightly unbalanced panel. However, the percentage of sectors not fully reported for the entire period is less than 10%. Although a similarly constructed dataset has been employed in a previous study for Chile by Alvarez and Claro, (2009), the current dataset including newly released data from the ENIA, is to the best of our knowledge, used for the first time for the analysis of the post-FTA period.
In appendix (a) description of all variables, their definition and sources is presented.

1.5.2 Methodology

The econometric specification is based on a standard Cobb-Douglas production function where output *Y* is proxied by constant Sales while Labour (employment) and Capital (fixed assets) enter the regression as controls. For the empirical specification relating to manufacturing production performance, we estimate specification of the following form:

$$Y_{j,t} = \beta_1 ImPenCH_{j,t} + \beta_2 ImPenUSA_{j,t} + \beta_3 K_{j,t} + \beta_4 ZL_{j,t} + \beta_5 Z_{j,t} + \beta_6 Z_{j,t} * ImPenCH_{j,t} + \beta_7 Z_{j,t} * ImPenUSA_{j,t} + \lambda_t + \lambda_j + \varepsilon_{j,t} \quad (3)$$

$Y_{j,t}$ refers to the dependent variable - the logarithm of Sales, the rate of employment growth (in logs) and the logarithm of labor productivity - in industry *j* in year *t*. *ImPenCH* denotes import penetration from China and *ImPenUSA* is the equivalent for imports from the USA; Z is a vector of industry-specific characteristics that are shown to affect sales and employment growth, such as capital intensity, skill intensity, the export orientation of the industry and foreign investment proxied by the percentage of foreign ownership. Interactions with the vector Z will be included to determine the conditional effect of import penetration. Finally, λ_j denotes industry fixed effects and λ_t stands for year fixed effects. Industry-level fixed effects are included to control for unobserved time-invariant industry characteristics and year fixed effects aim to capture temporal macroeconomic shocks that limit within-industry and within year omitted variable bias, respectively. All monetary values, such as: sales and exports have been converted to constant Chilean pesos, using industry-level deflators provided by the Central Bank of Chile. In the following section, we analyze the impact of import competition from both China and the USA on three, industry performance measures: *aggregate sales, employment growth and labour productivity*.

1.6 Empirical results

1.6.1 Domestic Sales

In Table 1.3, we report the results from the baseline and the extended models (Columns 1-6). We report results including industry and year fixed effects with robust standard errors (White correction for heteroskedasticity) clustered at the four-digit industry levels to address standard concerns pertaining to the serial correlation in the error term[17]. The parameter estimates of the control variables in all regression models have been tested for potential multicollinearity. The standard tests based on the variance inflation factor (VIF) reject any degree of multicollinearity (with VIF values well below the conventional threshold of 10). We detect a negative and statistically significant association between import penetration from China and domestic sales at the 1% level in all specifications suggesting possible crowding out effects from products of a lower cost component combined with production scale effects which may act as substitutes to domestic production. This finding is corroborated by the fact that Chinese imports are significantly lower in cost, compared to countries of a similar income level attributed to the massive labour abundance that pushes Chinese wages well below the levels of Latin American countries and thus make them more competitive than domestic production leading to crowding out effects (Moreira, 2007; Alvarez and Claro, 2009).

The heterogeneous effects stemming from industry–level characteristics reveal that exporting industries, more skill intensive and those with higher percentages of foreign ownership appear to be shielded from competition pressures and benefit form trade with China. Our results suggest that more dynamic firms in terms of higher skills, levels of foreign investment and export intensity are able to both compete and reap benefits from Chinese trade attributed to potential efficiency enhancing effects from cheaper intermediates.

We control for the simultaneous integration of import exposure with both partners and compare the conditional effect for both (Column 5 and 6). Import penetration from the

[17] Usually knowing the exact error structure is not straightforward, however with aggregated variables clustering at the same level is necessary.

USA is not statistically significant in all specifications, which confirms our assumption that competition from the USA is concentrated in higher-tech industries, which pose a weaker competitive pressure to the domestic manufacturing sector and exhibit a smaller substitution effect. In other words USA imports characterized by a higher degree of technological superiority (shown in the descriptive section) do not seem to directly compete with the domestic industries. The USA import exposure does not allow for margins for productivity adjustments due to the high unevenness in terms of quality and sophistication between domestic production and imported US goods. The latter is due to the fact that the bulk of US imports are final products unlike Chinese imports that also consist of intermediates that could potentially enhance production efficiency for some industries.

The control variables capital and labour as well as foreign investment have the expected positive and significant signs. Industries with higher assets and labour have higher output while foreign investment is positively related to sales suggesting that industries with a high presence of foreign-owned firms (or firms with high percentages of foreign investment) appear more productive relative to their domestic counterparts, a result in line with the literature stressing the superiority of foreign firms in terms of productive capacities (Fernandes and Paunov, 2012).

Exporting industries in the case of both US and China are benefiting from trade which constitutes the only characteristic that shields industries from competition from both trade partners and allows for positive effects in terms of sales growth to materialize (Column 2 and 4). The result partly advances the findings from Bernard et al., (2006), who stress that more capital-intensive firms manage to escape competitive pressures in the case of USA. Our study finds that instead, in the Chilean case it is not factor intensity that plays the role but the cross-industry variation in the level of trade integration proxied by export intensity.

The higher integration of an industry in global trade (proxied by export intensity) may implicitly capture the impact of participation into Global Value Chains. This assumption, is tested by means of an interaction between the import penetration variable and the export orientation of the industry. The interaction term is a proxy of GVC participation based on the following reasoning: to the extent that an industry benefits from increased exports as a result of increases in import penetration then, the latter is most likely attributed to backward and forward linkages generated within a value chain in which intermediate

imports are factored into exports. This finding also mirrors the fact that backward integration has been accelerating in Chile and is measured as the share of foreign value-added in each sector's exports. To illustrate the latter with an example, the chemicals and non-metallic minerals sector's foreign value-added, accounts for 35% of exports while foreign value-added in textiles, accounts for 32% of exports (OECD, 2015).

Drawing on the results from the extended models, although import penetration has an overall negative and significant effect on domestic sales, the inclusion of the interactions confirms our assumption that the impact is asymmetric across industries, revealing dynamics related to GVC participation, which are reflected by the positive effect of import penetration on the export-oriented industries. This positive and significant impact of Chinese import penetration in the case of export-oriented industries (columns 2 and 4), is indicative of a dichotomy of import-*using* versus import-*competing* industries with export intensity acting as an efficiency-enhancing channel in the case of Chinese imports and a knowledge-diffusion channel in the case of USA imports. The latter is grounded also on assumptions suggesting that "trade is a conduit for disembodied technology diffusion by exporting to knowledgeable buyers who provide them with blueprints and give technical assistance" Tybout (2001 p.77).

In order to assess the heterogeneous responses of the domestic industry with respect to foreign investment, we test this hypothesis by means of an interaction term between the percentage of foreign investment by industry and the import penetration variable. Foreign presence by industry can also act as a proxy for GVC participation. Considering that as much as one third of Chile's backward linkages is attributed to FDI openness[18], combined with the fact that foreign firms import 18% of their intermediate inputs (OECD, 2015), then industries with higher shares of foreign ownership could be considered as more integrated into GVCs. The latter is confirmed by the positive sign and statistical significance of the interaction term between foreign ownership and Chinese import penetration (Column 2). Import exposure from China seem to benefit foreign owned firms in terms of cost and operating efficiency due to higher use of cheaper inputs fueled by the FTAs. To this end, intensified trade with China, which has also increased trade in

[18] FDI stock as a percentage of GDP stood at 70% in 2014 (OECD, 2015)

intermediate inputs[19], may disproportionately benefit foreign owned firms within industries due to their higher financial capacities and scale economies (compared to non-foreign firms) (Moreira, 2007). The results provide evidence that industries with higher foreign presence are positively affected by increases in Chinese import penetration but not for USA imports. In the case of USA imports, foreign firms do not seem to gain in terms of sales growth as the interaction term is not statistically significant (Column 4). This reflects the fact that USA imports refer mainly to final products (not intermediates) and thus do not have a specific efficiency enhancing effect compared to Chinese imports.

The fact that *foreign* manufacturing firms in Chile are more capital-intensive and generate more value-added per worker (OECD, 2015) in combination with the fact that the use of foreign inputs is shown to positively affect export performance, confirms our results on the positive impact of Chinese penetration for both foreign and export oriented industries. To this end, our finding corroborates with recent OECD reports on Chile's GVC potential that stress that industries that expanded their backward linkages experienced larger increases in domestic value added.

[19] A more useful proxy would be the use of intermediate inputs values or input-output tables by industry, unfortunately the latter is not available by the National Statistical Office of Chile while values in intermediate inputs were not consistently reported by product category in the UN Comtrade database. Consequently, jointly exploiting the variation in trade integration by industry and the sectoral import penetration is the best alternative proxy considering the availability of data.

Table 1. 3 Import penetration and manufacturing sales

Dep. Var.: *Domestic Sales*	(1) China	(2) China	(3) USA	(4) USA	(5) Both	(6) Both
ImPen China	-1.030***	-1.427***			-0.992***	-1.306***
	(0.364)	(0.388)			(0.370)	(0.394)
ImPen USA			-0.372	-1.839***	-0.276	-1.615**
			(0.284)	(0.620)	(0.275)	(0.644)
Log K	0.218***	0.213***	0.228***	0.223***	0.217***	0.206***
	(0.039)	(0.038)	(0.040)	(0.039)	(0.039)	(0.037)
Log L	0.568***	0.550***	0.590***	0.559***	0.568***	0.527***
	(0.090)	(0.086)	(0.090)	(0.086)	(0.090)	0.527***
Foreign Inv.	0.017*	0.015	0.017*	0.014*	0.017*	0.012*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)
Export intensity	-0.084***	-0.083***	-0.091***	-0.086***	-0.084***	-0.078***
	(0.009)	(0.010)	(0.015)	(0.015)	(0.009)	(0.009)
Skill ratio	-0.010	-0.016	-0.011	-0.006	-0.010	-0.005
	(0.010)	(0.011)	(0.010)	(0.015)	(0.010)	(0.018)
*ImpChina*Exp*		4.321***				3.795***
		(0.728)				(0.711)
*ImpChina*Skill*		0.066**				0.039
		(0.034)				(0.035)
*ImpChina*Foreign*		0.003**				0.003***
		(0.001)				(0.001)
*ImpUSA*Exp*				2.827***		2.502***
				(0.830)		(0.874)
ImpUSA Skill*				-0.035		-0.043
				(0.081)		(0.079)
ImpUSA Foreign.*				-0.000		-0.001
				(0.001)		(0.001)
INDUSTRY FE	YES	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES	YES
Observations	1321	1321	1321	1321	1321	1321
R sq	0.91	0.91	0.90	0.91	0.91	0.91

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the logarithm of Domestic sales in constant prices.

The skill ratio appears to not have a significant effect in reversing the effect of import competition. The latter could reflect a plethora of factors such as the way firms self-define their personnel as *skilled* or may cast doubt as to real quality of skills.

The export orientation of the industries is negative [20]and statistically significant which may imply that exporting industries in general are not performing well in our treatment period

[20] The negative sign of the export orientation variable is also attributable to two facts, firstly, as shown in Alvarez and Claro (2009) the main exporters in Chile are concentrated in the labor-intensive and the

due to competitive pressures and that only the *import-using* exporting industries that are integrated in GVCs are reaping the benefits of increased exposure. The latter is confirmed in the findings of Kasahara and Lapham, (2013), who conclude that there are complementarity effects from imports of inputs and export performance in Chilean plants. In this case, complementary effects will prevail over substitution if the latter enhance domestic production and therefore complement, rather than compete with, domestic production activities.

1.6.2 Employment growth

Other margins of adjustment for foreign competition are the responses related to employment losses or employment growth. This assumption is stimulated by related findings presenting evidence that, within industries, employment will decrease in import-competing firms (Alvarez and Claro, 2009).

Table 1.4, reports the results of the impact of import penetration on employment growth. The dependent variable $\Delta\, Employment_{t,t+1}$ is the employment change (in logs) between *t* and *t + 1* of industry *j* in year *t*. Following related literature, we add industry specific characteristics that have been shown to affect employment growth, such as input intensities measured as the ratio of capital per worker proxying within industry capital deepening (Alvarez and Claro, 2009).

We find that increased import penetration from China (Column 1, 2 and 5) is negatively associated with employment growth - albeit at a low significance level - revealing evidence that employment is negatively affected by the increase of Chinese import penetration. This could imply that domestic producers in Chile are reacting to increased competition through downsizing.

The results are indicative of two margins of adjustment. First, the negative impact may be attributed to imports, which embody efficiency-enhancing/labor-saving new technologies. As Autor and Dorn (2013) argue, "if the trend towards the automation of routine jobs in

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extractive industry that reported a marked decline in sales growth within the study period due to the economic crisis and lowering demand from China. The over-achievers are in fact the input-using exporting industries and not the traditional exporters. Secondly the normalization of the export orientation variable on total industrial sales may be producing a "mechanical" negative sign on the coefficient due to the fact that *Sales* is the dependent variable.

manufacturing continues, the application of these new technologies is likely to do much more to boost growth in value added than to expand employment on the factory floor". Second is the downsizing transmission channel due to substitution effects in import-competing industries which is in line with the findings of previous studies exploring firm-level data (e.g. Alvarez and Claro, 2009 for Chile, Acemoglu et al., 2016 for US, Revenga 1992; Mion and Zhu, 2012 for Belgium).

In order to detect whether the potential employment effects are conditional upon the variation in factor intensities we include interaction effects between the capital intensity and the main regressors as well as with the export intensity variable. We show evidence that the negative effect of import competition is significantly higher for more capital-intensive firms as suggested by the negative sign and significance of the interaction term (Columns 2 and 4 for import exposure from China and the USA respectively). This evidence hints to the fact that capital-intensive firms are exposed more fiercely to low and medium-tech import competition which pose a stronger substitution effect for those firms producing at a similar technological level. In the case of USA import competition the negative effect may be attributed to technologically advanced labor-saving inputs. Our result contrasts studies by Bernard et al., (2006) for the USA, which find that the loss of employment is higher in labour intensive and wage sensitive industries and also contrast the finding of Alvarez and Claro, (2009) on Chile who show that employment effects do not depend on factor intensities.

Interestingly, the interaction with the export orientation of industries suggests that although import competition on export oriented industries has a positive effect on sales (as shown in the previous section) however, these industries do not seem to translate the trade-related benefits into employment gains. Skill intensity and foreign ownership do not alter the substitution effect from Chinese or US trade in boosting employment as the interaction terms are not statistically significant.

Overall, the observed negative association between employment and import penetration is expected to be associated with higher fragmentation within industries. The closure of larger plants in Chile that led to job losses resulted in the increase of small self-owned or home-based firms (much smaller in size) that were established by the recently laid off personnel.

Table 1. 4 Import penetration and employment growth

Dep. Var.:	(1)	(2)	(3)	(4)	(5)
Δ Log $Employment_{t,t+1}$	China	China	USA	USA	Both
ImPen China	-0.100**	-0.093*			-0.099**
	(0.047)	(0.054)			(0.047)
ImPen USA			-0.014	-0.120	-0.007
			(0.025)	(0.081)	(0.024)
Log (K/L)	-0.012**	-0.008*	-0.012**	-0.009**	-0.012**
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
Skill ratio	-0.009***	-0.009***	-0.010***	-0.012**	-0.009***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.003)
Foreign Inv.	-0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Export intensity	-0.000	-0.000	-0.000		-0.000
	(0.000)	(0.001)	(0.001)		(0.000)
*ImPen CH*Foreign*		0.000			
		(0.000)			
*ImPen CH*Export*		0.139			
		(0.101)			
ImPen USA Foreign*				0.000	
				(0.000)	
*ImPen USA*Export*				0.162	
				(0.105)	
*ImPen CH*Skilled*		-0.004			
		(0.008)			
*ImPen CH*K/L*		-0.002***			
		(0.000)			
*ImPen USA*Skilled*				0.014	
				(0.014)	
*ImPen USA*K/L*				-0.008***	
				(0.002)	
INDUSTRY FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES
Observations	1,205	1,205	1,205	1,205	1,205
R sq	0.25	0.25	0.23	0.23	0.24

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.6.3 Labour productivity

The next critical adjustment margin is labour productivity. Labor productivity is assumed to increase via production efficiency improvements used as a "defense" mechanism for escaping import competition by increasing competitiveness (Bloom et al., 2016). Given the

lack of detailed data [21] in our dataset to measure (industry-level) total factor productivity we resort to using sales per worker as a proxy for labour productivity, following Baccini et al., (2015).

The results in table 1.5, shows that productivity has not increased as a result of intensified import penetration from China and is in fact negatively affected suggesting a larger contraction of output relative to potential employment losses. Our result partly corroborates with the evidence shown by Alvarez and Claro (2009) who find no effect of Chinese imports on productivity improvements or product upgrade and no evidence that Chilean firms have altered their production techniques from low- to high-capital intensity in response to import competition from China. The controls have the expected signs, capital-intensive and foreign firms have higher labour productivity confirming the widely argued superiority of FDI intensive industries in productivity growth (Baccini et al., 2015).

The interaction terms show that the association between import penetration and labour productivity is conditional upon specific industry characteristics. Higher skill intensity across industries, higher foreign investment and export orientation are positively affected by increases in Chinese import penetration (Column 4). Our assumption that heterogeneity in terms of trade integration, factor intensities and within industry variation in ownership structure/FDI presence (the variable *Foreign Inv.*), is confirmed in determining the extent and significance of the substitution effects. We show evidence that export-intensive industries are positively affected (in terms of labor productivity) by increases in import competition while capital-intensive industries are negatively impacted due to escalated competition from both trade partners. This result contrasts Bernard et al., (2006) who show that more capital-intensive firms in the USA are less affected by Chinese competition [22] and the evidence in Alvarez and Claro (2009), who show that factor intensity does not condition the import effects in Chilean firms.

Interestingly, our hypothesis that GVC participation (proxied by the interaction of high export-oriented industries with increased import penetration) may allow industries to reap the benefits from increased exposure is confirmed, as the impact turns to positive, when

[21] For example, consistent annual data on wages to measure the cost of labour were not available.
[22] The difference could be attributed to the fact that capital-intensive industries in the USA are more technologically advanced, productive and resilient to import competition from China compared to capital-intensive industries in Chile.

the interaction with the export orientation of the industry is included (column 4). Increased GVC participation may transform the competition effect into a productivity-enhancing effect with the use of more sophisticated imports (from USA) and lower-cost intermediates (from China).

In the case of Chinese imports, more skill-intensive and foreign-owned firms record higher productivity improvements from import exposure. This suggests that skills offer higher capacities to shield industries from competition and translate trade into efficiency benefits. Further, foreign-owned firms may be gaining from trade by factoring into both their production process and their gross exports, lower cost raw materials. According to OECD (2005), industries that are more skill intensive in Chile are in the machinery and transport equipment sectors, which constitute the most exposed sectors. Employing the same dataset, the report concludes that domestic firms in Chile tend to hire more skilled-labour than foreign-owned firms. Therefore higher skills are possibly acting as a productivity enhancement diffusion channel counteracting negative competition effects.

The fact that skill-intensity is offering immunity to increased import penetration is of high relevance to policy making given that foreign -mainly US affiliates in Chile – "spend very little shares on R&D activities (0.06% of their sales in 2012)" (OECD, 2005 p.87). Consequently, foreign investment and skill intensity could offer a channel of enhanced performance as a result of increased trade if foreign[23] firms participated in more high-value added sectors and invested more in R&D.

Overall, the results on productivity hint to the point that it is not capital deepening that plays the role in eluding competition but higher investments in skills, the potential diversification of foreign owned firms in higher value added sectors and the exploitation of dynamic export capacities in manufacturing.

[23] The vast majority of foreign affiliates in Chile are concentrated in sectors such as food, basic metals, wood, paper and printing.

Table 1. 5 Import Penetration and Labour productivity

Dep. Var.: **Labour productivity** (log)	(1) China	(2) USA	(3) Both	(4) China	(5) USA
ImPen China	-0.666**		-0.629*	-0.927***	-1.493***
	(0.333)		(0.338)	(0.333)	(0.530)
ImPen USA		-0.328	-0.253		
		(0.237)	(0.225)		
Log (K/L)	0.235***	0.242***	0.234***	0.267***	0.266***
	(0.038)	(0.039)	(0.039)	(0.036)	(0.036)
Skill ratio	-0.004	-0.005	-0.004	-0.010	-0.010
	(0.013)	(0.012)	(0.012)	(0.012)	(0.014)
Foreign Inv.	0.017*	0.017*	0.016*	-0.081***	0.015*
	(0.009)	(0.009)	(0.009)	(0.010)	(0.008)
Export Intensity	-0.085***	-0.092***	-0.085***	0.015*	-0.078***
	(0.009)	(0.016)	(0.009)	(0.010)	(0.008)
*ImPen China*Foreign*				0.002**	
				(0.001)	
ImPen USA Foreign*					-0.001
					(0.001)
*ImPen USA*ExportOr*					2.399***
					(0.702)
*ImPen China*ExportOr*				3.885***	
				(0.672)	
*ImPen China*Skilled*				0.062*	
				(0.033)	
*ImPen China*K/L*				-0.020***	
				(0.003)	
*ImPen USA*K/L*					-0.020***
					(0.003)
*ImPen USA*Skilled*					0.029
					(0.075)
INDUSTRY FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES
Observations	1,321	1,321	1,321	1,321	1,321
R sq	0.68	0.67	0.68	0.69	0.67

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.6.4 Robustness checks

A major complication that is emphasized in micro econometrics is the possibility of inconsistent parameter estimation due to endogenous regressors. In order to ensure that the estimates measure not only the magnitude of association, but the magnitude and direction of causation, which is needed for policy analysis, we have applied an instrumental variable strategy. To minimize the endogeneity problem associated with omitted variables, we have included a rich set of controls as well as industry and year fixed effects to control for unobservable industry characteristics. However, given that potential bias may still be present stemming from additional omitted variables and reverse causality concerns we implement an instrumental variable strategy (which is described in detail in the next section).

The potential endogeneity of Chinese and USA imports could emanate from unobserved industry-specific demand shocks affecting both the outcome variables (i.e. sales) and the key regressor (import penetration variable). Among the possible causes could be a negative productivity shock that results in a decrease in sales, which will induce a higher import rate. Such concerns have been addressed in the literature instrumenting the import penetration variable with a) time lags of the import penetration variable (Alvarez and Claro, 2009), b) product quotas and tariffs or transport costs (Bernard et al., 2006), c) export shares of the trade partner in other countries excluding the study-country (Autor et al. 2013) and d) the production growth or evolution of the production cost in the trade partner's domestic sector (i.e. China).

Due to data limitations we cannot resort to options b) and d) and we will address the endogeneity concern, following Autor et al., (2013) based on option c) using Chinese sectoral exports to the world as an instrument. Specifically, we instrument for import penetration from China into the Chilean economy with the contemporaneous composition and growth of Chinese exports to the rest of the world (excl. Chile). The proposed IV is correlated with Chinese exports into Chile but uncorrelated with Chilean domestic sales and employment growth satisfying the relevance and exogeneity requirements of a valid IV.

The exogeneity of the proposed instrument is justifiable on the grounds that Chinese exports to the rest of the world (excluding Chile) will capture changes in China's comparative advantage that are not related to Chile's domestic industrial production. Additionally, the variation in Chinese exports will proxy for both Chinese productivity in each sector *j* and the decrease in transportation costs/tariffs[24] which are exogenous to the Chilean domestic production but are correlated with Chinese imports into Chile (relevance requirement) as Chile is one of the first countries to complete a FTA with China and is heavily and increasingly importing from China as shown in the above descriptive section.

The first-stage estimate reported in Table 1.6 confirms the reliability of our instrument, which is positively and significantly correlated with our main regressor (Chinese import penetration) in all specifications. In addition to that and in compliance with the econometric literature on weak instruments (Staiger and Stock, 1997; Stock and Yogo, 2005), the F-statistic for the first-stage as reported in Table 1.6 shows a value that is high (437) and above the conventional thresholds of ten (Stock and Yogo, 2005). The second stage confirms that domestic sales and labour productivity are lower in response to Chinese competition re-confirming the OLS estimates.

The same does not hold for employment growth, the estimate retains the negative sign but is not statistically significant. A possible explanation of the effect on employment growth is that perhaps the OLS estimate suffers from an upward bias and that the effect may be conditional on the scale of the industry, assuming that larger scale industries producing closer substitutes to Chinese imports in labor intensive sectors or sectors of a lower technological level are disproportionately affected. To test whether there is a heterogeneous effect stemming from the scale of the industry we stratify the sample into two categories. Industries with employment above and below the mean. The results are presented in table 1.7 and confirm that larger scale industries (above the mean of 50% which is 3697 employees) seem to suffer disproportionately in terms of employment contraction from increases in import competitions pressures from China. The asymmetric effect stemming from the scale of the industry can be seen as the other side of the coin elaborating on the results of the capital intensity's interaction effect. The negative coefficient of the interaction between capital intensity and Chinese import penetration may

[24] An example of the latter is the expiration of textile tariffs in 2001 and 2005 that led to huge increases in textiles imports from China worldwide.

suggest that larger scale, low technology and capital-intensive sectors are more negatively affected. When taking a closer look (in the dataset) at which sectors are actually above the mean (in terms of labour size) the low and medium tech sectors (basic metals, plastic, electrical machinery) stand out followed by labour intensive (textiles and apparel). Furthermore, another possible explanation is that industries with larger average firm size may be more flexible in hiring and firing and respond to pressures faster that smaller firms or family businesses.

Table 1. 6 IV estimation (China Import penetration)

IV 2SLS estimation	(1)	(2)	(3)
Dependent variable:	Domestic Sales	Δ Log Employment$_{t,t+1}$	*Log* Labour productivity
ImPen China	-1.806***	-0.047	-0.974***
(Second stage)	(0.282)	(0.034)	(0.306)
IV	0.049***	0.050***	0.053***
(First Stage)	(0.002)	(0.002)	(0.002)
F statistic First Stage	387	377	379
Industry level controls	YES	YES	YES
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	1321	1205	1321

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 1. 7 IV estimates for Employment growth – scale effects

IV 2SLS estimation	(1)	(2)
Dependent variable:	Employment growth (Employees < 50%)	Employment growth (Employees > 50%)
ImPen China	-0.013	-0.127**
(Second stage)	(0.034)	(0.063)
IV	0.056***	0.041***
(First Stage)	(0.003)	(0.004)
F statistic First Stage	301	91
Industry level controls	YES	YES
Industry FE	YES	YES
Year FE	YES	YES
Observations	816	372

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The proposed instrumental variable for China does not apply for the USA import penetration variable and we resort to using three-year time lags of USA imports penetration following Alvarez and Claro (2009). The reason behind the unsuitability of overall USA exports as an instrument for US import penetration into Chile is that USA (manufacturing) exports are much more diversified than China's and not a good proxy for Chile's import trade profile given that Chile imports specific products not covering the broad spectrum of USA's exports. The latter is justifiable on the grounds that Chile by having a relatively lower income level compared to that of USA's traditional trade partners such as the EU and other advanced economies does not have a similar import pattern thus USA's exports to the ROW does not satisfy the relevance requirement. As reported in Table 1.8, the relevance requirement is confirmed given that the three year time lag of USA import penetration is positively and significantly correlated with our main regressor and the F-statistic is high and above the conventional thresholds of 10 (Stock and Yogo, 2005). Considering that the effect from USA in the majority of cases is found to have a non-significant impact in the baseline model we conclude that the IV confirms the insignificance of the OLS parameters. The second stage confirms our initial results, which are relatively stable across the three specifications (Columns 1-3).

Table 1. 8 IV estimation (USA Import penetration)

IV 2SLS estimation	(1)	(2)	(3)
Dependent variable:	Log Domestic Sales	Δ Log Employment$_{t,t+1}$	Log Labour productivity
Imp Pen USA	-0.291	0.059	-0.363
(Second stage)	(0.580)	(0.043)	(0.619)
IV	0.355***	0.374***	0.374***
(First Stage)	(0.036)	(0.038)	(0.038)
F statistic First Stage	96	94	91
Industry level controls	YES	YES	YES
Industry FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	1321	1205	1321

Notes: A constant is included but not reported; Standard errors are clustered at the four-digit ISIC level; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

1.7 Conclusion

The ascent of China to the world's largest manufacturing powerhouse has raised concerns about the future of Chile's position in the international division of labour. Despite the numerous studies on the competition pressures in the developed world, there is still a scarcity of empirical evidence in less economically advanced countries. Moreover the opportunities and threats from deeper integration with partners of different income levels have not been studied before and our contribution offers insight into the asymmetric effects based on the level of integration and foreign investment across industries.

We examined the conditional effect of increased import penetration on the domestic manufacturing sector by assessing the effect in favor of both, export-oriented industries as well as industries with higher levels of foreign investment, skills and factor intensity. Employing the study period corresponding to the implementation of Chile's two most important free trade agreements we find an overall negative effect of import penetration on domestic manufacturing sales, employment growth and labour productivity which turns to positive when interactions with the export orientation and foreign ownership are introduced in the model.

Considering the significant positive impact of import penetration on export-oriented industries, policies that support and promote firms' exporting strategies should be promoted with a focus on domestic enterprises at the higher ends of the value chain. Therefore, the detrimental impact of increased import penetration can be reversed by supporting the export oriented industries as a vehicle to "upgrade" Chile's presence in global and regional value chains and provide a promising way of avoiding the "resource curse" which the country faces due to its' heavy reliance on copper exports.

In order to better reap the benefits of increased exposure to economic superpowers such as USA and China and increase the immunity of the domestic sector, Chile should apply policies promoting higher skilled-industries, which in turn will attract FDI in more skill-intensive, and higher value-added products, which will ensure higher participation in global value chains. To this end, the emergence of Chile in global value chains (OECD, 2015) may give rise to a winner-loser pattern where exporting industries, can not only

escape foreign competition but also capitalize on the participation in backward linkages essentially using cheaper or technologically more advanced foreign value-added into their gross exports. Furthermore, to the extent that manufacturing supports innovation and job creation, there is scope for facilitating and attracting more investment in that sector in Chile, especially if such attraction can build on Chile's existing vast engineering know-how related to the extractive industry.

The need to diversify into higher value-added products and away from standardized labour intensive products is additionally a way to escape the fact that Chile as other Latin American countries will rely on geographical proximity to the US market and will tend to specialize in heavy, low-value added products with high transport costs (Jenkins and Barbosa, 2012). Overall, the picture that emerges is that the significant exposure of Chile to increased competition has had a detrimental effect on the domestic manufacturing sector but may also pose an opportunity to upgrade and support strategic industries that will allow a deeper engagement into global and regional production networks which could be further facilitated by the recent upward trends of offshoring within the Latin American region.

The emergence of Chile in global value chains (OECD, 2015) may give rise to a winner-loser pattern where exporting industries can not only escape foreign competition but also prosper in the participation in backward linkages essentially using cheaper or technologically more advanced foreign value-added into their gross exports. Overall, an industrial policy targeting industries with an emphasis on low and medium-tech sectors due to severe Chinese competition should be combined with a strategic focus on high skilled industries. The latter by acting as a source of knowledge and innovation diffusion should be emphasized before further deepening of trade relations to ensure that the domestic industry is sufficiently prepared for the competition and enhanced with the absorptive capacity necessary to benefit from trade.

As Mayer (2009), emphasized the trade-off between trade and industrial policy objectives is nested into a debate of whether participation in GVCs is enough for "capturing value and promoting economic development, or whether supportive domestic policy is needed". Therefore the rationale for industrial policy should focus on enhancing "the ability to maintain, use and enlarge policy space without having to "opt out of international commitments" (Mayer, 2009). One of the main policy priorities of Chile as a response to i)

the increase of trade opportunities prosed by the FTAs and ii) the financial crisis, is to increase the participation into global value chains (GVC). These developments have triggered a re-thinking of Chile's medium-term growth prospects with a strong emphasis on the role of global value chains (GVCs), and a search for appropriate trade, investment and innovation policy responses (OECD, 2015).

It is essential to give a word of caution regarding the limitations of this study, which is the absence of a clear distinction of the effects of intermediate inputs. The latter especially in the case of labour productivity would add more precision to the analysis since studies have shown that access to cheaper imported inputs can raise productivity via learning, variety and quality effects (Mendoza, 2010). Further exploration on the empirical part should take into account possible interactions of the main regressors with dummies proxying low, medium and high tech and R&D expenditure to assess the temporal effects on actual domestic industrial upgrading. Future research should look at how levels of high-technology exports have responded to increased import penetration as well as the role played by the local and regional environment and the improvement of transport infrastructure in order to allow industries to upgrade and capitalize on deeper economic integration.

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Appendix

Table 1.A. 1 Variable list (definition and sources)

Variable	*Definition*	*Source*	*Geography*	*Time*
Domestic Sales	Logarithm of firm sales aggregated at the 4 digit ISIC level in constant (2008) prices	Manufacturing census by INE [25] – National Statistic Office of Chile	Chile	2000-2013
Employment Change	Yearly change of the Log of firm-level employment aggregated at the 4 digit ISIC level	Manufacturing census by INE [26] – National Statistic Office of Chile	Chile	2000-2013
Labour productivity	Logarithm of labour productivity (measured as sales per worker) averaged at the 4 digit ISIC level	Manufacturing census by INE [27] – National Statistic Office of Chile	Chile	2000-2013
ImPen China	Import penetration from China in sector j at year t (normalized on apparent consumption in same sector)	United Nations Statistical Division (COMTRADE database)	China	2000-2013
ImPen USA	Import penetration from USA in sector j at year t (normalized on apparent consumption in same sector)	United Nations Statistical Division (COMTRADE database)	USA	2000-2013
Size	Average firm size by industry j in year t	Manufacturing census by INE – National Statistic Office of Chile	Chile	2000-2013
Foreign Inv.	Percentage of foreign ownership by (ISIC) industry	Manufacturing census by INE – National Statistic Office of Chile	Chile	2000-2013
Export Intensity	Export revenue as a percentage of total sales by (ISIC) industry	Manufacturing census by INE – National Statistic Office of Chile	Chile	2000-2013
Log (K/L)	Capital intensity by industry: The ratio of capital (proxied by total assets) over employment	Manufacturing census by INE – National Statistic Office of Chile	Chile	2000-2013
Skill ratio	Ratio of skilled workers over total workers	Manufacturing census by INE – National Statistic Office of Chile	Chile	2000-2013

[25] Instituto Nacional de Estadisticas (INE) - Chile
[26] Instituto Nacional de Estadisticas (INE) - Chile
[27] Instituto Nacional de Estadisticas (INE) - Chile

Table 1.A. 2 Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
Domestic Sales (in logs)	24.43	2.21	17.89	30.98
Employment Change (in logs)	1.00	0.13	0.51	1.99
Labour productivity (in logs)	17.38	1.16	12.14	21.33
ImPen China	0.11	0.19	0	0.95
ImPen USA	0.10	0.19	0	3.15
Size	4.015	8.00	0	100
Foreign Investment	6.47	11.40	0	100
Export Intensity	0.20	1.51	0	56.99
Capital Intensity (in logs)	13.58	2.06	3.27	20.38
Skill ratio	1.15	2.57	0	35.30

Table 1.A. 3 Pair wise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Domestic Sales (1)	1								
ImPen China (2)	-0.37	1							
ImPen USA (3)	-0.26	-0.00	1						
Capital Intensity (4)	0.12	-0.07	-0.12	1					
Size (5)	-0.06	-0.08	0.06	0.08	1				
Skill ratio (6)	-0.17	0.12	0.05	0.08	0.02	1			
Export Intensity (7)	0.01	-0.04	-0.01	-0.04	-0.00	-0.02	1		
Foreign Inv. (8)	0.09	-0.16	0.08	0.09	0.70	-0.03	0.02	1	
Labour productivity (9)	0.43	-0.15	-0.06	-0.01	0.00	-0.00	-0.00	0.17	1

2. The heterogeneous effects of trade integration across the regional income distribution: evidence from Greece

2.1 Introduction

One of the key features of the EU integration process is the enormous opportunity presented for deeper trade integration across member states (European Economy, 2007). The latter is expected to unravel a multitude of benefits in terms of growth-inducing factors such as larger market access, productivity and knowledge transfer gains. However, it may also pose a serious of threats such as substitution effects for the domestic competing industries and the regions which are more exposed to the trade integration dynamics (Petrakos et al., 2012; Autor et al., 2013) which gives rise to a rigorous debate on the growth returns from trade. Despite the anticipated large macro-economic benefits of the internal market and the increased competition it entails (European Commission, 2007; 2015), the sub-national distribution of the benefits has been both debatable and overlooked by the bulk of the related literature.

This paper sets out to contribute to the existing empirical evidence pertaining to the geographically uneven growth effects of increased trade in a peripheral economy in the EU, following accession to the Eurozone. Given the observed spatial imbalances in both the evolution of trade and the growth trajectories of EU regions (Cappelen et al., 2003, Camagni and Capello 2009), our analysis aims to uncover the mechanisms behind the relatively poor performance of Greek regions. Despite the deepening of the EU integration process (which offers growth opportunities particularly through increased trade), the great majority of Greek regions - with the exception of prefectures in Attica and distinct islands - did not manage to surpass the 75–80% threshold of the EU GDP per cap average, which corresponds to the less developed/transition status (EC, 2014). The observed stagnation and lack of dynamic growth has attracted the attention of international scholars seeking to reveal the mechanisms and shed light on the causes of the weak industrial growth of Greek regions and the lack of regional convergence in Greece (Rodríguez-Pose et al., 2012; Petrakos and Psycharis, 2016; Petrakos et al., 2012). Among the salient factors identified in the literature are competition pressures related to the widening and deepening of the EU integration process (Petrakos et al., 2012), the inability of the Public Investment Programmes in

promoting regional convergence and narrowing the development gap among Greek prefectures (Rodríguez-Pose et al., 2012), the specialization of Greek regions in export-declining sectors that experience labour productivity losses (Kallioras et al., 2016), and the peripherality of the Greek economy compared to the EU core. Studies also stress the institutional weaknesses and the limited effectiveness of the adjustment programmes (Kotios et al., 2017), the uneven growth returns of the EU Structural Funds programmes (Sotiriou and Tsiapa, 2015) and the severe impact of the financial crisis (Petrakos and Psycharis, 2016).

The study of Greece and in particular the period of analysis chosen is important on account of a number of prominent reasons. Greece is one of the countries that became part of the Eurozone with much lower levels of competitiveness than other countries, it is characterised by a weaker industrial base in terms of economies of scale and regional inequalities were quite pronounced. The examination of the Greek case presents also a setting for external validity to other peripheral economies (in pre-accession stages or experiencing the consequences of deeper integration dynamics) while the phenomenal deep recession affecting regional economies needs to be addressed in light of the previous failures in securing competitiveness and sustainable growth.

The country's accession to the Eurozone (2001) led to a deepening of trade integration, due to the catalyst effect of the common currency in reducing overall transaction costs including borrowing[28] costs that facilitated the surge of imports. Although trade liberalization (i.e. inclusion into the EU common market) started in the late '80s, it was after the mid-90s that imports from the EU more than doubled, while exports followed a less pronounced upward trend (Eurostat data). The combination of intensified trade with the EU, the uneven distribution of economic activity in the Greek territory due to the great concentration in two main urban centres (Psycharis et al., 2014), as well as the heterogeneity of Greek regions with respect to their structural characteristics provide an interesting setting to empirically explore the regional response to the deepening of EU trade in a peripheral economy.

Empirical evidence on regional disparities has identified a mosaic of determinants

[28] Interest rates fell from 25% to 5% (ECB, 2005).

explaining the uneven growth trajectories which include geography, initial levels of income, human capital endowments, the quality of infrastructure as well as accessibility and institutional deficiencies (Rodriguez -Pose et al., 2012; Crescenzi and Rodríguez-Pose, 2012; Midelfart-Knarvik and Overman, 2002; Monastiriotis et al., 2017). The extent to which trade acts as a causal mechanism of uneven growth at the sub-national (regional) level is much less explored and the evidence appears inconclusive (Paluzie, 2001; Kallioras and Pinna, 2015; Petrakos et al., 2012).

As per the literature and according to the European Commission, increased trade, benefits EU countries in multiple ways. First, it is found to be a powerful engine of growth and job creation, generating export opportunities which are of crucial importance for sectors undergoing structural change and reduces costs through greater choice of inputs which contributes to the competitiveness of EU firms (EC, 2012). In addition, intra-EU imports are a source of productivity gains, innovation and new technologies that benefit both industries and consumers by lowering prices and broadening choice, thereby affecting the prosperity of member states and regions (EPRS, 2017). Although the aforementioned diffusion channels are expected to contribute to increases in aggregate efficiency and national welfare; at the sub-national level, there is inconsistent empirical evidence of an inherent link between the process of EU integration and regional growth since there is a conundrum surrounding which typology of region benefit or loses from the process.

Studies identify the decisive role played by the composition of trade in explaining regional disparities suggesting that the evolution of manufacturing-to-agriculture share of exports is a driver of global regional inequalities (Rodríguez-Pose and Gill, 2006). For Greece, the deeper integration of the manufacturing sector into the European economy (Petrakos et al., 2012; Kallioras and Pinna, 2015), was found negative in terms of growth suggesting that the Greek regions that were more exposed to European competition suffered the most (Petrakos et al., 2012). In the same vein, studies focusing on the crisis period conclude that improving trade openness and integration into the EU market had an adverse effect on regional growth in Greece and suggest that the EU market appears too competitive for the internationalization efforts of the Greek regions (Petrakos and Psycharis, 2016).

For Central and European Countries (CEC) the regions that benefited the most were those that were more economically developed, service-based and diversified with high access to markets. This process took place at the expense of poorer more agricultural and less competitive regions (Monastiriotis et al., 2017). Examining which regions were more severely affected by the crisis, Groot et al., (2011), find that EU regions with increased trade openness experienced a higher output reduction. When they disentangle the effects of exports versus imports they conclude that higher imports appear to have a stronger association with output reduction as opposed to exports, while the current account balance is even stronger correlated with the depth of the recession suggesting "that trade imbalances[29] are a good predictor of the severity of future crises" (Groot et al., 2011 p.443).

The current study aims to fill the gap in the empirical literature pertaining to the income level of the region and identifies the conditional effects stemming from different types of integration (EU trade versus global trade). The different types of integration are expected to have heterogeneous competition effects and thus produce a different set of growth-inducing and substitution effects across the regional income distribution. We thus contribute to the existing debate by explicitly testing the hypothesis that the economic development of a region, and specifically its position in the regional income distribution will influence the nature and intensity of the trade effect.

The heterogeneous trade integration effects will be evaluated by means of quantile regression techniques, which allow us to test whether the impact of increased EU trade differs according to the income level of a region. We thus test the hypothesis that more advanced regions will be more affected by EU trade, due to their relatively similar sectoral structure to the composition of EU trade flows (compared to non-EU trade) which in turn intensifies import competition pressures. In other words, a more advanced region will produce (and export) a more similar bundle of products to those of its core EU trade partners compared to a poorer agricultural, "sheltered[30]" and more

[29] Countries with a surplus on the current account balance before the crisis on average experience a smaller decline of GDP and a smaller increase of unemployment (Groot et al. 2011).
[30] "Sheltered" regions are those economies that rely heavily on agricultural subsidies and the public sector with a low integration in the global economy (Petrakos and Psycharis, 2015). As stressed in Fratesi and Rodriguez-Pose (2016) 'sheltered' economies are those "more impervious to changes in the business cycle;

peripheral region, rendering the competition from the EU fiercer for the advanced region compared to the poorer region.

Consequently, substitution effects from EU trade (especially intra-industry EU trade) will affect richer regions and will not impact on poorer regions to the same extent, as they do not directly compete with the more advanced EU imports. The methodological novelty of the analysis is to detect the heterogeneity of the trade-growth nexus across the regional income distribution by decomposing the effects of two different types of trade integration. Although quantile regression techniques have received attention in cross-country growth studies (Crespo-Cuaresma et al., 2011), the regional dimension is underexplored (Costa-i-Font and Rodriguez-Oreggia, 2005). Additionally, the parameter heterogeneity of a number of growth determinants across regions provides fruitful insight for policy recommendations.

The remainder of the paper is organized as follows. In section 2.2 the theoretical framework and review of the empirical evidence is presented. Section 2.3 provides a descriptive analysis of EU trade and the regional growth performance in Greece; section 2.4 is devoted to methodology and empirical results and in section 2.5 we summarize the concluding remarks and discuss some policy implications.

2.2 Literature review

2.2.1 Spatial implications of trade on growth

The theoretical models on the intra-national spatial distribution of the benefits stemming from deeper trade integration are modeled primarily in the context of the new economic geography (NEG) theory (Krugman and Livas, 1996). The corresponding models are mostly concerned with the question of "whether increasing cross-border integration leads to a greater intra-national concentration of manufacturing activity, thereby increasing regional inequality" (Rodríguez-Pose, 2012 p.112). The latter gives rise to core-periphery patterns which are the outcome of the interplay between centripetal and centrifugal forces which depend on a set of

with an economic structure less capable of taking advantage of high growth periods" (Rodríguez-Pose and Fratesi, 2007: 624).

assumptions pertaining to transport costs and the mobility of (agricultural and manufacturing) labour (Paluzie, 2001). As such, in the theoretical literature the trade-growth relations at the regional level are framed only implicitly as a response to the relocation of economic activity across space.

The current study encompasses elements from New Trade Theory (NTT), the New Economic Geography (NEG) and the endogenous growth theory. The NTT explains the surge of intra-industry trade within the EU as a result of increasing returns to scale and product differentiation. NEG and, in part, the endogenous growth theory, offer the theoretical foundations for explaining the growth returns of trade in large agglomerations. One of the main predictions of NEG supported by empirical evidence is that the reduction in trade costs- in combination with increasing returns to scale- is expected to increase the growth returns from trade in large urban agglomerations (e.g. Ottaviano et al., 2002) thus producing uneven growth patterns induced by trade. The gradual reduction in transport costs worldwide and the reduction in transaction costs from the creation of the Eurozone played a catalyst role in the deepening of EU trade integration leading to within country concentration trends in manufacturing and services (Brülhart and Traeger, 2005).

In the standard regional convergence frameworks (Barro and Sala-i-Martin, 1995), which imply that initially poorer regions will on average grow faster than rich regions, what is missing, that is partially addressed by NEG models, is the interplay between trade on the one hand and the increasing returns to scale and the specialization patterns on the other hand. The question to be answered is "if long term growth is driven by the endogenous accumulation of experience through learning-by-doing, then trade between regions can lead one region to specialize in industries in which it has a comparative advantage (e.g. traditional economic activities), but for which the opportunities to learn are relatively small, so that the growth rate in that region may be lower precisely because of trade integration" (Martin, 2001 p. 6). With initial conditions reflecting the superiority of the EU core's specialization on higher value added industries, trade and in particular the reduction of transaction costs are expected to lead to a spatial concentration of increasing returns to scale activities in the EU core whereas the

periphery will tend to specialize in constant returns to scale industries[31] (Martin, 2001).

Acting via knowledge transmission channels, trade may amplify core-periphery patterns by benefiting disproportionately core areas with high concentrations of specialized labour and other prior advantages of higher levels of R&D expenditure, physical and human capital and more effective institutional settings. Clustering is expected to occur due to the prevalence of agglomeration forces such as firm level economies of scale and external economies of scale which combined with high specialized labour turnover and reduced trade (transport and transaction) costs creates virtuous cycles of growth in core regions (Senior Nello, 2012). As per the NEG, the surge of trade will thus benefit regions of the EU core to a larger degree compared to regions of the EU periphery that lack the favorable geography and initial conditions to compete successfully in the integrated market.

The endogenous growth theory predicts that trade is a vehicle of positive externalities and spillover effects which facilitate the transition and dissemination of technological progress, knowledge and ideas (Fine, 2000). However, this may not be the case when trading counterparts exhibit considerable differences in terms of endowments and level of technology, while lagging economies may find it difficult to grasp the dynamic effects of trade also attributable to the lack of absorptive capacities (Devereux and Lapham, 1994). To this end, as Martin (2001, p. 2) argues "because neither policy-makers, nor economists are ready to give up the gains from trade integration, a natural implication is to employ public policies to counteract the possibility of increased regional inequalities which are viewed as unacceptable on distributional and political grounds". The latter signifies the expected uneven or even negative net effects from deeper EU trade integration for some regions, which urges regional policy intervention.

The theoretical models on the spatial effects of trade were constructed by Krugman and Livas (1996) and have been challenged by other scholars, such as Paluzie. Using the example of Mexico, Krugman and Livas (1996) show that trade liberalization brought a de-concentration of industrial activity and shifted it away from Mexico City to the northern states (due to proximity to the US border and the centrifugal forces of congestion). They explain that the economic landscape changed rapidly after the country opened up to trade and economic activity evened out as inputs could be

[31] For example agriculture and low technology industries.

sourced from abroad and output was exported, leading to a dispersal of manufacturing activity, reducing regional disparities[32].

The association between trade and regional inequalities was further explored by Paluzie (2001). Departing from similar assumptions[33], she contradicts Krugman and Livas (1996) and constructs a model to explain the evolution of regional inequalities in Spain. She finds that the opening up of a closed economy brought further regional polarization that coincided with the interruption of the convergence process in the EU and especially in Spain (in the 1980s). This model adheres more to the basic Krugman core-periphery model in which labour mobility plays a key role in reinforcing the unequal geography of trade and the regional polarization, which comes as a result of trade liberalization (Paluzie, 2001). For the study of the regional growth-trade nexus the theoretical framework is very limited as the existing theoretical models in the NEG literature use the fluctuation in transport costs to determine the location of economic activity, which in turn drives the evolution of regional disparities. Much less is spelled out in relation to the actual benefits and costs of increased trade conditional on the wealth of regions. The existing empirical literature has relied mostly on broad typologies of rural versus urban areas or poor versus rich countries (e.g. Rodriguez Pose and Gill, 2006; Rodriguez-Pose, 2012; Krugman and Livas, 1996).

Although not directly related to regional growth outcomes, the above conceptual framework offers insight in terms of the 'location' responses of economic activity within countries, as the latter will determine the regions' exposure to trade. Consequently, the concentration of Greece's manufacturing in the upper quantiles of the regional income distribution determines the level of exposure to EU trade and to overall trade openness. Economic activity may agglomerate to benefit from positive externalities (Duranton and Storper, 2008) however, agglomeration dynamics do not guarantee immunity from competition pressures as the differences (in scale economies and product sophistication) between trade partners – in this case between the EU and Greece – are still very large rendering the growth-inducing effects from trade

[32] With the exception of the south of Mexico, which has been lagging behind at a profound rate.
[33] These include two sectors, two regions and the emphasis on the relocation of manufacturing activity due to free trade. However, the main difference between Krugman and Livas (1996) and Paluzie's model is that the centrifugal force is the congestion cost in the first case, while in the second case it is the agricultural population which is tied to the land.

questionable.

Combining the predictions of the Heckscher–Ohlin (H-O) model[34] and Paluzie's model, Rodríguez-Pose and Gill (2006) conclude that the outcome of the regional disparities will depend on the *relative* increases of agricultural versus manufacturing trade as well as on the assumptions pertaining to labour mobility. To the extent that manufacturing trade within the EU increases due to deeper integration and agricultural population is tied to its land, Paluzie's model seems to better describe the kind of regional inequalities generated by deeper European integration.

Considering that the bulk of trade between Greece and the EU is concentrated in the manufacturing sector (Petrakos et al., 2012), the above models offer insight for the study of regional growth trajectories. The surge of trade for an EU peripheral small country such as Greece has led to high trade deficits (Eurostat data), due to the inability of the economy to compete with the economies of scale of northern EU industries leading often to import competition and substitution effects that harm the incumbent industry in manufacturing hubs (e.g. Petrakos et al., 2012), affecting disproportionally the growth trajectories of more advanced regions.

2.2.2 EU trade and regional growth

The stagnation in the regional convergence process in the European Union since the 1980s, suggests that "poorer regional economies have failed to grow faster than the rich ones at the first stages of EU integration" (López - Bazo, 1997 p. 346). Nowadays, "the convergence has bifurcated reflecting East-West convergence but North-South divergence, within the euro area, with the North diverging from the South" (Gross, 2018 p.1). These trends are analyzed with respect to a wide range of potential drivers among which, trade, has attracted the lower attention in empirical studies particularly at the spatial level, partly due to the lack of available data at fine levels of geographical disaggregation.

[34] As per the predictions of the traditional H-O based models, increases in trade may lead to declining disparities if capital and investment is attracted to areas with a lower cost base and if labor migrates to higher salary regions (Rodriguez-Pose and Gill, 2006). While Paluzie (2001) provides evidence that the opening up of a closed economy brings regional polarization due to labor mobility acting as a force working in favor of industrial agglomeration (Paluzie, 2001 p.82). This force is responsible for generating the unequal geography within a country and emphasizes that trade liberalization reinforces an internal core-periphery pattern.

To this end, the growing skepticism regarding the ability of more peripheral regions to adjust to trade and import competition, calls for increased attention into the empirical investigation of the trade-growth dynamics. The existing empirical evidence confirms that trade may lead to uneven growth patterns at the subnational level (Rodriguez Pose 2012, Autor et al., 2013; Petrakos et al., 2005) which suggests heterogeneous responses to the increases in trade exposure. Further, the detection of evidence (although partly inconclusive) pointing to the fact that integration amplified existing intra-national trends in EU regions as shown in Petrakos et al., 2005 reveals the importance of studying the regional-adjustment dynamics in specific countries for the validation of previous findings.

In a relevant study, López -Bazo et al., (2009) explore the evolution of disparities and convergence among NUTSII EU regions (from 1981-1992) and find that the process of economic integration contributes to equalizing productivity among firms and among regions, attributed to the need to achieve common standards of competitiveness. However the study concludes, that in a framework of liberalization and deeper EU trade integration, large firm exit from regional markets due to competitiveness pressures, results in "poorer regions suffering higher disequilibrium in their labour markets" (López -Bazo et al., 2009, p. 366) leading to negative effects on growth and convergence.

There is wide consensus in the literature that intra-industry trade is more conducive to economic growth than inter-industry trade, and that the former tends to take place between countries with similar factor endowments, to stimulate innovation and to exploit economies of scale (Helpman, 1987). Given the fact that there is a positive correlation between GDP growth and intensity of intra-industry trade (IIT), new EU members hoped to achieve higher growth rates and sustainable development as a result of an increase in IIT with other EU member states. This was the case between the more industrially advanced regions of the EU core, while for the north-south EU relations, the increases in IIT were expected to be associated with higher competition pressures, due to differences in economies of scale of the domestic industries and in the regional levels of technological development.

The increased competitive pressures both in terms of quality from the EU and in terms of price/cost competitiveness from trade with Asian markets led firms to relocate for survival purposes to other countries (mainly the Balkan region) (Kapitsinis, 2018). The competition effects are thus a result of deeper integration in both the EU and the global markets. IIT is also found to be more vertical (trade in intermediate products) between core EU countries and the southern countries rather than horizontal (trade in end products of the same industry), resulting in complementary production patterns (Caporale et al., 2015). To this end, the spatial consequences are an uneven distribution of industrial activity in the EU with a higher concentration of employment in scale-intensive industries at the center of the EU (Brülhart and Torstensson, 2001).

In theory, vertical IIT could be regarded as beneficial and growth-inducing rather than producing purely a substitution effect. However, Greek firms have not managed to branch out heavily into global value chains (GVC) within the EU, and GVC participation is recorded as weak taking the form of backward linkages/upstream participation (OECD, 2016) i.e. sourcing intermediates from abroad in specific sectors which crowds out local suppliers (especially in light manufacturing). The low participation in forward linkages is impeded by the peripheral geographical position of the Greek territory, the average firm size, factor prices and deficiencies in the institutional and regulatory environment.

In accordance with EU trade integration, Greek regions have been engaging in intra-industry trade but do not benefit equally. The optimistic predictions of the growth-inducing effects of knowledge and technology diffusion that would upgrade the domestic industries and would lead to higher regional growth and employment do not seem to have offset the negative effects of import substitution as shown by the weak performance of regional industrial growth in CEECs and Greece (Petrakos et al., 2012; Kallioras and Petrakos, 2010).

The opening of Greek regions to trade in the early 1980s coincided with amplifying the concentration of economic activity in the core urban cities and manufacturing hubs. This led to growing regional inequalities, in terms both of the location of economic activity and the growth prospects of regions. More specifically, higher value-added manufacturing production in Greece is concentrated in the upper quantiles of the

regional income distribution leading to rising regional disparities (Caraveli and Tsionas, 2012). This polar development model renders the intensity of the effect of EU trade, highly heterogeneous.

The vast majority of studies addressing the implications of trade, focus mainly on the effects it entails in terms of inequalities across and within countries and on how EU trade integration affects the geographical location (concentration versus dispersion) of industrial activity (Rogriguez-Pose 2012; Badinger and Tondl, 2002; Petrakos et al., 2005). The evidence on the sub-national growth returns from trade for developing countries (versus developed) is informative also for in an EU context due to the high unevenness across countries and regions. Interregional sectoral differences, the shares of governmental expenditure and the size of internal transaction costs play a significant role when examining the link between trade liberalization and within-country inequalities across 28 countries over a 30-year period (Rodriguez-Pose 2012). Changes in trade patterns seem to affect the evolution of regional inequality in developing countries to a far greater extent than in developed ones. In the case of developing countries, Rodríguez-Pose and Ezcura (2014) find a positive link between trade and spatial inequality in 22 developing countries over the period 1990–2006. They conclude that a greater degree of trade openness reduces the GDP per capita of poorer regions and increases that of richer regions, thereby creating winners and losers that coincide with rich and poor regions respectively. The decisive role played by changes in the composition of trade flows was found significant in explaining regional disparities in 7 out of 8 counties attributed to the decrease of the global ratios of agricultural exports relative to manufacturing exports (Rodriguez-Pose and Gill, 2006). This trend affected developing countries disproportionately while regional disparities were found to decline when the agricultural export shares became more important.

In the 1990s, the effects of trade on the growth of EU regions were determined partly by trade-induced technological catch-up facilitated by higher education attainment levels in lagging regions (Badinger and Tondl, 2002). The study employs a spatial lag model on 159 EU regions and detects that apart from physical capital and labour participation, “foreign trade contributes to regional growth, by promoting technological catching-up” (Badinger and Tondl, 2002 p.216).

Assessing the effects of deeper integration focusing solely on EU trade, empirical evidence during the pre-accession phase on EU NMS[35] regions, stress that regions that were initially more exposed to trade competition, suffered the most in terms of destruction in industrial employment leading to "de-industrialisation which was a result of the combined outcome of market forces and transition policies, which led to an abrupt exposure of poorly organised domestic activities to external competition" (Kallioras and Petrakos, 2010). The latter illustrates that peripheral[36] regions with weak industrial structures will suffer significant employment losses related to the opening of their markets and integration with the EU, with implications on growth. Specifically, the impact was fiercer for the more industrially advanced regions – i.e. the regions that produce the greatest part of the national industrial gross domestic product (Kallioras and Petrakos, 2010).

Analysis into the very first stages of EU integration is informative for interpreting current trends. Studies on the first decade of Greece's participation in the EU, stress, that despite a long transition period following EU accession[37] the Greek economy recorded no export gains and saw a marked decline in competitiveness attributed to high levels of import penetration (Arghyrou and Bazina, 2003). Although the latter refers to the national-level it is expected to produce (as empirical evidence suggests), a significant regional footprint.

At the sub-national level, empirical evidence on Greece's EU integration experience, revealed the inability of Greek regions to compete (successfully) with their more advanced counterparts in capital-intensive manufacturing and knowledge-intensive economic activities (Petrakos et al., 2012). Along the same lines of research, employing an international trade adjusted shift-share approach to detect changes in regional manufacturing employment (from 1995–2003) Fotopoulos et al., (2010), conclude that the export performance of most sectors in Greek regions was weak,

[35] EU NMS include Slovenia, Hungary, Slovakia, Czech Republic, Poland, Latvia, Lithuania and Estonia that became EU members in May 2004, and Bulgaria and Romania that became EU members in January 2007 (Kallioras and Petrakos, 2010 p. 668)

[36] Peripheral in this case is perceived within the European setting not within national boundaries.

[37] "When Greece joined the EU in 1981 it negotiated and achieved an immediate abolition of all barriers imposed on Greek exports in the EU market; and the right to abolish trade barriers protecting domestic producers against EU competitors in the Greek market only gradually. This transition period ended in 1989." (Arghyrou and Bazina, 2003 p. 3).

highlighting the role played by competition from imports in producing negative employment (growth) effects. The analysis detects the growing importance of local conditions (defined as "competitive shifts[38]") as well as the regional business cycles in explaining how regional idiosyncratic features drive employment growth patterns. In their analysis, domestic demand stands out as the critical driver of regional employment growth. Although the study does not focus on EU trade explicitly, considering that the surge of manufacturing imports originates from the EU, the results are implicitly also capturing adjustments to EU trade dynamics.

In the period before the crisis unfolded in Greece, empirical evidence showed that the higher the increase in manufacturing trade with the EU, the lower the growth of the regional manufacturing sector (industrial GVA output). In a 25-year panel at the NUTS III level, Petrakos et al., (2012), find that the effect of the deeper integration of the manufacturing sector into the EU market is negative and statistically significant. They attribute the low performance of the Greek regional economies to the peripherality of the country, the institutional weaknesses and the structural characteristics of the Greek regions (Petrakos et al., 2012). Drawing upon the results of this study, we assume that to the extent that the richer regions host higher shares of industrial activity (Caraveli and Tsionas, 2012) then more advanced regions will face higher competition pressures than more "sheltered" or poorer regions, which is in line with our hypothesis. The industrial sector is considered the main diffusion channel of the integration dynamics in a spatio-structural context (Amiti, 1998) due to "the displaceable character of its activities, the tradable character of its products and the linkages it retains with the other sectors of production" (Petrakos et al., 2012, p. 347).

With respect to the crisis period, Petrakos and Psycharis (2016) provide empirical evidence that showcases (through interaction terms) that while regions with higher initial levels of overall trade openness perform better when openness increases further, higher prior levels of EU trade integration do not seem to have a similar effect, suggesting that the EU market seems too competitive for the internationalization efforts of the Greek regions. This renders them unable to translate the benefits of EU trade into growth. As a response to both the crisis and the competition pressures, the authors

[38] The authors measure "competitive shift" as the difference of sectoral employment growth rates between region *r* and those of its neighbors.

stress the difficulty of regions to penetrate the EU and thus seek trade opportunities in third markets, where entry requirements may be lower. Although the impact of increased trade on regional growth and on regional disparities has been analyzed (Rodriguez Pose, 2012, Petrakos et al., 2012, Kallioras and Petrakos, 2010), the heterogeneous effects on the regional income distribution in a peripheral EU country following the deepening of trade integration remains underexplored.

The use of quantile regressions in the EU regional context revealed that development covariates have different effects across growth quantiles. Using Bayesian Model Averaging (BMA) on quantile regression models, Crespo-Cuaresma et al., (2011) propose that growth determinants differ across quantiles. They stress that the estimated impact of physical investment, skill endowment and initial gross domestic product per capita varies across quantiles suggesting significant parameter[39] heterogeneity across quantiles. In line with the above results, Costa-i-Font and Rodriguez-Oreggia (2005) use QR techniques to assess the impact of public investment in Mexico according to the position of each region in the conditional distribution of regional income and find that public investment mainly helped to reduce regional inequalities among the richest regions.

The large differences between core EU countries compared to the weaker regional industries structures in terms of economies of scale in trading industries, the disparities in innovation rates and the degree of market penetration are perceived to be a channel of unbalanced competition. We assume that the regional response to trade is determined by the income level of the region, which is indicative of its sectoral profile and will subsequently influence the level and type of competition that a region will face from intensified EU trade. This setting is informative regarding the regional adjustment process of a less advanced EU member state such as Greece.

Although there is a growing literature exploring the heterogeneity of growth determinants across the regional income distribution, empirical evidence on the impact of trade in the EU integration context remains scarce. The econometric investigation

[39] In terms of the quantile empirical results, Crespo-Cuaresma et al. (2011) find that physical capital has a stronger association in "over-achievers", while the results on human capital depend on whether or not country effects are included.

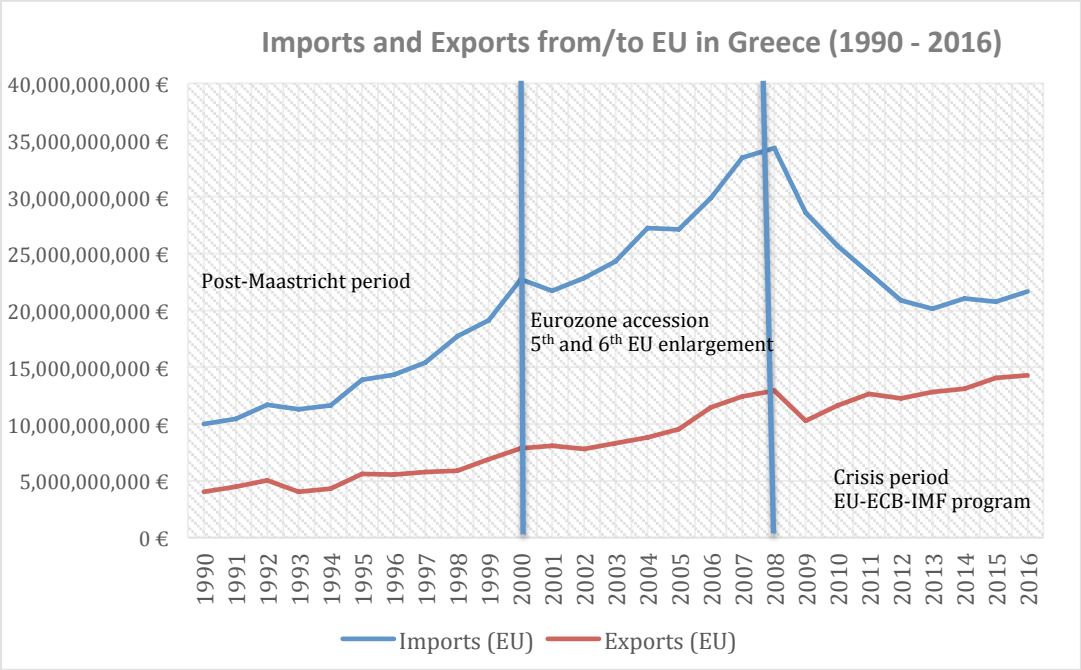
into the hypothesis that there is high heterogeneity in the EU trade-growth nexus across the regional income distribution will shed new light into the asymmetric effects of increases in EU trade intensity with potential extensions on the EU regional convergence process.

2.3 Contextual background

Trade integration

The EU has traditionally been the most significant trade partner for Greece, from the end of the 1990s to 2015 (although this was the case in the 1980's, barriers to trade in that decade were still used to "shield" domestic industries). The following graph (Fig. 2.1) sketches the evolution of EU imports into Greece as well as Greek exports to the EU. From 2000 onwards there is a sharp climb of EU imports, which coincided with the accession into the Eurozone. The high absorption of EU imports was fueled by the lower transaction costs of the common currency union and the large reduction in borrowing costs (interest rates fell from 25% to 5%) for both corporations and consumers. In the same period there is also an upward trend in exports; however, the gap between imports and exports widened significantly after accession and up until the crisis erupted in late 2008.

Figure 2. 1 Evolution of Greece's Trade with the EU

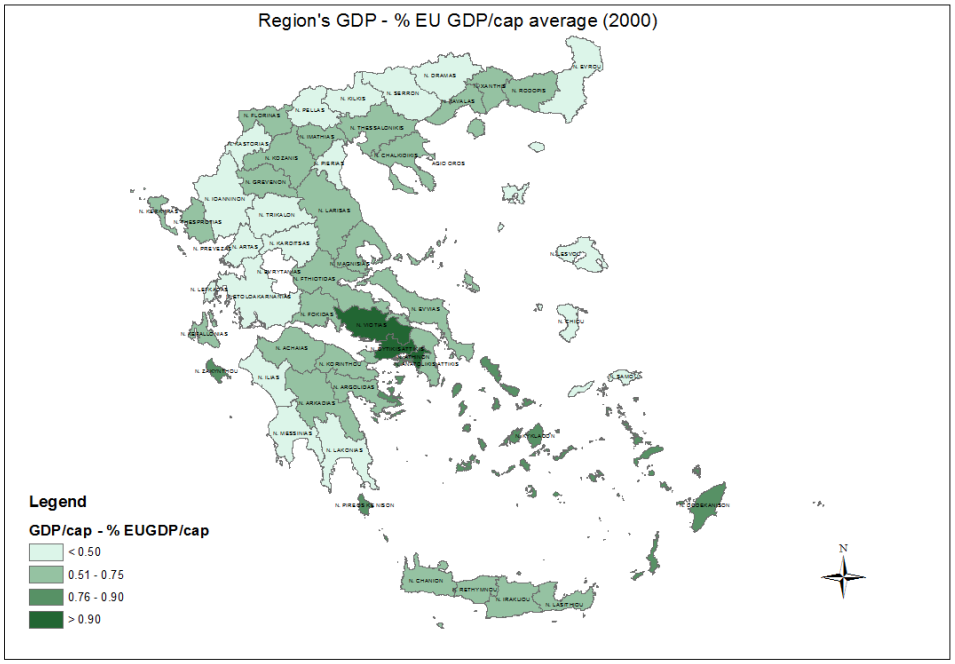


Source: own elaboration using data from Eurostat (*International trade database*)

Greece's largest increase in the trade deficit was marked in 2002–2008 following Eurozone accession (Eurostat data). The trade deficit is regarded as one of the channels of the impact of integration on national and regional growth. The above trend is reflected also in the evolution of the trade balance of Greece with the EU (Fig A.3 in appendix). We compare Greece and Portugal as they are found to be comparable in terms of their peripherality within the EU, both are under the EU Cohesion Fund, have a similar export base and face common structural and institutional challenges. The Greek trade deficit is high for a number of reasons, including the low competiveness of price and cost of Greek products (due to indirect taxes and barriers which impede efficiency), the low levels of capital and technology-intensive exports compared to the EU core, the lower levels of export penetration, the particularly high import content of exports as well as the lower levels of product quality compared to its core EU counterparts. The largest trading partners of Greece are Germany, Italy and the Netherlands while outside the Eurozone there is an increase in trade (often surpassing the EU in terms of export destination) with the Balkan countries, Asia and Africa (Konstantakopoulou, 2015, Tsiapa, 2019).

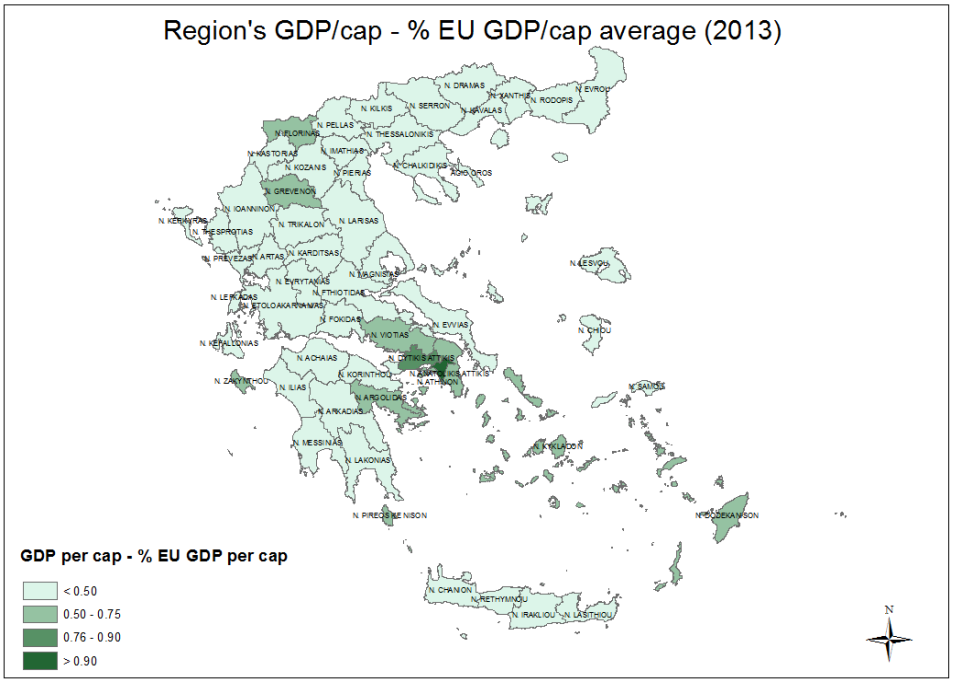
With regard to the regional dimension, the maps in Figures 2.2 and 2.3 display the spatial heterogeneity of the regional GDP as a percentage of the EU average for the years 2000 and 2013 respectively. As can be observed from the five color classifications with the exception of Attica and some advanced islands, the remaining regions still fall under the *transitional* or *less developed* status (75% of EU average) in 2000, while in 2013 the vast majority of regions did not manage to surpass 50% of the EU average, asserting the sensibly very low performance of the Greek regions during the economic crisis.

Figure 2. 2 Map of Region's GDP as a percentage of the EU average (2000)



Source: own elaboration using data from EUROSTAT

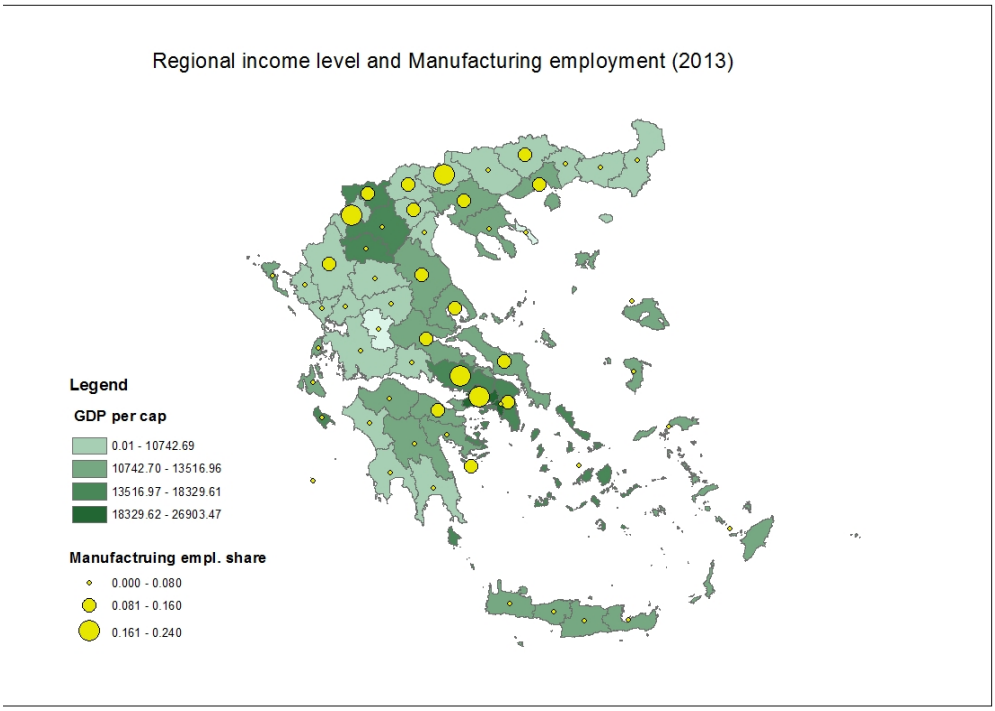
Figure 2. 3 Map of Region's GDP as a percentage of the EU average (2013)



Source: own elaboration using data from EUROSTAT

Figure 2.4, below offers a snapshot of the spatial distribution of the economic development of Greek regions (in terms of GDP per cap.) and the share of manufacturing employment by region with darker colours corresponding to higher levels of economic development and larger circles representing higher shares of manufacturing. The majority of the economically advanced regions (located on the east north-south axis) host high shares of manufacturing, while the poorer regions in the north (bordering the Balkan region) specialize in lower value-added and more labour- and resource-intensive manufacturing. This pattern underlies our hypothesis that more advanced regions which host higher value-added manufacturing are competing with EU imports to a greater extent than poorer regions. The relatively advanced regions in the southern Peloponnese and Crete that have lower shares of manufacturing rely mainly on high value-added agricultural production or high rates of tourism.

Figure 2. 4 Map of Economic development and MNF share at NUTS III (2013)

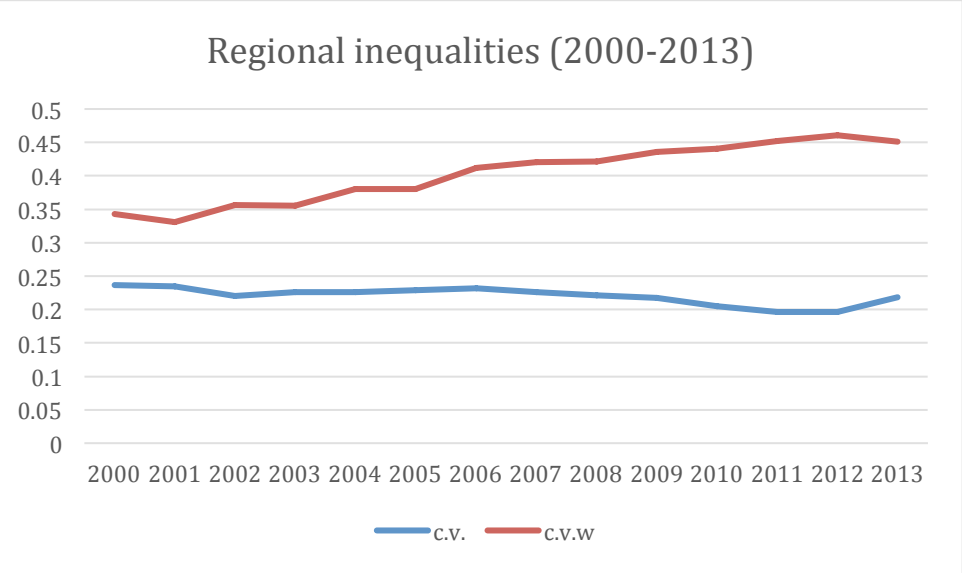


Source: own elaboration using data from EUROSTAT

Figure 2.4 illustrates the evolution of regional disparities based on the calculation of both the coefficient of variation (c.v.) of GDP per capita as well as the population-weighted coefficient of variation (c.v.w.), following Petrakos and Psycharis (2016). As depicted in the graph, the un-weighted coefficient of variation (c.v.) shows a stable and perhaps declining trend of regional inequalities that could be attributed to the

underperformance of the more advanced regions. This trend is in line with our hypothesis on the more pronounced negative effects of increased EU trade for regions in the upper quantiles of regional income distribution. The latter is based on the hypothesis that the contraction of the manufacturing sector, which is concentrated in the mid-income and richer regions, results in bringing them closer to the regional income average, thus reducing regional disparities. However the weighted C.V. follows a slight upward trend indicating a widening of regional inequalities, which is attributed to "the dominant position that Athens has in the Greek economy and its relatively better performance than the rest of the regions which maintains the previous trends of divergence" (Petrakos and Psycharis, 2016 p.142).

Figure 2. 5 Evolution of regional inequalities



Source: own elaboration using data from El.STAT

2.4 Methodology and description of data

The econometric analysis is based on a production-function specification where regional output (Y) is modeled as a function of two main factors of production (capital and labour). Capital (K) is proxied by the expenditures of the public investment programme commonly used in the regional growth literature and labour (L) is proxied by population (normalized on regional area size) which also accounts for size and urbanization. For the assessment of the impact of EU trade integration on regional GDP growth, the equation takes the following form:

$$Log\ (Y_{r,t}\ ) = \beta_1 TII_{r,t-1} + \beta_2 K_{r,t-1} + \beta_3 L_{r,t-1} + \sum_{k=1}^{v} \beta_k\, X_{r,t-1} + \delta_t + \varphi_r + \varepsilon_{r,t} \quad (4)$$

The model is extended with the addition of a set of controls *X* which is a vector of $k = 1, \dots, \upsilon$ region-specific variables (growth determinants). The dependent variable is the natural logarithm of real GDP per capita in region *r,* at year *t;* region and year fixed effects (φ_r and δ_t) are included in all models to capture idiosyncratic time-invariant differences in growth rates across regions and national business-cycles, respectively. The model is equivalent to a growth model as it is a panel fixed effects model with log GDP per cap as the dependent variable. The analysis covers the period corresponding to the EMU accession from 2000–2013 and is estimated at the NUTS III level (50 regions/prefectures). Prefectures in Greece have traditionally been the key spatial level for regional development policy (Rodriguez-Pose et al., 2012) and represent the most disaggregated administrative unit for which trade-related data are available. The empirical analysis is based on a balanced panel evaluated by means of a fixed effects regression and the use of quantile regression techniques followed by a system GMM estimation for robustness checks.

The key regressor (TII) takes the form of two different types of trade integration: the EU Trade integration (EUTII) which is our main explanatory variable and the Rest of the World (ROW) index, the construction of both indices is explained in detail below. Following Petrakos and Psycharis (2016) and Petrakos et al., (2005), the main regressor is the EU trade integration index (EU trade), which is measured according to the following formula:

$$EUTII_{r,t} = \frac{M_{r,t}^{EU} + X_{r,t}^{EU}}{M_{r,t}^{W} + X_{r,t}^{W}} \quad (5)$$

The index is the ratio of EU imports and exports in region *r* in year *t* over the total imports and exports of region *r* in year *t*, and is a measure of EU trade intensity. The variable is measured using the actual annual regional trade flows at the NUTS III level provided by the National Statistical Office of Greece (ELSTAT). We use actual trade flows at the region (*nomos*) level and not proxies based on location quotients, which was the method, used before the new data became available. All variables and their sources are described in detail in the appendix (Table 2.A.1).

We factor in the level of *openness* of the region by including the trade openness index (*Open*), which captures overall trade. The index follows the traditional definition of openness used widely in the literature, which is the ratio of overall trade (imports and exports) of the region over the region's GDP (Ezcurra and Rodriguez-Pose, 2014 Frankel and Romer, 1999; Frankel and Rose, 2002).

$$Open_{r,t=} \frac{Trade_{r,t}}{GDP_{r,t}} \quad (6)$$

We further test the effects of trade with the rest of the world (ROW) which essentially measures non-EU trade intensity and is included to detect the heterogeneous effect of trade with countries outside the EU. Integration in non-EU markets is likely to produce smaller substitution effects while export capacities of Greek regions in less competitive non-EU markets are expected to be higher. The index is measured following the same formula as the trade integration index:

$$ROW_{r,t=} \frac{M_{r,t}^{nonEU} + X_{r,t}^{nonEU}}{M_{r,t}^{W} + X_{r,t}^{W}} \quad (7)$$

The variable is measured as the ratio of trade with non-EU countries over total trade by region and by year and captures increases in the trade intensity with countries outside the EU. The latter essentially reflects trade with the largest non-EU trade partners such as Turkey, the Balkan countries, Asia and the North African region.

All variables are included in one-year lags in order to capture potential delays of the impact of our main regressor and of the controls on regional development and also partly mitigates reverse causality concerns.

In the vector of controls we include the logarithm of population density (*log PopDen*). This variable has traditionally been included in standard economic development models and is a proxy of agglomeration economies and market size. However, the positive effect on growth is not always confirmed by the empirical literature. As noted by Groot et al., (2012) and empirically tested by Psycharis et al., (2014), large agglomerations are more exposed to economic downturns and therefore often experience higher negative effects in periods of economic crisis than the less developed areas, rendering the growth effect negative rather than positive. In addition, larger agglomerations are often characterized by the presence of clusters and can be highly exposed to asymmetric shocks. In the case of Greece, larger agglomerations are expected to underperform in periods of crisis and are not considered necessarily more dynamic or immune during an economic downturn. Specifically, regions hosting large cities or specializing in manufacturing (like Central Macedonia and part of Continental Greece, Thrace and Thessaly) were hit harder due to 'the difficulties of most industries in maintaining production in the face of reduced demand, severely cut bank credit, imported supplies and export guarantees' (Petrakos and Psycharis, 2016 p.143).

In the baseline model we include the regional public investment programme (PIP) measured as the per capita expenditure in region *r* in year *t (log PIP*), which is considered the main regional development tool of the country incorporating the EU's structural funds. It is also designed to promote convergence towards the standards of living of the EU and to reduce domestic regional asymmetries. However, the potential returns of public investment programmes in general, and in Greece in particular, have been widely disputed on both theoretical (Aschauer, 1989; Hirschman, 1958) and on empirical grounds (Rodríguez-Pose et al., 2012; Monastiriotis and Psycharis, 2014; Costa-i-Font, 2005). Studies have reached contradictory results as to the growth returns of public investment programmes, while the programme is found not to be territorially progressive enough (Rodríguez-Pose et al., 2012) and often prone to lobbying powers in Greece, rendering the growth returns questionable.

In order to test the robustness of our main regressors and improve the fit of the model we also include the geo-economic position of the region proxied by its connectivity (*accessibility*). This variable is measured as the inverse time-distance weighted population using road network data in the EU. The distance decay function is a fairly steep exponential function that approaches zero after four hours of travel. The connectivity of a region is expected to be positively related to growth as it captures the growth dynamics from increased market potential. Although transport infrastructure is debatable in the literature, it has traditionally been regarded as an 'unpaid factor of production' which encourages increased output (Rodríguez-Pose and Crescenzi, 2012) and has multiplier effects on growth (Aschauer, 1989). Among the controls we also include the share of the public sector in the regional economy measured as the ratio of GVA produced in the public sector over the region's total GDP, following Petrakos and Psycharis (2016).

The aforementioned control variables are included firstly to improve the fit of the model and secondly to test the robustness of our main regressor to the inclusion of alternative growth determinants. Our analysis follows the use of quantile techniques, which provide insights in terms of the heterogeneity of the main regressors and the growth determinants across the regional income distribution.

2.4.1 Empirical results

The following section compares panel fixed effects models with quantile regression techniques to firstly assess the impact of increased EU trade intensity, overall openness and trade with non EU markets on the growth performance of the regions and subsequently identify the heterogeneous effects of the various types of trade integration across the regional income distribution. The hypotheses to be tested are the following:

Hypothesis 1:

- The impact of trade depends on the origin of trade (EU trade versus ROW trade) as it captures the composition of trade flows.

Hypothesis 2:

- The income level of the region will determine the heterogeneous impact of the two different types of trade on growth.

We expect that: to the extent that the production structure and sectoral profile of regions in the upper quantiles are more similar to the EU average, then the higher a region is in the distribution, the more it will directly compete with the advanced EU imports compared to the poorer regions, which i) are expected to specialize in lower value-added products and ii) are classified as more sheltered economies and thus do not face direct substitution effects from the EU (Petrakos and Psycharis, 2016). Conversely, the economically more advanced regions will produce a more capital-intensive bundle of products, which accentuates the impact from increases in EU trade intensity.

The use of quantile regressions allows us to assess how the impact of EU trade *varies* with the conditional distribution of regional income (GDP per capita). Our analysis estimates the effect of EU trade at five points of the regional income distribution, specifically, for the 0.10, 0.25 0.50, 0.75 and 0.90 quantiles. By using QR techniques we account for the heterogeneity across regions, which allows the coefficients of our main regressors, and the explanatory variables to differ and capture the asymmetric effects of EU trade on growth. The QR method can also be thought of as a way to implicitly control for un-modeled growth determinants.

The assumption of parameter homogeneity is neither an empirical nor a theoretical result (Crespo-Cuaresma et al., 2011). From a theoretical point of view, the fact that economic units which are affected by policies, or hit by negative growth shocks, may present different economic dynamics which would "require the specification of a different data-generating process has received attention in the economic growth literature" (Crespo-Cuaresma et al., 2011 p.811) justifying the need for empirical models with parameter heterogeneity. Furthermore, parameter heterogeneity is potentially even more relevant in the framework of regional data sets, where un-modeled spatial dependence in the form of geographical polarization of economic growth renders standard OLS estimates biased (Crespo-Cuaresma et al., 2011).

Empirically, the rationale for using QR is that standard linear regression techniques summarize the average relationship between a set of regressors and the outcome variable based on the conditional mean function $E(y|x)$. This provides only a partial view of the relationship, considering that we might be interested in describing the

relationship at different points in the conditional distribution of *Y*. The most important feature of quantile regressions is their ability to estimate quantile-specific effects that describe the impact of covariates not only on the center but also on the tails of the outcome variable's distribution. While the central effects, such as the mean effect obtained through conditional mean regression, provide interesting summary statistics of the impact of a covariate, they fail to describe the full distributional impact unless the variable affects both the central and the tail quantiles in the same way (Chernozhukov and Hansen, 2004 p.2) which is highly unlikely in the context of a heterogeneous set of regions in terms of production structure, income and geography. In addition, interest focuses on the impact of covariates on points other than the center of the distribution.

Analogous to the conditional mean function of linear regression, we therefore consider the relationship between the regressors and outcome using the conditional median function where the median is the 50th percentile, or quantile *q*, of the empirical distribution. The quantile $q \in (0;1)$ is that *y* which splits the data into proportions *q* below and *1- q* above. Among the advantages of QR is also that, while OLS can be inefficient if the errors are highly non-normal, QR is more robust to non-normal errors and outliers.

Table 2.1 presents the results for the fixed effects models firstly for the openness index. Overall trade openness returns a negative and significant sign for the mean region indicating that overall openness has been detrimental for growth, a result similar to the findings of Petrakos and, (2016) and Rodriguez Pose (2012).

Table 2. 1 Fixed Effects - Overall Openness

VARIABLES	(1) *Log GDP cap*	(2) *Log GDP cap*	(3) *Log GDP cap*	(4) *Log GDP cap*
Openness	-0.025***	-0.024***	-0.023***	-0.023***
	(0.008)	(0.008)	(0.008)	(0.008)
Pop density (log)	-0.412***	-0.437***	-0.432***	-0.431***
	(0.092)	(0.092)	(0.092)	(0.092)
PIP (log)		-0.021***	-0.020***	-0.021***
		(0.007)	(0.007)	(0.007)
Accessibility			0.057	0.048
			(0.064)	(0.064)
Public share				0.194
				(0.143)
Observations	650	650	650	650
R-squared	0.807	0.810	0.810	0.811
REGION FE	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES

Notes: A constant is included but not reported; all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Year and region FEs included.

In Table 2.2, we present the results for the impact of EU trade integration, EU trade has a negative and statistically significant association with regional growth and is stable across specifications adding progressively the controls. We would have expected that increases in EU trade would positively affect regional growth as the EU market presented an opportunity for further market expansion. However, the EU seems too competitive for the internationalization efforts of Greek firms suggesting potential import substitution effects thus leading to a contraction of economic activity and affecting GDP growth confirming in part the results detected at the EU level by Petrakos et al., (2005).

Overall openness preserves its negative and significant association and magnitude. Among the control variables, the public investment programme is negative and significant which may be attributed to the low or non-existent growth returns of the public investment programme (Rodríguez-Pose, 2012). To this end, the highly centralized allocation of the public investment programme (the national component remains by far the largest, accounting for 76% of total funds (in 2010)) combined with the fact that the spatial allocation patterns of the expenditures are found to be surprisingly stable over time and do not follow a logic of efficiency or equity

(Monastiriotis and Psycharis, 2014) questions their effectiveness in promoting growth. These findings according to the authors may be reflecting potential "political inertia" (Monastiriotis and Psycharis, 2014, p.451) and may impede the optimal and territorially progressive allocation of funds rendering the effect weak or negative as shown in the current analysis.

Population density is found to be negative but not significant which seems to be specific to Greek regions, as larger regional markets are found to struggle with high unemployment rates and a severe contraction of their economy due to the crisis. Although we would expect population density (proxying agglomeration economies and urbanization) to be positively associated to growth, in the case of Greece, denser regions hosted a higher number of economic activities that were negatively affected and experienced lower adjustment rates. Therefore, we explicitly test the hypothesis that population density has a "varying" impact depending on the stage of the economic cycle, assuming a negative impact during economic decline. We test the latter by stratifying our sample period in two sub-periods: one referring to *before* the crisis and one *during* the crisis. The results presented in the appendix (Table 2.A.3) show that during the crisis period specifically large agglomerations and the most urbanized areas are the ones most affected and more vulnerable, a result in line with the findings of a recent study by Psycharis et al., (2014) who conclude that during the crisis larger agglomerations were the ones most affected by the crisis. The share of the public share is positive and significant in explaining regional growth while accessibility returns a positive albeit non-significant sign in the baseline models (as opposed to the QR models below). The overall explanatory power of the model is quite satisfactory for panel models, with a high R-squared in all specifications.

Table 2. 2 Fixed Effects - EU trade

VARIABLES	(1) *Log GDP cap*	(2) *Log GDP cap*	(3) *Log GDP cap*	(4) *Log GDP cap*	(5) *Log GDP cap*
EU trade	-0.039*	-0.056**	-0.053**	-0.055**	-0.061***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.024)
Pop density (log)	-0.342***	-0.434***	-0.458***	-0.452***	-0.453***
	(0.090)	(0.093)	(0.092)	(0.092)	(0.092)
Openness		-0.029***	-0.028***	-0.027***	-0.028***
		(0.008)	(0.008)	(0.008)	(0.008)
PIP (log)			-0.020***	-0.019***	-0.020***
			(0.007)	(0.007)	(0.007)
Accessibility				0.067	0.056
				(0.149)	(0.141)
Public share					0.252*
					(0.144)
Observations	650	650	650	650	650
R-squared	0.804	0.808	0.812	0.812	0.813
REGION FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES

Notes: A constant is included but not reported; all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Year and region FEs included.

In Table 2.3, we present the results of trade with the rest of the world (non-EU trade). The positive and significant sign of trade with non-EU countries reveals that although EU trade is negative and significant due to stronger competitive pressures from EU imports, non-EU trade seems to be positive and significant for the average region due to the lower substitution effects and the higher competitiveness of Greek exports in non-EU markets. The latter renders the effect of the *ROW* variable positive. This result suggests that the EU is too competitive for the internationalization efforts of the Greek firms, which sought export opportunities in foreign markets that reflect Greece's competitive advantage (i.e. Turkey, North Africa China, Balkan countries, Russia). Although many regions responded to the crisis by expanding their relations with foreign markets, this expansion does not always seem to include the EU. For reasons related to the fragmented character of their productive base and their specialization many regions find it difficult to penetrate the EU and seek trade opportunities in third markets, where entry requirements may be lower, (Petrakos and Psycharis, 2016 p. 146). All controls preserve their sign and significance as in the baseline model.

Table 2. 3 Fixed Effects- ROW (*Non-EU* trade)

VARIABLES	(1) *Log GDP cap*	(2) *Log GDP cap*	(3) *Log GDP cap*	(4) *Log GDP cap*
ROW	0.047**	0.043**	0.049**	0.051**
	(0.021)	(0.021)	(0.021)	(0.021)
Pop density (log)	-0.431***	-0.454***	-0.453***	-0.449***
	(0.093)	(0.092)	(0.092)	(0.092)
Openness	-0.029***	-0.028***	-0.029***	-0.028***
	(0.008)	(0.008)	(0.008)	(0.008)
PIP (log)		-0.020***	-0.020***	-0.020***
		(0.007)	(0.007)	(0.007)
Public Share			0.256*	0.244*
			(0.143)	(0.144)
Accessibility				0.058
				(0.064)
Observations	650	650	650	650
R-squared	0.808	0.811	0.812	0.813
REGION FE	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES

Notes: A constant is included but not reported; all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Year FEs included

Tables 2.4 and 2.5 (below) display the results of the model across the five income quantiles. In Table 2.4, we present the results of the effect of EU trade across the regional income quantiles. The impact of EU trade is highly heterogeneous as revealed by the significance of the variable in the upper quantiles and the insignificance of it, in the lower quantiles. The regions, which are more affected by increases in EU trade intensity, are the more advanced regions, namely the medium-income (0.50), the rich (0.75) and the richest regions (0.90) whereas EU trade does not seem to affect the poorest (0.10) and poor regions (0.25) in the lower tails of the income distribution. Regions citing at the lower tails of the distribution do not directly compete with EU imports due to the small or inexistent tradable sectors, which shields them from substitutions effects. These findings confirm our hypothesis that EU trade's competitive pressures are more pronounced in the upper quantiles of the regional income distribution were higher value added economic activity is concentrated. As revealed by the results in the upper quantiles, these regions are expected to contract due to differences in the price, cost competitiveness and quality in similar industrial products. This is attributed to differences in the economies of scale of the industrial sector in Greece compared to its core trading partners (Germany, Italy, Spain, the

Netherlands) and to differences in the production efficiency, which intensifies within-industry competition.

The negative growth returns from EU trade (mainly in manufacturing) dot not adhere to the predictions of new trade theory (NTT) and the endogenous growth theory. This partly reflects the fact that Greek firms did not branch into the EU global value chains, especially as regards backward linkages (i.e. supplying intermediate products), which could have been a positive source of vertical IIT. This has been the case for other countries such as Italy and Spain or Central and Eastern European countries (the latter attracted a large proportion of the offshoring of German manufacturing). Greece, by contrast, has been more a recipient of, cheaper intermediate inputs and of technologically advanced inputs from EU countries crowding out domestic suppliers, which is in line with reports that attribute the large Greek trade deficit to the high import content of Greek exports (Konstantakopoulou, 2015). The low participation in both global and European production networks is justifiable on the grounds of the peripherality of the Greek economy (within the EU), the average firm size and institutional weaknesses.

An example of the crowding out of manufacturing activity in the upper quantiles, which coincided with the surge of EU imports into Greece, is the prefecture of Viotia. During Greece's growth period (from 2000 to 2008) – which coincides with the highest volumes of imports from the EU and the largest widening of the trade deficit – the upward trend of economic activity included almost all the NUTS III regions/prefectures of the country, with the exception of Viotia (the neighboring region to Attika where the bulk of the manufacturing activity of Athens -and of Greece as a whole- has been exported to) (Psycharis et al., 2014 p.74). The example of Viotia which is located on the upper quantiles (0.75 and 0.90) supports our hypothesis that regions with high levels of manufacturing and a similar sectoral structure to the EU imports are potentially more exposed to competition pressures and their dynamic export capacities cannot be enhanced by deeper integration.

Table 2. 4 Quantile Regressions - EU trade and Openness

	(0.10)	(0.25)	(0.50)	(0.75)	(0.90)
VARIABLES	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*
EU trade	-0.018	-0.025	-0.047**	-0.069**	-0.055**
	(0.028)	(0.029)	(0.022)	(0.029)	(0.023)
Openness	-0.021**	-0.021**	-0.033***	-0.021**	-0.007
	(0.010)	(0.010)	(0.008)	(0.010)	(0.008)
Pop density (log)	-0.265**	-0.353***	-0.380***	-0.469***	-0.354***
	(0.111)	(0.116)	(0.087)	(0.116)	(0.091)
PIP (log)	-0.020**	-0.018**	-0.013**	-0.014*	-0.010
	(0.008)	(0.008)	(0.006)	(0.008)	(0.006)
Accessibility	0.092	0.062	0.118**	0.237***	0.169***
	(0.077)	(0.080)	(0.060)	(0.080)	(0.063)
R-squared	0.832	0.824	0.836	0.856	0.884
Observations	650	650	650	650	650
REGION FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES

Notes: A constant is included but not reported; all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Region and year FEs in all models

Table 2.5, presents the results for regional trade with non-EU markets across regional income quantiles. The ROW variable returns a positive and significant sign for the advanced regions and an insignificant one for the poorer regions. This finding suggests that trade with non-EU countries is beneficial for the medium and advanced regions (0.50 and 0.75) which host significant shares of the tradable sector and therefore are able to reap benefits from non-EU trade. These regions which host the largest shares of the country's productive activity appear more competitive in non-EU markets and are not exposed to substitution effects from trade with those economies. Furthermore, exports from these regions may appear more competitive in non-EU markets (as opposed to the more competitive EU markets) thus contributing to regional growth. The trend towards non EU markets intensified in the period 2008-2012 when the Balkans was the most important destination for Greek exports (Tsiapa, 2019) reflecting "the transformation of the regions' export pattern that entails an expansion of export demand by encouraging new more co-operation schemes with fast growing countries' (Tsiapa, 2019 p.634). Further, as stressed in recent studies "the economic crisis partially suspended the trade co-operation networks between Greece and the EU due to emerging restrictions on financing and credibility, and gave emphasis to more flexible co-operation schemes with the Balkans based on the advantages of geographical proximity and historical ties - while the export share in markets such as Asia and

Africa recorded also a notable rise" (Tsiapa, 2019 p. 629). The latter confirms the higher relative competiveness of regional exports in non-EU markets.

This is not the case for the poorest and poor regions (0.10 and 0.25), which are mainly sheltered economies (i.e. rely heavily on the public sector and agricultural subsidies) have a small tradable sector and do not record significant growth returns from non-EU trade due to low degrees of integration in the global economy (Petrakos and Psycharis, 2016). During the crisis period, Greek regions manifested "an average 13% increase in the level of dependence on sheltered types of activities during the period 2008–2012, and a decrease of 5% in the participation of the tradable sectors in their GDP" (Petrakos and, 2016 p. 146). Finally, the richest regions in the 0.90 quantile consist mainly of exceptionally rich islands that are more service-based with a productive base that is less dependent on purely trade activities.

Table 2. 5 Quantile Regressions – ROW (*Non-EU* trade)

	(0.10)	(0.25)	(0.50)	(0.75)	(0.90)
VARIABLES	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*
ROW	0.033	0.023	0.039**	0.053**	0.018
	(0.025)	(0.027)	(0.020)	(0.027)	(0.021)
Open	-0.023**	-0.020*	-0.039***	-0.027***	-0.005
	(0.010)	(0.010)	(0.007)	(0.010)	(0.008)
Pop density (log)	-0.259**	-0.332***	-0.386***	-0.467***	-0.320***
	(0.112)	(0.118)	(0.086)	(0.116)	(0.091)
PIP (log)	-0.020**	-0.019**	-0.011*	-0.015*	-0.011*
	(0.008)	(0.008)	(0.006)	(0.008)	(0.006)
Accessibility	0.090	0.070	0.115*	0.217***	0.151**
	(0.079)	(0.083)	(0.061)	(0.082)	(0.064)
R-squared	0.833	0.824	0.836	0.856	0.884
Observations	650	650	650	650	650
REGION FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES

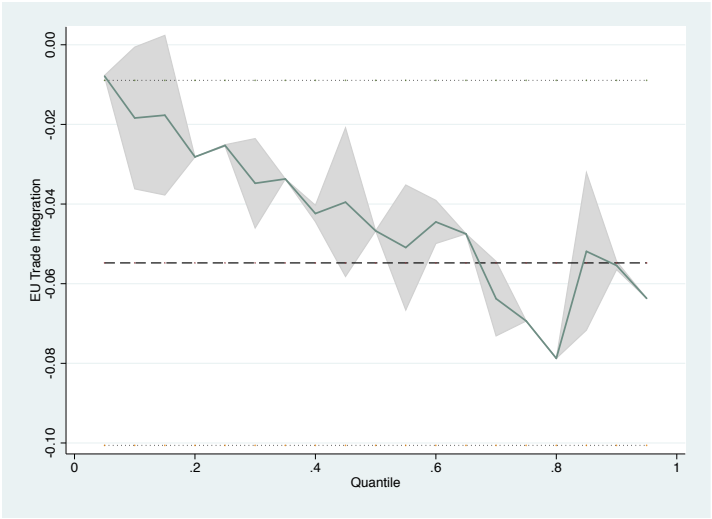
Notes: A constant is included but not reported; all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. region and year FEs in all models

As a further robustness check we replicate the quantile regressions including the public share control variable for both sets of regressions (appendix Tables 2.A.5 and 2.A.6). The coefficients of EU trade and ROW trade remain stable in direction and statistical significance confirming the robustness of the main estimates to the inclusion of additional controls and reassure us that results are not driven by the specification.

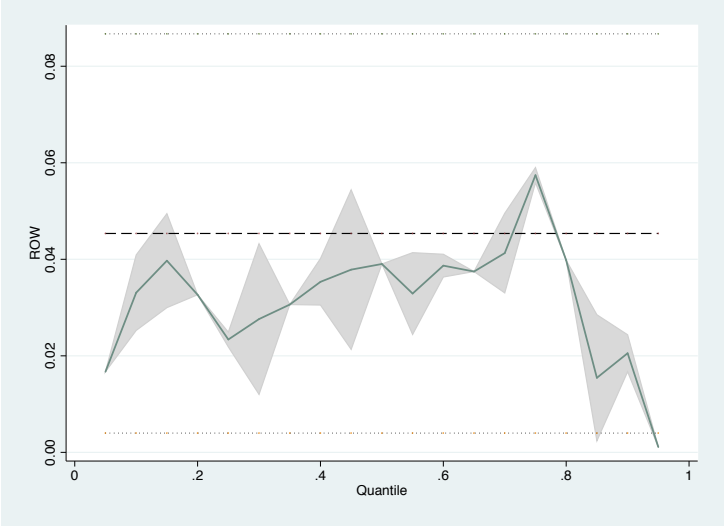
Interestingly, the parameter heterogeneity in the QR reveals that public share is positively related to regional growth for the lowest quantile (0.10) which are the sheltered regions and the richest regions (0.90) where the highest functions of public policy related positions are concentrated.

For a visual representation of the heterogeneity of the main regressors, Figure 2.6 below displays the coefficient of our key variables across regional quantiles. It is evident from the graph that the negative effect of EU trade integration is lower in the lower quantiles while it increases in size as we move up the regional income quantiles, and the trend peaks just before the 0.90 quantile. By contrast, the positive coefficient of the ROW index increases in size and becomes significant as we go up the regional income distribution (specifically from the 0.50 up to the 0.80) showcasing the positive growth returns - for the more industrialized and more advanced regions - from trade with non-EU countries.

Figure 2. 6 Spatial variation of EU TII and ROW across regional quantiles



EUTII



ROW

2.4.2 Endogeneity concerns

We aim to address standard endogeneity issues by means of GMM estimators that use appropriate lags of the explanatory variables as instruments of their own current values. We use the system GMM estimator proposed by Blundell and Bond (1998). We use longer lags of the instrumented variables to improve efficiency (Roodman, 2009), however in light of the trade-off "with respect to overfitting and to guarantee a parsimonious use of instruments, we limit the number of instruments to four" (Mohl 2013, p.52). Using too many instruments can over-fit instrumented variables (Roodman, 2009b) and reduce the power properties of the Hansen test. In Table 2.A. 4 (in appendix), the results of the FE regressor and the system GMM estimator are presented followed by the standard post estimation tests.

The FE estimator is compared to the GMM estimator with two- to four-year lags, the system GMM estimator confirms the statistical significance and direction of the main regressor. The test statistics for all specifications are presented in the lower section of each table. In particular, the Arellano-Bond for serial correlation in the first differences of the residual rejects the hypothesis of no first-order serial correlation while it fails to reject at higher orders, as desired. This allows us to exclude the presence of residual serial correlation in the original error term. In addition, the Hansen statistics (including the Difference-in-Hansen tests of exogeneity of instrument subsets) are used to test overidentifying restrictions; the Hansen test (Roadman, 2006) returns a p-value of 0.310 and thus confirms the validity of the selected instruments in the baseline specifications, as it does not allow us to reject the null hypothesis that all instruments are exogenous. We can therefore infer that the main regressors which is the EU trade integration and openness indices are robust both to the inclusion of additional controls and based on the GMM estimation results including the post estimation tests.

This econometric approach is still unlikely to address all endogeneity concerns. To the extent that regional growth is path dependent, the proposed time lags cannot constitute sources of exogenous variation. Therefore the usual threats to internal validity such as reverse causality or omitted variable bias, may still persist. This is an obvious caveat when claiming causality of the proposed relationship, thus the investigation should be

considered as an investigation into the direction of a complex set of relationships between regional growth and the various sources of trade.

2.5 Conclusion

This study explored the link between increases in EU trade integration and regional GDP growth following Greece's accession to the Eurozone. The empirical evidence detected the interplay between trade integration, the relative position of the regions within the regional income distribution and regional characteristics. The results reveal that there is a negative association between growth and EU trade for the average region, due to dynamics associated with substitution effects. In order to assess the heterogeneity of the impact across the regional income distribution we employed quantile regression techniques to identify potential differences in the trade elasticities of poor and rich regions. The evidence reveals that EU trade integration has more pronounced effects in the upper quantiles of the regional income distribution, due to the fiercer import competition which is present in more advanced regions. The latter is justified on the grounds that more advanced regions (compared to the poorer regions) are expected to be competing directly with their EU counterparts, due to similarities in the regional sectoral profile. By contrast, poorer regions seem to escape the substitution effects from EU trade, due to their insignificant and dissimilar tradable sector. The panorama emerging from detecting the dynamics of trade effects for low, medium and high-income regions reveals that the effects are markedly different and this heterogeneity of various types of regions is overlooked when one considers them as a case study of peripheral regions.

In line with theoretical and empirical findings of related studies (Rodriguez Pose 2012; Rodriguez Pose and Gill 2006; Paluzie, 2001; Krugman and Livas, 1996) the channel regarding the effects of EU trade on poor regions is associated with the composition of the trade flows. In terms of EU trade, when the share of agricultural to manufacturing trade declines, the poorer regions will be unable to reap the benefits of deeper integration which is reflected in the absence of positive effects of the EU trade. Conversely, when manufacturing trade increases but the regional industrial economies cannot compete with their EU counterparts then increases in EU trade intensity will lead to a contraction in growth due to competition pressures.

Regarding the more advanced regions, the channel of impact is attributed to substitution effects from more competitive products (either in terms of cost or technological sophistication). This finding is in line with recent studies (Petrakos et al., 2012; Kallioras and Petrakos, 2010), which conclude that regional industrial growth has been negatively affected by increases in EU trade within the same sectors (IIT). With regard to the regions in the upper quantiles, although classified as the most advanced regions within Greece, they are still considered as relatively less advanced and peripheral within the EU context and as such are characterized by weak industrial structures and institutional weaknesses which impede the growth-inducing effects of the opening of their markets. Finally, the evidence shows that the median region is the one that loses from EU integration, which is important for policy implications pertaining to the spatial distribution of future public investment programmes that aim to address the negative effects of integration. In light of further reforms of the EU regional policies, high-level decision making "should embrace the goal of achieving (or enhancing) development in all types of regions, but not be based on any formulaic notions of convergence" (Iammarino et al., 2008 p. 2).

The economic and financial crisis in Greece combined with the absence of counter-veiling policy measures and the low growth returns from trade may lead to a further decline in the growth prospects for more advanced regions. To avoid this, spatially redistributive and regionally sensitive macroeconomic (fiscal) policies and institutional reforms are needed to reverse a vicious cycle that will deprive regions of their real potential. A posteriori, trade integration is not always a panacea for the growth-inducing effect to materialize, but complementary policies should be implemented in combination with a realistic fiscal plan that will address weaknesses of structure and geography and allow the tradable sector to survive and upgrade. These policies could include a customized industrial policy tailored to the needs of the local industry with an emphasis on upgrading the productivity of import competing regions and promote export competitiveness in higher value added manufacturing with an emphasis on generating scale economies in agricultural manufacturing.

Further, as a critical complementary policy tool, the EU Structural Funds (SF) programmes should focus on expanding the tradable sector and finance projects that re-

prioritize away from export-declining sector and in favor of industries with strong export dynamic capacities. The regional policies designed should adopt new methods of shieling and upgrading more efficiently import competing regions through re-training schemes and by providing financial incentives for R&D investments. Further research should focus on industry-specific shocks and the effects on employment and wage outcomes at the regional level as well as on the compositional nature of employment responses (i.e. low- versus high-skilled labour). Further research should explore the way industry-specific shocks and regional employment interact and what is the compositional nature of employment responses (i.e. low- versus high-skilled labour) in transforming regional labor markets. Moreover, a meaningful task for future empirical contribution would be the replication of a similar study in different contexts to assess the validity of the current study and to derive evidence for cross-country and cross-regional comparisons of the EU trade integration experience.

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Appendix

Table 2.A 1 List of variables

Variable (code)	Definition	Time & spatial dimension	Source
EU Trade	The ratio of EU imports and exports over total imports and exports of the region	• NUTS III • 2000-2013	National Statistical Office (ELSTAT)
Log GDP cap	GDP per capita at constant 2005 prices in logs	• NUTS III • 2000-2013	National Statistical Office (ELSTAT)
Openness	The ratio of total imports and exports over GDP	• NUTS III • 2000-2013	National Statistical Office (ELSTAT)
log PopDen	Ratio of population over area (km^2)	• NUTS III • 2000-2013	National Statistical Office (ELSTAT)
log_PIP	The log of the annual per capita expenditures of the Public Investment Programme	• NUTS III • 2000-2013	Ministry of Economy
Accessibility	Road accessibility is measured as the inverse time-distance weighted population	NUTS II 2000-2013	European Commission DG for Regional and Urban Policy
Public share	GVA of public sector over regional GDP	• NUTS II 2000-2013	National Statistical Office (ELSTAT)

Table 2.A 2 Correlation matrix

	Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
(1)	*Log GDP/cap*	1.00							
(2)	*Log PopDen*	0.56	1.00						
(3)	*Openness*	0.51	0.50	1.00					
(4)	*EU Trade*	-0.04	0.05	-0.09	1.00				
(5)	*Spec*	-0.20	-0.25	0.10	-0.39	1.00			
(6)	*Access*	0.53	0.79	0.79	-0.07	0.05	1.00		
(7)	*Public share*	-0.21	-0.03	-0.03	0.10	-0.20	-0.03	1.00	
(8)	*Log PIP*	0.04	-0.19	-0.13	0.10	-0.05	-0.07	-0.14	1.00

Table 2.A 3 Regression results before and during the crisis

	pre-crisis: 2000-2008	during crisis: 2009-2013
VARIABLES	*Log GDP/cap*	*Log GDP/cap*
EU Trade	-0.094**	-0.103**
	(0.036)	(0.049)
Openness	-0.055***	-0.038
	(0.014)	(0.032)
Log PopDen	-0.260	-1.301***
	(0.300)	(0.356)
Log PIP	-0.015	0.005
	(0.010)	(0.009)
Observations	400	150
R-squared	0.683	0.835
YEAR FE	YES	YES
Region FE	YES	YES

Notes: all explanatory variables are one-year lags; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 2.A 4 Dynamic panel-data estimation, system GMM

	FE	**System GMM (***2 -4 instruments)*
VARIABLES	*(1)*	*(2)*
EU Trade	-0.053**	-0.201**
	(0.023)	(0.076)
Controls	YES	YES
Observations	650	650
YEAR FE	YES	YES
Region FE	YES	NO
Hansen statistic	-	5.96
p-value		0.310
AR(1) statistic	-	-4.72
p-value		0.000
AR(2) statistic	-	-0.35
p-value		0.725

Notes: dependent variable is the log GDP per cap.; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

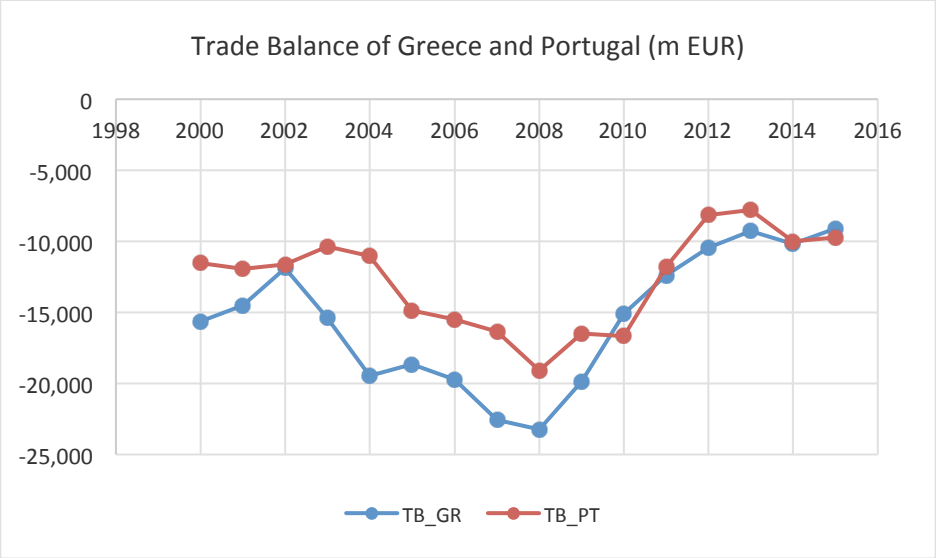
Table 2.A 5 QR regressions – EU Trade (extended versions)

	(0.10)	(0.25)	(0.50)	(0.75)	(0.90)
VARIABLES	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*
EU trade	-0.032	-0.029	-0.048**	-0.069**	-0.047**
	(0.029)	(0.030)	(0.023)	(0.029)	(0.023)
Open	-0.344***	-0.318***	-0.378***	-0.501***	-0.349***
	(0.111)	(0.119)	(0.091)	(0.115)	(0.091)
Pop density (log)	-0.028***	-0.018*	-0.036***	-0.020**	-0.006
	(0.010)	(0.010)	(0.008)	(0.010)	(0.008)
PIP (log)	-0.022***	-0.017**	-0.013**	-0.014*	-0.010
	(0.008)	(0.008)	(0.006)	(0.008)	(0.006)
Accessibility	0.059	0.065	0.107*	0.247***	0.179***
	(0.078)	(0.083)	(0.063)	(0.080)	(0.063)
Public Share	0.385**	0.252	0.054	0.279	0.349**
	(0.174)	(0.185)	(0.142)	(0.180)	(0.142)
R-squared	0.83	0.82	0.83	0.85	0.88
Observations	650	650	650	650	650
REGION FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES

Table 2.A 6 QR regressions – *non*-EU Trade (extended versions)

	(0.10)	(0.25)	(0.50)	(0.75)	(0.90)
VARIABLES	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*	*Log GDP cap*
ROW	0.041	0.026	0.041**	0.047*	0.021
	(0.026)	(0.028)	(0.021)	(0.026)	(0.021)
Open	-0.318***	-0.307**	-0.389***	-0.490***	-0.340***
	(0.111)	(0.120)	(0.090)	(0.115)	(0.092)
Pop density (log)	-0.032***	-0.019*	-0.040***	-0.026**	-0.005
	(0.010)	(0.010)	(0.008)	(0.010)	(0.008)
PIP (log)	-0.024***	-0.018**	-0.011*	-0.014*	-0.010
	(0.008)	(0.009)	(0.006)	(0.008)	(0.007)
Accessibility	0.052	0.052	0.106*	0.226***	0.157**
	(0.077)	(0.083)	(0.063)	(0.080)	(0.064)
Public Share	0.444**	0.250	0.018	0.269	0.375***
	(0.173)	(0.187)	(0.141)	(0.179)	(0.143)
R-squared	0.88	0.83	0.88	0.85	0.83
Observations	650	650	650	650	650
REGION FE	YES	YES	YES	YES	YES
YEAR FE	YES	YES	YES	YES	YES

Figure 2.A 1 Trade balance of Greece and Portugal with the EU-28 in m EUR



Source: own elaboration using data from EUROSTAT

3. When peripheries invest in other peripheries: Outward FDI and the regional skill composition in Greece

3.1 Introduction

The home country effects of outward foreign direct investment (OFDI) have been hotly debated for over three decades covering a broad spectrum of potential employment impacts (Mariotti et al., 2003; Amiti and Wei, 2005). Despite the prolonged period of analyses, the topic has received revived attention due to the proliferation of trade and investment agreements and the widening and deepening of the EU integration process. Greece's role as an international investor in the Balkan macro-region has been expanding in recent decades owing to its favourable geography (Labrianidis, 2000), greater proximity than other longer term members of two new EU member states and the Balkans, and the multiple incentives offered (i.e. low corporate tax rates and institutional quality improvements). Hence, recent EU enlargements have acted as both an enticement and as a catalyst for the internationalization of Greek firms (Bitzenis, 2006; Demos et al., 2004), which until recently and with few exceptions had fundamentally operated within the country. Therefore in the last two decades "Greece shifted from being a net receiver of (private) FDI into a net exporter of capital, with the Balkans being the privileged destination of direct investment abroad" (Labrianidis et al., 2004 p. 1184).

The current analysis is nested within the debate of how foreign direct investment (FDI), in general, and OFDI, in particular, affect employment. Our research has a specific focus on how increased investments abroad by local companies determine occupational changes at the regional level and, how, specifically these new dynamics in European relatively peripheral economies, such as Greece, determines employment patterns across the country. These home economy effects of the rising outward FDI from EU peripheral economies remain largely understudied (Demos et al., 2004).

Much has been written about the effects of inward FDI on the *host* economy (e.g. Blomström and Kokko, 1998). Much less has focused on the impact of OFDI on the *home* economy. And we know very little about how the rising volume of OFDI from relatively peripheral economies is affecting employment at the regional level in the countries of origin. Although there is some empirical evidence on home employment effects at the

national level (worldwide), the analysis at the sub-national (regional) level has been largely overlooked. This is also the case for Greece. The large majority of the literature on Greek OFDI and the associated home-economy effects has focused on either the national level (i.e. GDP growth, exports ext.) or on firm-level performance, by examining the evolution of stock returns of Greek companies investing abroad (Demos et al., 2004). A review of the related literature reveals that, to the best of our knowledge, there are no studies on outward FDI effects at the sub-national level in Greece.

Overall, the production relocation in the form of FDI is linked to the positive effects of production restructuring and is regarded also as a benefit of economic integration between old and new EU member states (Rojec and Damijan, 2008). FDI can pose a challenge for economic policy as the employees that may lose their jobs as a result of the relocation of economic activity are not necessarily those that gain from the restructuring of the economy into more high value added activities (Rojec and Damijan, 2008; Crinò, 2009). The sectoral breakdown and typological classification of investments and the associated employment effects reveal that efficiency-seeking manufacturing OFDI as opposed to market-seeking OFDI in services is associated with employment reduction in the investing economy (e.g. Castellani et al., 2008).

The existing empirical literature, which has focused almost entirely on the national level, has tended to examine the dynamics of outward foreign direct investment on the home economy's labour market and on the skill composition of the labour force. It has mainly found that offshoring[40] significantly affects certain types of occupations in the country of origin (e.g. Castellani et al., 2008; Mion and Zhu, 2013). Moreover, the distribution of benefits and costs stemming from increases in OFDI has been highly contentious in the academic and public arena. On the one hand, there is a growing opposition to offshoring, as it is deemed to destruct lower-skill jobs, especially in manufacturing (Autor et al., 2012). On the other hand, benefits are detected in terms of cost efficiency strategies that raise the productivity and specialization of offshoring firms leading to skill upgrading (Castellani et al. 2008). Although the evidence is still ambiguous, employment outcomes are found to heavily depend on the typology of investments i.e. resource/efficiency seeking

[40] The use of the term offshoring throughout the text follows the international business literature and refers to the relocation of production abroad but within the same MNE, not the relocation outside the firm to unaffiliated suppliers (e.g. international outsourcing).

vs. market seeking or technology-seeking investments[41]. The aforementioned (national-level) studies have found that OFDI and offshoring to developing economies appears to have a destructive effect on lower skill, routine jobs and to lead to wage differentials (e.g. Anderton and Brenton, 1999; Ebenstein et al., 2015; Autor et al., 2012; Ekholm and Hakkala, 2006). While a positive effect is detected on non-routine occupations, leading to virtuous productivity cycles (e.g. Mion and Zhu, 2013; Castellani et al., 2008). Finally, the empirical investigations exploring the impact of the internationalization induced by multinational enterprises (MNEs) – at both the national and firm level – is far from conclusive (Castellani et al., 2008).

The scant evidence of home country effects in Greece come from older, mainly descriptive studies. These studies stress the negative effects of OFDI in terms of unemployment in regions (specifically in Northern Greece) that experienced a high internationalization rate in certain industrial sectors such as the textiles industry (Labrianidis, 1996), but without providing sound empirical evidence. However, several theoretical and survey based studies conclude that, by and large, the relocation of the production of Greek firms to Central and Eastern European Countries (CEECs), by seeking labour cost minimization strategies, is linked to the reduction of manufacturing employment in certain (most affected) industries (Labrianidis, 2000). This is assumed to produce a spatially uneven distribution of the associated costs.

The scarcity of empirical evidence at the sub-national level and on the skill composition specifically is not unique for the Greek case. The analysis worldwide of the OFDI effects at the regional level is limited to four studies (one of them on regional productivity outcomes (Castellani and Pieri, 2016)). Only one study has explicitly analysed the dichotomy of routine versus non routine for the UK (Gagliardi et al., 2015). The two remaining studies in Italy do not take account of the region as the unit of analysis and only look at broader categories of the regional skill composition.

The current analysis aims to examine the geographical implications of increased OFDI with a specific focus on the regional skill composition outcomes. Following Gagliardi et al., (2015), the method employed in the empirical analysis, is based on the pre-existing

[41] "Technology driven ODFI are foreign direct investments undertaken predominantly with the aim of accessing and/or learning to master technologies not previously within the grasp of the multinational and generating new knowledge" (Chaminade, 2015 p. 14) .

industry specialization of regions which determines the degree of regional exposure to OFDI. The effects are detected at the regional labour market level (NUTS II) and examine the evolution of the skill composition of the regional workforce and specifically the type of jobs affected. We distinguish between routine and non-routine jobs to identify potential geographical polarization of jobs, across space.

The remainder of the paper is structured as follows: section 3.2 offers an overview of the related empirical literature and discusses the contribution of this study, section 3.3 describes the data, the construction of the OFDI measurement and the methodology of the empirical framework, section 3.4 presents the econometric model and the empirical findings, while section 3.5 concludes and discusses the policy implications of the main findings.

3.2 The territorial impact of OFDI

3.2.1 The employment implications of OFDI

Unpacking the typology of OFDI, vertical FDI is generally based on asset/efficiency-seeking strategies led by the incentive to exploit: location-specific factors of production (Mariotti et al., 2003), the international differences in factor prices and also the need to re-organize production to achieve scale economies (Agarwal, 1997).

The drivers of the efficiency-seeking MNE are based on exploiting "different factor endowments, cultures, institutional arrangements, economic systems and policies" (Dunning, 1993, p.59). In order for efficiency-seeking foreign production to take place, 'cross-border markets must be both well developed and open, therefore it often flourishes in regionally integrated markets' (Dunning 1993, p.59). The latter can be confirmed by the upsurge of Greek OFDI flows to the Balkans following Bulgaria's and Romania's EU accession. Dunning (1993), presents another category of OFDI. This is called labour-seeking investment, undertaken by 'manufacturing and service MNEs from countries with higher real labour costs, which set up or acquire subsidiaries in countries with lower real labour costs to supply labour intensive intermediate or final products' (OECD, 2008 p. 4). In the EU the vast majority of efficiency-seeking and labour–seeking OFDI has targeted

the CEECs and the Western Balkans (OECD, 2008). To this end, Dunning and Lundan, (2008) stress "that efficiency-seeking investment has been drawn into accession countries by low wages, which even when adjusted for differences in productivity, are still well below the EU average" (Dunning and Lundan, 2008 p. 35).

Horizontal FDI is based on market-seeking incentives and aims to serve domestic or regional markets. It usually involves the replication of the economic activity abroad and not the transfer of the firms. Such investments tend to depend heavily on the size of the host market and the dynamic increases in aggregate demand for specific products in those countries.

The third broad typology used is 'strategic asset-seeking' OFDI in which case, investments aim at exploring and exploiting technological and knowledge capabilities of the host location in order to increase global competitiveness. The 'strategic asset-seeking' OFDI refers mostly to the acquisition of firms in advanced economies "that are more advanced in terms of technology, skills and management capabilities than the investing firm" (Meyer, 2015 p.5), or to investments in knowledge intensive activities such as R&D, also referred to as 'capability augmenting' type of investments (Chung and Alcácer, 2003; see also Iammarino and McCann, 2013). Lastly, resource-seeking FDI is driven by the demand of MNEs for new sources of raw materials mainly minerals and oil; these corporations are mostly active in mining, agricultural and forestry activities (Meyer, 2015).

The concerns regarding the home employment effects of increases in OFDI dates back to the beginning of the 1990s with concerns expressed by French politicians in the European parliament regarding the unemployment among factory workers (Agarwal, 1997). In the same vein, in Japan the debate was fuelled by the rising trends of MNEs relocating to lower cost Asian neighbouring countries (OECD, 1995) and the associated export substitution concerns. Further, the establishment of NAFTA initiated a number of studies stressing the rising wage gap between skilled and unskilled labour (Campbell and Mc Elrath, 1990), while in Germany the same discussion has been centred around the so-called "locational competition" according to which the relocation of German industry to Central and Eastern European countries (following their EU accession) is driven by direct and indirect labour costs (Agarwal, 1997). Although the related empirical literature has not reached a consensus regarding the employment effects of OFDI, when the typology of the

investment is factored in, the results show that the efficiency-seeking as opposed to the natural resources and market-seeking types of OFDI are associated with a negative net impact on employment (Agarwal, 1997). The effects of strategic asset-seeking investment abroad are ambiguous while market-seeking OFDI is associated with positive net effects on the employment of home countries (ibid). By altering the home activities the type of investment can produce heterogeneous effect on the labour demand and may impinge on income distribution as changes in factor demand affect relative factor prices (Navaretti and Venables, 2008).

The theoretical foundation of the hypothesis that the typology of the investment drives the employment outcomes is grounded on the following reasoning. When a MNE[42] undertakes an efficiency-seeking FDI, the labour-intensive activities are likely to be transferred to lower cost countries. This shifts the demand for specific skills (low versus high) thus affecting heterogeneously labour markets and industrial sectors that are more exposed to OFDI (Navaretti et al., 2009; Gagliardi et al., 2015). The literature suggests that firms relocating their production to low cost or less developed countries generally substitute domestic employees with employees in foreign affiliates (Crinò, 2009; Navaretti et al., 2009). In other words, to the extent that the low-skill-intensive parts of production are offshored abroad (while the home country continues to carry out the high-skill intensive activities), then increases in OFDI will act as a transmission channel inducing changes in the composition of employment at home.

Firms which undertake vertical investment "dismantle the structure of their value chain through the re-localisation of the labour-intensive activities in low-cost countries" (Mariotti et al., 2003 p. 420). To this end, according to the theory on vertical OFDI, the geographical fragmentation of production "can alter the factor mix of the home economy increasing the concentration of skill and technology intensive tasks" (e.g. Navaretti et al., 2009). However, the vast majority of the related literature focuses mainly on employment and productivity outcomes with a relatively smaller focus on skill composition effects.

[42] An MNE according to Dunning (1996) is a company that owns subsidiaries in more than one countries and according to Navaretti and Venables (2004) are firms that own a significant equity share of 50% and above of another company operating in a foreign country. Given that FDI as per the IMF/OECD definitions is an investment in a foreign company where the investor owns at least 10% of the ordinary shares with a lasting interest and significant management influence of the firm, our use of OFDI activity of firms throughout the text does not always necessarily mean that these firms are MNEs. Despite the conceptual and measurement differences between OFDI and MNEs authors use OFDI and MNE as synonyms (Navaretti and Venables, 2004 p. 3).

3.2.2 The rise of Greek OFDI

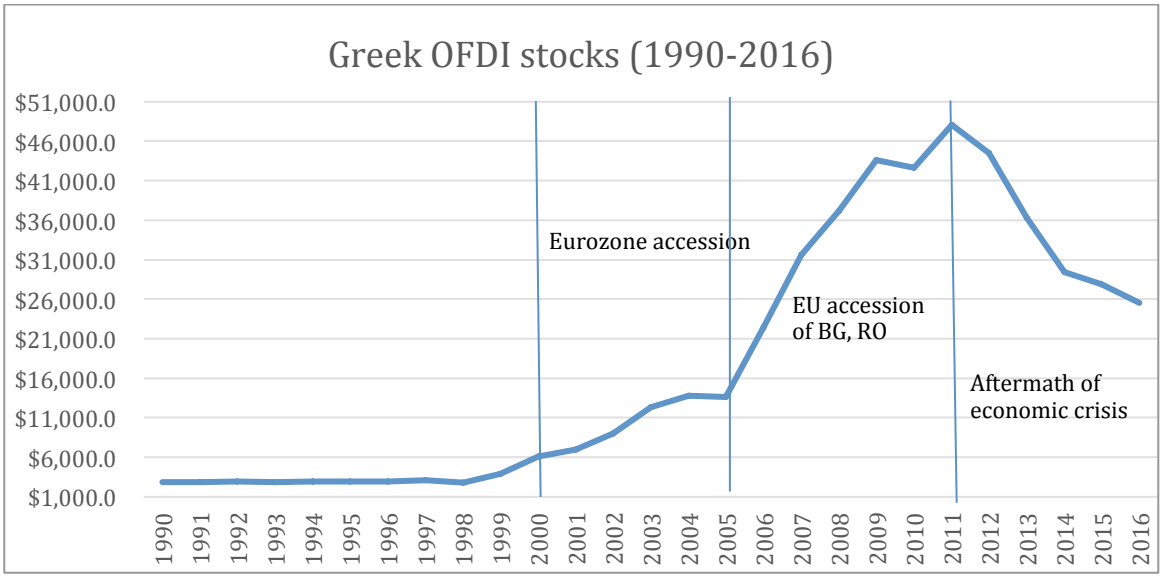
The internationalization of Greek firms originated in the early 1990s following the opening of Eastern European markets. Most Greek investment was channelled towards neighbouring South-European countries (mainly Bulgaria and Romania), which offered to Greek firms new opportunities for market expansion and investment incentives for cost efficiency strategies (Kapitsinis, 2017).

Greek outward OFDI stocks rose from $2 billion in 1990 to $6 billion in 2000 and climbed to $43 billion in 2009, following Bulgaria's and Romania's accession to the EU in 2007 (UNCTAD data, 2019). These substantial increases were attributed to the upgrading of the Athens Stock Exchange, the Europeanization process of Turkey and the EU enlargements waves that created a new investment platform for Greek firms (Karagianni and Labrianidis, 2001). The share of Balkan countries in the total Greek OFDI stock followed an upward trend from 21% in 2001 to 41% in 2007 (Bank of Greece data, 2018), highlighting the importance of the area as a target economy for Greek firms. This new drive re-ranked Greece as one of the major regional investors in the mid-2000s. From 2001 onwards, Greek firms benefited from a fixed exchange rate, greater political stability in the Balkan region, a significantly lower inflation rate in the recipient countries, and the lower borrowing rates following Greece's European Monetary Union (EMU) membership. Moreover, the fact that business operation in Greece became more expensive than its neighbouring countries (Kapitsinis, 2017), the low (and flat) corporate tax rate (offered particularly in Bulgaria and Romania) combined with the overall lower operating costs, incentivized Greek firms to seek cost efficiency strategies in the neighbouring Balkan macro-region.

The temporal evolution of Greek outward FDI stocks from 1990 to 2016 is depicted in Figure 3.1, as it can be observed, the large increase in OFDI took place after 2001 (following accession to the Eurozone) which coincides with the significant reduction in borrowing costs that facilitated investments aboard. Simultaneously, increases in the costs in the domestic market following the adoption of the common currency further strengthened this trend. From 2005 – in anticipation of Bulgaria's and Romania's entry into the EU in 2007 – up until 2009 (before the crisis started to affect the Greek economy)

there is a sharp climb essentially from $7 billion to $48 billion. During this period Greek firms further exploited the low cost financing and low operating cost advantages in the Balkans, following cost-efficiency, resource-seeking and market expansion strategies (Kapitsinis, 2017). Our period of analysis from 2003 to 2015 essentially captures the effects of Greece' accession in the Eurozone, the 2007 EU enlargement wave towards the Balkans, and the on-going crisis period.

Figure 3. 1 Greek OFDI stocks (1990-2016)



Source: own elaboration using data from UNCTAD
Notes: values in millions US dollars

Greek MNEs' strategies

The opening of the Balkan economies combined with the low degree of penetration of Western European Multinational Enterprises (MNEs) in these countries, created an environment of lower competition for Greek firms (Labrianidis, 2000). Among the "pull factors" the cultural closeness, the fact that the CEECs markets were still unshaped – in the sense that competition was based on price and not quality and product differentiation – the reduced tariff impediments – and the existing strong trade channels among them featured highly. These host markets were used as a "bridge" for further investments in other CEECs and also as an export platform to core EU countries (Iammarino and Pitelis, 2000; Bitzenis, 2006).

The basic "push factors" that domestic MNEs in Greece experienced were the intensified

competition from greater European economic integration, especially in the form of import penetration in specific sectors and the rising costs in labour intensive industries[43] (Labrianidis, 2000). These made them seek cost-efficient strategies not only for expansion but also for survival (Kapitsinis, 2017; Labrianidis 1997). At that time, "subsidies and grants for exports, restrictions, and duties on imports from developing countries and therefore, protectionism of the Greek economy were abolished" (Kapitsinis, 2018 p. 332). The commodities produced by the Greek firms could compete neither with those of the developed economies in terms of quality, nor with those of the developing economies in terms of price (Kapitsinis, 2017).

In order to position Greek investment within the aforementioned typology it is important to unveil the determinants of Greek OFDI. The type of investments undertaken will in turn shed light on the transmission channels of the occupational shifts in the "sending" regions. Among the determinants of the efficiency-seeking internationalization of Greek firms are: the proximity to the Balkan macro-region, the lower cost of raw materials in those countries, institutional factors, and the abundance of low skilled workers and low operating costs (Kapitsinis, 2018; Bitzenis, 2006; Iammarino and Pitelis, 2000). For the case of Greek OFDI targeting Bulgaria, Bitzenis (2006) finds a strong association between low unskilled labour costs and the origin of MNEs, concluding that among the main incentives of Greek FDI in Bulgaria were the low labour costs of unskilled workers, international pressures from competition and globalization, cultural and trade links to neighbouring countries and, to a lesser extent, the prospects for market growth and the lack of local competition.

In terms of the sectoral breakdown of OFDI stocks, manufacturing accounted for 31% of total[44] Greek productive investments excluding financial services in 2001 and climbed up to almost 40% in 2010 (3 years after Bulgaria and Romania's EU accession). The sectors of trade together with transport and storage are among the ones with the sharpest increases

[43] The most affected industries included textiles and apparel, footwear and fur.

[44] I calculate the percentages of each sector, on the total OFDI stock excluding financial services. Given that financial services make up more than half of the total OFDI, in order to get a better sense of the relative importance of each sector as a share of productive investments, I calculate and refer to **total** OFDI stocks subtracting financial services from this total. Therefore, the percentage of each sector is based on the aforementioned sub-total (i.e.: total OFDI minus financial services). Note: only financial services are subtracted; all other types of services are included in the denominator. The Bank of Greece provides the raw data.

from 14% in 2001 to 44% in 2017. Information and communication[45] recorded one of the highest shares, 44% in the beginning of the study period (2001), peaking at 52% in 2007 (the largest recipients being Bulgaria and Romania), dropping to 12% in 2017. This drop can be mainly attributed to the contraction of the economy during the crisis. Financial and insurance services account for the lion share of total OFDI ranging from 44% in 2001 to 60% in 2017 as a result of large acquisitions and investments in the Balkan region undertaken by Greek Banks[46]. Although the largest OFDI in value from Greece are in the oil, banking and telecommunications sectors, the bulk of the relocation abroad in manufacturing was carried out by small and medium enterprises, especially in the case of Bulgaria (Kapitsinis, 2017). The latter trends were prevalent in the 1990s but continued during the pre- and post-crisis and covered a wide range of sectors from metal and textiles to trade in food and business activities services.

Within manufacturing, the 'food and beverages' sector amounted to over €500 million in 2010 (data from Bank of Greece). The OFDI stock in metal products rose from €226 million in 2001 to above €700 million in 2010 (Bank of Greece), with the largest recipients being Bulgaria, Spain and the UK, while 40% of OFDI in plastics targeted Romania (Giakoulas, 2014). Other important sectors in which Greek MNEs are present are textiles as well as wholesale and retail trade (data from Bank of Greece). Overall, the most affected sectors within manufacturing are aluminium, textiles and food industries, as reported by survey studies (e.g. Kapitsinis, 2017). This is confirmed when cross-referencing these figures with the national-sectoral OFDI data (Bank of Greece).

In terms of the geographical breakdown, the majority of Greek investments to Central and Eastern European countries originated from Northern Greece, marking a pronounced geographical unevenness in the distribution of the OFDI effects. This trend was more pronounced in the pre-crisis period, while during the crisis the phenomenon of relocation spread throughout the country (Kapitsinis, 2017). In the early 2000s, the majority of firms that relocated (with a few exceptions) were labour-intensive, small scale operations in industries with mature technologies; they were competing on price rather than product differentiation, did not have an established brand name, and some formed joint ventures with local entrepreneurs (Labrianidis, 2000; Kapitsinis, 2017). However, also a number of

[45] The largest investments abroad came from OTE (National Telecommunication Company) and Intracom Holdings.
[46] By 2005, Greek banks had spent US$1 billion buying banking assets in the Balkans (Bitzenis and Vlachos, 2011). Cyprus is treated both as a tax haven and as a channel for transhipped FDI.

large MNEs[47] invested in countries more developed than Greece with highly competitive markets and with strict control of the affiliates from the parent company.

Drawing on the literature and the insight provided by the determinants of Greek OFDI, the cost-efficiency nature of the majority of Greek investments is expected to act as a transmission channel, affecting the demand for specific types of occupations in the regions that are more exposed to the relocation of production. The importance of using the region as the unit of analysis is that the relocation of production does not only affect the firm itself, but impacts also the local suppliers operating around the investing firm (Mariotti et al., 2003). Consequently, it affects the demand for intermediate inputs, which will in turn influence the skills/tasks required in a given region (Federico and Minerva, 2008). OFDI is found to have indirect effects on the business environment in which the investing firm operates through "subcontracting relations and local externalities induced by the demand for specialised inputs, services, managerial and operative skills" (Elia et al., 2009, p.359). This accentuates the relevance of the region as the unit of analysis when examining the effects of outward investments, and enriches our understanding of the home economy's labour market outcomes, compared to firm-level studies.

Within the commonly used typology of resource-seeking, market-seeking, efficiency-seeking and strategic asset-seeking types of OFDI, the bulk of Greece's productive outward investments are expected to fall under the efficiency-seeking type (due to the lower tax and labour and operating costs incentives of the destination economies), with a relatively smaller fraction characterized as market-seeking.

The large majority of Greek investments as stated earlier, targeted Romania and Bulgaria which at the time of EU entry were still much less economically developed that Greece and thus were treated as a lower cost production and lower tax destination. Departing from this finding and combining it with the determinants of firm investments choices which stress the low skill, lower operating costs of the host countries and lower corporate tax incentives as the most important determinants, it is safe to assume that the majority of Greek productive investments abroad were of an asset and efficiency–seeking nature. Therefore, the relocation of the labour-intensive production branch of the firm is expected to have significant employment effects in the "sending" regions. This leads us to the formulation of our hypothesis that increases in OFDI (based on the regional industrial specialization)

[47] E.g. Titan, J&P-Avax SA, Chipita, Petzetakis (seized operation in 2017), 3E, Thrace Paper Mills.

will negatively affect the demand for specific types of occupations namely routine occupations. Alternatively, non-routine occupations may be positively affected if the investments lead to efficiency gains and productivity increases from the exploitation of competitive advantages in different locations, or scale effects from market seeking strategies. The market-seeking or strategic asset-seeking strategies are a relatively smaller fraction of Greek productive investments that managed to branch out to the EU core.

Although the current study focuses on revealing the channel of association between increased investments abroad and home regions' occupations, understanding the determinants of the relocation decisions sheds light on which operational functions and fractions of the production process are being offshored. The latter, will in turn determine changes in the skill composition at the local level through the effects on the demand of the low skilled jobs. To this end, among the key criteria underlying investment choices by Greek firms, expected economic growth scores highest, followed by geographical location, tax incentives, labour costs and, with a slightly lower frequency, increase in market shares (Iammarino and Pitelis, 2000). Using a probabilistic model based on data from a survey on entrepreneurs, this study finds that proximity to the core EU market is likely to foster outward vertical FDI from Eastern European locations, which provide comparative advantages in terms of availability of relatively skilled, but low cost, labour force. Regarding the destination choice, Romania has generally been preferred to Bulgaria as a target because of its greater potential as an export-platform to the EU market. In line with this finding, Bitzenis (2006) concludes that 22% of Greek MNEs in their survey mentioned establishing an export base, which suggests the complementary nature of trade and FDI. The authors conclude that outward FDI may have been "job exporting", with Greek firms moving to lower cost locations.

Similarly, Louri et al., (2000) study the internationalization of Greek firms and find that the majority of firms investing abroad are more labour intensive, export-oriented firms, and firms with high sales growth rates. The investment decision of the firms is also positively correlated with the size and openness of the host countries (with Greek firms preferring smaller and open economies) and the presence of distribution networks in the destination (Stoian and Filippaios, 2008).

Examining the pre- and post-crisis period separately, most Greek SMEs moved the whole firm from Greece to Bulgaria in both periods and relocation was perceived as an opportunity to expand the market and restore competitiveness. During the crisis, relocation from Greece to Bulgaria was perceived more as a necessity for most entrepreneurs (Kapitsinis, 2017). This study highlights that relocation was a pure survival decision, less caused by the lack of capacity to produce cheap products and more linked to the inability to pay daily operations in Greece, including salaries and taxes. The study further identifies a clear division between "true entrepreneurs" (with high-growth productive firms) and survivors (Kapitsinis, 2018). The "true entrepreneurs" owned mainly medium-sized firms, made important internal changes, such as development of new products, aiming at quality upgrade, increased integration into new market networks and promoted innovation. The findings reveal that the operations of these firms in Bulgaria appear to be long-term, while several of them mainly in the manufacturing sector reported that they would have relocated even if the crisis had not unfolded. This implies that manufacturing continues to follow expanding strategies with significant employment effects in the "sending" regions irrespective of the economic crisis. These findings provide insight into the type of Greek investment abroad and the dynamics on the investing firms' regional labour market.

3.2.3 OFDI empirical evidence worldwide

The temporal trends in job polarization are directly linked to offshoring patterns, which are conditional upon the development level of the destination countries – i.e. developed versus emerging economies. The latter distinction implicitly captures the typology of investment with horizontal (market-seeking investments) targeting mostly high income counties and vertical (efficiency-seeking) targeting lower income or emerging economies. Overall, there is consensus that FDI when undertaken in less developed countries - which largely refer to vertical (efficiency-seeking) investment - tends to reduce the labour intensity of the home country production. Horizontal investment seems to increase it due to productivity gains, specialization, positive externalities and increased intra-firm trade that fuels exports (Mariotti et al., 2003; Agarwal, 1997). Positive effects on home country employment from vertical or horizontal FDI are also attributed to the expansion of managerial departments of parent companies leading to a higher demand of white-collar employment, warehouse management and of customer service jobs (Agarwal, 1997; Elia et al., 2009).

Firm level studies employing data on Italian and French firms find no evidence of negative effects of outward investments (to lower wage countries) on home output and employment; on the contrary they detect an increase of efficiency, productivity and competitiveness through cost saving and knowledge transfer channels (Bertrand and Cabron, 2015; Navaretti et al., 2010). To showcase the extent of the contradictory results on very similar research questions, a diametrically opposite empirical finding at the firm level, concludes that larger foreign production from US firms is associated with smaller parent employment attributed to the offshoring of labour-intensive stages of production to affiliates in low-wage countries (Blomström et al., 1997). In the case of Swedish firms, employment is enhanced due to the need for more supervisory and auxiliary employment in the parent firm. The difference of the impact is attributed to the different investment strategies namely efficiency-seeking versus market seeking motives (see Blomström et al., 1997 for US and Sweden; Debierne et al., 2010 for South Korea).

As widely acknowledged in the related literature, the distinction according to the destination of the investment is important, as the incentives and consequently the effects of investing in different markets are radically different. This leads to different channels of impact for the home economy, essentially a change in factor use for vertical investments and a scale effect for horizontal ones (Navaretti et al., 2010). Empirical evidence stresses that the demand for low skilled and lower educational attainment workers is negatively affected when FDI targets developing countries, but increases when FDI targets developed markets (Mariotti et al., 2003; Castellani et al., 2008 for Italy; Ekholm and Hakkala, 2006 for Sweden). Evidence from Spain, finds that outward FDI increases home employment and especially that of skilled workers when investments target the EU-15 and Latin America and particularly in services compared to manufacturing. The latter showcases that the distinction of developed versus emerging economies as a decisive factor for the employment impact is not clear-cut in the literature. The authors attribute the outcome to the increased competitiveness and expanded sales of those Spanish firms that invest abroad following a resource or market-seeking strategy (Bajo-Rubio and Díaz-Mora, 2015).

On the occupational composition, the evidence focuses almost entirely at the national level and in large part converges in that increased OFDI and shifts in the demand for certain types of skills do have an inherent link. Specifically, vertical FDI may reduce the demand

for unskilled labour in the home economy and increase the demand for skilled labour (Feenstra and Hanson 1996; Castellani et al., 2008). A survey of studies by Crinò (2009), concludes that manufacturing offshoring[48] is a determinant of rising wage inequality worldwide by lowering labour demand for employees with the lowest skill levels. In contrast, investments in the services sector change the composition of the workforce in favour of white-collar and highly-skilled. In the case of Italy, domestic demand for low-skilled workers decreased due to both foreign production undertaken by Italian companies (outward FDI proxy) and capital-biased technological change (Elia et al., 2009). The study employs seemingly unrelated regression (SUR) techniques to investigate the impact stemming from the destination country and conclude that lower-skilled labour is affected by FDI targeting low-income countries due to the incentives of firms for resource-seeking investments[49]. The empirical results point to a decrease in the demand for high-skilled workers when OFDI is addressed to high-income countries revealing the decisive role played by the destination of outward FDI.

On the contrary, empirical evidence in the US and the UK, stresses that the relocation of the unskilled-intensive part of the production from relatively skilled abundant countries to unskilled abundant countries increases the demand for skilled labour at home and hence increases the skill premium (Amiti and Wei, 2005; Feenstra and Hanson, 1997; 1999). Studies at the national and firm/industry level stress that offshoring to China is associated with increases in the share of non-production workers in Belgium, suggesting the same channel of impact on skill upgrading at the firm level (Mion and Zhu, 2013). Offshoring is also associated with demand shifts towards non-routine and highly educated workers for the manufacturing sector in Germany (Becker et al., 2013). Conversely, in the case of the US, the impact of OFDI (termed in the paper "occupational offshorability") was not associated with the decline of manufacturing employment in US local labour markets (Autor et al., 2012). The observed decline in employment (especially in commuting zones with high shares of routine-task intensive occupations) was instead attributed to import

[48] Offshoring in this case refers to the firm's relocation of production abroad to either an affiliate or unaffiliated supplier.

[49] The study detects a negative effect of OFDI targeting high-income countries on demand for low and high skilled labour. They explain that the effect on low-skilled labour may be related to the fact that cost saving investments have been increasingly undertaken also in high income countries while the negative impact on high skilled labour may be related to the increasing outsourcing of services and activities that had been traditionally maintained within the headquarters.

competition pressures from Chinese within-industry trade. Analysis on the occupation wage differentials in the US, reveals that offshoring has a detrimental effect on routine occupations, as these specific tasks are easier copied by foreign workers (Ebenstein et al., 2015).

Studies at the sub-national level are impressively limited, and empirically investigate the employment or productivity outcomes at the local labour market or regional level (Castellani and Pieri, 2016). Among the very few sub-national level analyses on the occupational outcomes of OFDI, the review of the literature showed that only one study examines the evolution of the dichotomy of routine versus non-routine occupations at the local labour market level (Gagliardi et al., 2015). The two remaining studies that examine employment responses analyse the effects on the broader and vaguer categories of low versus high skilled labour (Elia et al., 2009; Mariotti et al., 2008) and do not use the region or labour market as the level of analysis but the industrial *filière* [50].

The evolution of the routine and non-routine jobs in the UK is empirically assessed to detect the spatial effects of OFDI on the skill composition at the local level (Travel-to-work areas). The study finds that increases in the amount of investments abroad led to a reduction in the number of routine occupations in the UK (Gagliardi et al., 2015). On the contrary, non-routine occupations are positively affected in the long run and only when OFDI targets developing and emerging countries attributed to efficiency gains from the rationalization of production geographically, signifying the huge "spatial heterogeneity in the impact of OFDI trends (Gagliardi et al., 2015 p. 17).

In the case of Greece, the existing empirical evidence on OFDI has focused mainly on the determinants and incentives of the internationalization of Greek firms (e.g. Iammarino and Pitelis, 2000; Bitzenis, 2006; Salavrakos and Stewart 2006; Louri et al., 2000; Kapitsinis, 2017), and on the impact of OFDI on firm-level performance (Demos et al., 2010). The current study is to the best of our knowledge the first empirical investigation into the employment (and skill composition) effects of increases in outward FDI on regional economies in Greece.

[50] The unit of analysis in this paper is the ''regional industry'' which is constructed 'as the ensemble of firms operating in the same industrial macro-sector—constituted by interdependent sectors belonging to the same industrial filie´re—and localised in the same geographical region' (Elia et al. 2009 p. 358)

Therefore this paper intends to contribute to the literature in a threefold way: it empirically investigates the impact of the outward internationalization of firms' for a peripheral EU economy and elucidates the EU integration experience towards the Balkans; second, it is to our knowledge the first study of Greek OFDI effects at the regional level; and third, it contributes to the existing empirical studies by proposing the use of new instrumental variable approaches to address endogeneity issues.

3.3 Data and descriptive evidence

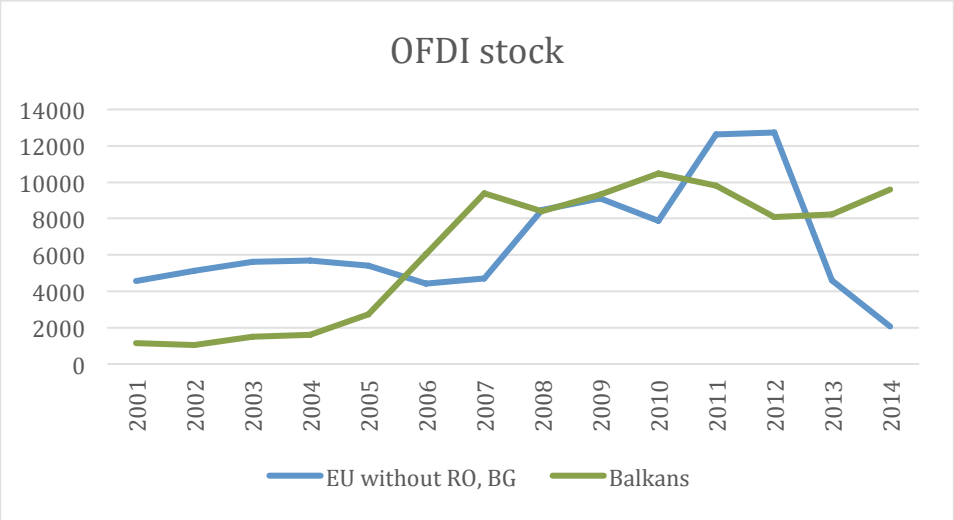
The dataset consists of OFDI flows by two-digit manufacturing sector, classified by region of origin. It, unfortunately, does not include a parallel two-digit manufacturing sector distinction by destination country. This lack of simultaneous breakdown by sector and destination country is due to confidentiality reasons (OECD) meaning that the data by destination country or industry aggregates. Given that the main destination block of countries is the Balkan region according to UNCTAD, OECD, EUROSTAT and the Bank of Greece (as from section 2.2 above), we assume that the effects captured by the OFDI variable, by and large, reflect the internationalization of Greek firms in the neighbouring Balkans countries. The data – stemming from the Bank of Greece – refer to OFDI flows and are broken down by either industrial sector (2-digit NACE sector) or destination country. Given that the construction of the proxy requires information on the sectoral breakdown of the flows, we use the sectoral OFDI data for our measurement without a possibility for further stratification of the sample by destination countries.

The OFDI flows are provided by the Bank of Greece and are cross-referenced with both UNCTAD and OECD databases. They refer to financial flows between resident and non-resident firms that are under a direct investment relationship. A direct investment relationship is established when a Greek firm (direct investor) holds at least 10% in the share capital of a non-resident firm (direct investment firm). Direct investment includes the establishment of a branch as well as real estate investment. All transactions following the initial one, establishing the direct investment relationship related to the maintenance, expansion or termination of this relationship, together with any loans and suppliers' credit granted between a direct investor and a direct investment firm, are recorded under direct

investment[51]. Finally, direct investment includes retained (reinvested) earnings. The methodology of recording flows by the Bank of Greece follows the extended directional principle according to the methodology of OECD Benchmark Definition of Foreign Direct Investment, 4th edition.

Figure 3.2 depicts the geographical breakdown of OFDI stocks to the EU and to the Balkans. The increase in investments to the Balkans started in anticipation of the accession of Bulgaria and Romania in 2007 and peaked in 2010, right before the crisis hit the real economy in Greece. From 2014 onwards there are signs of the investment rate picking up, which are, either due to relocation of firms for survival or signs of some recovery for certain expanding sectors.

Figure 3. 2 Geographical breakdown of Greek OFDI (stocks)



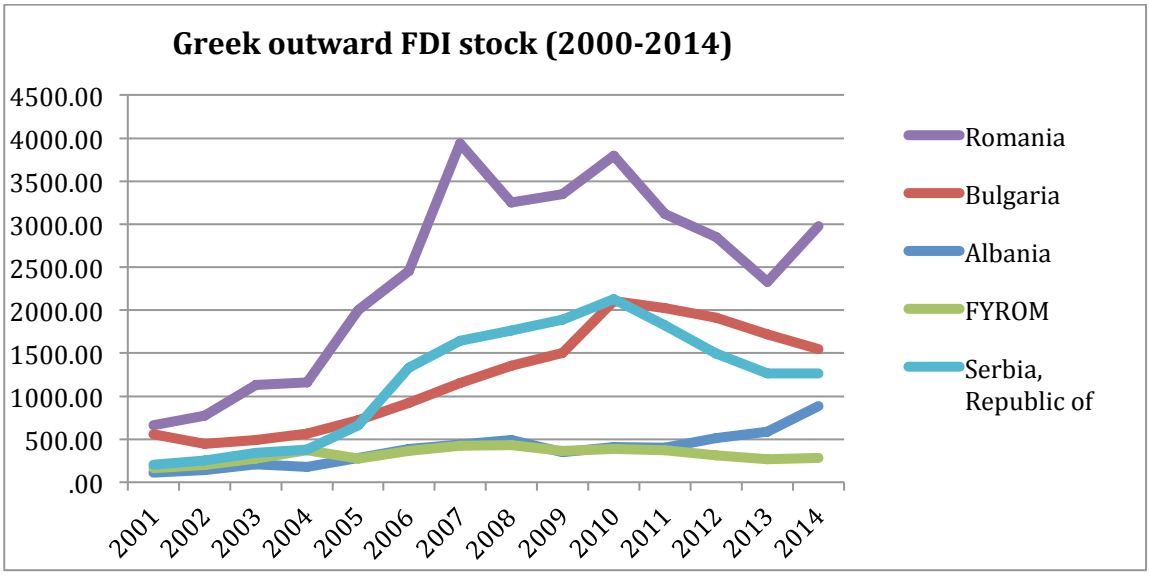
Source: own elaboration using data from the Bank of Greece (BoG).
Notes: The Balkan countries include Bulgaria, Romania, Macedonia, Albania, Serbia. Values are in millions of EUR.

When zooming into the Balkan region in Figure 3.3 below, it is evident that Romania and Bulgaria stand out and attract the lion share of the Greek investments, followed by Serbia. These high levels of investment are associated with the catalyst effect of EU accession in attracting investments through reduced transaction costs, improvements in the regulatory environment of Romania and Bulgaria post-EU accession and to the lowering of the

[51] If the firms under a direct investment relationship are monetary financial institutions, direct investment records the initial participation in the share capital (if >10%) and any further increase of this participation. Transactions are recorded under direct investment according to the criterion of the investment's 'direction' (directional principle) (Bank of Greece).

corporate tax rates in the rest of the neighbouring economies (Salavrakos and Stewart, 2006).

Figure 3. 3 Outward Greek FDI in the Balkan region

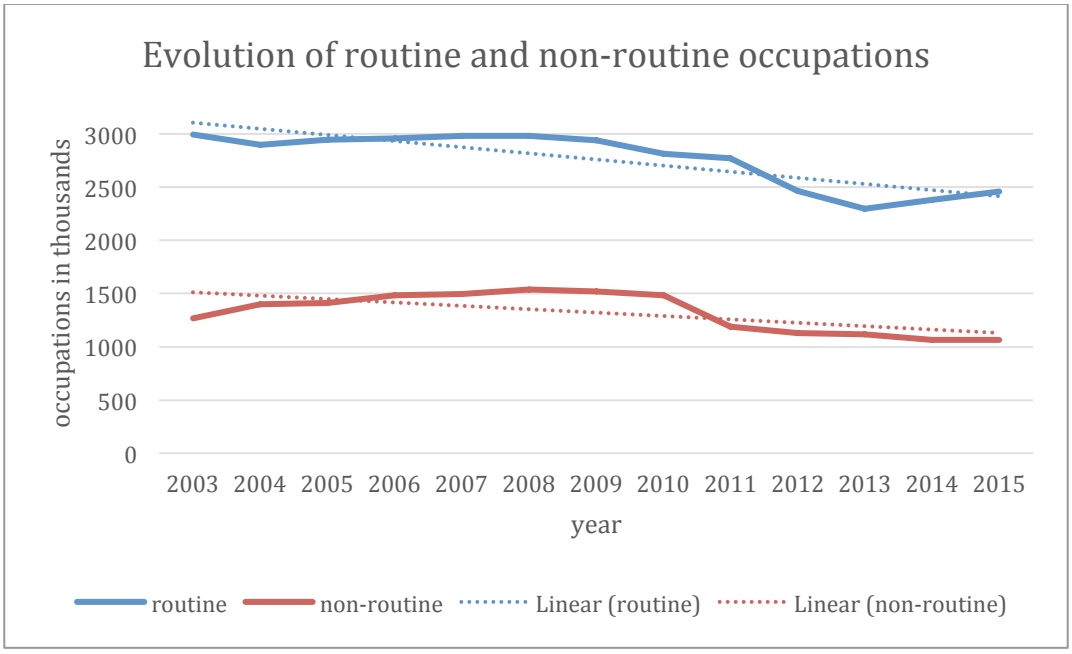


Source: own elaboration using data from the Bank of Greece (BoG).
Notes: Balkan countries include Bulgaria, Romania, FYROM, Albania, Serbia. Values are in millions of EUR.

The typology of jobs, which is our main outcome variable, is based on the division between routine and non-routine jobs of the ISCO-O8 classification of occupations. The data are provided by the EU Labour Force Survey (LFS) (the details on the construction of the variable follow in the next section).

Figure 3. 4 portrays the temporal evolution of the aggregate number of routine and non-routine jobs within the period of analysis. As can be observed, although both follow a downward trend, routine jobs exhibit a relatively sharper decline. Routine jobs actually decreased by over half a million within the period of analysis.

Figure 3. 4 Evolution of routine and non-routine occupations (2003-2015)



Source: own elaboration using data from EUROSTAT – Regional database

The maps in Figures 3.5 and 3.6 illustrate the spatial distribution of changes in OFDI as a percentage of GDP [52] across NUTS II regions in Greece from 2003 to 2015. Investments abroad increased in almost all Greek regions, implying that the phenomenon of the relocation of production covered the entire country throughout the period of analysis. However, the largest increases in OFDI outflows are concentrated in regions with high manufacturing activity such as Thessalia and Sterea Ellada (where Viotia is located, one of the prefectures with the largest shares of manufacturing activity) and regions bordering the Balkan countries (i.e. Anatoliki and Kentriki Makedonia, Dutiki Makedonia kai Ipeiros) in absolute numbers (as opposed to shares of GDP) the OFDI proxy variable is much higher in the regions bordering the Balkans than in the rest of the country.

[52] We are not able to resort to firm level data from global firm databases as the geographical allocation of investment to regions in Greece is not possible since most investing firms can be tracked only through their headquarters (HQ) which are mainly based in the two large metropolis in Greece (Athens and Thessaloniki). This lack of spatial variation in the location of the parent company in combination with the fact that the HQs are not always the production units from which the relocation occurred poses a major drawback in precisely assigning the actual geographical effect of the investment.

Figure 3. 5 Spatial distribution of changes in OFDI (GDP) across NUTS II Regions

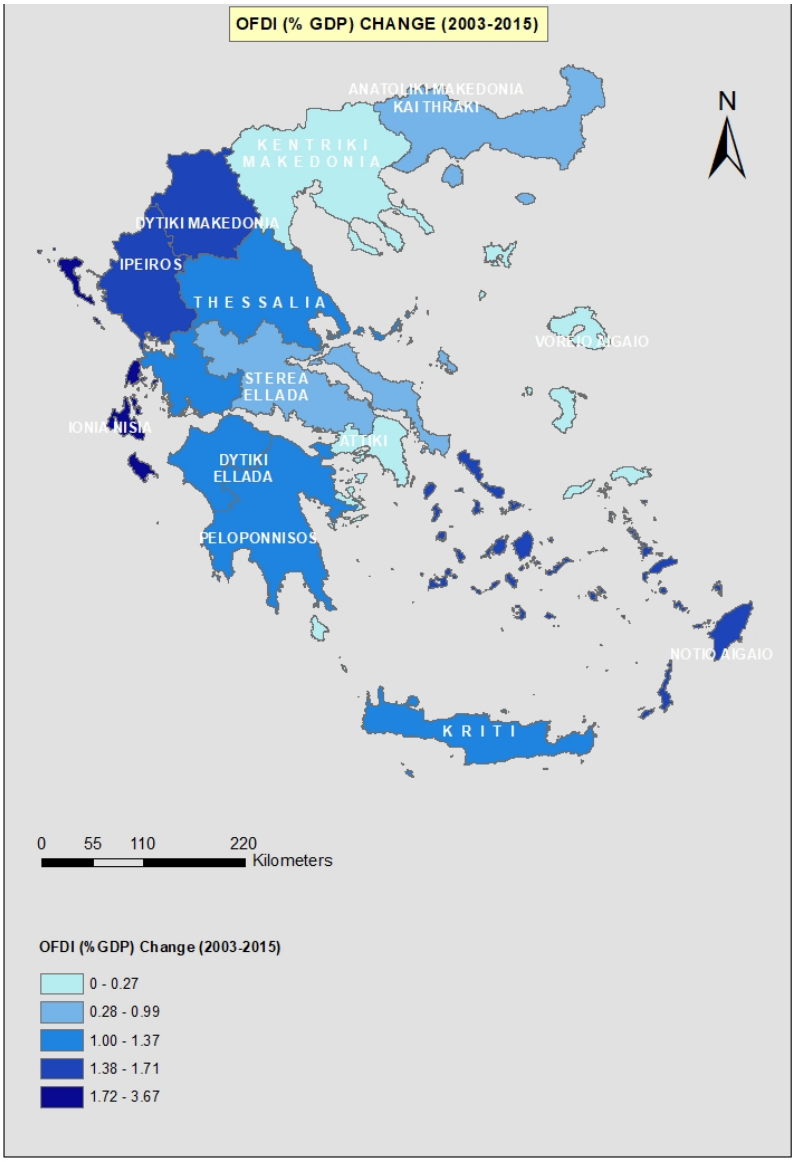


Figure 3.6 depicts the geographical distribution of the changes in the share of routine occupations. The largest decreases in the routine jobs were found in the regions that experienced the highest increases of OFDI. Specifically, the (central) north-south axis from the region Central Macedonia to Peloponnese is the main corridor that experiences both a decline in routine jobs and an increase in OFDI, within the period of analysis. Figure 3.7 shows the spatial distribution of routine jobs in the initial period of our analysis (2003). The highest shares of routine occupations are concentrated in the regions with the largest increases of OFDI and the places more affected by reductions in the routine occupations.

Figure 3. 6 Spatial distribution of changes Routine jobs across NUTS II Regions

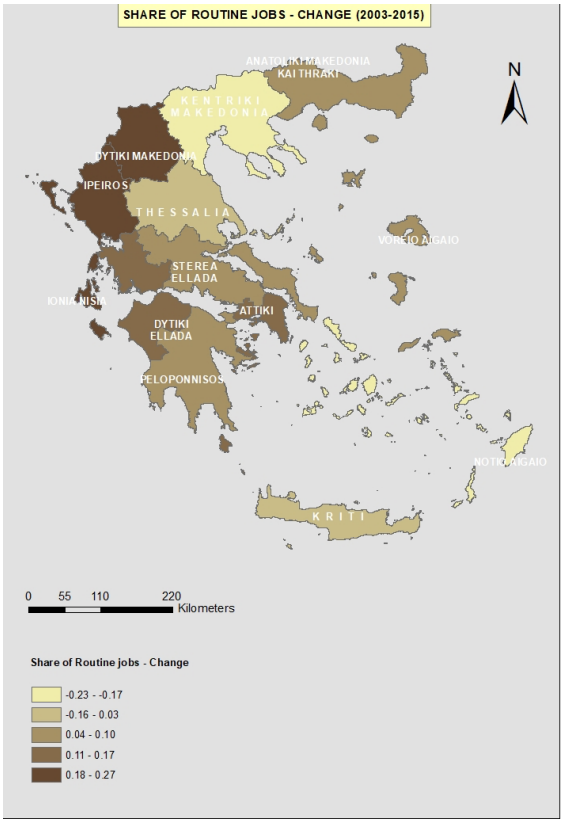
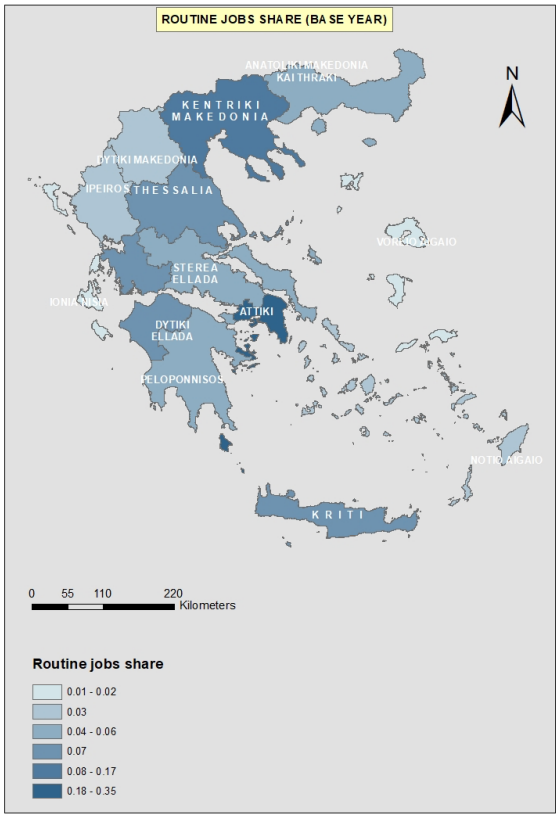
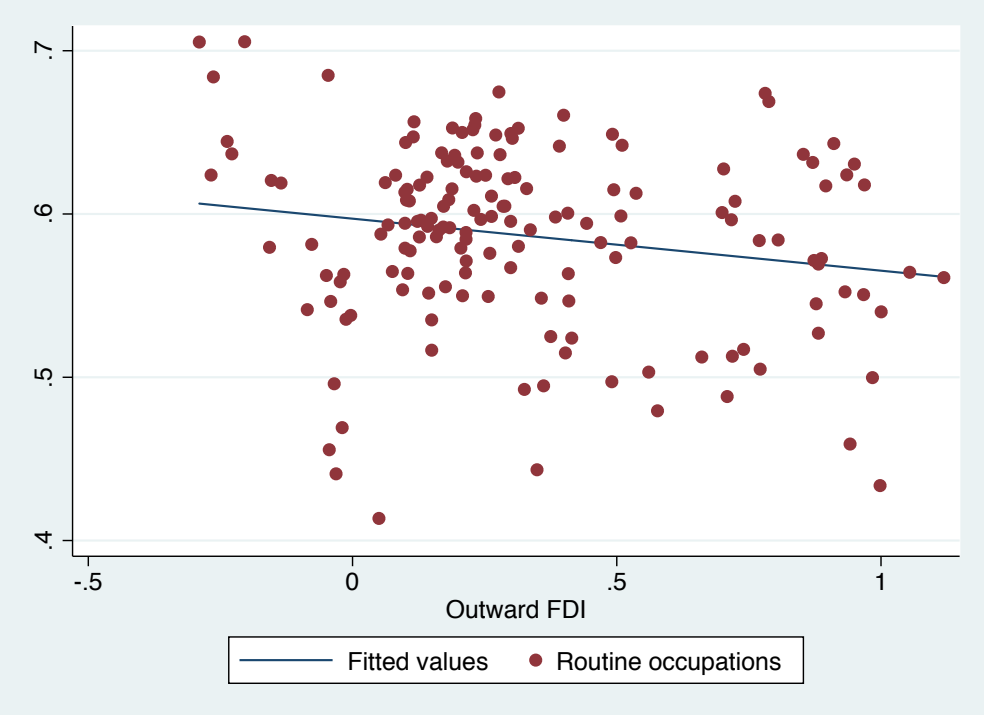


Figure 3. 7 Spatial distribution of Routine jobs (share) across NUTS II Regions (2003)



The negative association between OFDI and the evolution of routine jobs is illustrated in the scatterplot below (Figure 3.8). The figure plots OFDI against the share of routine occupations, between 2003-2015 at the NUTS II level. The negative slope of the regression line indicates that the higher the investments abroad the lower the demand for routine occupations across Greek regions.

Figure 3. 8 Two-way Scatterplot - Outward FDI and Routine occupations in Greek regions



Coeff: -0.031; stand. error: - 0.013

3.4 Variable description and Empirical Framework

The empirical analysis for the estimation of the effects of outward FDI on the job composition at the regional level takes the form of a fixed effect panel estimation controlling for region-specific characteristics (Gagliardi et al., 2015). The period of analysis spans from 2003 to 2015 and the unit of observation is the NUTS II regions. The estimation equation takes the following form:

$$Y_{r,t} = \beta_1 OFDI_{r,t} + \beta_2 X_{r,t} + \varphi_r + \delta_t + \varepsilon_{r,t} \quad (7)$$

The dependent variable (Y) is the share of routine or non-routine occupations in region r in year t while X represents a vector of regions specific controls such as the manufacturing share, human capital and wages at region r in year t (the measurements are explained in the next section), φ and δ refer to region and year fixed effects respectively.

The classification into the two categories follows the ISCO-O8 classification of occupations and is provided by the EU Labour Force Survey (LFS) by Eurostat[53]. The EU-LFS results provide information on labour market status for persons in the age group of 15 years or older. The survey is compulsory in Greece and is carried out annually. The variable is constructed as the employment rate of routine and non-routine jobs, which is measured as the number of routine or non-routine jobs over the region's workforce (economically active population). The evolution of the employment rate of each category of occupation is considered the most appropriate method of measurement compared to ratios of routine over non-routine jobs as the ratio's fluctuation could depend on changes either on the numerator or the denominator preventing us from isolating the true effect on each typology of workers. The shortcoming of using the ratio has been acknowledged in relevant studies that proceed with this method irrespectively (Elia et al., 2009).

The International Standard Classification of Occupations (ISCO) developed by the International Labour Organization (ILO) is used to measure the occupational status of employed persons. ISCO is a tool for organizing jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job. Following Gagliardi et al., (2015)

[53] The survey is carried out annually as a continuous survey providing quarterly results. The weighting procedure uses variables on gender, age groups, region (NUTSII).

and Acemoglu and Autor (2011), the routine occupations or jobs refer to those which "are not necessarily mundane, but rather sufficiently well understood/codified tasks that can be fully specified as sequential series of instructions while non-routine occupations are activities that require problem-solving, intuition, persuasion, and creativity" (Gagliardi et al., 2015, p.7). Workers performing non-routine tasks refer to managerial, professional, creative, and technical occupations (Gagliardi et. al 2015). If the negative effect is concentrated on workers at the lower ranks of the skill distribution, then the uneven patterns of OFDI will lead to a progressive geographical polarization of skills at the regional level.

The main regressor capturing Greece's direct investments abroad is constructed following the approach used by Gagliardi et al., (2015), which is based on the shift-share factor loading method. The regressor is constructed as an interaction between the time–variant national OFDI flows in sector *s* and the time-invariant employment share in sector *s* in the initial year of the study period[54]:

$$OFDI_{r,t} = \sum_{s=1}^{n}(Employment_{r,2001}^{s} \times Outward\ FDI_{s,t-1}) \quad (8)$$

According to this method the local market impact of the relocation of production abroad will be proxied by modelling the degree of exposure of different regional (labour) markets to outward FDI changes according to their pre-existing industrial structure. The rationale is to model the impact of an observable time trend component (i.e. outward FDI) on regional units (i.e. NUTSII) by means of a factor loading (i.e. the share of workers by sector at a base year) (Autor et al., 2012; Gagliardi et al., 2015, p.10). A similar method is adopted by Autor et al., (2013), in measuring US regional labour market exposure to national import shocks and also to "regionalize" the national trade flows in Greece based on the industrial structure of regions using location quotients to proxy the degree of regional exposure (Petrakos et al. 2012).

This method is based on related empirical literature of common shocks (Bai, 2009) to assess the impact of an observable time trend component (i.e. OFDI) on different spatial

[54] The study period starts from 2003 as the data on OFDI flows from the Bank of Greece were provided from 2002 onwards. Given that the construction of the variable requires a time lag (i.e. OFDI in 2002 for the OFDI proxy in year 2003) we start the period of analysis from 2003.

units (in this case the NUTSII Greek regions) by means of a factor loading (i.e. the share of labour by sector). The interaction term, which keeps the factor loading as a time invariant component mitigates endogeneity concerns of simultaneity bias between the OFDI and the regional industrial specialization. The heterogeneous effects stem from the fact that regions that are more exposed to the relocation of firms are expected to be more intensely affected and this is dependent on their sectoral specialization (Gagliardi et al., 2015).

The main regressor in this study captures implicitly the internationalization of Greek firms in the Balkan region and the relocation of production, as the majority of outward investment in productive activities (mainly manufacturing) has targeted Bulgaria, Romania and to a lesser extent other Balkan countries (i.e. Albania, Serbia).

For the interaction term the outward foreign investments by two-digits sector *i* (NACE Rev.2) at *t-1* are attributed to each region *r* by means of the share of people employed in sector *i* in 2001. This variable reflects the exogeneity conditions of the shift-share approach (e.g. Moretti, 2010; Faggio and Overman, 2014), which "keeps the industry mix unchanged and limits concerns about simultaneous changes in the industry specialization of regions which may be correlated with the outward FDI variable" (Gagliardi 2015, p. 11). In other words, this mitigates concerns pertaining to reverse causality between regional labour market responses and national trends.

This approach based on value is preferable to other measures used in the literature i.e. the number of investment projects from *FDI markets*, which represents a more imperfect measure, especially in cases when there is a systematic tendency of some regions to engage in larger projects, combined with the fact that the number of projects do not capture capital value. Considering that the number of investment projects are assigned to the legal unit of the parent company undertaking the investments and given that this is not always located in the same region as the actual production plants, mitigates the reliability of such measures (Castellani and Pieri, 2016). Further, *FDI Markets* collects only information on greenfield projects, so it does not allow to test for the effects of outward investments occurring through acquisitions of firms in foreign countries.

We test the robustness of our estimates to omitted variables with the inclusion of regional level controls that are expected to affect the demand for routine and non-routine

occupations. The introduction of these controls aims to mitigate omitted variable bias (OVB) concerns and improve the fit of the model. Among the controls we include the following:

- ***MNF***: the share of manufacturing employees in region *r* in year *t*, assuming that regions with higher share of manufacturing will have stronger responses with respect to the evolution of routine jobs.
- ***HC***: the share of human capital measured as the percentage of tertiary education graduates (ISCED11 – levels 5-8) in region *r* in year *t*, provided by EUROSTAT.
- **Wages**: routine and non-routine wages measured as the mean annual earnings by category of occupation (ISCO-08), in region *r* in year *t* provided by EUROSTAT.

All variables are expressed in one-year lags to allow for the effect on the demand for jobs to materialize. The standard errors are heteroscedasticity robust and clustered by region to address potential serial correlation in the error term. This is the standard procedure in panel data analysis (Angrist and Pischke, 2009).

3.4.1 Endogeneity concerns

In order to capture the effect of outward FDI on the composition of jobs and minimize endogeneity concerns related to confounding factors (omitted variable bias) as well as simultaneity bias between the main regressor and the outcome variable, we use the following methodology when constructing the OFDI variable. The proxy, which is based on the shift share approach addresses simultaneity bias through the time-invariant component of the interaction, drawing on the theoretical reasoning of the instrumental variable approach, was first introduced by Bartik (1991). The latter provides exogeneity since the sectoral specialization of the region (which is held constant) and the investment activity do not change simultaneously and are not correlated. The Bartik instruments are defined as the local employment growth rate predicted by interacting local industry employment shares with national industry employment growth rates. The Bartik approach and its variants have been widely used across many fields in economics, including labour, public, development, macroeconomics and international trade.

We also address further endogeneity concerns related to omitted variables that may be correlated with the endogenous evolution of routine and non-routine jobs and may bias our estimates. Technological improvements may impact on specific job functions and import competition in specific sectors which may destruct employment through substitution effects. The literature suggests that technological progress which increases the automation of production can make certain routine occupations redundant (Autor and Dorn, 2013).

Following Gagliardi et al., (2014), technological trends that induce skill-bias technological change will be proxied by the annual values of ICT Investments by region and will be used in extensions of the baseline model to test the robustness of our estimate. The ICT variable is measured as gross capital formation in ICT, and is provided at the NUTS II level by the Greek national statistical office (ELSTAT).

Further threats to the endogenous evolution of labour demand stem from import competition. Import competition from lower cost economies is found to affect specific occupations at the lower end of the skill distribution, due to substitution effects at the industry level. We proxy import competition as the share of import flows (the ratio of imports over total trade) from lower-cost economies[55]. The latter is based on the rationale that imports may displace certain industrial activities and reduce employment in lower skill functions within industries. Data on trade flows are provided at the NUTS II level by trade partner and by year. The related empirical literature suggests that within-industry import competition has affected manufacturing employment in the USA, due to increased competition from Chinese trade (Autor et al., 2012). A similar finding was detected for Chile (Álvarez and Claro, 2009) and Belgium attributed to higher import competition from lower cost economies (Mion, 2009).

Finally, considering the production structure of Greek regions and the fact that some regional labour markets rely heavily on tourism, we also control for this share in extensions of our baselines models as an additional robustness check. Since functions and occupations in tourism are classified as routine, then the endogeneity of the evolution of our outcome variable will be mitigated. Following Psycharis et al., (2014) we proxy

[55] In the basket of countries classified as lower cost economies we include China, India, Indonesia and Bangladesh following the related literature which studies

tourism as the nights spent at tourist accommodation establishments by NUTS 2 regions and year (nights/ inhabitant). These data are provided by Eurostat.

The estimation strategy includes region and year fixed effects to control for time invariant unobservables that vary across regions, and time variant shocks that vary across years. This provides additional robustness checks to our estimates. Furthermore, the panel data structure of our data set addresses the problem of heterogeneity bias stemming from any association between unobserved effects and the explanatory variables.

Further potential sources of bias are also addressed employing an instrumental variables (IV) strategy exploiting information on the regulatory quality of the destination countries of Greek FDI abroad. The proposed IV instruments the regional OFDI flows using a) the distance of each region from the host countries[56] and b) components of the regulatory quality that are expected to determine investment attraction. The rationale of this approach is that the closer a region is to the host country and specifically regions in northern Greece, the more likely it is to invest in the Balkan region. Geographic distance to the border is expected to be correlated with investments abroad (Bevan and Estrin 2004). Secondly, improvements in the regulatory environment with respect to investment attraction in host countries can facilitate investment. The improvements in the institutional quality following EU accession have been profound especially in Bulgaria and Romania and are perceived as a "pull" factor of Greek investments in those countries. Ascani et al., (2016) stress that the quality of economic institutions in host economies (i.e. business regulations) determine FDI location choices in EU NMS, while overall regulatory quality is found to be the single most important investment driver in southeaster European countries (Kaditi, 2013; Daude and Stein, 2007).

The construction of the IV is based on a product of two components, the regional inverse distance weights (of each region to the destination countries) and the regulatory quality index related to investment attraction. The indices used are the ranking of the countries'

[56] The countries considered are Bulgaria, Romania, Albania, Northern Macedonia, Serbia and Netherlands as they jointly account for (approx.) over 70% of total Greek OFDI stock. The typology of investment to those countries is mostly cost-saving in manufacturing and trade unlike investments to Cyprus which are in the financial sector.

starting a new business[57] and the *marginal payroll tax*[58]. This approach – via the parameter of the distance decay effect – essentially "weights" for each region the relative importance of improvements in the institutional environment in recipient countries.

The instrumental variable is constructed based on the following formula:

$$IV_{r,t} = \sum_{i=1}^{n}\left(\frac{\frac{1}{d_{i,r}}}{\sum i\frac{1}{d_{i,r}}} \times RQ_{i,t}\right) \quad (9)$$

Where *d* stands for the geographical distance measured in hours of travel from the centroid of region *r* to host country *i* and *RQ* represents the regulatory quality (RQ) proxy in country *i* in year *t*.

The RQ is expected to satisfy the relevance requirement as the improvement in the quality of economic intuitions will be positively correlated with investment decisions (OFDI) and so is the (inverse) distance to the host countries. Both distance and the institutional quality in the destination countries are not expected to directly influence the demand for routine or non-routine occupations in Greek regions which satisfies the exogeneity requirement of the proposed IV.

As a second IV strategy we employ the productivity improvements (also taken as a comparative advantage proxy) of the host countries in determining the intensity of Greek investments. The rationale underlying this approach is that a sectoral productivity growth in the host economies will be reflected in rising industry level exports which will in turn attract investments. Rapid productivity growth following EU accession of Bulgaria and Romania combined with extensive policy reform have contributed to a large increase in the Balkan countries' manufacturing capacity making them attractive destinations for Greek investments.

In the same vein, Autor et al., (2013) exploit the variation in Chinese productivity (proxied by the rise in within-industry exports from China) to instrument the import shock in US's

[57] This index is designed to identify the extent to which business regulations and bureaucratic procedures restrain entry and reduce competition. In order to score high in this portion of the index, countries must allow markets to determine prices and refrain from regulatory activities that retard entry into business and increase the cost of producing products (Economic Freedom of the World: 2018 Annual Report. The Fraser Institute).

[58] "High marginal tax rates that apply at relatively low income levels are also indicative of reliance upon government. Such rates deny individuals the fruits of their labour. Thus, countries with high marginal tax rates and low income thresholds are rated lower" (Economic Freedom of the World: 2018 Annual Report. The Fraser Institute)

local labour markets. Similarly, in the current study the rising competitiveness in specific sectors of the host countries is assumed to explain the rising FDI flows from Greece given that productivity attracts investments. The rationale builds on findings stressing that an industry's comparative advantage is one of the major determinants of FDI into that industry. In Bulgaria and Romania, sectors with positive within sector productivity growth saw a considerable increase in FDI inflows between 2001 and 2008 (World Bank, 2015). However, a potential threat to the validity of this IV strategy is that the relationship may be going the other way around i.e. increased FDI investments can boost productivity. To this end, studies in the case of the Balkan region confirm that the observed productivity growth is not attributed to FDI but due to liberalization and deregulation in banking, insurance services and reforms in the energy and telecommunication sector which boosted TFP across sectors (Ospina, 2002).

In order to instrument the Greek OFDI, we use an interaction of productivity in host economies (proxied by exports[59] at the two digit NACE industry level of the host countries) with the home regional sectoral employment by industry in the base year. Data are provided by UN Comtrade at the product level (Harmonised System) and have been matched with home regional sectoral employment at the two digit level (NACE Rev. 2) based on the below formula:

$$Productivity_{r,t} = \sum_{j=1}^{n}(L_{s,r,t=0} \times exports_{s,t}^{j}) \quad (10)$$

Where *L* is employment in sector *s* in region *r (of the home economy)* while exports refer to the export values in (two-digit) sector *s* at time *t*, of the host economies *j*.

3.4.2 Results – Main Findings

The results of the main specification are presented in Table 3.1, Column (1) reports the results of the effects of OFDI on the share of routine jobs; while columns (2-5) present the estimations adding progressively all the controls. OFDI is negatively and significantly associated at the 1% level to the share of routine occupations in all specifications. The

[59] The exports refer to the values to the rest of the world excluding Greece as exports to Greece and OFDI from Greece may be correlated due to intra-firm trade.

magnitude and significance level remain unchanged confirming the robustness of the main estimate.

The rationale of the hypothesis is that when a MNE undertakes an efficiency-seeking FDI or is relocating for pure survival, labour intensive activities are the most prone to be transferred to the lower cost countries, reducing demand for routine occupations at the regional level. Our results are in line with the empirical findings of Elia et al., (2009) in the case of lower-skilled workers in Italy, and Gagliardi et al., (2015) in the case of routine occupations in the UK. Hence, regions more exposed to increased OFDI based on their initial industrial specialization experienced a significant decline in routine jobs as a result of the internationalization strategies of Greek MNEs. These results are consistent with the assumption that investments addressed to lower income countries are predominantly efficiency-seeking investments of a cost-saving type. The latter implies the transfer of labour-intensive activities from the home to the host countries, thereby decreasing the demand for domestic low-skilled workers.

The association holds after controlling for region specific characteristics and the progressive addition of related control variables (i.e. human capital, wages, etc.) signifying the robustness of our estimate. The control variables have in general the expected signs. The wages return the negative and significant sign as per economic theory. The demand for labour [60] will be negatively sloped when demand is elastic. As expected, when wages rise, the demand for labour (the routine occupations in this case) is reduced. Human capital is negatively and statistically significantly correlated with routine jobs (Column 3). However, it loses significance when we control for tourism signifying that tourism is a more relevant control variable explaining the evolution of routine occupations in the Greek regions (Column 4). It thus explains much more of the variation in routine occupations making human capital non-significant (as it is less relevant compared to the tourism control variable in explaining the evolution of routine jobs in Greek regions which heavily rely on tourism) when included in the same model.

The proxy for technological change (capturing skill biased technological change effects) was not found to be associated with the destruction of routine jobs at the regional level, which is in line with the findings on low skill labour, in Elia et al., (2009), who detect a

[60] When one factor of production (i.e. labour) becomes more expensive firms substitute labour for capital and the demand of the more expensive factor is reduced.

positive and significant effect only for high skill functions. The main regressor remains significant after controlling also for tourism and import competition.

The assumption that regions with a higher average firm size may exhibit a stronger effect on routine jobs when investing abroad is also tested by means of an interaction of the *OFDI* variable with average firm size at the regional level. The insignificance, albeit with a positive sign, of firm size and the negative sign of the interaction term (column 5), reveals that there is no significant evidence that OFDI's effects are conditional upon firm size in explaining changes in routine jobs. The latter is in line with the findings of Labrianidis (2000), who concludes that the majority of firms internationalizing are small or medium, labour-intensive, of a lower technological level and seeking to gain competitiveness from production cost minimization.

Table 3. 1 Main results – OFDI and Routine Jobs (share)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Dep. Variable:	**Routine share**	**Routine share**	**Routine share**	**Routine share**	**Routine share**
OFDI	-0.043***	-0.042***	-0.040***	-0.049***	-0.050***
	(0.010)	(0.012)	(0.011)	(0.014)	(0.013)
Human Capital	-0.006**	-0.006*	-0.006**	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Wages rout. jobs	-0.012**	-0.013***	-0.014***	-0.019**	-0.019**
	(0.005)	(0.004)	(0.004)	(0.008)	(0.008)
Manufacturing	0.336	0.317	0.328	0.071	0.084
	(0.248)	(0.216)	(0.235)	(0.231)	(0.236)
Tech. change		-0.110	-0.135	-0.279	-0.306
		(0.264)	(0.263)	(0.339)	(0.354)
Import competition			0.018	0.013	0.012
			(0.013)	(0.012)	(0.012)
Tourism				0.000	0.000
				(0.000)	(0.000)
OFDI*Firm size					-0.013
					(0.014)
Firm size					0.008
					(0.029)
Obs	144	144	144	144	144
R^2	0.766	0.767	0.772	0.772	0.792
Year and Region FE	YES	YES	YES	YES	YES

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Routine jobs (Routine jobs as a share of the workforce/ economically active population). Standard errors are clustered at the region level.

In order to test that the effect on the share of routine job in Greek regions is not driven by changes in the denominator, we replicate the same specification using the absolute value of routine jobs as the dependent variable (instead of the share) to rule out the possibility that the effect is driven by changes in the ratio. The results are presented in Table 3.2, the sign and level of significance of the main regressor is preserved, confirming the robustness of the estimate to alternative measures of the dependent variable. This confirms that the effect is indeed related to the number of routine jobs and does not stem from contemporaneous changes in the overall regional workforce.

The findings on routine jobs reflect the overall decline in manufacturing in specific regions due to the relocation strategies of Greek firms i.e. the big exodus of most textiles and apparel firms from the Northern Greek border to the neighbouring Balkan countries (Kapitsinis, 2017; Karagianni and Labrianidis, 2001). The phenomenon of foregone investment in the most affected regions reveals the strong spatial footprint of the OFDI trends showcasing that the regional dimension in the analysis of employment responses from OFDI is critical.

Table 3. 2 Main results – OFDI and Routine Jobs (absolute value)

Dep. Variable	(1) Routine jobs	(2) Routine jobs	(3) Routine jobs	(4) Routine jobs	(5) Routine jobs
OFDI	-0.107***	-0.105**	-0.101***	-0.011***	-0.123***
	(0.031)	(0.034)	(0.032)	(0.004)	(0.038)
Manufacturing	1.304*	1.254**	1.281**	0.603	0.694
	(0.598)	(0.526)	(0.543)	(0.503)	(0.581)
Wages routine jobs	-0.017	-0.021*	-0.023*	-0.000	-0.036
	(0.011)	(0.010)	(0.010)	(0.000)	(0.022)
Human Capital	-0.014**	-0.014*	-0.015**	-0.008*	-0.009
	(0.006)	(0.007)	(0.006)	(0.004)	(0.009)
Tech. change		-0.302	-0.365	-1.062	-0.835
		(0.690)	(0.663)	(0.690)	(0.886)
Import competition			0.044	0.048**	0.026
			(0.031)	(0.021)	(0.031)
Tourism				0.014***	0.000
				0.003	(0.000)
Firm					0.047
					(0.074)
Firm*size					-0.039
					(0.041)
Obs	144	144	144	144	144
R^2	0.735	0.735	0.755	0.790	0.769
Year & Region FE	YES	YES	YES	YES	YES

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the natural logarithm of routine jobs (absolute number). Standard errors are clustered at the region level.

Table 3.3 presents the results for the non-routine occupations. The association between OFDI and non-routine jobs does not appear significant, suggesting that OFDI does not impact on the demand for non-routine occupations based on the OLS estimates and remains unchanged after progressively adding the controls. The generally non-significant positive coefficient for non-routine occupations suggests that efficiency seeking outward FDI may positively affect higher-skill, technically specialized, managerial or science related functions, although the association lacks significance under the OLS estimation. Human capital significantly affects the increases in the demand for non-routine occupations, as expected, suggesting that regions with a higher concentration of human capital lead to increases in the demand for high skilled and non-routine (scientific and managerial) functions.

Table 3. 3 Main results – OFDI and Non -Routine jobs

	(1)	(2)	(3)	(4)
Dep. Variable:	**Non-routine share**	**Non-routine share**	**Non-routine share**	**Non-routine (abs. value)**
OFDI	0.007	0.009	0.009	0.037
	(0.009)	(0.009)	(0.009)	(0.029)
Human Capital	0.004**	0.004**	0.004**	0.021***
	(0.002)	(0.002)	(0.002)	(0.007)
Wages non-routine jobs	-0.015	-0.017	-0.017	-0.206***
	(0.015)	(0.016)	(0.016)	(0.048)
Manufacturing	0.145	0.122	0.122	0.665
	(0.300)	(0.308)	(0.308)	(1.624)
Tech. change		-0.131		0.141
		(0.112)		(0.569)
OFDI*Firm size				-0.088
				(0.055)
Firm size				0.052
				(0.067)
Obs	144	144	144	144
R^2	0.878	0.878	0.878	0.897
Year and Region FE	YES	YES	YES	YES

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Non-Routine jobs (Non-Routine jobs as a share of the economically active population/workforce). Standard errors are clustered at the region level.

Although the bulk of Greek OFDI is of an efficiency-seeking type, there is also a fraction of investments that can be categorized as horizontal market-seeking strategies (i.e. highly specialized oil refineries MNEs, engineering or telecommunication and banking). Thus, increases in the internationalization of Greek firms in those sectors is likely to increase the relative demand for white collar employees, if the coordination needs of MNEs expand significantly and if efficiency enhancing is creating margins that allow for employment expansion and HC investment. This finding reflects the high heterogeneity of the type of domestic firms internationalizing (large productive versus SMEs).

3.4.3 IV estimates

In order to test whether the main estimate, suffers from any sort of attenuation or negative bias due to unobservables that affect the endogenous evolution of jobs, we employ an IV strategy. Concerns regarding the endogeneity of the estimate refer to factors that are difficult to proxy or for which detailed data are not available. These could include structural shifts at the regional level that drive the demand for high skills or non-routine

occupations such as changes in public investments in knowledge intensive sectors (i.e. establishment of R&D centres or innovation hubs, business incubators) or re-training of individuals in new ICT tools which improves the ability of the regional workforce to climb up the skill hierarchy and obtain jobs classified as non-routine.

The results of the IV estimate are reported in the next section and reveal that non-routine occupations are positively and significantly affected by increases in OFDI suggesting a potential virtuous productivity cycle from efficiency enhancing internationalization strategies within Greek MNE HQs. This could be a result of increased internal organizational needs for coordination of more demanding cross border business operations and science positions for R&D or marketing functions.

Table 3.4 (Column 1) reports the results of the instrumental variable approach described in section 4.1 employing the business regulation index of the host economies to instrument outward FDI. The sign and significance of the IV estimate confirm that OFDI and routine occupations are significantly and negatively correlated at the 1% significance level. The first stage (Columns 3 and 4) also confirms the relevance of the instrument and returns a positive and significant association with OFDI signifying that the quality of economic institutions in host economies significantly determines the internationalization of firms. The second IV used in the estimation is payroll tax. The association of the variable with the main regressor satisfies the relevance requirement i.e. higher payroll tax generally would discourage investments abroad. The first stage F statistic however is lower than the threshold level of 10 (Stock and Yogo, 2005) and may mean that the IV is not strong. However, in smaller sample sizes the magnitude of the first stage F statistic tends to be lower than in large samples (Wooldridge, 2014). Finally, the Hansen (j) statistic does not allow us to reject the null hypothesis that both instruments are exogenous confirming the validity of the proposed IV (Column 1).

The results in the case of non-routine occupations (Table 3.5), reveal that the OLS estimates may be suffering from some negative bias. The TSLS estimate returns a positive and significant sign at the 1% level. The magnitude of the estimate is also higher and the F statistic of the first stage is, in this case, closer to the 10 threshold (column 3) which given the small sample size can be considered acceptable for validity. This finding suggests that we detect signs of OFDI positively affecting the demand for higher skill, managerial or science based functions in regions hosting firms that internationalize and become dynamic

MNEs.

As a second IV approach we employ a productivity proxy in the host economies, which is expected to affect the increase of outward FDI but not the evolution of occupations for the sending regions. The results of the alternative IV strategy using productivity to proxy the comparative advantage of host economies are reported in Table 3.4 (column 2). The TSLS estimate confirms the significance and sign of the main regressor's effect on routine jobs. The first stage (column 4) confirms the relevance criterion with a strong and positive association between the productivity proxy and OFDI, however the F-statistic of the first stage is below the standard minimum threshold of 10 and indicates that the IV may suffer from weak bias (Stock and Yogo, 2003). In the same regression we include as an alternative IV the difference between the business regulation index of Greece and that of the host countries based on the reasoning that the smaller the difference of the index between the two countries, the higher the productivity improvement in the host country increasing the possibility of investing abroad. In other words, an increase of the difference between the quality of the regulatory environment between the countries will discourage Greek OFDI abroad, therefore we expect a negative relationship for the first stage. On the other hand, A decrease in the difference that indicates an improvement of the Balkan countries' institutional environment will encourage investments abroad.

The aforementioned negative association is confirmed as shown in the first stage (Table 3.4, column 4). However, the Hansen (j) statistic rejects the null of exogeneity of both instruments implying that one or other of the instruments is problematic. In such cases economic reasoning is used to justify which of the two is valid. To this end, the business regulation index (first IV strategy) is justifiably more relevant as it influences the decision to invest and is clearly a more important determinant especially compared to the payroll tax which in the case of the Balkan countries is not very high.

Overall, the IV estimates produce some interesting results, first they showcase the importance of the regulatory quality in host economies as a determinant of Greek investments abroad, they confirm the robustness of our OLS estimates in the case of routine occupations and reveal that there is a strong positive association of OFDI and non-routine occupations when the OLS potential bias is corrected via the IV strategy proposed.

Table 3. 4 IV estimates - Routine jobs

	(1)	(2)	(3)	(4)
Dep. Var.: Routine jobs share	**IV - RQ**	**IV – Prod.**	**OFDI (RQ)**	**OFDI (Prod.)**
OFDI	-0.469***	-0.155*		
	(-0.133)	(-0.080)		
RQ (Business reg.)			5.851***	
			(1.777)	
Payroll tax			-1.603***	
			(0.435)	
Productivity (comp.adv.)				0.020**
				(0.009)
RQ (Business reg. diff)				-1.753**
				(0.730)
Controls	YES	YES	YES	YES
FE	YES	YES	YES	YES
F test of excluded instruments			7	5.34
Hansen J statistic (χ2)	2.066	5.793		
P-value:	(0.150)	(0.016)		

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Routine jobs (Routine jobs as a share of the workforce). Standard errors are clustered at the region level.

Table 3. 5 IV estimates - Non Routine jobs

	(1)	(2)	(3)	(4)
Dep. Var.: Non - Routine jobs share	IV (RQ)	IV (Prod.)	OFDI (RQ)	OFDI (Prod.)
OFDI	0.162***	0.184**		
	(0.049)	(0.086)		
RQ (Business reg.)			6.563***	
			(1.916)	
Payroll tax			-1.814***	
			(0.451)	
Productivity (comp.adv.)				0.001*
				(0.000)
RQ (Business reg. diff)				-2.091**
				(0.813)
Controls	YES	YES	YES	YES
FE	YES	YES	YES	YES
F-test of excluded instruments			8.13	4.86
Hansen J statistic (χ2)	2.066	5.793		
P-value:	(0.150)	(0.016)		

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Non-routine jobs (Routine jobs as a share of the workforce). Standard errors are clustered at the region level.

3.4.4 Overall robustness and sensitivity analysis

As a further robustness check we also run the baseline specification using first differences to assess the robustness of the OFDI variable to alternative estimation strategies. The sign and significance of the main regressor is negative, significant and similar in magnitude as in the fixed effects estimation (Table 3.6 column 1-4). The latter is reassuring that the association of outward FDI and regional skill composition is not driven either by the estimation strategy employed or the specification chosen as it is robust to alternative specifications and remains stable across alternative strategies and across extensions of the baseline model as presented in section *3*. In Table 3.6.2 the results compare the IV estimates with the FE and FD for non-routine jobs, as mentioned the IV may be correcting a bias of the OLS estimate.

Table 3. 6 Summary of alternative specifications

Dep. variable:	**(1)**	**(2)**	**(3)**	**(4)**
Routine jobs (share)	**FE**	**FD**	**IV (RQ)**	**Sensitivity analysis**
OFDI	-0.040**	-0.038**	-0.469***	-0.107***
	(0.002)	(0.017)	(-0.133)	(0.031)
Controls	YES	YES	YES	YES
Obs	144	144	144	144
R sq	0.741	0.477		0.775

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Routine jobs (Routine jobs as a share of the workforce). In column (4) Dep. Var: absolute number of Routine jobs. Standard errors are clustered at the region level.

Table 3. 7 Summary of alternative specifications

Dep Variable.	**(5)**	**(6)**	**(7)**
Non-Routine jobs (share)	**FE**	**FD**	**IV**
OFDI	0.010	0.007	0.162***
	(0.012)	(0.011)	(0.049)
Controls	YES	YES	YES
Obs	144	144	144
R sq	0.893	0.659	

Notes: A constant is included but not reported; Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Dependent variable is the employment rate of Non-Routine jobs (Non-Routine jobs as a share of the workforce). Standard errors are clustered at the region level.

3.5 Conclusion

This study empirically assessed the link between increases in outward foreign direct investment and the demand for routine and non-routine occupations in Greek regions. It was motivated by the large exodus of Greek firms and by the need to move beyond looking at aggregate trends to actually uncover the spatial footprint at the regional level.

The results point to a negative association between increases in OFDI and the demand for routine jobs in Greece and, especially, in those Greek regions in the North of the country and with a higher manufacturing base that have been the greatest relative source of OFDI. As a consequence, regions more exposed to firm relocation abroad based on their production structure are experiencing larger effects concerning the skill composition of the local workforce and actual losses in specific types of employment. The results are robust to the inclusion of a rich set of controls and hold after taking into account skill-biased technological change and low skill import competition from abroad. The estimates are re-confirmed when employing alternative methodologies (such as first differences and IV strategies). The effects on the demand for non-routine occupations – derived from the IV estimation strategy – reveal a thought-provoking positive transmission channel generated by the internationalization of Greek firms, which is in line with the findings of similar studies (Elia et al., 2009, Gagliardi et al., 2015).

Hence, cost-saving strategies by Greek firms seem to be producing an adjustment which entails, on the one hand, a decline in routine activities and, on the other, an expansion of non-routine higher skill functions within the MNE HQs in the home regions. The negative effect on routine occupations leads to regional unemployment, disinvestment and forgone income, which are detrimental for long-term regional growth and can lead to an exacerbation of existing regional divergence patterns in Greece. By contrast, the positive effects on the non-routine occupations point to a more optimistic outcome related to enhanced opportunities and incentives for skill upgrading at the regional level. Overall, the two opposite effects on the type of employment call for increased policy attention regarding the spatial job and skill polarization effects for regions more exposed to investments abroad. The overall decline in manufacturing, the deindustrialization waves in the Greek territory and the relocation of production abroad should be the centrepiece of the policy agenda.

The costs of the 'employment loss' from the internationalization of firms have been discussed in the literature highlighting the need for a restructuring of the Greek industry to diversify into more competitive sectors. The tax incentive – which represents the most important motive of Greek businesses (as opposed to labour cost which was prevalent in the past) – should be reassessed by policy-makers, as it represents a central 'push' factor, which does not lead to enhancement of the production process or pure efficiency gains (which should be the aim) and favours the relocation of economic activity in search of stable and favourable tax regimes. Investments abroad that mainly deprive the country of production and employment and create geographically concentrated job losses in medium to low wage occupations need to be reassessed. Similarly, investments that align more with the real notion of internationalization and the subsequent production enhancement effect which will contribute to the growth prospects in the home regional economies should be a priority that has been so far overlooked by the Greek state.

Regarding the limitations of the current study, the availability of consistent geographically detailed regional data on outward investment would strengthen the precision of the OFDI measurement while a detailed overview of the actual number of job losses from closing firms would add more precision to the analysis. Admittedly, a more accurate assessment of the effects would require the use of firm-level data in order to assess the direct effect of offshoring on the productivity and size of the firms investing abroad. The latter would also be enhanced by looking at the indirect effects on the changes in the size, entry/exit and employment outcomes of other local firms surrounding the investing firm.

Future research should also focus on the exact link between the evolution of the *determinants* of Greek MNEs relocation and the regional distribution of skills. This would be useful for a new regional policy designed to address the decline of regional employment in the most affected areas and also enhance the internationalization experience of Greek firms in promoting their growth and long term performance in higher value added sectors.

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Appendix:

Table 3.A 1 Descriptive statistics

Variable	Mean	Std. dev.	Min	Max
Routine Share	.58	.05	.41	.70
Non-routine Share	.23	.050	.13	.36
Manufacturing	.08	.02	.03	.15
Human Capital	19.4	5.09	10.4	37
Tech. change	9.59	.83	6.78	11.71
OFDI (re-scaled)	.33	.32	-.28	1.11
Tourism	3.958.861	5633083	42989	2.22e+07
Import competition	.674214	.3000075	.036946	.9997229
Firm size	.4953072	.374814	.0071402	1.687
Wages routine jobs (national)	20818.37	2.398.635	17079.47	25054
Wages non-routine jobs (national)	32684.08	3.524.253	26830	40447
RQ (Business reg.)	.103204	.1170851	.0124417	.4880497
Payroll tax	.0516734	.0681054	.0037414	.3402269
Produc (comp.adv.)	6.78e+08	1.40e+09	2355162	9.31e+09
RQ (altern. measure)	-.001281	.0118962	-.0789921	.0248493

Table 3.A 2 List of Variables (definitions and source)

Variables	Measurement	Source
Routine Share	Ratio of number of routine jobs over workforce at the NUTS II level	EU Labour Force Survey (Eurostat)
Non Routine Share	Ratio of number of non-routine jobs over workforce at the NUTS II level	EU Labour Force Survey (Eurostat)
Human Capital	Percentage of tertiary education graduates (ISCED11 – levels 5-8) at the NUTS II level	Eurostat
Manufacturing	Share of manufacturing employees at the NUTS II level	Eurostat
Wages: routine and non-routine wages	Mean annual earnings by category of occupation (ISCO-08)	EUROSTAT
Technological change	Value of gross capital formation in ICT at NUTS II level as a percentage of GDP	National statistical office (ELSTAT).
OFDI	Interaction between the time–variant national sectoral OFDI flows and the time-invariant regional sectoral employment share in the initial year of the study period	Eurostat (regional sectoral employment) Bank of Greece (OFDI flows)
Tourism	Number of nights spent at tourist accommodation establishments by NUTS 2 regions and year (nights/inh.)	Eurostat
Import competition	Import flows (the ratio of imports over total trade) from lower-cost economies at NUTS II level.	National statistical office (ELSTAT).
Firm size	Ratio of labour (employees) over number of firms (proxy for internal economies of scale)	ELSTAT

Table 3.A 3 Pair wise correlations

	Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
(1)	Routine Share	1								
(2)	Non-routine Share	-0.003	1							
(3)	OFDI (re-scaled)	-0.186	0.033	1						
(4)	Manufacturing	0.032	0.104	-0.191	1					
(5)	Wages routine jobs	0.221	0.418	0.104	0.038	1				
(6)	Wages non-routine jobs	-0.337	0.559	0.145	0.315	-0.003	1			
(7)	Human Capital	-0.649	0.214	0.267	0.217	-0.039	0.677	1		
(8)	Tech. change	-0.351	0.425	0.008	0.040	0.057	0.766	0.564	1	
(9)	Tourism	0.014	0.018	0.196	-0.483	-0.011	-0.006	-0.079	0.030	1