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## An Investigation into the Causal Links Among FDI Determinants: Empirical Evidence from Greece\*

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### ABSTRACT

The attraction of inward FDI in Greece is a critical condition for Greece's economic recovery due to the prolonged economic crisis and sustained investment hardship. Consequently, this study aims to provide essential implications by examining factors that can influence foreign direct investment decisions. The findings provide new insights regarding the diachronically high importance of technological capabilities compared to other FDI determinants such as the market size, trade openness, quality of the indigenous workforce, and local infrastructure, as the main determinants of inward FDI in Greece over the period 1980–2016.

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## Introduction

Since the early 1990s, the considerable growth in FDI flows across economies have forced many governments to formulate strategic friendly policies to promote their economies as a destination of high degree and quality of FDI (see Bitzenis and Vlachos 2016). In particular, Greece has not been historically an important destination for MNEs. Paradoxically, even the entrance of Greece in the European Union (EU) in 1981 and the European Monetary Union (EMU) in 2001 did not yield substantial and measurable results to improving the attractiveness of the Greek economy to foreign investors as compared to other peripheral economies such as Portugal and Spain. The low penetration of foreign capitals into the Greek economy is

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**Επιχειρησιακό Πρόγραμμα**  
**Ανάπτυξη Ανθρώπινου Δυναμικού,**  
**Εκπαίδευση και Διά Βίου Μάθηση**  
Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης



mainly attributed to key discouraging factors such as the macroeconomic instability, the high degree of bureaucracy and corruption, the excessive tax rates, the complexities in the legislative system, as well as the diachronically preferential treatment of domestic investors by the Greek political system. These factors prevented long-term foreign direct investments (Bitzenis, Tsitouras, and Vlachos 2009a, 2009b; Tsitouras 2016).

Along the same lines, it is worth pointing out that Greek economy over the period 1990–2007 averaged 4% GDP growth, which permitted the economy to converge about 95% of the Eurozone average “private standard of living” at the end of 2008 (Pelagidis 2010). Several empirical studies associate this vigorous growth to the following factors: (1) the internal demand boom; (2) the relatively high real wage growth; (3) the low interest rates since joining the euro in 2001; (4) the fast credit expansion stemming from the entry to the European Monetary Union (EMU); (5) the massive inflow of EU funds to the Greek economy, in terms of EU structural funds and the Common Agricultural Policy; and (6) the development of the shipping and tourism industries, which assisted upsurge internal demand and lessen the huge trade deficit (Conway and Nicoletti 2006; OECD 2007; Mitsopoulos and Pelagidis 2009; Angeletos et al. 2017).

From the period of economic growth (1990–2007) to the period of economic recession, the Greek economy has been suffering from severe structural weaknesses such as: (1) dwindling competitiveness due to high margins across most industries, considerable administrative costs and increasing Labor costs; (2) excessive trade deficits; (3) increasing debt to GDP; and (4) anemic inflow of FDIs (Pelagidis 2010; Garcia Pascual and Ghezzi 2011; Christopoulou and Monastiriotis 2018).

In this context, considerable progress has been made on the discussions on analyzing the origins of the Greek crisis by focusing extensively on the institutional insufficiencies of the overall Greek socioeconomic and political system. In particular, the deeper causes of the crisis in Greece are reflected in the following factors: (1) the presence of an anemic political system that resulted to a continuous mismanagement of the national economy by promoting the fiscal profligacy and public indebtedness (see Rapanos and Kaplanoglou 2014); (2) a political system established on patron-client relations as the result of Greece’s specific system of populist democracy which promoted the lack of meritocracy and shielded bureaucracy (see Vlassos and Chatzinikolaou 2019); (3) the impact of the Greek shadow economy, its interface with the official economy and its connection with high degree of corruption that exists in the case of Greece (Bitzenis and Vlachos 2015); (4) the fact that Greece has been classified continuously at the bottom in Europe on almost all indicators that measure the investment and business climate (Theocharis and van Deth 2013); and (5) the negative influence

towards any structural reform of inward-looking domestic policy coalitions with exclusive privileges such as business associations, trade unions, and other minor but severely engrained rent-seeking interest coalitions that have been vital features of mainstream economic system in Greece (Kutlay 2019).

It is widely accepted that in the run-up to the global financial crisis, all the above-mentioned Greek pathogenies suddenly emerged to the surface (Pelagidis 2010). In fact, the economic crisis in Greece began with the revision in budget figures and the disclosure of huge public debt subsequent to the September 2009 elections and has extended since the bail-out and painful austerity programs by the Europeans and IMF since 2010 (Pappas 2013). For the period 2008–2016, Greece's GDP contracted almost 29% whose magnitude is analogous, if not worse, to the Great Depression (World Bank 2017). To make matters worse, the outcomes of the recession have been noticeable in terms of living standards. Meanwhile, unemployment – mainly among youth – reached unprecedented levels that triggered an immense wave of brain drain (Dimitrios 2012; Kutlay 2019).

In retrospect, over the period (1980–2016), Greece constitutes an indicative case study that illustrates the consequences of an unorthodox distinctive economic model, based mostly on EU funds, shipping, tourism, and public borrowing that induced higher growth rates but left the real economy and the institutional environment with outdated and rigid structures. Most important, Greece during the crisis suffered from profound social, political, and economic distress as a result of punitive austerity measures forced by the “Troika” (International Monetary Fund, European Commission, and European Central Bank), so as Greece could avoid bankruptcy, but all of those eventually resulted in undermining any considerable structural reform prospect (Pelagidis 2010; Kutlay 2019).

Thus, it is vital to scrutinize the occurrences of these years in order to comprehend the crisis's roots and to assess the policies that might facilitate Greece to overcome the crisis, as well. In reality, after a prolonged period of economic recession, it is generally accepted that investment hardship in Greece cannot be met by public spending and endogenous resources, stemming from the significant reduction of domestic savings by households and companies and the problem of red loans in Greek banks. Thus, Greece has an urgent need to attract many direct foreign investments in order to provoke the resumption from the deep recession that has taken place.

It is broadly accepted among researchers, policymakers, and development practitioners that FDI is a significant source for stimulating economic growth in the host country. According to neoclassical scholars, FDI similarly contributes to economic expansion as domestic investment. (Brems

1970). In contrast to the neoclassical economic theory, the new endogenous economic growth theory is mostly focused on technologic progress. It is proposed that FDI can promote economic growth in the long run by expanding the existing stock of technology and via knowledge of spillover effects. In these models, technologic progress is regarded as an endogenous variable and is fueled either by the activities of business or private entities (see Romer 1990; Grossman and Helpman 1991; Ethier and Markusen 1996; Aghion and Howitt 1998; and Chowdhury and Mavrotas 2006).

In particular, Greece urgently needs the establishment of larger companies, so as a foreign direct investment can efficiently cover the investment gap in the economy (see e.g. Omisakin, Adeniyi, and Omojolaibi 2009; Islami, Mulolli, and Skenderi (2016). MNEs international character can contribute to the effective interconnection of the Greek economy with the necessary international networks and global value chains (see e.g. Gereffi, Humphrey, and Sturgeon 2005; Amendolagine et al. 2017). In addition, MNEs can introduce valuable expertise and innovative practices (see e.g. Kedia, Gaffney, and Clampit 2012; Seid 2018), enhance the productivity (see e.g. Alfaro, Kalemli-Ozcan, and Sayek 2009; Demir and Duan 2018) and the employment opportunities (see e.g. Tsaurai 2018; Moran et al. 2018) of the Greek economy contribute to the overall economic upgrading, and thus increase the incomes of indigenous citizens (see e.g. Tsitouras 2016; Teixeira and Loureiro 2019).

While in the recent past theoretical and empirical contributions (see Vernon 1992; Dunning 2009) emphasized mainly firm and industry factors that may affect MNE's decision for expansion into foreign economies, recently the topic of discussion has been redirected to location aspects, in the sense that each country competes with each other to attract a significant share of foreign investment. To this purpose, there is a tendency from host national entities and policymakers that the macroeconomic environment and regulatory reform of the local business context be constant on their policy agenda so as to grasp the benefits of FDI in delivering long-run economic growth for their citizens (Tsitouras et al. 2017).

Furthermore, it is advocated that globalization and new technologies have triggered the geographical fragmentation of production. Thus, traditional determinants of FDI are assessed as inadequate to provoke FDI inflows (see Kokko 2002; Brackman et al. 2011). Except for some recent studies of Villaverde and Maza (2015) and Aregbeshola (2018), the existing empirical literature on determinants of FDI into both developing and developed economies has not provided sufficient emphasis on country-specific factors that compose origins of dynamic comparative advantages. Within this context, technological capabilities can act as an FDI stimulator factor as the development of new cutting-edge technologies contributes to

productivity gains, production efficiency, and overall to higher returns on investment (see Vogiatzoglou and Tsekeris 2016; Kaditi 2013). Finally, evaluating the relative ambiguity that surrounds the determinants of FDI from theoretical standpoints and the mixed findings that is retrieved from numerous empirical studies, there is a strong motivation for us to provide a fresh insight into the determinants of FDI.

In retrospect, it is apparent that Greece is a motivating case study owing to the prolonged economic crisis and sustained investment hardship. Thus, this study aims to provide critical implications guidance policies for governmental entities and policymakers in their mission for sustainable economic growth by managing effectively factors that can influence investment decisions.

In fact, this study contributes to the relative literature in the following aspects: First, it provides a profound understanding of the determinants of inward FDI by means of offering fresh insights relating to macroeconomic policy influences on the location decisions of FDIs (see e.g. Mugableh 2015; Boateng et al. 2015). Second, this study incorporates insights from the new economic geography and agglomeration effects (clustering of production) (see Ertur and Koch 2011; Venables 2009). In fact, while the existing empirical literature on determinants of FDI has not dedicated sufficient emphasis to country-specific factors that compose origins of dynamic comparative advantages (see Diyamett and Mutambla 2014; Villaverde and Maza 2015), this study contributes to the current discussion by examining the Greek domestic's technological capabilities as a factor for inward FDI. Third, the existent empirical studies except for some recent studies of Vogiatzoglou and Tsekeris (2016) and Pegkas and Tsamadias (2016) that investigated the determinants of Greek inward FDI, have not included sufficient data for the period of the Greek economic crisis. Thus, this research aims to contribute to the existing empirical literature by covering this research gap. Considering the latest macroeconomic trends in the case of Greece, this study contributes to the literature by evaluating whether the effect of the persistent economic crisis has emerged as a turning point in the magnitudes of inward FDI determinants. Fourth, this study of the Greek economy, adopts modern advances in time series modeling research on the Fully Modified Ordinary Least Squares (FMOLS) (see e.g. Sirag, SidAhmed, and Ali 2018; Ahmad et al. 2019), and Vector Error Correction Mechanism, multivariate framework (VECM) (see e.g. Golitsis, Avdiu, and Szamosi 2018; Vo 2018). Finally and most importantly, considering that a causal link between inward FDI and its determinants may not be direct and/or can be supported solely in the medium term, we postulate a more comprehensive approach (see e.g. Boateng et al. 2015; Azam et al. 2016) to

supplement the relative discussion by considering possible two or more-way causal links, both in the short and long term.

The rest of this study is organized as follows. The following section gives a background to the study through a brief discussion of the theoretical literature on FDI determinants, a review of the empirical research on FDI determinants in the case of Greece and a presentation of critical inward FDI trends in Greece. The subsequent section presents the statistical methods of analysis, the investigated variables, and the data sources. The article proceeds with the presentation and discussion of the empirical findings. Finally, the study concludes by providing significant policy recommendations.

## **Background**

This section is divided into a discussion about theoretical considerations of the variables investigated in this study (namely market size, human capital, openness, infrastructure, and technology), its empirical literature, and trends on Greece's inward FDI.

### ***FDI determinants: a review of the literature***

According to Dunning (1993), there are four taxonomies of FDI determinants: market seeking, resource seeking, efficiency seeking, and strategically motivated, seeking motives. While the first three are regarded as “asset-exploiting strategies”, the last is considered as an “asset-augmenting strategy”. In particular, market-seeking FDI is fueled by factors like the host country's market size, per capita income and market growth with the goal to serve the local market directly rather than to export. The resource seeking FDI can be stimulated by the availability of local natural resources, raw materials, a skilled and well-trained labor force, creative assets such as technological capabilities and good quality of infrastructure. Efficiency-seeking FDI is driven by the goal of companies to establish the most cost-effective and competitive global production networks by lower production costs caused by the minimization of transportation costs, lower raw material costs, and labor. Factors such as government policy, regulations, and funding are equally crucial for this kind of investors. Finally, the strategic asset-seeking FDI is linked to firms with significant ownership advantages that pursue the acquisition of established assets (technology products, brands, distribution networks, R and D expertise, and facilities), to promote their long-term strategic objectives.

Furthermore, Dunning (2001) suggested an integrated solution that encompasses all aspects and determinants of FDI. Dunning's eclectic paradigm pinpoints three preconditions for direct investments to evolve:

- a. Ownership advantages that are held exclusively by the company and are related to core competencies such as brand name, marketing and management skills, technology patents and financial assets.
- b. Location advantages refer to the broad spectrum of economic, social, cultural and political factors, which are present in a particular geographical area.
- c. Internationalization advantages assume that ownership-specific benefits exist. It is prudent for the company to exploit these advantages internally in the value-added chain in the host market, instead of selling or licensing them to other indigenous firms.

Recently, there has been an evolving empirical literature suggesting that technological edges are crucial in interpreting economic development across economic territories as technological improvements in one country might be diffused to other countries as well (see e.g. Akcigit, Celik, and Greenwood 2016; Acemoglu, Robinson, and Verdier 2017; and Aghion et al. 2018). More importantly, it was the path-breaking studies of Paul M. Romer (1990;1993) that provided the understanding of how market R&D efforts have been critical for the technological improvement of the developed economies into the contemporary growth epoch. As Romer suggests, in the context of endogenous theory, new ideas have two prominent distinctive features related to the rest of economic goods: (1) are non-rival in the sense that a new approach can also be applied simultaneously by many individuals, (2) are possible excludable by means of regulation/patent law or through technical protection. In this sense, these two preconditions are vital for the development of new ideas in the market (Committee, Nobel Prize 2018).

International trade transactions connect economies, through engendering a shared production among economies with significant trade volumes. Nevertheless, it is claimed that solely in economies engaging in R&D activities will there be a convergence in economic growth rates. In contrast, in economies with no motivations to invent, growth prospects would look rather miserable (Ertur and Koch 2011). In contrast to classic trade and growth theory that promotes that deprived economies will steadily move toward a high-income level (see, for example, Lucas 2000), several coherent arguments have lately proposed that modern sector export growth can result in immediate economic development but this will be irregular in three perceptions: (i) geographic extent, as it will be uneven, concentrating



on a restricted number of economies solely and a tendency to grow serially rather than in parallel; (ii) product range, as economies incline to be focused in a limited range of tasks, in opposition to the production of compiled products; and (iii) temporal viewpoint, as preliminary drawbacks in terms of competences may prevent some economies from fully participating in production links, thus falling behind for an extended period of time (Venables 2009).

In addition to the theories presented previously in this study, significant strides have been made on the empirical examination of the statistical significance of various FDI determinants. In reality, we can classify the multiple determinants into two broad categories, the first one consists of domestic policies or other country-specific factors that can have a positive impact on FDI location decision and the second consists of country-specific characteristics and government policy strategies that may act in reality as barriers to foreign investment to penetrate an economy. This study focuses merely on the first taxonomy, which comprises factors that can act as FDI stimulators in a sluggish economy like Greece. Above all else, this research aims to examine only macroeconomic fundamentals as well as country-specific factors that demonstrate the dynamic comparative advantages and subsequently can influence investment decisions as FDI motives in Greece.

### *Market size and growth prospects*

One of the main motives that stimulate FDI is the size of the host market and the potential demand that stems from promising growth rates. A large market as indicated by an economy's total GDP and GDP per capita is essential for competent utilization of resources and exploitation of economies of scale and can deliver relatively better prospects to an MNE's desire towards making profits. More importantly, an economy's growth rates are an indicator that ties with a potential augmented demand that can result in FDI's further expansion in a host market. For example, Resmini (2000), examining manufacturing FDI, points out that countries in Central and Eastern Europe with larger populations are inclined to stimulate more FDI, whereas Bevan and Estrin (2000) see similar findings in transition economies with a broader domestic market. In other words, they also tend to attract more FDI.

The vast majority of empirical researchers who focused on the set of South and Eastern European countries highlight the positive impact of market size and growth prospects on FDI inflows. We can briefly refer to the findings of Economou and Hassapis (2015) and Economou (2019) in four South European economies, Gutiérrez-Portilla et al. (2016) in Spain, Júlio, Pinheiro-Alves, and Tavares (2013) in Portugal, Bitzenis, and Žugić (2014) in the Serbian manufacturing industry, Estrin and Uvalic (2013) in

nine South East European economies, Islami and Mulolli (2016) in Western Balkan countries, Simionescu (2017) in Romania and Bulgaria with a sample period that covers solely the recent economic crisis (2008–2015) and more recently to Andrašić, Mirović, and Kalaš (2019) in six South East European Economies.

### *The quality of human capital*

It is also widely accepted that investment attractiveness is strongly linked to human capital both in terms of quality and availability. According to Billington (1999), MNEs tend to evaluate the attributes of the local workforce they intend to hire in the host economy, namely, the labor costs, the availability and competence of local labor and the strength of unions. In fact, labor workforce must be qualified and trained at a certain minimum level to be able to make use of new technology and knowledge spillover. In contrast, Cheng and Kwan (2000) point out that most of the education variables (proxied as a percentage of the population with primary and high education) have a negligible effect on FDI. More importantly, Carstensen, Gundlach, and Hartmann (2009) support that the inadequate statistical significance of the human capital is linked to the fact that education generates externalities and spillover effects in production, which are challenging to identify applying a merely standard set of regressors.

The existing applied research on determinants of FDI into South East European economy countries has not provided substantial evidence for the positive effect of the quality of labor on FDI inflows, stemming from the fact that the main bulk of FDI in the region has concentrated in production activities that do not require highly trained individuals (see Dornean and Oanea 2015). However, unlike previous studies, in a recent study, Kersan-Škabić and Tijanić (2014) provide evidence for the positive effect of quality of labor on FDI inflows in the set of Croatian regions. Thus, it can be inferred that in the wealthiest economy of South East Europe, Croatia, the main bulk of FDIs has concentrated in sectors that needed highly qualified employees (see Tsitouras and Nikas 2016). In addition, other studies focused on the set of South European countries provide robust evidence for the positive impact of human capital on FDI (Villaverde and Maza 2015; Gutiérrez-Portilla et al. 2016).

### *Trade openness*

The relationship between trade openness and FDI is less definitive as it differs in accordance with the motivation for performing FDI activities (Markusen and Maskus 2002). In fact, trade openness provokes export-

oriented FDI, while more restrictive trade regimes stimulate more “tariff-jumping” FDI (Kosteletou and Liargovas 2000). In other words, an increase in trade barriers triggers more horizontal FDI as investors seek to overcome trade barriers via greenfield investments and deter vertical FDI that consists of physical transfers of intermediate products from one MNEs’ plant to another. However, Resmini (2000), examining manufacturing FDI data, in Central and Eastern Europe, confirms that vertical FDI flows eventually benefit from more trade openness, as might be anticipated in an industry for which international trade transactions in intermediate and capital goods are vital for the final product. Above all, trade liberalization under regional and multilateral agreements promotes investment climate as it boosts the confidence for both indigenous and foreigners’ investors in the host economy.

Considerable evidence exists showing that greater trade openness stimulates more FDI inflows in the set of South East European countries. Briefly, we can stress the findings of Economou and Hassapis (2015) in four South European economies, Júlio, Pinheiro–Alves, and Tavares (2013) in Portugal, Hengel (2011) in Western Balkan countries, Kersan-Škabić (2013) in eight South East European economies, Dauti (2015) in five South East European economies, Islami and Mulolli (2016) in Western Balkan countries, and more recently Disoska et al. (2018) in nine South East European countries.

### *Quality of the local infrastructure*

Substantial evidence exists showing that the quality of infrastructure can play a paramount role in stimulating FDI. Wheeler and Mody (1992) in a seminal study, argue that the availability of infrastructure through transportation links, electricity production plants, as well as supply facilities for telecommunication, gas, and water, are essential factors for successful FDI projects irrespective of the type of FDI. In particular, the authors advocate that the quality of infrastructure is the crucial factor for influencing investment decisions in developing economies, whereas specialized provision services are more significant for advanced economies. On the other hand, Lankes and Venables (1996) bear out local infrastructure to be of only negligible significance in the FDI location decision in the case of post-communist economies. This, of course, coincides with the fact that these economies in the early phase of transition to market economies endured severe obsolete capital stock, inadequate infrastructure, with an immediate necessity of upgrading their production capacities (Benacek et al. 2000).

However, in a more recent study in the set of European transition economies, Bellak and Leibrecht (2009) confirm that information and communication infrastructure is more significant than transport links and

electricity production plants. In addition, studies such as Kersan-Škabić (2013) and Kersan-Škabić and Tijanić (2014), support the decisive role of infrastructure developments on FDI in the set of South East European countries. More recently, Villaverde and Maza (2015) in a study in the 260 EU NUTS2 regions confirm a significant impact of infrastructure on FDI location patterns.

### *Technological capabilities*

The empirical literature has only recently begun to study the importance of technological capabilities as a fundamental factor for attracting FDI as it has been disjointedly selected or overlooked in the academic literature for many years. In reality, Romer's path-breaking studies (1990,1993) endogenized technological improvements and gave an impetus in further research focusing on how market economies might advance new technologies via profit-focused research-and-development (R&D) endeavors (see e.g. Acemoglu et al. 2012; Acemoglu, Robinson, and Verdier 2017; and Aghion, Dewatripont, and Stein 2008). In fact, microeconomic statistics related to patents and patent occupants have become accessible and there is nowadays vigorous research analyzing different versions of endogenous-growth theory (Committee, Nobel Prize 2018).

Furthermore, Palit and Nawani (2007) argue that as the entire production system evolves into more composite and technology-intensive, the importance of traditional locational advantages such as cheap labor costs has gradually faded. Similarly, it is confirmed for the case of Southeast Asia and India that domestic innovative technological capacities and the ability of a country to integrate, apply, adapt, and develop existing technologies appears to play a paramount role in influencing foreign direct investment decisions. In addition, Iqbal, Hadi, and Zafar (2016) point out that only countries with substantial local technological capacities appear to have a robust advantage in stimulating inward FDI to the Indian sub-continent. More recently, Aregbeshola (2018), in a study, reveals the importance of technological capacity as an FDI determinant in emerging markets. The results show strong evidence that technological advancements in Brazil and China are robust FDI stimulators while in the case of African economies, the technology backwardness hinders the flows of FDI in most of them.

Therefore, it appears that the FDI inflows focusing on host countries R&D-based innovative capacities is efficiency and strategic asset seeking FDI rather than market seeking or resource seeking. This suggests that firms with significant ownership advantages attempt the gaining of locally established assets (technology products, brands, R&D expertise, and facilities), in order to boost their long-term strategic objectives (Diyamett and Mutambla 2014).

Contrary to this view, it has been argued that FDI stemming from firms of emerging economies cannot be broadly explained by causes that stimulate FDI of firms established in developed economies (Holtbrügge and Kreppel 2012). Consequently, and in relation to the Dunning's OLI (Ownership, Location, Internalization) framework (Dunning 2001), it can be inferred that firms from developed countries often invest abroad to take advantage of labor and production costs, while firms from emerging economy may identify for their first internationalization steps different location factors such as the access to superior technology and management expertise as more significant. Thus, the internationalization of emerging country firms is mainly driven by asset acquisition and augmentation in terms of patents and technology products rather than by asset-exploitation (Dunning 2006). Concerning this issue, Schueler-Zhou, Schuller, and Brod 2012 point out that Chinese outward FDI has targeted mainly high-tech investments in Western EU member states as compared to targeted investments in the industries of textiles, manufacturing electronics, and tourism industry in Eastern EU economies.

### ***FDI determinants in Greece: a review of the empirical literature***

The current empirical research on FDI determinants in the case of Greece is rather inadequate but also shows the same mixed findings confirmed in the international empirical research. From a review of the relevant empirical literature in the case of Greece, a few essential facts can be highlighted.

First, we can classify the related literature into two main categories, that of surveys (e.g. Bitzenis, Tsitouras, and Vlachos 2009a, 2009b; Vlachos et al. 2019) and econometric studies. The latter category includes both: (a) Time Series Analysis Studies (e.g. Pantelidis and Nikolopoulos 2008; Pantelidis and Paneta 2016; Miskinis and Juozenaite 2015) and (b) Panel Regressions Studies (e.g. Leitão 2010; Petrakou 2013; Kaditi 2013; and Vogiatzoglou and Tsekeris 2016).

Concerning the type of data applied, we can stress that: (a) most of these econometric studies examine country-level data and macroeconomic factors (e.g. Leitão 2010; Pantelidis and Nikolopoulos 2008; Pantelidis and Paneta 2016; and Petrakou 2013) while (b) a number of studies apply either industry-level or/and firm-level data (e.g. Georgopoulos and Gert Preusse 2006; Anastassopoulos, Georgiou, and Maroudas (2008); Kaditi 2013; and Vogiatzoglou and Tsekeris 2016).

However, there are some issues in these previous empirical studies on FDI determinants in the case of Greece:

- a. Regarding the econometric methodology approach, it is essential to note that the majority of the econometric studies applied the OLS cross-section analysis but their regression results may be spurious due to the presence of non-stationarity contained in time series macro data as the cointegration relationships should have been detected (see among others, Pantelidis and Nikolopoulos 2008; Pantelidis and Paneta 2016; Anastassopoulos, Georgiou, and Maroudas 2008; Georgopoulos and Gert Preusse 2006).
- b. There is no indication that the relevant FDI data were deflated in many of these empirical papers (see among others, Pantelidis and Nikolopoulos 2008; Leitão 2010; Economou and Hassapis 2015; Pantelidis and Paneta 2016).
- c. In fact, the studies that applied industry or/and firm-level data focused merely on the manufacturing sector as a result of the relative availability of this data. However, the manufactured FDI represents a small amount of the Greek total inward FDI stock. More importantly, these empirical studies are regularly incapable of reckoning entirely for all of the economic transactions (in buildings, land, machinery, and technology equipment) of foreign affiliates in a host economy. Hence studies applying disaggregated data may result in significant empirical biases by underestimating the standard errors except for the case that robust standard errors are calculated (Hale and Long 2011).
- d. Finally, many econometric studies that applied the panel data analysis in their samples use Greece alongside with other economies with different level of economic development (see, for example, Kaditi 2013; Anastassopoulos, Georgiou, and Maroudas 2008; Economou and Hassapis 2015). Virtually, the supplementary knowledge stemming from these empirical papers is useful. Nonetheless, these papers failed to deliver comprehensive policy recommendations for the reason that factors that act as positive enhancers of the attractiveness for FDI in an economy can substantially differ according to the perceptible level of economic development.

In general, the most important determinants of FDI in Greece, as well as the sign of the coefficient, as revealed by the earlier literature, are summarized in the following [Table 1](#).

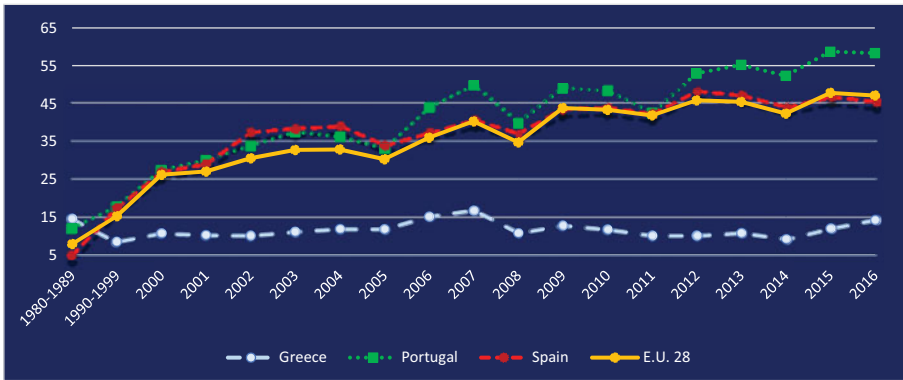
### ***Key trends of foreign direct investment in Greece***

Regarding the FDI inward stock, Greek registered stock for the period 1980–2016 (see [Figure 1](#)), which on an average, is equivalent to almost 12%

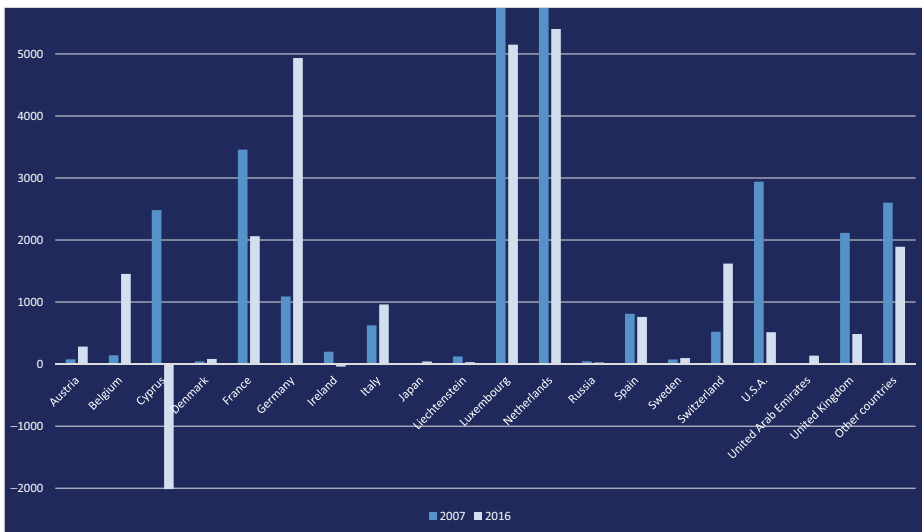
**Table 1.** The summary of selected studies for the determinants of FDI in Greece.

Period of study	Selected empirical studies																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Type of data	1980-2000	1995-2003	2000-2004	1976-2004	1970-2005	1998-2007	1981-2009	1998-2006	2004-2008	1974-2012	1995-2013	2001-2012	1970-2012	1975-2013	1982-2013	2018	2018
Empirical methodology	Firm level data	Questionnaire survey	Firm and country level	Country level	Panel data fixed and random effects	Country level	Country level	Firm and country level	Regional and macro level	Country level	Country level	14 Industries	Time series, granger causality	Time series, granger causality	Time series, granger causality	Country level	Country level
Empirical methodology	Econometric analysis	Questionnaire survey	Panel data OLS.	Time series OLS.	Panel data fixed and random effects	Country level	Time series OLS.	Panel data GMM	Panel data OLS.	Time series, granger causality	Panel data-GMM	Panel data-FE-PCSE estimator	Time series, granger causality	Time series, granger causality	Time series OLS.	Country level	Questionnaire survey
<b>Determinants</b>																	
GDP growth	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(-)	(+)	(-)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Market size		(+)				(+)											
Total population			(+)														
Overall			(+)														
productivity																	
Trade openness			(+)		(+)	(+)	(-)	(+)		(-)	(+)	(-)	(-)	(+)	(+)	(+)	(+)
Export intensity	(-)						(+)					(-)	(+)				
Labor productivity								(+)				(+)	(-)				
Human capital quality			(+)						(+)				(-)				
Unit labor cost			(-)			(-)	(-)				(-)	(+)	(-)				(+)
Domestic investment													(-)				
Interest rate			(-)														
Exchange rates			(-)														
Infrastructure																	
Financial depth																	
R&D activities								(+)									
EU accession	(-)							(-)									
EU accession 2004		(+)															
Olympic games																	
Financial crisis																	
Energy intensity		(+)															
Political stability		(+)															
Macroeconomic stability		(+)															
Links to neighboring countries		(+)															
Geographical proximity to EU		(+)															
Institutional environment		(+)															
Cultural similarity																	
Corporate tax																	

Note: The symbol in the parenthesis indicates the relationship between FDI and its determinants, while parenthesis ( ) without symbol denotes that the variable is insignificant at the accepted significant level (i.e. 1, 5, and 10%). [1] = Georgopoulos and Gert Preusse (2006); [2] = Bizzenis, Tsiouras, and Vlachos (2009a); [3] = Anastasopoulos, Georgiou, and Maroudas (2008); [4] = Pantelidis and Nikolopoulos (2008); [5] = Katsaitis and Doulos (2009); [6] = Letão (2010); [7] = Pantelidis, Kyriklis and Nikolopoulos (2011); [8] = Kaditi (2013); [9] = Petrakou (2013); [10] = Miskinis and Juozenaite (2015); [11] = Economou and Hassapis (2015); [12] = Vogiatzoglou and Tsekeris (2016); [13] = Pegkas and Tsamadas (2016); [14] = Azam et al. (2016); [15] = Pantelidis and Paneta (2016); [16] = Vlachos et al. (2018); [17] = Vlachos et al. (2019).



**Figure 1.** Greek FDI Stocks as % of GDP.  
 Source: Authors' calculations based on UNCTAD (2017) database.



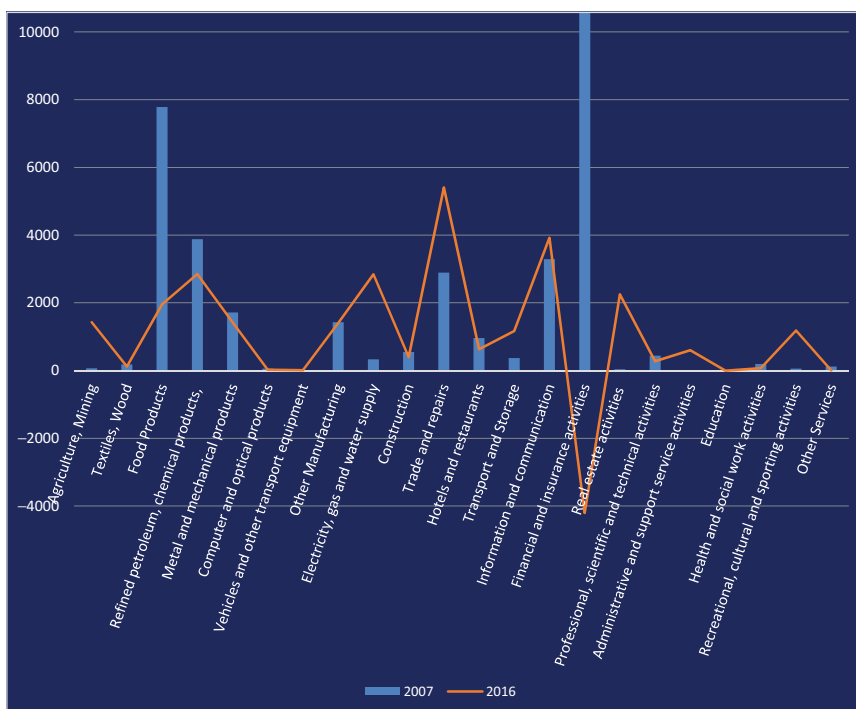
**Figure 2.** Inward FDI by country of origin (in millions of Euros).  
 Source: Authors's calculations based on Bank of Greece (2017) database.

of the country's GDP and demonstrates the lowermost percentage in the EU area.

In contrast, other peripheral economies of southern Europe, as Spain and Portugal, have capitalized their entrance in the European Union and to the Economic Monetary Union and enhanced their investment attractiveness as host bases for FDI operations.

Countries with a substantial investment presence in Greece in recent years have been Germany, France, Belgium, Luxembourg, the Netherlands, Switzerland and Italy, and Cyprus whose presence was significant as well before the economic crisis period. Finally, Greece has been receiving a considerable amount of FDI from the USA and the United Kingdom, but this dropped during the crisis period.





**Figure 3.** Greek inward FDI by sector of economic activity (in millions of Euros).  
*Source:* Authors' calculations based on Bank of Greece (2017) database.

Concerning the FDI structure, the majority of FDI flows over the period 1963–1973 was directed to chemicals, basic metals, and the transportation sector. These types of industries contributed significantly to the upgrading and the development of the country's manufacturing base. Nevertheless, a gradual shift of FDI structure, occurred after Greece's accession to the EU in the early 1980s till mid 1990s, when sectors, i.e. textiles, food and drink, and consumer electronics were the main destinations of FDI activities (Paliginis 2001).

In addition, during the period 1996–2007 as a result of the liberalization of the financial and telecommunications sectors, a substantial redistribution is registered regarding the structure of FDI. In fact, FDI inflows were directed primarily to the tertiary sector, especially in the areas of financial services, telecommunications and to a lesser extent real estate and commerce. In the secondary sector, foreign investors were primarily focused in the areas of chemicals, machinery, and foodstuff and to a lesser extent to metallurgical products and refineries (Papanastassiou, Louri, and Loufir 2000).

Finally, it is evident (see Figure 3) that a significant redistribution exists concerning the sectoral allocation of FDI in Greece during the economic crisis period 2008–2016. In fact, during the period of economic crisis, the

main bulk of FDI inflows in Greece has been focused mostly in sectors, i.e. agriculture and mining, electricity, gas and water supply, real estate and commerce, recreational, cultural and sporting activities. On the contrary, the outbreak of the global financial and Greek economic crisis resulted in the shrinkage of foreign presence in the financial and insurance sector.

## Method and data

In Greece, after a prolonged period of recession, it is generally accepted that public spending and endogenous resources cannot meet investment hardship. This means that Greece has an urgent need to attract increased direct foreign investments for years to come in order to provide the basis for a maintainable resumption of growth and development. Thus, this study aims to provide critical implications by examining factors that can influence investment decisions.

Above all, considering that a causal link between inward FDI and its determinants may not be direct and/or can be supported solely in the medium term, we postulate a more comprehensive approach to supplement the relevant discussion. We consider two or more-way possible causal links, by applying the VECM framework), which is a basic VAR model and includes the error correction term ( $ECT_t - 1$ ) to seize the long-run relationship among the estimated variables.

Admittedly, a substantial issue of employing aggregate FDI data to detect the factors motivating the investment decisions of MNEs is the fact that econometric estimation may be influenced by aggregation bias and measurement errors. In fact, the regional and industrial distribution of aggregate FDI data may be flawed when a small number of new investment projects encompass a large amount of capital. However, considering the limited availability of recent disaggregated data (of firm and industry level) this study opts the total inward FDI stock for the dependent variable for the following reasons: First, FDI stock data as compared to FDI flow data encompass more evidence of MNEs decisions that do not fade with time. Second, Wacker (2016) in a recent study, finds compelling evidence that shows that the use of FDI stock or flows is not a significant issue of concern as the latter is a simple function of the former. Above all, it is confirmed that any calculation on equilibrium models for the multinational firms, the use of aggregate FDI data replicate this equilibrium element firmly. Third, FDI stock data as a cumulative stock variable tackle effectively the issue of home bias, which is not thoroughly investigated in the context of foreign direct investments as compared to portfolio investments. We believe that new corporate investment decisions are affected by the proximity of the environment where

investment initiatives have previously succeeded. Fourth, FDI flows in Greece under the period of estimation have been somewhat volatile and total Greek gross FDI inflows after the 2008 crisis are much higher than net FDI flows that are produced by various databases (IMF, UNCTAD, OECD), as their estimation method calculates the negative reinvested earnings which have exceeded the standard figures as a result of the Greek crisis. Hence, we opt to use the FDI stock variable. Fifth, considering that FDI stock is available only at current prices, we adjusted it to constant prices, in US dollars for the year 2010. This implies that the constant yearly sums are not biased towards any excessive observation of the examined period. Finally, the main body of empirical evidence on the FDI determinants uses aggregate FDI data, with the most prominent researcher Dunning et al. to trust both FDI stocks and flows in their often-cited studies (see among others, Dunning 1993; Dunning, Fujita, and Yakova 2007; and Dunning and Lundan 2008).

All the variables applied in this study are converted into semi log-linear specification and hence a multiple regression is used to study the effects of various determinants of Real Gross Domestic Product (as a proxy for the market size), Education (as a proxy for the quality of human capital), Trade Openness (sum of exports and imports as percentage of GDP), a proxy for Infrastructure (utilization of landline telephone per 100 people), and a proxy for Technological Capabilities (patent applications).

The model of our study that aims to study the determinants of inward FDI in Greece is specified as follows:

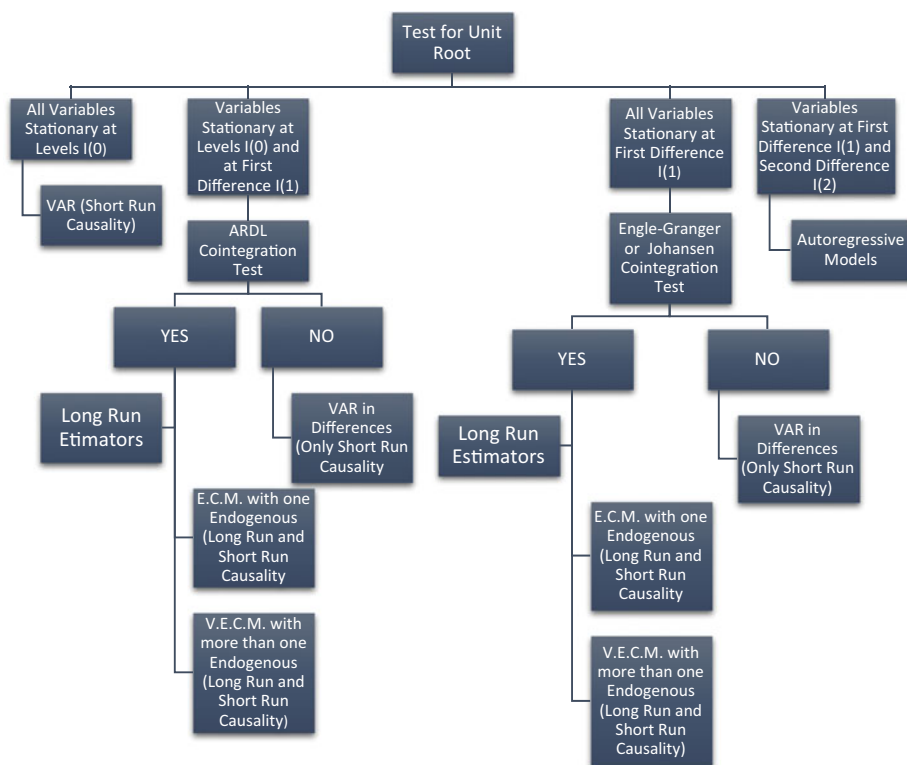
$$FDI_t = f(GDP_t, Tr.Open._t, Educ._t, Infra._t, Tech.Cap._t) \quad (1)$$

The original dataset contains annual observations for Greece, of real inward foreign direct investment stock (FDI) retrieved from the UNCTAD statistical database, real gross domestic product (GDP), trade openness, enrollment in education and infrastructure obtained from the World Bank, while the data for technological skills were obtained from OECD over the period 1980–2016 (see Table 2 for more details).

Figure 4 describes the steps of the econometric methodology applied in this study. In fact, time-series analysis requires the following steps: first, stationarity examination for each variable. Second, the cointegration examination to inspect the long-run relationship between the variables. Third, the use of the Granger test to examine the causality links between the variables. In particular, in case we validate the existence of co-integration (long-run relationship) among these series, this study will proceed by estimating the cointegrated parameters and the standard causality test will be augmented by an error correction term formulated ( $ECT_{t-1}$ ) to seize the

**Table 2.** List of variables and data sources.

Variable	Label of variable	Type of FDI determinant	Expected effect (sign)	Unit of measurement	Source	Website
Inward FDI stock	FDI			Log of FDI Stocks	UNCTAD	<a href="http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx">http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx</a>
Real gross domestic product	GDP	Market-seeking	Positive (+)	Log of total GDP	World Bank	<a href="https://data.worldbank.org/indicator/NY.GDP.MKTP.KD">https://data.worldbank.org/indicator/NY.GDP.MKTP.KD</a>
Trade openness	Trade openness	Market/Efficiency - seeking	Positive (+)	% of GDP	World Bank	<a href="https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS">https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS</a>
School enrollment, tertiary	Education	Resource/Efficiency - seeking	Positive (+)	% Gross	World Bank	<a href="https://data.worldbank.org/indicator/SE.TER.ENRR">https://data.worldbank.org/indicator/SE.TER.ENRR</a>
Telephone lines per 100 people	Infrastructure	Resource /Efficiency - seeking	Positive (+)	% of GDP	World Bank	<a href="https://data.worldbank.org/indicator/IT.MLT.MAIN.P2?view=chart">https://data.worldbank.org/indicator/IT.MLT.MAIN.P2?view=chart</a>
Patent applications	Technological capabilities	Resource or/Efficiency/ Strategic market - seeking	Positive (+)	Log of Patent Applications	OECD	<a href="https://stats.oecd.org/Index.aspx?DataSetCode=PATS_IPC">https://stats.oecd.org/Index.aspx?DataSetCode=PATS_IPC</a>



**Figure 4.** Diagram of research methodology for time series analysis.

long run connection among the estimated variables. Finally, variance decomposition and impulse response analysis can be conducted in order to compare the variation levels and calculate the direction of the reaction of one-time standard deviation shock on the present and future values of the estimated variables. This econometric procedure has been followed by a significant number of recent empirical studies, such as Tang, Yip, and Ozturk (2014); Boateng et al. (2015); Ibrahim and Hassan (2013); Kinuthia and Murshed (2015); Vo (2018) who examined the inward FDI determinants in the economies of Malaysia, Norway, Sudan, Kenya, and Vietnam, respectively. It is worth mentioning that regarding Greece's neighbors, probably owing to the availability of times series data, this similar econometric procedure has been applied in a relatively small number of studies such as Nikolaidou and Vogiazas (2014); Andrei and Andrei (2015); Golitsis, Avdiu, and Szamosi (2018) who examined the association of some macroeconomic variables in the economies of Bulgaria, Romania, and Albania, respectively.

The existence of co-integration in our findings will lead us to investigate the causal relationships between the variables using a VECM framework, in order to extract a clear picture of which might be useful for Greek

policymakers to design comprehensive policies to trigger the economic development by attracting considerable amounts inward FDI. In fact, the VECM technique reveals both the short-term dynamics via the significance of the Wald Test and the long run relationship between the variables via the application of the statistically robust error correction term.

The augmented form of the Granger causality technique is specified in a multivariate  $p$ th order vector error model formulated as follows:

$$\begin{aligned}
 \Delta \ln(FDI_t) & a_1 & \beta_{11i} & \beta_{12i} & \beta_{13i} & \beta_{14i} & \beta_{15i} & \beta_{16i} & \Delta \ln(FDI_{t-1}) \\
 \Delta \ln(GDP_t) & a_2 & \beta_{21i} & \beta_{22i} & \beta_{23i} & \beta_{24i} & \beta_{25i} & \beta_{26i} & \Delta \ln(GDP_{t-1}) \\
 \begin{bmatrix} \Delta \ln(Tr.Open_t) \\ \Delta \ln(Educ_t) \end{bmatrix} & = \begin{bmatrix} a_3 \\ a_4 \end{bmatrix} + \sum_{i=1}^{k-1} \begin{bmatrix} \beta_{31i} & \beta_{32i} & \beta_{33i} & \beta_{34i} & \beta_{35i} & \beta_{36i} \\ \beta_{41i} & \beta_{42i} & \beta_{43i} & \beta_{44i} & \beta_{45i} & \beta_{46i} \end{bmatrix} \begin{bmatrix} \Delta \ln(Tr.Open_{t-1}) \\ \Delta \ln(Educ_{t-1}) \end{bmatrix} \\
 \Delta \ln(Infrast_t) & a_5 & \beta_{51i} & \beta_{52i} & \beta_{53i} & \beta_{54i} & \beta_{55i} & \beta_{56i} & \Delta \ln(Infrast_{t-1}) \\
 \Delta \ln(Tech.Cap_t) & a_6 & \beta_{61i} & \beta_{62i} & \beta_{63i} & \beta_{64i} & \beta_{65i} & \beta_{66i} & \Delta \ln(Tech.Cap_{t-1})
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 & \psi_1 & u_{1t} \\
 & \psi_2 & u_{2t} \\
 & + \begin{bmatrix} \psi_3 \\ \psi_4 \end{bmatrix} ECT_{t-1} + \begin{bmatrix} u_{3t} \\ u_{4t} \end{bmatrix} \\
 & \psi_5 & u_{5t} \\
 & \psi_6 & u_{6t}
 \end{aligned}$$

$\Delta$  is the difference operator, while ECM is the error correction term stemming from the long-run cointegrating equation. The constant terms are symbolized by  $\alpha$  ( $i=1, 2, 3, 4, 5,6$ ) in the VECM equations, and  $u$  ( $i=1, 2, 3, 4, 5,6$ ) residual term is expected to be normally distributed.

## Findings

### Time-series unit root tests

This empirical examination applies both the DF-GLS introduced by Elliott, Rothenberg, and Stock (1996) and the Ng and Perron (2001), unit root tests to determine the order of integration of the variables. The results in Table 3 indicate that the null hypothesis of a unit root in logarithm is not rejected in levels. However, as we can see from the same Table 3, all the variables are stationary in first differences. Thus, we proceed with the investigation of the long-run relations among the six variables of our dataset.

### Time-series cointegration test

In this study, we use the Johansen and Juselius (2009) multivariate cointegration method so as to grasp the dynamic relationships among the six variables. The results are presented in Table 4. Both trace statistics and

**Table 3.** Unit root tests.

Variables	DF-GLS		Ng-Perron		
	Constant	Constant and trend	Constant	Constant and trend	
	Statistic	Statistic	Statistic	Statistic	
<b>At levels</b>					
L.GDP	-1.414	-2.144	-0.528	-8.203	
L.FDI	-1.502	-2.157	-5.207	-8.203	
Trade openness	-0.841	-2.249	-2.069	-7.022	
Education	-0.297	-2.137	0.286	-6.725	
L.Tech.Cap.	-1.499	-1.717	-3.972	-8.324	
Infrastructure	-0.873	-0.550	-0.343	-0.717	
<b>At first difference</b>					
$\Delta$ .L.GDP	-2.228**	-3.351**	-9.283**	-24.764***	
$\Delta$ .L.FDI	-3.398***	-4.040***	-17.299***	-17.874**	
$\Delta$ .Trade openness	-4.825***	-4.880***	-26.534***	-26.789***	
$\Delta$ .Education	-5.125***	-5.612***	-16.997***	-17.287***	
$\Delta$ .L.Num. Patents	-2.983***	-4.970***	-17.197***	-35.639***	
$\Delta$ .Infrastructure	-4.672***	-5.266***	-16.718***	-31.610***	
		Critical values for the DF-GLS test		Critical values for the NP (MZA) test	
	Constant	Constant and trend	Constant	Constant and trend	
1%	-2.633	-3.770	-13.800	-23.800	
5%	-1.951	-3.190	-8.100	-17.300	
10%	-1.611	-2.890	-5.700	-14.200	

Notes: \*\*\*, \*\*, and \* denote rejection of the null hypothesis of a unit root at the 1, 5, and 10%, levels, respectively.

The lag length is identified by the minimum Akaike (AIC) criterion.

Source: authors' calculations by using the Statistical Software EVIEWS 10.

**Table 4.** Time series Johansen and Juselius (2009) cointegration tests.

Null hypothesis	Trace statistics	5% Critical value	Prob.	Maximal Eigen		
				value statistics	5% Critical value	Prob.
$r = 0$	510.457	117.708	0.000***	230.453	44.497	0.000***
$r \leq 1$	280.005	88.804	0.000***	114.483	38.331	0.000***
$r \leq 2$	165.522	63.876	0.000***	65.175	32.118	0.000***
$r \leq 3$	100.347	42.915	0.000***	52.963	25.823	0.000***
$r \leq 4$	47.384	25.872	0.000***	28.370	19.387	0.002***
$r \leq 5$	19.014	12.518	0.004***	19.014	12.518	0.004***

Notes: \*\*\* and \*\* denotes significant at the 1 and 5% levels, respectively. Model include constant.

$r$  is represented as the vector of cointegrating relationships among variables, under the  $H_0$ : rank =  $r$ .

The lag length ( $k$ ) is determined by the minimum Akaike (AIC) criterion:  $k = 3$ .

Source: authors' calculations by using the Statistical Software EVIEWS 10.

maximal Eigenvalue statistics show that there is, no less than, one cointegration vector and hence we verify that there exists a long association between the variables of our baseline equation.

### **Estimation of the long run relationships**

This study proceeds by estimating the cointegrated parameters by applying the Fully Modified Ordinary Least Squares (FMOLS) procedure proposed by Phillips and Hansen (1990). The main gains of the FMOLS estimator are that it performs efficiently in small samples (Phillips and Loretan 1991) and checks conventional OLS for bias caused by endogeneity and serial

**Table 5.** FMOLS results (dependent variable is L.FDI).

	Time period: 1980–2007		Time period: 1980–2016	
	Coefficient	<i>p</i> -Value	Coefficient	<i>p</i> -Value
L.GDP	0.159	0.000***	0.273	0.000***
Trade openness	0.011	0.043**	−0.003	0.680
Education	0.034	0.001***	0.004	0.643
L.Tech.Capa.	0.332	0.000***	0.328	0.000***
Infrastructure	0.006	0.183	0.016	0.009***
	$R^2 = 0.62$ , $R^2$ adj. = 0.55, F-stat. = 613 (0.000), Normality test: Jarque Bera = 1.035 (0.244)		$R^2 = 0.57$ , $R^2$ adj. = 0.51, F-stat. = 181 (0.000), Normality test: Jarque Bera = 835 (0.187)	

Notes: \*\*\* (\*\* and \*) denote statistical significance at the 1, 5, and 10%, respectively.

The probability values are reported in parenthesis. The AIC information criterion is applied to select the optimal lag order.

Source: authors' calculations by using the Statistical Software EViews 10.

correlation (Narayan and Narayan 2004). Accordingly, we believe that the use of the FMOLS estimator will ensure the robustness of our results in providing the long run estimators for the Greek inward FDI determinants. This empirical procedure is similar to the pioneer empirical study of Narayan and Narayan (2004), and to more recent studies of Singh (2010), Hossfeld (2010), Tang, Yip, and Ozturk (2014), Boateng et al. (2015), Sirag, SidAhmed, and Ali (2018) and Ahmad et al. (2019), and who also applied the FMOLS estimator to examine the long-run equilibrium coefficients in their time series econometric analysis.

Considering the latest macroeconomic trends in the case of Greece, it is motivating to evaluate whether the effect of the persistent economic crisis in Greece has emerged as a turning point in the magnitudes of inward FDI determinants. In pursuit of this objective, we estimate the size of the long-run elasticities of our model for the period until 2008 and for the period 1980–2016.

Table 5 reports the results for the FMOLS estimator, where FDI is the dependent variable. The variances concerning the two-time periods are somewhat significant with regards to the magnitude of the coefficients and their statistical significance.

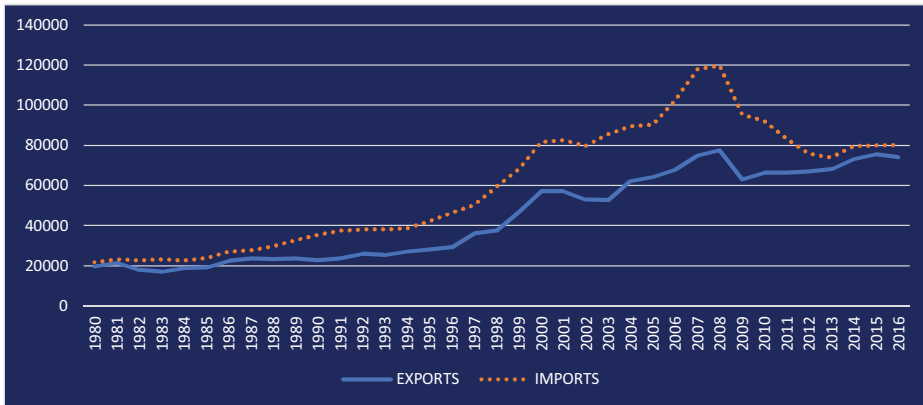
Interestingly though, evaluating the size of the coefficients of the FDI determinants, we reveal that the impact of Technological Capabilities as an inward FDI stimulator is diachronically (both in the pre-crisis and post-crisis epoch) superior to the rest of FDI determinants. In fact, for the period 1980–2016, a 1% increase in Technological Capabilities results in an increase of 0.328% in inward FDI while the same influence for the pre-crisis epoch is accounted for by a 0.332% increase. This finding indicates that multinational enterprises (MNEs) have considered these advanced technological innovations as a significant factor to transfer their funds to Greece. Thus, it is essential for Greece to enhance further the ability to transfer, adapt and create technological resources, so as to become more attractive to multinational companies.



Concerning the effect of GDP on inward FDI, we find that GDP also has a positive impact on FDI and is statistically significant at the 1% level of significance both in the pre-crisis and post-crisis period. This finding supports the “Growth-driven FDI” hypothesis in the case of Greece which suggests that FDI will be engrossed in growth-driven prospects in newly liberalized markets or from the implementation of market-friendly strategies and is consistent with the existing literature in the case of Greece (Bitzenis, Tsitouras, and Vlachos 2009a; Leitão 2010; Azam et al. 2016; Vlachos et al. 2018).

Remarkably, in Greece, the prolonged economic crisis triggered the exaggeration of the influence of GDP on inward FDI (from 0.159% before the crisis to 0.273% in the postcrisis period). Overall, this outcome seems quite plausible due to the following factors: (1) historically, most of the sectors of the Greek economy have shown strong indications of oligopolistic performance even after the entrance in European Union (see Filippaios 2006); (2) diachronically the majority of FDI have been concentrated in non-extrovert industries, chiefly in retail trade and in sectors servicing the – booming local market (see Malliaropoulos and Anastasatos 2013); (3) the appreciation of the real exchange rate resulted higher profit margins for products imported from MNE affiliates from abroad, with a given cost than produced and distributed locally (see Malliaropoulos and Anastasatos 2011); and (4) since the beginning of Greek crisis in 2008, the weakest domestic demand and scarcity of local credit resulted in crowding out of uncompetitive and non-extrovert indigenous firms due to the larger MNEs that have rushed to fill this gap in the domestic market by acquiring assets at a discount, thus supporting the “fire-sale FDI” that holds in economies enduring prolonged economic crises (see Tsitouras 2016; Vlachos et al. 2019).

Concerning the effect of trade openness on FDI, we find that it is positive and statistically significant at the 5% level of significance only in the pre-crisis period. In fact, for the period 1980–2007, a 1% increase in trade openness results in a rise of 0.011% in inward FDI. In contrast, for the post-crisis period, the influence of trade openness has faded significantly. We connect this result with the fact that diachronically, the openness of the Greek economy is mainly fueled by imports and not exports. Thus, high deficits in the external balance of Greece were the rule (see Figure 5). However, during the period of the Greek economic crisis, Greek imports decreased rapidly as a result of weak local demand. This, in turn, prevented foreign firms to invest in Greece as the domestic market has been considered as not profitable from MNEs. In addition, it is inferred that the primary motivation of FDI in Greece has been to serve the local market and not to act as an “export platform base” for other economies.



**Figure 5.** Greek total exports and imports (in millions of US dollars).  
*Source:* Authors' calculations based on World Bank (2017) database.

With regards to the positive contribution of education to inward, we can stress that this influence seems to be greater in the pre-crisis period as compared with the post-crisis period. We connect this result with the findings of Figure 3. In reality, Figure 3 imposes no assumptions, as it examines the sectoral distribution of Greek inward FDI in 2007 and 2016. There is evidence of a substantial redistribution in respect to the sectoral allocation of FDI in Greece during the economic crisis period 2008–2016. In particular, during the period of Economic Crisis, the main bulk of FDI inflows has been focused mostly in sectors such as (1) agriculture and mining; (2) electricity, gas, and water supply; (3) real estate and commerce; and (4) recreational, cultural and sporting activities. Hence, it is apparent that MNEs invested in Greece during the crisis in production activities of the economy that did not certainly need a highly trained workforce. Similarly, findings were also retrieved by studies such as Altomonte and Guagliano's (2003), which focused in Central and Eastern European and in Mediterranean countries and Dornean and Oanea's (2015) for the case of Romania over the period 2006–2012. The results of these studies confirm that education has a neutral impact on FDI's level if the investment is geared towards traditional sectors and a positive and significant impact only for investments in services and specific industries that necessitate highly qualified personnel.

On the other hand, during the pre-crisis period, it is apparent from the same Figure 3 that the main bulk of FDI was primarily focused in the areas of chemicals, machinery, and foodstuff in the secondary sector and mostly in the areas of financial services, telecommunications, and in the tertiary sector. Thus, it is apparent that MNEs considered a well-educated labor force as a significant determinant for FDI.

Finally, concerning the impact of infrastructure on inward FDI, it is favorable but statistically significant only in the post-crisis period at 1% level of significance. Hence, it is apparent that successive Greek governments during the crisis period have been more able to adequately use government funds to improve the quality of infrastructure probably because of the extensive technical guidance provided by the “Troika” (International Monetary Fund, European Commission, and European Central Bank).

### ***VECM Granger causality analysis***

The results regarding the VECM Granger causality test are presented in Table 6. Since the variables are co-integrated, causality can be divided into long and short-term relationships.

Beginning with the long run results, the coefficient of the lagged error correction term is statistically significant in the FDI equation at the 1% level and with the correct negative sign. In particular, the coefficient value of the estimated lagged ECT in the FDI equation is -0.656, indicating that changes from the short-run to the long-run time period are corrected by almost 66% over each year. Thus, fairly high speed of adjustment to equilibrium is implied after a shock. These long-run results support the there is a long causality from each of GDP, Trade Openness, Education, Infrastructure and Technological Capabilities to inward FDI.

Thus, this study provides strong evidence that GDP, trade openness, the quality of the workforce, infrastructure facilities and technological capabilities are significant determinants of Greek inward FDI in the long term. Hence, it is imperative for policymakers to encourage domestic policies which promote the competence of local labor and the economy's robust upsurge of total output, trade volume and infrastructure facilities in order to send a strong signal to MNEs for the presence of a capable and energetic market for business activities. Furthermore, strong emphasis should be put on removing not only trade barriers but also resolving structural weaknesses of the Greek economy such as (1) high margins across most industries; (2) great administrative costs; (3) constant institutional deficiencies that undermine the competitiveness of the Greek economy. This would be a catalyst for Greece to attract increased direct foreign investments in the future so as to provoke the resumption of economic growth on a sustained basis.

Checking out the short run effects in the FDI equation, the variables of GDP, Trade Openness, and Infrastructure appear significant at the 5% level, respectively, whereas the variables of Technological Capabilities and Education are significant at the 1% level of significance. This finding clearly indicates that in a short span of time, technological skills and quality of

**Table 6.** Results of the Granger causality for the time series analysis.

Dep. Var.	Wald test F-statistics – Short-run							Long-run
	$\Delta LFDI_t$	$\Delta LGDP_t$	$\Delta Trade\ open_t$	$\Delta Education_t$	$\Delta L.Tech.Capa_t$	$\Delta Infrastructure_t$	$ECT_{t-1}$	
$\Delta LFDI_t$	8.829 (0.032)**	11.284 (0.010)**	12.786 (0.005)***	11.419 (0.009)***	39.942 (0.000)***	9.889 (0.012)**	-0.656 [-4.086]***	
$\Delta LGDP_t$	7.093 (0.069)*	6.520 (0.088)*	0.165 (0.983)	8.029 (0.045)**	3.262 (0.353)	0.996 (0.802)	-0.043 [-1.645]**	
$\Delta Trade\ open_t$	1.886 (0.596)	0.893 (0.827)	6.241 (0.100)*	7.897 (0.048)**	6.028 (0.110)	5.589 (0.134)	-0.400 [2.576]***	
$\Delta Education_t$	0.738 (0.864)	1.046 (0.790)	1.178 (0.758)	1.031 (0.794)	0.551 (0.908)	10.085 (0.018)**	-0.531 [-1.240]	
$\Delta L.Tech.Capa_t$	8.971 (0.029)**	6.934 (0.074)*	8.353 (0.039)**	10.162 (0.017)**	8.753 (0.032)**	1.700 (0.637)	-0.225 [-0.998]	
$\Delta Infrastructure_t$							-0.124 [-2.970]***	

Note: \*\*\* (\*\* and \*) denote statistical significance at the 1, 5, and 10%, respectively. The probability values for the short run and long causality are reported in parenthesis. Values in square parenthesis are of t-statistics.

Source: authors' calculations by using the Statistical Software EViews 10.

labor has played a dominant role in stimulating inward FDI rather than the rest of the determinants tested in our study. Hence, it is vital for Greek policymakers in the short-term, to promote the linkages between the education system and labor market and to further reinforce the technological skills, education and training at all stages so as to attract more inward FDI.

Moreover, in the GDP equation, the Granger causality test runs from FDI and Education to GDP both in the short and long run. This finding supports the FDI led growth (FLG) hypothesis for Greece, which is consistent with the existing literature for this case, such as Malliaropoulos and Anastasatos (2013), and Tsitouras (2016). Thus, this study provides strong indications that inward FDI and the quality of labor are essential stimulators of economic growth for Greece.

In general, the results from the FDI and GDP equations imply a bidirectional causality relationship between economic growth and FDI at the 1 and the 5% significance level, respectively. This confirms that the relationship between FDI and economic growth is complementary. FDI leads to economic growth through spillover effects and foreigners are attracted to invest in profit-oriented ventures in Greece.

Furthermore, we observe in the Trade Openness equation that FDI, GDP and Education appear to be significant determinants of Trade, both in the short and long run. Finally, from the last equation, a Granger Causality is running from FDI, GDP, Trade Openness, Education, Technological Skills to local Infrastructure, both in the short and long run.

In retrospect, and based on the findings from Table 6, this study confirms that in the long run, three significant complementary relationships occur in Greece's case: (1) between FDI and GDP; (2) between FDI and Trade; and (3) between FDI and Infrastructure. These findings are important in the sense that an economy's vigorous expansion of GDP, Trade volume and infrastructure facilities attract more MNE's and in turn the augmented presence of MNE's leads to the further increase of the total output, trade volume and the quality of local infrastructure.

### ***Impulse response analysis***

Figure 6 illustrates the estimated impulse response analysis for a time interval with ten periods and with two standard error bounds. This analysis indicates the direction of the reaction of one-time standard deviation shock on the present and future values of the FDI itself, GDP, Education, Trade Openness, Infrastructure, and Technological capabilities. Figure 6 suggests that following a shock to inward FDI, there appears a positive impact and mild increases to itself until the seven-time period when it starts to decrease. In terms of GDP, the shock to GDP leads to a rise in inward FDI

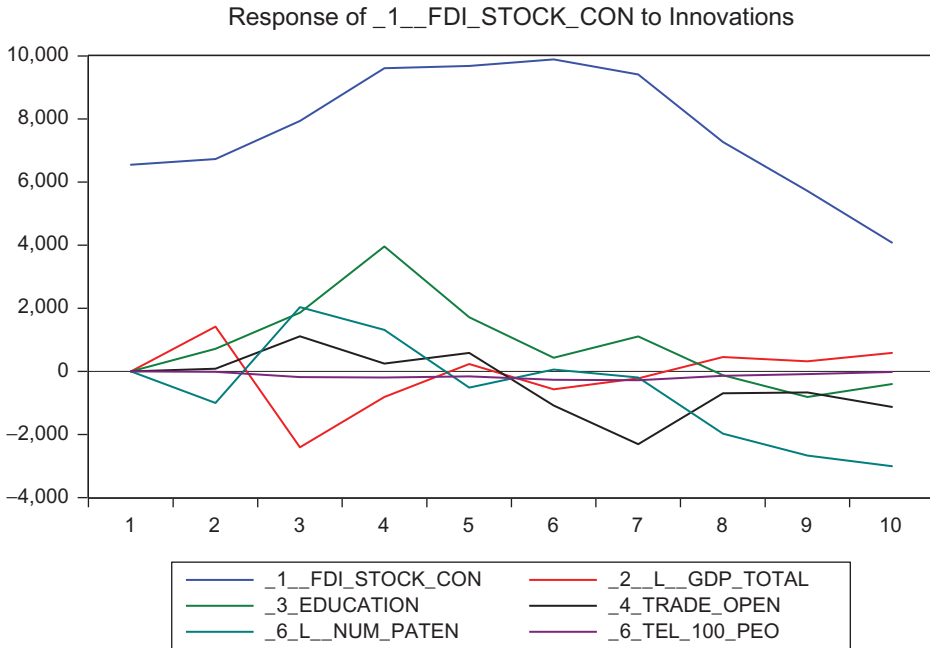


Figure 6. Impulse response analysis.

for the first two time periods and from period five to ten, with a small negative interval from period four to five.

Regarding the impact of Technological Capabilities, the initial response is negative but then becomes positive from period three to seven and then again becomes negative. The results also exhibit that the following: a shock to Education and Trade Openness, Greek inward FDI increases, but the effects of Greek inward FDI fade away. Finally, it should be stressed that responses in Greek inward FDI to a shock in Greek Infrastructure seem to be insignificant.

**Variance decomposition analysis**

The estimated results for the variance decomposition analysis are reported in Table 7. The results indicate that the variation in inward FDI feeds on its variance by 100 and 94% in the first and second year, respectively. However, in subsequent years, the share of inward FDI remains persistent to almost 66% followed by the volume of technology skills (to virtually 18%), the degree of trade openness (to almost 6.20%), and the level of education (to nearly 5.90%), whereas the volume of GDP and the level of infrastructure have the least explanatory power with 3.70 and 0.20% correspondingly, in explaining the variation of Greek inward FDI.

**Table 7.** Variance decomposition analysis.

Period	S.E.	FDI	GDP	Educ.	Tr.Open.	Tech. Cap.	Infra.
1	0.145	100.000	0.000	0.000	0.000	0.000	0.000
2	0.228	93.621	2.734	3.228	0.069	0.303	0.045
3	0.366	60.846	8.081	3.648	7.709	19.583	0.134
4	0.469	56.411	4.900	9.282	7.663	21.574	0.169
5	0.541	61.965	3.693	7.168	7.733	19.248	0.194
6	0.610	66.167	2.975	5.649	6.211	18.738	0.261
7	0.662	69.886	2.563	4.817	5.279	17.159	0.296
8	0.687	71.521	2.430	4.639	5.181	15.937	0.292
9	0.703	71.702	2.561	4.758	5.014	15.681	0.284
10	0.712	70.800	2.654	4.715	4.996	16.557	0.278

Source: authors' calculations by using the Statistical Software EVIEWS 10.s.

## Conclusions and policy recommendations

This empirical study has applied the Fully Modified OLS to detect the long run coefficients and the Vector Autoregressive and Error Correction Model to examine the causal links, both in the short term and long term, between FDI and its determinants using Greece as the case study.

The findings of this research paper indicate that the market size, trade openness, the quality of labor, Infrastructure facilities and technological skills stimulate inward FDI in Greece. In addition, the results confirm the long run relationship between FDI and its determinants. Accordingly, this study reveals that both foreign direct investment and the quality of human capital are important drivers of economic growth for Greece. Predominantly, this study shows three complementary relationships between FDI and GDP, between FDI and local infrastructure, and between FDI and international trade.

These findings are fairly significant in the sense that they provide new insights regarding the relationship between FDI and its determinants. The logic behind the above implication is the fact that an economy's robust increase of total output, trade capacity, and infrastructure facilities send a strong signal to MNEs as to the presence of a capable and energetic market for business activities. More importantly, in the long term, it is suggested that a mutual connection could be established between foreign private dynamic businesses and government authorities. This could operate as a source of sustainable increasing returns as the broader foreign private business sector triggers the vigorous expansion of total output, trade capacity, and local infrastructure. Thus, the outcome is a virtuous cycle. Therefore, it is crucial for Greece to rebuild trust and confidence by boosting the motives and diminishing the barriers to FDI in order to promote entrepreneurship and generate a constructive business climate so as to attract significant volumes of FDI inflows.

The policy implications of the selected FDI determinants in our model seem quite interesting. In the short span of time, the results show that an

improvement in the quality of labor and technology knowledge can play a dominant role in stimulating FDI, rather than the rest of the determinants which are the degree of Trade Openness, the total GDP, and the level of Infrastructure.

Accordingly, it is imperative for policymakers to promote linkages between the education system and labor market and to further reinforce the technological skills, education, and Training at all levels. This, in turn, is expected to attract more inward FDI that would provide the basis for a maintainable resumption of growth and development and prevent the further emigration flows and particularly the brain drain from Greece.

Above all, this study reveals that diachronically (before and after the Greek economic crisis) technological capabilities exert a more crucial role as an FDI stimulator when compared to the rest of FDI determinants. This finding highlights the need for Greece in today's competitive global business environment, to enhance further the ability to transfer, adapt and create technological resources, as robust origins of comparative advantage, so as to become more attractive to multinational companies. Thereby, we could conclude that multinational enterprises (MNEs) would prefer to transfer their funds to Greece in order to take advantage of those advanced technological innovations.

Our key policy implication is that in a small open economy such as the Greek one, with a relatively restricted domestic market and limited international trade transactions, in terms of volume, it is essential for the Greek economy to shift towards the production of advanced technology and innovative goods and quality services so as to stimulate FDI and in turn promote economic recovery. In addition, it is assumed that any effort at a persistent shrinkage of the labor cost will turn out to be unproductive, as there will always be neighboring economies in Central and South-East Europe with lower Labor costs.

Thus, efforts by policymakers should be directed towards the enhancement of Greece's investment attractiveness. A strong presence of foreign companies is the only hope for the economy to overcome structural pathogens and negative trends and perhaps most importantly, to reinforce the demand for institutional and economic reforms. It is envisaged that only reforms and subsequent FDIs can increase the productivity of capital and labor and integrate the Greek economy into global production networks.

In retrospect, this study contributes to the relevant literature in the following aspects: first, it provides a profound understanding of the determinants of inward FDI using offering fresh identifications relating to macroeconomic policy influences on the location decisions of FDIs. Second, this study incorporates insights from the new economic geography and agglomeration effects (clustering of production). In fact, while the existing empirical literature on determinants of FDI has not dedicated



sufficient emphasis to country-specific factors that compose origins of dynamic comparative advantages, this study contributes to the current discussion by examining the Greek domestic's technological capabilities as a factor for inward FDI. Third, this study contributes to the existing empirical literature by examining the most recent available data and by assessing whether the effect of the Greek economic crisis has emerged as a turning point in the magnitude of inward FDI determinants. Fourth, this study adopts modern advances in time series modeling based on the Fully Modified Ordinary Least Squares (FMOLS) and (VECM) Vector Error Correction Mechanism, multivariate framework. Finally, and most significantly, we propose a more comprehensive approach to supplement the relevant discussion by considering possible two or more-way causal links, both in the short and long term, concerning FDI, education, trade openness, GDP, infrastructure, and technological capabilities. Overall, the logic behind the above-mentioned suggestions is to provide robust implications and guidance policies for governmental entities and policymakers in their mission for sustainable economic growth by managing effectively factors that can influence investment decisions.

To conclude, this study has, however, certain limitations which are virtually associated with data availability constraints. In particular, this empirical study has not been able to apply extensive disaggregated Greek inward FDI data by the type of sector and by the country of origin. Undeniably the availability of any relevant micro-level data could deliver more options for identifying any possible differences in a causal link between FDI determinants if we could consider FDI in Greece from Western European countries vs. the rest or/and in manufacturing vs. service sector. Finally, the inclusion of any political and institutional variables that have confirmed as factors to investment in Greece in questionnaire-based studies (see Bitzenis, Tsitouras, and Vlachos 2009a, 2009b) could result to a specific set of lessons for researchers, policymakers, and development practitioners.

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