A MICROECONOMIC ASSESSMENT OF GREECE'S CORE-PERIPHERY IMBALANCES (1994-2002) CONFIRMING KRUGMAN'S INITIAL NEW ECONOMIC GEOGRAPHY MODEL

Constantinos IKONOMOU

Department of Economics, Law School, Department of Economics, 5 Stadiou Street, 10562 Athens, Greece
ikonomcos@googlemail.com

Abstract

This paper contributes to the literature of economic geography by providing a first empirical confirmation of Krugman's initial new economic geography model, in the Greek economy. A sample of Greek SMEs, drawn from four selected regions having different levels of centrality and five major industries in the 1995 – 2002 period, is found to be representative of the Greek business population, by the use of non-parametric tests. A cross-sectional model associates logarithmic SME employment growth with proxies used for capital, labour, land, industrial infrastructure, policy support, firm size, manufacturing and distance from Athens. The significance of the last three factors captures the operation of a microeconomic core-periphery model, as suggested by Krugman (1991) and agrees with a discussion on core-periphery imbalances in Greece. The latter however have not yet been diagnosed in literature by the use of models. Policy implications concerning Europe 2020 strategy relate to the need for manufacturing growth in peripheries, its interregional and inter-industrial diffusion.

Keywords: Core-Periphery Imbalances Economic Geography NEG Microeconomic Growth

1. INTRODUCTION

The 2020 strategy for Europe and its regions, introduced under the headings of "smart", "sustainable" and "inclusive" growth, discusses the need to exploit resources and wealth in the EU regions, benefiting from all available European assets (COM (2010) 2020). The targets are to achieve regional restructuring both at the national and EU level, resolve the most substantial structural problems in the EU regional economies and help regions to become resource efficient, by enhancing their growth potential (COM (2010) 2020).

This strategy however and related guiding documents (e.g. Barca, 2009) have neglected the role of manufacturing for achieving economic growth and the need to support its diffusion in peripheral economies through the production of new varieties of goods, as discussed in readings from new economic geography (Combes et al, 2008). Manufacturing and its spread in peripheries was emphasized for a long period in regional economics and

economic geography to be a principal cause for peripheral growth and a reason for creating, sustaining, strengthening or even reversing core-periphery imbalances (Myrdal, 1957; Chapman and Walker, 1987; Weber, 1929; Hoover, 1948; Losch, 1954; Greenhut, 1956; Isard, 1956**;** Smith, 1971; Armstrong and Taylor, 1999; Pitfield, 1978; Needleman and Scott, 1964).

At the same time, the assessment of the effects of EU Cohesion policies both at the national and the EU level remains rather inconclusive. Some studies have referred to club, σ or β-convergence highlighting policy success (Dall'erba and Gallo, 2008; Curaresma et al, 2008; Siano and D'uva, 2006; Mora et al, 2005; Badinger et al, 2004; Benos and Karagiannis, 2008; Alexiadis and Tomkins, 2006; Michelis et al,, 2004), while other referred to divergence (e.g. in Dall'erba and Gallo, 2008; Cappellen et al., 2003; Dall'ebra and Gallo, 2004, Tsionas, 2002). More recently, the need to combine macro with micro approaches was discussed, given the limited attention on microeconomic models (Bradley et al., 2006; Bradley, 2005). The present is a microeconomic study investigating the causes of business growth in Greece, in the 1995-2002 period. While evidence is provided on the factors associating with the growth of small and medium sized enterprises (SMEs) in a particular environment, their significance highlights existing microeconomic approaches in suggesting core-periphery imbalances (Krugman, 1991).

2. MICROECONOMIC MODELLING, THE NEW ECONOMIC GEOGRAPHY AND THE ASSESSMENT OF CORE-PERIPHERY IMBALANCES

Microeconomic models are increasingly being developed to explain spatial growth agglomeration and imbalances, in studies from new economic geography (Krugman, 2010; Combes et al., 2008). Though similar models were developed before in economic geography for the study of agglomeration and spatial concentration of phenomena, a new path for their general inference was offered by the use of general equilibrium modelling. This path helped to better integrate geography to economic thinking (Krugman, 2010). Historically, it coincided with an expressed criticism on the limitations of neoclassical thinking and other growth models to fully explain growth and its spatial agglomeration (Temple, 1999).

Microeconomic models such as those developed by Weber, Moses, Losch and Pallander emphasized demand, economies of scale and transportation costs for the location of manufacturing firms (see McCann, 2001). The role of these factors was explored in a model developed by Krugman (1991) that gave birth to the field of New Economic Geography and a subsequent debate on the subject. This model sought to explain circular causation and the conditions for core-periphery imbalances, by reference to manufacturing; whenever "some index that takes into account transportation costs, economies of scale and the share of non-agricultural goods in expenditure crosses a critical threshold, population will start to concentrate and regions to diverge; once started this process will feed itself" (Krugman, 1991; p. 487).

The original 1991 two-sector, two-region model, suggested two opposing spatial configurations likely to occur: a core-periphery pattern where the centre benefits mostly and a symmetric spatial equilibrium, with growth being equally distributed among regions (Krugman, 1991). Starting from these configurations, the economy remains in the same state and is, in macroeconomic terms, at a steady-state. If transportation costs are low and the share of manufacturing expenditure and the absorption of new varieties large, labour mobility among regions leads to concentration in the more advantaged regions, and core-periphery imbalances are formed in a circular causation process (Mossay, 2006). Short-run equilibriums can also be formed, based on the current labour distribution across regions (Mossay, 2006).

The use of transportation costs in the model acknowledges the role of trade in the creation of core-periphery imbalances. Both trading with other nations and among national regions is likely to affect the degree of spatial agglomeration (Schmutzler, 1999; Ohlin, 1933). Spatial agglomeration would also relate to inter-industrial association and the forward and backward linkages among industries (Hirschman, 1963; Hoover, 1948). But trade would also depend on particular physical conditions and barriers and the transportation infrastructure and activity.

Despite the interest expressed in Krugman's 1991 model, scanty empirical evidence has been provided to support these views. The absence of studies empirically confirming at least the main growth conditions prioritised in this model and discussed to cause spatial agglomeration, make its use highly suggestive. Even Krugman himself referred to a picture of growth and agglomeration mostly found at the beginning of the last century, limiting its general predictive value (Krugman, 2010). Hence, the task to empirically confirm this model or at least the factors composing it can be a valid precondition for studying its more general inference and usefulness and provide a focus for new economic geography research. Identifying the statistical significance of the model's factors in the case of a single economy, does not provide, from a geographical perspective, general evidence for all economies, as discussed in Martin (1999). But is a reason to further acknowledge how geography affects the economy, shapes growth agglomeration and the core-periphery imbalances.

Macroeconomic growth is generally discussed to have microeconomic foundations (Janssen, 2006; Hoover, 2008; Da Silva, 2009). Microeconomic models are concerned with the development of micro actors, such as consumers, NGOs or firms. As principal growth actors among others, firms and their growth are the subject of a large variety and heterogeneity of models. Microeconomic modelling is progressively associated with the role of increasing business returns highlighted in microeconomic theory and the need to better assess the role of policies, which reminds of the Lucas critique of macroeconomic analyses (Lucas, 1976). Studies using models of businesses investigate the effects of various factors associating with business growth in terms of size or numbers, business survival, death or their general operation (see in Hart and McGuiness, 2003; Smallbone et al., 1983; Curran and Storey, 1983; Storey, 1983; Vaessen and Keeble, 1995 and many other). Some of these models focus on surviving firms only, while other refer to both surviving and non-surviving firms.

The growth of businesses and SMEs in size terms is subject to various growth factors (Penrose, 1959; Cosh and Hughes, 2003; Hart and McGuiness, 2003) Business growth factors may derive from the business environment, general or specific to firm. They may also be internal to firm or the outcome of interaction between internal and external to firm factors. Internal to firm factors causing business growth are very broad in nature and relate to the role of entrepreneurs, human resources, training, administration and management, the absorption of R&D and many other issues influencing growth. The specific environment surrounding the firm, local or regional, is studied through factors such as those referring to capital availability, human capital and labour resources, infrastructure development or the land and its value (e.g. in Hart and McGuiness, 2003; Curran and Storey, 1983; Vaessen and Keeble, 1995; Cosh and Hughes, 2003). Many factors need to be included in a model to provide higher coefficients of determination, including internal to firm growth causes. Similar studies developing cross-sectional business growth models focus mostly on the significant associations captured in these models and the respective levels of significance, as a way to diagnose which particular factors contribute to business growth, the direction of their association with business growth and to offer a policy prescription (e.g. Bennett and Robson, 2000).

The general expectations in regional studies and economic geography are that firms in central locations and regions will grow faster due to their better access to markets, other businesses, services, high-skilled labour, capital, income resources, information sources,

networks and reduced transactions costs that help them to overcome growth barriers and problems (Friedman and Alonso, 1964). If physical geography acts as a barrier, then it should be removed or turned into a competitive advantage, for example through new infrastructure and transportation projects or investment at the periphery. On the contrary, in theory, businesses in geographically isolated and peripheral areas were expected to face physical barriers and thrive less and, as a result, to seek re-location to central regions. Suffering from information asymmetry, firms in these places need telecommunication, transportation or other infrastructure projects to expand their economic activity and reduce the gap when compared with more central and advanced regions. Low labour costs and wages in peripheral regions can help firms to reduce costs, increase profits and benefit from the use and application of new varieties of products (Combes et al., 2008).

These general expectations are not confirmed in studies testing the effects of various local and regional environments of firm growth. The latter do not present uniform results. For example SMEs in peripheral, disadvantaged regions were found to achieve higher growth rates in comparison to central (Vaessen and Keeble, 1996). Furthermore such outcomes may be subject to particular policy conditions and environments (Hart and McGuiness, 2003).

To conclude, the assessment of core-periphery imbalances can be made by using applied microeconomic analysis that confirms Krugman's 1991 model (or any other new economic geography model tested). Furthermore such assessments are subject to various theoretical expectations, which however may not be necessarily confirmed at the microeconomic level.

2.1 The focus on Greece: An international example of domestic geographical imbalance and its role in affecting the growth of the Greek economy

This study focuses on the growth of a sample of SMEs in Greece, which have survived between 1995 and 2002 and investigates the factors associating with their growth in size terms, in different geographical levels. The focus is given on a period before Greece's entrance at the Euro-zone, in 2002. Inside the common currency area core-periphery imbalances in Greece are likely to be affected (as discussed in Martin, 2001).

Recently the Greek economy has become the focus of considerable international attention. Various discussions have been held concerning its growth prospects and its increasing debt. In the period before joining the Euro-zone in 2002, Greece underwent numerous structural adjustments, such as the reduction of inflation and that of interest rates from more than 20% (in early 1990s) to less than 5% (in early 2000s) and what appeared at the time a steady economic growth rate (O.E.C.D., 2007).

The Greek economy is a peripheral EU economy, such as the economies of Spain, Portugal, Ireland or the Southern Italy. Located far away from EU economic centres, it has been physically isolated by land and its firms suffered from higher transportation costs to EU markets. But the country actually suffers from a double peripherality, not only within the EU but also inside its own territory.

Greece's physical geography is characterised by imbalances in its economic geography, which are difficult to overcome. Some of its regions are more central than others, while the most peripheral regions are physically very isolated. The most peripheral throughout the 1990's are those physically isolated by sea[1] and, in the mainland, those isolated by mountains and the absence of infrastructure. Approximately two-thirds of Greece's physical environment is an archipelago composed of islands, while the main part of the mainland is covered by mountains. This creates a permanent character of physical

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[1] It may take more than a full calendar month to transport labour or products from the islands to the mainland.

peripherality within Greece's territory that, until today, has been difficult for firms to overcome[2]. The same Greek geography imposes significant growth barriers. Economies of scale in the islands are enhanced through tourism, which can create inter-industrial linkages for all islands, taken together. There are almost three hundred populated islands which each add considerable public expenditure required to support education, public health, airports, sea transportation and other public services. The cyclical nature of tourism and economic activity in the islands affects the overall Greek economy, following any periodic interruptions. This is sustained both directly through various jobs in tourism and indirectly, as the labour force from islands moves towards the two main centres, Athens and Thessaloniki, seeking for permanent or part-time jobs during the non-touristic seasons.

On the mainland, business and economic growth is restricted by accessibility barriers and concentrated in some specific areas. The western region of Greece, Ipiros, is one of the most peripheral at the EU. For centuries it has lacked the necessary infrastructure to be accessed by land or sea and only remained partially integrated in the road and train infrastructure developed in the country at the north-south axis.

This peculiar physical environment has contributed strongly to the location of economic activity at the coastal zone, providing multiple equilibriums for minimising trade and business costs from cities to more than 100 main islands/destinations. Similarly, Greece's international trade and the related shipping activity has affected the location of cities-ports by the coastal zone, especially in what is known as the S-axis[3], where two-thirds of economic activity is located. Climatic conditions, especially in the summer season, also strongly affect economic activity and reinforce its location close to the coastal zone. Overall Greece's economic and physical geography pose various barriers to growth and substantially increase transportation costs, bringing insufficient economies of scale and limiting growth.

Various studies of the Greek economy that take a macroeconomic perspective highlight the presence of geographical imbalances in the period before Greece's entrance at the Euro-zone, referring to a geographical dualism between the North and the South (Asteriou et al., 2002; Tsionas, 2002; Siriopoulos and Asteriou, 1996). However the Greek regional convergence/divergence literature is not clear about the presence of substantial core-periphery imbalances, despite the fact that more than half of the population lives and commutes in the two main centres, in Attiki and Kentriki Makedonia, where the cities of Athens and Thessaloniki and the majority of economic activity are located (see for example the views held by Asteriou et al., 2002; Tsionas, 2002; Siriopoulos and Asteriou, 1996; Benos and Karagiannis, 2008). On the contrary, some studies -even from earlier periods- appear to suggest the presence of regional convergence or limited divergence (Michelis et al, 2004; Benos and Karagiannis, 2008). Beyond the macroeconomic perspective, the growth of Greek firms is discussed to relate to their investment patterns and their performance to be higher in central locations, in Athens and Thessaloniki (Fillipaios and Kottaridi, 2004) and subject to locational choices (Liargovas and Skandalis, 2008). EU regional policy assistance appears to affect new plant formation by changing the wider economic environment and boosting economic development. The location of manufacturing firms relates to market size, advanced infrastructure, human capital, labour cost and spatial proximity (Filippaios and Kottaridi, 2004). Hence, an interesting theoretical and empirical direction lies in investigating the presence of core-periphery imbalances in Greece from a microeconomic perspective and the factors associated to it.

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[2] As an indicative index of the particularity of Greece's geographical environment, the length of the coastal zone is comparable to that of the rest of the EU.

[3] From Thessaloniki to Patras all along the coastal zone that seems to create an S-axis. Most recent developments in road infrastructure attempts to overcome this problem by reducing the degree of peripherality in a way that changes the latin S to the Greek sigma (Σ-axis), to a certain extent (Skayannis, 2009).

2.2 The selection of the sample

This study focuses on business and SME growth in the 1994-2002 period, in different industries and regions of Greece. The sample was selected from the 1995 Greek V.A.T. database and the firms in the sample have been traced through the same database, in 2002. The Greek V.A.T. database is the largest Greek business database and the most accurate approximation of the business population.

A simple scale of centrality was created for the country's general core-periphery pattern by categorising regions from more central to more peripheral. Such rankings can be based on GDP per capita or other regional economic indexes. But the present study has made use of a broader composite ranking index, by using of several economic variables. Similar rankings for the Greek regions are found in other studies (Petrakos and Psycharis, 2004). This method was used to select four out of the thirteen Greek regions: two central Greek regions, Attiki and Kentriki Makedonia (where the capital, Athens, and the "capital" of the north, Thessaloniki, are located respectively), a region of moderate peripherality, Thessaly and the most peripheral region in Greece and one of the most peripheral in the EU at the time, Ipiros, located at the North-West of Greece. Hence the sample of firms was spread randomly across different regions, a method which is followed in other circumstances (e.g. Cosh and Hughes, 2003) to avoid reaching conclusions only on central areas, because of the relatively very large size of business population in the most central areas. In this research, the sample was limited geographically to the Greek mainland, given the strong geographical imbalances in the islands and the bias towards firms of certain activities (e.g. in maritime activities), smaller sizes and high transportation costs. The choice of regions removes the problem of spatial autocorrelation, as business growth is studied in regions distant to each other, of different levels of centrality.

The sample was limited to five industries: construction, manufacturing, tourism, trade, and services. These are dynamic industries of the Greek economy and belong to the two main sectors of production, manufacturing and services that represented approximately 90% of the Greek GDP in the late 1990s. The construction and manufacturing industries are comprised in the secondary (manufacturing) sector whose importance is high in the Greek economy.

As in Krugman's 1991 model, the sample comprises two main sectors and is drawn from four regions of different peripherality, two of which are central and the rest can be seen as non-central. The spatial configuration is that of core-periphery imbalances that already appears in the Greek territory (more than half of the population lives in the regions of Attiki and Kentriki Makedonia) and, following Krugman's (1991) model the factors causing this configuration should relate to transportation costs, economies of scale and the role of manufacturing production in the total expenditure. Such factors should be found to be significant for the growth of SMEs.

A stratified simple random sampling method was used, with quotas for the regions and industries selected. First, stratification was made for the employment variable only, using employment bands provided by the Statistical Services of Greece (EL.STAT). Only firms of initial employment size from 5 to 200 employees were selected. Employment thresholds were in agreement with the E.U. definition of SMEs and the pattern of employment size distribution found in the Greek economy, skewed to lower employment bands. Turnover thresholds were more than €0.15M and less than €50M, again in agreement both with the E.U. definition of SMEs and the pattern of turnover size distribution in Greece (2003/361/EC).

The number of firms calculated in each employment band was allocated to the preselected four regions and five industries. The allocation of the sample to the regions was made using the regional variance provided by EL.STAT. Each region and each industry had to contain a minimum of 50 firms, sufficient for econometric purposes (as discussed in

Barkham et al., 1996). This threshold is important for reaching conclusions at the regional level concerning business growth.

Simple random sampling was used to select each combination of employment band, region and industry. Overall, simple random sampling was undertaken for a total of one hundred combinations of employment, regions and industries. Quotas for the regions and industries were imposed to ensure that, in every region, a sufficient proportion of firms was allocated, as in the national population.

Overall 1,380 firms were identified for 1995 and were traced until the final year of the research, 2002. Those among them having a zero size in 2002 both for employment and turnover, were considered as inactive, having ceased operation and removed from the sample. Firms containing either final zero turnover or final zero employment were contacted to double-check the validity of their size values and, on several occasions, to correct it[4].

A total of 1,089 firms was finally selected, which, successfully passed the non-parametric tests, and they were found to be representative of both the full sample of 1,380 firms and the Greek business population. Representation was found for employment bands, regions and industries.

Further data correction was undertaken to ensure the robustness of results. As there was a limited extension of information on mergers and acquisitions in the Greek economy in the study period, all firms were assumed to be proper firms[5]. Data on employment in the construction industry for the final study year (2002) revealed the presence of partnerships (double-checked with information on legal status). Having removed the majority that had a zero value both in their final employment and final turnover, the remainder (only one quarter) were assumed to act as firms, given also that existing studies on SMEs in the construction industry at the study period had provided evidence of their underperformance. Firm relocation was assumed not to take place, given the very limited number of firms relocating from one region to another and the principal significance of the initial regional environment for taking such a growth-oriented decision . Hence only changes of the initial regional environment were tested upon firm growth.

Information contained in the sample was used to create variables (of size, industry and region) that were introduced as categorical and further broken down into several dummy variables. Initial employment size dummies were used to differentiate among micro, small and medium firms. The local and regional dummies were used to associate the sample with selected proxy-variables for the local and regional environment, using the regional and local accounts, available from the EL.STAT. (enlisted in **Table 1**). These variables, reflecting a variety of changes in economic factors at the local and regional level, such as financial capital and savings, population, labour, infrastructure and land, were grouped under the following headings: capital, labour, land, industrial infrastructure for services and manufacturing-based variables.

The role of the geographical environment was introduced both by the use of regional and local dummies and by their association with regional and local variables. Further to these geographical variables, the distance of firms from Athens (DIST) was also added, as a numerical variable, based on road distance data.

The particular role of manufacturing firms was tested through the respective variables on manufacturing sales, manufacturing value added and manufacturing investments of SMEs and

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[4] The correction was based on additional information provided by EL.STAT with respect to the law on confidentiality. Managers and accountants of the firms' contacted have traced data in their officially declared V.A.T. documents, using, in practice, the same source of information as that used in the V.A.T. database.
[5] It is mainly in the following years that mergers and acquisitions were intensified in the Greek economy.

larger firms, which are more likely to achieve economies of scale (MANFSMLSAL, MANFSMLINV and MANFSMLVA). The number of manufacturing firms was also introduced (MANFSML).

Table 1: The variables used in the study

CATEGORY	LEVEL	NAMES of PROXIES USED	DESCRIPTION
REGION	**BUSINESS**	REG1_95	REGION1 – MOST CENTRAL REGION, ATTIKI
		REG2_95	REGION2 - CENTRAL REGION, KENTRIKI MAKEDONIA
		REG3_95	REGION3 - MIDDLE PERIPHERAL, THESSALIA
		REG4_95	REGION4 - PERIPHERAL REGION, IPIROS
INDUSTRY	**BUSINESS**	IND1_95	INDUSTRY1 - CONSTRUCTION
		IND2_95	INDUSTRY2 – MANUFACTURING
		IND3_95	INDUSTRY3 – SERVICES
		IND4_95	INDUSTRY4 - TOURISM
		IND5_95	INDUSTRY5 – TRADE
INITIAL SIZE	**BUSINESS**	MICRO95	Initial micro size
		SMALL95	Initial small size
		MEDIUM95	Initial medium size
LABOUR	**REGION**	ACTIVE	Changes in activity rates, 1991-2001
	LOCAL	POPDENS_9401	Changes in population density, 1994-2001
LAND	**LOCAL**	PRHSINV_9401	Changes in private investment in housing, 1994-2001
MANUFACTURING	**LOCAL**	MANFSML_9401	Change in the number of SMEs and large manufacturing firms (more than 10 employees), 1994-2001
		MANFSMLINV_9401	Change in manufacturing SME and large firms investment, 1994-2001
		MANFSMLVA_9401	Change in manufacturing SME and large firms value added, 1994-2001
		MANFSMLSAL_9401	Change in manufacturing SME and large firms sales, 1994-2001
CAPITAL	**LOCAL**	SAVINGS_9400	Change in savings, 1994-2000
		INCDECL_9401	Change in declared income, 1994-2001
		INDTAX_9401	Change in indirect taxes, 1994-2001
		DIRTAX_9401	Change in direct taxes, 1994-2001
		TAXPAY_9401	Change in the number of tax payers, 1994-2001
INDUSTRIAL INFRASTRUCTURE (for services)	**LOCAL**	HOTELBED_9401	Change in the number of hotel beds, 1994-2001
DISTANCE	**BUSINESS**	DIST	Distance from the centre of Athens (km)
POLICY STATUS	**BUSINESS**	POLSTAT	Policy support status (dummy)

The role of policy is introduced in two ways. As Greek state policies are scheduled and applied within the context of EU Cohesion Policy, the latter is automatically integrated into

the study. Hence, local and regional level growth factors are the outcome of changes brought by the EU Cohesion Policy. To better clarify policy influences, the study of policy support at the firm level is introduced. The sample was matched with the largest dataset on policy supports from EU Regional Policy, available from the Greek Ministry of Finance. Overall, 315 firms were found to match the sample, a reasonable proportion, which was sufficient to draw conclusions on the effects of policy on SME growth and found to be representative of the overall policy dataset used. A dummy variable was introduced on the policy status of firms (POLSTAT), taking positive values for those SMEs in the sample that have received support.

Other variables from the local and regional environment were included and tested in the model and found not to be significant. These are some industrial proxies, education variables, variables-proxies for the financial activity status and unemployment status and are presented in **Table 1, Appendix**.

Business and SME growth is measured as a change of employment size over the study period. The study focuses on surviving firms only, in practice emphasizing the question of growth (more intensified in surviving firms).

3. ANALYSIS

3.1. Developing the growth models

The growth outliers were identified and removed, before models were built for the sample without outliers. Removing outliers is a standard practice in statistical analysis. Tracing the growth outliers was considered necessary in order to isolate the study of firms only to those more regular growth and was made with the help of the scattergram of employment and turnover growth (**Diagram 1**). Firms were ranked in terms of their employment growth and those with extreme increases or decreases in employment were removed. Similarly this was done for turnover growth outliers, taking into account that growth outliers overall should be a reasonable proportion of the full sample. Overall, 66 growth outliers were removed, reducing the sample to 1,023 firms.
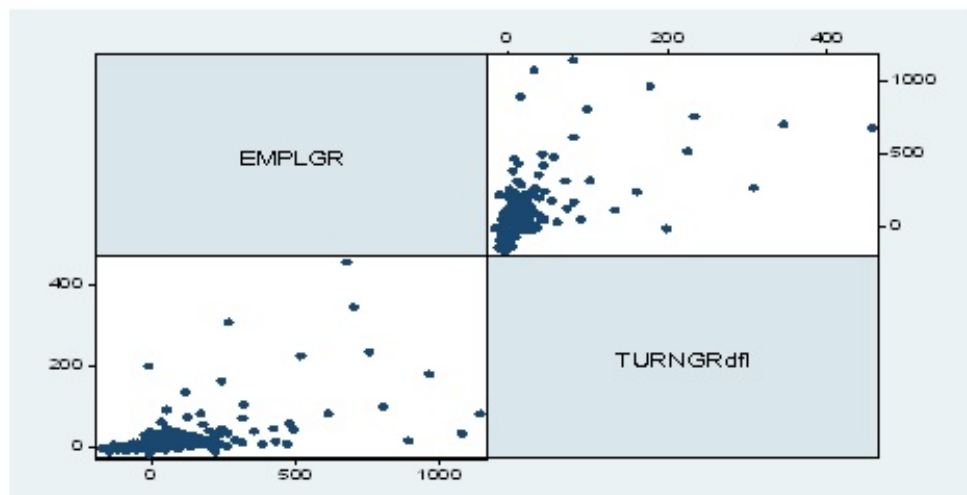
Diagram 1: Scattergram of employment growth and turnover growth for the full sample (1089 firms)

Notes: 1. Employment growth is measured as employees and turnover growth in M€.
2. Turnover values are deflated (TURNGRdfl)

As in related works (e.g. in Hart and McGuiness, 2004) SME growth modelling followed a consecutive reiteration method. First all explanatory variables are introduced in the model and then, the most significant among them (at the highest level of significance, $p \leq 0.001$), are selected and re-introduced. All variables, apart from one exception, are found to be significantly associated with SME growth at a very high level of significance. This method limits multi-collinearity and allows including numerous explanatory variables. Only highly significant associations are included in the final model. The use of logarithmic models (as in Hart and McGuiness, 2004) was preferred, to reduce the levels of heteroscedasticity. Modelling results are presented in **Table 2**.

Table 2: Model of logarithmic SME employment growth in Greece
(for the sample 1023 firms without outliers)

	LogEMPLGR
Model F-value	6.49
	(16, 927)
REG2_95	0.842***
IND1_95	-0.073**
MEDIUM95	-0.2***
POPDENS	-0.53***
PRHSINV	0.008***
HOTELBEDS	-0.001***
INCDECL	0.004***
INDTAX	0.012***
DIRTAX	-0.023***
TAXPAY	-0.001***
MANFSMLINV	0.000***
MANFSML	-1.672***
MANFSMLVA	-0.001**
MANFSMLSAL	-0.001***
DIST	-0.001***
POLSTAT	0.109***
Cons	-4.467*
R-square	0.1008
Adj R-square	0.0853
N	944
Degrees of Freedom (df)	
Model df	16
Residual df	927
Total df	943

Note: *, ** and *** indicate significance at the 90%, 95% and 99% level respectively

SME growth was found to associate with the central region of Kentriki Makedonia (REG2) and the distance from Athens (DIST). The latter is a negative association. Both associations highlight the significance of central locations on SME growth and the centripetal forces exercised on SMEs. The model also provides evidence on the association of SME growth with numerous variables at the geographical level: population density (POPDENS), private housing investments (PRHSINV), the number of hotel beds (HOTELBEDS), declared income (INCDECL), direct and indirect taxes (INDTAX and DIRTAX), the number of taxpayers (TAXPAY), investment, value-added and sales of firms in the manufacturing industry

(MANFSMLINV, MANFSMLVA, MANFSMLSAL) as well as the number of large-sized manufacturing firms (MANFSML).

Since all these geographical variables were used as proxies for capital, labour, land, infrastructure and the manufacturing industry variables, their role for SME growth is highlighted. For example the negative highly significant association with the construction industry (IND1) and the significant associations with numerous proxies for manufacturing relate to the role of the manufacturing (secondary) sector on SME growth.

The general form of the model can be expressed with the function:

SME Growth = f (centrality, capital, labour, Policy Status,
land, infrastructure, manufacturing sector, size)

The last four variables, namely land, infrastructure, manufacturing sector and the size of firms all related to firms' locational choices. The significant association of SME growth with land prices (PRHSINV) reveals the role of land. The significant association with SME growth highlights the role of firm sizes and that of their economies of scale. The proxy for industrial infrastructure in tourism (HOTELBEDS) is a part of the regional capital.

Manufacturing variables-proxies are found to negatively associate, revealing the negative association of sizes, value added and number of manufacturing firms with business and SME growth. The latter should relate with limitation in sizes, value added and number of firms in manufacturing and a reduced capacity to deliver growth.

The variables-proxies for distance (for transportation costs), size (for economies of scale) and the variables of manufacturing (for share in manufacturing) were all found to significantly associate with SME growth. Therefore, it can be argued that the final microeconomic model of SME growth for surviving firms between 1995 and 2002 in Greece reveals the significance of the variables that are discussed in Krugman (1991). In that respect it confirms the presence of a core-periphery configuration at the national level, empirically confirming the significance laid on Krugman's model for the growth of firms and SMEs.

The association with central areas (seen at the significance and sign of the variables REG2 and DIST) emphasises the association of SME growth with central Greek regions rather than with the periphery, strengthening the picture of the significance of centrality. What is more, the model contains significant variables for regional and local capital and labour. Hence, in its original functional form of the model incorporates the two main factors discussed in neoclassical growth theory:

SME growth = f (capital, labour)

A conclusion therefore can be reached that business and SME growth in Greece, in the period under study was a function not only of capital and labour, as in the neoclassic-type function, but also of the conditions discussed by Krugman (1991), the land, the policies implemented and the industrial infrastructure.

The empirically produced model was found to hold for surviving firms only and the model provided (with low levels of R-square) cannot be used for predictive but rather for suggestive purposes, while reference needs to be made on the particular policy environment promoting changes at the local and regional level, through EU Cohesion Policy and the business supports.

4. DISCUSSION AND MORE GENERAL CONCLUSIONS

This study has developed a model that shows which factors from the geographical and internal environment of the Greek SMEs significantly associate with their growth, in the 1995-2002 period. The findings have revealed a model that is, in its initial form, neoclassical and contains proxy-variables for both capital and labour. The model also contains significant proxies for the factors discussed in Krugman (1991): transportation costs, economies of scale and numerous proxies for the manufacturing industry. Furthermore, it reveals the significance of land prices, centrality and policy support.

Given the sample's representativeness of the Greek business population and the representativeness of all levels of centrality, the model gains a more general value. Results can be suggested to hold at the national level, highlighting the importance of the particular factors in the geographical Greek environment and their changes for SME growth, at the study-period.

Krugman's initial model in new economic geography (Krugman, 1991) that reveals a core-periphery pattern is further strengthened by the association found with capital and labour (discussed in neoclassical and classical economics) and the significance of the land (discussed in the classics and the economic geography studies). The present model bridges the neoclassical view with that on growth agglomeration in space. While neoclassical theory hypothesis is that capital and labour movements bring business growth at the national and non-national (regional or local) level, such business growth also agglomerates in space. This process associates to the geographical environment and to land values. The results do not seem to be a surprising outcome, due to the intensity of Greece's geographical imbalances, especially core-periphery imbalances that create imperfect markets and information asymmetries.

Important policy concerns are raised from the empirical validation of a Krugman's model. The first is whether geographically disadvantaged, peripheral EU regions are capable to avert their expected demise as peripheral regions. A limited level of manufacturing production, higher transportation costs, a less adequate infrastructure in many respects and the lower economies of scale are likely to enhance the causes of Greece's peripherality at the EU level and the spatial configuration of its domestic core-periphery imbalances.

Furthermore, the EU 2020 strategy should promote peripheral European growth by investing in manufacturing industries, in ways that could unlock growth potential across industries. On the basis of manufacturing development, a progressive integration of other industries can take place through an achieved enhanced inter-regional and intra-regional mobility of capital and labour. This could help to reach the aim to better exploit and use regional resources. In the Greek case study that suffers from a double peripherality, the conclusion reached relates to the basic economic wisdom hitherto addressed for a long period in regional studies and economic geography on the need to better spread manufacturing across the EU.

The present text has taken a microeconomic view on growth, by focusing on SME growth in representative Greek regions. While providing a consistent account of Krugman's model (1991), it also revealed a realistic problem for the sustaining of core-periphery patterns in Greece, by testing indirectly the role of factors discussed in economic theory.

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Appendix

Table 1, Appendix: List of variables not significantly associating with business and SME growth in the model

CATEGORY	LEVEL	NAMES of PROXIES USED	DESCRIPTION
LEGAL STATUS	**BUSINESS**	LGST1_95	Unlimited liability firms
	BUSINESS	LGST2_95	Mixed liability firms
	BUSINESS	LGST3_95	Limited liability firms
	BUSINESS	LGST4_95	Sole traders
	BUSINESS	LGST5_95	Other legal statuses
EDUCATION	**REGION**	HTE	Changes in Higher technical education1991-2001
	REGION	HvcE	Changes in higher vocational education1991-2001
	REGION	UnE	Changes in university-level education1991-2001
	REGION	SE	Changes in secondary-level education1991-2001
	REGION	CmplSE	Changes in Compulsory secondary Education, 1991-2001
	REGION	IL	Change of Illiteracy, 1991-2001
FINANCIAL ACTIVITY STATUS	**REGION**	FINACT	Change of financial activity, 1991-2001
	REGION	ACTIVE	Change of Activity rates, 1991-2001
	REGION	SelfEMPL	Change of self-employment per 100 inhabitants, 1991 – 2001
	REGION	SalEMPL	Change of salaried employment, 1991-2001
	REGION	SelfEMPLMNF	Change of self-employment in manufacturing 1991-2001
EMPLOYMENT	**REGION**	UNEMPL	Change in unemployment, 1991-2001
INDUSTRIAL INFRASTRUCTURE (for services)	**LOCAL**	TELLINES_9400, _9401	Change of telephone lines per100 inhabitants, 1994 – 2000