Regional Development Incentives and their Influence on the Location Decisions of Industrial Firms in Greece: An ordinal regression analysis

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Abstract

This empirical research investigates the determinants of industrial firms' location decisions in Greece. We adopted the prefectures (NUT III) as a unit of analysis in order to use ample social, economic, infrastructure and institutional indicators as the major explanatory variables. Based on relevant data on industrial investment through the Developmental Act *1892/90* for the period from 1991 to 1998 we set up an ordinal regression model for estimating the influence of selective firm relocation factors. The results indicate that population-related variables and indicators of infrastructure had a strong influence on location behaviour of industrial firms during the '90s in Greece

Keywords: Regional development, Incentives, Industrial Firms, Location decisions, ordinal regression.

1. Introduction

The provision of business incentives has long been one of the mainstays of economic development policy at the national level worldwide. Most developed and a lot of developing countries seek their economic growth by establishing economic development incentives aimed at reinforcing private investments. At the same time, regional development and regional inequalities are two important, yet close-related, areas of government policy. The expressed view for reducing regional inequalities has led policymakers to the design and application of different incentives for particular regions even within the borders of a country. Depending on the observed distribution of regional inequalities over geographical space these incentives are set to encourage new firms to locate or existing ones to relocate. State's economic development funding, which is targeted at distressed areas, is believed to influence the overall potential of a region to attract private investments (Rietveld, 1989). In turn, the quantity and quality of applied private investments are of crucial importance for creating favourable conditions of future regional development. Generally speaking, private investment can boost regional economic growth, increase employment and raise prosperity level (Cuadrado-Roura, 2001, Demurger, 2001, Pavlinek, 2004, Messis et al., 2006). In a changing global environment, as well as in a rapidly transformed domestic context, it is widely accepted that the higher the private investment applied on a region, the better the prospects for achieving development in the future in that region.

In Europe, spatial allocation of investment is of major importance to local, national and European policy makers who aim at assisting development processes in less developed European regions (Filippaios and Kottaridi, 2004). Thus, public authorities design and provide particular incentives in order to influence firms' location decisions. Generally speaking, it has been argued that measures seeking to encourage greater competition across Europe, such as the removal of barriers to trade as well as certain proposals for increasing mobility of capital and labour, will ultimately lead to greater efficiency in the allocation of goods and services and to a higher level of development. However, the infusion of competitive power associated with greater liberalisation could lead to the exacerbation of existing disparities between the rich and poor regions within the

EC (Moore et al., 1991). In this context the European Commission has sanctioned a large expansion in the level of resources devoted to assisting the process of structural reform across the member states of the EC.

Greece represents a particular case, being the most peripheral country in Europe. The regional inequalities intensified greatly during the first three post-war decades. Recent studies refer to a slight tendency towards a reduction in inequalities in a prefecture level (Petrakos and Saratsis, 2000). Parallel to the enhanced European Community Support Framework and Cohesion Funds (CF), the state itself have been providing investment motives to firms by means of developmental laws. However, the issue of unequal spatial distribution of income, economic opportunities and activities between the prefectures persists. In fact, this situation continues to be a significant economic as well as political issue. Although, the average level of development has increased, a number of prefectures have, apparently, failed to keep up with in the circuit of growth. They present stagnant or even declining socioeconomic indicators. Nevertheless, it seems that more needs to be done in order to improve the effectiveness of the applied economic development policy.

Amongst the critical factors that influence the size of regional inequalities is the spatial allocation of industrial activity. Firms and industrial activity in general tend to be spatially concentrated in certain regions creating clusters. These industrial clusters are seen as one of the main reasons for economic growth (Saxenian, 1996) and they have received much attention in economic research in the last decade (Gordon and McCann, 2000, Amin, 1999). How and why regions differ in terms of the concentration of industrial activity is a crucial question which may not have a simple answer applicable to all countries and regions of the world. Nevertheless, analyzing the spatial allocation of industrial activity can provide useful insights and lead to a detailed understanding of the allocation process. This understanding then can assist policymakers to plan and put in action more effective regional development policies.

In a previous work by Polyzos and Petrakos (2000), there were evaluated the major driving forces influencing firms' location decisions in Greece in all economic sectors by means of a multiple linear regression model. The model made not distinction between the different economic sectors. Instead, it dealt with the regional investments at an aggregate level considering together the investments in all sectors of the regional economies. We believe that a sectoral approach to the analysis of investments could refine the driving forces of firms' location decisions and make clearer which location factors are more crucial for the firms of the primary, secondary and tertiary sectors. Therefore, in this present work we deal with the analysis of likely driving factors for the location of industrial firms in Greece at the prefectural level.

In doing so, we focus on the private investments in the secondary sector. In particular, this work concentrates on identifying the relative importance which the companies give to various forms of regional policy assistance. We take a quantitative approach for estimating the direction and strength of the relationship between the various location factors and the rate of investment in the secondary sector. For this reason we propose an ordinal regression model. Statistically speaking, this type of model requires less strict assumptions than the linear regression one. It also provides several alternatives link functions for depicting the probabilities of the dependent variable subject to the distribution of the values of the dependent.

Following this introduction, the paper is divided into five sections. It begins in section 2 by reviewing the major theoretical approaches to the location behaviour of industrial firms. Section 3 deals with the definition and the description of location factors that we use in the analysis. It also provides the necessary information on the kind of data together with their sources that we use in the empirical model. Following, section 4 is devoted to the description of the proposed empirical model. In section 5 we present and analyze the results of the model estimations. The final section highlights issues for further discussion.

2. Theoretical approaches to location decisions of industrial firms

Socio-political, demographic, institutional and most of all economic factors interact in various combinations and drive most of the industrial firms location decisions. The investigation and comprehension of the major influential factors of deciding where to establish a firm or a productive activity in general, have long been the focus of considerable research in the context of new economic geography (Fujita et al., 1999, Gordon and McCann, 2000, Saxenian, 1996). The role of theories of location decisions in the study of this particular subject has been extremely helpful to various analytical tasks that attempt to understand and explain the observed economic reality. The indication of conceptual and operational expressions of firms' spatial distribution is tightly connected to location determinants and the relationships between them. Therefore, any quantitative investigation of location factors has an additional interest in that it provides the opportunity for evaluating regional policies both in ex-post and in ex-ante level. In this way, the quantitative investigation suggests appropriate explanatory schemata for understanding and interpreting the empirical evidence.

In most of the traditional location decision theoretical approaches, distance or alternatively transportation cost plays a decisive role in the whole process of locating a firm. However, the actual influence of distance has become increasingly enigmatic nowadays. In some cases, distance is a major location factor for businesses whereas in some other cases different factors and considerations outperform the real influence of distance. As Hoover and Giarratani (1999) point out, business locations display a great deal of inertia due to the costs involved in moving or even in considering moving and therefore even if some other location promises a higher return, the apparent advantage may disappear as soon as the relocation costs are considered. Since the influential work of von Thünen on the significance of distance to the spatial allocation of different crop types in the agricultural sector (Minetos and Polyzos, 2007) as well as the classical Weberian model on the influence of transportation and production factor costs on the location of production facilities in the industrial sector, several theoretical schemata have brought along varying location factors. Losch's and the Christaller's central place theory emphasized the importance of market size (Polyzos et al., 2007). This theory carries the assumptions that population and resources are uniformly distributed over a homogeneous plane, firms have free entry into the market, all firms have constant returns to scale, and perfect competition exists. Since this model proposes that firms locate in such a way as to maximize profits, production factors and transportation costs represent the key elements for understanding location patterns.

Following the emergence of multinational corporations in the mid-1960s, the interest of urban and regional economics started to move away from the economic determinism of profit maximization, towards new directions. There has been a growing interest in understanding the dynamics of the spatial dimensions of the businesses location phenomenon. For example, economic developments or changes in the environment of a particular firm may require or cause the firm to relocate. This implies that location choices are dependent, at least to some extent, on choices made in the past and choices made by other firms as well as public economic decisions (Meuboom and Voordijk, 2003).

Following the decade of '70, alternative theories of industrial location emerged that emphasized on the importance of spatial diffusion and consideration of political and social interactions. Moreover, they noted that the basic patterns of industry location could be processes endogenous to capitalist industrialization, contrarily to the neoclassical theories, in which firm location occurs more or less as a response to economic conditions in a region (Storper and Walker, 1989).

Krugman (1991) points out that central place theory is more of a geometrical accomplishment than one of economics. The importance and decisive role of transportation costs along with imperfect competition, market size and economies of scale in explaining the location of industry are all included in recent new economic geography models (Krugman, 1991). According to Krugman (1995), the general lack of formalization is one of the primary reasons for the inability of central place theory to garner broad attention within economics. As an alternative, Krugman suggests as likely explanations to firm location decisions: (a) the notion of social physics that is helpful in constructing economic relationships analogous to the observed laws of physics (e.g. the gravity model), (b) the suggested by Myrdal cumulative causation circular relationship, whereby a region attracts firms whose presence attracts other firms, who attract still other firms, and so on, (c) the positive local externalities reinforce the concentration of production providing insights into optimum city size and (d) the von Thünen's model explains "centrifugal" forces quite well, assuming a decrease of land values as one moves away from an urban centre, but it has little explanatory power with respect to the existence of economic centres (Krugman, 1995).

While theoretical endeavour of industrial location processes can be traced back to the establishment of industrialization, the theoretical schemata have often their limitations in unravelling practical location decision problems. Much of the contemporary research on industrial location suggests that the actual spatial distribution of firms does not always follow the prevailing theoretical suggestions. There are often significant differences between expected and observed industrial patterns. In some respects, this is because most of the existing industrial location theories provide understanding of only a portion of the empirical world. Therefore, they can be used for conceptualizing reality as well as providing guidance to an appreciation of the future industrial patterns but the actual future industrial topography remains to be seen. Complex multi-scale driving factors which are difficult to be introduced within a single theory, influence the spatial distribution of economic activities. Agglomeration economies, positive and negative externalities, new forms of territorial centralization of top-level management and control functions, deregulation and state intervention, all have an effect on the geography of enterprises. Combined action of such diverse location factors results in an extremely complex environment. In addition, economic reality puts continuously forward new location factors, while the heterogeneous kinds of economic relations perplex even more the allocation issue making it difficult for a single theory to be universal in its application (Polyzos and Petrakos, 2000).

Recently, researchers developed location choice models by using mathematical programming (Canel and Khumawala, 1996, Katayama, 1999). Based on the tradition of Weber's work, these models estimate the best location for firms by using all spatial differences between locations in terms of costs. All firms have a non-competitive nature in the sense that a firm does not react to the location decisions of rival firms, and that sales forecasts are exogenously imposed. Moreover, they mainly concentrate on the *where* aspect, paying little attention to *why* issues apart from the cost minimisation (Meuboom and Voordijk, 2003). Given the need for understanding and explaining industrial locational behaviour, the literature contains a considerable number and variety of location decision models. They differ in the types of the location factors that can take into account, the spatial scale of investigation and that spatiotemporal level of analysis. Therefore, the industrial location modelling literature contains several groups of models which are suitable for different foci of analysis.

3. The major location factors of industrial firms in Greece

3.1 Dependent and independent variables of the empirical model

The main objective of this article is to uncover the major influential factors of firms' location decisions in Greece for the period from 1991 to 1998. In addition, we attempt to identify the relative importance which the companies have given to regional policy incentives set by the National Development Law L.1892/90. Although there have already been contacted a lot of studies on at least some aspects of company locational behaviour there are still many gaps remaining in the state of current knowledge. One such gap is the lack of knowledge as to the relative importance of well-established location factors in the industrial sector (Moore et al., 1991). In addition, the location factors and their relative importance for firms present significant temporal variations and also differ between countries.

Based on a literature review, we introduced some selective socioeconomic variables into our analyses. For estimating the influence of each driving factor on industrial location decisions we employ an empirical model that includes most of these location factors. The model summarises the strength of the relationships between the location factors on the one hand and the private investments in the industrial sector on the other hand. Therefore, it allows us to identify the relative influence of each factor in the formulation of total «attractiveness» of each region. Model formulation involves selecting the type of mathematical model to fit to the data. We choose to use of a statistical model of ordinal regression for reasons that are explained shortly. Underneath, we give a detailed description of the factors chosen to construct the model.

Table 1: Description of the variables used in the ordinal regression model

	Variables	Description	Data Sources
Dependent Variable			
INV	Investment in Industry	Total amount of money invested in new industrial enterprises for the period 1991-1998	(Ministry of Economy and Finance, 2000)
Independent Variables			
IPP	Indirect Population Potential	The accessibility of each prefecture to the rest of the prefectures	(Ministry of Economy and Finance, 1993); (NSSG, 1993)
DPP	Direct Population Potential	The self- potential	(Ministry of Economy and Finance, 1993); (NSSG, 1993)
HUM	Human Capital	Population change, urban concentrations, hypsographic distribution, population age structure, educational level	(NSSG, 1993); (NSSG, 1998)
HIER	Administrative Hierarchy	The position of the capital city of each prefecture in country's administrative hierarchy	(Ministry of Interior, 1996)
AREA	Industrial Areas	Organized industrial sites	(Ministry of Development, 2004)
AIR	Airport	The presence or absence of "airport" facilities	(NSSG, 2001); (Ministry of Economy and Finance, 1993)
PORT	Port	The presence or absence of "port" facilities	(NSSG, 2001); (Ministry of Economy and Finance, 1993)
MOT	The Developmental Incentives or Motives	Zones of incentives according to the developmental Act L.1892/1990	(Ministry of Economy and Finance, 1999)
SPEC	Specialisation in the Secondary Sector	The degree of specialization of the regional economy in the secondary sector	(NSSG, 2000); (NSSG, 2001); (Epilogi, 1998)
PROD	Regional Productive Dynamism	A complex factor depicting developments in employment, level of production & productive structure of the local economy.	(Epilogi, 1998)

Dependent variable (INV)

The dependent variable represents the amount of money invested in new industrial enterprises for the period from 1991 to 1998 in each Greek prefecture (NUTS III). For fitting the variable to the ordinal model we treated it as a categorical one measured at the ordinal scale rather than a continuous one. The prefectures were classified according to the total investments on new industrial activities into four categories. These were the following:

- Category 1: Low investments in new industrial firms (≤ 110 million drachmas).
- Category 2: Medium investment in new industrial firms (110 – 199 million drachmas).
- Category 3: Medium investment in new industrial firms (200 – 399 million drachmas).
- Category 4: Very High investment in new industrial firms (400+ million drachmas).

Independent variables

A total of 10 variables describing economic, social and physical characteristics were employed for the empirical analysis. As a referencing unit for statistical analysis it was used the prefectural administrative level which corresponds to NUTS III level of Eurostat. The selection of the variables relied on the relative availability of data and a literature review on location factors. The variables are described underneath.

- **Regional Indirect and Direct Economic or Population potential (IPP) + (DPP)**
  Regional indirect population potential constitutes a measure of the volume of economic activities that a particular region can access. It is a function of (a) the volume of established and developing economic activities M_s to some other regions *s* $(s=1, .., n)$, with which the particular region *r* under investigation is connected to and trades, and (b) the interregional distances or «friction» d_{rs}. Therefore, this indicator measures the actual influence of both transportation distances (a factor that has been dealt with by most of the regional development theoretical approaches) and population size to the location decisions of firm. This is called indirect population potential (IPP_r) and for each particular region *r* can be estimated by the following mathematical formula (Clark et al., 1969, Keeble et al., 1982):

$$\mathrm{IPP}_r=\sum_{s=1}^{n} M_s(d_{rs}^{-a}) \qquad (1)$$

where:

IPP_r	=	The indirect population potential of region *r*.
M_s	=	The economic activities of region *s*, where $s=1,\ldots,50$ (fifty is the number of Greek prefectures minus the perfedcture under investigation).
d_{rs}	=	A measure of the distances between region *r* and regions *s*.
α	=	The superscript α is a measure of distance «friction».

For the purpose of the present study we estimate the «friction» of distance by using time-distances between the mainland Greek prefectures. The value of the alpha (α) term lies between *1.5* and *2.5* or *1.0* and *2.0* (Polyzos and Petrakos, 2000). An increase in the value of the alpha exponent indicates that the influence of distance decreases. For large values of alpha, indirect population potential tends to zero. In our model we assume that $\alpha=1.5$. As regards the term M_s, it can be used the size of population of each prefecture or the mean *GDP* of the prefecture for a period of five years. Differences of using either population size or mean *GDP* are negligible, so in this study we use population size.

Finally, the total regional economic or population potential consists of an additional term. This is the direct economic or population potential or else self-potential. This type of potential can be estimated by replacing in the same mathematical formula mentioned above the d_{rs} term with d_{rr}. Thus, the formula of direct potential is:

$$\mathrm{DPP}_r=M_r(d_{rr}^{-a}) \qquad (2)$$

For estimating d_{rr} we use a minimal time-distance of 15 minutes for all prefectures, but Attiki and Thessaloniki. In the case of Attiki we set time-distance at 25 min and in the case of Thessaloniki at 20 min.

- **Human Capital (HUM)**
  Human capital constitutes a fundamental influential factor of economic and regional development. Therefore, it is potentially an influential factor of firms' location decisions. We introduce this variable into the analysis for investigating how some particular population characteristics are related to the location decisions of firms. For the purpose of the present study, we assume that human capital in each prefecture is synthesized by some major human population characteristics such as temporal changes in population size, rate of urbanization, rate of rural population, demographic robustness and educational level. In particular, we have calculated and merged demographic and anthropometric indicators, which concerns the following:

  - Population change: We calculate the net percent change in the size of population of each prefecture for the period from 1981 to 1991. This change could be attributed to migration gains and losses, or to death and birth rates. It is a measure of the strength of the regional population and can indicate possible links between population dynamics and the business locational behaviour.
  - The existence of urban concentrations: In particular, we calculate the share of urban population – people that live in towns with a population of more than 10.000 - in each prefecture. We expect that the rate of urbanisation influences the location decisions of enterprises because a concentration of people could be a significant source of competitive advantage. However, concentrations are capable of creating both positive and negative externalities.
  - Hypsographic distribution of the human population: We estimate the percent of population in each prefecture that live in an altitude of less than 800m. We think that high altitudes are associated with the least advantageous areas. Usually, these areas have poor and inadequate infrastructure compared to the low-lying areas and therefore, they sustain less potential for future industrial development.
  - The percent of population between 15 and 45 years old in each prefecture: This is a measure of demographic stability or robustness of the population. We suggest that differences in demographic stability can affect the perspectives for economic development in an area.
  - Educational level of the population: Education contributes to economic development (Blanas, 2002) in numerous ways. In recent years, businesses concerns about educational quality of their personnel have risen considerably. As the relevant literature suggests, there is a positive relationship between the level of education of the workforce and industrial firms' performance. Hence, the educational level can potentially influence the location decisions of firms.

- **Administrative Hierarchy (HIER)**
  This variable describes the position of the capital city of each prefecture in the country's administrative hierarchy. Some studies have suggests that the higher a city is in the urban and administrative hierarchy, the better social and economic performance it will show (Chan and Zhao, 2002, Fujita et al., 1999). Therefore, we intent investigate whether the relative position of each regional urban centre in the administrative hierarchy of the country has an influence on industrial the location decisions. In fact, we expect that position in the national hierarchy would probably make a difference as regards secondary sector firms. Cities and consequently prefectures that are placed high in the administrative hierarchy tend to present important concentration of central administrative and other functions and are usually able of providing a variety of services to firms. For the purpose of the present study, this variable relates to the total number of civil servants found in each prefecture.

- **Industrial Areas (AREA)**
  Scare suitable land plots and poor location decisions can have serious detrimental effects on the industrial sector through opportunity and vitality loss. In addition, unplanned industrial development usually results in inefficient use of infrastructure, inconvenience and adverse effects on surrounding areas. Organized industrial areas are intended to provide suitable locations for industrially related uses. The need for rational use of land as well as regional and economic development needs have led to the formulation of certain state policies for enabling a wide range of activities to establish throughout the business and industrial areas. From a national point of view, the creation of industrial areas in Greece has been a policy objective for some decades. Although some industrial locations experience serious problems of environmental pollution and industrial unemployment, there have been important attempts for renewal and regeneration of these areas with a strong support from the Structural Funds of EU. We believe that the provision of suitable land for industrial uses facilitated by adequate infrastructure has played and will continue to play in the future an influential role on businesses locational behaviour.

- **Airports and Ports (AIR & PORT)**
  One of the main issues concerning the economic development of a region is the quality and quantity of each transportation infrastructure. The provision of infrastructure can lead to an increase of productivity of private production factors such as labour and capital (Rietveld, 1989). Therefore, public capital on physical infrastructure is crucial for regional growth and could have important effects on the production and location decisions of private industry. In this study we use in the ordinal model the presence or absence of "port" and "airport" as two factorial variables. We assume that the presence of such infrastructure in a particular prefecture implies that the total public infrastructure in that prefecture is at a satisfactory level in relation to the rest of the prefectures. As regards the secondary sector, such infrastructure accumulation can promote trade growth and increase accessibility and mobility of individuals and commodities.

- **Developmental Incentives or Motives (MOT)**
  In a lot of developed and most developing countries, firms are allured to locate or move by government regional policy through subsidies. In fact, this is a long pursued strategy for reducing regional inequalities and for enhancing employment opportunities and income (Begg and McDowal, 1986, Moore et al., 1991, Filippaios and Kottaridi, 2004). This type of financial assistance usually varies in geographical space and includes low interest loans for qualifying firms, subsidies to a business for capital investment project, tax abatements, grants, procurement and export assistance.

  Regional development incentives that were provided by the Greek state during the study period formed 5 geographical categories. These were zones A, B, C, D and Thrace. Through zones A to D the percentage of subsidy escalated from 0% to 55% of the total cost of each particular project. Zone D had very strong incentives, while Thrace was a special zone with higher incentives than even Zone D. As far as the relevant regional incentive legislation is concerned, the subsidies were given under the provisions of Act 1892/1990 as it was later amended by the Act 2234/1994. For the purpose of the present study we have classified the Greek prefectures into four categories according to the percentage of subsidy to private investments that the aforementioned act provided. These categories are: (1) Low, (2) Medium, (3) High and (4) Very incentives zones.

- **Specialization in the Secondary Sector (SPEC)**
  An important location factor for industry that is frequently encountered in the literature is the degree of specialization of the regional economy in the secondary sector. By employing this variable, we try to examine whether a high degree of specialization of the prefectural economy in manufacturing and other industrial operations creates the necessary conditions for the expansion of the existing companies or for attracting new ones. We think that

the existence of a large and diverse secondary sector in the local economy results in the accumulation of knowledge in the sector while establishing some local enterprising tradition. In turns, this may influence industrial location decisions. Therefore, this variable represents the mean gross domestic product of each prefecture in industry to the mean gross national product (GNP) in industry for the period from 1991 to 1998 in a prefectural level. It has been estimated by using the following formula:

$$\frac{mean\_GDP_{INDUSTRY\_in\_region\_i}^{from\_1991\_to\_1998}}{mean\_GNP_{INDUSTRY}^{from\_1991\_to\_1998}} \qquad (2)$$

where, $mean\_GDP_{INDUSTRY\_in\_region\_i}^{from1991\_to\_1998}$, is the mean GDP in the industrial sector in the prefecture *i* for the period from 1991 to 1998 and $mean\_GNP_{INDUSTRYi}^{from1991\_to\_1998}$ is the mean GNP in the industrial sector for the same period.

- **Regional Productive Dynamism (PROD)**
  The indicator of regional productive dynamism is a complex variable that depicts the development of regional employment, the level of production and the productive structure of the local economy over a period of time. We suggest that these three components of productive dynamism constitute important factors of locational behaviour, growth and enlargement of enterprises. Geographically speaking, any new firm should not be examined independent of the past entrepreneurial activity of its founders and the geographical position of its parent company. In a lot of instances, new companies are the result of expanding activity, enterprising progress and enlargement of some existing enterprises. Therefore regions with competitive and thriving companies are more likely to attract new firms that usually accumulate and create industrial clusters. The aggregate indicator of regional productive dynamism for each prefecture results from the estimation of the following factors:
  - Regional Productivity: This is the ratio of GDP in each prefecture to the number of employees in that prefecture.
  - The mean change of GDP of each prefecture for the period from 1985 to 1995.
  - The net change in employment for the period at the decade 1985-1995.

3.2 Data sources, data evaluation and estimation of indicators

For the estimations of the empirical model we have used statistical data from the National Statistical Service of Greece (NSSG), Ministries and Public Services Organisations. Following, we provide information on the data sources of each particular variable as well as the transformation procedures applied to the values of the variables in order to fit the model.

- For the dependent variable ***INV*** we have used data on the total investments in industrial firms through the provisions of the Greek Developmental Act 1892/90 for the period from 1991 to 1998. The data come from the Greek Ministry of Economy and Finance (MEF). According to the MEF (2000) the investments that were materialised through the provisions of Act 1892/90 constituted the great share of total investments in the industrial sector for the study period. This is because even in the prefectures where the level of subsidization was relatively low, investors pursued to take advantage of low interest loans and tax abatements provisions made by the Developmental Act.
- As regards independent variable ***MOT*** we have divided the country in four zones by merging the incentives zones and sub-zones set Act 1892/90. This independent variable takes the ordinal values of Low, Medium, High and Very High motives. In the first category we have assigned all areas in which the subsidization percentage was between 0% and the 15%. Therefore, in the first category they are classified Attiki, Viotia, Achaia, Korinthia, Larisa, Magnisia, Thessaloniki and Irakleio. The medium category encompassed the prefectures in which the subsidization percentage was 25%. These were Aitoloakarnania, Evia, Fthiotida, Argolida, Arkadia, Lakonia, Zakinthos,

Kerkyra, Kefallinia, Lefkada, Arta, Thesprotia, Ioannina, Preveza, Karditsa, Trikala, Imathia, Kavala, Chalkidiki, Kyklades, Lasithi, Rethymno and Chania. In the trird category the subsidization percentage was 35%. This classified together the prefectures of Evritania, Fokida, Ilia, Messinia, Grevena, Drama, Kastoria, Kilkis, Kozani, Pella, Pieria, Serres and Florina. Finally, the fourth category included the prefectures of Evros, Xanthi, Rodopi, Dodekanisos, Lesvos, Samos and Chios.

- For calculating independent variables ***IPP*** and ***DPP***, we used the distances between the prefectures, as these distances were estimating in a study by MEF (1993). The time-distances where estimated on the bases of the existing infrastructure in the period 1991-1993. In the mathematical formulas of the variables ***IPP*** and ***DPP***, we used the total population in each prefecture from the National Census of 1991 (NSSG, 1993).
- The variable ***AREA*** is binary and depicts whether a particular prefecture has got or has not got an industrial area. Data on this variable come from the Ministry of Development (2004).
- Similarly the variables ***AIR*** and ***PORT*** can take the values 1 if a prefecture has an airport or a port, otherwise the value 0. Data concerning these variables come from NSSG (2001) and MEF (1993).
- The variable ***HIER*** relates to the number of government officers that work in each prefecture. Data were derived from the Ministry of Interior (1996) and were also transformed before feeding the empirical model. In particular, we assumed that the mean value of this variable for the whole country was 100 and then we transformed proportionally the prefectural values to fit the scale.
- The variable ***HUM*** has resulted from the addition of four other indicators that where mention before (see description of HUM in section 3.1). For estimating the indicators we used statistical data from the National Census of 1991 (NSSG, 1993). All indicators but educational level were straightforward. For calculating the indicator of educational level we used the following mathematical formula proposed in a study by Kavvadias (1992):

  Indicator of Educational Level = $e \sum_j e_j \frac{P_{ij} P_n}{P_{nj} P_i} \partial_j$

  where,

  P_i = Total population of region *i*.
  P_n = Total population of the country
  P_{ij} = The population of region *i* that has education level *j*.
  P_{nj} = The population of country that has education level *j*.
  e_j = The coefficient of education level *j*.

  For *e*, there were set the values: e_1=1, e_2=0.85, e_3=0.7, e_4=0.60, e_5=0.45, e_6=0.25, $\partial_п$=0.1 and $e=\frac{100}{\sum \partial j}$

- For the estimation of variable ***PROD*** we used data covering the period 1991-98 from the database Epilogi (1998). From these data we estimated the per capita GDP for each prefecture. Finally, for the estimation of variable **SPEC** we used the relevant statistical data from Epilogi (1998), NSSG (2000) and NSSG (2001).

4. Model specification and estimation

4.1 Data description

As we can see form the following statistical tests of normality, the dependent variable does not come from a normal population. The observed significance levels for both the Kolmogorov-Smirnov and the Shapiro-Wilk tests (table 2) are low and therefore, we can reject the null hypothesis that the data come from normal populations.

Table 2: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Investment in Industry through Law 1892/90 for the period 1991-1998	0.210	51	0.000	0.805	51	0.000

[a] Lilliefors Significance Correction

The normal probability Q-Q plot (fig. 1) also shows that the variable is not normally distributed. We can see that after the low observed values there are a lot of values above the predicted normal line indicating that there is peak on the left which encompasses more cases. The detrended normal Q-Q (fig. 1) plot depicts the differences between the observed and the predicted values. When the distribution of the values of the dependent variable is normal then the values of the difference between observed and predicted fall randomly about the zero line. This is not the case here. There are groups of values far above and below the zero line. Therefore, the distribution of the values of the depended variable is not symmetric.

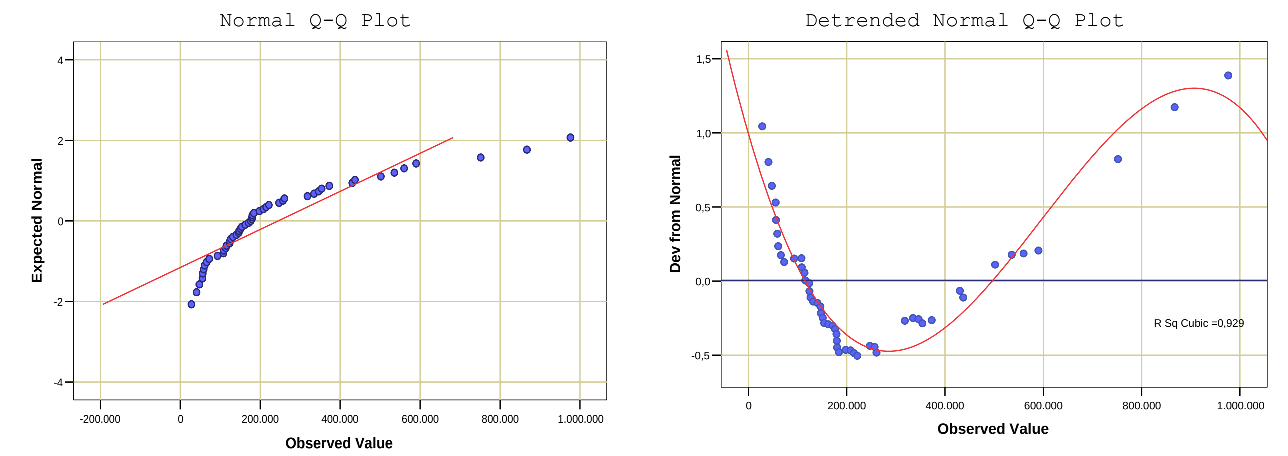


Figure 1: Normal Q-Q plot and Detrended Normal Q-Q plot of Investment in Industry through Act 1892/90 for the period 1991-1998

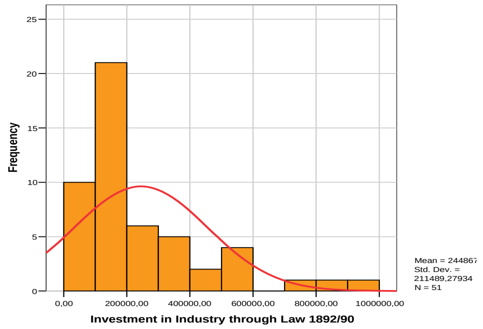
As the following plots indicate the distribution is skewed to the right having a tail towards larger values. In addition, both the stem-and-leaf-plot and the box-plot indicate that there are also extreme cases to the right side of the distribution.

```
Investment in Industry through Law 1892/90 for the
        period 1991-1998: Stem-and-Leaf Plot

 Frequency    Stem &  Leaf

 10.00        0.
              2445556679
 21.00        1.
              001122234445567777889
  6.00        2.
              012456
  5.00        3.
              13457
  2.00        4.
              33
  4.00        5.
              0358
      3.00 Extremes    (>=751868)

 Stem width:   100000,0
 Each leaf:        1 case(s)
```



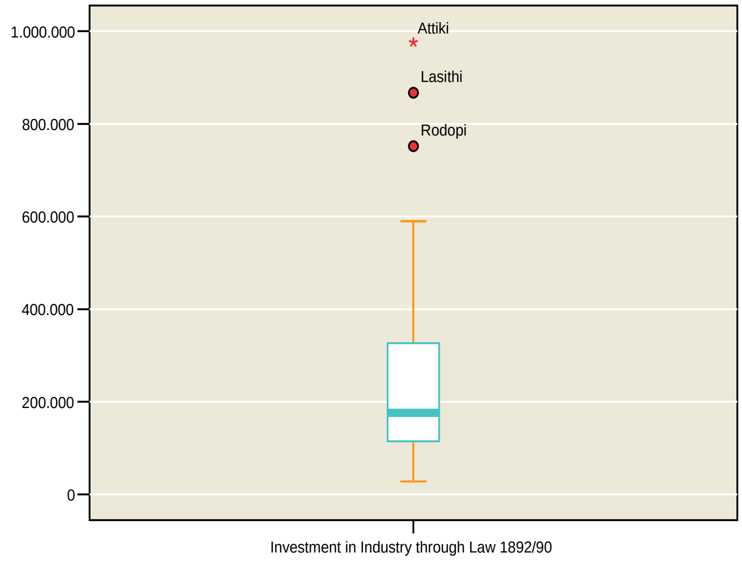
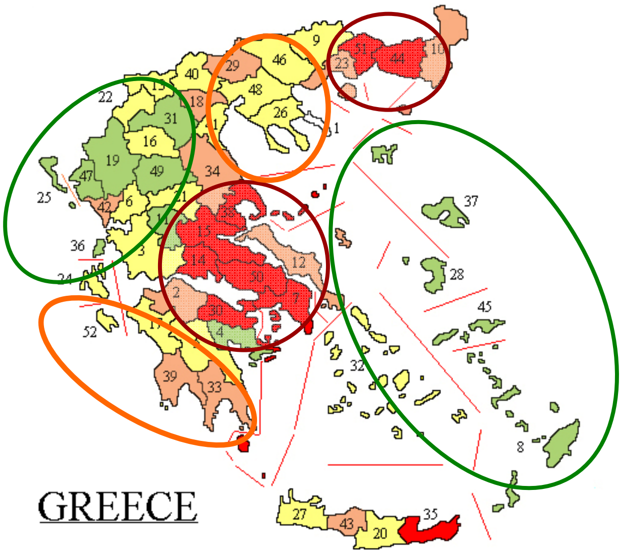


Figure 2: Stem-and-Leaf plot, histogram and Box-plot of the values of Investment in Industry in Greek Prefectures

In the stem-and-leaf-plot and the box plot (fig.2) we can seen that the 3 outliers are the prefectures of Attiki, Lasithi and Rodopi. They take value above 75 billion drachmas of investment during the study period. Summarising the above information we can conclude that two aspects need to be taken care of. These are (a) non-normality and (b) outliers. Bearing in mind this information, we choose to transform the continuous independent variable into a categorical one by classifying the prefectures in four categories according to the rate of "investment in the secondary sector for the period from 1991 to 1998". The first category represents the prefectures of low total investments in the secondary sector. The second class encompasses the prefectures with medium investments in industry, the third the prefectures with relatively high figures of investment and the last category is made up of the remaining prefectures of very high investments in the industrial sector. In this way we account for the effects of extreme cases. The cut points of the categories are presented in table 3. The non-normality issue is dealt with by employing an ordinal regression model and choosing the negative log-log link function in the mathematical equation (for more details see next section).

Figure 3 depicts the spatial distribution of the rate of investment in the secondary sector in Greece in the NUT III administrative level. As we can see, there are two geographical areas of low total investments in industry (indicated by the green elliptical line). These are the Aegean islands and the mainland mountainous northwest part of the country. As regards the prefectures with very high investments in industry (the red elliptical line), most of them are situated around the prefecture of Attiki and some others at the region of Thrace in the northeast part of the country (i.e. Rodopi and Xanthi) where the industrial location financial incentives provided by the state during the study period were the highest in relation to most of the regions of the country. There are also two areas of relatively medium investments in the secondary sector (the orange elliptical line), one at the north just around the city of Thessaloniki and the second at the southwest part of the country.

	Extreme Cases	Prefecture Name	Value
Greece: Investments in Industry 1991-1998	The 5 case with the estment in the period 1991-1998	Kyklades	28029,73
		Lefkada	40752,50
		Lesvos	47739,55
		Trikala	55458,89
		Samos	56223,00
	s with the estment in the period 1991-1998	Attiki	976146,0
		Lasithi	867203,8
		Rodopi	751867,9
		Fokida	589963,5
		Xanthi	559934,8



ADMINISTRATIVE DIVISIONS (PREFECTURES)

		14	Fokida	27	Chania	40	Pella
		15	Fthiotida	28	Chios	41	Pieria
		16	Grevena	29	Kilkis	42	Preveza
		17	Ilia	30	Korinthia	43	Rethimno
		18	Imathia	31	Kozani	44	Rodopi
		19	Ioannina	32	Kyklades	45	Samos
		20	Irakleio	33	Lakonia	46	Serres
	s	21	Karditsa	34	Larisa	47	Thesprotia
9	Drama	22	Kastoria	35	Lasithi	48	Thessaloniki
10	Evros	23	Kavala	36	Lefkada	49	Trikala
11	Evrytania	24	Kefallinia	37	Lesvos	50	Viotia
12	Evia	25	Kerkyra	38	Magnisia	51	Xanthi
13	Florina	26	Chalkidiki	39	Messinia	52	Zakinthos

low medium high very high

*This area was not included in the analysis

Figure 4: Spatial distribution of industrial investment in Greece for the period 1991-1998

The spatial evidence provided by figure 4 makes it clear that the centre of gravity lies around Athens.

4.2 Model Specification

The estimation procedure that we apply in order to investigate the relationship between the observed spatial distribution of investments in the secondary sector and the earlier mentioned socioeconomic indicators is ordinal regression. This methodology provides a framework for simulating how development policies and selective regional socioeconomic characteristics might affect the location patterns and intensity of industrial investment. Regarding the data are complex and do not follow the patterns of normality, we use ordinal regression to determine the direction of the relationship between each predictor and the ordinal nature of the categorical outcome.

The ordinal regression analysis employs a link function to describe the effect of the explanatory variables on ordered categorical outcome in such a way that the assumptions of normality and constant variance are not required (Agresti, 1999, Ananth and Kleinbaum, 1997, McCullagh and Nelder, 1989). A relevant application on industrial location decisions by means of ordinal regression has been conducted by van Dijk and Pellenbarg (2000). In particular, they explored the determinants of firm migration in The Netherlands.

There are five different link functions that can be used in the construction of an ordinal model depending on the distribution of values of the response variable's cumulative probability (Norusis, 2004b, SPSS Inc, 2006). We use the negative log-log link because the escalation the cumulative probability increases from 0 fairly rapidly and then slowly approaches 1 (see figure 2 and table 3).

The *negative log-log* link takes the form $-\ln(-\ln(\lambda_{ij}))$. The ordinal regression model instead of considering the probability of an individual event occurring, it estimates the probability of that event and all events that are ordered before it (cumulative probability). The general model for ordinal regression is:

$$link(\lambda_{ij}) = \alpha_j - \sum_{n=1}^{k} \beta_k X_k \quad , \quad \lambda_{ij} = \Pr ob(Y \le j \mid x_i) = \sum_{l=1}^{j} \pi_{il} \tag{4}$$

where,

$link\ (\lambda_{ij})$	=	The abovementioned *negative log-log* link. The index j refers to the subcategory of investment in industry (e.g. *low* investment, *medium*, *high*, *very high*).
Y	=	The response variable, which takes integer values from 1 to J.
λ_{ij}	=	The cumulative response probability up to and including $Y=j$ at subpopulation i.
X_k	=	The k predictor variables associated with the changes in the dependent variable.
α_j	=	The intercept of the regression equation or *threshold* for each cumulative probability. The index j refers to the subcategory of investment.
β_k	=	The coefficients of the predictor variables or the *locations* of the model. The threshold α_j and the regression coefficients β_k are unknown parameters to be estimated by means of the maximum likelihood method.
π_{ij}	=	The cell probability corresponding to $Y=j$ at subpopulation i.

However, there is a strict assumption that has to be made when using ordinal regression model, the parallel lines assumption. That is to say, the regression coefficients are equal for all corresponding outcome categories. Therefore, it is extremely important to carry out the test of parallel lines and if the assumption fails, the multinomial logistic regression model can be used as an alternative model. The test of parallel line compares the estimated model with a single set of coefficients for all categories to a model with a separate set of coefficients for each category.

In the present study the event of investment in the secondary sector has been defined as following:

$$\varphi_1 = -\log[-\log[prob(investment\_in\_industry \le low)]] \tag{5}$$

$$\varphi_2 = -\log[-\log[prob(investment\_in\_industry \le medium)]] \tag{6}$$

$$\varphi_3 = -\log[-\log[prob(investment\_in\_industry \le high)]] \tag{7}$$

Having chosen the negative log-log link the equation is written as following:

$$-\log(-\log(\lambda_{ij})) = \alpha_j - \sum_{n=1}^{k} \beta_k X_k \Rightarrow \tag{8}$$

$$\begin{aligned} -\log(-\log(INV_{ij})) = \alpha_j &- \beta_{IPP} * IPP + \beta_{DPP} * DPP + \beta_{HUM} * HUM + \beta_{HIER} * HIER + \\ &+ \beta_{AREA} * AREA + \beta_{AIR} * AIR + \beta_{PORT} * PORT + \beta_{MOT} * MOT + \\ &+ \beta_{SPEC} * SPEC + \beta_{PROD} * PROD \end{aligned}$$

5. Results and discussion

5.1 Model fitting information

Some summary statistics of the model are presented in table 3. In particular, it can be seen the coding scheme, the selected cut-points, the number of prefectures that fall into each individual category of investment and finally, the marginal and cumulative percentages.

Table 3: Summary statistics

	Categories & Codes	Intervals & Cut-points in million €	N	Marginal Percentage	Cumulative Percentage
Investment in Industry 1991-1998	1=Low	≤ 110	12	23.5%	23.5%
	2=Medium	111 - 200	19	37.3%	60.8%
	3=High	201 - 400	11	21.6%	82.4%
	4=Very High	401+	9	17.6%	100%
Valid			51	100.0%	---
Missing			0	---	---
Total			51	---	---

Table 4 present the test of parallelism, namely the assumption that the regression coefficients are the same for all four categories of industrial investment. The assumption of parallelism cannot be rejected because the level of statistical significance for the general model is 0.969. Therefore, we sustain the null hypothesis that the location parameters are the same across the response categories.

Table 4: Test of Parallel Lines(c)

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis	97.119	---	---	---
General	81.334(a)	15.785(b)	28	0.969

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.
a. The log-likelihood value cannot be further increased after maximum number of step-halving.
b. The Chi-Square statistic is computed based on the log-likelihood value of the last iteration of the general model. Validity of the test is uncertain.
c. Link function: Negative Log-log.

Table 5 presents the Goodness-of-Fit Pearson and Devience measures. The observed significance levels are large meaning that the null hypothesis that the model fits cannot be rejected. However, we should not rely on these measures because the number of empty cells in the model is very large due to the use of several continues independent variables (there was a warning that 153 or 75.0% cells with zero frequencies). As regards the overall-model test of the null hypothesis that the location coefficients for all of the predictor variables in the model are zero, it yields a significance level of 0.0002. Therefore, the intercept-only model does not perform better than the model with the predictors. This is an important test because the change in the likelihood function has a chi-square distribution even when there are cells with small observed and predicted counts (Norusis, 2004a). Finally, the pseudo-R^2 measures the success of the model in explaining the variations in the data which is an indication of the strength of association between the dependent and the independent variables. The pseudo R^2 for McFadden (0.292), Cox and Snell (0.544), and Nagelkerke (0.584) can be considered satisfactory as the values of the ordinal regression measures are almost always much smaller than the corresponding ones for a linear model (Norusis, 2005). Therefore, the interpretation of pseudo R^2 needs to be careful.

Table 5: Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.		
Intercept Only	137.216	---	---	---		
Final	97.119	40.097	14	0.000		
	Pseudo R-Square		**Goodness-of-Fit**			
			Chi-Square		**df**	**Sig.**
Cox and Snell	0.544					
Nagelkerke	0.584	**Pearson**	151,608		136	0.170
McFadden	0.292	**Deviance**	97,119		136	0.995

Link function: Negative Log-log.

5.2 Results and Discussion

The estimates in table 6 indicate that population-related variables and indicators of infrastructure had a strong influence on the location behaviour of industrial firms during the '90s in Greece. Firstly, the regression coefficient for the variable of Indirect Population Potential *(IPP)* has a positive sign and it is also statistically significant at the 0.097 level. The observed pattern for the indicator of Direct Populations Potential *(DPP)* is also very similar. This variable is positively related to industrial investments and the observed significance level is 0.027. The above results lead us to the conclusion that the accessibility of each prefecture to the rest of the prefectures seems to have been an important causal factor of industrial investment in Greece. The indicators measure the actual influence of both transportation distances and population size to the location decisions of firm. Therefore, it seems that industrial firms consider seriously the issue of accessibility which heavily relies on the existing interregional road transportation infrastructure. They also take into consideration the size of the population that they can access from the particular geographical position that they intent to locate. In other words, during the study period, industrial firms preferred to locate in geographical area where they could have easy access to markets for delivering their production.

The indicator of human capital *(HUM)* does not appear to be strongly related to the locational behaviour of industrial firms, at least in the current model. The level of statistical significance is 0.356 which is not satisfactory. Therefore, we cannot say that human capital was an influential factor of firms' location decisions during the study period in Greece. The investigation into the aggregate influence of population characteristics such as educational level, changes in regional population size, rate of rural population and age distribution has not yield a significant relationship with industrial investment. However, complex indicators always run the risk of shading existing relationships between the dependent variable and one or only some components of the indicator. In addition, when the study sample is not very large there is always the likelihood that some extreme or special cases have a distinctive influence on the results. As we can see in figure 5 from the scatter-plot (A) of the relationship between investment in industrial sector and human capital, it appears that there might be a linear relationship in place. If we look at the individual cases we can see that the relation is distorted due to some individual cases. Firstly, Thessaloniki has high human capital value and low investments in industry. In addition to the fact that the percentage of subsidy in most of this prefecture's territory was zero, there was also high competition from the nearby Thrace region where subsidies were large. Furthermore, after the bewildering political change in most Balcan countries, a substantial number of firms that had been initially established in North Greece, relocated or transferred their production sections across the borders to the nearby countries. New firms tended to also cross the boarders mainly for taking advantage of reduced labour costs.

Table 6: Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold								
φ_1 →	Investment in Industry (n= 1)	1.090	3.575	0.093	1	0.760	-5.917	8.097
φ_2 →	Investment in Industry (n= 2)	3.011	3.632	0.687	1	0.407	-4.107	10.129
φ_3 →	Investment in Industry (n= 3)	4.399	3.631	1.468	1	0.226	-2.718	11.516
Location								
IPP	Indirect Population Potential	0.023	0.014	2.447	1	0.097	-0.006	0.051
DPP	Direct Population Potential	0.012	0.006	4.918	1	0.027	0.001	0.023
HUM	Human Capital	0.035	0.038	0.852	1	0.356	-0.039	0.109
HIER	Hierarchy	-1.875	0.647	8.402	1	0.004	-3.143	-0.607
AREA	Industrial Area=No	-1.827	0.624	8.564	1	0.003	-3.051	-0.603
----	Industrial Area=Yes	0(a)	.	.	0	.	.	.
AIR	Airport=No	1.339	0.715	3.511	1	0.061	-0.062	2.740
----	Airport=Yes	0(a)	.	.	0	.	.	.
PORT	Port=No	-0.430	0.545	0.624	1	0.430	-1.498	0.637
----	Port=Yes	0(a)	.	.	0	.	.	.
MOT	Zone of Incentives=Low	-0.187	0.917	0.041	1	0.839	-1.984	1.611
----	Zone of Incentives=Medium	-0.709	0.656	1.169	1	0.280	-1.994	0.576
----	Zone of Incentives=High	-1.315	0.719	3.340	1	0.068	-2.724	0.095
----	Zone of Incentives= Very High	0(a)	.	.	0	.	.	.
SPEC	Specialization in the Secondary Sector = Low	0.134	0.624	0.046	1	0.830	-1.088	1.357
----	Specialization in the Secondary Sector = Medium	-1.460	0.597	5.980	1	0.014	-2.629	-0.290
----	Specialization in the Secondary Sector = High	0(a)	.	.	0	.	.	.
PROD	Productive Dynamism = Low	0.855	0.822	1.082	1	0.298	-0.756	2.465
----	Productive Dynamism = Medium	-0.586	0.612	0.915	1	0.339	-1.785	0.614
----	Productive Dynamism = High	0(a)	.	.	0	.	.	.

Link function: Negative log-log.
(a) This parameter is set to zero because it is redundant.

Secondly, the prefectures of Pieria, Kyklades, Chios, Lesvos and Samos are either coastal or insular and their economies have been based on tourism and recreation-related activities. Thirdly, on the middle upper part of the scatter-plot, the prefectures of Rodopi and Xanthi which present very high investments in relation to the values of their human capital were subsidised heavy by the Greek developmental law during that period. Finally, a great number of prefectures follow the pattern of increased industrial investment as the human capital value increases. A more insightful investigation of the influence of human capital on location behaviour of industrial firms might need to consider particular manufacturing activities within the secondary sector and possibly use discriminant analysis, cluster analysis or some other more appropriate statistical procedure.

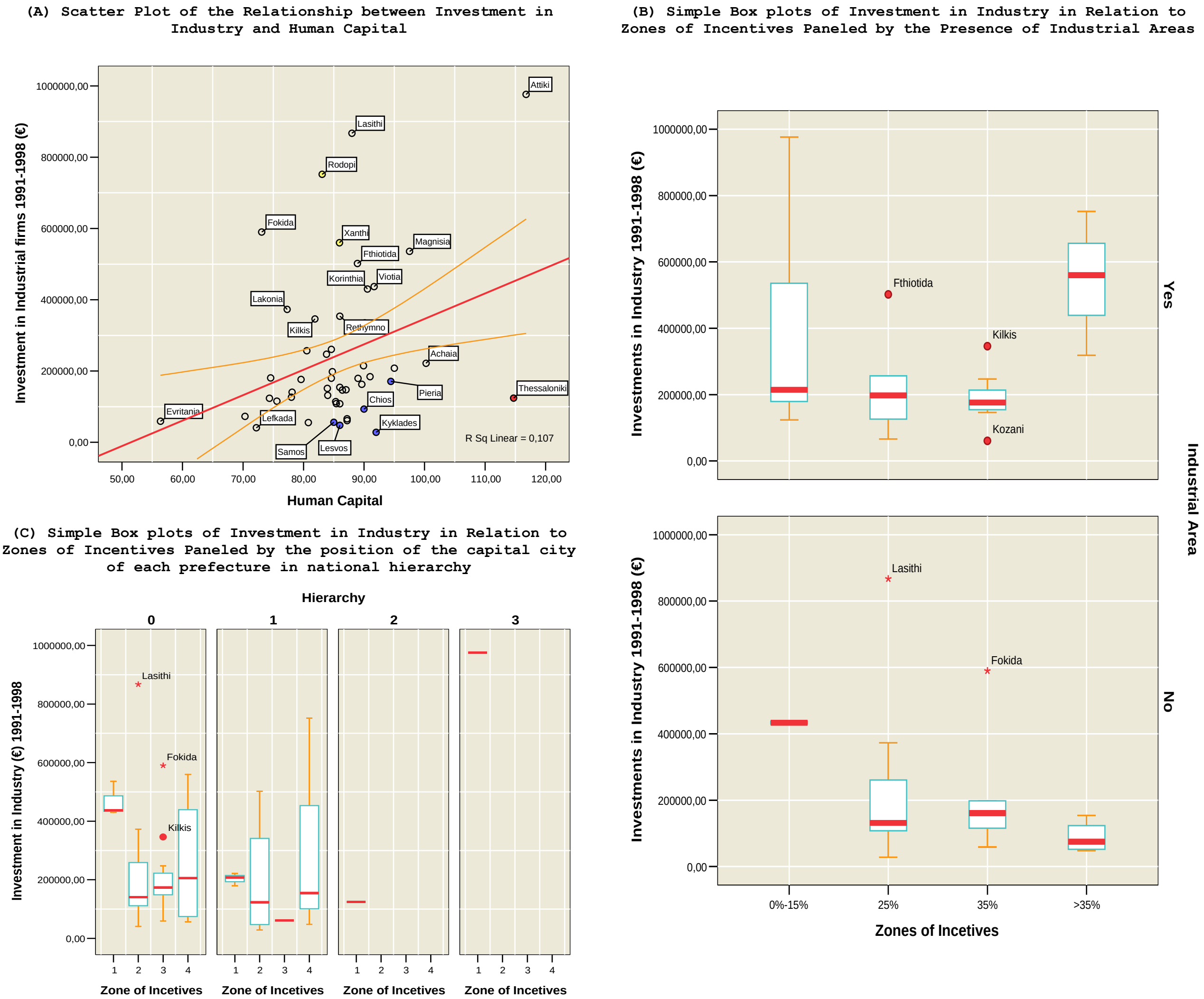


Figure 5: Further Investigation of Selective Relationships

As regards the variable administrative hierarchy *(HIE)*, the relevant coefficient has a negative sign and the observed significance level is less than 0.05 indicating a statistically significant relationship. Therefore, during the study period, it seems that the prefectures which were ranked low in the scale of hierarchy managed to attract higher industrial investments in relation to those areas that had a better position in the national hierarchy. This is possibly due to the fact that the important areas in terms of administrative hierarchy were getting almost negligible subsidies during the study period because they had already had their economy developed. In figure 5 (section C), we can see the Box plots of investment in industry in relation to the zones of incentives panelled by the position of the capital city of each prefecture in the national hierarchy. We notice that the median industrial investment is larger at the first zone of low incentives and at the fourth zone of very high incentives for the prefectures that are ranked low in the administrative hierarchy. This is interesting because it suggests that there were some areas with both low incentives and low ranking in the administrative hierarchy that were receiving substantial industrial investments during the study period. If we look at the map of figure 4 we will see that these areas are situated around the prefecture of Attiki. Therefore, despite the disadvantages of low incentives and poor administrative structure, these areas were benefited by their proximity to large urban concentrations. Finally, the length of the boxes, a measure of the spread of the data values, is larger for the second and the fourth zones of incentives in the 0 and 1 levels of hierarchy (the level 2 of hierarchy corresponds to Thessaloniki whereas the level 3 to Attiki). This suggests that the provision of generous incentives is not always and everywhere capable of attracting investments. There are possibly more requirements for an area in order to become attractive to industrial investments.

This is evident if we look at the variable of industrial areas (AREA). It is statistically significant and the coefficient is negative. This means that the prefectures which do not have any organized industrial areas (code 0) are less likely to attract investments in the secondary sector than those prefectures which have such organised areas. In figure 5 (section B) we see some simple box plots of investment in industry in relation to zones of incentives panelled by the presence of organized industrial areas. It is evident that the median of industrial investment in all zones but the first is higher in the cases where an organized industrial area is present. Therefore, the provision of suitable land for industrial use seems to play an influential role on businesses locational behaviour.

The coefficient of the variable airport (AIR) has a positive sign for the absence of this particular transportation infrastructure and it is statistically significant at 0.062. This means that airport infrastructures were not an important location factor for businesses during the study period in Greece. In Greece most of the airports are situated on insular prefectures. The majority of insular economies are mainly based on tourist rather than on secondary sector activities. As regards the variable port (PORT) the relevant coefficient is not significantly different from 0 indicating that this variable was not strongly related to the industrial investment decisions during the study period. At least for the current model, the accessibility of each prefecture to the rest of the prefectures seem to be an important causal factor of industrial investment in terms of interregional road transportation as we saw above from the population potential variables.

The variable representing the zones of incentives *(MOT)* set by the Developmental Act 1892/90 has negative regression coefficients for all categories; however the only statistically significant category is the High category (*p=0.068*). The negative sign in the coefficients indicate that the prefectures with low incentives (code=low), with medium incentives (code=medium) and with high incentives (code=high) are all less likely to receive industrial investments than the prefecture with very high incentives (namely the redundant category with code=very high). Therefore, developmental incentives were a very important location factor for new industries, at least for most of the areas that they were assigned. The fact that the categories of low and medium incentives areas are not statistically significant indicates that despite low incentives these areas still received substantial investment. As it was noted above these areas are situated around the prefecture of Attiki and in spite of the disadvantages of low incentives they benefited from their proximity to the metropolitan area.

As regards the variable of specialization in the secondary sector (SPEC) it appears negative and statistically significant *(p=0.014)* for the second category (code=medium) and not statistically significant for the first category (code=low). This means that the prefectures with high specialisation in the secondary sector are more likely to attract additional industrial investments than the prefectures which have less developed secondary sector. This is logical since the existence of a large and diverse secondary sector in the local economy usually results in the accumulation of knowledge and tradition in the sector that influence new industrial location decisions.

Finally, the variable of regional productive dynamism *(PROD)* is not statistically significant in all categories indicating that, at least in the current model, productive dynamism does not appear to be strongly related to industrial investment.

6. Conclusions

This paper has dealt with the likely location factors of industrial investment in Greece for the period from 1991 to 1998. Making informed regional policy decisions is central to achieving economic development and to reducing regional inequalities. Prior to formulating certain regional policy objectives and targets, the baseline information which is needed is the kind of driving forces that influence industrial location and relocation decisions. Therefore, we present an empirical model aimed at finding associations between a group of independent variables drawn from the regional economics literature and the locational behaviour of firms.

The ordinal model itself is flexible and does not assume the normality and constant variance, which are basic assumptions of most regression models. However, it requires the assumption of parallel lines across all levels of the categorical outcome. An additional advantage of the model is that allows observing the relationship and calculating the relevant coefficients concerning the dependent variable and all categories of likely factorial independent variables.

The results on direct and indirect population potential suggest that interregional transportation infrastructure is of outmost importance for industrial location. Other transportation infrastructures such as ports and airports may not be of the same importance as road infrastructure. On the other hand, the provision of suitable locations for industrial uses is an important location factor. In addition, proximity to metropolitan areas or to large urban concentration seems to be highly influential on the behaviour of firms. Incentives set by the state are important location factors but not always and everywhere. In certain localities, other factors might be more important. The tradition of a region in accommodating on activities of the secondary sector is also an important location force. Hierarchy and human capital need to be interpreted very carefully. As regards hierarchy it is often ranked relatively low by companies when seeking suitable location. The complex indicator of human capital may need further investigation and may also require distinguishing particular manufacturing activities within the secondary sector.

These findings have a number of implications for formulating future national and regional policy measures for the secondary sector. An integrated and coherent understanding of the socioeconomic and institutional forcing and its interactions with industrial firms is a prerequisite for improving the effectiveness of the applied regional policy. As companies become established in an area we need to know the reasons of this phenomenon. The results could guide further research for improving understanding on spatial processes such as the unfoldment of industrial location patterns and for rationalizing incentives-related decision making.

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