INDUSTRIAL GROWTH IN THE INTEGRATED EUROPEAN ECONOMIC SPACE

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Abstract: *The European space has experienced relentless geo-economic changes that result in a re-conceptualisation of their industrial growth pattern. The aim of this paper is to empirically detect the determinants of industrial growth covering the entirety of Europe, thus embracing economies of different production systems and welfare levels. Integration has influenced the economies and their industrial growth not only inside the EU but inside the whole European area, on the one hand, by attributing to them common behavioural characteristics, and on the other hand, by forming their industrial growth pattern under the influence of different natural factors in alignment with the regions' comparative advantage and the markets' maturity levels.*

Key words: *industrial growth, Europe, integration, productive systems*

1. Introduction

The European integration is a process that is being extended and reinforced (following the mid-1980s neoliberal path, Bohle and Greskovits, 2006) first inside the EU economies by the EU enlargement and the accession to the Single European Market. Secondly, integration is extended and reinforced between the EU and its neighboring countries by the establishment of institutional and economic linkages, the improvement of market access, the bifurcation of trade, and the growing interdependence of developed and developing countries by their participation in global value chains. To this end, firms may collaborate via a variety of 'networking' strategies involving subcontracting and outsourcing of production of components and services (Hudson, 2002), or may decide to be located not only within EU but also beyond it, thereby changing the geographies of production.

However, this process *has two sides*. On the one hand, former European socialist economies become *similar* to the Western economies in their institutional setup and in the extent of internationalisation (Bohle & Greskovits, 2006). On the other hand, as macro-regional integration proceeds, economies become more specialised in what they

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most efficiently produce and market (Smith et al., 2002) and *differentiated* in terms of their comparative and competitive advantages.

Indeed, globalisation influences both the nature of the comparative or location-specific advantages of countries and the competitive or ownership-specific advantages of corporations. Thus, some countries become more capital- and skill-intensive, while others have been trapped in a much more traditional division of labour. Value-adding activities could also become increasingly knowledge- or information-intensive, not just in high-technology sectors, but also in those that were previously regarded as natural resource- or labour-intensive sectors (Narula & Dunning, 2000). Thereby, developing countries do not necessarily represent a homogenous group as they do not display development levels or production structures that are similar to more developed countries. This is explained by the fact that less developed countries could be more specialised by virtue of either inter-sectoral differences based on factor endowments and the classical pattern of comparative advantages, or intra-sectoral differences based on technological capabilities.

Consequently, increasing European and global economic integration is likely to lead to new trends of production differentiation and to important reconfigurations in the geography of economic activity (Smith et al., 2002), and to constitute formative moments in redrawing the map of Europe (Martin, 2001). In this line of thought, economic integration and the altering geography of production is a complex process which makes it necessary to understand the changing fabric of the European economy by studying the changes in its industrial organisation and growth patterns. Furthermore, several stages have been discerned during the industrial upgrading and comparative advantage evolution which lie from the traditional H-O sectors to more advanced innovation-intensive sectors (Narula & Dunning, 2000).

Based on these arguments, the goal of this paper is to detect the factors that influence the industrial growth of European countries with the intention of assessing to what degree these are common for all countries guided by the gradual European economic integration, and/or different for various economic and production systems. Furthermore, following Lall (2010), industrialisation remains an engine of development and our attempt is to detect under which conditions for each country (or group of countries) this engine works.

From this point of view, this paper intends to econometrically evaluate the factors that contribute to industrial growth over the medium-term (1989-2007) and to determine the long-run (dynamic) growth effects at play in Europe at large (37 countries). The analysis includes old and new EU member states as well as non-EU member states that seem either to employ different economic and productive systems, or have different welfare levels, or have been integrated to a different degree into the European area. Thus, the paper studies the significant relationships and influences that are exerted in

the *whole European area* encompassing different economic systems and dynamics. The methodology of analysis takes under consideration the element of synthesis, which is important in any research agenda (Cheshire & Malecki, 2004), by extending relevant previous works for the detection of the determinants of (industrial) growth in a multi-theoretical base (Arvanitidis et al., 2010) and therefore, leading to more enriched and valid conclusions.

This paper is structured as follows. Section 2 summarises the most important determinants of economic and industrial growth that have been identified in the literature and provides theoretical evidence. Section 3 examines the determinants of industrial growth in Europe by developing and assessing the econometric model. Section 4 offers concluding remarks.

2. Theoretical review of the determinants of industrial growth

The patterns of industrial growth have been analysed and assessed in a series of studies confirming their evolution and transformation over time. With regard to the determinants of industrial growth, it is attested that they are altered diachronically as they are dependent on different economic and production systems, and industrial organisation modes and structures.

Therefore, a series of studies have attempted to provide some explanations (Wheat, 1986) to the question why some regions have faster manufacturing growth than others. First, it was alleged that markets or factory-to-market transportation was the leading regional determinant of industrial location (Thompson & Mattila, 1959) as transportation changes have strongly strengthened the pull of markets since the 1920s (Chinitz & Vernon, 1960). Climate was another determinant of industrial growth, as defined not only by industrial settlement but also by migrant location (Svart, 1976). The favourable labour climate along with the factor of market adjacency are assessed as the basic factors of industrial expansion (Schmenner, 1982). The leading determinants of industrial growth, according to Wheat (1973), were climate, labour, thresholds, resources and urban attraction, which had varying degrees of impact in several areas (Wheat, 1986).

Chenery (1960), in search of explanations to the rise of industry, analysed the systemic changes in supply conditions as well as in demand with rising income. He reached the conclusion that the capital stock per worker and education are the two factors of general importance. Chenery and Syrquin (1975) made an attempt to quantify some of the patterns of "modern economic growth" which Kuznets (1959) describes as the cause of the structural transformation of economy. They found that the accumulation of physical and human capital, the shifts in composition of demand, trade, output, and factor use as well as socioeconomic trends like urbanisation, demographic transition and changes in income distribution were the main determinant factors. These results

are also in line with the UNIDO (1979) outcomes and with its analysis of industrial change. Until the 1980s, the literature on industrial growth models suggested the existence of four classes of independent variables: (a) domestic market accessibility; (b) production factor costs like land, labour, and capital; (c) climate or other physical environment variables; and (d) taxation and public expenditures (Erickson, 1989).

More recent research has developed a new economic school composed of New Trade Theory and New Economic Geography. These new strands of research focus on externalities, input-output linkages among industries and market size as the determinants of agglomeration (Krugman, 1979, 1991). They also underline the tendency of economic growth to be associated with some sort of agglomeration that requires a minimum threshold of resources and activities. The literature attempts precisely to analyse the new environment of industrial production systems which occurs in an increasingly globalised world and an integrated market, and to generate new structures and modes of organisation characterised by an international perspective and by an export-oriented behaviour (Chiarvesio et al., 2010).

This has inspired studies of determinants of industrial growth to be focused mainly on salient factors of the new economic geography school. Specifically, the important role of trade in spurring industrial growth has been underlined for both developed and less developed countries. This has been done by an array of studies, which pinpoint asymmetric positive trade effects in areas of different economic levels and production patterns, or support the adoption of outward-oriented trade strategies in contrast to import substitution industrialisation policies in developing areas (Brülhart & Sbergami, 2006; Clark, 1995; Petrakos et al., 2012).

The contribution of regional integration to industrial growth constitutes another issue that has been given special focus. Madani (2001) shows that not all industries or countries would benefit from the promised scale effect of regional integration. In the same vein of regional integration but with a different avenue, Kallioras and Petrakos (2010) examine the causes of poor industrial performance of the new member states of the European Union and conclude that with the exception of national characteristics, all other drivers of industrial growth tend to favour the larger, central and better structured regions advocating for a selective process of integration in the industrial growth of regions.

The significance of technological capabilities to industrial growth has been broadly stressed and analysed by the different stages of low-, medium-, mature- and high-technology which define the pace of industrial growth (Kong, 2006). In addition, the impact of banking, infrastructure and labour (Pal, 2011), the impact of portfolio debt, portfolio equity and FDI inflows (Aizenman & Sushko, 2011) or foreign aid (Feeny & Ouattara, 2009) on industrial growth have been the subject of various studies.

3. An econometric approach to evaluating the determinants of industrial growth

A. Compilation of the econometric model

As the trade liberalisation and the economic and production systems in Europe evolve, the patterns of industrial growth are influenced by a series of factors that fluctuate in space and time. The goal of this section is to determine the main variables that contribute to the industrial growth of Europe based on the 'new geography of development' and, by extension, on the 'new geography of industrial production' or the 'new geography of industrial growth'.

The analysis is based on two significant points: first, the way that structural changes, which are realised during the evolution of an economy by the industrial upgrading, are related to the manufacturing comparative advantage evolution (Narula & Danning, 2000). Therefore, a country at different stages of development and maturity in its economic and production systems (Tsiapa, 2011) could be related with factors of different nature of comparative advantages and theoretical streams.

Second, the econometric analysis follows modern approaches and empirical analyses on the determinants of industrial growth which are part of a new 'wave' of empirical growth models. According to it, growth models, due to the lack of a unifying theory on economic growth, are based on a multi-theoretical framework without adhering exclusively to any theoretical approach (Overman et al., 2001; Cuaresma et al., 2009). Thus, their econometric results achieved may be based on different (and in different degrees) but equally valid theories.

The factors influencing industrial growth are determined by compiling and estimating the econometric model with the following form:

$$Y_{it} = \alpha_o + \sum_{j=1}^{n} (\alpha_j X_{jit}) + \varepsilon_{it},$$

where Y_{it} is the dependent variable of industrial growth; α_0 is the constant term; $\sum_{j=1}^{n} X_{jit}$ is a set of growth determinants; $\sum_{j=1}^{n} a_j$ is a set of estimators of growth determinants; $\varepsilon_{it} \sim N(0,\sigma^2)$ is the disturbance term (with 0 mean and constant variance); *i* denotes the countries in question; *j* denotes the independent variables 1-n; and *t* is the time period under study. The econometric model evaluates all of the European countries from 1989 to 2007.

Analytically, the econometric model for determining industrial growth takes the following form:

$$Y_{it} = a_o + b_1 INT_{it} + b_2 AGGL_{it} + b_3 SPEC_{it} + b_4 SPEC_{it} VACAP_{it} + \\ + b_5 DEMAND_{it} + b_6 GRAV_{it} + b_7 LINK_{it} + b_8 LINK_{it} RCLAB_{it} + b_9 HC_{it} + \varepsilon_{it} \quad (1)$$

where i=1,2,3 … 37 countries, t=1,2,3 … 19 years.

The weighted industrial value-added growth has been used as the dependent variable (Y_i). The selection of the value-added growth is based on its ability to reflect and directly account for any events taking place, indicating either a productive increase and prosperity or industrial sways and shocks. Inversely, it has avoided using employment growth as a dependent variable because this is a factor that, first, could be affected partly by social policies and might be eventually inconsistent with output growth, and second, could display similar results with the output growth but with a time lag. Thus, industrial value-added growth is more appropriate (de Lucio et al., 2002) because it directly reflects the phenomenon under study.

Another significant feature of the dependant variable is its weighting by the size of each country. The growth of any variable is biased based on the initial value of the variable. Therefore, the growth rate of an initially small value during a given time period could be enormous, whereas the growth rate for a value that is initially large could be small, reflecting relative rather than absolute performance. For this reason, the weighted industrial growth is used as the dependent variable, which indicates that the industrial value-added growth is weighted by the size of the population in each country.

The independent variables were selected in an effort to cover many of the dimensions, parameters, or theoretical frameworks that contribute to industrial growth. The variables that are used in the econometric model are described below.

The *trade integration* (INT) is a significant component of globalisation and trade liberalisation so it is used in the econometric analysis. The variable is related to the degree of integration in an economy, including more favourable terms of access to the market and the ability to develop important trade transactions. This proposition has received persuasive intellectual support from the new theories of growth (Romer, 1986; Lucas, 1988; Grossman & Helpman, 1991; Barro & Sala-i-Martin, 1995). The most recent ones indicate that openness contributes to an increase in industrial concentration and regional specialisation, and that benefits lead to increased income and development levels on the sectoral and spatial level (Krugman & Venables, 1996). Based on this argument, the contribution of the variable is expected to be positive (equation 2).

The variable *agglomeration economies* (AGGL) is a significant parameter of both neo-classical theory and modern trade theories. The former is based on the concentration of activities in those countries that are relatively abundant in the factors that they use intensively. The latter is based on the economies of scale and the industrial externalities and linkages that lead to a cumulative process of increasing returns and concentration of economic activity (Krugman, 1991; Venables, 1996). Greater firm density, indicating the existence of agglomeration economies, is related to higher levels of productivity and thus, to better economic and industrial performance (Combes & Overman, 2003). Therefore, this variable reflects the benefits of external economies of scale. A positive sign implies the exploitation of those economies of scale and their contribution to industrial growth.

The empirical portion of the literature relates the concentration positively with economic growth and other development parameters (Nakamura, 1985), whereas in other cases, the mutually reinforcing relationship between growth and agglomeration is the emphasis (Baldwin et al., 2001; Martin & Ottaviano, 2001). Although there have been ambiguous views on the robustness of the positive effects of concentration in space and different positions on the form and limits of its spatial effects[1], the nature of the external economies of scale implies the fact that they might occur even if industries are producing under constant returns to scale (Feige, 2008). Consequently, the contribution of the variable, given the broad range of its effects in both less and more competitive areas, is expected to be positive (equation 3).

The industrial growth of a region is related to its economic and productive performance and dynamism which are formed by the fields and the degree of *specialisation* (SPEC). Modern theories claim that, on the one hand, central regions and those with markets of a considerable size or that have made substantial technological progress will increase their degree of specialisation in capital- or scale-intensive sectors. On the other hand, peripheral regions and those with lower levels of development growth will increase their degree of specialisation in sectors of constant or low increasing returns and in labour- and resource-intensive sectors (Brülhart, 1998). In any case, regions are seen as increasing their specialisation index according to their characteristics.

However, the influence of an economy's specialisation ability can be seen in a different way. A high specialisation index (vertical specialisation) can be related to the exploitation of comparative advantage, a decline in opportunity cost and dynamic export performance. Alternately, it can be associated with a strong dependence on a small variety of products that increase the danger of exogenous imbalances and, thus, vulnerability. A small specialisation index can be related to a broad productive base, the limitation of exogenous crises and the existence of a large variety of products to be traded. Alternately, it can be associated with limited exploitation of comparative advantage, high opportunity cost and a modest level of technological incorporation and advancement. Empirically, both a positive relation between specialisation and economic growth (Brülhart, 1998) and negative dependencies (Aiginger, 2000; Combes, 2000) have been determined. Generally, *both* the specialisation index and the sophistication level of an economy define its developmental path, a fact that has been

[1] Specifically, on the one hand, it is suggested that economies evolve in a positive direction because agglomeration economies encourage and support overall economic robustness, with central and peripheral areas not converging but presenting substantial growth rates (Basile et al., 2005). On the other hand, a less positive view is that the concentration process leads to spatial disequilibrium and asymmetry because the degree of attractiveness and the intensity of the cumulative forces in specifically favoured areas cause serious 'peripherality' in other areas (Aiginger & Davies, 2004). This raises the question of whether most or a lesser part of the areas under study benefit from the concentration process and from economies of scale or, alternately, whether most areas benefit from this process only given a series of preconditions or conditions.

noted by both theoretical (Grossman & Helpman, 1991) and empirical perspectives (Lau, 1992). UNIDO (2009) remarks that low-income countries exhibit a high degree of specialisation in less sophisticated goods, whereas fast-growing low-income countries or slow-growing medium-income countries develop a certain amount of productive diversity and produce more sophisticated goods. At the same time, fast-growing medium-income or high-income countries continue to specialise more and more in highly sophisticated products. On this basis, an unambiguous relationship emerges between specialisation and the proportion of high-technology products in an economy's output. For this reason, the variable of specialisation is included in the econometric model and its relation to *value-added share in capital products* (VACAP) is evaluated to assess its relationship with advanced production. Quantitatively, the effect of the SPEC and VACAP variables on the dependant variable is indicated by equations 4 and 5.

Market size is considered as a salient parameter in the industrial growth. It is related with positive externalities in the accumulation of human capital, the transmission of knowledge and the increasing returns (Romer, 1986; Lucas, 1988), with linkages and pecuniary externalities (Krugman, 1991; Krugman & Venables, 1996) or with constant returns to scale and trade benefits (Alesina et al., 2004). The *size of the market demand* (DEMAND) is used in the econometric model and is calculated as the sum of productive GDP plus imports because they serve the domestic market, while the volume of exports is subtracted because they serve the market outside national borders (Alesina & Wacziarg, 1998). The specific variable indicates the 'market expansion' of each country, determining the size of the market in relation to the 'extent of the internal market'. This is part of the new economic geography and is a component of the home market effect. The relationship between the size of market demand and industrial growth is said to depend on the trade cost (Davis, 1998), and it is expected to be positive in the econometric model (equation 6) as a result of the progressive trade integration.

In addition to the size of a market, its geographic position also plays an important role, determining and defining to a significant degree the spatial and productive dynamics at play by designating patterns of firm location and activities. Geography has been recognised as a crucial scaffolding for economic and industrial development (Gallup et al., 1999) as it is closely related with trade cost and more recently with agglomeration economies and powerful markets (Krugman, 1991; Brülhart, 1998), and it is characterised by the ability to self-organise areas into a structure of centres of activity (Henderson et al., 2000). The geography factor is represented in the econometric model by the *geographic gravity variable* (GRAV), which is an index of centrality and accessibility in space (Petrakos, 2000) as it defines the position of each country according to geographic and economic dynamics. The contribution of this variable to the dependent variable is expected to have a positive sign and is presented in equation 7.

Vertical disintegration is a new form of productive organisation as a consequence of globalisation and trade cost decline. A production process can be broken down into a series of distinct steps or tasks to exploit differences in comparative advantage in different locations or to reduce the optimal scale of production. These industries are related via input-output linkages or vertical relationships. They indicate the development of synergies among the economic units as a result of their 'forward and backward' linkages. This sort of connection runs contrary to the horizontal relationships that develop among firms at the same level in the productive chain (Fujita et al., 1999). In the econometric model, this factor, which determines the form of the economic relations between industries, is represented by the variable *inter-industrial input–output linkages (LINK)*. This variable measures the degree to which an industry uses imported inputs and is calculated by determining the ratio of the subtraction of output and value added in the total output (Forslid et al., 2002). High values for this variable imply the existence of vertical or input–output linkages between industries. These linkages provide industries with the raw materials or semi-finished products that are needed to produce final goods. Furthermore, the role of downstream industries in the industrial growth of an economy is underlined by the high values of the variable. In contrast, low values for this variable indicate a horizontal linkage between industries at the same level of the value chain.

Research has shown the increasing role of industrial outsourcing as a result of the increasing integration of world markets and the disintegration of the production process. A positive contribution to industrial growth (as indicated in Forslid et al., 2002) implies the restructuring of the productive pattern to include new forms of vertical specialisation. Another matter that requires examination is the characteristics of the economies that better support this form of trade. Generally, vertical specialisation has become apparent in the production of mainly capital-intensive goods by the advanced economies and of labour-intensive goods by the less developed ones. This evidence indicates that poor countries are at risk of being pushed to continue to specialise in low-technology and unsophisticated industrial processes (UNIDO, 2009). For this reason, the econometric model includes a variable for industrial input-output linkages in relation to each country's relative concentration in labour-intensive industries (RCLAB). The relationship between industrial input-output linkages and relative concentration in labour-intensive industries indicates the role of the outsourcing industry in the industrial growth of labour-intensive economies. Based on the benefits of the division of labour and increasing specialisation, these variables are expected to have a positive effect on the dependent variable (equations 8 and 9).

The quality of *human capital* (HC) constitutes another significant component of the development of industrial activity and is represented in the econometric model by the proportion of the population that has graduated from a tertiary-education

institution. The theories of endogenous development place particular emphasis on this factor (Romer, 1986; Lucas, 1988), and neoclassical theory also does so to a certain extent (Mankiw et al., 1992). The important contribution of the variable to economic development (Barro, 1991; Levine & Renelt, 1992) is underlined through its role in the flexibility of the market, the convenience of application of structural arrangements and the improvement of the adjustment of countries to the social, technological and cultural demands of the twenty-first century (OECD, 1987). This variable by its positive contribution to industrial development would indicate the role of a well-trained labour force in the productive process and development (Artelaris et al., 2006). On the contrary, a different (negative) result would indicate the inability of productive structures to exploit this input properly. The effect of the variable on industrial growth is presented in equation 10 and is expected to be positive.

Finally, a time dummy variable has been included in the econometric model (TIME) to capture the effects of the single market and the enlargement of the EU eastwards in the industrial growth, which receives a value of '1' during the period 1995-2007, and '0' otherwise.

B. The results of the econometric model

The econometric model is estimated based on panel data as it includes both cross-section data (for 37 countries) and time series data (covering the period 1989-2007). The determinants of the econometric model are evaluated using pooled regression model. However, it is likely that some variables and industrial growth are to be jointly determined. Thus, the estimates of the effect on industrial growth may be biased. For this reason, whether there is a correlation between the explanatory variables (X_{jit}) and the error term (ε_{it}) is examined, whereas the standard approach to testing each variable for non-stationarity over time is to be estimated by augmented Dickey-Fuller regression (ADF).

The conventional single-equation ADF test is based on the following regression equation:

$$\Delta X_{it} = \alpha_i + \beta_i X_{i,t-1} + \sum_{j=1}^{k} \theta_{ij} \Delta X_{i,t-j} + \varepsilon_{it},$$

where Δ is the first difference of the variable X_{it}, i is the country, t is the year, k is the number of lagged first differences, ε_{it} is a white-noise disturbance with a variance of σ^2, and $t = 1, 2, \ldots, T$ indexes time. The null hypothesis of $\beta = 0$ is based on the existence of a unit root, whereas the alternative hypothesis of $\beta < 0$, if validated, will indicate that X_{it} is stationary. For the unit root test, the Levin-Lin-Chu (LLC) test is conducted, which is widely used for this purpose in the literature (Li & Liu, 2004). Table 1 lists the

results of the LLC test, based on which the null hypothesis of non-stationarity failed to reject for the independent variables for the agglomeration economies (AGGL) and the demand market size (DEMAND). The same test was employed on the first difference level of the data indicating the stationarity of the variables.

TABLE 1. **Results based on the Levin, Lin and Chu test for pool regression models**

	Level	**First difference**
Independents		
INT	-3.040***	
AGGL	**1.297**	-13.840***
SPEC	-1.231*	
SPEC· VACAP	-2.343***	
DEMAND	**5.828**	-9.522***
GRAV	-3.927***	
LINK	-1.877**	
LINK· CRLAB	-2.115**	
HC	-1.375*	
TIME	-1.731**	

*** statistically significant at the 1% level, ** statistically significant at the 5% level,
* statistically significant at the 10% level

Table 2 (column 1) presents the regression results for the base model which includes the whole of the European countries[2]. In general, the effect of all variables is positive (by a direct or under relational conditions) and statistically significant on industrial growth. In general, lines, central, large, open markets and markets reinforced by agglomeration economies are favourable areas of industrial growth. This aspect configures a European space in which the market forces and market features accord more with the claims of the modern theories than of the classical ones. Furthermore, it seems that the period after 1995 is marked by higher industrial growth rates stimulated by the determinant factors.

In terms of the influence of *specialisation* (SPEC) on industrial growth, it is shown to depend on capital-intensive production. This variable contributes positively and is statistically significant to the dependent variable according to the condition: $\partial Y_{it} / \partial SPEC_{it} = b_3 + b_4 VACAP_{it} > 0 \Rightarrow VACAP_{it} > -b_3 / b_4$ or VACAP>16.25. This is true for the majority of European countries (Figure 1), which form a group of areas whose industrial growth benefits from specialisation in capital-intensive sectors. The range of values of the indicator is quite broad (16.25-45).

2 All the necessary tests for problems of multicollinearity, heteroskedasticity and autocorrelation have been successfully realised.

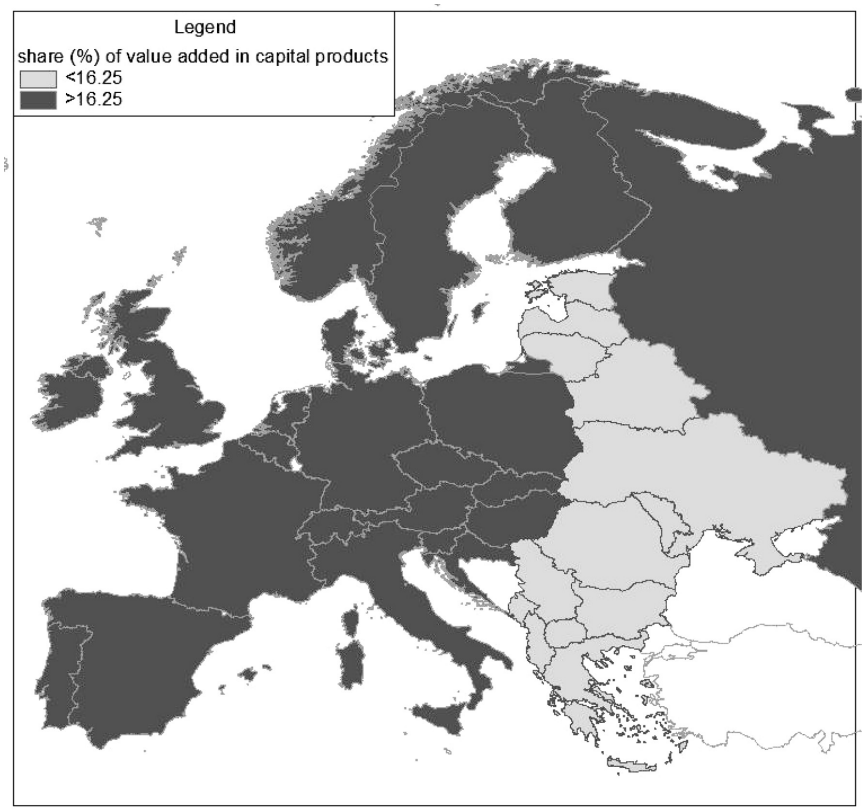

FIGURE 1. **Differences in the influence of specialisation on industrial growth based on the share (%) of value added in capital products**

Similarly, the correlation of *industrial input–output linkages* (LINK) to industrial growth is conditional as it is positive and statistically significant under the condition of a relative concentration in labour-intensive industries: $\partial Y_{it} / \partial LINK_{it} = b_8 + b_9 RCLAB > 0 \Rightarrow RCLAB > -\frac{b_8}{b_9}$ or RCLAB>0.001. This implies that industrial outsourcing plays a significant role in the economies with a high relative concentration of labour-intensive industries. However, it should be highlighted that labour-intensive industries are not always unsophisticated industries as sophistication is also related to soft technology. Indeed, based on Figure 2, it shows that industrial outsourcing is part of production in developed countries (Mediterranean countries) as well as in less developed ones (countries of Eastern Europe), being equally an essential parameter of their industrial growth.

After detecting the main determinants of industrial growth in the European space, their role in European countries with distinctly different welfare levels and productive systems should be investigated. For this purpose, following Forbes (2000) and Tavares and Wacziarg (2001), the sensitivity of the estimates to geographic coverage by

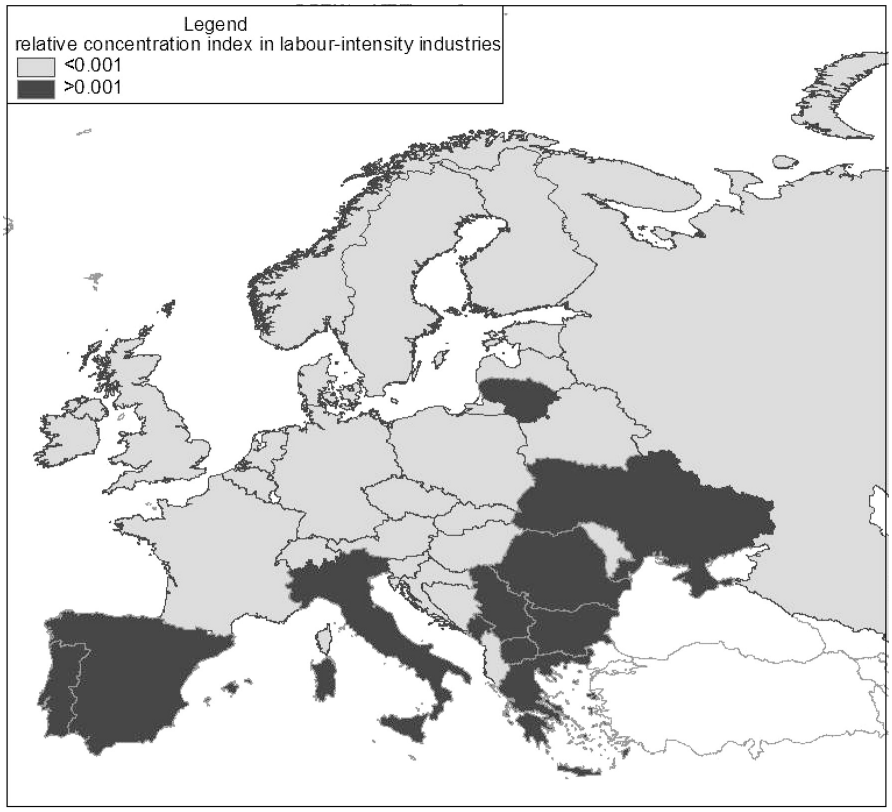

FIGURE 2. **Differences in the influence of input-output industrial linkages on industrial growth based on the relative concentration index in labour-intensity industries**

sequentially restricting the estimates to the following sub-samples (or macro-regions) is examined: Western Europe, new EU member states (NMS) and Eastern Europe (Table 2, columns 2-4). The contribution of the determinants, despite the decrease in degrees of freedom, proves to be significant. Furthermore, the coefficients and the standard errors of the equations are stable for the most part.

However, there are some significant points that have to be highlighted. First, agglomeration economies, market demand, geography and trade integration are critical factors for the industrial development of *all* European economies accentuating their significance in countries independent of their economic or integration level. Therefore, this paper attests that the significance of those parameters, which are integral to the industrial growth according to the recent stream of new economic geography, has the same power in all the European areas, cultivating a coherent and consistent regulatory environment of industrial transformation, expansion and competitiveness.

Second, the variable that seems to be important mainly for the *advanced Western Europe* is the *specialisation related with high share of value added in capital products*, as

its estimator sign changes from positive to negative when the referred macro-region is excluded from the analysis. On the contrary, for the rest of the areas (NMS and Eastern Europe), specialisation seems to constitute an essential factor in the industrial growth as its correlation is positive and statistically significant with the dependant variable, without, however, being (heavily) related to the technologically inferior part of production. Consequently, this signifies two productive systems: the first includes Eastern Europe and NMS, and the second consists of Western Europe. Even though they experience similar trends of augmenting specialisation, they focus on different fields of technological ability, and thus are amenable to a higher maturity level.

Third, the variable that seems to be most significant for the industrial growth of *NMS* compared to other macro-regions is the *time period*. Particularly, the dummy variable of time period displays a non-significant contribution to industrial growth in cases where NMS are excluded from the analysis. This outcome has a straightforward interpretation as the accession of NMS in the EU in 1995 seems to be related with high industrial growth rates, even higher from those of Western Europe's. The reason for that is that the expansion of manufacturing activities in low-income environments is fraught with externalities and spillovers of all kinds (Rodrik, 2006).

Fourth, the variables that seem to be significant, mostly for the industrial growth of *Eastern Europe*, are the *industrial input-output linkages in labour-intensive industries and the human capital*. The empirical analysis underlines the factors which are related to an inferior technological level and production structure and wield the sceptre of their industrial growth. Concerning the contribution of industrial input-output linkages to regions of abundant labour concentration, this, in essence, underlines the task-based production where countries of higher income tend to specialise in the production of more sophisticated tasks, while countries of lower income specialise in less sophisticated tasks (UNIDO, 2009). This asserts the issue of the different patterns of production and specialisation among western and eastern European areas. In our case, outsourcing activities in labour-intensive industries seem to be important to Eastern Europe verifying their increasing role in many low-technology sectors (Scott, 2006). As regards human capital, it has long been stressed as a pre-requisite for economic growth. However, the attainment of the labour force or its retention in less developed areas is something that is not considered as granted, on the contrary, it is appraised as a significant factor in economic prosperity at the first stages of industrial growth.

Consequently, the integration process contributed to the evolution of the production systems in Europe by a re-organisation of its economic activity and re-configuration of the industrial growth pattern. In an attempt to illustrate the association of the nature of determinants of industrial growth (on the basis of their theoretical shelter) with the evolution of the production systems of European countries, the stages of comparative advantage evolution are given in Table 3. They are derived more from the differences

rather than similarities of the determinants of industrial growth as indicated in the preceding analysis. According to it, each group of countries is situated in a different stage.

TABLE 2. **Results of the econometric model of industrial growth in Europe, 1989-2007**

Independents	***Dependent: weighted growth of industrial output***			
	Pooled two-stage least squares			
	Base model	**Sensitivity to geographic coverage**		
	Europe	**Excluding Western Europe**	**Excluding NMS**	**Excluding Eastern Europe**
	(1)	(2)	(3)	(4)
INT	0.09***	0.12***	0.0008*	0.05**
AGGL	0.0001*	0.004***	0.0006*	0.0004*
SPEC	-12.31**	0.63	1.88	-14.16***
SPEC· VACAP	0.75***	-0.31**	0.30***	0.77***
DEMAND	$7.94 \cdot 10^{-9}$***	$2.02 \cdot 10^{-7}$*	$9.98 \cdot 10^{-9}$***	$4.86 \cdot 10^{-9}$***
GRAV	$1.02 \cdot 10^{-8}$***	$2.47 \cdot 10^{-7}$***	$1.25 \cdot 10^{-8}$***	$7.67 \cdot 10^{-9}$***
LINK	-11.36**	-31.72***	-23.98***	110.00**
LINK· CRLAB	8899.38***	14243.52***	15401.63***	-1379.91*
HC	0.14***	0.45***	0.59***	0.06
TIME	3.21***	6.37***	6.10	2.29***
R^2adj	0.36	0.88	0.81	0.51
F	25.64	655.30	132.03	41.11
N	522 (18·29)	252 (18 ·14)	342 (18·19)	450 (18 ·25)

Notes:
*** statistically significant at the 1% level, ** statistically significant at the 5% level, * statistically significant at the 10% level

TABLE 3. **Industrialisation and evolution of production systems in factors of comparative advantage**

Stages of evolution of production systems in factors of comparative advantage				**Macro-regions**
Stage 1	Factors by Hecksher-Ohlin theory, factors by endogenous growth theory			
Stage 2		Factors (of inferior technology) by new economic geography		*Eastern Europe*
Stage 3				*NMS*
Stage 4			Factors (of superior technology) by new economic geography	*Western Europe*

4. Conclusions

The goal of this paper is to empirically detect and evaluate the determinants of industrial growth in the increasingly integrated Europe, which is characterised by a gradually changing geography of production, improvements in market access, bifurcation of trade, and growing interdependence between developed and developing countries through their participation in global value chains. In this line of thought, we attempt to discern the factors that foster industrial growth for countries that not only are part of this evolving European environment but are also characterised by production systems of different nature or idiosyncrasy, and of economic systems characterised by different prosperity and integration levels. The econometric analysis has provided some insight into the factors that influence industrial growth of macro-regions belonging to different productive systems.

First, the main factors that seem to play an important role in the industrial growth when examining Europe as a whole, are geo-economic accessibility, agglomeration economies, trade integration, specialisation in capital value-added products, size of the demand market, inter-industrial input-output linkages in areas with a higher concentration of labour-intensive industries and human capital. These factors overwhelmingly assert the dominance of market forces supported by more recent theoretical venues (i.e., the new economic geography).

Subsequently, the question that arises is whether the role of the determinants of industrial growth in Europe is equally robust in European macro-regional economies of different welfare and integration levels and/or of production systems of a different structure. The answer is both yes and no, proving that integration steers economies into becoming both more similar and more different. The analysis shows that integration has influenced the economies and their industrial growth, on the one hand, by attributing to them *common* behavioural characteristics and, on the other hand, by forming their industrial growth pattern by *different* natural factors in alignment with the regions' comparative advantage and the markets' maturity levels.

Specifically, this paper has shown that, on the one hand, agglomeration economies, market size, trade integration and geography are equally essential determinants of industrial growth in macro-regions which belong to different economic and production systems as well as developmental trajectories. This important outcome essentially attests to the degree in which integration has influenced the economies, not only inside the EU, but inside the whole European area by attributing to them common behavioural characteristics.

On the other hand, there are different factors that promote the industrial growth of different economical systems in line with their comparative advantage and their level of market's maturity. Thus, for Western Europe, specialisation as a driver of industrial growth and related to a high share of value added in capital products derives not only from the relative competitive advantage in industry but also from an advanced

production system and a mature market. For NMS, the benefits reaped from the EU accession signify that economies in the incipient stages of economic and production restructuring could display high growth rates in industry by favouring the appropriate conditions for an environment fraught with any kind of externalities and spillovers. For Eastern Europe, the production structure is proved, first, to be characterised by factors of labour-intensive and low technological ability and second, to be based on factors of two different theoretical streams, the human capital (a critical parameter of endogenous theory) and industrial outsourcing (a factor of the new economic geography). Thus, it seems that integration contributed to the fact that the eastern and out of EU area proceeded to restructuring of its production which did not alter the nature of its comparative advantage (of labour-intensive) but changed the form of the production system towards a mixed one, including features from the neoclassical and endogenous growth theory as well as from the NEG.

Consequently, the integration process contributed to the evolution of the production systems of European macro-regional economies (inside and outside the EU) leading them to adopt more common features in their production organisation (participation in commodity chains and networks, specialisation, externalities), but co-instantaneously to be also more differentiated among themselves (inter-sectoral patterns) in line with their comparative advantage and their level of market maturity. At this point, it should be mentioned that some areas which specialise in slightly inferior products and produce task-based manufacturing goods, exhibit high industrial growth rates confirming the statement of Stiglitz (2002) that it makes no difference what a region produces, what matters is whether the output is maximised.

The European integration is an on-going process and its effects on the industrial growth and on the evolution of production systems in areas of different developmental routes will continue to constitute an interesting field of research. For this reason, the above-mentioned outcomes will offer an interesting benchmark for comparisons with future results to investigate whether deeper integration grounded in the context of 'new trade politics' and 'embedded liberalism' (Pauwelyn, 2008; Cramme & Diamond, 2009) brings greater differentiations among production systems, with some regions successfully playing the games of "scale politics" (Hudson, 2002), or whether the on-going economic and fiscal crisis will modify the already existing economic and production systems towards more skewed patterns.

References

Aiginger, K. (2000). Specialisation of European Manufacturing. *Austrian Economic Quarterly, WIFO, 5*(2), 81-92.

Aizenman, J. & Sushko, V. (2011). Capital Flow Types, External Financing Needs, and Industrial Growth: 99 countries, 1991-2007. *NBER working paper No 17228.*

Alesina, A. & Wacziarg, R. (1998). Openness, country size and the government. *Journal of Public Economics, 69*(3), 305-321.

Alesina, A., Spolaore, E. & Wacziarg, R. (2004). Trade, growth and the size of countries. In P. Aghion, and S. Durlauf, (Eds), *Handbook of Economic Growth*, edition 1, volume 1, number 1, September.

Basile, R., Arbia, G., & Mantuano, M. (2005). Does spatial concentration foster economic growth? Empirical evidence on EU regions. In F. J. Trivez, J. Mur, A. Angulo, M. B. Kaabia, & B. Catalan (Eds), *Contributions in spatial Econometrics.* Faculdad de Ciencias Empresalares i Economicas, Universidad de Zaragoza, pp. 301-326.

Artelaris, P., Arvanitidis, P. & Petrakos, G. (2006). Explaining knowledge-based economic dynamism in a global scale. *(DYNREG working paper), No* 7/2007.

Arvanitidis, P., Petrakos, G. & Pavleas, S. (2010). On the dynamics of growth performance: an expert survey. *Contributions to Political Economy, 29*(1), 59-86.

Baldwin, R., Martin, P. & Ottaviano, P. (2001). Global income divergence, trade and industrialization: the geography of growth take-offs. *Journal of Economic Growth, 6*, 5-37.

Barro, R. (1991). Economic growth in a cross section of countries. *Quarterly journal of economics, 106*(2), 407-443.

Bohle, D. & Greskovits, B. (2006). Capitalism without compromise: strong business and weak labour in Eastern's Europe new transnational industries. *Studies in Comparative International Development, 41*(1), 3-25.

Brülhart, M. (1998). Trading places: industrial specialization in the EU. *Journal of Common Market Services, 36*(2), 319-346.

Brülhart, M. & Sbergami, F. (2006). Agglomeration and growth: empirical evidence. *Eighth Annual Conference of ETSG (European Trade Study Group), 7-9 September 2006*, WIIW and Universität, Wien.

Barry, F. (1999). *Understanding Ireland's economic growth*. Palgrave Macmillan.

Camagni, R. (1992). Development Scenarios and Policy Guidelines for the Lagging Regions in the 1990s. *Regional Studies, 26,* 361-374.

Chenery, H. (1960). Pattern of industrial growth. *American Economic Review, 50,* 624-54.

Chenery, H., Robinson, S. & Syrquin, M. (1986). *Industrialization and growth, a comparative study*. London: Oxford University Press.

Chenery, H. & Syrquin, M. (1975). *Patterns of Development: 1950–1970*. New York: Oxford University Press for the World Bank.

Cheshire, P. & Malecki, E. J. (2004). Growth, development and innovation: a look backward and forward. *Papers in Regional Science, 83*, 249-267.

Chiarvesio, M., Di Maria E. & Micelli, S. (2010). Global Value Chains and Open Networks: The Case of Italian Industrial Districts. *European Planning Studies, 18*(3), 333-350.

Chinitz, B. & Vernon, R. (1960). Changing Forces in Industrial Location. *Harvard Business Review, 38*, 126-136.

Ciccone, A. & Jarocinski, M. (2010). Determinants of Economic Growth: Will Data Tell?. *American Economic Journal: Macroeconomics, 2*(4), 222–246.

Clark, D. (1995). Trade orientation and industrial sector growth in developing countries. *The Journal of developing areas, 30*, 1-10.

Combes, P. (2000). Economic structure and local growth: France, 1894-1993. *Journal of Urban Economics, 47,* 329-355.

Combes, P. & Overman, H. (2003). The spatial distribution of economic activities in the European Union. *Urban and Regional Economics, vol. 4* (Henderson & Thisse, eds.).

Cramme, O. & Diamond, P. (2009). *Social justice in the global age.* Polity Press, p.13.

Cuaresma, J., Doppelhofer, G. & Feldkircher, M. (2009). The determinants of economic growth in European regions. *(CESifo working paper), No 2519*. CESifo Group, Munich.

Davis, D. (1998). The home market, trade and industrial structure. *The American Economic Review, 88*(5), 1264-1276.

De Lucio, J., Herce, J. & Goicolea, A. (2002). Value added instead employment: The effects of externalities on productivity growth in Spanish industry. *Regional Science and Urban Economics, 32,* 241-258.

Dunning, H. (1997). The European internal market program and inbound foreign direct investment. *Journal of Common Market Studies, 35*, 1-30.

Erickson, D. (1989). Export Performance and state industrial growth. *Economic Geography, 65*(4), 280-292.

Eurostat (2011). *Statistics Database*. Available from http://epp.eurostat.ec.europa.eu.

Falcioğlu, P. & Akgüngör, S. (2006). *Regional Specialization and Industrial Concentration Patterns in Turkish Manufacturing: Industry after Trade Liberalization.* Paper presented in conference Shaping EU regional policy: Economic, social and political pressures, June 8 & 9, Leuven, Belgium.

Feeny, S. & Ouattara, B. (2009). What type of economic growth does foreign aid support? *Applied Economic Letters, 16*(7), pp. 727-730.

Feige, I. (2008). *Transport, trade and economic growth*. Berlin: Springer.

Forbes, K. (2000). A reassessment of the relationship between inequality and growth. *American Economic Review, 90*(4), pp. 869-887.

Forslid, R., Halland, J. & Midelfart-Knarvik, K. (2002). A U shaped Europe? A simulation study of industrial location. *Journal of International Economics, 57*, 273-297.

Fujita, M., Krugman, P. & Venables, A. (1999). *The spatial economy: cities, regions and international trade*. MIT Press.

Gallup, J., Sachs, J. & Mellinger, A. (1999). Geography and economic development. *(Center for International Development working paper), No 1*.

Grossman G.M., Helpman E. (1991). *Innovation and Growth in the Global Economy*. Cambridge, Mass.: MIT Press.

Helpman, E. & Krugman, P. (1985). *Market Structure and Foreign Trade*. Cambridge, MA: MIT Press.

Hudson, R. (2002). Changing industrial production systems and regional development in the New Europe. *Transactions of the Institute of British Geographers, 27*(3), 262-281.

Islam, N. (1995). Growth Empirics: A Panel Data Approach. *The Quarterly Journal of Economics, 110*(4), 1127-70.

Kallioras, D. & Petrakos, G. (2010). Growth, Integration and Structural Change in the Regions of the EU New Member-States. *The Annals of Regional Science, 45*(3), 667-680.

Kong, X. (2006). *Learning, Evolution of Technology Capabilities and Its Impacts on Industrial Growth of Electronics Industry in China.* Paper presented in the Atlanta Conference on S&T Policy US-EU Policies for Research and Innovation, May 18-20, Atlanta, GA.

Krugman, P. (1979). Increasing returns, monopolistic competition and international trade. *Journal of International Economics*, 9, 469-479.

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy,* 99, 484-499.

Krugman, P. (1998). *The role of geography in development.* Paper in Annual Bank Conference on Development Economics, April 20-21.

Krugman, P. & Venables, A. (1996). Integration, specialization and adjustment. *European Economic Review, 40*, 959-967.

Kuznets, S. (1959). On comparative study of economic structure and growth of nations. In NBER (ed.), *The Comparative Study of Growth and Structure.* New York.

Lall, S. (2010). The technological structure and performance of developing country manufactured exports, 1985-98. *Oxford Development Studies, 28*(3), 337-369.

Lau, D. (1992). Local concentration and international competitiveness: some empirical evidence for manufacturing sectors in selected European countries. *Konjunkturpolitik, 42*(2-3), 181-205.

Levine, R. & Renelt, D. (1991). Cross-country studies of growth and policy. *(World Bank working paper), No 608,* World Bank.

Levine, R. & Renelt, D. (1992). A Sensitivity Analysis of Cross-Country Growth Regressions. *American Economic Review, 82*(4), 942-63.

Li, X. & Liu, X. (2004). Foreign Direct Investment and economic growth: an increasingly endogenous relationship. *World Development, 33*(3), 393-407.

Lucas, R. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics, 22*, 3-42.

Madani, H. (2001). *South-South Regional Integration and Industrial Growth: The Case of the Andean Pact* (DECRG-Working Paper Series), The World Bank.

Mankiw, N., Romer, D. & Weil, D. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics, 107*(2), 407-437.

Martin, P. and Ottaviano, P. (2001). Growth and agglomeration. *International Economic Review, 42*, 947-968.

Massey, D. (1995). *Spatial divisions of labour: social structures and the geography of production*. London: Macmillan.

Murphy, K., Shleifer A. & Vishny R. (1989). Industrialization and the big push. *Journal of political economy, 87*(5), 1003-1026.

Nakamura, R. (1985). Agglomeration economies in urban manufacturing industries: A case of Japanese cities. *Journal of Urban Economics*, *17*(1), 108-124.

Narula, R. & Dunning, J. (2000). Industrial development, globalisation and multinational enterprises: New realities for developing countries. *Oxford Development Studies, 28* (2), 141-167.

OECD (1987). *Structural adjustment and economic performance.* Study, OECD.

Overman, H, Redding, S. & Venables, A. (2001). The economic geography of trade production and income: a survey of empirics. *(CEPR Discussion Paper), No 2978.*

Pal R. (2011). The relative impacts of banking, infrastrucuture and labour on industrial growth. *Macroeconomics and Finance in Emerging Market Economies, 4*(1), 101-124.

Pauwelyn, J. (2008). New Trade Politics for the 21st Century. *Journal of International Economic Law, 11*(3), 559-573.

Petrakos, G. (2000). Spatial impact of East-West integration. In G. Petrakos, G. Maier & G. Gorzelak (Eds), *Integration and transition in Europe.* London: Routledge.

Petrakos, G., Fotopoulos, G. & Kallioras, D. (2012). Peripherality and integration: industrial growth and decline in the Greek regions. *Environment and Planning C: Government and Policy, 30*(2), 347-361.

Pietrobelli, C. & Saliola, F. (2008). Power relationships along the value chain: multinational firms, global buyers and performance of local suppliers. *Cambridge Journal of Economics, 34*(2), 1-12.

Rodrik, D. (2006). Industrial development: some stylized facts and policy directions. In UN (ed.), *Industrial development for the 21st century*. UN: New York.

Quah, D. (1993). Empirical Cross-Section Dynamics in economic growth. *European Economic Review, 37*, 426-434.

Romer, P. (1986). Increasing returns and long run growth. *Journal of political economy, 98*(5), s71-s181.

Schmenner, R. (1982). *Making Business Location Decisions*. Englewood Cliffs, NJ: Prentice-Hall.

Scott, A. (2006). The Changing Global Geography of Low-Technology, Labor-Intensive Industry: Clothing, Footwear, and Furniture. *World Development, 34*(9), 1517-1536.

Smith, A., Rainnie, A., Dunford, M., Hardy, J., Hudson, R. & Sadler, D. (2002). Networks of value, commodities and regions: Reworking divisions of labour in macro-regional economies. *Progress in Human Geography, 26*(1), pp. 41-63.

Sbergami, F. (2002). Agglomeration and economic growth: some puzzles. *(Graduate Institute of International Studies working paper)* 02/2002, Geneva.

Stiglitz, J. (2002). *Development policies in a world of globalisation*. Paper presented at the seminar New International Trends for Economic Development, fiftieth anniversary of the Brazilian Economic and Social Development Bank (BNDES), Rio Janeiro, September 12-13, 2002.

Svart, L. (1976). Environmental Preference Migration: A Review. *Geographical Review, 66*, 314-330.

Tavares, J. & Wacziarg, R. (2001). How democracy affects growth. *European Economic Review, 45*, 1341-1378.

Thompson, W. & Mattila, J. (1959). *An Econometric Model of Postwar State Industrial Development*. Detroit, MI: Wayne State University Press.

Tsiapa, M. (2011). Trade relations and potential of the Western Balkans. *International Journal of Economic Policy in Emerging Economies, 4*(2), 140-158.

UNIDO (1979). *World Industry since 1960: Progress and Prospects.* New York: United Nations.

UNIDO (2009). *Industrial Development Report 2009*. UNIDO.

Venables, A. (1996). Equilibrium locations of vertically linked industries. I*nternational Economic Review, 37*, 341-359.

Wheat, L. (1973) *Regional Growth and Industrial Location: An Empirical Viewpoint*. Lexington, MA D. C. Heath.

Wheat, L. (1986). The determinants of 1963-77 regional manufacturing growth: why the South and West grow. *Journal of Regional Science, 26*(4), 635.