Regional and Sectoral Foreign Direct Investment in Portugal since Joining the EU:
A Dynamic Portrait

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Abstract:

Despite the very few studies regarding FDI in Portuguese regions - especially regarding its effects - FDI can be an important catalyst for regional economic development and growth. This work studies the existing FDI in the Portuguese regions, analysing its distribution by NUTS III, the sectors in which FDI has more weight in each region, as well as it evolution between 1986 and 2009. Over the years analysed, the results show an increase in the number of firms with FDI in Portugal, although their relative weight remained constant. At the same time, these firms spread to all regions of the country, besides the main economic and services agglomerations (Lisboa and Porto). The regions attracted not only FDI for the sectors in which they have already been specialized, but also for other activities, diversifying the regional productive structure. The increase and diversification of FDI coincided with the tertiarisation of the economy, approaching the totality of the productive specialization of the country, while continuing to focus on manufacturing.

JEL- Codes: F21, F23, R12.

Keywords: Regional FDI, Regional Distribution of the Economic Activity of Multinationals, Productive Specialization of the Regions, Cluster Analysis, Shift-Share Analysis, Portugal.

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1. Introduction

The financial and economic crisis that Portugal is currently undergoing, felt more acutely since the international rescue package is in place, has prompted a heated discussion about the structural problems of the Portuguese economy. The primacy of the sectors that produce tradable goods and services, reforms in justice, controversial labour laws and the laws of competition have been identified as vectors that are vital to change structurally the Portuguese economy to increase productivity and lead to a sustained recovery.

Foreign Direct Investment (FDI) has also gained strength in discussions aimed at redefining the route of the Portuguese economy, being presented as a variable that can contribute decisively to improve its performance. In fact, history shows that the injection of foreign capital in Portugal has been instrumental in the economic development of the country. Foreign investment was present in the processes of industrialization, albeit short, that Portugal crossed in the eighteenth and nineteenth centuries. In the beginning of the twentieth century became insignificant with the arrival of the totalitarian regime to power, but would return with the opening of the Portuguese economy in the early 60s, with the accession to the European Free Trade Association (EFTA). At the time, foreign capital was concentrated mainly in labour intensive industries, taking advantage of cheap labour and access to productive resources of the country (such as cork), but foreign capital has also played a key role in the diversification of the production structure of the country, in sectors such as chemicals or electrical equipment.

The Portuguese Revolution of 1974, which ended 48 years of dictatorship, despite having left intact foreign companies (who escaped nationalization), had a negative impact on FDI due to the hectic political climate, social, and economic time that followed. The return of foreign investors happened during the 80s, with Portugal joining the European Economic Community (EEC) in 1986. A new injection of foreign capital has begun at the beginning of the second decade of this century. The lack of equity of Portuguese companies and financing constraints by the banking system has them become increasingly eager of the injection of foreign capital. Recently, privatizations, which intensified after the signing of the agreement with the troika (International Monetary Fund (IMF), European Central Bank (ECB), and European Commission (EC)), have boosted the flow of foreign investment in Portugal. Besides the traditional investors in Portugal (Europe and USA) are increasingly frequent reports on investments by developing countries with wealthy elites, such as Angola, Brazil, and China. Regionally, there are several areas of the country that have been reported in the ability to attract foreign investors. In Alentejo and Trás-os-Montes there are several mines in prospecting phases. The Brazilian Embraer already started producing this year aeronautical components in Évora. European multinationals like Nokia and Ikea are other companies that are strengthening their position in Portugal.

Previous literature about regional FDI in Portugal is almost inexistent and they are mainly aimed to draw conclusions about possible spillover effects that foreign companies can have on domestic ones (e.g. Crespo *et al.* 2009; Crespo *et al.* 2012). Other studies, namely Guimarães *et al.* (2000) and Alegría (2006) study agglomeration economies for foreign firms.

In a study for the Portuguese manufacturing industry between 1982 and 1992, Figueiredo and Guimarães (1997) used the database Quadros do Pessoal (using labour as the variable of analysis) to analyse and describe, at the regional level, the presence of FDI in the Portuguese economy from 1982 until 1992. Our work is intended as a contribution to the analysis of regional FDI in Portugal following the pioneering study of Figueiredo and Guimarães (1997). The purpose is to analyse FDI in regional and sectoral perspectives, at the Nomenclature of Territorial Units for Statistics (NUTS III) level since 1986 until 2009. Thus, the objective of this study is to undertake a careful analysis of FDI by region, the privileged sectors in each region by foreign capital, the characteristics of sectors and regions and how its evolution has been over

the period analysed, which is fundamental to the definition of economic policy in this matter. We use the yearly survey Quadros do Pessoal, a database collected by the Portuguese Government for all existing companies operating in the country (except family businesses without wage-earning employees).
This work has the following structure. After the introduction, Section 2 presents a literature review related to regional FDI in Portugal. In Section 3 we present a brief description of the data used. In Section 4 we describe the methods used and in Section 5 we analyse the results. Section 6 sets forth the main conclusions of the study.

2. FDI in Portugal – A Brief Historical and Literature Overview

The existence of FDI in Portugal is recorded for at least two centuries. According to Matos (1973), the Portuguese economy remained "on the sidelines of the international movement of capital" and, in the 19th century, Germans, French, and British came to Portugal to invest mainly in extractive industries and in the financial sector, still doing export and import. The entry of foreign capital in Portugal would not change with the end of monarchy and establishment of the Republic in the early twentieth century. However, from the 1920s, nationalism and economic protectionism measures marked the little openness demonstrated by the regime that occupied power since the 28 of May of 1926, which restrain trade relations (Figueiredo and Guimarães, 1997).
The Law of Industrial Conditioning (*Lei do Condicionamento Industrial*), aiming to keep in Portuguese hands, firms which were considered strategic for the domestic economy, contributed to the flight of foreign investment, which then became "insignificant", considers Lopes (2004). Nevertheless, there were foreign companies operating in the telecommunication sector (in Lisboa and Porto) and in the distribution of gas, electricity, and urban transportation in Lisboa.
The beginning of the 60s would bring a new impetus to FDI in Portugal, boosted by the accession to the EFTA in 1959 and the creation of legislation that facilitated the entry of foreign capital in specific sectors. These measures guaranteed the non-discrimination and repatriation of profits and legally framed the possibility of tax benefits. Given the earlier foreign investments in public service concessions, this time foreign investors sought the advantages of the low cost of Portuguese labour and the country's natural resources sectors, to bet on products such as tomato paste, clothing, paper pulp, electronic items or ship repairs (Lopes, 2004).
Matos (1973) records that between 1961 and 1967, the foreign capital that entered Portugal were ten times higher than in the previous two decades and, that in manufacturing, in the 60s, foreign investment has contributed to 30 percent of gross fixed capital formation. Fernandes (1992) highlights that in 1973 36.7 percent of exports came from subsidiaries of foreign capital, a value that focused mostly on two major groups: industries labour-intensive (especially clothing and electrical and electronic equipment) and manufacturing based on natural resources (both traditional industries such as cork or recent established sectors such as canned fruits). Still, Lopes (2004) points out that even if between 1965 and 1973 the level of foreign investment was multiplied 10 to 20 times compared to the 50s, these level was only 0.8 percent of the Gross Domestic Product (GDP).
The end of the dictatorship in Portugal in 1974, and the troubled period that followed the path to the implementation of a democratic regime, along with the international recession following the oil shock of the 70s, made foreign capital regress, and despite its affiliated companies had escaped nationalization or land reform.
The flow of FDI improve in the early 80s (Renault made the investment in Portugal in this decade) but it would be the entry of Portugal in the then EEC in 1986, that stimulated the exponential growth of foreign capital inflows in Portugal, fostered by legislative changes towards more economic liberalization and also by the privatization programs. Financial activities, machinery, transportation and electrical equipment, chemicals, agricultural and food goods, non-metallic minerals, textiles, clothing, and footwear were the

sectors that benefited the most (Saraiva, 1993), appearing then various investments directed to exports thanks to the absence of export restrictions. In 1991, according to Lopes (2004), FDI accounted for 4.6 percent of GDP in Portugal and 18 percent of gross fixed capital formation, being most of it original from European Union (EU) member countries.

By region, Carrière and Reix (1989) state that in the mid-1980s, FDI in Portugal concentrated on the coast and, in particular, in Lisboa and Porto and surrounding areas. In 1985-86, 75.2 percent of foreign firms in the sample (1471) were in the districts of Lisboa and Porto.

Figueiredo and Guimarães (1997) conclude that the existence of FDI in manufacturing remained stable during the 1982-1992 period, without significant changes resulting from the entry of Portugal into the EEC. Foreign capital bet especially in capital-intensive sectors (metal mechanics, chemical and metallurgy industry), which meant a diversification of the pattern of manufacturing specialization, as the industry owned by Portuguese capital bet more in labour-intensive sectors (textile, clothing and footwear industries).

Regarding the spatial distribution of FDI, the industry owned by foreign capital "tends to focus on five districts around the two main cities, Lisbon and Porto." Still, the authors find that industry owned by foreign capitals is less concentrated than the industry held by Portuguese investors, so, the FDI doesn't worsen the spatial asymmetries in the industry distribution. In fact, there is "spatial deconcentration of the structure of the industry participated by foreign capital", claim Figueiredo and Guimarães (1997).

Finally, the authors state that the study concludes that FDI does not merely reproduce the national industrial structures that already exist, but it contributes to the diversification of industry resident in almost all districts of mainland Portugal.

Besides the entry of foreign capital in manufacturing, Lopes (2004) highlights the attractiveness of FDI in banking, real estate and trade between 1986 and 1992.

A historical overview of FDI in Portugal allows us to understand the historical development - adjusted to economic and political cycles of the country - as well as it shows that a regional perspective of FDI is still scarce. This way, is fundamental to explore this perspective taking into account the importance that foreign investment can play in economic growth and regional development.

Guimarães *et al.* (2000) studied the location decisions of new business projects wholly or partly owned by foreign capital between March 1985 and the same month of 1992, using Quadros de Pessoal database and doing the analysis at the county level. According to the authors, these projects were located mainly on the west coast of Portugal and along the country's main cities, Lisboa and Porto, demonstrating a geographical concentration of activity. The authors then analyse the factors that determine this location decision and reached the conclusion that agglomeration economies were the determining factor for the location of foreign investment, highlighting the impact of agglomeration of services, a measure of the urbanization of economies. Moreover, membership of a county to the districts of Lisboa or Porto is an additional factor for the location decision. The distance from the cities of Lisboa and Porto have a negative impact on the location decision due to transportation costs, although the authors consider that the improvement of communication infrastructure should lead investors to opt for other locations in the future. As for the cost of labour, while recognizing that low wages may be a factor in attracting foreign investors to Portugal compared to other European countries, the authors find that this characteristic does not influence the location decision of foreign companies when deciding to invest in Portugal. Also the population density is not found to be statistically significant.

Alegría (2006) also found the same type of geographic concentration in Portugal found by Guimarães *et al.* (2000). The author analysed the location decisions of multinational in 25 European countries and 246 regions, between 1997 and 2005, and demonstrated that the motivations for determining the location of multinationals differ depending on the observed spatial level (national or regional). European economic integration has led many multinationals to locate part of its activities in peripheral countries such as Portugal, attracted by low labour costs. According to the findings, the location of FDI is positively

influenced by variables related to the market potential and there is an appetite for investments in countries with large internal and external market potential, like the UK or France. Besides location, wages are another variable that significantly influences the decision. The low cost of labour is considered a dispersion force, leading multinationals to locate activities in countries with low production costs. Also the density of production, which negatively affects the location decision, is another reason for multinationals to opt for peripheral countries. The author confirms his initial assumption that European economic integration was a reallocation force of the activity of multinationals to peripheral countries (Portugal's case since mid-1980), blurring the standard centre- periphery pattern in Europe for the location of FDI. The author justifies this trend with the fact that the economic union has allowed the reduction of trade costs, which lessened the incentives for agglomeration, leading companies to favour the existence of low labour costs in the European periphery. Conclusions which, he says are in line with the models of the New Economic Geography (NEG), like in the work of Krugman (1991).

In terms of the regional analysis, the author studies the attractiveness of regions within each country, uncovering a centre-periphery dichotomy, with capital and regions which lie on the border with Western Europe receiving more foreign investment in manufacturing and gives the example of Lisboa and Porto. These results contrast with the behaviour of FDI at the European level. While low wages are a factor affecting the choice of multinationals to invest in a specific country, at the regional level this factor has no impact. The external market potential is a variable that has impact on the location choice of multinationals, both regionally and nationally. However, at the regional level, multinationals do not care about the internal market, since they operate in an integrated economic area. In short, he concluded, the results differ depending on the geographic unit of analysis, and the determinants of agglomeration dominate the decisions of multinational companies at the regional level. The central role of agglomeration factors in attracting FDI in a regional perspective has been confirmed by several authors. The conclusions of Alegría (2006) that the wage level has little impact on the choice of the location of FDI in regional terms, meet Dunning (1998), since while globalization geographically separates ownership and location of production forces, agglomeration activity concentrates in specific regions and countries.

Crespo *et al.* (2009, 2012) used regional data to draw conclusions about the advantages or disadvantages of geographical proximity and/or absorptive capacity of regional FDI by domestic firms, i.e., spillovers. Crespo *et al.* (2012) made an analysis of externalities or spillover effects of FDI in Portugal by regional perspective, considering both inter-industrial externalities as intra-industrial. The authors used geographical proximity factors between multinational and domestic and the developmental level of the region - two factors that have in common the space dimension - to see whether the these two factors have an impact. Using a econometric model in which the unit of measure for the regions was the 275 municipalities in Continental Portugal, the authors concluded that the spillovers are only observed in more developed regions, "confirming the importance of absorptive capacity of the region", and that the geographical proximity of multinational companies and locations are also important, since "a statistically significant effect was found only in cases where the presence of multinational is measured within regions" thereby confirming theory. Moreover, the effects were still detected inter-industrial, i.e. more likely to occur spillovers at the vertical than at the horizontal level. Similar results were reached by the same authors (Crespo *et al.*, 2009) in a previous article that concluded by the negative effect of horizontal spillovers, but positive effects of the vertical ones. According to the authors, these results should be taken into account in public policy regarding the attraction of FDI, in the sense that not only the national but also local authorities should create favourable conditions for FDI.

3. Data

In this work we analyse the distribution of FDI by regions across the period 1986-2009, and we also assess the sectors in which foreign capital have more weight in each region, to do a comparison between

sectors and regions which attracted or repelled foreign investment and also between foreign and domestic firms in the regions and sectors.

The analysis of FDI in Portugal was based in Quadros de Pessoal of the Office of Strategy and Planning (GEP) of the current Ministry of Solidarity and Social Security (MTSS). This database contains micro level data, having information about firms, establishments, and workers. It also has the additional advantage of covering all firms operating in Portugal, with the exception of family businesses without wage-earning employees.

In this paper, we use data relative to the number of firms to analyse in detail the FDI that prevails in Portuguese regions, as well as the sectors which attract more foreign investors. The variable used was the number of firms with foreign capital. A firm is defined as a FDI/multinational if the percentage of foreign equity is 10% or more of total equity (following the IMF recommendation for what is considered FDI for statistical purposes) broken down by NUTS III and the Portuguese Classification of Economic Activities (CAE) at the two digits-level.

We chose to divide territory by NUTS III (30 units, of which 28 on the mainland and two corresponding to Açores and Madeira) because this is a high level of disaggregation of sub-regions, but yet suitable for analysis. With a greater level of detail (for counties and parishes) the observations would be irrelevant for the number of firms. Since 1986, the boundaries of NUTS III have been modified several times.[1] These changes were mainly due to the reallocation of some counties between regions (e.g. Mealhada passes from Baixo Mondego to Baixo Vouga), the emergence of new counties (the counties of Trofa, Vizela,, and Odivelas, created in 1998, were integrated in the same NUTS III of municipalities that originated them – in Ave for the first two and Odivelas in Grande Lisboa), but mainly by the appearance of another region in 1989 with the deployment of the Pinhal Interior in Pinhal Interior Norte and Pinhal Interior Sul. Despite these changes, the data collected for the period in question (1986, 1998, and 2009) is based on the latest delimitation of regions, so the changes don't have an impact on the results and the analysis conducted below.

In the case of CAE, the compatibility had to be made at the two-digit level. This happens because in 1986 the classification used to define economic activities was CAE 73, in 1998 it was the CAE 2nd Revision and in 2009 CAE 3rd Revision.[2] The fact that CAE have changed over the years implied that both the number and the name of the activities included in each sector changed. This led to the need to match the CAE 2nd and 3rd Revisions with CAE 73, the smallest aggregate. Additionally we have removed the code sector "Insufficiently Defined Activities", which includes activities that don't fit in the other defined sectors. Therefore, in the end, we worked with a database with 33 sectors for the entire time period. [3]

In the regional analysis, besides the 30 NUTS III, we noted that some firms appear classified with two other codes: Foreign and ZZZ. These are, respectively, firms whose headquarters are abroad and those who the technicians responsible for Quadros de Pessoal could not fit in the 30 regions listed.

Data included in Quadros de Pessoal was collected for the years 1986, 1998, and 2009. The first year was when Portugal joined the EEC, which allows us to analyse the existing FDI in Portuguese regions before the flow of foreign investment from the countries of the economic bloc. 1998 is the year before the introduction in the money market of the euro as an accounting currency (used on its non-physical form) and a peak of economic growth in Portugal. Finally, in 2009, the last year of the analysis matches with the international financial and economic crisis and the deterioration of the Portuguese general government debt to GDP ratio.

In addition to the data about FDI, we also use another variable taken from Quadros de Pessoal - the total number of firms in Portugal in 1986, 1998, and 2009 (by NUTS III regions and CAE at the two-digit level)

[1] Changes contained in Decree-Law No. 46/89, No. 163/99, No. 317/99, Law No. 28/2001 of 12 July and Decree-Law No. 244 / 2002. See Appendix A for a list of the NUTS III regions and Figure A1 for a map of their distribution across the Portuguese territory.

[2] Decrees-Law No. 182/93 and No. 381/2007.

[3] The exercise of compatibilisation is available upon request. See Table B in Appendix for a description of the 33 sectors.

and even FDI that emerged in each year, which we designated as Recent FDI (either greenfield investment, or FDI by purchase, merger, or other type of transactions). However, firms were required to disclose the starting year of activity in Quadros de Pessoal only since 1995, so in this case the data is available only for the years of 1998 and 2009.

4. Methodology

A regional analysis of FDI and its characterization was performed based on three different methodologies. First, measurements of localization and specialization were calculated to characterize the regions over the selected time period. We then use the shift-share analysis to take conclusions on the relative position of each region against other territorial units in terms of FDI. Finally, we used the methodology of clusters to identified patterns of FDI between regions. This analysis was also performed with a dynamic perspective to see whether the patterns found have changed between 1986 and 2009.
No mention in these analyses will be done to the 'Public Administration and Defence' and 'International Organizations and Other Extraterritorial Institutions' sectors since there has been no FDI in these sectors in the analysed period.

4.1. Indicators

4.1.1. Location Measures

Measures of location analyse the spatial distribution of a variable (in this case FDI) for each sector. For this, we constructed a matrix of relative frequencies of the territorial distribution of the variable FDI by sectors of activity that allowed us to calculate the two most common location indicators used in the regional analysis - the Location Coefficient (LC) and Location Quotient (LQ) - as well as the Herfindahl Index (H). These measures of relative concentration compare the spatial distribution of the variable with the reference space, in this case Portugal.

$$LC_{ik} = \frac{\frac{x_{ik}}{x_k}}{\frac{x_i}{x}}, LC_{ik} \geq 0 \text{ , } LC_K \in [0,1[\qquad (1)$$

The ***Location Coefficient*** indicates the location pattern of sector *k* and the deviation relative to the reference space pattern. The similarities, or not, against the reference space, allows us to assess the level of relative concentration of a sector. A result of 0 means that the pattern of location of a sector in some region is exactly equal to the reference space and 1 means the opposite, i.e., that sector is entirely concentrated in only one region. Hence, as we approach 1, the sector is concentrated in territory. If the activity is too concentrated, but the regions have a large weight in the aggregate, the value of the coefficient will be attenuated.

$$LQ_{ik} = \frac{\frac{x_{ik}}{x_k}}{\frac{x_i}{x}}, LQ_{ik} \geq 0 \quad (2)$$

The ***Location Quotient*** evaluate the relative contribution of the territorial unit *i* for sector *k*, given the relative contribution of this region to the national economy. If LQ_{ik}> 1 means that FDI in this sector is relatively concentrated in that region. If LQ_{ik} <1 that region has a lower relative importance on the weight of FDI in that sector compared to the reference space.

$$H_K = \sum_{i=1}^{1} \left(\frac{X_{IK}}{X_K} \right)^2, \qquad H_K \in \left[\frac{1}{I}, 1 \right] \quad (3)$$

The ***Herfindahl Index*** is a measure of geographical concentration calculated squaring the contribution of each territorial unit *i* for each sector *k*. This indicator explains that there is a minimum concentration of FDI in that sector, being the contribution of FDI equally distributed between territorial units for that sector, or whether, by contrast, is highly concentrated, which means that at the maximum value, the FDI of that sector is present in a single region. For the analysed data, the Herfindahl index ranges between 0.033 and 1.

4.1.2. Specialization Measures

The specialization measures assess the productive specialization of each territorial unit. Like in location measures, also in this case was initially constructed a database of relative frequencies of the sectorial distribution of FDI by territorials units. This matrix allow us to proceed with the calculation of the relative indicators of specialization - Location Quotient (LQ) and Coefficient of Specialization (CS), which measure the specialization of each region compared to the reference space - as well as the Entropy Index (E) and the Rodgers's Index of Diversification (RID) that assess the distribution of variable by sectors in each region.

$$LQ_{iK} = \frac{\frac{X_{iK}}{X_i}}{\frac{X_K}{X}}, LQ_{iK} \geq 0 \quad (4)$$

The ***Location Quotient*** allow us to know if a region is more specialized in terms of FDI in a sector relative to the reference space, in this case the Portuguese economy, calculating the indicator by comparing the relative importance of sector *k* in the territorial unit *i* relative to the reference space. When LQ_{ik}>1 FDI of that sector has more importance in that region than in the national economy, so this region is relatively specialized in FDI of that sector. If LQ_{ik}<1 the region is not relatively specialized. This measure is the same used in location measures.

$$CS_i = 1/2 \sum_{K=!}^{K} \left| \frac{X_{iK}}{Xi} - \frac{X_K}{X} \right|, CS_i \in [0,1[\quad (5)$$

The ***Coefficient of Specialization*** compares the sectorial distribution of FDI in the territorial unit *i* with the sectorial distribution in the reference space, realizing if the region is specialized over the aggregate. At the lower limit of this indicator, the analysed region has a specialization profile in terms of FDI similar to Portugal, so it does not have a relative specialization. As the coefficient approaches one it means that the region has a specialized production structure relative to the reference space.

$$RID_i = \sum_{K'=1}^{K^o} F_{ik'} \,,\; RID_i \in \left[\frac{K+1}{2}, K \right] \tag{6}$$

To calculate the ***Rodger's Index of Diversification*** we have to calculate the relative contribution of each sector to the total value of the variable in the territorial unit, then to sort the relative distribution in descending order, to calculate the partial cumulative values and finally add up all the accumulated partial values. The Rodger's Index of Diversification in this analysis varies between 17 and 33, taking into account the 33 sectors considered. The lower limit occurs when the distribution of FDI by sectors is equally distributed, so there is minimum specialization in this region. At the upper limit, FDI of one sector of activity is only present in one region, i.e., maximum specialization.

$$E_i = -\sum_{k=1}^{K} \left(\frac{X_{iK}}{X_i} \right) \log \left(\frac{X_{iK}}{X_i} \right), \; E_i \in [0, \log K] \tag{7}$$

The ***Entropy Index***, which for the data of this work varies between zero and 1.52 - the lower limit corresponds to the maximum of specialization of territorial unit *i* and occurs when the variable *X* depends only on the contribution of one sector. Thus, the region has a more specialized production structure. Hence, the upper limit should be interpreted as the maximum diversification, in this case, when FDI is evenly distributed among sectors, within that territorial unit. Since the weight of each sector in the region is weighted by the logarithm of the same relative weight, this indicator is less sensitive than the Rodger's Index of Diversification to the existence of sectors overrepresented in the analysis.

4.2. Shift-Share

$$\sum_k \Delta X_{ik} = \sum_k \left[X_{ik}(t) - X_{ik}(t-1) \right] \equiv \sum_k \left[NX_{ik} + SX_{ik} + RX_{ik} \right] \tag{8}$$

The classical model of analysis of variance components (or shift-share) consists on the following components:

ΔX_{ik} is the variation of variable X_{ik}

$X_{ik}(t)$ is the variable X measured in region *i*, in sector *k*, at moment *t*

NX_{ik} is the national component

SX_{ik} is the sectoral (or structural or industry mix) component

RX_{ik} is the regional (or competitiveness, or differential) component

These three components can be defined as:

$$NX_{ik} = g_{NX} X_{ik}(t-1)$$
$$SX_{ik} = (g_{NXk} - g_{NX}) X_{ik}(t-1)$$

$$RX_{ik} = (g_{ik} - g_{NXk})X_{ik}(t-1)$$

In which:

g_{NX} is the percentage variation of variable *X* at the national level relative to the base year *t-1*

g_{NXk} is the percentage variation of variable *X* at the national level in sector *k*

g_{ik} is the percentage variation of variable *X* observed in region *i*, in sector *k*

This analysis was originally developed by Dunn (1960), which attempts to break down the factors that influence the differences in growth between regions, since these are more than just a replica of what happens at the macro level.

This analysis contains three components:

- The ***national component*** evaluates if the performance of the variable studied in the region follows the same variation observed at the national level;
- The ***sectoral or industry mix component*** assesses the differences between the behaviour of the region and the reference space attributable to dissimilarities in the sectorial composition, since the productive structure of each region is distinct from national, with the sectors to have different weights. When the structural component results in a positive value means that the region is specialized in sectors that, at the national level, are growing above average. Hence, we can conclude from this component on a specialization more or less favourable in the region;
- The ***regional or competitiveness component*** captures changes in the local economy that are not attributed to national and structural components. It measures the deviation between the growth of each sector at the regional level and what would be expected if the behaviour was the same as shown in the sectorial growth rate at the national level. If the value of this component is positive, the region has comparative advantages that benefit the growth of the sector.

This technique of analysis of regional growth has not been without criticism. According to Loveridge and Selting (1998) there are four major flaws on shift-share analysis. The first one refers to the absence of a theory behind this analysis that explains the reasons for the differences in growth between regions. Proponents of the technique believe that the shift-share fits precisely in the role to identify and describe, whilst the other models and case studies do the theoretical justification. The aggregation of variables is another of the limitations to this analysis, the levels of disaggregation chosen both by sectors and by regions to take effect on the values resulting from calculations of the components. For example, if the break in sectors is larger, the sectorial component tends to explain more the growth than the regional component, whose significance decreases. Proponents of the shift-share acknowledge this limitation, but consider that is not enough to reject this analysis and point out that the problems of the breakdown are common to other methods. It is also the subject of debate how the selection of variables to consider and the base and terminal years are influencing the values of the components. Finally, in the shift-share analysis, interdependence between the structural and regional component prevails, which has led to one of the most frequent criticisms of this model and the development of alternative formulations to overcome this criticism. To address this problem, in Esteban-Marquillas (1972) is proposed an alternative formulation, clearly separating the different components that influence the growth of a variable in a region.

Despite the alternatives that have been suggested by several authors to overcome these problems, in Loveridge and Selting (1998) is consider that the classical formulation of the shift-share analysis continues to be the most advantageous to understand the regional economy. This is also our choice. As Esteban-Marquillas (1972) pointed out, this has the advantage that, through simple information, allows various possibilities for analysis, which is even more important at the regional level where statistical information is scarce.

Therefore, we proceeded with the shift-share analysis for 1986-1998, 1986-2009, and 1998-2009. To make the calculations of the first two time periods was necessary to resort to some assumptions due to the

amount of zeros on existing arrays, which turned infinite the results of many calculations related to the growth rate.
Since, in these cases, we were unable to use the growth rate to continue the calculations for the industry mix component, we construct minimum and maximum ranges of values that the component may take on the value of this component, which would later influence the value the remaining components, obtained by difference from the industry mix component. The zero value was always the minimum, and the maximum value would be the value corresponding to the value of the sector in the national economy.

4.3. Cluster Analysis

Cluster analysis allow us to group a population of *n* individuals, characterized by *q* variables in relatively homogeneous groups in which individuals are more similar to each other than against other groups. Clustering allow us to detect similarities or dissimilarities between them. There are various clustering techniques and there is not one that we can single out as the better one, since all the methods have advantages and disadvantages. For this work we chose the agglomerative hierarchical method.[4]
Accordingly, we performed cluster analysis using as a variable the weight of the sectors in each NUTS III for (i) all firms operating in Portugal, (ii) for firms with FDI, and for (iii) firms with Recent FDI in each of the years analysed. In all cases, data is for the years 1986, 1998, and 2009, except for the variable Recent FDI for which no data was available in the database Quadros de Pessoal in 1986.
Using the SPSS software, we chose the hierarchical agglomerative cluster method, i.e., a method which begins with each individual region being a single cluster and ends with all the regions in the same cluster, if not stopped earlier. In order to use this method, an aggregation (or desegregation) criterion must also be chosen, and in this case the complete linkage method was chosen. With this method the distance between two groups is defined as the distance between its least similar members. Given two groups *(l,j)* and *(k)*, the distance *(d)* between them is the biggest distance between their members:

$$d_{(l,j)k}=max\{d_{lk};d_{jk}\}$$

In this method, the elements of each group are more similar to each other than any of the other groups of elements, resulting in clusters with very similar elements. The measure of distance used is the Pearson correlation coefficient, which has the advantage of not being affected by differences in both dispersion and also in the scale of the variables.
The first group being formed tends to be the more homogeneous, i.e. the one with the highest correlation coefficients between its members.
We decided to stop the formation of clusters before the correlation coefficient goes beyond the average bilateral correlations between regions. For that, we calculate the bilateral correlations between regions for the variables mentioned above, for each of three years under consideration, and then proceeded to calculate their average. This was the cut-off criteria which seemed most appropriate to mark the point at which it ceases to be aggregation of the regions in groups.

5. Results

5.1. The importance of Regional FDI in the National Context

Before using a more refined analysis based on the three methods mentioned above, we draw a first picture of FDI in 1986, 1998, and 2009, comparing it to all companies operating in Portugal in those years (both domestic and with foreign capital) and with foreign investment which first appeared in 1998 and 2009, which we designate by Recent FDI.

[4] See Hair *et al.* (2010) - a multivariate data analysis manual that includes cluster analysis.

Looking at the data for the total number of firms surveyed in Quadros de Pessoal, it appears that in 1986 existed 106,770 companies, a number that would more than double in 1998, to 228,819. In 2009, there were 349,816. There is a considerable increase in businesses with foreign capital between the years 1986 and 2009, when the number have risen four times. While in 1986 1162 firms had foreign capital in Portugal, in 1998 this figure was already more than the double, settling in 2403. In 2009 that number had risen to 4413. Analysing the weight of FDI in the total number of firms over the 23 years analysed, despite the significant increase in the number of companies with FDI, they remained at about 1% of the total business sector.

This first picture of the distribution of FDI shows its concentration around Lisboa and, although with less weight, Porto, regions where are also located the majority of Portuguese firms. Data that meets the criteria to be considered within the concept of business clusters has recently been approached by the NEG, in which companies benefit from establishing their businesses in a geographical area where suppliers already exist, customers, and even other industries or companies with whom they can share knowledge and benefit from externalities. Guimarães *et al.* (2000) demonstrated that agglomeration economies are the determining factor for the location of foreign investment in Portugal, especially the clustering of services, which compensates for the lack of familiarity with the local environment.

The total number of firms operating in the manufacturing sector in Portugal was on a downward trend between 1986 and 2009, decreasing its weight from 24% in 1986 to 11.7% in 2009. However, if we analyse the weight of FDI in industrial activities, the behaviour was different: between 1986 and 1998 it decreased (from 21.23% to 19.12%), but increased again in 2009 to 27.11%. Although foreign firms still favour industrial activities, it is worth noting that, recently, both FDI companies and the entire business sector direct their investment to tertiary sector activities, especially trade and the myriad of services that fit within the sector “Operations on real estate and business services”.

There is also a notoriously high market share of companies with FDI in activities related to the extraction of resources, as well as in sectors such as electricity, water supply or financial services (banking and insurance). These were activities which, in 1986, had further reduced foreign investment and, in later years, would attract foreign investors who profited from the changes to legislation and the liberalization of some sectors of the economy which came into force.

5.2. Indicators

5.2.1. Results of Location Measures

In the analysis that follows, we will be relating the results for the Coefficient of Location, which are on Table 1 below, with the Location Quotient (see Appendix C, Tables C1, C2, and C3), enabling to attain accurate information about the level of concentration of FDI in each of the 33 sectors, and subsequently their location among the 30 regions considered in the analysis.

The primary activities - such as agriculture, fisheries, and natural resource extraction - are those with a pattern of FDI location furthest from the total of the Portuguese economy, with total foreign investment in these activities being located in regions that generally have a low level of attraction of foreign capital, as the Alentejo or the interior north of Portugal.

In the secondary sector there are distinct patterns. While activities related to ‘Textiles’, ‘Wood’ and ‘Other Manufacturing Industries’ present a distinct pattern, the remaining sectors have a distribution of FDI similar to the rest of the space reference. This difference relates to the goods they produce and the need of being or not located in major urban areas that are, as we see above, those which attract more foreign investment.

Foreign investment activities of the tertiary sector show a pattern similar to the total economy, and once again they are preferentially located in regions benefiting most from the injection of foreign capital. The only exception is ‘Water Supply’, with relative concentration of FDI in areas outside the main centres.

Table 1 - Location Coefficient

Sectoral CAE Code	1986	1998	2009
11 Agriculture and hunting	0.55	0.62	0.70
12 Forestry and logging	n.a.	0.97	0.61
13 Fishing	0.87	0.95	0.76
21 Coal extraction	n.a.	n.a.	n.a.
22 Extraction of crude petroleum and natural gas	0.36	n.a.	n.a.
23 Extraction of metal ores	0.46	0.73	0.99
29 Extraction of non-metallic minerals and industrial rocks	0.53	0.66	0.59
31 Manufacture of food products, beverages and tobacco	0.25	0.36	0.35
32 Manufacture of textiles and leather	0.59	0.58	0.67
33 Manufacture of wood and cork	0.70	0.74	0.57
34 Paper industries; graphic arts and publishing	0.16	0.3	0.23
35 Industries of chemical petroleum and coal products, rubber and plastic	0.15	0.24	0.3
36 Industries of non-metallic mineral products, except for crude	0.25	0.46	0.51
37 Manufacture of basic metals	0.34	0.69	0.73
38 Manufacture of metal products and machinery, equipment	0.22	0.35	0.41
39 Other manufacturing activities	0.49	0.34	0.47
41 Electricity, Gas and steam	0.36	0.24	0.25
42 Water supply	n.a.	0.62	0.75
50 Construction and public Works	0.25	0.17	0.14
61 Wholesale	0.18	0.16	0.15
62 Retail	0.14	0.13	0.14
63 Accommodation and food service activities	0.42	0.41	0.32
71 Transportation and storage	0.19	0.16	0.22
72 Communications	0.36	0.32	0.37
81 Banks and other monetary and financial institutions	0.23	0.27	0.26
82 Insurance	0.29	0.38	0.41
83 Real estate operations and business services	0.25	0.26	0.2
91 General government and national defence	n.a.	n.a.	n.a.
92 Sewerage and cleaning services	0.36	0.4	0.43
93 Social work and similar activities provided to the community	0.36	0.27	0.22
94 Recreational and cultural services	0.38	0.34	0.32
95 Personal and household services	0.2	0.57	0.27
96 International organizations and other extraterritorial institutions	n.a.	n.a.	n.a.

Source: Data based on Quadros do Pessoal, own calculation

According to the Herfindahl Index, presented in Table 2 below, in 1986 there were 12 sectors with high levels of concentration and, of these; six had even higher values (one), which means that the FDI of each of these sectors was present in only one region. Aside from 'Fishing', with total concentration on the Grande Porto, the remaining sectors with maximum concentration in 1986 – 'Extraction of Crude Petroleum and Natural Gas', 'Electricity, Gas, and Steam', 'Sewerage and Cleaning Services', 'Social Work and Similar Activities Provided to the Community' and 'Communications' - were located in Grande Lisboa. The region surrounding the capital is also evident in other sectors that have a very high concentration (though not total) – 'Construction', 'Wholesale', 'Transportation and Storage', 'Banks', 'Insurance' and Real Estate Operations and Business Services'. Conversely, 'Agriculture' and the

industries of ‘Textiles and Leather’ and ‘Wood and Cork’ were the least concentrated sectors in 1986, with ‘Agriculture’ present mainly in the south and Madeira, while industries give priority to the north of Portugal.

Table 2 – Herfindahl Index

Sectoral CAE Code	1986	1998	2009
11 Agriculture and hunting	0.16	0.09	0.12
12 Forestry and logging	n.a.	0.33	0.18
13 Fishing	1.00	0.50	0.22
21 Coal extraction	n.a.	n.a.	n.a.
22 Extraction of crude petroleum and natural gas	1.00	n.a.	n.a.
23 Extraction of metal ores	0.28	0.25	0.50
29 Extraction of non-metallic minerals and industrial rocks	0.28	0.15	0.14
31 Manufacture of food products, beverages and tobacco	0.29	0.17	0.10
32 Manufacture of textiles and leather	0.17	0.12	0.11
33 Manufacture of wood and cork	0.18	0.27	0.15
34 Paper industries; graphic arts and publishing	0.45	0.53	0.43
35 Industries of chemical petroleum and coal products, rubber and plastic	0.49	0.22	0.14
36 Industries of non-metallic mineral products, except for crude petroleum and coal	0.42	0.14	0.13
37 Manufacture of basic metals	0.34	0.18	0.15
38 Manufacture of metal products and machinery, equipment and transport	0.28	0.13	0.09
39 Other manufacturing activities	0.22	0.18	0.10
41 Electricity, gas and steam	1.00	0.33	0.24
42 Water supply	n.a.	0.22	0.22
50 Construction and public Works	0.65	0.47	0.27
61 Wholesale	0.68	0.49	0.39
62 Retail	0.54	0.41	0.37
63 Accommodation and food service activities	0.39	0.30	0.29
71 Transportation and storage	0.68	0.43	0.22
72 Communications	1.00	0.71	0.48
81 Banks and other monetary and financial institutions	0.63	0.68	0.47
82 Insurance	0.82	0.84	0.81
83 Real estate operations and business services	0.70	0.56	0.42
91 General government and national defence	n.a.	n.a.	n.a.
92 Sewerage and cleaning services	1.00	0.44	0.17
93 Social work and similar activities provided to the community	1.00	0.39	0.24
94 Recreational and cultural services	0.52	0.56	0.46
95 Personal and household services	0.42	0.21	0.22
96 International organizations and other extraterritorial institutions	n.a.	n.a.	n.a.

Source: Data based on Quadros do Pessoal, own calculation

In 1998, foreign capital was a bit more scattered over the territory and only the insurance activities were still concentrated in only one region, Lisboa. Still, the general features of the previous 12 years prevail.
In 2009, there would be no sectors concentrated in a single region and even the more concentrated - which are mostly the same as previous years - recorded would see a drop in concentration values. Besides ‘Banks’, ‘Insurance’ and ‘Communications’, also ‘Extraction of Metal Ores’ emerges from the group of the most concentrated, located in the regions of Alentejo and Cova da Beira. Among the least

concentrated, three sectors that were already in 1998 remain, joined by the 'Manufacture of Food products, Beverages and Tobacco' and 'Other Manufacturing Industries'.
This analysis reveals that FDI is concentrated around the capital, Lisboa, especially in the most capital-intensive sectors, while those who depend on the intensity of labour, such as agriculture and industrial activity, exhibit greater diversity in regional distribution.

5.2.2. Results of Specialization Measures

The results of the Specialization Coefficient, in Table 3 below allow us to realize that over the time period analysed, the Portuguese regions were becoming less specialized in terms of FDI (we considered a region to be less specialized if the coefficient is lower than 0.50), since FDI has since increased and spread throughout the country, reducing its weight proportionally in regions where it ~~is~~ was present.

Table 3 – Specialization Coefficient

NUTS III	1986	1998	2009
Minho Lima	0.85	0.51	0.44
Cávado	0.62	0.56	0.34
Ave	0.75	0.57	0.48
Grande Porto	0.26	0.18	0.14
Tâmega	0.90	0.43	0.48
Entre Douro e Vouga	0.67	0.59	0.44
Douro	n.a.	0.56	0.44
Altro Trás-os-Montes	n.a.	0.92	0.58
Algarve	0.65	0.52	0.47
Baixo Vouga	0.57	0.45	0.34
Baixo Mondego	0.53	0.44	0.23
Pinhal Litoral	0.46	0.45	0.34
Pinhal Interior Norte	0.78	0.76	0.53
Dão Lafões	0.61	0.57	0.48
Pinhal Interior Sul	0.98	0.94	0.98
Serra da Estrela	n.a.	0.92	0.75
Beira Interior Norte	0.51	0.83	0.82
Beira Interior Sul	n.a.	0.75	0.60
Cova da Beira	0.91	0.62	0.66
Oeste	0.56	0.40	0.29
Médio Tejo	n.a.	0.55	0.53
Grande Lisboa	0.15	0.18	0.16
Península de Setúbal	0.36	0.23	0.24
Alentejo Litoral	0.95	0.72	0.59
Alto Alentejo	0.80	0.48	0.50
Alentejo Central	0.76	0.54	0.75
Baixo Alentejo	0.94	0.91	0.78
Lezíria do Tejo	0.57	0.41	0.28
Açores	0.77	0.60	0.58
Madeira	0.37	0.44	0.34

Source: Data based on Quadros do Pessoal, own calculation

In 1986, 80% of the NUTS III had a specialized productive structure, which fell to 68% in 1998. In 2009 the regions specialized were already less than half (42%), and most of them, had a productive structure similar to reference space, i.e., the national economy.

The results of the Rodgers's Index of Diversification in Table 4 and the Entropy Index, in Table 5 (both below), indicate, as the Specialization Coefficient, that in 1986 most of the regions were specialized, while in 2009 their productive structure was generally more diverse. However, the indicators show differences in the analysis of the productive structure of regions, especially regarding the Grande Lisboa region. In 1986, the results of the three specialization measures indicate the region which includes the capital of Portugal as the least specialized. In 1998, only the Specialization Coefficient keeps this result, while both the Rodgers's Index of Diversification as the Entropy Index point the Baixo Mondego region as less specialized in terms of FDI, relegating Grande Lisboa to several places below in the ranking. Finally, in 2009, Grande Lisboa does not appear in any measure as the region with the most diversified productive structure. The Specialization Coefficient indicates the Grande Porto and the Entropy Index and the Rodgers's Index of Diversification the Minho-Lima region. Still, while the Coefficient puts Grande Lisboa as the second most specialized region, in the other two it does not appear in the first positions.

Despite this mismatch of opinions between the three measures of specialization, is possible to find a consensus on regional specialization. The most specialized region is unanimous - Pinhal Interior Sul (region in 1986 specialized in the 'Manufacture of Wood and Cork' and in the following years in 'Manufacture of Textiles and Leather'). The Alentejo also arises between the more specialized due to activities related to 'Agriculture'.

Among the less specialized, or more diversified, is the Grande Lisboa and nearby regions like Península de Setúbal and Lezíria do Tejo. Also noteworthy among the regions with a more diverse structure are Baixo Mondego, Grande Porto, and Minho-Lima (in 2009), and even Madeira.

The Location Quotient tell us that FDI regional productive structure has become more diverse in the 23 years analysed, with most regions to become more specialized in activities throughout the time period analysed.

Initially, foreign investment was located in regions largely due to the existing productive structure. Northern regions, such as Cávado, and Tâmega Ave, or the Centro, as Baixo Vouga, Baixo Mondego, Pinhal Litoral, Pinhal Interior Norte, and Dão-Lafões, had in 1986 foreign investment directed only to the industries, activities so prevalent in these units territorial. The same applied to the Alentejo regions that had FDI oriented to primary and industrial activities. With the increased flow of foreign capital to Portugal, which had a major boost after joining the then EEC in 1986, we witness not only a growth in foreign investment in sectors where it was already present, but also an extension of interests of investors in other areas.

These results are in agreement with those of Guimarães *et al.* (2000), that in a study about regional FDI in Portugal between 1985 and 1992, anticipated that the heavy concentration of FDI in major cities could decrease in the future, taking into account what happened in other European countries and the United States of America (USA).

Decreased concentration of FDI around major cities benefited other regions, not only with more foreign investment but with a diversification of its productive structure.

In general, in the regions mentioned above, companies with foreign capital are mainly focusing on tertiary activities such as trade and real state and services for companies and also in services such as electricity, water or communications, while also being present in industrial sectors.

In other cases, although a minority, there was a reduction in the number of sectors in which the regions were specialized, taking into account the first and last years of the analysis as it is the case of Grande Lisboa or Algarve. Grande Porto and Madeira in 2009 keep the same number of sectors with favourable specialization than in 1986, which contrasts with the rest of the country. However, the loss of specialization cannot be understood as disinvestment of foreign capital in these regions, since that in absolute number,

FDI has increased even in sectors that lost their specialization. The reason lies in the fact that in the first year of the analysis, foreign investment is still relatively low in Portugal and, so, concentrated in more developed regions. As it has grown, so has spread throughout the country, which means that some sectors lose weight on these regions in terms of FDI and thus favourable specialization.

Table 4 – Rodger's Index of Diversification

NUTS III	1986	1998	2009
Minho Lima	32.00	29.25	28.07
Cávado	32.18	30.47	29.10
Ave	32.36	31.50	30.14
Grande Porto	29.98	29.40	29.42
Tâmega	32.80	30.17	30.24
Entre Douro e Vouga	31.94	31.27	29.24
Douro	n.a.	31.80	29.69
Alto Trás-os-Montes	n.a.	32.50	30.00
Algarve	30.95	30.78	30.71
Baixo Vouga	30.94	30.35	28.92
Baixo Mondego	31.00	28.43	28.19
Pinhal Litoral	31.43	29.85	29.14
Pinhal Interior Norte	32.25	31.58	29.79
Dão Lafões	31.50	30.20	28.83
Pinhal Interior Sul	33.00	33.00	33.00
Serra da Estrela	n.a.	32.50	32.50
Beira Interior Norte	32.00	31.57	31.33
Beira Interior Sul	n.a.	30.56	29.25
Cova da Beira	32.75	29.81	31.44
Oeste	30.58	29.51	29.76
Médio Tejo	n.a.	29.31	28.76
Grande Lisboa	29.37	29.75	29.99
Península de Setúbal	29.74	28.83	29.15
Alentejo Litoral	32.50	30.93	30.91
Alto Alentejo	32.25	30.17	29.63
Alentejo Central	32.00	28.68	30.28
Baixo Alentejo	31.80	32.50	31.89
Lezíria do Tejo	30.20	28.85	29.53
Açores	31.33	31.57	30.06
Madeira	29.81	30.63	31.12

Source: Data based on Quadros do Pessoal, own calculation

Table 5 – Entropy Index			
NUTS III	1986	1998	2009
Minho Lima	0.48	1.01	1.15
Cávado	0.51	0.88	1.05
Ave	0.45	0.70	0.92
Grande Porto	0.96	1.02	1.02
Tâmega	0.22	0.92	0.92
Entre Douro e Vouga	0.58	0.76	1.04
Douro	n.a.	0.58	0.96
Alto Trás-os-Montes	n.a.	0.30	0.91
Algarve	0.80	0.81	0.86
Baixo Vouga	0.80	0.91	1.08
Baixo Mondego	0.75	1.10	1.13
Pinhal Litoral	0.67	0.97	1.04
Pinhal Interior Norte	0.45	0.66	0.95
Dão Lafões	0.60	0.92	1.07
Pinhal Interior Sul	0.00	0.00	0.00
Serra da Estrela	n.a.	0.30	0.30
Beira Interior Norte	0.48	0.64	0.68
Beira Interior Sul	n.a.	0.82	0.96
Cova da Beira	0.24	0.94	0.71
Oeste	0.83	1.00	0.98
Médio Tejo	n.a.	0.98	1.05
Grande Lisboa	1.01	0.97	0.94
Península de Setúbal	0.98	1.08	1.06
Alentejo Litoral	0.30	0.77	0.74
Alto Alentejo	0.45	0.88	0.99
Alentejo Central	0.48	1.04	0.91
Baixo Alentejo	0.58	0.38	0.53
Lezíria do Tejo	0.90	1.07	1.00
Açores	0.68	0.64	0.91
Madeira	0.96	0.85	0.78

Source: Data based on Quadros do Pessoal, own calculation

5.3. Results of Shift-Share

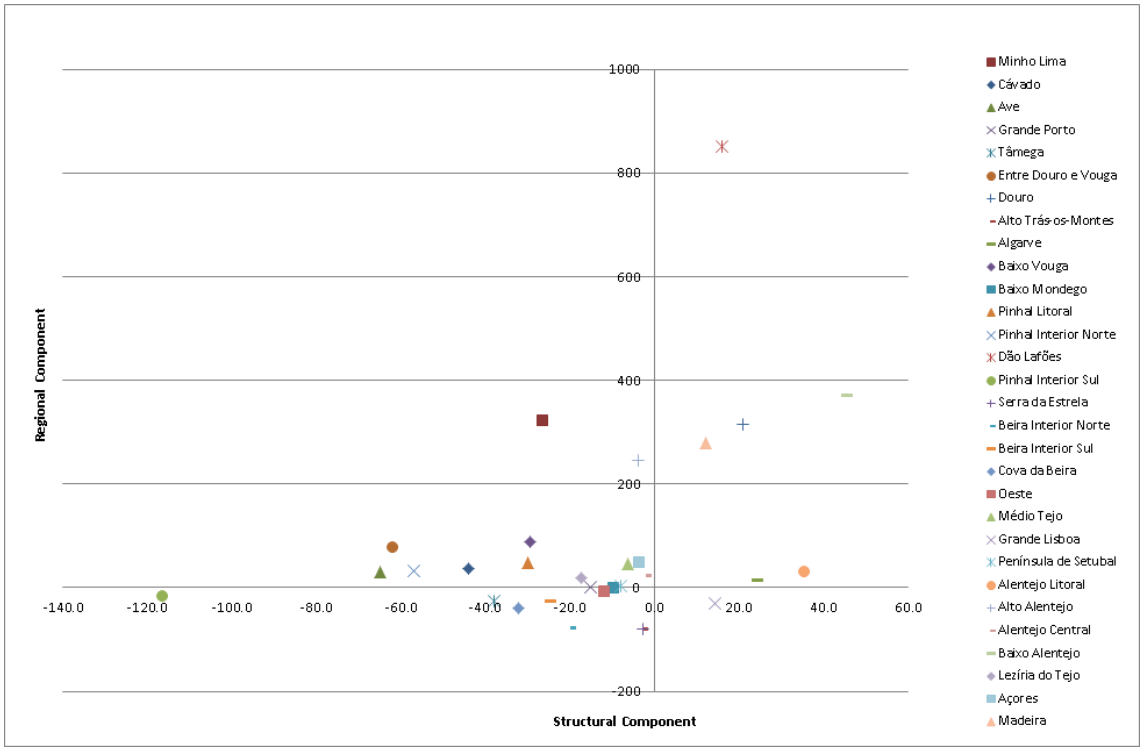
Under the Shift-Share analysis (see detailed results in Appendix D, Tables D1, D2, and D3), four regions showed a favourable performance in terms of the national, industry mix, and regional components in the 23 years between 1986 to 2009: Minho-Lima, Douro, Médio Tejo, and Madeira. The same regions also had positive performances in other interim periods - Minho-Lima and Médio Tejo between 1986 and 1998 and Douro and Madeira between 1998 and 2009. The results indicate, therefore, that these four regions

have managed to stay specialized in two distinct periods in sectors that grew above the national average in terms of FDI, as well as having characteristics that favour the growth of certain sectors.

Minho-Lima, Médio Tejo, and Douro benefit of foreign capital whose stake is divided between tertiary sectors as 'Construction', 'Electricity, gas and steam' and industrial activities, such 'Industries of non-metallic mineral products', and also Agriculture. FDI inflows to Madeira are in tertiary activities that gained weight in the last 20 years in the Portuguese economy, such as 'Real estate operations and business services'.

Conversely, regions that show an unfavourable performance are those in which foreign investment is intended primarily to activities of the secondary sector of the economy - especially 'Manufacture of textiles and leather', 'Industries of chemical, petroleum and coal products' and 'Manufacture of metal products and machinery' - who lost weight in the productive structure of the economy over the 23 years analysed, during which the Portuguese economy trod the path of tertiarisation. The northern regions of the country, both coastal and interior, fit into this category. Figure 1 below gives us an overview of the results for the last period analysed and confirms the results above.

Figure 1: Decomposition of FDI Regional Growth 1998-2009



5.4. Results of Cluster Analysis

First we analysed clusters formed based on FDI firms and discover some interesting patterns. Table 6 show us the results of cluster analysis for the total number of firms with FDI operating in Portugal.

Table 6 - Clusters Based on the Total Number of Firms with FDI Operating in Portugal

	1986	1998	2009
Cluster 1	Cávado, Ave, Tâmega, Cova Beira, Pinhal Interior N., B. Vouga, B. Mondego, P Setúbal, Alentejo Central	Alto Trás-os-Montes, Serra da Estrela, Beira Interior Norte	Alentejo Litoral, Baixo Alentejo, Beira Interior Sul, Alentejo Central
Cluster 2	Grande Porto, Beira Interior Norte, Pinhal Litoral, Grande Lisboa, Madeira	Baixo Vouga, Pinhal Litoral, Dão Lafões, Tâmega, Médio Tejo	Grande Porto, Grande Lisboa, Oeste, P. Setúbal, Lezíria Tejo, B. Vouga, Pinhal Litoral, Ave, Tâmega, Cávado, Entre Douro e Vouga
Cluster 3	Oeste, Lezíria do Tejo, Dão Lafões	Cávado, Ave, Minho Lima, Pinhal Int. N., Pinhal Int. S., Cova Beira, Entre D. Vouga	Algarve, Açores, Alto Trás-os-Montes
Cluster 4	Entre Douro e Vouga, Pinhal Interior Sul	Oeste, P. Setúbal, Alto Alentejo, B. Mondego, Lezíria do Tejo, Porto, Lisboa	Minho Lima, Baixo Mondego, Pinhal Interior Norte, Dão Lafões
Cluster 5	Minho Lima, Baixo Alentejo	Alentejo Litoral, Baixo Alentejo, Douro, Alentejo Central	Cova da Beira, Médio Tejo
Cluster 6	Alentejo Litoral, Açores	Algarve, Madeira	Douro, Alto Alentejo, Beira Interior Norte
Cluster 7	-	-	Serra da Estrela, Madeira
Regions out of cluster formation	A. Alentejo, Douro, Médio Tejo, Beira Interior S., Serra Estrela, Trás-os-Montes, Algarve	Açores, Beira Interior Sul	Pinhal Interior Sul
Average bilateral correlations between the regions	0.285	0.312	0.353
Value of correlation before clusters formation was stopped	0.331	0.458	0.454
Value of correlation after clusters	0.238	0.307	0.300

formation was stopped			

Grande Lisboa and Grande Porto always appear in the same group throughout the time period analysed, due to the similarity in terms of foreign investment in the two main cities of the country. Despite the diversity of FDI in these regions, in the three years analysed (1986, 1998, and 2009), they are presented in the cluster dominated by the 'Wholesale', a very important activity in these two regions. Also regions Cávado and Ave form an inseparable pair in clusters dominated by 'Manufacture of Textiles and Leather' in 1986 and 1998, and in 2009 by the 'Wholesale' and 'Manufacture of Metal Products and Machinery'. This denotes a shift in the productive structure of these regions in terms of FDI with the entry of foreign capital in services, accompanying the structural transformation of the national economy.

By sectors, it is clear the importance of activities related to trade ('Wholesale' and 'Retail') and 'Manufacture of Metal Products and Machinery' in cluster formation. Also visible is the growth of 'Real Estate Operations and Business Services', which in the last year is the main sector of two clusters, compared to only one in 1998 and none in 1986. Algarve and Madeira are constant regions in clusters dominated by this activity. Alentejo regions are predominantly in clusters in which there are agricultural activities.

Industrial activities lose weight in the formation of clusters over the period analysed. If in 1986 they were the main activities of four clusters, in 1998 were only important in three clusters and just two in 2009 (both with 'Manufacture of Metal Products and Machinery'). The textile-related industries, which arise both in 1986 and in 1998, disappeared in the last year, as well as the 'Manufacture of Wood and Cork', which have only a brief appearance in the first year of analysis.

In order to know whether the above cluster analysis, in terms of FDI firms, has correspondence with the overall structure of the national productive activity and its evolution, we examine the formation of clusters having as variable the weight of sectors in each NUTS III for the totality of firms in Portugal, with foreign or domestic capital, shown in Table 7.

The formation of clusters based on the referred variable shows the growing dominance of the 'Retail' sector. In 1986, just one cluster was formed based on 'Retail' (although it was present, with less relevance, in other clusters in the same year), number which increased to three clusters in 1998 and all five in 2009. The 'Construction' has also gained importance throughout time, as well as the 'Real Estate Operations and Business Services'. Conversely, sectors as 'Agriculture' and 'Manufacture of textiles and Leather' lost weight in the formation of clusters, as the economy invests in the tertiary sector.

By regions, the most part of regions from Alentejo belong to the first cluster. However, if in the first year of this analysis the dominant activity is 'Agriculture', followed by the 'Retail' sector, in 1998 and 2009 the relationship is reversed, like stated before.

Cávado, Ave, and Entre Douro e Vouga are regions with a similar pattern of production. However, if the first two years are dominated by 'Manufacture of textiles and Leather', followed by 'Retail', the last year the industry loses importance, appearing only after the 'Retail' and 'Construction' sectors.

Comparing the clusters formed from the weight of sectors in each NUTS III for all firms in Portugal with the weight of sectors in each region taking into account FDI firms only, it appears that the pattern of FDI firms begins to compare to that of the entire economy (for all firms) in 1998 and 2009, with foreign capital to redirect to activities of the tertiary sector of the economy, although it continues to privilege the so called tradable sectors, as it is the case of secondary sectors.

In 1986, while the 'Retail' was already the main activity in two clusters for the total of firms, for FDI firms four clusters were dominated by industrial sectors, one by the 'Agriculture' (as in the totality of firms), and one by 'Wholesale'.

Table 7 - Clusters Based on All the Companies Operating in Portugal

	1986	1998	2009
Cluster 1	Alentejo Central, Baixo Alentejo, Açores, Alto Alentejo	Alentejo Central, Baixo Alentejo, Alto Alentejo, Açores, Alentejo Litoral, Beira Interior Sul	Alto Alentejo, Alentejo Central, Douro, Baixo Alentejo
Cluster 2	Douro, Alto Trás-os-Montes, Baixo Mondego, Península de Setúbal, Oeste, Algarve, Madeira, Grande Lisboa, Grande Porto, Baixo Vouga, Pinhal Litoral, Dão Lafões, Beira Interior N., Minho Lima, Pinhal Interior Norte, Cávado, Serra Estrela	Alto Trás-os-Montes, Médio Tejo, Douro, Beira Interior Norte, Minho Lima, Dão Lafões, Pinhal Interior Sul, Pinhal Interior Norte, Serra Estrela, Pinhal Litoral, Oeste, Lezíria Tejo, Cova Beira, B. Mondego, P. Setúbal, Gd. Lisboa, Algarve, Madeira	Dão Lafões, Médio Tejo, Cova Beira, Alto Trás-os-Montes, Beira Interior N., Serra Estrela, Pinhal Litoral, Pinhal Interior Norte, Pinhal Interior Sul
Cluster 3	Cova da Beira, Médio Tejo, Beira Interior Sul, Alentejo Litoral, Lezíria do Tejo	Grande Porto, Baixo Vouga	Baixo Mondego, Península Setúbal, Baixo Vouga, Grande Porto, Grande Lisboa, Algarve, Madeira
Cluster 4	Ave, Entre Douro e Vouga	Cávado, Ave, Entre Douro e Vouga	Oeste, Lezíria Tejo, Minho Lima, Beira Interior S., Alentejo Litoral, Açores
Cluster 5	-	-	Cávado, Ave, Entre Douro e Vouga
Regions out of cluster formation	Tâmega, Pinhal Interior Sul	Tâmega	Tâmega
Average bilateral correlations between the regions	0.751	0.838	0.889
Value of correlation before clusters formation was stopped	0.774	0.876	0.898
Value of correlation after clusters formation was stopped	0.750	0.813	0.875

For the year of 1998 the 'Retail' sector was already the predominant sector in three of the four clusters for the totality of firms, while for FDI firms only, three of the six clusters were dominated by industrial activities (one for the textiles sector, as the for the totality of firms) and one dominated by 'Agriculture'. Finally, in 2009, in terms of FDI firms, there are two clusters in which industry is the dominant activity ('Manufacture of Metal Products and Machinery'), and there is still a cluster dominated by 'Agriculture'. For the totality of firms, all clusters in 2009 are dominated by the 'Retail' sector. This pattern is possibly related to the low labour costs in Portugal, which adds the closeness and free access to the markets of European countries, as evidenced by Barbosa *et al.* (2004) and Barbosa (2010). It should also be noted that in the case of the activities related to trade, foreign capitals are mainly invested in 'Wholesale' (and not in 'Retail') and they still give enough importance to the 'Real Estate Operations and Business Services', which dominated two clusters in 2009.

This analysis indicates that the investment of foreign capital has shifted increasingly to tertiary activities, but still continues to favour more export-led activities, as the industry. The comparison between Total FDI and Recent FDI, the later with results in Table 8 below, detects, similarities between them, which indicates that new foreign investments tend to follow the pattern of production and location of existing foreign companies.

Table 8 - Clusters Based on Companies with Recent FDI Operating in Portugal

	1998	2009
Cluster 1	Grande Porto, Grande Lisboa, Tâmega, Alentejo Central, Entre Douro e Vouga	Cávado, Dão Lafões, Baixo Mondego, Entre Douro e Vouga, Algarve
Cluster 2	Cávado, Pinhal Litoral, Ave	Grande Lisboa, Madeira, Grande Porto, Pinhal Litoral
Cluster 3	Algarve, Baixo Vouga	Tâmega, Alto Alentejo, Baixo Vouga
Cluster 4	Baixo Mondego, Madeira, Península de Setúbal	Serra da Estrela, Açores
Cluster 5	-	Minho Lima, Lezíria do Tejo
Cluster 6	-	Oeste, Península de Setúbal
Regions out of cluster formation	Minho Lima, Açores, Baixo Alentejo, Alentejo Litoral, Alto Alentejo, Oeste, Médio Tejo, Beira Interior Sul, Cova da Beira, Serra da Estrela, Beira Interior Norte, Dão Lafões, Pinhal Interior S., Pinhal Interior Norte, Douro, Alto Trás-os-Montes	Alentejo Central, Baixo Alentejo, Alentejo Litoral, Médio Tejo, Douro, Beira Interior S., Cova da Beira, Beira Interior Norte, Alto Trás-os-Montes, Pinhal Interior Sul, Pinhal Interior N., Ave
Average bilateral correlations between the regions	0.224	0.151
Correlation before clusters formation was stopped	0.295	0.263

Correlation after clusters formation was stopped	0.000	0.000

In 1986, the new foreign investment form clusters was dominated by the 'Wholesale' and the 'Manufacture of Textiles and Leather' which also exist in total FDI and even have some common regions. Compared to 2009, this similarity is also visible, with four of the six clusters forming correspondence with Total FDI ('Agriculture', 'Wholesale', 'Transportation and Storage' and 'Real Estate Operations and Business Services'). From the data we can infer that the 'Transportation and Storage' becomes the dominant activity of a cluster in 2009 precisely because of the investment of foreign capital in this sector.

Also new FDI investment is attracted to regions where foreign firms are already in place. This is visible in Cávado and Ave, that appear together in the same cluster dominated by the 'Manufacture of Textiles and Leather' in 1986, both in the analysis covering the whole productive sector and in the one covering FDI firms only. In 1998, these regions are again grouped in the same cluster in terms of Recent FDI, which means that FDI is attracted to regions where there are other companies in the same industry. In 2009, with the deepening of the tertiary economy, this trend ceases to verify for the two regions. Still, the FDI that arise in that year for Ave region went entirely to the textile industry.

The trend of new investments to follow the location of existing ones is verified in 2009 in the Algarve region, by the 'Real Estate Operations and Business Services'. This region appears in the cluster dominated by this sector for both Total FDI and Recent FDI.

In the cluster analysis of Recent FDI, most regions were without any grouping mostly due to the absence of any new investment in the years analysed. In 1998, in the group of regions without cluster, only Beira Interior Sul registered investment, and in 2009 it was Ave, as noted above. Moreover, nine regions (Douro, Alto Trás-os-Montes, Pinhal Interior Norte, Pinhal Interior Sul, Beira Interior Norte, Cova da Beira, Médio Tejo, Alentejo Litoral and Alentejo) did not get any Recent FDI in both 1998 and 2009. These results confirm the lack of attractiveness of these regions mentioned in other sections, since these are the NUTS III with less foreign investment coming into Portugal.

The cluster analysis allows us to realize that foreign investment has been on the path already charted in the 1980's by the overall structure of the national productive activity towards the tertiary sector of the economy. Between 1986 and 2009, there is an increase in foreign investment in tertiary sector activities, oriented to domestic consumption, such as 'Real Estate Operations and Business Services', which in the last year are the main activity of two clusters, from only one in 1998 and none in 1986.

Still, compared to what happens with domestic firms, foreign investors continue to invest an important part of its capital in activities that produce tradable goods directed for export, such as industry or agriculture.

6. Conclusions

Portugal's accession to the then EEC, in 1986, and later the European Monetary Union (EMU), in 1999, were defining moments in recent economic history, which are reflected in the structural transformation of the national productive activity, and also in the flows of foreign direct investment. The study of regional FDI between 1986 and 2009 allowed us to draw a dynamic picture of foreign investment in Portugal.

Although the ratio of companies with foreign capital remained constant in the 23 years analysed – just about 1% of the companies have FDI -, there was an increased flow of foreign capital (in absolute numbers the companies with FDI almost quadrupled, from 1162 in 1986 to 4413 in 2009), that spread across the country, contributing to the diversification of the regional productive structure.

Foreign capital followed the structural change of the Portuguese economy and the intensification of investment in tertiary activities, especially those relating to trade, real state, and services to companies. Also financial services and public goods such as electricity or water attracted foreign investors, taking advantage of legislative changes and liberalization of these sectors. The tertiarisation of FDI is evident in

the results of the shift-share analysis between 1986 and 2009, in which the regions which are most penalized are those who base a substantial part of their productive structure in industrial activities: Cávado Ave, Grande Porto, Tâmega and Entre Douro e Vouga, Baixo Vouga, Baixo Mondego, and Península de Setúbal.

Since 1986, when Portugal joined the EEC, foreign investment had already increased its appetite for the tertiary sector of the economy, however, there was still a high proportion oriented for labour intensive sectors like the secondary sector. If we take as the reference the market share, we must also highlight the importance of capital-intensive sectors linked to resource extraction and mining. Despite the increase of tertiarisation, foreign capital continued to invest in the primary and especially in the secondary sector. In the period analysed, when we look at the total number of firms in the economy, we see that the weight of the secondary sector fell from 24 percent in 1986 to 11.7 in 2009, while in FDI firms the fall was from 39 to 18.9 percent. Now if we analyse the weight of FDI firms in the secondary sector, this increased from 21.23 in 1986 to 27.11 percent in 2009, which means that the interest of companies with foreign capital by industry fell less than for the total number of firms (mostly domestic firms), so that FDI has increased its market share in the secondary sector.

Cluster analysis also confirms these previous results. In 2009, while by the analysis of FDI firms there are two clusters in which the secondary sector is the dominant sector (manufacture of metal products and machinery), and there is still a cluster dominated by agriculture, the analysis of the results for the total number of firms in the economy reveals that all groups are dominated by the retail sector. The regions that include the biggest cities of the country (Grande Lisboa and Grande Porto) are the most attractive for foreign investment. This empirical evidence confirms the validity for Portugal of the concept of Marshallian agglomerations, more recently developed by the NEG. The theory that economic agglomerations and services contribute substantially to the location choices of firms with FDI in Portugal has been previously tested in the work of Guimarães *et al.* (2000) and Alegría (2006). While it is clear the bigger attractiveness of economic agglomerations, the increase of companies with foreign capital was accompanied by decentralization of investment beyond the major urban centres, confirming the anticipated conclusion by Guimarães *et al.* (2000).

If in 1986 there were six sectors concentrated in a region (one in Porto and the other five in Grande Lisboa), in 2009, there was no longer any sector concentrated only in one region. Similarly, in the first year of analysis there were regions which were specialized in just one sector of the economy, in the last year this evidence no longer applies, except Pinhal Interior Sul. The regions in the centre of Continental Portugal – Baixo Vouga, Baixo Mondego, Pinhal Litoral, Pinhal Interior Norte, and Dão-Lafões that in 1986 were only specialized in activities of the secondary sector gain expertise in the following years also in primary and tertiary activities.

The regions with a more diversified productive structure include Grande Lisboa and nearby regions like Península de Setúbal and Lezíria do Tejo. Also noteworthy among the regions with a more diverse structure are Baixo Mondego, Grande Porto, Minho-Lima (this region only in 2009), and Madeira. The Pinhal Interior Sul region is less specialized, concentrating their FDI only in industry (in 1986, in the 'Manufacture of Wood and Cork' and in the following years in 'Manufacture of Textiles and Leather'). The Alentejo region also arises within the more specialized regions due to 'Agriculture'.

Despite the spread of FDI across the country and the diversification of the production structure of regions, it appears that companies with foreign capital continue to be located according to the existing production structure of each region. Activities of the secondary sector are predominant in the northern regions, such as Ave, Cávado, and Tâmega, or in the centre as Baixo Mondego and Baixo Vouga. FDI directed to activities of the primary sector such as agriculture, fishing and extraction of natural resources are especially present in regions that generally have a low level of attraction of foreign capital, as the Alentejo or the interior north of Portugal. The regions around Lisboa and Porto attract predominantly tertiary activities.

This work aims to contribute to the analysis of regional and sectoral FDI. This analysis is crucial because, historically, it is involved in key moments in the evolution of the Portuguese economy and, empirically, there is growing literature that confirms the importance of foreign investment in developing countries and regions. This analysis also gives room to measures of regional policy. The previous work of Júlio *et al.* (2011) is one of the few papers in this area. The authors emphasize the importance of the improving certain institutions: "increasing the independence of the financial system, lowering the levels of corruption, improving the strength and impartiality of the legal system and the popular observance of the law, and improving some business regulations."

Avenues for future research include the relationship between the nationality of capital and business performance, an issue that is missing for Portugal, given that literature imputes advantages to multinationals relative to domestic firms. Additionally, it is important to understand whether FDI contributes to regional disparities, since foreign investment that favours entry costs and low wages tend to be associated with particularly intensive industries, while seeking advantages like agglomeration effects and knowledge suggests higher value added.

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Appendix

Appendix A - List and Map of NUTS III for Portugal

Portugal (NUTS I)

Norte (NUTS II - 8 NUTS III)

Alto Trás-os-Montes

Ave

Cávado

Douro

Entre Douro e Vouga

Grande Porto

Minho-Lima

Tâmega

Centro (NUTS II - 12 NUTS III)

Baixo Mondego

Baixo Vouga

Beira Interior Norte

Beira Interior Sul

Cova da Beira

Dão-Lafões

Médio Tejo

Oeste

Pinhal Interior Norte

Pinhal Interior Sul

Pinhal Litoral

Serra da Estrela

Lisboa (NUTS II - 2 NUTS III)

Grande Lisboa

Península de Setúbal

Alentejo (NUTS II - 5 NUTS III)

Alentejo Central

Alentejo Litoral

Alto Alentejo

Baixo Alentejo

Lezíria do Tejo

Algarve (NUTS II - 1 NUTS III)

Região Autónoma dos Açores (NUTS II - 1 NUTS III)

Região Autónoma da Madeira (NUTS II - 1 NUTS III)

Figure A1 - Map of Portugal with NUTS III

Appendix B – List of Sectors

Sectoral CAE Code
11 Agriculture and Hunting
12 Forestry and Logging
13 Fishing
21 Coal Extraction
22 Extraction of Crude, Petroleum and Natural Gas
23 Extraction of Metal Ores
29 Extraction of Non-Metallic Minerals and Industrial Rocks
31 Manufacture of Food Products, Beverages and Tobacco
32 Manufacture of Textiles and Leather
33 Manufacture of Wood and Cork
34 Paper Industries, Graphic Arts and Publishing
35 Industries of Chemical, Petroleum and Coal Products, Rubber and Plastic
36 Industries of Non-Metallic Mineral Products, except for Crude, Petroleum and Coal
37 Manufacture of Basic Metals
38 Manufacture of Metal Products and Machinery, Equipment and Transport Equipment
39 Other Manufacturing Activities
41 Electricity, Gas and Steam
42 Water Supply
50 Construction and Public Works
61 Wholesale
62 Retail
63 Accommodation and Food Services Activities
71 Transportation and Storage
72 Communications
81 Banks and Other Monetary and Financial Institutions
82 Insurance
83 Real Estate Operations and Business Services
91 General Government and National Defence
92 Sewerage and Cleaning Services
93 Social Work and Similar Activities Provided to Community
94 Recreational and Cultural Services
95 Personal and Household Services
96 International Organizations and Other Extraterritorial Institutions

Appendix C – Location Quotient

Table C1 - Location Quotient – 1986

	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Minho Lima	20,4	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	3,3	0,0	0,0	n.a.	0,0	0,0	9,2	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Cávado	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	6,1	0,0	0,0	0,0	0,0	13,2	1,8	0,0	0,0	n.a.	0,0	0,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Ave	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	7,1	2,9	0,0	0,0	0,0	0,0	2,2	4,4	0,0	n.a.	1,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Grande Porto	0,0	n.a.	7,6	n.a.	0,0	1,5	2,5	1,4	2,7	0,0	1,4	0,8	0,6	1,9	1,4	1,9	0,0	n.a.	0,0	0,9	1,1	0,0	0,7	0,0	1,9	0,4	0,2	n.a.	0,0	0,0	0,0	1,5	n.a.
Tâmega	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	8,9	12,9	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Entre Douro e Vouga	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	4,2	24,2	0,0	0,7	0,0	0,0	1,2	0,0	0,0	n.a.	0,0	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Douro	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Alto Trás-os-Montes	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Algarve	3,2	n.a.	0,0	n.a.	0,0	0,0	0,0	0,6	0,0	1,7	1,1	0,3	0,0	0,0	0,0	0,0	0,0	n.a.	2,6	0,0	1,5	11,9	1,1	0,0	0,0	0,0	2,6	n.a.	0,0	0,0	0,0	3,1	n.a.
Baixo Vouga	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	1,2	2,0	3,8	2,4	2,7	0,0	8,5	2,9	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,7	n.a.	0,0	0,0	0,0	0,0	n.a.
Baixo Mondego	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	2,6	2,8	0,0	5,2	1,4	0,0	0,0	2,5	0,0	0,0	n.a.	0,0	0,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Pinhal Litoral	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	3,0	1,6	0,0	0,0	0,0	25,5	0,0	1,4	0,0	0,0	n.a.	0,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Pinhal Interior Norte	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	5,6	0,0	10,4	0,0	0,0	0,0	2,5	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Dão Lafões	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	10,4	0,0	0,0	0,0	2,5	24,2	0,0	n.a.	0,0	0,8	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Pinhal Interior Sul	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	64,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Serra da Estrela	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Beira Interior Norte	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	3,7	0,0	0,0	0,0	0,0	0,0	3,3	0,0	0,0	n.a.	0,0	1,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.

Table C1 - Location Quotient – 1986

	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Beira Interior Sul	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cova da Beira	0,0	n.a.	0,0	n.a.	0,0	58,1	0,0	0,0	8,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Oeste	5,1	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	0,9	0,0	0,0	1,0	0,0	0,0	3,3	16,1	0,0	n.a.	2,8	0,3	0,0	2,4	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Médio Tejo	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Grande Lisboa	0,5	n.a.	0,0	n.a.	1,6	0,6	0,5	0,8	0,2	0,3	1,0	1,1	1,0	0,8	0,8	0,5	1,6	n.a.	1,2	1,3	1,1	0,8	1,3	1,6	1,2	1,4	1,3	n.a.	1,6	1,6	0,9	0,9	n.a.
Península de Setúbal	2,7	n.a.	0,0	n.a.	0,0	0,0	0,0	1,8	1,7	2,8	0,0	2,5	1,9	0,0	1,5	0,0	0,0	n.a.	0,7	0,5	0,6	0,6	0,5	0,0	0,0	0,0	0,3	n.a.	0,0	0,0	0,0	2,5	n.a.
Alentejo Litoral	0,0	n.a.	0,0	n.a.	0,0	0,0	96,8	10,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Alto Alentejo	15,3	n.a.	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	5,8	0,0	0,0	2,5	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Alentejo Central	0,0	n.a.	0,0	n.a.	0,0	0,0	0,0	7,0	3,7	0,0	0,0	0,0	0,0	0,0	3,3	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Baixo Alentejo	24,5	n.a.	0,0	n.a.	0,0	46,5	38,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	5,5	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Lezíria do Tejo	4,1	n.a.	0,0	n.a.	0,0	0,0	0,0	2,8	0,7	8,6	0,0	0,0	6,0	0,0	2,6	6,5	0,0	n.a.	2,2	0,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Açores	10,2	n.a.	0,0	n.a.	0,0	0,0	0,0	7,0	0,0	0,0	0,0	1,9	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	4,7	3,5	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Madeira	4,7	n.a.	0,0	n.a.	0,0	0,0	0,0	3,3	1,3	0,0	0,0	0,0	0,0	0,0	0,4	0,0	0,0	n.a.	0,0	0,8	1,1	2,2	0,8	0,0	0,0	2,1	1,4	n.a.	0,0	0,0	17,9	0,0	n.a.

Source: Data based on Quadros do Pessoal, own calculation

Table C2 - Location Quotient – 1998																																
	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Minho Lima	4,9	0,0	0,0	n.a.	n.a.	0,0	7,2	0,0	3,9	3,5	0,0	2,3	2,2	0,0	2,0	4,6	0,0	0,0	1,1	0,2	0,6	0,0	0,9	0,0	0,0	0,0	0,5	n.a.	0,0	0,0	0,0	0,0	n.a.
Cávado	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	5,0	0,0	0,0	0,8	1,6	5,9	2,8	0,0	2,9	0,0	0,0	0,2	1,7	0,0	0,6	0,0	0,0	0,0	0,4	n.a.	0,0	0,0	3,1	7,9	n.a.
Ave	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	7,5	0,0	0,0	1,0	0,0	7,7	2,3	2,1	0,0	0,0	1,0	0,5	0,3	0,6	0,0	0,0	0,0	0,0	0,1	n.a.	0,0	0,0	0,0	0,0	n.a.
Grande Porto	0,4	0,0	0,0	n.a.	n.a.	0,0	1,6	1,1	1,9	0,5	0,5	1,2	0,5	2,6	1,4	1,0	1,0	0,0	0,6	1,2	1,0	0,5	1,0	0,6	1,0	0,3	0,5	n.a.	0,0	0,3	0,3	2,6	n.a.
Tâmega	0,0	0,0	0,0	n.a.	n.a.	17,2	9,8	0,0	4,0	0,0	2,5	0,8	3,1	0,0	1,7	6,2	0,0	0,0	0,7	0,8	0,4	0,0	0,0	0,0	0,0	0,0	0,4	n.a.	0,0	0,0	0,0	0,0	n.a.
Entre Douro e Vouga	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	5,2	25,8	0,0	0,0	1,2	0,0	0,5	2,4	0,0	0,0	1,1	0,4	0,6	0,0	0,0	0,0	0,0	0,0	0,4	n.a.	0,0	0,0	0,0	0,0	n.a.
Douro	23,4	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	3,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,7	0,0	0,0	0,0	0,0	0,0	0,0	1,3	n.a.	0,0	0,0	0,0	0,0	n.a.
Alto Trás-os-Montes	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	50,1	0,0	0,0	0,0	7,1	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Algarve	1,3	0,0	13,8	n.a.	n.a.	0,0	0,0	0,4	0,0	1,0	0,0	0,3	0,0	0,0	0,1	0,0	0,0	0,0	1,2	0,3	0,2	10,8	1,0	0,0	0,0	1,2	2,0	n.a.	0,0	2,0	1,2	3,1	n.a.
Baixo Vouga	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	1,5	0,0	0,0	3,1	9,2	0,0	2,8	0,0	1,9	7,7	0,5	0,7	0,5	0,6	0,0	0,0	0,0	0,0	0,4	n.a.	0,0	1,7	0,0	0,0	n.a.
Baixo Mondego	5,9	0,0	0,0	n.a.	n.a.	0,0	5,7	3,4	1,6	0,0	5,7	0,9	3,6	0,0	1,6	3,6	3,3	0,0	0,9	0,6	0,5	0,0	0,7	0,0	0,0	0,0	0,0	n.a.	0,0	2,9	0,0	0,0	n.a.
Pinhal Litoral	1,5	0,0	0,0	n.a.	n.a.	0,0	0,0	0,9	2,4	0,0	2,2	3,5	5,5	0,0	2,5	2,8	0,0	10,3	0,7	0,6	0,7	0,0	0,6	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Pinhal Interior Norte	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	5,2	13,8	0,0	2,3	0,0	0,0	3,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	3,6	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Dão Lafões	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	2,6	10,4	0,0	2,3	2,2	0,0	3,0	4,6	0,0	16,7	0,0	0,5	1,2	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	11,1	n.a.
Pinhal Interior Sul	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	15,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Serra da Estrela	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	50,1	0,0	0,0	0,0	7,1	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Beira Interior Norte	0,0	0,0	0,0	n.a.	n.a.	0,0	24,5	0,0	0,0	11,8	0,0	0,0	0,0	0,0	1,7	0,0	0,0	57,2	0,0	0,0	6,1	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.

Table C2 - Location Quotient – 1998																																
	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Beira Interior Sul	6,5	89,0	0,0	n.a.	n.a.	0,0	0,0	3,8	1,7	0,0	0,0	6,0	5,9	0,0	2,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Cova da Beira	0,0	0,0	0,0	n.a.	n.a.	37,5	0,0	2,1	3,9	5,2	5,4	0,0	0,0	0,0	1,5	0,0	0,0	0,0	3,2	0,2	0,9	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	10,7	0,0	0,0	n.a.
Oeste	1,4	0,0	29,3	n.a.	n.a.	0,0	0,0	4,1	0,4	2,0	0,0	0,0	3,9	0,0	2,6	5,3	0,0	0,0	0,0	0,8	0,7	1,5	1,1	0,0	0,0	0,0	0,3	n.a.	0,0	2,1	0,0	0,0	n.a.
Médio Tejo	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	1,2	0,0	0,0	2,1	0,0	15,4	1,8	0,0	15,4	0,0	2,0	0,6	0,0	0,0	1,7	0,0	0,0	0,0	0,0	n.a.	37,0	6,6	0,0	0,0	n.a.
Grande Lisboa	0,3	0,0	0,0	n.a.	n.a.	0,5	0,3	0,6	0,1	0,1	1,3	0,8	0,5	0,2	0,5	0,7	1,0	0,6	1,2	1,2	1,1	0,7	1,2	1,5	1,5	1,7	1,4	n.a.	1,1	1,1	1,4	0,4	n.a.
Península de Setúbal	1,1	0,0	0,0	n.a.	n.a.	0,0	0,0	1,9	1,0	0,0	0,8	2,2	1,0	1,8	2,4	1,0	0,9	0,0	0,9	0,7	1,0	0,9	1,4	1,8	0,4	0,0	0,5	n.a.	4,4	1,6	0,0	0,0	n.a.
Alentejo Litoral	25,1	57,2	0,0	n.a.	n.a.	0,0	0,0	4,8	0,0	0,0	0,0	1,9	0,0	14,3	0,0	0,0	0,0	0,0	0,0	0,3	0,0	0,0	1,6	0,0	0,0	0,0	0,4	n.a.	0,0	0,0	0,0	0,0	n.a.
Alto Alentejo	4,9	0,0	0,0	n.a.	n.a.	0,0	0,0	5,6	0,0	0,0	0,0	2,3	0,0	0,0	2,0	0,0	0,0	0,0	0,0	0,6	2,4	2,6	0,0	0,0	0,0	0,0	0,5	n.a.	0,0	0,0	0,0	0,0	n.a.
Alentejo Central	12,3	0,0	0,0	n.a.	n.a.	0,0	27,1	1,8	0,8	0,0	0,0	1,4	2,8	10,5	1,3	0,0	0,0	0,0	1,4	0,2	0,7	0,0	0,0	0,0	0,0	0,0	0,3	n.a.	0,0	0,0	5,5	0,0	n.a.
Baixo Alentejo	39,1	0,0	0,0	n.a.	n.a.	100,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,4	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Lezíria do Tejo	4,5	20,5	0,0	n.a.	n.a.	0,0	4,4	6,9	0,8	2,1	0,0	0,7	2,7	0,0	1,5	0,0	0,0	0,0	1,3	0,6	0,4	0,8	0,0	0,0	1,0	0,0	0,3	n.a.	0,0	0,0	0,0	6,8	n.a.
Açores	8,4	0,0	0,0	n.a.	n.a.	0,0	0,0	14,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,5	2,0	0,0	0,0	0,0	0,0	0,0	0,9	n.a.	0,0	0,0	0,0	0,0	n.a.
Madeira	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	2,7	0,8	0,0	0,0	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,5	0,7	3,3	2,3	0,0	1,1	0,0	2,3	n.a.	0,0	0,0	5,5	0,0	n.a.

Source: Data based on Quadros do Pessoal, own calculation

Table C3 - Location Quotient – 2009																																
	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Minho Lima	1,7	0,0	6,4	n.a.	n.a.	0,0	7,7	0,5	3,3	1,4	0,5	2,6	5,3	4,8	3,3	2,2	0,0	0,0	1,4	0,4	0,6	0,5	0,4	0,0	0,0	0,0	0,4	n.a.	2,4	1,6	0,0	1,8	n.a.
Cávado	0,0	0,0	0,0	n.a.	n.a.	0,0	3,7	0,0	7,8	2,6	1,0	2,5	1,1	0,0	1,4	2,8	2,2	0,0	1,7	0,6	0,8	0,5	0,3	0,0	0,0	0,0	0,8	n.a.	0,0	1,0	0,0	3,5	n.a.
Ave	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	9,9	2,0	1,6	1,2	2,6	7,2	3,8	2,2	1,7	0,0	0,3	0,8	0,2	0,0	0,2	0,0	0,0	0,0	0,3	n.a.	0,0	0,8	1,5	0,0	n.a.
Grande Porto	0,1	0,0	0,0	n.a.	n.a.	0,0	1,2	0,9	1,4	0,9	0,6	1,0	0,6	2,1	1,1	1,4	1,0	0,0	1,0	1,3	1,1	0,5	1,6	0,0	0,7	0,7	0,7	n.a.	1,6	0,9	0,7	0,8	n.a.
Tâmega	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	2,5	10,1	0,0	0,0	1,4	0,0	0,0	2,3	6,1	6,4	0,0	0,0	0,8	1,1	0,0	0,4	0,0	0,0	0,0	0,1	n.a.	0,0	3,0	0,0	0,0	n.a.
Entre Douro e Vouga	4,4	7,1	0,0	n.a.	n.a.	0,0	0,0	1,2	5,7	14,2	0,7	0,7	1,5	0,0	2,2	6,7	0,0	0,0	0,2	0,7	0,4	0,0	0,4	0,0	0,4	0,0	0,5	n.a.	0,0	0,0	0,0	0,0	n.a.
Douro	4,5	0,0	0,0	n.a.	n.a.	0,0	0,0	8,1	0,0	0,0	0,0	0,0	0,0	10,6	1,3	0,0	10,3	0,0	0,8	0,6	0,9	0,0	2,5	0,0	0,0	0,0	0,6	n.a.	0,0	0,0	0,0	0,0	n.a.
Alto Trás-os-Montes	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	5,2	0,0	0,0	0,0	0,0	0,0	3,2	0,3	2,7	2,4	2,5	15,4	0,0	0,0	0,4	n.a.	0,0	4,8	0,0	0,0	n.a.
Algarve	1,0	3,3	0,0	n.a.	n.a.	0,0	0,0	0,8	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0	0,0	0,0	3,3	0,2	0,6	7,6	0,8	0,0	0,4	0,0	1,5	n.a.	0,0	1,9	3,0	2,2	n.a.
Baixo Vouga	0,0	5,0	5,8	n.a.	n.a.	0,0	0,0	0,8	1,7	2,5	2,0	3,1	6,5	2,2	2,9	0,7	1,1	5,8	0,8	0,8	0,9	0,7	0,8	1,6	0,0	0,0	0,3	n.a.	2,2	0,0	0,0	0,0	n.a.
Baixo Mondego	1,5	0,0	28,3	n.a.	n.a.	0,0	4,2	1,0	0,8	0,0	1,2	2,3	1,3	0,0	2,2	1,6	0,0	0,0	1,2	0,5	0,9	1,2	0,6	0,0	0,7	1,5	1,0	n.a.	5,3	0,0	0,0	0,0	n.a.
Pinhal Litoral	0,0	0,0	0,0	n.a.	n.a.	0,0	2,8	1,3	2,1	2,0	2,4	3,9	6,9	0,0	1,5	2,1	0,0	0,0	0,5	1,1	0,7	1,2	0,4	0,0	0,0	0,0	0,2	n.a.	0,0	1,6	0,0	2,7	n.a.
Pinhal Interior Norte	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	4,5	8,3	0,0	3,2	0,0	14,5	1,7	8,9	0,0	0,0	0,0	0,0	2,5	1,6	0,9	0,0	0,0	0,0	0,8	n.a.	0,0	0,0	0,0	0,0	n.a.
Dão Lafões	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	2,5	5,1	15,0	0,0	1,4	3,2	0,0	3,1	2,0	3,2	0,0	0,5	0,3	1,7	0,7	0,8	0,0	0,9	0,0	0,4	n.a.	0,0	0,0	0,0	0,0	n.a.
Pinhal Interior Sul	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	42,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Serra da Estrela	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	10,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,5	n.a.	0,0	0,0	0,0	0,0	n.a.
Beira Interior Norte	0,0	0,0	0,0	n.a.	n.a.	0,0	36,8	8,8	0,0	0,0	0,0	0,0	0,0	0,0	2,7	0,0	0,0	0,0	0,0	0,0	0,0	5,1	5,4	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.

Table C3 - Location Quotient – 2009																																
	11	12	13	21	22	23	29	31	32	33	34	35	36	37	38	39	41	42	50	61	62	63	71	72	81	82	83	91	92	93	94	95	96
Beira Interior Sul	9,8	52,5	0,0	n.a.	n.a.	0,0	0,0	4,4	0,0	0,0	0,0	2,5	0,0	0,0	1,4	0,0	0,0	0,0	1,7	0,3	1,0	0,0	0,0	0,0	3,2	0,0	0,0	n.a.	0,0	5,2	0,0	0,0	n.a.
Cova da Beira	0,0	0,0	0,0	n.a.	n.a.	122,6	0,0	5,8	4,7	0,0	0,0	0,0	0,0	0,0	7,3	4,7	0,0	0,0	0,0	0,6	0,0	0,0	0,9	0,0	0,0	0,0	0,0	n.a.	0,0	0,0	0,0	0,0	n.a.
Oeste	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	3,1	1,3	0,0	0,9	0,5	3,0	0,0	2,2	2,5	2,0	0,0	0,3	1,2	1,6	0,5	0,7	3,0	1,1	0,0	0,4	n.a.	0,0	0,0	0,0	0,0	n.a.
Médio Tejo	0,0	0,0	0,0	n.a.	n.a.	0,0	0,0	1,8	0,0	0,0	2,1	3,1	2,3	0,0	4,5	2,9	9,2	25,4	0,7	0,1	1,2	0,0	1,1	0,0	0,0	0,0	0,3	n.a.	9,5	2,1	0,0	0,0	n.a.
Grande Lisboa	0,1	0,6	0,3	n.a.	n.a.	0,0	0,3	0,5	0,1	0,3	1,3	0,6	0,4	0,0	0,4	0,3	0,9	0,3	1,0	1,2	1,2	0,8	0,8	1,4	1,4	1,8	1,3	n.a.	0,6	0,9	1,3	0,9	n.a.
Península de Setúbal	1,0	0,0	0,0	n.a.	n.a.	0,0	0,0	1,9	0,0	0,8	1,0	1,9	0,3	4,2	2,3	1,7	0,7	0,0	1,0	0,8	1,1	0,2	2,3	1,0	0,6	0,0	0,5	n.a.	2,8	1,3	0,0	2,2	n.a.
Alentejo Litoral	21,2	18,0	0,0	n.a.	n.a.	0,0	0,0	1,5	0,0	0,0	0,0	0,9	0,0	0,0	0,0	0,0	0,0	0,0	0,6	0,3	0,0	0,9	0,5	0,0	1,1	0,0	0,6	n.a.	0,0	1,8	3,3	0,0	n.a.
Alto Alentejo	5,4	0,0	0,0	n.a.	n.a.	0,0	0,0	3,1	0,0	0,0	0,0	3,0	0,0	0,0	0,6	1,7	0,0	28,8	0,8	0,4	0,9	0,0	4,5	0,0	0,8	0,0	0,3	n.a.	0,0	2,4	0,0	0,0	n.a.
Alentejo Central	12,0	0,0	0,0	n.a.	n.a.	0,0	22,6	1,3	2,2	4,0	0,0	0,0	0,0	7,1	3,4	2,2	0,0	0,0	0,5	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,1	n.a.	7,1	8,0	0,0	0,0	n.a.
Baixo Alentejo	27,1	0,0	0,0	n.a.	n.a.	61,3	0,0	4,4	0,0	0,0	0,0	0,8	0,0	0,0	0,5	0,0	3,7	0,0	0,6	0,0	0,0	0,0	0,0	0,0	1,1	0,0	0,3	n.a.	0,0	0,0	0,0	0,0	n.a.
Lezíria do Tejo	3,3	0,0	0,0	n.a.	n.a.	0,0	3,1	5,8	0,0	0,0	0,9	1,3	1,9	3,8	0,9	0,0	0,0	0,0	0,6	1,2	0,6	0,9	1,4	0,0	0,0	0,0	0,6	n.a.	3,8	0,0	0,0	2,9	n.a.
Açores	2,4	0,0	46,0	n.a.	n.a.	0,0	0,0	6,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	2,6	0,0	1,5	5,7	0,0	12,5	0,0	0,0	0,9	n.a.	0,0	3,9	0,0	0,0	n.a.
Madeira	0,2	0,0	0,0	n.a.	n.a.	0,0	1,2	0,6	0,0	0,0	0,3	0,3	0,0	0,0	0,0	0,0	0,7	4,1	0,6	0,9	0,2	0,9	1,5	2,2	3,0	0,0	2,2	n.a.	0,0	0,0	1,9	1,2	n.a.

Source: Data based on Quadros do Pessoal, own calculation

Appendix D - Decomposition of FDI Regional Growth in Shift Share Components

Table D1 – Decomposition of FDI Regional Growth in Shift Share Components (2009-1986)

	Industry mix Comp. (1)				Regional Comp. (2)				National Comp. (3)		Effective Variation (1)+(2)+(3)	
	$g_{NXk} - g_{NX}$		$\sum SX_{ik}$		$g_{ik}-g_{NXk}$		$\sum RX_{ik}$		g_{NX}	$\sum NX_{ik}$	gi	ΔX_i
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*				
Minho Lima	195.3	628.6	5.9	18.9	2825	3258.3	84.7	97.7	279.8	8.4	3733.3	112.0
Cávado	-205.1	-86.9	-22.6	-9.6	252.6	370.8	27.8	40.8	279.8	30.8	445.5	49.0
Ave	-209.8	-150.7	-46.1	-33.1	120.9	180.0	26.6	39.6	279.8	61.6	250.0	55.0
Grande Porto	-94.4	-85.9	-144.5	-131.5	52.6	61.1	80.4	93.4	279.8	428.1	246.4	377.0
Tâmega	-268.7	-8.7	-13.4	-0.4	468.9	728.9	23.4	36.4	279.8	14.0	740.0	37.0
Entre Douro e Vouga	-225.7	-144.4	-36.1	-23.1	320.9	402.1	51.3	64.3	279.8	44.8	456.3	73.0
Douro	0.0	+ ∞	0.0	13.0	0.0	+ ∞	13.0	26.0	279.8	0.0	+ ∞	26.0
Alto Trás-os-Montes	0.0	+ ∞	0.0	13.0	0.0	+ ∞	-11.0	2.0	279.8	0.0	+ ∞	2.0
Algarve	146.3	180.6	55.6	68.6	-52.4	-18.2	-19.9	-6.9	279.8	106.3	407.9	155.0
Baixo Vouga	-160.3	-83.8	-27.2	-14.2	445.2	521.7	75.7	88.7	279.8	47.6	641.2	109.0
Baixo Mondego	-187.4	-24.9	-15.0	-2.0	295.2	457.7	23.6	36.6	279.8	22.4	550.0	44.0
Pinhal Litoral	-73.1	112.6	-5.1	7.9	636.2	821.9	44.5	57.5	279.8	19.6	1028.6	72.0
Pinhal Interior Norte	-209.4	115.6	-8.4	4.6	-20.4	304.6	-0.8	12.2	279.8	11.2	375.0	15.0
Dão Lafões	-67.8	257.2	-2.7	10.3	413.1	738.1	16.5	29.5	279.8	11.2	950.0	38.0
Pinhal Interior Sul	-224.2	1075.8	-2.2	10.8	-1355.6	-55.6	-13.6	-0.6	279.8	2.8	0.0	0.0
Serra da Estrela	0.0	+ ∞	0.0	13.0	0.0	+ ∞	-11.0	2.0	279.8	0.0	+ ∞	2.0
Beira Interior Norte	-159.5	273.8	-4.8	8.2	-453.6	-20.3	-13.6	-0.6	279.8	8.4	100.0	3.0
Beira Interior Sul	0.0	+ ∞	0.0	13.0	0.0	+ ∞	-1.0	12.0	279.8	0.0	+ ∞	12.0
Cova da Beira	-294.8	30.2	-11.8	1.2	40.0	365.0	1.6	14.6	279.8	11.2	350.0	14.0
Oeste	-53.7	54.6	-6.4	6.6	124.0	232.3	14.9	27.9	279.8	33.6	458.3	55.0
Médio Tejo	0.0	+ ∞	0.0	13.0	0.0	+ ∞	16.0	29.0	279.8	0.0	+ ∞	29.0
Grande Lisboa	45.1	46.8	336.9	349.9	-133.7	-132.0	-998.9	-985.9	279.8	2089.	192.9	1441.
Península de Setúbal	-114.7	-86.4	-52.7	-39.7	130.5	158.8	60.1	73.1	279.8	128.7	323.9	149.0
Alentejo Litoral	-136.7	513.3	-2.7	10.3	857.0	1507.0	17.1	30.1	279.8	5.6	1650.0	33.0
Alto Alentejo	-102.3	222.7	-4.1	8.9	672.5	997.5	26.9	39.9	279.8	11.2	1175.0	47.0
Alentejo Central	-219.5	213.8	-6.6	6.4	706.4	1139.8	21.2	34.2	279.8	8.4	1200.0	36.0
Baixo Alentejo	113.3	373.3	5.7	18.7	-33.0	227.0	-1.7	11.3	279.8	14.0	620.0	31.0
Lezíria do Tejo	-84.2	2.5	-12.6	0.4	97.8	184.4	14.7	27.7	279.8	42.0	380.0	57.0
Açores	-65.5	151.2	-3.9	9.1	-264.3	-47.6	-15.9	-2.9	279.8	16.8	166.7	10.0
Madeira	46.6	96.6	12.1	25.1	216.0	266.0	56.1	69.1	279.8	72.7	592.3	154.0

Source: Data based on Quadros do Pessoal, own calculation

Table D2 - Decomposition of FDI Regional Growth in Shift Share Components (1998-1986)

	Industry Mix Comp. (1)				Regional Comp. (2)				National Comp. (3)		Effective Variation (1)+(2)+(3)	
	$g_{NXk} - g_{NX}$		$\sum SX_{ik}$		$g_{ik}-g_{NXk}$		$\sum RX_{ik}$		g_{NX}	$\sum$	gi	ΔX_i
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*				
Minho Lima	55.8	355.8	1.7	10.7	237.4	537.4	7.1	16.1	106.8	3.2	700.0	21.0
Cávado	-46.2	35.6	-5.1	3.9	66.7	148.5	7.3	16.3	106.8	11.7	209.1	23.0
Ave	-45.7	-4.8	-10.1	-1.1	34.4	75.3	7.6	16.6	106.8	23.5	136.4	30.0
Grande Porto	-25.9	-20	-39.7	-30.7	18.5	24.4	28.3	37.3	106.8	163.4	105.2	161.0
Tâmega	-55.3	124.7	-2.8	6.2	368.5	548.5	18.4	27.4	106.8	5.3	600.0	30.0
Entre Douro e Vouga	-51.8	4.4	-8.3	0.7	70.0	126.3	11.2	20.2	106.8	17.1	181.3	29.0
Douro	0.0	+ ∞	0.0	9.0	0.0	+ ∞	-4	5.0	106.8	0.0	+ ∞	5.0
Alto Trás-os-Montes	0.0	+ ∞	0.0	9.0	0.0	+ ∞	-7	2.0	106.8	0.0	+ ∞	2.0
Algarve	38.2	61.9	14.5	23.5	-39.7	-16.1	-15.1	-6.1	106.8	40.6	128.9	49.0
Baixo Vouga	-53.8	-0.9	-9.2	-0.2	100.0	152.9	17	26	106.8	18.2	205.9	35.0
Baixo Mondego	-63.6	48.9	-5.1	3.9	119.3	231.8	9.5	18.5	106.8	8.5	275.0	22.0
Pinhal Litoral	10.8	139.4	0.8	9.8	211.0	339.5	14.8	23.8	106.8	7.5	457.1	32.0
Pinhal Interior Norte	-64.9	160.1	-2.6	6.4	-66.9	158.1	-2.7	6.3	106.8	4.3	200.0	8.0
Dão Lafões	-45.7	179.3	-1.8	7.2	-286.1	-61.1	-11.4	-2.4	106.8	4.3	0.0	0.0
Pinhal Interior Sul	-45.7	854.3	-0.5	8.5	-861.1	38.9	-8.6	0.4	106.8	1.1	100.0	1.0
Serra da Estrela	0.0	+ ∞	0.0	9.0	0.0	+ ∞	-7	2.0	106.8	0.0	+ ∞	2.0
Beira Interior Norte	-36.7	263.3	-1.1	7.9	-236.7	63.3	-7.1	1.9	106.8	3.2	133.3	4.0
Beira Interior Sul	0.0	+ ∞	0.0	9.0	0.0	+ ∞	0.0	9.0	106.8	0.0	+ ∞	9.0
Cova da Beira	75.0	150.0	-3	6.0	43.2	268.2	1.7	10.7	106.8	4.3	300.0	12.0
Oeste	-28.2	46.8	-3.4	5.6	88.1	163.1	10.6	19.6	106.8	12.8	241.7	29.0
Médio Tejo	0.0	+ ∞	0.0	9.0	0.0	+ ∞	4.0	13.0	106.8	0.0	+ ∞	13.0
Grande Lisboa	11.9	13.1	89.2	98.2	-44.2	-43	-330	-321	106.8	797.8	75.8	566.0
Península de Setúbal	-41	-21.4	-18.9	-9.9	51.6	71.1	23.7	32.7	106.8	49.1	137.0	63.0
Alentejo Litoral	-25.6	424.4	-0.5	8.5	68.8	518.8	1.4	10.4	106.8	2.1	600.0	12.0
Alto Alentejo	-66.4	158.6	-2.7	6.3	-65.4	159.6	-2.6	6.4	106.8	4.3	200.0	8.0
Alentejo Central	-57.6	242.4	-1.7	7.3	184.1	484.1	5.5	14.5	106.8	3.2	533.3	16.0
Baixo Alentejo	22.7	202.7	1.1	10.1	-289.5	-109.5	-14.5	-5.5	106.8	5.3	20.0	1.0
Lezíria do Tejo	-20	40.0	-3	6.0	13.2	73.2	2.0	11.0	106.8	16.0	160.0	24.0
Açores	-48.5	101.5	-2.9	6.1	-191.6	-41.6	-11.5	-2.5	106.8	6.4	16.7	1.0
Madeira	22.6	57.3	5.9	14.9	-117.9	-83.3	-30.7	-21.7	106.8	27.8	46.2	12.0

Source: Data based on Quadros do Pessoal, own calculation

Table D3 - Decomposition of FDI Regional Growth in Shift Share Components (2009-1998)

	Industry Mix Comp. (1)		Regional Comp. (2)		National Comp. (3)		Effective Variation (1)+(2)+(3)	
	$g_{NXk} - g_{NX}$	$\sum SX_{ik}$	$g_{ik} - g_{NXk}$	$\sum RX_{ik}$	g_{NX}	$\sum NX_{ik}$	gi	ΔX_i
Minho Lima	-26.4	-6.3	321.9	77.3	83.6	20.1	379.2	91.0
Cávado	-44.1	-15.0	37.0	12.6	83.6	28.4	76.5	26.0
Ave	-65.0	-33.8	29.4	15.3	83.6	43.5	48.1	25.0
Grande Porto	-15.3	-47.9	0.4	1.3	83.6	262.6	68.8	216.0
Tâmega	-38.0	-13.3	-25.6	-9.0	83.6	29.3	20.0	7.0
Entre Douro e Vouga	-61.9	-27.8	76.0	34.2	83.6	37.6	97.8	44.0
Douro	21.1	1.1	315.3	15.8	83.6	4.2	420.0	21.0
Alto Trás-os-Montes	-2.8	-0.1	-80.9	-1.6	83.6	1.7	0.0	0.0
Algarve	24.6	21.4	13.6	11.8	83.6	72.8	121.8	106.0
Baixo Vouga	-29.5	-15.3	88.2	45.8	83.6	43.5	142.3	74.0
Baixo Mondego	-9.7	-2.9	-0.6	-0.2	83.6	25.1	73.3	22.0
Pinhal Litoral	-29.9	-11.7	48.9	19.1	83.6	32.6	102.6	40.0
Pinhal Interior Norte	-57.1	-6.8	31.8	3.8	83.6	10.0	58.3	7.0
Dão Lafões	15.9	0.6	850.5	34.0	83.6	3.3	950.0	38.0
Pinhal Interior Sul	-116.5	-2.3	-17.1	-0.3	83.6	1.7	-50.0	-1.0
Serra da Estrela	-2.8	-0.1	-80.9	-1.6	83.6	1.7	0.0	0.0
Beira Interior Norte	-19.8	-1.4	-78.1	-5.5	83.6	5.9	-14.3	-1.0
Beira Interior Sul	-24.4	-2.2	-26.0	-2.3	83.6	7.5	33.3	3.0
Cova da Beira	-32.3	-5.2	-38.8	-6.2	83.6	13.4	12.5	2.0
Oeste	-11.9	-4.9	-8.3	-3.4	83.6	34.3	63.4	26.0
Médio Tejo	-6.4	-0.8	45.9	6.0	83.6	10.9	123.1	16.0
Grande Lisboa	14.4	189.6	-31.4	-412.9	83.6	1098.3	66.6	875.0
Península de Setúbal	-8.1	-8.8	3.3	3.6	83.6	91.2	78.9	86.0
Alentejo Litoral	35.7	5.0	30.7	4.3	83.6	11.7	150.0	21.0
Alto Alentejo	-3.8	-0.5	245.1	29.4	83.6	10.0	325.0	39.0
Alentejo Central	-2.0	-0.4	23.6	4.5	83.6	15.9	105.3	20.0
Baixo Alentejo	45.8	2.7	370.6	22.2	83.6	5.0	500.0	30.0
Lezíria do Tejo	-17.4	-6.8	18.4	7.2	83.6	32.6	84.6	33.0
Açores	-3.6	-0.3	48.6	3.4	83.6	5.9	128.6	9.0
Madeira	12.1	4.6	278.0	105.6	83.6	31.8	373.7	142.0

Note: Regional components were calculated by difference

Source: Data based on Quadros do Pessoal. own calculation