ISCTE ◉ Business School
Instituto Universitário de Lisboa

CONNECTING THE DOTS – THE SPATIAL EVOLUTION OF PORTUGUESE ECONOMIC ACTIVITY

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Dissertação – Mestrado em Economia da Empresa e Concorrência

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Junho 2013

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RESUMO

Nos últimos anos Portugal tem-se mostrado vulnerável a um ambiente económico internacional extremamente volátil. Apesar do processo de abertura ao exterior ter-se iniciado há já algumas décadas, este tem vindo a ser reforçado com a integração na Europa comunitária. Assim, a progressiva queda das barreiras ao comércio internacional não deixou de influenciar o desempenho dos mais variados sectores da economia.

Estas dinâmicas influenciam, naturalmente, a geografia económica interna do país, situação ampliada pela falta de um mercado interno significativo. O trabalho aqui apresentado vai de encontro a esta questão e visa tentar compreender melhor como é que a economia portuguesa tem evoluído em termos da sua organização espacial nos últimos anos.

Assim, pretende-se analisar, dentro da lógica das teorias da nova geografia económica, se a liberalização do comércio tem permitido um maior equilíbrio territorial ou se, pelo contrário, têm surgido regiões "vencedoras" e "perdedoras". Embora os artigos científicos respeitantes a esta temática sejam numerosos, raramente é dada atenção às realidades internas dos países, focando-se geralmente a vertente internacional. Para além do reduzido número de estudos publicados que focam as dinâmicas espaciais internas, no nosso caso iremos utilizar um nível de detalhe inédito para o caso português, já que trabalharemos dados de emprego agregados por município.

Face às actuais desigualdades sentidas entre os diferentes estados-membros da União Europeia, pretende-se também questionar o papel das instituições europeias enquanto promotoras do crescimento económico e da harmonia territorial, designadamente ao nível das suas políticas de coesão.

Palavras-chave: liberalização do comércio, desigualdades regionais, mega regiões, políticas de coesão.

JEL Classification System: F15, R12.

ABSTRACT

In recent years Portugal has proved vulnerable to the consequences of an extremely volatile international economic environment. Although the process of opening up began some decades ago, it has been enhanced with European integration. Consequently, the gradual decline of international trade barriers did not fail to influence the performance of various economic sectors.

These dynamics influence, of course, the economic geography of the country, a situation magnified by the lack of a significant domestic market. The work presented here approaches this issue and aims to better understand how the Portuguese economy has evolved in terms of its spatial organisation in recent years.

Thus, we intend to analyze, within the logic of the theories of the new economic geography, if trade liberalization has allowed a more balanced territorial distribution or whether, by contrast, "winner" and "loser" regions have emerged. Although there are numerous scientific articles relating to this subject, attention to the inner spatial reality of countries is rarely given, as the focus is usually in the international aspect. In addition to the small number of published studies that focus on internal spatial dynamics, in our case we will use an unprecedented level of detail for the Portuguese case, since we will work employment data aggregated by municipality.

We will also address the current inequalities experienced between the different member states of the European Union, questioning the role of European institutions while promoters of regional economic growth and territorial harmony particularly at the level of cohesion policies.

AGRADECIMENTOS

Ao Prof. Nuno Crespo pelo apoio, orientação superior, disponibilidade total e conhecimentos transmitidos.

À Prof. Nádia Simões pelos conselhos sobre como levar este trabalho a bom porto.

Aos colegas do Mestrado de Economia da Empresa e Concorrência com quem tive o prazer e a honra de trabalhar.

Aos meus pais.

À Teresa.

"A mudança veio de fora."

Vasco Pulido Valente,
Portugal - Ensaios de História e de Política

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ABREVIATION INDEX

WTO – World Trade Organisation

EU – European Union

NEG – New Economic Geography

US – United States

NAFTA – North American Free Trade Agreement

CEEC – Central and Eastern European Countries

GDP – Gross Domestic Product

TEN-T – Trans-European Transport Network

HSR – High-Speed Rail

NUTS – National Units of Territorial Statistics

CAE – Code of Economic Activity

NACE - Nomenclature of Economic Activities of the European Community

HHI – Hirschman-Herfindahl index

MA – Market Accessibility index

LRP - Light-based Regional Product

SUMÁRIO EXECUTIVO

A análise da localização das estruturas económicas internas não é tradicionalmente uma área muito focalizada pela literatura económica. No entanto, esta área tem assumido uma importância crescente nos últimos anos, em particular o estudo das consequências espaciais do processo de globalização. A este nível, os modelos derivados dos princípios da nova geografia económica têm assumido um papel central, ainda que privilegiando mais as realidades internacionais.

Partindo desta base, é propósito deste trabalho ter uma visão da liberalização do comércio internacional dentro da realidade territorial Portuguesa. Esta análise será feita a um nível de detalhe inédito neste tipo de trabalhos, já que iremos utilizar dados de emprego relativos a todos os municípios de Portugal continental.

Assim, propomo-nos estruturar o nosso trabalho da seguinte forma:

Introdução: Onde será realizada uma abordagem inicial do problema, dos seus antecedentes e também a justificação da relevância dos assuntos a abordar.

Enquadramento teórico: Revisão da literatura económica no que concerne à pioneira teoria dos sistemas urbanos e, principalmente, aos modelos da nova geografia económica. Dando particular ênfase a este último enquadramento teórico, iremos explorar a dicotomia concentração/dispersão espacial como consequência da queda das barreiras ao comércio. Iremos também encontrar, numa lógica semelhante à nossa, alguns casos empíricos tratados pela literatura económica, e será feito o resumo das respostas de diversas realidades espaciais internas face à problemática em questão.

Análise dos custos do comércio: Pretende-se ter em conta a forma como os custos de comércio têm vindo historicamente a evoluir, assim como a forma como os mesmos se podem dividir. Vamos incidir em particular sobre a evolução desta realidade na União Europeia (UE), cujo contexto apresenta significativas diferenças face à restante realidade mundial, e onde o conjunto de normas e regulações comunitárias assume um papel preponderante.

Políticas de desenvolvimento regional na UE: O princípio da solidariedade e coesão territorial encontra-se entre os princípios fundamentais proclamados pela EU. Tradicionalmente o grosso dos fundos europeus de coesão tem sido aplicado no apoio ao desenvolvimento de infraestruturas de transporte, particularmente a alta velocidade ferroviária, considerada como uma aposta estratégica para o desenvolvimento. No entanto, as

consequências espaciais deste tipo de estrutura são bastantes controversas ao nível da harmonia territorial.

Ao mesmo tempo, nos últimos anos as políticas territoriais têm ganho uma atenção crescente com a entrada dos países da Europa Central e de Leste, os quais trouxeram uma pressão adicional em relação aos antigos "países da coesão": Portugal, Espanha, Grécia e Irlanda. Estes últimos têm sido também os países mais violentamente atingidos pela crise internacional, enfatizando o problema. A promoção de políticas de fomento à competitividade e crescimento com maior qualidade tornou-se desta forma uma necessidade ainda mais premente, o que deverá ter reflexos já no próximo ciclo de políticas comunitárias, relativo ao período de 2014-2020.

Metodologia: Neste capítulo iremos explicitar o tipo de dados utilizados no nosso trabalho, os quais são relativos aos números do emprego nos anos de 1995, 2002 e 2006, organizados por subclasses da CAE Rev. 2. Irá também ser exposta a escolha dos índices de localização, absolutos e relativos, a utilizar na sua análise – índices de Hirschman-Herfindahl, Gini Absoluto e de Krugman. De seguida, vamos apresentar os principais resultados desta análise, bem como observar as principais características dos dados de emprego acima referidos.

Apesar de genericamente os resultados indicarem uma melhoria dos indicadores de emprego e uma tendência para a dispersão espacial da actividade económica, as dinâmicas entre 2002 e 2006 demonstram diversas diferenças face à evolução verificada anteriormente entre 1995 e 2002. Assim, na fase final diversas regiões do interior demonstraram já dificuldade em acompanhar o ritmo de crescimento (ele próprio em desaceleração), perdendo mesmo parte da importância relativa conquistada anteriormente.

Criação de um índice espacial específico: Em virtude das características particulares do território português (pequeno país periférico dentro do contexto europeu), foi desenvolvido um índice espacial que procura classificar o nível de acessibilidade aos mercados internacionais do conjunto de municípios em análise. As dimensões consideradas para a construção deste indicador são as seguintes:

- Densidade rodoviária;
- Distância para a fronteira relevante mais próxima;
- Distância para o aeroporto internacional mais próximo;
- Distância em relação a um porto de mar relevante;
- Distância para a área metropolitana mais próxima.

Para calcular este índice foram utilizadas as distâncias entre concelhos constantes do *software* ROUTE 66.

A apresentação dos resultados, a nível global e por dimensão, será realizada no ponto seguinte, onde apresentaremos diversos mapas divididos por município e regiões NUTS III que pretendem facilitar a interpretação das principais tendências. As diferenças entre a faixa litoral densamente urbanizadas entre Setúbal e a fronteira com a Galiza e o interior desertificado são também aqui contextualizadas.

Acessibilidade aos mercados e variação dos níveis de emprego: Neste capítulo pretende-se fazer a ligação entre a evolução dos dados dados de emprego e os diferentes níveis de acessibilidade existentes no território nacional. Desta forma, pretende-se saber se as regiões mais privilegiadas ao nível da acessibilidade conseguiram atingir resultados mais favoráveis ao nível da criação de emprego do que aquelas que se encontram relativamente mais isoladas.

Conclusões do trabalho: Principais ideias a retirar do trabalho e algumas pistas para o futuro das políticas de desenvolvimento regional.

INTRODUCTION

The study of the spatial location of economic activity became the subject of numerous analyses in the past decades. As a consequence of the very significant political events that occurred in the end of the XX century, such as the fall of the iron and bamboo curtains, the creation of the European Single Market and the progressive fall in trade tariffs as a result of several rounds of the World Trade Organisation (WTO), we have been observing the progressive openness of international trade. This has in turn been provoking important changes in the location of both manufacturing industries and service centres.

In addition to this very dynamic international environment, several important technological advances occurred in recent years that became important catalysts to what is generally known as globalization process. In view of this reality, the influence of decreasing cross-border trade barriers and transaction costs on international trade has been analysed in a vast number of studies, several of them focusing the European Union (EU).

However, the impact of the abovementioned factors has not been so closely scrutinized as regards the intra-national spatial context in several of the affected economies, although a number of useful models do exist. In this regard, Brülhart (2011: 60) mentions that *"the theoretical exercise undertaken in these papers is simple: they track what happens to the allocation economic activity across different regions with in a country as trade with the rest of the world becomes less costly. This thought experiment abstracts from simultaneous changes in intra-national trade costs by assuming that within-country trade costs do not change, and that they are either zero or significantly lower than between-country trade costs."*

Taking in mind this principle, we will try and analyse the intra-national spatial reality of the Portuguese territory. In addition to the scarce number of papers that this line of work has produced to date, we will also go into further insofar as the level of data detail goes, by means of using municipal – and not only regional – employment official information. Three distinct periods will be scrutinized: 1995, 2002 and 2006, as changes in legislation radically changed the nature of more recent data and made its conversion into a common denominator morose and unreliable.

As regards the structure of our work, we will begin with a revision of related economic literature, dwelling on the major schools of thought concerning these issues: the urban systems and new economic geography theories. Focusing on the latter, more relevant model,

we will explore the different approaches taken by several authors, and explore the reasons that sustain both spatial convergence and divergence as possible outcomes to the opening up to international trade. We will also search concrete examples of this reality by means of empirical studies and the main results shown by them.

Afterwards, we will try to dissect the nature of trade costs themselves, tracing their evolution along the ages and dividing them into major categories. The somewhat special nature of trade costs in Europe shall also be taken into consideration, as a major influencing factor on the behaviour of Portuguese economic actors.

Special attention will be given to European cohesion policies, as they represent a major regional development instrument, and suffered a number of important revaluations in recent years. The traditional priority given to the development of transport infrastructure - and high-speed rail in particular - is worth of special notice, due to its mixed track record in terms of consequences on the spatial distribution of economic activities. This debate was of special interest in Portugal until very recently, as it was considered to be an essential strategic investment by recent governments.

In the methodological chapter the choice of locational indices used - Hirschman-Herfindahl, Absolute Gini and Krugman - will be developed in detail, hand in hand with the organisation and legal framework of the used employment data. The first, general results are to be presented here as well, concerning both the concentration of economic activities grouped in subclasses and its geographical concentration.

Nonetheless, the specific nature of the Portuguese territory and the historical evolution of its population distribution will be taken into account in our work in addition to the traditional usage of measurement indices. Therefore, we will develop a case-specific spatial index to measure accessibility to markets, and afterwards connect it to the changes in the distribution of employment inside the country. The relation between growth and regional access to international trade will be, in this sense, put to trial.

In the concluding part the work we will reinforce the main ideas projected by our results, and develop some concepts relevant for the development of more intelligent, territorially-focused regional policies. In a time when they constitute one of the few available instruments for growth in the country, and the EU itself, this is an ever-growing necessity.

Hence, the formal construction of the paper will be as following: **1. Theoretical background**, where we revise the main economic background of our work; **2. Evolution of trade costs**, where we trace the history and current structure of the costs associated with commerce; **3. Spatial development policies in Europe**, where we will focus on community-level regional cohesion policies; **4. Methodology**, where the explanation of the data and indices used will be made; **5. Creation of a case-specific spatial index**, where we will incur in the construction of a geographic measure of accessibility for the Portuguese municipalities; **6. Market accessibility and variation in employment levels**, where we try to relate local accessibility to international markets and the changes verified in employment shares; and lastly **Conclusions**, where the principal conclusions and ideas for the future will be put forward.

1. THEORETICAL BACKGROUND

The models devoted to the study of the spatial location of economic activity are generally organized in two generations: the older "urban systems" approach, which takes into account perfectly competitive markets with exogenous region-level scale economies, and the newer and more popular "new economic geography" (NEG) models, based in monopolistically competitive markets and endogenous regional scale economies. We will now review the basic principles behind these two concepts, more so as regards the NEG literature based on Krugman's (1991a) seminal model, nowadays considered as the more relevant one. In addition, we will also distinguish between uniform and heterogeneous intra-national spaces.

1.1. Urban systems theory

As mentioned before, the intra-national spatial dimension of economic areas has not been followed in detail by a great number of surveys. It is widely believed that only with Henderson's (1982) general-equilibrium model of external trade and internal geography this matter was first considered in some detail. Based on his influential model of urban systems (Henderson, 1974), he develops a structure of city size distributions, where firms produce with constant returns to scale and outputs are homogenous.

This neoclassical model considers a uniform intra-national space, and its main assumption shows that the main principals of neoclassical trade theory hold equally in his urban systems theory, assuming a small open economy. Here, all workers are perfectly mobile, meaning equilibrium in real wages. Import restrictions increase specialization in cities, representing important spatial effects. Furthermore, if these protectionist policies apply to industries based on larger cities, an increase in urban concentration is expected. Finally, and applying the Hecksher-Olin theorem, should a country be relatively labour abundant, then more cities would specialize in labour-intensive industries, or capital-intensive if their country is capital-intensive.

As regards non-equal intra-national regions, where at least one of them is considered to have privileged access to international trade (coastal or border regions, for instance), the first relevant model was developed by Rauch (1991), who previously had already developed a model based on uniform intra-national space (1989). This author presented a geography containing several monocentric cities that develop a multi-sector Ricardian trade model, as in Henderson (1974, 1982). Here internal trade costs exist in iceberg form (as defined by

Samuelson, 1954), meaning that part of the goods are consumed while in transit to their destination market, a value that represents the transport cost. As in Henderson, real wages are considered to be the same across the country, which limits the analysis to the size of cities.

The geography of this model is represented by a line (the "river") that runs perpendicularly to the country's border (in this case, the "coast"), which gives an obvious advantage to the cities closer to foreign markets should trade barriers be reduced. Therefore, in an intermediate level, cities closer to the coast will specialize and participate in international trade, while more interior cities will remain autarkic. Also, the size of the city will monotonically increase as its location approaches to the coast. In conclusion, openness to trade will bring urban concentration to the areas associated with lower trade costs, a trend that will increase as international barriers become less significant.

One important difference in the NEG models that we will now engage is that wages are not equal amongst regions in fully agglomerated equilibrium, as the inhabitants of the regions that receive manufacturing activity earn higher real wages. However, in interior equilibria, real wages are cross-country equal, as in the neoclassical model. This difference is crucial as it implies that regions with better access to foreign markets might benefit from a welfare increase, but interior regions might not, leading to increasing inequality. Analysis on the national implication of this situation was addressed by Haaparanta (1998) and Beherens et al. (2007), concluding that trade openness can be globally welfare reducing, as a consequence of excessive concentration. The answer to this troubling scenario could lie in corrective regional policies and regulatory policies, but the authors all also give way to welfare-inducing equilibria scenarios via liberalisation.

In addition, as shown by Fujita et al. (1999) the changing locating patterns of industries can differ in a significant way across industries (access to raw materials or greater need of cheap land, for instance), leading to situations of regional specialization as trade barriers progressively fall, thus reducing the spatial agglomeration of economic activity.

1.2. New economic geography

In classical literature, the reduction of trade barriers should in principle cause convergence in standards of living and welfare. However, empirical analysis shows several examples of cases of regional divergence as a consequence of increasing movement of goods and services, leading to the conclusion that there are several factors absent in the traditional theory.

The Spatial Evolution of Portuguese Economic Activity

One of the most significant contributions regarding this issue in recent years is the well-known *Increasing Returns to Scale and the Pattern of Trade* work by Paul Krugman (1991a). Further developing this paper, Krugman and Elizondo (1996) studied regional adjustment to international trade liberalisation, taking into consideration the dispersion of manufacturing industry as a whole. By modelling convergence and divergence forces, these works (that permitted the development of the new economic geography approach) allow a framework that studies the evolution of regional inequalities in an increasingly integrated environment. A logical conclusion of this examination is that regions should generate different regional policies, in order to better adapt to their individual forces and weaknesses, as well as their relative position inside the country (like poorer vs. richer or peripheral vs. core regions).

The author delineated a model where a country - constituted by two regions, 1 and 2 - traded with the rest of the world - 0. Only one economic sector was considered, comprising mobile workers, increasing returns to scale and immobile agricultural workers. Furthermore, there are internal transport costs regions 1 and 2, as well as between the internal regions and the rest of the world. Both use the iceberg costs model.

The basic question that lies behind this study is whether the openness of international trade causes the dispersion or concentration of internal economic activity. On one side, Krugman and Elizondo (1996) consider backward and forward linkages as centripetal forces, representing the interest of firms and consumers to locate in the same region. On the other, centrifugal forces are considered to be the congestions, higher rents and higher costs associated with geographical concentration. With an increase in international trade, more products are sold abroad and more inputs are imported, and thus the tendency – and consequent interest – to agglomerate decreases, together with the relative importance of the internal market.

Hence, firms would tend to progressively seek an equilibrium situation in cheaper and less congested locations, a hypothesis that is followed by several numerical simulations. Linking their conclusions to the process of urbanization in Third World nations, the authors believe that the creation of huge megalopolises in poorer countries is deeply connected to the fact they continue to persist in maintaining closed domestic markets.

In consequence, countries with a concentrated population that start to engage in international trade will at an early stage maintain this concentration, but with time the exclusive reliance on the domestic market will start to wane as backward and forward linkages become weaker.

Therefore, spatial dispersion will eventually take off according to this model. In the opposite case, at a country that begins to engage in more protectionist policies, the *ex-ante* division of labour across regions will be maintained, but as concentration forces start to grow more powerful, the region with greater comparative advantages will begin to grow into an increasingly dominant role, a *Rome without an empire* as Bairoch put it.

The much-quoted and in many ways singular example of Mexico is the starting point for this paper, as manufactures typically chose Mexico City to build their plants due to the huge concentration of demand and inputs in that megalopolis. However, the distribution of economic activity was indeed much more evenly spread across the national territory before the Mexican government started an import-substitution policy,

The same conclusions were reached more recently by Behrens et al. (2007), this time using the monopolistic competition model of Otttaviano et al. (2002). This formula permits an analytical solution and further welfare analysis on the core-periphery model, the impact of expectations in shaping economic geography and the effects of urban congestion costs on the interregional dispersal of activities. Here, the world is constituted by two identical countries, each encompassing two symmetric regions, with an immobile agricultural population considered as a centrifugal force (in the mould of the original work of Krugman, 1991a), but the intensity of competition in highly concentrated regions is also used as another dispersion force. The additional welfare scrutiny tends to link dispersion to higher welfare, giving to international trade a generally favourable light.

However, the opposite conclusions were reached by Paluzie (2001). Also considering a two region-country that interacts with the rest of the world, Paluzie assumes the immobility of agricultural inputs in opposition to those in manufacturing industries and, likewise to Behrens et al. (2007), uses the pull of the potential market of a dispersed agricultural population as a centrifugal force representing the magnitude of scale economies. Thus, *"agricultural goods can be freely transported and are produced under constant returns to scale so that agricultural workers will have the same wage rate in all regions."* Hence, labour mobility plays a decisive role towards the agglomeration of economic activities, triggering greater inequalities within national boundaries as trade becomes easier. In this model, centripetal forces are considered to be a combination of economies of scale, market size and transport costs.

This work is closer to the seminal Krugman (1991a) paper in the sense that it relies on the original Dixit-Stiglitz representation of preferences and does not introduce urban congestion costs, which the author believes are better suited to explain spatial development dynamics when nations participate in international trade, contrarily to Krugman and Elizondo's (1996) urban model, which primarily seeks to explain the emergence of third world megalopolises.

Here, when international trade barriers decrease, firms are no longer limited to their original agricultural domestic markets, being now capable of using cheaper foreign inputs and selling their goods abroad. Consequently, and in contradiction to Krugman and Elizondo (1996), there is a greater incentive for manufacturing firms to agglomerate, as the dispersion forces are reduced more heavily than the concentration ones. Again, numerical simulations are used to assist this conclusion.

Hence, the author infers that the opening up of a closed economy actually brings more regional polarization, instead of correcting inequalities produced in closed environments. The importance of labour mobility as an accelerator of industrial concentration is also highlighted, as it creates regional unbalances as international trade increases. The author also assumes some limitations in the model common to several NEG approaches, such as the non-inclusion of capital in manufacturing or the assumption of non agricultural transport costs.

It is also relevant to keep in mind that the basic scenario behind Paluzie's paper is the industrialization process in Spain which, differently to Mexico, and despite also pursuing protectionist policies, produced greater inequalities across the Spanish regions. However, national cohesion policies allowed for a redistribution production that reduced regional inequalities in the last decades, a tendency that stopped with the country's entry into the EU in 1986, when growing inequalities eventually started to appear again.

We will dwell a little on the issue of cohesion funds in the EU context further on, as it proves to be a key factor when regarding the regional inequality issue. Paluzie (2001) defends that several trade costs remain basically unaltered, as linguistic and cultural barriers remain powerful and prevent a fully free movement of workers inside the EU in contrast with the reality of the United States (US), for example. Because these remaining barriers are not usually present in the interior of member states, we see much freer movement of workers at this level. Thus, intra-regional spatial divergence tends to grow, but intra-national convergence remains possible and indeed European statistics support, at least on an overall average, this paradoxical tendency.

A significant number of additional studies have come to conclusions similar to Paluzie (2001), namely the ones by Monfort and Nicolini (2000) and Monfort and van Ypersele (2003), with the difference that the latter use a model where two two-region countries interact with rest of the world. Empirical evidence also backs these findings, as we will see later on. Mansori (2003), based on the model by Krugman and Elizondo (1996), also concluded for agglomeration, and assumed a new concentration factor as the unitary cost of transporting goods decrease when trade grows. Montfort and Nicolini (2000) also mention the possible emergence of clusters in some activities due to the favourable environment of international economic integration as another factor towards regional concentration at an intra-national level.

Likewise, Alonso Villar (1999) created a model consisting of two symmetric single-region countries that trade with a three-region country, with two areas bordering one of the foreign countries and one interior region, all represented on a line. Access to foreign markets is considered to be at the same cost. The author concludes that with large enough outside countries and sufficiently low trade costs stop concentration in the interior regions being possible. Hence, it is argued that border regions gain advantage with the openness of international commerce. Nevertheless, the effects in internal spatial distribution are not considered in a specific fashion.

Despite the fact that they all fit into the typical NEG model, the difference between these papers rely on the type and strength of the dispersion forces, which may go from immobile agricultural population to strong congestion costs or lower mark-ups in more agglomerated regions. Insofar as to the validity of the main conclusions, it cannot be said with certainty that one option is better than the other. Indeed, the only way to conclude is by analysing empirical data, which leads us to the study of heterogeneous intra-national spaces, inherently closer to reality.

Another difference in relation to real-world regions is that there are unequal factor endowments, an issue explored by Haaparanta (1998). Here we see a model with two countries comprising two regions each, and with each region possessing only one of two production factors. Therefore, each good is only nationally produced by its respective region. With the occurrence of international trade, manufacturing activity will tend to group in the region that produces the good where a national comparative advantage exists. In conclusion, the tendency to create specialized one-industry regions is only increased via openness of trade, in a typically Ricardian approach.

Brülhart et al. (2004) and Crozet and Koenig (2004) both address this issue, using Krugman and Elizondo's (1996) model of a two-region country trading with a one-region outside world. Two essential conclusions are reached in this asymmetric model: one, that an increase in foreign demand means that the former national agglomeration force weakens, making industries to relocate to a near-border location; the other, meaning that as more foreign inputs are purchased, there is a compensation phenomenon where firms can now locate in the interior region, giving them greater protection from international competition. So, a possible relocation process towards the border region may occur in cases where a large concentration of economic activity prior to the opening of trade already exists, the degree of this opening is high, the newly accessible foreign market is large and, finally, there is a complementary structure of said foreign market.

1.3. Empirical evidence

The study of concrete geographic data is therefore an essential tool in helping to define specific national realities. These works can be essentially divided between surveys that study variation in a set of countries and the ones that analyse changes at a purely intra-national level. Therefore, as the subject of our work will regard internal Portuguese data, we will pay more attention to the latter. Still, as regards cross-country studies, it can be mentioned that most studies use information measuring concentration in city-size distributions, even if the approaches vary considerably. Most papers of this nature are consistent in concluding that an increase in international trade has either no statistically relevant effect or it leads to spatial agglomeration.

Interestingly enough, the literature dedicated to the study of intra-national data is more diverse in its conclusions, as we can find examples of spatial concentration, dispersion or no discernible effect. One other relevant factor is that a great number of these works is dedicated to one specific country, Mexico. The attraction to the Mexican case is partly explained due to the fact that it had a relatively protectionist economic policy until the mid-eighties. With greater openness to international trade and its integration in the North American Free Trade Agreement (NAFTA), a process of spatial divergence is usually found out to have happened, as the already more prosperous US-border regions attracted even more economic activity (Hanson, 1997, 1998). This trend is repeated in several Asian nations, and especially China (Kanbur and Zhang, 2005), where the historical richer coastal regions gain even greater

standing. One exception to this apparent rule is Argentina, with data showing that trade openness in the eighties attracted relatively more manufacturing industries to the poorer regions than the autarkic policies of previous times.

For an easier interpretation, we will now present a summed-up table with several within-country regression studies, largely based on the survey by Brülhart (2011):

Table 1: Results of within-country regression studies

Study	Country	Verdict
Henderson and Kuncoro (1996)	Indonesia (Java)	spatial divergence
Hanson (1997)	Mexico	no effect
Hanson (1998)	Mexico	spatial divergence
Pernia and Quising (2003)	Philippines	spatial divergence
Chiquiar (2005)	Mexico	spatial divergence
Kanbur and Zhang (2005)	China	spatial divergence
Rodriguez-Pose and Sanchez-Reaza (2005)	Mexico	spatial divergence
Faber (2005)	Mexico	unconclusive
Gonzalez Rivas (2007)	Mexico	spatial divergence
Redding and Sturm (2008)	West Germany	spatial convergence
Crespo and Fontoura (2008a)	Portugal	spatial convergence
Crespo and Fontoura (2008b)	Portugal	spatial convergence
Chiquiar (2008)	Mexico	unconclusive
Sanguinetti and Volpe Martincus (2009)	Argentina	spatial convergence
Brülhart, Carrère and Trionfetti (2010)	Austria	spatial convergence
Volpe Martincus (2010)	Brazil	unconclusive

Source: Brülhart (2011), Crespo and Fontoura (2008a, 2008b)

Nevertheless, we can see that in Europe this type of empirical evidence can give way to other interpretations, especially if we take into account the after-effects of the 2004 integration of ten Central and Eastern European Countries (CEECs). The experience of economic integration in the EU has, to some extent, allowed for greater convergence across the member countries, a tendency fuelled also by monetary transfers in the form of cohesion funds, as we will see next.

Analysing the dynamics of the CEECs, Crespo and Fountoura (2007) demonstrate that the trade specialization patterns are getting closer to those of the former EU-15 countries, with income per head and inward foreign direct investment (FDI) converging to western standards, in a process that continues to occur. In that sense, the authors conclude that *"the deep transformation of CEECs' export structures led to a convergence movement both at inter and intra-sectorial levels: on the one hand, CEECs' export structures converged towards the corresponding structures of the old members; on the other hand, relevant transformations were also observed within the sectors, expressed in a quality upgrading of exports from CEECs to the EU market."* Additionally, this integration process saw the concentration of

economic activity around the CEEC's capital cities (in the service sector, above all), despite their already very high agglomeration indexes (Brülhart and Koenig, 2006).

Hand-in-hand with this propensity, however, there has also been noted a tendency towards internal divergence inside the member states (Melchior, 2008), which adds further importance to the study of the regional effects of the EU single market in terms of economic spatial distribution. Brülhart (2001) and Brülhart and Traeger (2005) have shown that some sectors are more intensely affected by a decrease in trade barriers, being particularly prone to geographic concentration at an intra-national level. Nonetheless, one should also bear in mind that the occurrence of this twin effect is certainly affected also by other political and technological changes, making definitive conclusions about the changing patterns in the EU's spatial distribution harder to attain.

Another relevant paper was produced by Melchior (2009), who set up grid of 90 regions across 9 EU countries, using a one factor-one sector monopolistic competition model to assess the spatial changes caused by lower trade costs and their consequent effect on wages. In general, the author finds that regions closer to newly accessible markets tend to benefit from a larger real-wage increase, c*eteris paribus.* However, if an interior region benefits from earlier agglomeration advantages, such as some capital cities, then these regions are set to benefit the most. This result is consistent with Brülhart et al. (2004) and Crozet and Koenig (2004), and the consequent internal convergence or divergence process will depend very much on the previous relative position of these border regions, i.e. if they were poorer or richer than the national average.

As to the effects of the enlargement process on the original EU-15 intra-national regions, Brülhart et al. (2004: 870) suggests that they vary a great deal according to their proximity to the new member states, insofar as that *"external liberalisation favours the concentration of the mobile sector in the domestic region that is close to the outside country (the 'border region'). Our empirical simulations suggest that the economic impacts of enlargement are indeed likely to be significantly different depending on regions' geographic location relative to the new member states. We find that the effect on regional per capita income is six times larger in the most affected Objective 1 region (Burgenland, Austria) than in the least affected one (South Yorkshire, UK). In terms of manufacturing employment, this difference rises to a factor seven."*

In a nutshell, geography matters, as the territories closest to the new eastward expansion of the EU stood more to benefit. In a purely speculative note, one could draw a parallel with the latest news of a free trade agreement between the EU and the US (or even NAFTA), which could provide a very important boost (political as well as economic) to commerce between the two largest trading blocs of the world. In this scenario, the regions bordering the Atlantic could ripe the greatest advantages, even with some predictable limitations in sensitive areas (such as agriculture or the famed "cultural exception"), regions of relatively low income countries but that possess important natural advantages, as occurs in the old cohesion countries (Portugal, Spain, Ireland and to a lesser extent Greece, which stands closer to the CEEC's) should gain from such an endeavour and return to their catch-up process to the EU-15 wealthier nations.

Dwelling on said structural differences on the older member states, Palan and Schmiedeberg, (2010) found out an important inter-sectorial convergence in Western European economies. Indeed, as the process of economic integration advanced, with the previously agricultural-heavy sectors of Southern European countries starting a strong tertiarization process. However, inter-industry results are mixed, as the author refers that "*the lack of clear convergence or divergence in manufacturing and service industries might be caused by opposing trends in different industries: if some industries diverge and others converge, these (simultaneous) shifts cancel each other out in the aggregate view. An analysis on the industry level is therefore necessary to detect the convergence and divergence tendencies within the manufacturing and service sectors, respectively*".

Complementarily, Midelfart-Knarvik et al. (2002) studied the link between the characteristics of countries and industries and its impact on location of manufacturing. This work shows that high tech industries – such as chemicals, electrical devices and transports - remained concentrated in major urban centres, benefiting from increasing returns to scale, while medium to high tech industries related to information and communication technologies spilled over their location from cities to suburban areas. On the other hand, industries largely dependent on internal markets or on the intensive use of unqualified labour have been spreading out across the European territory due to weak inter-industry linkages and a reduction in transport costs, as is the case of textiles, leather and furniture. Therefore, by concentrating in the periphery, these industries benefit from lower production costs. However, the next logical step for them is to relocate from the European peripheries to other even more price-competitive locations, as has so often happened in the last two decades.

The authors also analysed five highly aggregated services sectors, which were found to be in most cases evenly distributed across regions. This result is coincident with the common logic that manufacturing is more affected by the reduction of trade costs in developed countries, as in general goods are more easily traded than services. Taking into consideration that in the CEECs there was a great concentration of service-related jobs into the most important centres, we will give in our study some attention to this analysis, as it can be used as a barometer of the maturity degree of the Portuguese economy in the EU context.

Reviewing the aforementioned papers, it can be argued that regions with easier access to foreign markets stand to benefit more from a reduction in trade barriers. Therefore, governments that try to even out welfare gains across all domestic regions should endeavour to grant them all better access to international markets, improving transport and communications networks and legal framework as well as their associated services. Indeed, the better and more efficiently connected a region is the more chances it will have to improve its prosperity, with natural repercussions to the national wealth and socio-political cohesion. Consequently, the interaction between public policies and the convergence or divergence effects of trade openness may also merit further development.

This in turn leads to the potential distinction that can be made between welfare gains caused by the reduction of trade costs connected to purely legal aspects, such as tariff rights, and the ones directly derived from a reduction in transport costs as a consequence of technological advances. Many scientific works try only to measure these costs, but don't try to explain their cause. However, some trade costs also provide benefits, no doubt due to the relation between domestic and international trade costs, market structure and political economy (Anderson and van Wincoop, 2004).

Some works, such as Glaeser and Kohlase (2003) try to address this issue, highlighting the fact that in the US, during the last three decades, there has been an actual increase in the cost of moving people (due to road delay, for instance), at the same time that the transport costs for goods have fallen. As cities are areas where distance costs are ideally eliminated, urban landscapes dramatically changed, with people leaving the hinterland to information and contact hubs (major cities or "black holes"), where business contacts are greatly facilitated, and manufacturing industries relocating to medium density regions, where congestion costs are lower and transport links sufficiently good.

In addition, typically industrial cities also lose population – and importance – to more pleasant and centrally located cities (the example of Detroit in the US is illustrative), as access to raw materials and natural transport hubs becomes less and less relevant to highly developed human communities.

2.   EVOLUTION OF TRADE COSTS

One of the cornerstones of the aforesaid analyses is the fact that tariff barriers in international trade have become increasingly low, reaching on average less than 5% in developed countries and between 10% and 20% in developing countries.

Transport costs have fallen even more dramatically with, for example, the real dollar cost per ton-mile for US railroad shipping decreasing tenfold in the last century and French road freight declining almost 40% between 1978 and 1998, just to mention two examples. On international transport this assessment is harder to prove, but some studies point to a steep decline in air transport cost since the 1970s and a least pronounced drop in sea transport costs since 1985 (due to containerisation, which increase quality and efficiency, but at a higher cost in its early years, circa 1970-1985), as shown by Duranton and Storper (2005).

These historically low values should provide a considerable incentive to the growth of trade between nations and influence the geographical location of economic activities. Also, as Storper (2010) mentions, the field of spatial economics has made great progresses in theorizing and measuring agglomeration effects, trade costs and urbanization. However, these models naturally establish strong assumptions about which forces are relevant and how they interact, therefore establishing structural determinants on firms, agents, spatial costs and market structures. Many of these conventions are questionable, however, and according to the author there is the danger of building highly complex but unrealistic theories that avoid the fundamental questions about how the economy works as a Schumpeterian dynamic. In this sense, there is a necessity to engage in a framework that considers the way that agents create and deal with innovation, growth and development.

Accordingly, it is relevant to analyse the importance of the abovementioned changes in policy barriers and transport costs in the context of trade costs as a whole as to better perceive their real importance.

2.1.   Trade costs segmentation

Trade costs can be defined as all costs incurred when delivering a good to its final consumer, with exception of the marginal cost of production itself. Therefore, transportation costs (in freight as well as in time), information costs, contract enforcement costs, currency costs (when trading with different monetary areas), legal and regulatory costs and finally policy barriers (defined as tariff and nontariff barriers) can all be considered as trade costs.

An extensive study by Anderson and van Wincoop (2004) uses a gravity-based model to conclude that trade costs reach on average 170% in ad-valorem tax equivalent, based on U.S. data. This value can be broken down into 55% local distribution costs and 74% international trade costs (1,7=1,55*1,74-1). Another possible distribution for this number is between 21% as regards transportation costs, 44% border-related trade barriers and 55% retail and wholesale distribution costs (2,7=1,21*1,44*1,55). It should be said, however, that the quality of the existing measures is deficient, with direct measures of policy barriers being especially hard to monitor.

Focusing on border-related trade barriers for developed countries only, this estimate breaks down the border-related trade barriers figures into an 8% policy barrier, 7% language barrier, 14% currency barrier, 6% information cost barrier and, finally, a 3% security barrier. This gives perspective to how lightweight the role of tariff and nontariff barriers have become in these countries, but nontariff barriers in particular can vary a great deal, ranging from zero in many sectors to values between 5% and 33% (in the case of US textiles and apparel).

Like we just saw, another much commented trend has been the fall in transport costs, with authors such as Cairncross (2001) even announcing the "death of distance". As with Mark Twain, however, the report of the death of distance in international trade appears to have been greatly exaggerated, as evidence points out to total trade costs having actually risen on the whole in the last decades (Hanson, 2005; Combes et al., 2004).

Therefore, if trade barriers and transport costs have fallen, some other factors must have compensated this tendency. Duranton and Storper (2005) believe that retail and wholesale costs must also have decreased due to the development of supermarkets, large retail chains and wholesale costs. So, only a large increase in endogenous transaction costs could explain this phenomenon, which they prove via a model of vertically linked industries in the machine sector where (i) the quality of inputs is not contractible and (ii) suppliers become more costly with distance provided given a certain level of quality. In this sense, *"lower transport costs imply that higher quality inputs are traded in equilibrium. The effect of this higher quality can be such that trade costs increase despite lower transport costs."* This conclusion could be linked with the data provided by Glaeser and Kohlase (2003) or, in other words, the cost of participating in a market has been increasing hand in hand with its quality, which could lead to the necessity of people moving to information and communication hubs.

2.2.   Trade costs in the EU

In the specific case of the EU, one should also take into account the efforts put into the cohesion principle, announced as a policy that allows the maximization of overall growth whilst also achieving continuous convergence in outcomes and productivity across Europe's regions (Farole et al., 2010 However, this has not occurred, with the average disparity in per capita GDP having increased from 26,5 to 28,5 between sub-national regions of the EU-15 from 1990 to 2000, despite standard deviation among member states as a whole decreasing from 12,5 to 11,4. It is thus unclear that cohesion policies have bettered the development of less well-prepared regions in a decisive manner. The sheer scale of the funding involved in comparison to other programmes on a full federal scale (like in the case of US federal or German post-reunification policies) may help in giving an answer to the problem, as well as *"the absence of a realistic view of the economic geography of development and hence of the possibilities, constraints, and potential trade-offs faced by efforts to promote convergence."*

The evolution of economic integration in Europe appears to continue to promote a two-tier scale of regions, comprising "core regions" that concentrate the largest economic agglomerations and "peripheries" that lack these type of agglomerations and sometimes even fail to generate scale economies. The apparent perpetuation of inter-regional divergences together with a slight tendency towards equality in per capita GDP of member states as a whole, despite a reduction in policy barriers and transport costs, can give way to the belief that trade costs have also being increasing even in the highly integrated EU common market.

One other major factor that distinguishes the European reality to that of other major economies (such as the US), is the fact that labour movements are much more restricted, which could explain the much wider differential both in income and unemployment rates that exists in the EU as a whole. Also, European consumers show a greater tendency to consume goods that are locally produced, therefore taking less advantage of new consumption possibilities and reducing the impact of diverging forces (Palan and Schmiedeberg, 2010).

Reasons such as the differences in language and cultural habits are commonly used to justify this situation. However, in addition to these, the issue of income disparities should also be taken into account, as in intermediate stages of integration it is predictable and, perhaps, even desirable, that poorer regions grant smaller wages to workers during a catching up process.

However, as Puga (1999) mentions, in several cohesion countries (namely, Italy and Spain) national governments introduced schemes that limited disparities in salaries between regions,

an intervention that severely minimized the tendency towards internal migration. An illustrative example of this situation is the one of the Italian Mezzogiorno, which despite several investments in infrastructure became increasingly divergent from the more prosperous Northern regions. Indeed, the fall in transport costs and increase in real wages (and, therefore, local production costs) reduced the natural protection that local companies previously enjoyed. This cycle could constitute one major factor to increasing regional inequalities inside European countries, despite national convergence as whole and, predictably, further integration of the European economic space should only enhance it.

3.   SPATIAL DEVELOPMENT POLICIES IN EUROPE

European regional policy has been subjected to some changes in their objectives in the last decades however, in accordance with the "duty" concept of the Union itself. In fact, social and economic cohesion only became a central goal of the EU with the approval of European Single Act in 1987. This is somewhat indicative of a relatively recent regional/territorial focus of the European process and its objectives, which has also been enriched by new concepts such as sustainable growth, for example.

Until recently, the European Commission used the so-called endogenous growth theory as a basis to a more active regional financing policy. The interest in the development of each region's endogenous potential led to several changes in the paradigms of local development: from locational to innovation factors; from hard to soft factors, such as local synergies and the quality of governance; and finally from a functional to a cognitive approach.

This evolution can be summarized by the concept of *territorial capital*, as defined by Camagni and Capello (2010): the ensemble of assets – at a natural, humane, artificial, organisational, relational and cognitive level – that constitute the competitive potential of a determined region.

In view of this perspective, it is ever more important to create development policies more capable to respond to the challenges of the XXI Century. This objective can only be carried out if with the use of "intelligent" tools specifically built to support each individual region's territorial capital, a task that depends on the listening of several local partners and the knowledge of each territory's geographic specificities in order to maximize the return of this kind of intervention.

As nowadays it is almost a taken for granted that in the more prosperous countries an adequate infrastructure structure already exists, its simple presence can no longer be considered as a differentiation factor. However, the quality of said infrastructures, together with other fundamental conditions typified in the last decades (attractive legal and fiscal policies, qualified manpower or relevant research & development centres, for instance) remains essential in order to guarantee sustainable growth and welfare prospects to local populations.

Thus, whilst not forgetting what was considered as essential in the past, development policies should integrate these concerns with the new problems posed by the opening of international

trade, developing those factors that are unique to their home regions and harder to replicate elsewhere – the basis of the *network paradigm* (Lopes, 2001).

Despite this conceptual framework and the changes in course towards the paradigm of the *learning society* in highly developed countries, European cohesion funds are nowadays still putting a particular emphasis in transport infrastructural investment, as the Commission sees that they play *"a key role in efforts to reduce regional and social disparities in the EU and in the strengthening of its economic and social cohesion"* (Commission of the European Communities, 1999), hence the continual support of several projects integrating the Trans-European Transport Network (TEN-T).

3.1. EU transport policies – The focus on high-speed rail

The effects of this type of investment are felt at several levels on a cost-benefit basis. As Puga (2002) puts it, *"The first impact f a transport project comes from the construction expenditure. Given the sums involved, this is not negligible. A transport project also generates costs and revenues associated with its operation. Further, it also has a direct impact on regions affected, typically by reducing the cost and increasing the quality of transport between them; this in turn induces changes in the total number of journeys undertaken, and in the way in which these are split between different modes of transport. All of these effects, together with the environmental impact, are normally considered as part of the economic evaluation of projects"*. The visibility of these returns perhaps helps to explain the EUs interest on such investments.

High-speed rail in particular has benefited from generous funding by the EU in the last decade. This type of infrastructure has very high sunk costs in comparison to roads and conventional rail. Not being suitable to the transport of most goods, its effects on the location of industry could be considered to be somewhat negligible. However, the location of business services is greatly affected, with the predictable consequence that headquarters concentrate in a few large urban centres (the abovementioned "black holes"). Accordingly, costs in these major hubs should increase, driving manufacturing industries that are not so dependent on these factors to more peripheral locations, resulting in a process of specialization by function, instead of sector (Puga, 2002), which is also coherent with the work of Glaeser and Kohlase (2003).

Another important distinction is between hub-and-spoke networks, that promote agglomeration in the respective centre (where transport costs are smaller), and multilateral networks. Typical examples of the first are the high-speed rail networks in France and Spain, where Paris and Madrid have gained increasing economic weight, particularly as regards the location of companies' headquarters. Whether these consequences result from a conscientious centralizing policy originating from national governments or are an unintended result of investment in better transport networks is cause for another debate.

Furthermore, and contrarily to roads, high-speed rail only concentrates activity in the ends of the line, instead of in several points across it, making it more difficult to create a harmonious regional development, making it important to distinguish between those projects that improve trade inside a region (such as local roads) and those that improve trade between different regions (such as high-speed rail). It can therefore be questioned if this paradigm of cohesion investment projects is the best suited to promote growth in more depressed regions.

Empirical evidence in Europe also shows that despite an overall increase in accessibility, there is now a greater divergence in terms of transport costs between hubs and their periphery. As mentioned before, areas located in in-between nodes suffer in particular due to the choice of high-speed rail in detriment of roads (in the case of highways this can also occur to some extent, and a study of the Portuguese situation regarding this would be of interest).

Coinciding with this perspective, a study by Combes and Lafourcade (2001) dwelled on the evolution of transport costs in France from 1978 to 1993, revealing an average decline of 38%. However, only 7,5% of this value is justified by improvements in infrastructure, with the remaining 92,5% being caused by reductions in fuel consumption, maintenance and driver-related costs. Relating these findings with a new economic geography model, the authors concluded that this drop in transport costs contributed to the spatial concentration of employment in France, therefore increasing regional inequalities.

In addition to traditional cost-benefit analysis, some models have more recently been focused on the general equilibrium of specific projects and included a more detailed microeconomic structure (even if it cannot be tested econometrically). This approach permits pointing out cases where a project in a single region may carry important welfare benefits in several other regions, in particular if it serves as a link between previously existing infrastructures (such as the M40 ring road in Madrid), or projects that promote mainly local effects (such as the

project of a new Tagus bridge in Lisboa). Again, the difference between circular/multilateral and hub and spoke projects is clear, as circular works generally give origin to more evenly spread territorial benefits.

A work published by Melibaeva et al. (2010) dwells precisely on the prediction of this type of consequences taking as example existing high-speed rail networks. The paper is of increased interest for us as it uses Portugal (as well as the US) as the subject for this extrapolation. In the Portuguese case one the fundamental questions is how deeply affected the existing spatial economic would be, and if the formation of megalopolis could be occur around the Lisboa-Porto axis.

The predicted scenarios were: *"(1) megalopolis forming between two main end cities (Lisbon- Porto); (2) megalopolis forming at one of either ends of the HSR routes or both simultaneously (Lisbon-Oeste-Leiria and Porto-Aveiro-Coimbra); and (3) emergence of combinations of both cases in (1) and (2) simultaneously creating a "hybrid megalopolis" (see sketches of various combinations in Figure 9 of Annex A). A fourth possibility is for no megalopolis to form. Since the Lisbon-Porto corridor already has well-developed rail services, the incremental impacts from increased speed on most of the cities may be very small."*

The main conclusion is that, despite the critical role of pre-existent conditions (coherently with Melchior, 2009), high-speed rail does benefit the creation of megalopolises. Also, its benefits are not uniformly distributed, creating "winner" and "loser" regions. Hence, these regions present the need for planning on a new spatial scale, and the choice of high-speed rail links can be used to "*direct and shape the direction of megalopolises in Portugal*".

In order for reduce the negative effects of possible "black holes", the usage of structures of feeder services that enhance compatibility with both conventional rail and other transports is recommended, as well as frequent stops at intermediate stations (as long as there is adequate frequency, allowing sufficient direct journeys).

Even if the current crisis quickly dispelled such grandiose projects for the foreseeable future, we will nonetheless return to the concept of megalopolis – or mega-region – when we present our results.

3.2. Going for growth – Cohesion funds 2014-2020

All things considered, it is possible the question the rationality of the current focus in transport networks and high-speed rail as a tool towards greater convergence inside the European territory. The heavy sunk costs involved and growing concentration of highly-skilled jobs in a few large urban centres can indeed be put into question, especially in the current economic juncture.

The bleak economic outlook has took its toll, and the current objective of EU cohesion policies has, at least in theory, shifted towards the simple promotion of economic growth, and stepping away from the active pursuit of spatial economic convergence. The argument behind this change is that, as long as all regions can achieve robust growth rates, the existence of inequalities is not in itself harmful, because in the European case access to information and communications networks is practically universal, thus granting innovation and development opportunities to all.

Also, the need to revaluate the role of European development and territorial cohesion instruments is no doubt in order, taking into the account the new paradigms of spatial development and a focus on quality and innovation, as defended on the *Creating an Innovative Europe* report (Aho, 2006). The current precarious position of the EU as a competitor in global markets sheds further doubt whether some degree of cross-regional equality is even possible in the foreseeable future.

Alongside this dilemma, another fundamental debate is being held about the spatial level at which the cohesion should be granted. In fact, and in opposition to the defenders of the maintenance of current *status quo,* a new school of thought has emerged that sustains that territorial cohesion policies should be primarily decided by national government instead of Brussels. The obvious consequence of this position (held by the well-known *An Agenda for a Growing Europe r*eport (Sapir et al, 2004), for instance), is that cohesion funds should be given directly to central governments and not directly to regions, an option that would guarantee more efficiency and a greater return to these investments, as each member-state has a better understanding of the development priorities of its constituting territories.

As it should be each regions' task of to develop its own territorial capital, the notion that national governments might be given a certain degree of autonomy is indeed tempting, allowing for a certain degree of freedom for them to choose tailor-made solutions for their specific problems, instead of applying one-size-fits-all programmes which are notoriously

inefficient. However, the European authorities should still define clear and transparent mechanisms that guarantee high quality result measurement and a common ground for benchmarking, thus making strides to maximize the return of investments on a long term perspective.

In sum, a proper implementation of cohesion policies should consider three main aspects for its proper use, as defined by Barca et al. (2012): the introduction of "conditionings" that promote binding agreements between all interested parties; the *a priori* establishment of the goals to achieve and of the end results at both a social welfare and economic growth levels; and the development of a public debate forum between all local representatives that allows for alternative views to emerge and seeks the improvement of the collaboration between these actors and all levels of government.

The current negotiation round for the new EU cohesion funds programme of 2014-2020 constitutes undoubtedly a perfect opportunity for these concerns to be debated and put into practice, so that a fairer, healthier, union might arise.

In fact, and in what at least theoretically still claims to have the ambition of becoming the most dynamic economic bloc of the world, it should seem anathema to simple abandon whole regions (or countries) to a vicious circle of impoverishment. Therefore, the EU should create tools to reverse this tendency, although bearing in mind three essential restrictions: the budget restriction of a union enlarged to 27 countries; the aspirations of the new member states to become the principal receivers of the EU funds; and the demands of the cohesion countries, that are fighting to keep the same levels of financing.

The current political climate is also not the most auspicious, as unfortunately most great advances in the European integration process were usually held in pro-cyclical times. When the political timing does not coincide with periods of prosperity and economic growth satisfactory agreements are much harder to obtain, as the tensions caused by the protection of national interests make relevant progresses usually impossible to be reached, a tendency enhanced with the new reality of an enlarged and even more differentiated community (Navarro and Ysarte, 2008).

However, the future of the EU depends fundamentally on the success of the Common Market, a free trade area where the majority of the benefits are currently concentrated in the hands of just a few members, leaving many negative consequences to the others. These unbalances are socially and politically unbearable as is already clearly visible, and are against the principles

of territorial cohesion consecrated in the Treaty of the European Union, which creates a scenario which is unique in the world.

Bearing in mind all of this theoretical and socio-political framework, we will try to shed some light to some of these questions as regards the Portuguese reality, with the aid of empirical evidence.

4.   METHODOLOGY

The data used as a basis for our paper consists on the number of people registered to work in each municipality of mainland Portugal, as supplied by the Labour and Social Security Ministry. They are aggregated by economic activity as mentioned in the second revision of the Portuguese Classification of Economic Activities (CAE Rev. 2) at a two digit level, which will allow an analysis in considerable detail.

The CAE Rev. 2 was introduced by the Decree-Law 182/93 and entered into force in 1 January 1994. In 2003 the Decree-Law 197/2003 brought some minor changes (the so-called CAE Rev. 2.1). However, and in order to bring Portuguese terminology closer to EU rules (as approved by Regulation 1893/2006, that created the 2nd revision of the Nomenclature of Economic Activities of the European Community - NACE Rev. 2), the Decree-Law 381/2007 deeply changed the Classification of Economic Activities, introducing the CAE Rev. 3.

This legislation brought a considerable dilemma for our work, as it was soon visible that a simple conversion of codes would be almost impossible with such a new and substantially different CAE. Therefore, the question arose of whether to use or not labour data from the period from the introduction of the CAE Rev. 3 on, as it was the more recently available. However, the reduced number of years available to date brought us to the conclusion that it would more fruitful to use data from the CAE Rev. 2 period, as it would give us a wider scope into the spatial changes of the Portuguese economic activity.

Hence, we chose to analyse the years of 1995, 2002 and 2006, hoping that the considerable space between them would permit spotting the more relevant macroeconomic trends, thus giving increased relevance to our work. Also, by analysing this data at a municipal basis, we expect to bring specific additional knowledge at a level never previously done, to the better of our knowledge.

In this paper we will use a methodological base consisting of several indices, which we can divide in two basic groups: absolute and relative location indexes.

While a absolute location index tries to determine if a country concentrates a high level of employment in a reduced number of activities by using the employment shares in all industries as a benchmark, a relative location index tries to quantify if the structure of a certain activity substantially deviates from the average behaviour of said activity in a group of comparable countries (or, in our case, the national average), even if its absolute specialization degree is not high. Indeed, in highly qualified economic sectors such as

communications or medical research, a country can compare well to the reference group despite still not employment a very large percentage of its active population, thus being considered relatively specialized using the average economic structure as a benchmark. Another issue is the average distribution of a reference group, as larger countries tend to be underestimated in their importance by being attributed the same weight as smaller ones. One way to improve this problem is to use the group average of an activity, and in our case we will use Portuguese average in comparison with each municipality, thus minimizing this risk.

A useful aid for our work was the *Measurement of Specialization – the Choice of Indices* paper (Palan, 2010). Analysing a series of indices used to measure empirical data on international trade and international specialization patterns, from "*simple descriptive indicators to complex econometric technics",* and applying them to data regarding employment structures in Europe, spanning 51 industries and 24 countries, this works seems particularly adequate for our objectives.

The author considers six essential criteria to evaluate the benefits and weaknesses of each index, which we will now be briefly enunciate:

Axiom of Anonymity: the re-ordering of employment shares should provide no impact on the end results;

Axiom of Progressive Transfers: a country should become less specialized overall if one hour of labour is transferred from an activity where it is more specialized to one where it is less specialized, and vice-versa;

Bounds: in order to be able to read clear results the investigator should define appropriate bounds. Thus, in absolute specialization the upper bound is reached when a country is specialized in one activity only, where in relative specialization it is reached when a country is concentrated in one activity only and also all other countries are specialized in other activities.

Decomposability: A good index should be able to both decompose into inter-sectorial/inter-industry heterogeneity and inter/intra-regional heterogeneity.

Classification of industries: If economic activities are divided into sub-activities or, one the other hand, assimilated into one large activity, indices should react accordingly (i.e. absolute specialization should decrease/increase). This is a very common problem as regards the division of labour in services in comparison with manufacturing, as the latter is normally

much more finely divided. In relative specialization, merging or uniting activities should not, in principle, alter the degree of specialization in comparison with the reference group.

Number of industries: The addition of activities with a zero/negligible level of employment should have no discernible impact in the end results.

The choice of indices is very relevant indeed as regards the final results to be expected. In fact, and as Palan mentions, *"we find that results differ widely according to which measure is used. As expected, results from measures of absolute specialization cannot be compared to indices of relative specialization, since they follow two distinct concepts of specialization. But even within both groups the indices differ from each other due to different construction and weighting schemes"*.

Trying to achieve the largest scope and equilibrium possible, we are going to use four different indices, three of which we will describe now. The final one, different in nature, is going to be explored in the next chapter.

4.1. Choice of indices

- *ABSOLUTE LOCATION*

Absolute location indices only take into consideration the distribution of a sector (in the general notation, j) by different regions. Hence, total spatial concentration of sector j will be accomplished when this sector is totally concentrated in a single region, whilst minimum concentration is reached when it is equally dispersed trough all measured regions

In terms of measuring market concentration, the most widely used instrument is the **Hirschman-Herfindahl index (HHI)**, which is also popular in the research of oligopoly or cartels. It is calculated by squaring the market share of each sector competing in a market, and then summing the resulting numbers:

$$HHI = \sum_{i=1}^{I} b_i^{\alpha} \qquad (1)$$

Where b_i is the share of sector *i* in the market and I is total the number of sectors. In our specific case, it will compare the distribution of employment in a sector with a uniform distribution (where all municipalities have people employed in a certain job subclass). This

index is notable because it fulfils all the abovementioned criteria, despite not being in itself decomposable.

Another popular index that captures this concept of concentration is the **Absolute Gini index (Gj(A))**.

When calculating this index, we must first organize the values of sji in an increasing order, designating them by aj(h) with h (h = 1, 2, …, I) and indicating the order. Afterwards, the partial accumulated values dj(h) should be found such has dj(1) = aj(1), dj(2) = dj(1) + aj(2), …, dj(I) = dj(I-1) + aj(h). Finally, one must define cj(h) = (h/I). The Absolute Gini index for sector j is then given by:

$$G_j(A) = 1 - \frac{\sum_{h=1}^{I-1} d_j(h)}{\sum_{h=1}^{I-1} c_j(h)} \quad ; \quad G_j(A) \in [0;1] \qquad (2)$$

Where Gj(A) will be equal to 1 when sector j is located in only one region. Notwithstanding its usefulness, The Absolute Gini presents some problems, as it isn't decomposable, it doesn't fulfil the Axiom of Progressive Transfers and total heterogeneity isn't possible when splitting industries in inter-sectorial and inter-activity (by way of third effect called transvariation). Even the number of activities carries some distortion in this index.

Although only rarely being used in the field of absolute measurement of specialization, its usefulness in the field of spatial economics led to it being used in our work, though being less perfect than the HHI.

Another option would be the Shannon Entropy index, which is defined as the negative sum of employment shares multiplied by the natural logarithm of each single activity's employment share. However, this index is rarely used in specialization measurement, being more common in income distribution analysis.

- *RELATIVE LOCATION*

Relative concentration usually uses one particular activity as reference, whilst individual activities are compared to it in terms of spatial distribution. Additionally, the regional dimension is also taken into account as regards the concentration of activities.

A commonly used measure of relative concentration is the so-called **Krugman index (Ej)**, which can be expressed as:

$$E_j = \beta \sum_{i=1}^{I} \left| s_{ji} - s_{qi} \right| \quad ; \quad E_j \in \left[0; 2\beta\right[\qquad (3)$$

If Ej = 0, the spatial distribution of sector j in a certain municipality is identical to that of the country as a whole (q). This index is generally used in relative specialization measurement and is considered to be of high quality, as it only fails to meet the decomposability criterion.

An alternative as regards relative concentration would be the Relative Gini index, which is also commonly used in many studies dwelling on industry structure and specialization. However, it is more complex to calculate and presents the same basic shortcomings of the Absolute Gini index (basically it is estimated in the same fashion except the employment shares in the focus subject are compared with employment of the reference group), and in this sense we decided not to use it our work.

4.2. Results

- *ABSOLUTE LOCATION*

In view of the abovementioned methodological choices, we now present the results calculated for the Hirschman-Herfindahl index as regards the specialization of CAE Rev. 2 subclasses in the Portuguese municipalities:

Table 2: CAE Rev. 2 subclasses ordered by Hirschman-Herfindahl index score (2006)

Rank	CAE Rev. 2 subclass	1995	2002	2006	Var Total
1	Manufacture of office machinery and equipment for automatic data processing	0,188	1,000	1,000	432,37%
2	Tobacco industry	0,625	0,732	0,892	42,64%
3	International organisms and other extra-territorial institutions	0,917	1,000	0,748	-18,42%
4	Air transport	0,719	0,698	0,699	-2,76%
5	Extraction and preparation of metal ores	0,531	0,591	0,504	-5,07%
6	Insurance, pension funds and other complementary activities of social security	0,354	0,340	0,332	-6,26%
7	Manufacture of coke, refined petroleum products and nuclear fuel treatment	0,247	0,000	0,308	24,93%
8	Water transports	0,562	0,496	0,274	-51,25%
9	Computer activities and others related	0,228	0,215	0,176	-22,81%
10	Research and development	0,377	0,199	0,176	-53,45%
11	Post and telecommunications	0,172	0,146	0,156	-9,23%
12	Financial intermediation, except insurance and pension funding	0,217	0,166	0,154	-28,89%
13	Supporting and auxiliary transport services; travel and tourism agencies	0,223	0,133	0,140	-37,15%
14	Other services provided mainly to businesses	0,184	0,122	0,138	-25,28%
15	Tanning and dressing of leather; manufacture of luggage, leather goods, saddlery, harness and foot	0,094	0,124	0,136	43,78%
16	Activities auxiliary to financial intermediation	0,271	0,173	0,110	-59,34%
17	Recreational, cultural and sporting activities	0,204	0,127	0,102	-49,79%
18	Manufacture of radio, television and communication equipment	0,132	0,077	0,096	-26,89%
19	Manufacture of textiles	0,082	0,080	0,090	9,67%
20	Activities of membership organizations, n.e.c.	0,218	0,136	0,077	-64,69%
21	Fishing, aquaculture and related service activities	0,100	0,095	0,076	-24,42%
22	Manufacture of other transport equipment	0,082	0,083	0,071	-13,47%
23	Publishing, printing and reproduction of recorded media	0,108	0,078	0,071	-34,61%
24	Manufacture of medico-chirurgical, orthopedic, precision, optical and watchmaking instruments a	0,104	0,085	0,062	-40,56%
25	Manufacture of wood and cork and related articles, except furniture; articles of straw and plaiting	0,054	0,059	0,056	3,54%
26	Manufacture of electrical machinery and devices, n.e.c.	0,065	0,060	0,055	-14,72%
27	Production and distribution of electricity, gas, steam and hot water	0,040	0,044	0,055	36,09%
28	Manufacture of motor vehicles, trailers and semitrailers	0,084	0,070	0,053	-37,40%
29	Real estate activities	0,112	0,065	0,051	-54,48%
30	Manufacture of furniture; other manufactures, n.e.c.	0,059	0,050	0,051	-14,15%
31	Capture, treatment and distribution of water	0,665	0,179	0,045	-93,17%
32	Hotels and restaurants (restaurants and similar)	0,069	0,049	0,045	-34,94%
33	Manufacture of pulp, paper and paperboard and related articles	0,049	0,044	0,044	-8,97%
34	Manufacture of chemicals	0,053	0,044	0,040	-24,15%
35	Manufacture of wearing apparel; preparation and dyeing of fur articles	0,031	0,034	0,040	29,93%
36	Manufacture of basic metals	0,056	0,043	0,040	-29,06%
37	Manufacture of rubber and plastic products	0,035	0,034	0,038	8,45%
38	Renting of machinery and equipment without operator and of personal and household goods	0,104	0,052	0,036	-65,25%
39	Other service activities	0,066	0,039	0,033	-50,33%
40	Sanitation, public hygiene and similar activities	0,171	0,043	0,032	-81,40%
41	Education	0,075	0,045	0,032	-57,78%
42	Recycling	0,096	0,028	0,030	-68,62%
43	Land transport; transport via pipelines	0,083	0,041	0,030	-64,14%
44	Manufacture of machinery and equipment, n.e.c.	0,029	0,030	0,028	-2,42%
45	Wholesale trade and commission trade, except of motor vehicles and motorcycles	0,066	0,034	0,028	-58,21%
46	Health and social work	0,051	0,028	0,026	-49,16%
47	Retail trade (except of motor vehicles, motorcycles and vehicle fuel); repair of personal and househ	0,043	0,031	0,026	-41,06%
48	Public administration, defence and compulsory social security	0,155	0,107	0,025	-83,91%
49	Other mining and quarrying activities	0,029	0,023	0,022	-23,23%
50	Manufacture of other non-metallic mineral products	0,024	0,022	0,021	-12,85%
51	Sale, maintenance and repair of motor vehicles and motorcycles, retail sale of automotive fuel	0,033	0,020	0,018	-45,46%
52	Manufactured metal products, except machinery and equipment	0,025	0,019	0,017	-30,88%
53	Construction	0,025	0,014	0,013	-46,80%
54	Forestry, logging and related service activities	0,015	0,013	0,012	-15,44%
55	Manufacture of food products and beverages	0,015	0,012	0,011	-29,30%
56	Agriculture, livestock, hunting and related service activities	0,011	0,010	0,008	-22,64%
57	Coal, lignite and peat extraction	0,660	0,680	0,000	-100,00%
58	Petroleum and natural gas extraction and related services, except prospection	1,000	0,000	0,000	-100,00%
59	Mining of uranium and thorium	0,689	1,000	0,000	-100,00%

As we can see, the great majority of the represented subclasses (47 out of 59) present by 2006 a HHI below 0,15, meaning that these labour sectors are considered to be unspecialized in their spatial distribution. The subclass of 'agriculture, livestock, hunting and related services' activities even scores below 0,01 (0,008), indicating a highly dispersed activity. This is entirely justified by the territorial nature of this activity and the remains of an agrarian culture that made some call Portugal the last rural country in Europe (Domingues, 2001).

The exceptions to this rule basically belong to a few specialized activities such as 'manufacture of office machinery and equipment for automatic data processing' (scoring a perfect 1 due to only two people being registered in this subclass, both in the municipality of Porto), 'tobacco industry' with 0,892 (corresponding to 871 workers in Sintra and 53 in Coruche), 'international organisms and other extra-territorial institutions' with 0,748 (a total of 43 people nationwide, 37 of which working in Lisboa), or 'air transport' scoring a HHI of 0,699 (more representative, with 7.829 workers, 6.522 of them located in the capital). Additionally, only nine subclasses actually increased their HHI in comparison with 1995, as all others actually became less specialized in terms of geographic location.

Therefore, we can safely say that only a few niches of the labour market assume a strongly specialized nature in their location. But what explains the actual reduction in the HHI values of such a vast majority of sectors? First of all, there was an impressive overall increase on the universe of people considered in the labour statistics, from 2.153.439 in 1995 to 2.708.261 in 2002 and 2.990.993 in 2006 (38,89% more in total). This large creation of employment came from all around the country and in many different activities, guaranteeing less spatial concentration of the economic fabric in general, as only nine activities grew their HHI.

However, a relevant number of subclasses suffered a reduction in job numbers (24 in total), with four registering a loss of more than 10.000 jobs in absolute terms. All of these, 'manufacture of textiles' (from 110.143 jobs in 1995 to 73.087 in 2006), 'manufacture of wearing apparel; preparation and dyeing of fur articles' (128.326 jobs in 1995, 95.231 in 2006), 'tanning and dressing of leather; manufacture of luggage, leather goods, saddlery, harness and footwear' (66.448 jobs in 1995, 44.282 in 2006) and 'manufacture of electrical machinery and devices, n.e.c.' (28.491 jobs in 1995, 17.061 in 2006), are traditional exporting sectors, which more than probably suffered from the opening up of global trade, a conclusion supported by the conclusions of Midelfart-Knarvik et al. (2002).

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Here are the CAE Rev. 2 subclasses ordered by number of workers, offering a global picture of this evolution:

Table 3: CAE Rev. 2 subclasses ordered by number of workers (2006)

CAE Rev. 2 subclass	1995	2002	2006	Var Total
Construction	200.561	357.672	367.735	83,35%
Other services provided mainly to businesses	102.932	208.999	320.326	211,20%
Retail trade (exc. motor vehicles, motorcycles and fuel); repair of personal and household goods	185.992	257.772	290.052	55,95%
Hotels and restaurants (restaurants and similar)	132.949	184.666	204.749	54,01%
Wholesale trade and commission trade, except of motor vehicles and motorcycles	161.429	198.823	201.487	24,81%
Health and social work	58.946	113.684	174.304	195,70%
Sale, maintenance and repair of motor vehicles and motorcycles, retail sale of automotive fuel	84.435	102.132	102.238	21,08%
Manufacture of wearing apparel; preparation and dyeing of fur articles	128.326	113.517	95.231	-25,79%
Manufacture of food products and beverages	88.787	85.696	93.682	5,51%
Land transport; transport via pipelines	62.334	79.032	85.719	37,52%
Manufacture of textiles	110.143	80.954	73.087	-33,64%
Manufactured metal products, except machinery and equipment	64.137	74.017	72.646	13,27%
Education	38.410	47.892	70.629	83,88%
Financial intermediation, except insurance and pension funding	67.535	60.067	62.002	-8,19%
Manufacture of other non-metallic mineral products	63.451	60.792	53.519	-15,65%
Agriculture, livestock, hunting and related service activities	33.464	44.283	50.533	51,01%
Manufacture of furniture; other manufactures, n.e.c.	46.596	47.667	48.333	3,73%
Leather tanning and dressing; manufact. luggage, leather goods, saddlery, harness and footwear	66.448	52.377	44.282	-33,36%
Manufacture of machinery and equipment, n.e.c.	39.948	38.359	38.977	-2,43%
Manufact. Wood, cork and related articles, except furniture; articles of straw and plaiting mat.	42.393	42.438	38.875	-8,30%
Activities of membership organizations, n.e.c.	9.642	23.280	35.758	270,86%
Other service activities	16.681	24.855	31.963	91,61%
Publishing, printing and reproduction of recorded media	30.340	31.736	31.503	3,83%
Post and telecommunications	37.759	37.543	31.410	-16,81%
Supporting and auxiliary transport services; travel and tourism agencies	19.151	27.032	30.155	57,46%
Manufacture of motor vehicles, trailers and semitrailers	18.195	24.018	29.117	60,03%
Recreational, cultural and sporting activities	19.019	25.843	28.813	51,50%
Real estate activities	9.108	20.230	28.545	213,41%
Public administration, defence and compulsory social security	2.346	14.548	28.405	1110,78%
Manufacture of rubber and plastic products	19.510	20.453	24.206	24,07%
Computer activities and others related	5.038	18.605	24.082	378,01%
Manufacture of chemicals	23.669	22.870	21.308	-9,98%
Manufacture of electrical machinery and devices, n.e.c.	28.491	23.743	17.061	-40,12%
Manufacture of radio, television and communication equipment	14.670	21.276	12.437	-15,22%
Insurance, pension funds and other complementary activities of social security	12.665	12.352	11.502	-9,18%
Manufacture of basic metals	10.239	10.837	11.411	11,45%
Other mining and quarrying activities	12.179	13.263	11.386	-6,51%
Manufacture of pulp, paper and paperboard and related articles	14.134	12.264	10.370	-26,63%
Manufacture of other transport equipment	13.732	10.333	9.149	-33,37%
Production and distribution of electricity, gas, steam and hot water	16.211	10.254	8.578	-47,09%
Fishing, aquaculture and related service activities	5.320	4.387	8.117	52,58%
Sanitation, public hygiene and similar activities	511	5.279	7.993	1464,19%
Air transport	8.971	9.653	7.829	-12,73%
Activities auxiliary to financial intermediation	3.845	5.996	7.517	95,50%
Renting of machinery and equipment without operator and of personal and household goods	4.758	7.137	7.207	51,47%
Manufact. Medico-chirurgical, orthopedic, precision, optical, watchmaking instrum. and appl.	5.557	5.663	6.143	10,55%
Forestry, logging and related service activities	3.237	4.658	5.897	82,17%
Capture, treatment and distribution of water	1.421	1.935	3.877	172,84%
Recycling	418	1.588	2.578	516,75%
Research and development	757	1.772	2.308	204,89%
Manufacture of coke, refined petroleum products and nuclear fuel treatment	2.569	0	2.092	-18,57%
Water transports	1.748	1.753	1.684	-3,66%
Extraction and preparation of metal ores	1.321	1.076	1.217	-7,87%
Tobacco industry	787	1.158	924	17,41%
International organisms and other extra-territorial institutions	23	4	43	86,96%
Manufacture of office machinery and equipment for automatic data processing	99	8	2	-97,98%
Coal, lignite and peat extraction	23	5	0	-100,00%
Petroleum and natural gas extraction and related services, except prospection	22	0	0	-100,00%
Mining of uranium and thorium	57	15	0	-100,00%
Total	**2.153.439**	**2.708.261**	**2.990.993**	**38,89%**

The first three of these activities were among the small group that saw their specialization levels actually rise, with 'tanning and dressing of leather; manufacture of luggage, leather goods, saddlery, harness and footwear' increasing the most from 0,094 in 1995 to 0,136 in 2006 (43,78% more).

Contrarily to the aforementioned sectors, all of the subclasses representing more than 100.000 jobs in 2006 registered significant net increases in job creation in the 1995-2006 years. Thus, 'construction', the continuous leader in employment volume, rose from 200.561 jobs in 1995 to 367.735 in 2006, 'other services provided mainly to businesses' from 102.932 jobs in 1995 to 320.326 in 2006 (a burgeoning growth of 211,20%), 'retail trade (except of motor vehicles, motorcycles and vehicle fuel); repair of personal and household goods' from 185.992 jobs in 1995 to 290.052 and 'health and social work' from 58.946 jobs in 1995 to 174.304 in 2006 (195,70% more), just to quote the CAE Rev. 2 subclasses that registered a net creation of over 100.000 jobs. All of the above saw a decrease of between 25% and 49% in their HHI, reaching in 2006 values of no more than 0,026, except 'other services provided mainly to businesses' with 0,138 (but even here indicating a non-specialized spatial distribution).

Despite this overall positive trend, the bulk of employment growth was created during the 1995-2002 period, with a very significant deceleration in 2002-2006, perhaps already foretelling the more dramatic evolution that would occur in the Portuguese economy soon afterwards.

The more important exceptions to this rule are 'other services provided mainly to businesses', 'health and social work', 'education' , 'public administration, defence and compulsory social security' and 'manufacture of rubber and plastic products', which still grew consistently in these final years. With the exclusion of the latter, these subclasses belong to the services sector or to areas strongly tied to government action, suggesting that in this last period net job creation by private business was fading fast (evident in 'construction'), a tendency that the government partially compensated trough the growth of the public sector. On the other hand, employment in industry and other activities related to the production of transactional goods went into relative and in some cases even absolute decline.

Using a different angle, the Absolute Gini index gives us additional relevant information about geographic concentration. We now present the table with its results:

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Table 4: CAE Rev. 2 subclasses ordered by Absolute Gini index score (2006)

Rank	CAE Rev. 2 subclass	1995	2002	2006	Var Total
1	Extraction and preparation of metal ores	0,623	0,710	0,711	14,27%
2	Manufacture of textiles	0,294	0,345	0,372	26,47%
3	Manufacture of office machinery and equipment for automatic data processing	0,088	0,335	0,363	312,82%
4	Leather tanning and dressing; manufact. luggage, leather goods, saddlery, harness and footwear	0,319	0,328	0,309	-3,11%
5	Manufacture of coke, refined petroleum products and nuclear fuel treatment	0,375	0,000	0,303	-19,08%
6	Water transports	0,188	0,177	0,282	50,10%
7	Manufacture of other transport equipment	0,149	0,186	0,220	47,60%
8	Manufact. Wood, cork and related articles, except furniture; articles of straw and plaiting mat.	0,151	0,192	0,204	35,04%
9	Manufacture of basic metals	0,000	0,199	0,186	64456,62%
10	Manufacture of wearing apparel; preparation and dyeing of fur articles	0,101	0,166	0,168	67,52%
11	Manufacture of machinery and equipment, n.e.c.	0,079	0,141	0,159	100,74%
12	Tobacco industry	0,110	0,150	0,152	39,16%
13	Manufacture of rubber and plastic products	0,066	0,098	0,146	122,34%
14	Manufacture of other non-metallic mineral products	0,156	0,144	0,143	-8,07%
15	Manufacture of chemicals	0,168	0,118	0,129	-22,98%
16	Other mining and quarrying activities	0,003	0,104	0,121	3652,16%
17	Manufacture of pulp, paper and paperboard and related articles	0,058	0,053	0,116	99,34%
18	Other services provided mainly to businesses	0,128	0,115	0,110	-14,07%
19	Supporting and auxiliary transport services; travel and tourism agencies	0,147	0,108	0,110	-25,24%
20	Production and distribution of electricity, gas, steam and hot water	0,085	0,074	0,106	24,82%
21	Air transport	0,092	0,091	0,106	15,72%
22	International organisms and other extra-territorial institutions	0,087	0,097	0,103	18,62%
23	Insurance, pension funds and other complementary activities of social security	0,097	0,100	0,099	2,26%
24	Recycling	0,068	0,054	0,095	40,88%
25	Computer activities and others related	0,106	0,102	0,092	-12,57%
26	Land transport; transport via pipelines	0,116	0,099	0,088	-24,01%
27	Manufactured metal products, except machinery and equipment	0,070	0,091	0,086	22,63%
28	Sanitation, public hygiene and similar activities	0,011	0,139	0,085	704,11%
29	Manufacture of furniture; other manufactures, n.e.c.	0,063	0,085	0,083	31,91%
30	Publishing, printing and reproduction of recorded media	0,092	0,064	0,080	-12,68%
31	Financial intermediation, except insurance and pension funding	0,093	0,079	0,076	-18,56%
32	Activities auxiliary to financial intermediation	0,087	0,065	0,069	-20,66%
33	Recreational, cultural and sporting activities	0,052	0,062	0,068	31,31%
34	Post and telecommunications	0,053	0,066	0,067	27,02%
35	Other service activities	0,060	0,060	0,062	3,05%
36	Education	0,079	0,085	0,060	-23,44%
37	Research and development	0,069	0,077	0,060	-13,00%
38	Manufacture of motor vehicles, trailers and semitrailers	0,058	0,102	0,059	1,15%
39	Public administration, defense and compulsory social security	0,067	0,035	0,058	-13,42%
40	Renting of machinery and equipment without operator and of personal and household goods	0,054	0,068	0,057	5,32%
41	Retail trade (exc. motor vehicles, motorcycles and fuel); repair of personal and household goods	0,072	0,056	0,055	-23,67%
42	Activities of membership organizations, n.e.c.	0,080	0,064	0,055	-31,40%
43	Wholesale trade and commission trade, except of motor vehicles and motorcycles	0,078	0,059	0,051	-34,39%
44	Construction	0,071	0,043	0,048	-31,95%
45	Agriculture, livestock, hunting and related service activities	0,022	0,012	0,041	84,03%
46	Forestry, logging and related service activities	0,035	0,049	0,040	15,22%
47	Hotels and restaurants (restaurants and similar)	0,059	0,039	0,038	-35,16%
48	Sale, maintenance and repair of motor vehicles and motorcycles, retail sale of automotive fuel	0,046	0,037	0,032	-30,90%
49	Manufact. Medico-chirurgical, orthopedic, precision, optical, watchmaking instrum. and appl.	0,001	0,007	0,031	2397,58%
50	Real estate activities	0,034	0,021	0,031	-9,29%
51	Manufacture of food products and beverages	0,055	0,041	0,031	-43,94%
52	Health and social work	0,058	0,026	0,028	-52,57%
53	Manufacture of electrical machinery and devices, n.e.c.	0,036	0,032	0,016	-55,93%
54	Capture, treatment and distribution of water	0,133	0,020	0,011	-92,07%
55	Manufacture of radio, television and communication equipment	0,049	0,019	0,005	-89,46%
56	Fishing, aquaculture and related service activities	0,124	0,185	0,005	-95,80%
57	Coal, lignite and peat extraction	0,672	0,038	0,000	-100,00%
58	Petroleum and natural gas extraction and related services, except prospection	0,102	0,000	0,000	-100,00%
59	Mining of uranium and thorium	1,000	0,888	0,000	-100,00%

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In this case, almost half of the CAE Rev. 2 subclasses (29 out of 59) increased their Absolute Gini value from 1995 to 2006, meaning an increase in the concentration of some economic activities, a much large portion than in the HHI, although globally the scores are still low.

The activity with the greatest Absolute Gini was by far 'extraction and preparation of metal ores' with a level of 0,711 in 2006 (0,623 in 1995 and 0,710 in 2002), which is expected due to the locational nature of mining activities. Following this concentrated subclass are 'manufacture of textiles' (0,372 in 2006, from 0,294 in 1995), 'manufacture of office machinery and equipment for automatic data processing' (0,363 in 2006 from 0,088 in 1995), 'tanning and dressing of leather; manufacture of luggage, leather goods, saddlery, harness and footwear' (0,309 in 2006 from 0,319 in 1995) and 'manufacture of coke, refined petroleum products and nuclear fuel treatment' (0,303 in 2006 from 0,375 in 1995). None of these activities employed in 2006 more than 50.000 people.

On the other hand, the activities that assume greater importance as regards employment volume all assume very low Absolute Gini values, reaffirming in this measure their dispersed characteristic. Only 'other services provided mainly to businesses' surpassed the 0,1 threshold in 2006 (0,110). Even more, all subclasses that employed more than 100.000 people in 2006 saw a decrease in their result in the years before, coherently with their HHI scores. As we previously saw, all of these suffered an increase in jobs created, which brought even less concentration to their spatial distribution.

- *RELATIVE LOCATION*

The use of the Krugman index gives a complementary perspective. Here we compared the average weight of all CAE Rev. 2 subclasses in the whole of continental Portugal with each individual municipality. Due to the vast number municipalities considered - 275 in 1995 and 278 in 2002 and 2006 (in 1998 the municipalities of Vizela, Odivelas and Trofa were created from the breakup of Guimarães, Loures and Santo Tirso, respectively), we opted to present the top and bottom 20 municipalities by degree of proximity with the national average in all three considered years, as well as their employed population:

Table 5: Krugman index - Top and bottom 20 municipalities (1995, 2002 and 2006)

Rank	Municipality	1995	EmplPop	Rank	Municipality	2002	EmplPop	Rank	Municipality	2006	EmplPop
1	Vila Nova de Gaia	0,435	62.624	1	Vila Nova de Gaia	0,334	68.070	1	Vila Nova de Gaia	0,294	76.705
2	Sintra	0,480	52.250	2	Figueira da Foz	0,376	16.504	2	Braga	0,352	58.431
3	Braga	0,482	44.624	3	Braga	0,387	54.093	3	Leiria	0,371	48.046
4	Leiria	0,484	27.790	4	Sintra	0,395	80.827	4	Sintra	0,388	85.785
5	Castelo Branco	0,484	11.824	5	Viseu	0,404	24.266	5	Caldas da Rainha	0,392	14.533
6	Coimbra	0,489	34.440	6	Maia	0,418	44.775	6	Castelo Branco	0,399	13.579
7	Viseu	0,493	16.783	7	Leiria	0,435	41.925	7	Viseu	0,404	26.956
8	Santarem	0,502	12.229	8	Odivelas	0,436	20.833	8	Valongo	0,406	18.261
9	Figueira da Foz	0,505	12.637	9	Valongo	0,437	17.484	9	Coimbra	0,419	46.638
10	Loures	0,509	59.312	10	Viana do Castelo	0,442	23.375	10	Torres Novas	0,428	11.154
11	Matosinhos	0,511	45.034	11	Setúbal	0,449	29.244	11	Maia	0,428	51.864
12	Guarda	0,532	8.309	12	Coimbra	0,450	42.072	12	Matosinhos	0,430	58.816
13	Porto	0,557	128.413	13	Matosinhos	0,455	51.297	13	Setubal	0,434	30.594
14	Viana do Castelo	0,560	20.134	14	Mafra	0,459	15.399	14	Figueira da Foz	0,441	16.461
15	Torres Vedras	0,565	13.462	15	Santarém	0,460	16.196	15	Viana do Castelo	0,443	25.501
16	Amadora	0,567	31.625	16	Fundão	0,470	5.998	16	Santarém	0,449	18.928
17	São Pedro do Sul	0,580	1.728	17	Torres Vedras	0,470	20.697	17	Torres Vedras	0,451	22.333
18	Amarante	0,588	6.542	18	Castelo Branco	0,480	13.631	18	Odivelas	0,454	23.579
19	Maia	0,592	37.780	19	Barreiro	0,483	14.916	19	Faro	0,456	24.066
20	Abrantes	0,592	6.551	20	Gondomar	0,496	23.476	20	Cascais	0,461	47.315
Rank	Municipality	1995	EmplPop	Rank	Municipality	2002	EmplPop	Rank	Municipality	2006	EmplPop
259	Alvito	1,188	277	259	Ferreira do Alentejo	1,050	1.366	259	Belmonte	1,047	2.233
260	Tabuaço	1,191	365	260	Sta Marta Penaguião	1,054	771	260	São João Pesqueira	1,047	1.484
261	Redondo	1,222	857	261	Vila Velha de Rodão	1,055	822	261	Felgueiras	1,057	23.431
262	Boticas	1,223	392	262	São João Pesqueira	1,058	1.113	262	Vale de Cambra	1,059	7.559
263	Castro verde	1,235	1.857	263	Paços de Ferreira	1,070	14.768	263	Alcoutim	1,064	417
264	Ferreira do Alentejo	1,242	962	264	Tarouca	1,075	2.017	264	Idanha-a-Nova	1,065	1.785
265	Alandroal	1,244	497	265	Alvito	1,078	397	265	Mourão	1,069	287
266	Gaviao	1,257	319	266	Belmonte	1,081	2.328	266	Alter do Chão	1,088	641
267	Felgueiras	1,259	19.606	267	Avis	1,086	947	267	Vila Velha de Rodão	1,092	694
268	Avis	1,266	819	268	Baião	1,089	3.528	268	Sta Marta Penaguião	1,103	1.162
269	Constãncia	1,274	813	269	Alandroal	1,090	869	269	Campo Maior	1,104	2.607
270	Monforte	1,308	432	270	Constância	1,093	906	270	Boticas	1,105	989
271	Vila Velha de Rodão	1,334	620	271	Manteigas	1,098	865	271	Alandroal	1,146	811
272	Vila Viçosa	1,335	2.563	272	Vila Viçosa	1,099	2.654	272	Cinfães	1,152	3.564
273	Castro Marim	1,378	446	273	Idanha-a-Nova	1,135	1.845	273	Sabrosa	1,161	1.290
274	Belmonte	1,390	2.434	274	Arronches	1,146	473	274	Monforte	1,188	562
275	Idanha-a-Nova	1,403	1.625	275	Tabuaço	1,163	734	275	Avis	1,197	902
276	Barrancos	1,404	93	276	Felgueiras	1,170	21.769	276	Arronches	1,199	468
277	Castanheira de Pêra	1,458	733	277	Boticas	1,217	755	277	Vizela	1,205	7.778
278	Mourão	1,488	388	278	Vizela	1,311	6.895	278	Constância	1,292	1.051

The results allow for several conclusions. The first is that the top 20 municipalities count for much more working population then the bottom 20. In 2006 the top 20 represented 719.545 jobs (or 24,06% of the working population), while in 1995 they represented 634.091 (29,45%) and in 2002 625.078 (23,08%). As to the bottom 20, in 2006 they represented just 59.715 jobs (2,00% of the total), while in 1995 the value was 36.098 (1,68%) and in 2002 65.822 (2,43%). Curiously, there is a countercyclical nature in the behaviour of these two groups, as the relative importance of the most similar municipalities fell in the first half of our period of analysis, then increasing again in the final one, while the most dissimilar group increased its weight until 2002, falling afterwards. It is important to stress that both these group are dynamic in their constitution along the years, though.

In individual terms, the municipality of Vila Nova Gaia, neighbour of Porto, consistently occupies the number one spot across the years, evolving from a Krugman index of 0,435 in 1995 to just 0,294 in 2006. The following places are occupied by Braga, Leiria and Sintra, a Lisboa suburb. Only in 2002 was this top four disturbed, when Figueira da Foz, a COASTAL medium sized municipality in the centre of the country, reached 2nd place. The localities that usually score best in this field are medium-to-large in size, located, with some exceptions (Castelo Branco, Viseu), near the coastline, and presenting some industrial structure as well as a significant number of service-related jobs.

An interesting fact is that the two most important municipalities, Lisboa and Porto fail to figure in the top positions. Despite reaching 13th in 1995 (with a score of 0,557), Porto dropped afterwards to 39th in 2002 (0,554) and climbed to 37th in 2006 (0,549). Lisboa, far and away the greatest employment hub (397.607 jobs in 2006, 13,29% of the total, with Porto being responsible for 124.206 – 4,15%), lies even further down, placing 64th in 1995 (0,713), 97th in 2002 (0,694) and 121st in 2006 (0,704).

As a comparison, a paper presented by Prothero (2012) studying industrial specialisation in British local areas showed that London was the most dissimilar region, not only in comparison with the national total but also in comparison with every other region in Great Britain. Even if in our case we are considering municipalities and not regions, it is easy to see that very large urban concentrations tend to differ from the national average, especially if they specialise in sectors such as finance or business services, less common elsewhere.

There is as greater dynamic across the years in the bottom 20 of table, but in general the overall values also tend to reduce, with the most dissimilar result in 1995 being 1,488, in 2002 1,311 and in 2006 only 1,292 (in a maximum of 2).

Enlarging our universe of all considered municipalities, it is possible to see that the vast majority saw a reduction in their Krugman index, with only 27 out of 278 becoming less like the national average, showing that the country became more alike in the period. However, if we breakdown the periods, it is visible that between 1995 and 2002 26 municipalities diverged from the average, but the number has risen to 107 between 2002 and 2006. This means that an increasing large number of territories in the country could no longer accompany the tendency to spatially homogenise the national labour structure. This reality allows a parallel with the analysis of Spanish reality made by Paluzie (2001), in the sense that after an initial period of global regional converge some areas eventually began to lag behind.

5. CREATION OF A CASE-SPECIFIC SPATIAL INDEX

As well as the abovementioned indexes, we will also use a case-specific index, developed with the needs of our work in mind. We will name it **Market Accessibility Index (MA)**.

In preparation for this task we consulted varied economic literature that dwells on the subject. Most of the consulted papers focus on the issue of market size and trade patterns as regards core-periphery economic relations (mostly within the NEG theoretical models), taking in consideration econometric values such as each regions' GDP over the geographic location itself, mostly using data for NUTS II units in the case of the EU (for example, Combes & Overman, 2004).

However, a recent work by Brülhart et al. (2012) called *How Wages and Employment Adjust to Trade Liberalisation: Quasi-Experimental Evidence from Austria*, takes into consideration the issue of proximity to border in this country's regions and municipalities. While in this case the main focus of analysis is the possible economic location swing from the western to the more eastern parts of Austria following the fall of the Iron Curtain and the opening of the markets in Central and Eastern Europe, the purely geographical concept of *border* is clearly employed. Here, *border* considers all of Austrian municipalities whose geographic centre is no more than 25 km from the nearest border crossing to a CEEC.

The article then applies this concept to estimate variations in wage values and employment rates which will also be useful to our work further on (and represented in the indexes mentioned in previous points), but it is also relevant to consider the differences between the geographies of Austria, a landlocked country in the centre of Europe, and Portugal, a peripheral country in the context of the EU with a vast seashore.

The question of simple proximity to foreign markets is more complex in the Portuguese case, where many exports are carried via sea or air routes, as well as roads. Rail freight isn't traditionally a relevant export means of transport (another consequence of periphery, despite current efforts to improve links between the Sines deep sea port and Spain via Elvas/Caia) and therefore we won't take into consideration.

5.1. Spatial dimensions

Taking in mind these factors, the construction of our index considered the following dimensions:

- Road density (km/ km²), according to the National Road Plan (RoadDens);

- Distance (km) to the nearest main border crossing (DistBord);

- Distance (km) to the nearest international airport in the Portuguese mainland (DistAirp);

- Distance (km) to a relevant sea port (DistPort);

- Distance (km) to the nearest metropolitan area (DistMet).

By considering all of these dimensions, we will be able to cover several important aspects that determine the geographic location of companies, such as appropriate road connections (road density), access to foreign markets and important transport links (major border crossings, airports, and ports) and proximity to qualified labour and innovation centres (here represented by the two metropolitan areas of Lisboa and Porto, also functioning as the internal market cores).

Several variations of this model were measured. In one case we didn't considered the distance to the nearest urban area, but the results didn't give sufficient difference in the estimated values and most of the territory scored quite similar results, a problem minimized with the inclusion of the DistMet dimension. Another possibility was the usage of the density of motorways instead of all roads belonging to the National Road Plan, but here the problem of similar results in vast geographical areas was even greater, and therefore this possibility was also discarded.

For each municipality we chose the smallest distance to each type of hub (for instance, if a certain municipality is located 200 km from Porto but 130 km from Lisboa, we will consider 130 km as the value regarding distance to a metropolitan area). These values are taken from the ROUTE 66 database. With respect to road density, we considered data from the National Statistics Institute (INE) about road density by district, which we then applied to the respective municipalities.

As regards distance, as smaller values give in this case a measure of centrality, we opted to invert the value by using the expression (1000-Dj)/1000, where a distance of 50 km would give a result of 0,95. We then considered the municipality with the highest GD value (Maia) as the reference to all other municipalities to be compared with in relative terms, for easier interpretation.

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We now present the location of the considered transport and centrality hubs:

Table 6: Transport and centrality hubs

Border Crossings	Airports	Ports	Metropolitan Areas
Valença	Maia (Pedras Rubras)	Viana do Castelo	Porto
Chaves (Vila Verde Raia)	Lisboa	Matosinhos (Leixões)	Lisboa
Almeida (Vilar Formoso)	Faro	Aveiro	
Elvas (Caia)		Figueira da Foz	
Vila Real St. António		Lisboa	
		Setúbal	
		Sines	
		Portimão	
		Faro	

After some sensibility analysis, we opted to consider these five dimensions, giving each the same relative weight ($\alpha = 0,2$). Hence, for each municipality j its MA value will be given by:

$$MAj = \alpha RoadDensj + \alpha DistBordj + \alpha DistAirpj + \alpha DistPortj + \alpha DistMetj \; ; \; MAj \; \varepsilon \;]0;1[\; ; \; \alpha = 0,2 \qquad (4)$$

5.2. RESULTS

- *GENERAL RESULTS*

We now present a map of Portugal with the results, displayed by municipality and NUTS III unit:
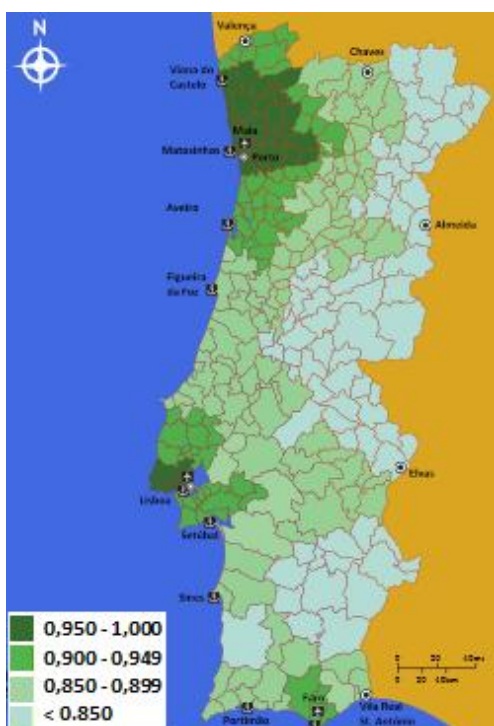
Fig. 1: MA results by municipality   **Fig. 2: MA results by NUTS III unit**

It is easily observed that two clear clusters emerge with the highest scores, with the index values then progressively reducing as we come closer to the border. A smaller cluster in the south is also visible. These three main hubs are sufficiently powerful to allow territorial continuity between them at a medium/low level.

In terms of the location the main transport hubs, airports are located in medium/high or a high scoring area, which doesn't necessarily occur in ports or border crossings. Due to the concentration of attraction points near the coast, nearly the whole of the eastern border municipalities lie in the lower bracket of MA index results.

We also show a table with the top and bottom 20 municipalities according to relative MA value:

Table 7: Market Accessibility Index - Top and bottom 20 municipalities

Rank	Municipality	MA Value	Rank	Municipality	MA Value
1	Maia	1,000	259	Vinhais	0,809
2	Porto	0,999	260	Oleiros	0,805
3	Matosinhos	0,998	261	Crato	0,805
4	Vila Nova de Gaia	0,996	262	Marvão	0,804
5	Trofa	0,994	263	Bragança	0,804
6	Gondomar	0,993	264	Freixo de Espada à Cinta	0,804
7	Vila do Conde	0,992	265	Castelo de Vide	0,800
8	Valongo	0,991	266	Mação	0,799
9	Póvoa de Varzim	0,991	267	Moura	0,795
10	Santo Tirso	0,990	268	Belmonte	0,793
11	Paços de Ferreira	0,980	269	Mogadouro	0,789
12	Esposende	0,979	270	Covilhã	0,786
13	Vila Nova de Famalicão	0,979	271	Vimioso	0,784
14	Paredes	0,977	272	Barrancos	0,782
15	Penafiel	0,975	273	Fundão	0,781
16	Lousada	0,973	274	Penamacor	0,779
17	Lisboa	0,971	275	Vila Velha de Ródão	0,775
18	Braga	0,971	276	Castelo Branco	0,769
19	Barcelos	0,967	277	Idanha-a-Nova	0,758
20	Amarante	0,967	278	Miranda do Douro	0,748

As we can see, the lowest ranked municipality (Miranda do Douro) scores less than 75% of the value calculated for Maia, a considerable difference.

In terms of the 28 NUTS III units, the distance between the highest (Grande Porto) and lowest ranking region (Beira Interior Sul) is also only slightly smaller than the one between the extreme values of municipalities (22,8% against 25,2%), which also shows consistency across the municipalities that constitute each NUTS III statistical unit. These values are

showed in the next table with their respective scores (calculated with the average values of each respective municipality):

Table 8: Market Accessibility Index - NUTS III ranking

Rank	NUTS III	MA Value	Rank	NUTS III	MA Value
1	Grande Porto	0,989	15	Douro	0,867
2	Ave	0,967	16	Alentejo Litoral	0,865
3	Cávado	0,964	17	Pinhal Litoral	0,862
4	Grande Lisboa	0,956	18	Serra da Estrela	0,859
5	Tâmega	0,942	19	Alentejo Central	0,859
6	Minho-Lima	0,932	20	Médio Tejo	0,846
7	Península de Setúbal	0,928	21	Pinhal Interior Norte	0,843
8	Entre Douro e Vouga	0,922	22	Beira Interior Norte	0,838
9	Baixo Vouga	0,912	23	Alto Trás-os-Montes	0,837
10	Oeste	0,898	24	Baixo Alentejo	0,830
11	Algarve	0,881	25	Alto Alentejo	0,826
12	Dão-Lafões	0,880	26	Pinhal Interior Sul	0,810
13	Lezíria do Tejo	0,877	27	Cova da Beira	0,787
14	Baixo Mondego	0,876	28	Beira Interior Sul	0,771

The results show a strong concentration around the main urban centres of Porto and Lisboa, as well the Ave and Cávado valleys, which curiously enough are also among the more densely populated regions, mainly the area inside and around the so-called Quadrilátero (square) of Braga-Guimarães-Famalicão-Barcelos.

Also following the Portuguese population concentration patterns, the geographical area with the highest values (above 95% of the highest score) is much more concentrated in the Lisboa metropolitan area than in the North, where population patterns are traditionally more dispersed and continuous (Portas, 2012). On a second level there are also relatively high values (above 90%) for the regions around the aforementioned centres, as well as for the Algarve, which benefits from the transport cluster around Faro due to its privileged location as a touristic destination.

But what of the results by dimension? Which factors where the most influential in forming these values? This is the topic that we will approach next.

- *DECOMPOSED RESULTS*

As regards **road density**, and as we mentioned before, our data was based on information gathered by the INE, which was organized by district (a traditional administrative and judicial division of the Portuguese territory). The data is as follows:

Table 9: Road density by district

Rank	District	Km/ Km²	Km
1	Porto	0,343	801
2	Braga	0,307	830
3	Lisboa	0,292	819
4	Viana do Castelo	0,209	463
5	Aveiro	0,185	517
6	Leiria	0,181	634
7	Coimbra	0,180	715
8	Setúbal	0,173	880
9	Viseu	0,172	863
10	Faro	0,150	752
11	Vila Real	0,144	621
12	Guarda	0,134	743
13	Évora	0,125	926
14	Santarém	0,120	808
15	Bragança	0,119	782
16	Portalegre	0,115	702
17	Castelo Branco	0,097	641
18	Beja	0,089	914
	National Average	0,151	13.411

Fig. 3: Continental Portugal by districts

We can see that there is an obvious advantage to small, highly populated districts, particularly Porto, Braga and Lisboa. As we don't have access to more detailed information at a municipal level, the district values were directly allocated to the correspondent municipalities.

Hence, the municipalities of Porto and Braga occupy the highest places in the national rankings, where the ones belonging to Castelo Branco and Beja lie in the lowest. The latter are traditional sufferers of insufficient connections to major population and economic centres, decreasing their appeal as possible productive activity recipients and creators. The table with these results is now presented:

Table 10: Road density - Top and bottom 20 municipalities

Rank	Municipality	RoadDens	Rank	Municipality	RoadDens
1	Santo Tirso	0,343	259	Idanha-a-Nova	0,097
2	Trofa	0,343	260	Penamacor	0,097
3	Gondomar	0,343	261	Vila Velha de Ródão	0,097
4	Maia	0,343	262	Belmonte	0,097
5	Matosinhos	0,343	263	Covilhã	0,097
6	Porto	0,343	264	Fundão	0,097
7	Póvoa de Varzim	0,343	265	Odemira	0,089
8	Valongo	0,343	266	Aljustrel	0,089
9	Vila do Conde	0,343	267	Almodôvar	0,089
10	Vila Nova de Gaia	0,343	268	Alvito	0,089
11	Amarante	0,343	269	Barrancos	0,089
12	Baião	0,343	270	Beja	0,089
13	Felgueiras	0,343	271	Castro Verde	0,089
14	Lousada	0,343	272	Cuba	0,089
15	Marco de Canaveses	0,343	273	Ferreira do Alentejo	0,089
16	Paços de Ferreira	0,343	274	Mértola	0,089
17	Paredes	0,343	275	Moura	0,089
18	Penafiel	0,343	276	Ourique	0,089
19	Amares	0,307	277	Serpa	0,089
20	Barcelos	0,307	278	Vidigueira	0,089

Understandably, a completely different dynamic is brought by the **distance to border** dataset:

Table 11: Distance to border - Top and bottom 20 municipalities

Rank	Municipality	DistBord	Rank	Municipality	DistBord
1	Vila Real de Santo António	1,000	259	Figueira da Foz	0,773
2	Valença	0,999	260	Almeirim	0,773
3	Castro Marim	0,998	261	Leiria	0,771
4	Almeida	0,997	262	Pombal	0,766
5	Chaves	0,997	263	Cartaxo	0,764
6	Elvas	0,997	264	Sines	0,764
7	Vila Nova de Cerveira	0,986	265	Mafra	0,761
8	Monção	0,985	266	Marinha Grande	0,760
9	Campo Maior	0,983	267	Batalha	0,752
10	Pinhel	0,979	268	Torres Vedras	0,752
11	Sabugal	0,979	269	Rio Maior	0,752
12	Paredes de Coura	0,979	270	Santarém	0,752
13	Figueira de Castelo Rodrigo	0,979	271	Cadaval	0,750
14	Tavira	0,979	272	Caldas da Rainha	0,734
15	Boticas	0,977	273	Lourinhã	0,731
16	Borba	0,973	274	Bombarral	0,730
17	Valpaços	0,972	275	Alcobaça	0,727
18	Arronches	0,970	276	Óbidos	0,719
19	Vila Viçosa	0,968	277	Nazaré	0,716
20	Alandroal	0,968	278	Peniche	0,713

In here, municipalities in which there are, or are located near, the most important border crossings (as defined by the Spain-Portugal Border Observatory) score the highest, as they benefit from greater geographical proximity to European markets. Many of them (Elvas, Valença) are traditional market towns that receive an important influx of Spanish visitors, although the introduction of the Euro somewhat diminished this relation.

On the other hand, coastal municipalities are penalized; several of them score less than 75% of the highest value (Vila Real de Santo António, in the Algarve), namely Caldas da Rainha, Lourinhã, Bombarral, Alcobaça, Óbidos, Nazaré and Peniche. All of the latter are located in the Oeste NUTS III region.

Moving on to the analysis of **distance to airports**, there are three major beneficiaries of these transport structures, obviously corresponding to the number of international airports:

Table 12: Distance to airports - Top and bottom 20 municipalities

Rank	Municipality	DistAirp	Rank	Municipality	DistAirp
1	Maia	1,000	259	Mogadouro	0,776
2	Lisboa	1,000	260	Marvão	0,775
3	Faro	0,999	261	Vila Nova de Poiares	0,774
4	Olhão	0,993	262	Almeida	0,774
5	Porto	0,991	263	Vimioso	0,771
6	Amadora	0,990	264	Góis	0,766
7	Almada	0,990	265	Barrancos	0,766
8	Matosinhos	0,986	266	Figueira de Castelo Rodrigo	0,761
9	Trofa	0,986	267	Castelo Branco	0,760
10	Odivelas	0,985	268	Pampilhosa da Serra	0,758
11	Oeiras	0,985	269	Vila Velha de Ródão	0,754
12	São Brás de Alportel	0,985	270	Arganil	0,748
13	Loures	0,984	271	Tábua	0,745
14	Gondomar	0,983	272	Penamacor	0,745
15	Valongo	0,983	273	Miranda do Douro	0,740
16	Vila Nova de Gaia	0,983	274	Oliveira do Hospital	0,728
17	Vila do Conde	0,982	275	Idanha-a-Nova	0,724
18	Loulé	0,982	276	Fundão	0,717
19	Santo Tirso	0,980	277	Covilhã	0,698
20	Seixal	0,979	278	Belmonte	0,683

If the location of two of the three major airports in the largest metropolitan areas (Maia, in the outskirts of Porto, and Lisboa) brings no surprise, only reinforcing the centripetal force of these conurbations, the location of an airport in Faro, the capital of the Algarve, greatly helped to create a transport cluster in the south of Portugal. Opened in 1965, this airport was a major factor in the Algarve's tourism boom which gradually spread through most of the region, and municipalities like Faro, Olhão or Loulé (with the paradigmatic example of the Vilamoura luxury complex, the largest in Europe) were among the highest beneficiaries.

In contrast, interior municipalities like Covilhã or Belmonte score particularly poor in this area (less than 70% of the highest score), further enhancing their deficiencies in the access to air travel. Recently the military air base of Beja was reconverted to a civilian airport, which could benefit these more inland localities, but so far, no relevant passenger traffic was generated.

In a similar way, the places with the highest **distance to ports** score are the ones were these structures are placed or located nearby. The catchment area of these hubs is somewhat different then that of airports, with locations such as Aveiro and Viana do Castelo, in the second tier of global results (90-95%), scoring highly, or Sines and Figueira da Foz, which are globally less competitive, also doing well:

Table 13: Distance to ports - Top and bottom 20 municipalities

Rank	Municipality	DistPort	Rank	Municipality	DistPort
1	Matosinhos	1,000	259	Alfândega da Fé	0,809
2	Lisboa	0,999	260	Figueira de Castelo Rodrigo	0,805
3	Portimão	0,998	261	Campo Maior	0,805
4	Setúbal	0,996	262	Fundão	0,804
5	Aveiro	0,994	263	Crato	0,804
6	Faro	0,993	264	Vila Velha de Ródão	0,804
7	Sines	0,992	265	Marvão	0,800
8	Viana do Castelo	0,991	266	Castelo de Vide	0,799
9	Figueira da Foz	0,991	267	Barrancos	0,795
10	Ílhavo	0,990	268	Penamacor	0,793
11	Porto	0,980	269	Idanha-a-Nova	0,789
12	Olhão	0,979	270	Bragança	0,786
13	Lagoa	0,979	271	Vinhais	0,784
14	Palmela	0,977	272	Ponte de Sor	0,782
15	Vagos	0,975	273	Nisa	0,781
16	Amadora	0,973	274	Freixo de Espada à Cinta	0,779
17	Almada	0,971	275	Mogadouro	0,775
18	Montemor-o-Velho	0,971	276	Vimioso	0,769
19	Silves	0,967	277	Castelo Branco	0,758
20	Maia	0,986	278	Miranda do Douro	0,748

The Sines case is important as it is the only deep sea port that can harbour the latest generation of super-containers. This means that although it is only third in the number of ships received, it is the largest Portuguese port in terms of tonnage (INE Transport Statistics, 2011 Edition). This fact, together with the existing oil refinery (the other one being located in Leça da Palmeira, a locality close by the Leixões port in Matosinhos, Greater Porto), makes Sines an important transport and industrial complex in the middle of a scarcely populated region. This location will further benefit from the projected high speed rail connection (although in a conventional line) to the border of Elvas/Caia and to the Spanish hinterland

until Madrid and the French border, increasing its attractiveness to related economic activities.

The more interior municipalities score the lowest, naturally, with Miranda do Douro (in Alto Trás-os-Montes) registering less than 75% of the highest value, thus giving a telling image of its difficulty to access major sea and air platforms (it's also in bottom of the DistAirp rank).

The **distance to metropolitan areas** dimension, as mentioned earlier, tries to weigh in factors such as access to markets, services and qualified labour. Therefore, it is no surprise that the urban municipalities in and around Lisboa and Porto score the highest in here, and the geographically more distant regions, such as the Algarve lie in the bottom:

Table 14: Distance to metropolitan areas - Top and bottom 20 municipalities

Rank	Municipality	DistMet	Rank	Municipality	DistMet
1	Porto	1,000	259	Castelo Branco	0,809
2	Lisboa	0,999	260	Monchique	0,805
3	Vila Nova de Gaia	0,998	261	Penamacor	0,805
4	Gondomar	0,996	262	Miranda do Douro	0,804
5	Matosinhos	0,994	263	Silves	0,804
6	Odivelas	0,993	264	Albufeira	0,804
7	Maia	0,992	265	Lagos	0,800
8	Amadora	0,991	266	Mação	0,799
9	Almada	0,991	267	Alcoutim	0,795
10	Oeiras	0,990	268	Vila do Bispo	0,793
11	Loures	0,980	269	Lagoa	0,789
12	Valongo	0,979	270	Idanha-a-Nova	0,786
13	Espinho	0,979	271	Loulé	0,784
14	Seixal	0,977	272	Portimão	0,782
15	Sintra	0,975	273	Faro	0,781
16	Trofa	0,973	274	São Brás de Alportel	0,779
17	Cascais	0,971	275	Olhão	0,775
18	Montijo	0,971	276	Tavira	0,769
19	Alcochete	0,967	277	Vila Real de Santo António	0,758
20	Vila do Conde	0,967	278	Castro Marim	0,748

The historical low industrialization of the Algarve, specializing in activities that don't depend on access to these factors, such as fishing, agriculture, or agro industries such as canning, is justified by this, in part. The tourism boom of the last decades and the settlement of a large foreign community consisting of older, affluent consumers changed this paradigm considerably, with the introduction of hospitality-related activities such as golf or fine-dinning. Nonetheless, it remains a region with quite specific needs and opportunities.

Also scoring low are several municipalities of Alto Trás-os-Montes, another traditionally isolated region, in this case with even fewer alternatives to traditional agriculture, despite

efforts to increase the added value in activities such as wine, cork and olive oil, which are internationally competitive.

- *NATIONAL AND INTERNATIONAL CONTEXTUALIZATION OF RESULTS*

One of the first impressions that we have when analysing the MA results is the striking similarity between them and the population distribution in the Portuguese territory. If we contemplate the population density by municipality as considered in the last available census (compiled in 2011 by the National Statistics Institute) the resemblances are salient:

Fig. 4: Population density by municipality
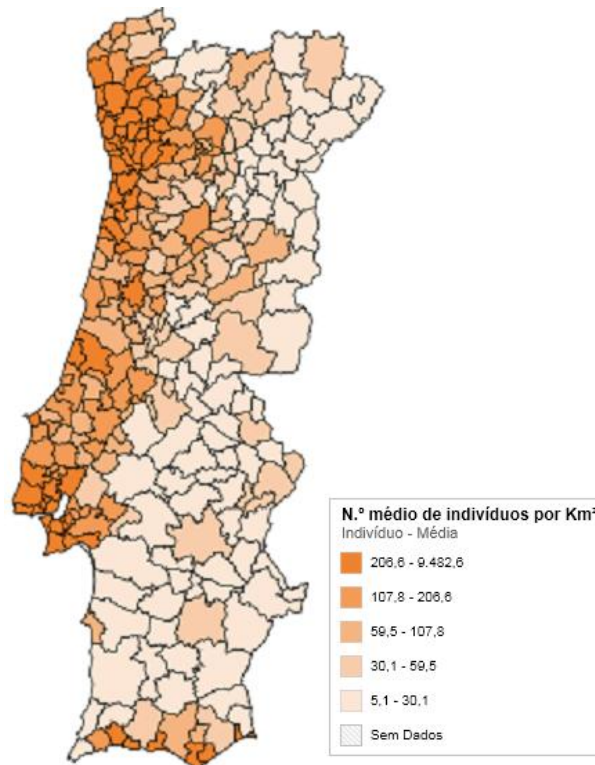
**Source:** Census 2011, National Institute of Statistics (INE)

Whether people gather where infrastructures lie or vice versa can be discussed to some degree, but the nature of the territory itself and the manner in which it was occupied always gave way to this type of dichotomy (Ribeiro, 1945; Mattoso et al., 2010). Therefore, the connection between geography and the location of people is visible, with the reduction of trade barriers only enhancing this phenomenon in the last decades.

To be sure, the tendency towards investing in transports and technology in the most populated areas only reinforced the dual nature of the Portuguese territory, dividing the urban

coastline and the increasingly deserted interior. It matters to be seen if the location of economic activity fully follows this reality, or the effects of regional policies managed to balance this picture somewhat.

A possible better integration of the smaller urban systems in the Portugal/Spain border (the so-called Raia Ibérica) could in theory provide some solution to this issue difficult problem, functioning in a polycentric organisation that complements (or in same cases overlaps) the heavily populated Atlantic coast and thus achieving some scale that could allow the installation of more specialized activities, not least in population welfare sectors such as health education, for instance. One possible scenario for this type of interaction is proposed in a work by Medeiros (2008), where he relates a number of small and medium-sized urban centres located relatively near the border:

Fig. 5: Border interaction scenario
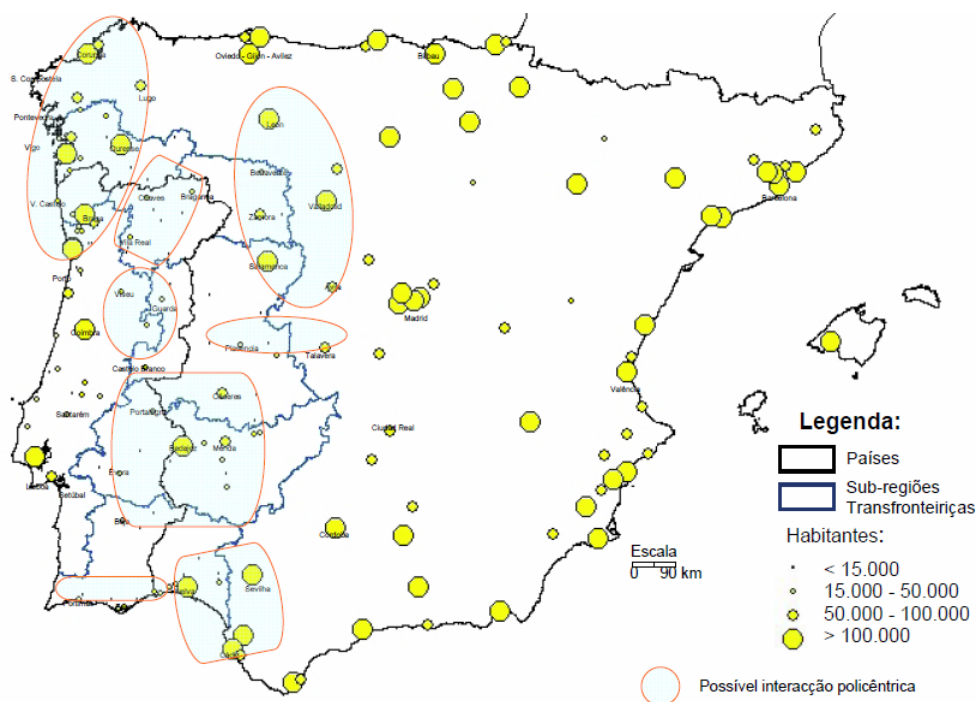
Source: Medeiros (2008)

However, and despite the creation of EU sponsored cross-border management structures such as the euro-regions, or in a smaller scale the euro-cities, little actual profit has been achieved so far in terms of economic activity attraction created via this type of articulation.

In contrast, and has mentioned previously, the vast majority of the Portuguese population lives in the coastal strip between Setúbal and the border with Galicia. Some authors that analysed this issue at a pan European scale even go to the point of considering this territory to

be a part of a European mega-region together with the Galician coastal area until A Coruña and Ferrol (Florida et al., 2008).

According to this study, *"Lisbon constitutes one of the 12 mega-regions identified in Europe as economic hubs of population density allied to economic production and technological and scientific innovation"*. The Lisboa (Lisbon) conurbation had an estimated Light-based Regional Product (or LRP, an indicator designed to aggregate estimates of GDP) of $110 billion, the same value of Scotland's Glas-burgh and above Madrid and Berlin ($100 billion LRP each).

This urban continuum can be seen in a map made by these authors representing all major European mega-regions:

Fig. 6: Europe's mega-regions
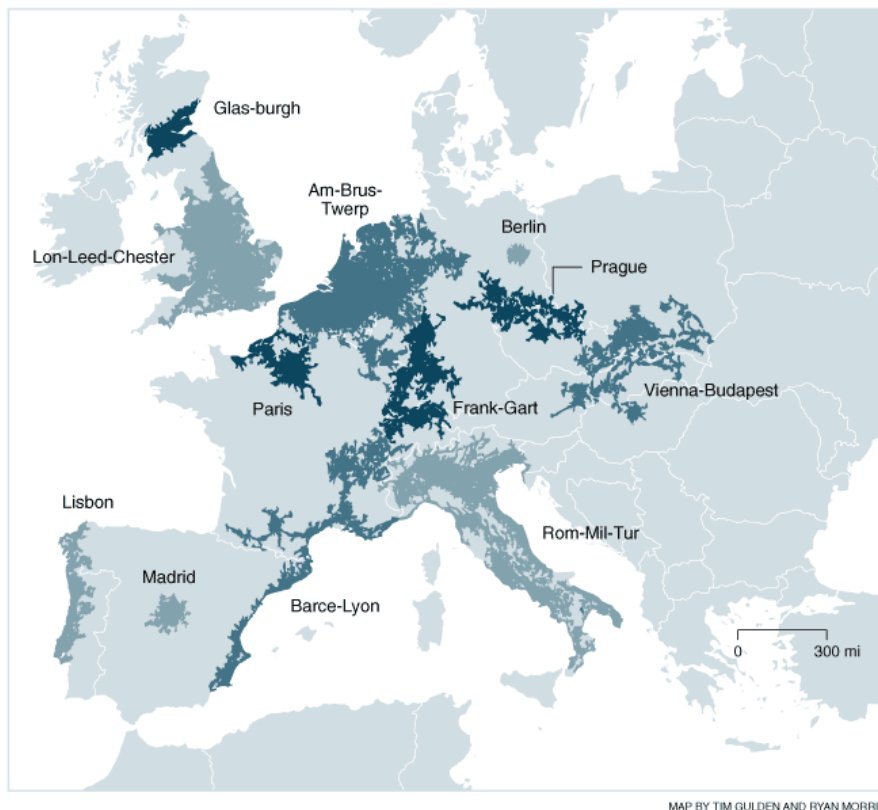
Source: Florida et al. (2008)

Interestingly, and although comparable in size to those in North America, European mega-regions tend to be are anchored by urban cores that actually tend to be smaller (with the exceptions of Paris and London). This makes the concept of mega-region especially pertinent in Portugal, where the urban core of Lisboa is small in comparison with its surrounding territory. Transport connections with the rest of the mega-region are therefore essential to the

economic spatial dynamics of this large urban space, an issue which represents a particularly hot topic in the EU (and its choice of cohesion policies) and that we discussed earlier on.

This issue is even more salient as the Lisboa mega-region only covers a minority of the national space, in contrast with central Europe, where there is almost a sequence of mega-regions that border each other and that can be redefined in a number of ways due to their proximity (Am-Brus-Twerp, Frank-Gart, Paris or Barce-Lyon), or Britain and Italy, where the respective mega-region covers almost all of the national territory. How spatial policies can best enhance the relation between this large conurbation and its peripheral territory is therefore a key question.

In fact, the lowest MA values (less than 85%) clearly reside in the more interior and isolated municipalities of mainland Portugal, even those that take part in the catchment area of some of the stronger road links to Spain and the rest of Europe (Almeida/Vilar Formoso, Elvas/Caia). These sparsely inhabited regions suffer from distance to significant socio-economic centres, as across the border there also aren't any major urban centres (Madrid lies 300 km across of the border, in the centre of the Iberian Meseta), in contrast with the border regions of Austria analysed by Brülhart et al. (2012), which lie in the middle of the Vienna-Budapest mega-region.

This might suggest that such different realities could benefit from different approaches in the application of European regional funds, for instance. Alternatives such as the creation of the abovementioned polycentric systems could deserve deeper analysis as means for the developing of the existing territorial capital. In order to do so, one desirable scenario would be, as referred by Ferrão and Mourato (2011), the introduction of a specific territorial dimension in the existing EU integrated impact assessment instruments in the new policy-making cycle of 2014-2020.

Most importantly, as mentioned by the authors, is that *"Regardless of the shape it may take, any future form of territorial impact assessment must be perceived as an exercise in policy learning, institutional innovation and citizenship. This is crucial to guarantee a more intelligent relationship between the territorial cohesion objective, the need to reinforce the coordination of sectorial policies with relevant territorial impacts, the development of efficient forms territorial governance, and finally the use of innovative approaches to spatial planning policy evaluation."*

6. MARKET ACCESSIBILITY AND VARIATION IN EMPLOYMENT LEVELS

Hand in hand with the more traditional analysis of the geographical location of economic activities made previously with the help of absolute and relative location indices, we believe that there is additional value in relating the available data with our custom-made spatial index, in particular as regards spotting some specific trends of the Portuguese reality.

As mentioned earlier, in the analysed period there was a substantial increase in the total number of jobs, Therefore, an interesting exercise consists in relating the changes in the distribution of employment with the accessibility of municipalities, i.e. if the localities with the best accessibilities became more or less relatively important over time.

In order to do so, we created scatterplots that compare the variations in the relative weight of employment in each municipality with our location index (MA) and each of its dimensions. However, first of all it is important to know where employment is mostly located:

Table 15: Number of employed people - Top and bottom 20 municipalities (1995, 2002 and 2006)

Rank	Municipality	1995	% TotalJobs	Rank	Municipality	2002	% TotalJobs	Rank	Municipality	2006	% TotalJobs
1	Lisboa	342.681	15,91%	1	Lisboa	359.782	13,28%	1	Lisboa	397.607	13,29%
2	Porto	128.413	5,96%	2	Porto	121.227	4,48%	2	Porto	124.206	4,15%
3	Vila Nova de Gaia	62.624	2,91%	3	Sintra	80.827	2,98%	3	Sintra	85.785	2,87%
4	Loures	59.312	2,75%	4	Vila Nova de Gaia	68.070	2,51%	4	Oeiras	78.924	2,64%
5	Guimarães	58.105	2,70%	5	Oeiras	65.478	2,42%	5	Vila Nova de Gaia	76.705	2,56%
6	Sintra	52.250	2,43%	6	Guimarães	56.944	2,10%	6	Guimarães	59.450	1,99%
7	Matosinhos	45.034	2,09%	7	Braga	54.093	2,00%	7	Matosinhos	58.816	1,97%
8	Braga	44.624	2,07%	8	Matosinhos	51.297	1,89%	8	Braga	58.431	1,95%
9	Vila Nova de Famalicão	43.239	2,01%	9	Loures	47.318	1,75%	9	Loures	52.393	1,75%
10	Maia	37.780	1,75%	10	Vila Nova de Famalicão	45.013	1,66%	10	Maia	51.864	1,73%
11	Santa Maria da Feira	36.001	1,67%	11	Maia	44.775	1,65%	11	Vila Nova de Famalicão	49.484	1,65%
12	Oeiras	34.620	1,61%	12	Santa Maria da Feira	44.339	1,64%	12	Leiria	48.046	1,61%
13	Coimbra	34.440	1,60%	13	Cascais	43.884	1,62%	13	Cascais	47.315	1,58%
14	Santo Tirso	34.067	1,58%	14	Coimbra	42.072	1,55%	14	Coimbra	46.638	1,56%
15	Cascais	32.032	1,49%	15	Leiria	41.925	1,55%	15	Santa Maria da Feira	44.299	1,48%
16	Amadora	31.625	1,47%	16	Amadora	39.328	1,45%	16	Barcelos	41.364	1,38%
17	Barcelos	30.463	1,41%	17	Barcelos	36.176	1,34%	17	Amadora	38.884	1,30%
18	Leiria	27.790	1,29%	18	Vila Franca de Xira	32.074	1,18%	18	Vila Franca de Xira	37.157	1,24%
19	Setúbal	25.321	1,18%	19	Almada	32.000	1,18%	19	Almada	35.136	1,17%
20	Almada	24.174	1,12%	20	Setúbal	29.244	1,08%	20	Aveiro	31.822	1,06%
Rank	Municipality	1995	% TotalJobs	Rank	Municipality	2002	% TotalJobs	Rank	Municipality	2006	% TotalJobs
259	Cuba	350	0,02%	259	Mesão Frio	573	0,02%	259	Murça	676	0,02%
260	Marvão	345	0,02%	260	Murça	564	0,02%	260	Vila de Rei	666	0,02%
261	Santa Marta de Penaguião	326	0,02%	261	Monforte	556	0,02%	261	Alter do Chão	641	0,02%
262	Gavião	319	0,01%	262	Alfândega da Fé	555	0,02%	262	Crato	628	0,02%
263	Carrazeda de Ansiães	316	0,01%	263	Alter do Chão	548	0,02%	263	Cuba	619	0,02%
264	Mesão Frio	307	0,01%	264	Vila de Rei	547	0,02%	264	Vila Nova de Paiva	619	0,02%
265	Portel	304	0,01%	265	Crato	531	0,02%	265	Alfândega da Fé	592	0,02%
266	Vila Flor	302	0,01%	266	Ribeira de Pena	499	0,02%	266	Castelo de Vide	589	0,02%
267	Armamar	292	0,01%	267	Arronches	473	0,02%	267	Manteigas	579	0,02%
268	Alvito	277	0,01%	268	Gavião	470	0,02%	268	Monforte	562	0,02%
269	Vila de Rei	265	0,01%	269	Marvão	464	0,02%	269	Gavião	559	0,02%
270	Vinhais	248	0,01%	270	Cuba	461	0,02%	270	Freixo de Espada à Cinta	494	0,02%
271	Arronches	243	0,01%	271	Mourão	412	0,02%	271	Marvão	479	0,02%
272	Ribeira de Pena	217	0,01%	272	Alvito	397	0,01%	272	Alvito	475	0,02%
273	Freixo de Espada à Cinta	196	0,01%	273	Vimioso	335	0,01%	273	Vimioso	472	0,02%
274	Vila Nova de Paiva	176	0,01%	274	Freixo de Espada à Cinta	327	0,01%	274	Arronches	468	0,02%
275	Vimioso	165	0,01%	275	Vila Nova de Paiva	298	0,01%	275	Alcoutim	417	0,01%
276	Penedono	136	0,01%	276	Alcoutim	262	0,01%	276	Barrancos	291	0,01%
277	Alcoutim	107	0,00%	277	Penedono	232	0,01%	277	Penedono	288	0,01%
278	Barrancos	93	0,00%	278	Barrancos	211	0,01%	278	Mourão	287	0,01%

As expected, there is a high concentration of employment in just a few municipalities. Nevertheless, the top 20 lost some relative importance in this ranking as they represented 55,01% of all employment in 1995 but only 49,33% in 2002 and 48,96% in 2006. Conversely, the bottom 20 represent a miniscule part of all jobs but increased its weight, passing from 0,23% in 1995 to 0,32% in 2002 and 0,35% in 2006. These results are not very different from the top and bottom 20 municipalities of the Krugman index, but the participants are somewhat diverse.

In complement with this information, we also show which municipalities gained and lost the most in relative terms along the years:

Table 16: Var. % Employment - Top and bottom 20 municipalities (1995, 2002 and 2006)

| Rank	Municipality	Var 95-02	% TotalJobs	Rank	Municipality	Var 02-06	% TotalJobs	Rank	Municipality	Var 95-06	% TotalJobs
1	Portel	166,79%	0,01%	1	Vila Nova de Paiva	88,08%	0,01%	1	Portel	221,62%	0,05%
2	Cinfães	156,25%	0,04%	2	Sabrosa	73,56%	0,02%	2	Armamar	180,84%	0,04%
3	Celorico de Basto	144,37%	0,04%	3	Armamar	71,89%	0,02%	3	Alcoutim	180,59%	0,01%
4	Cabeceiras de Basto	120,67%	0,04%	4	Castro Marim	66,24%	0,03%	4	Celorico de Basto	173,09%	0,10%
5	Vieira do Minho	118,41%	0,03%	5	Alijó	50,73%	0,04%	5	Cinfães	169,54%	0,12%
6	Resende	107,65%	0,02%	6	Óbidos	46,31%	0,07%	6	Santa Marta Penaguião	156,63%	0,04%
7	Vila Flor	106,42%	0,01%	7	Arcos de Valdevez	46,29%	0,10%	7	Vila Nova de Paiva	153,22%	0,02%
8	Alcoutim	94,70%	0,00%	8	Mondim de Basto	45,01%	0,02%	8	Vieira do Minho	151,03%	0,07%
9	Almodôvar	94,51%	0,02%	9	Alcochete	44,55%	0,11%	9	Ribeira de Pena	150,83%	0,03%
10	Vinhais	93,65%	0,01%	10	Alcoutim	44,12%	0,01%	10	Cabeceiras de Basto	140,13%	0,09%
11	Santa Marta Penaguião	88,05%	0,02%	11	Melgaço	41,39%	0,03%	11	Óbidos	127,17%	0,10%
12	Tarouca	87,14%	0,04%	12	Mesão Frio	37,95%	0,02%	12	Barrancos	125,28%	0,01%
13	São João da Pesqueira	85,14%	0,02%	13	Ribeira de Pena	37,18%	0,02%	13	Vila Nova de Cerveira	123,54%	0,14%
14	Ribeira de Pena	82,84%	0,01%	14	Freixo Espada à Cinta	36,79%	0,01%	14	São João da Pesqueira	123,52%	0,05%
15	Vila Nova de Cerveira	81,48%	0,06%	15	Santa Marta Penaguião	36,47%	0,03%	15	Valpaços	119,77%	0,07%
16	Barrancos	80,40%	0,00%	16	Terras de Bouro	33,97%	0,04%	16	Resende	118,58%	0,04%
17	Póvoa de Lanhoso	80,14%	0,13%	17	Carregal do Sal	33,66%	0,06%	17	Vinhais	110,19%	0,02%
18	Carrazeda de Ansiães	79,41%	0,01%	18	Arruda dos Vinhos	30,96%	0,09%	18	Castro Marim	109,54%	0,04%
19	Valpaços	78,36%	0,03%	19	Vimioso	27,58%	0,01%	19	Sabrosa	108,71%	0,04%
20	Lagos	72,28%	0,18%	20	Celorico da Beira	27,20%	0,04%	20	Vila Flor	106,69%	0,03%
Rank	Municipality	Var 95-02	% TotalJobs	Rank	Municipality	Var 02-06	% TotalJobs	Rank	Municipality	Var 95-06	% TotalJobs
259	Vila Nova de Gaia	8,70%	2,91%	259	Ourique	-15,04%	0,04%	259	Avis	-20,71%	0,03%
260	Sines	7,62%	0,21%	260	Santo Tirso	-15,19%	0,88%	260	Portalegre	-20,73%	0,20%
261	Mourão	6,19%	0,02%	261	Vila Viçosa	-15,29%	0,10%	261	Idanha-a-Nova	-20,91%	0,06%
262	Entroncamento	6,02%	0,21%	262	Alandroal	-15,50%	0,03%	262	Covilhã	-22,14%	0,41%
263	Gondomar	5,20%	1,04%	263	Porto de Mós	-15,62%	0,30%	263	Seia	-22,35%	0,19%
264	Lisboa	4,99%	15,91%	264	Redondo	-16,41%	0,05%	264	Entroncamento	-24,50%	0,15%
265	Covilhã	4,94%	0,53%	265	Mogadouro	-16,65%	0,04%	265	Castanheira de Pêra	-24,96%	0,03%
266	Vila Nova de Famalicão	4,10%	2,01%	266	Águeda	-17,71%	0,77%	266	São João da Madeira	-26,15%	0,45%
267	Castro Verde	3,82%	0,09%	267	Espinho	-18,54%	0,27%	267	Guimarães	-26,34%	1,99%
268	Vila Viçosa	3,55%	0,12%	268	Sardoal	-18,90%	0,03%	268	Espinho	-27,06%	0,22%
269	São João da Madeira	1,93%	0,61%	269	Tarouca	-19,19%	0,07%	269	Pinhel	-28,51%	0,05%
270	Alter do Chão	0,37%	0,03%	270	Borba	-20,39%	0,07%	270	Castelo de Vide	-30,14%	0,02%
271	Guimarães	-2,00%	2,70%	271	Castelo de Vide	-22,71%	0,03%	271	Vila Viçosa	-30,25%	0,08%
272	Belmonte	-4,35%	0,11%	272	Pampilhosa da Serra	-23,32%	0,03%	272	Porto	-30,36%	4,15%
273	Porto	-5,60%	5,96%	273	Vila Velha de Ródão	-23,55%	0,03%	273	Belmonte	-33,95%	0,07%
274	Seia	-7,42%	0,24%	274	Mora	-27,46%	0,04%	274	Loures	-36,40%	1,75%
275	Castanheira de Pêra	-15,96%	0,03%	275	Póvoa de Lanhoso	-30,56%	0,23%	275	Alcanena	-38,35%	0,17%
276	Alcanena	-20,09%	0,28%	276	Pinhel	-31,54%	0,08%	276	Mourão	-46,74%	0,01%
277	Loures	-20,22%	2,75%	277	Mourão	-36,92%	0,02%	277	Manteigas	-47,17%	0,02%
278	Santo Tirso	-30,14%	1,58%	278	Manteigas	-39,39%	0,03%	278	Santo Tirso	-52,89%	0,75%

Clearly, the municipalities which achieved the highest increases in their relative importance are very small in terms of employment volume, as only a few hundred jobs created caused a huge relative increase of their weight. The most evident example is Portel, where employment saw an increase of 221,62% by passing from 0,01% of all employment in 1995 to 0,05% in 2006 (304 jobs in 1995, 1.020 in 2002 and 1.358 in 2006). The total percentage

of jobs of the 20 municipalities that grew the most still represented no more than 1,11% of the total in 2006.

On the other hand, the 20 municipalities that lost the most weight summed 10,80% of all employment. Of this group, Porto stands out with 4,15% (still clearly the 2nd most important, but scoring less 30,36% than in 1995, when it represented 5,96%), as well as Guimarães (1,99%), Loures (1,75%) and Santo Tirso (0,75%), who understandably figure here as they lost some of their territory to form new municipalities in 1998 (Vizela, Odivelas and Trofa, respectively). All others score below than 0,50%.

6.1. Main tendencies

Bearing this information in mind, we will now look more closely at relation between accessibility and above-average creation of employment:

**Graphic 1: Var. % employment / measure of accessibility**
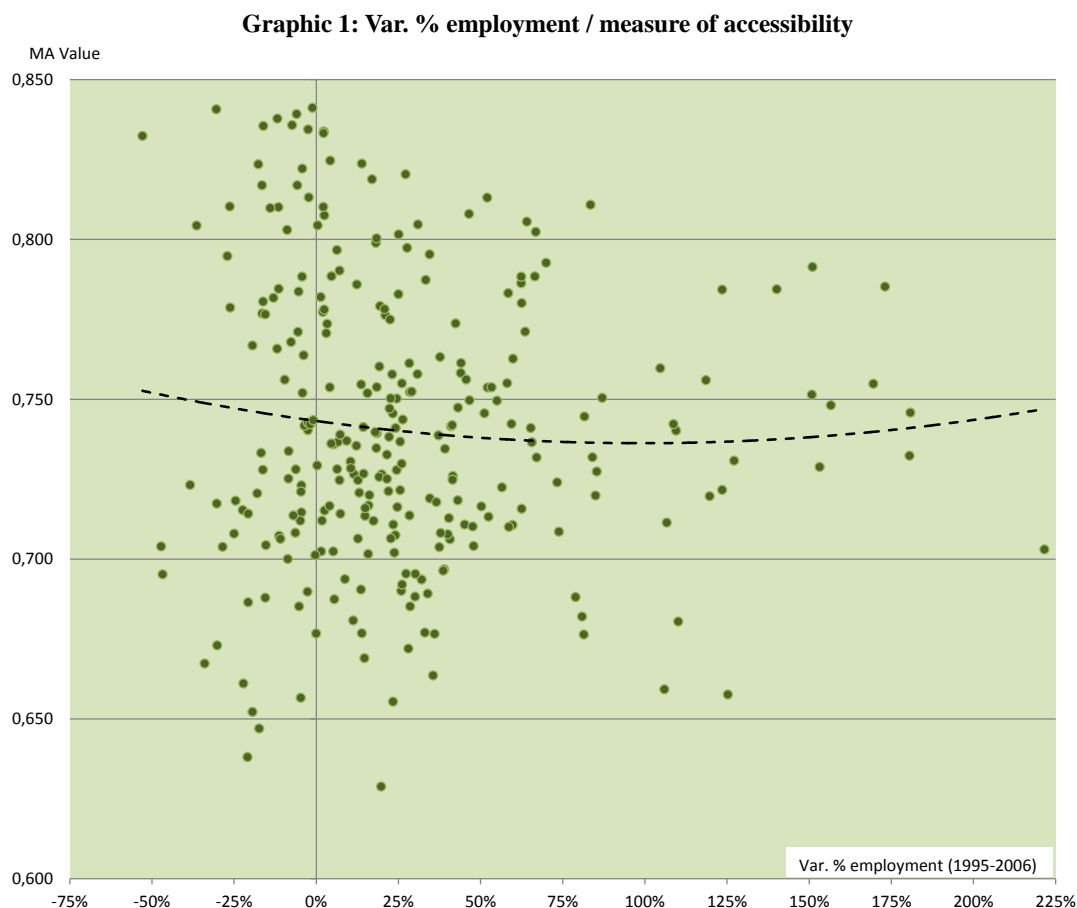
At a first analysis, there isn't a clear relation between a high MA score and an increased weight. Indeed, the logarithmic curve shows that the lower and higher end of results as

regards the variation of employment share score best in terms of MA, while the middle section tends to score slightly less.

Decomposing the MA index, we first show the relation between higher growth in employment and road density:

Graphic 2: var. % employment / road density
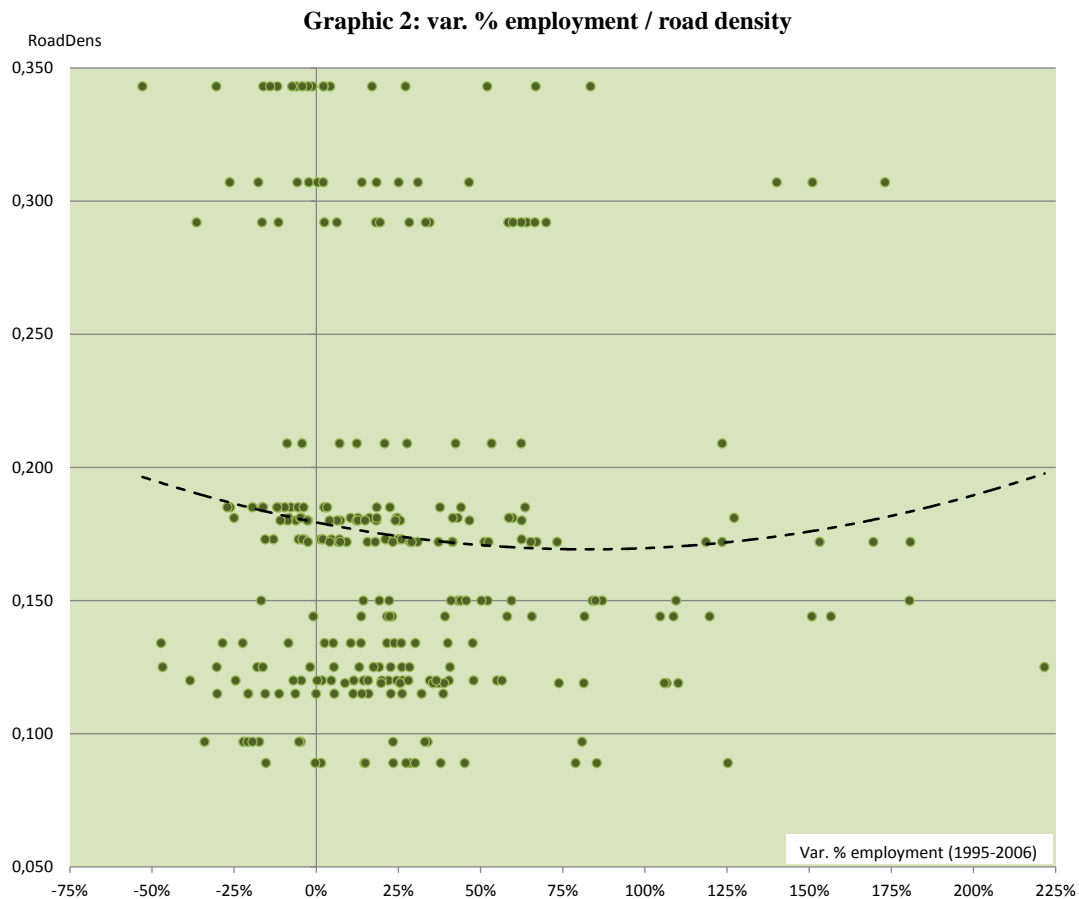
As our information regarding this dimension is only at the level of districts, our analysis is sketchier, but nevertheless, again the tendency for higher values at the extremes of employment share variation is apparent.

This picture is substantially changed in the case of distances to border points. Here, it is quite clear that municipalities closer to the border tend to grow more than others. One possible motive is that the employment base values are usually quite lower in the Portuguese interior, but nevertheless it is relevant to regard that in this period of time some of the usually considered less attractive regions managed to create jobs at a faster rate:

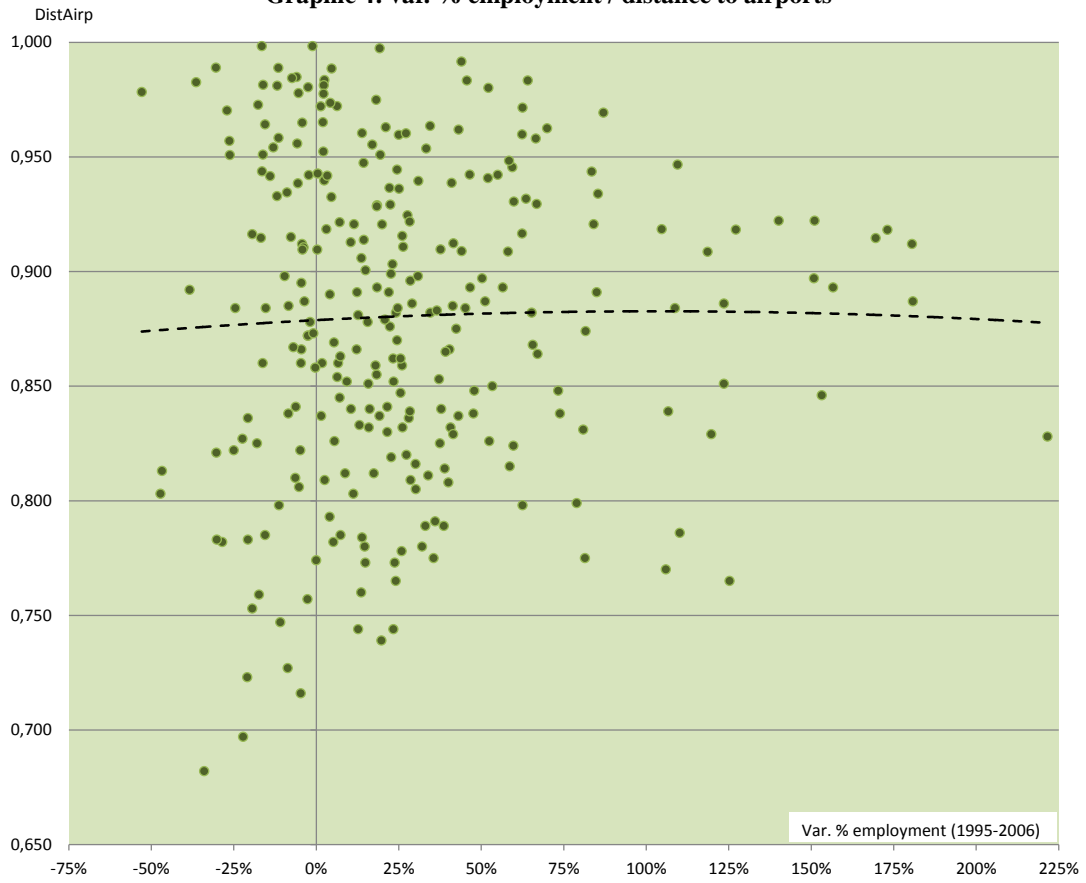**Graphic 3: var. % employment / distance to border**
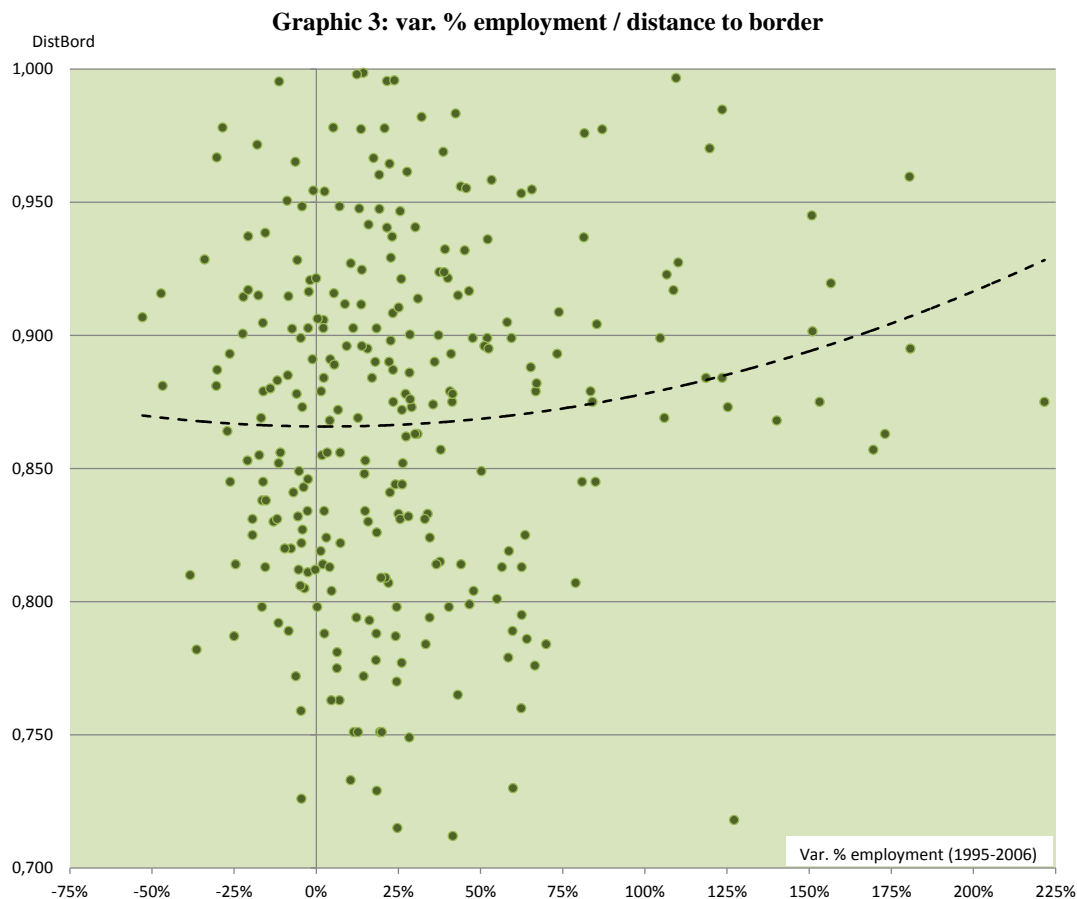
The results concerning distances to airports also go towards this tendency, if more discreetly so. Here, the edges of the logarithmic curve score slightly lower than the centre, and as all main airports are located near the coastline, the logic of more growth in the interior of the previous graphic is supported.
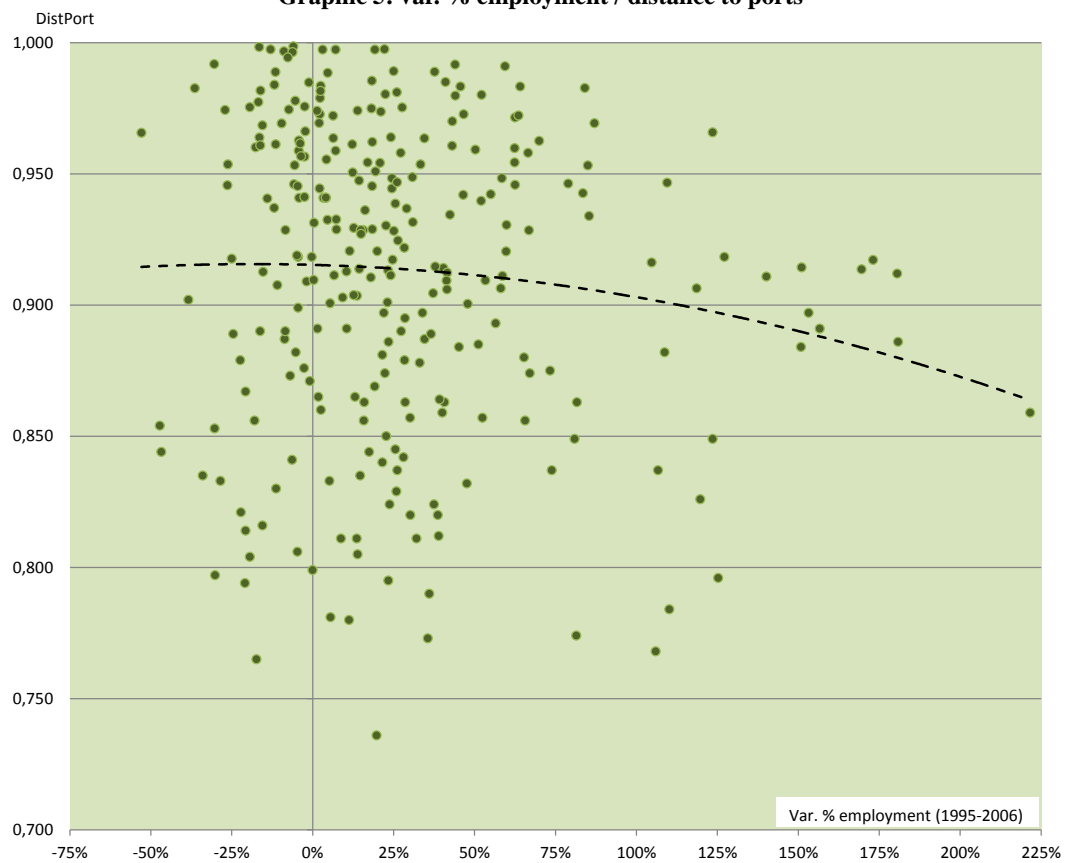
However, the location of an airport in Faro, near the coast but also relatively near the border slightly changes this reasoning here, perhaps causing a less steep curve. All in all, this dimension doesn't seem to have a very strong correlation with a variation in the share of employment.

Also coherent are the graphic results from distance to ports. Here, as in distance to border, municipalities further away from ports clearly tend to increase their share of employment. We present them both next:

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Graphic 4: var. % employment / distance to airports

DistAirp

Var. % employment (1995-2006)

Graphic 5: var. % employment / distance to ports

DistPort

Var. % employment (1995-2006)

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Finally, we present the results of the pairing distance to the metropolitan areas of Lisboa and Porto and the variation of the total employment share:

Graphic 6: var. % employment / distance to metropolitan areas
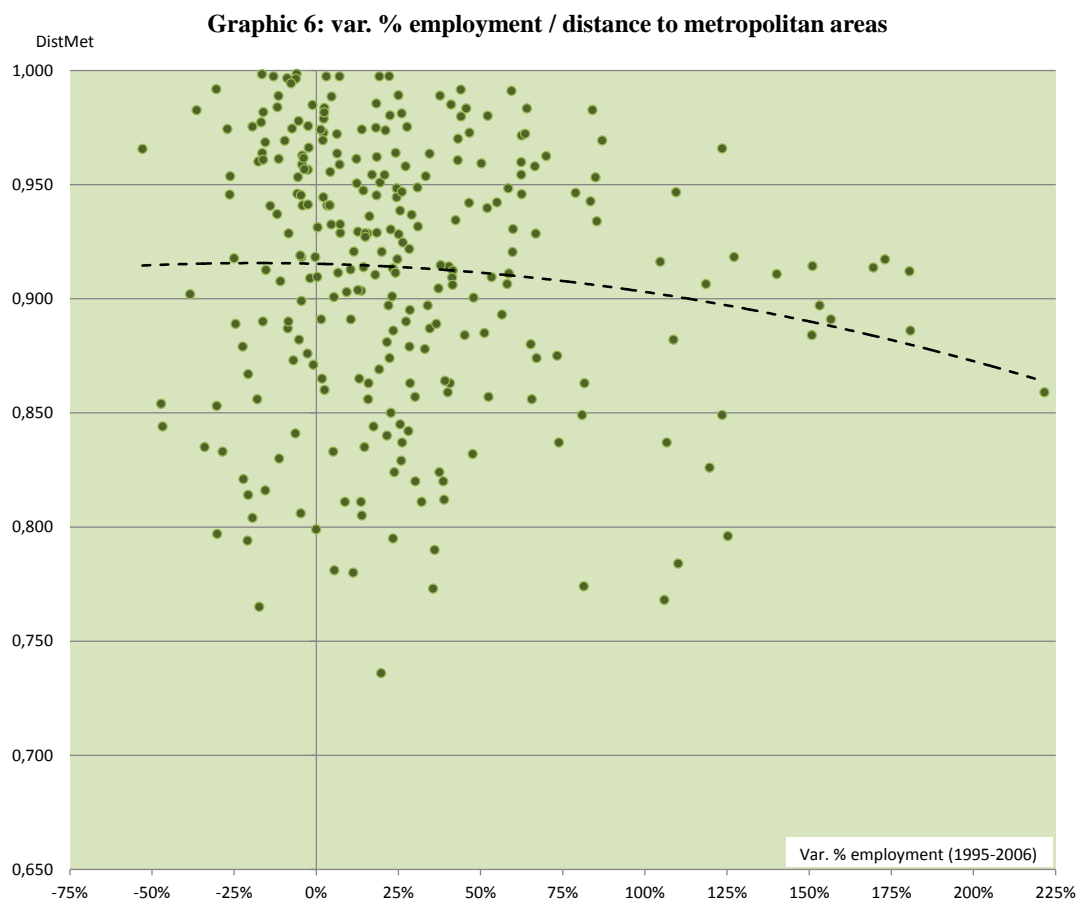
Once again, the municipalities that grew their employment share the most are located further away from these metropolitan areas.

In sum, we can say that there isn't a very strong causal link between a growth in the employment share and the MA index as a whole. However, some dimensions, such as distance to border, distance to ports and distance to metropolitan areas, show some correlation that points to several municipalities spatially located closer to the Spanish border saw their share of employment grew faster than the rest.

6.2. Regional results

The observation of the map of Portugal divided by municipalities allows for further development of this general idea. In order to do so, the following figures represent the

evolution of employment shares between 1995 and 2002, 2002 and 2006 and finally in the whole of the considered period:

Fig. 7: Var. employment share 95-02   Fig. 8: Var. employment share 02-06   Fig. 9: Total var. employment share
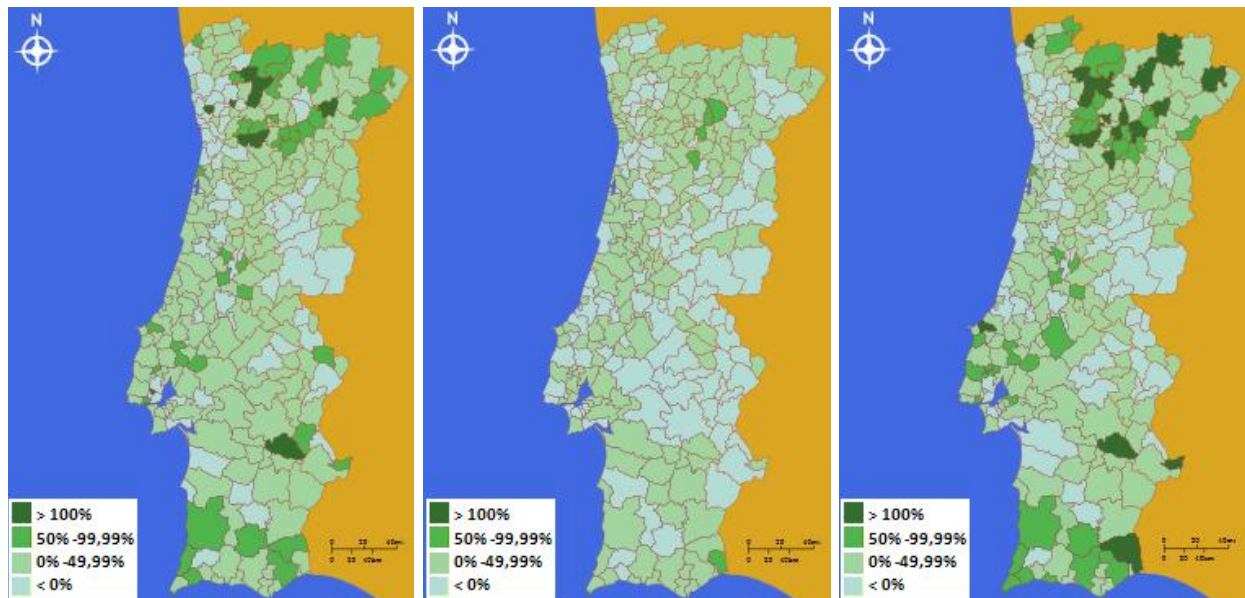
In the first picture there is a clear tendency for a decrease in the weight of the major urban centres of Lisboa and Porto (as well as their suburbs) towards their surrounding territories, in a typical "oil spill" process. The creation of three new municipalities close by also added to this tendency. This swing was even more notable in the north, while many interior municipalities, particularly in northeast and in and around the Algarve also managed to create jobs at a faster pace.

There are some notable exceptions to this process, with the central area close to the border deserving a special mention. In fact, a clear cluster of municipalities in this region lost relative importance in terms of employment numbers, missing out of this general trend to spread jobs more evenly across the territory.

In the second period, however, this tendency is clearly fading and in come cases is even reversed. Lisboa and some of its neighbours manage to gain some employment share, as well as many municipalities around Porto (but not the city itself, still losing relevance). Many of the municipalities with biggest dynamism, both in the north and south, still grew faster than average, but a much smaller pace.

Moreover, the losing area of the interior central belt spread heavily, reaching out to the NUTS III regions of Beira Interior Norte, Alto Alentejo and Alentejo Central. Interestingly, these losing areas in the interior follow very closely the pattern of the MA index map,

perhaps showing a trend towards a greater importance of accessibility in an increasingly open environment (2002 being a watershed year with the introduction of the Euro).

Looking at the decade long evolution of 1995-2006, the interior areas around the more heavily populated northwest and the southern regions in the Algarve and Baixo Alentejo gained more importance. The metropolitan area of Lisboa presents mixed results, with its more peripheral municipalities growing than the area around its core, but in the latter years even some of these more central localities recovered their share of employment, as is the case of the capital city itself. A likewise situation occurs in the urban region around Porto, but here the recovery is usually patchier and the centre didn't stop its losing trajectory.

In the centre of the country again the results appear to be mixed, with the more interior municipalities constantly growing at lower than average rates, and in a few cases (Manteigas, Alcanena, Belmonte) actually losing jobs in absolute terms, while others located halfway towards the coast improving their standings considerably.

Grouping these municipalities in NUTS III regions allows for an easier reading:

Fig. 10: Var. employment share 95-02   Fig. 11: Var. employment share 02-06   Fig. 12: Total Var. employment share
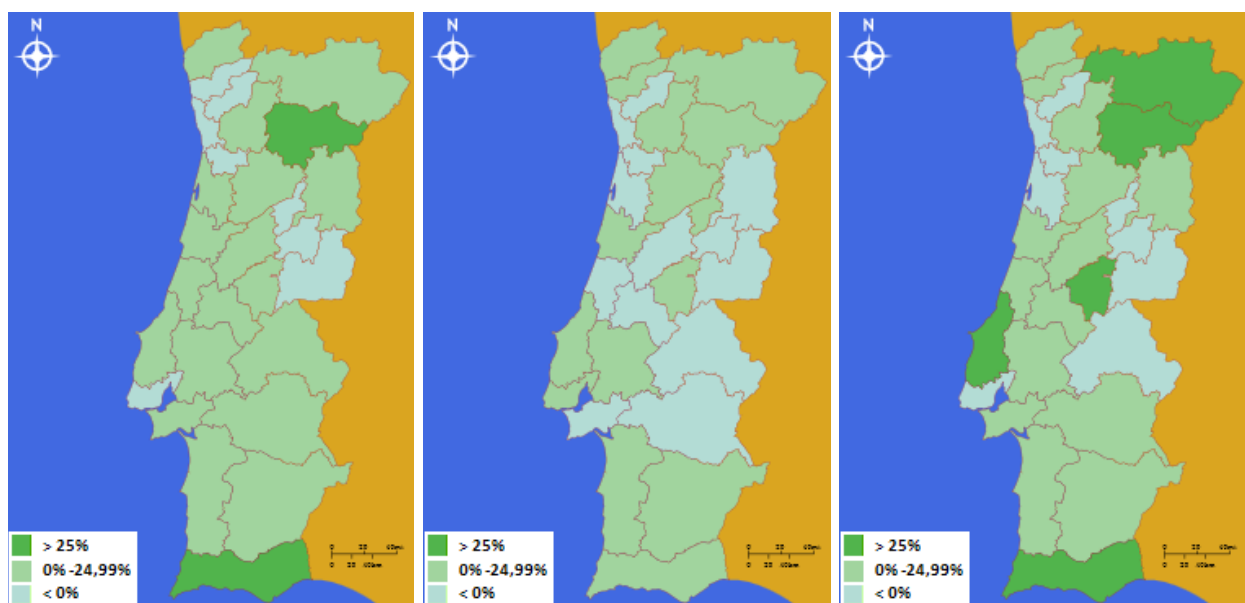
In this universe and in the period of 1995-2002, the Algarve and Douro regions saw their share of employment grow more than 25%, while heavily urbanised Grande Lisboa, Grande Porto, Ave, Cávado and Entre Douro e Vouga lost importance. The interior regions of Serra da Estrela, Cova da Beira and Beira Interior Sul also grew blow par.

Between 2002 and 2006 the picture is much more balanced, with 15 "winner" and "13 loser" regions, but always at modest rates. Grande Lisboa, Cávado and Serra da Estrela managed to

reverse their downward tendency, while Baixo Vouga, Pinhal Interior Norte, Beira Interior Norte, Pinhal Litoral, Médio Tejo, Alto Alentejo, Alentejo Central and Península de Setúbal began to lost some clout.

Globally, Alto Trás-os-Montes, Douro, Pinhal Interior Sul, Oeste and the Algarve increased their share of employment in more than 25% in the 1995-2006 years. Inversely, Grande Lisboa, Grande Porto, Ave, Entre Douro e Vouga, Baixo Vouga, Serra da Estrela, Cova da Beira, Beira Interior Sul and Alto Alentejo saw their shares drop.

Again, the spillover effect is visible, running wider in the north than in the south were it is more contained. This situation is coherent both with the findings of Krugman and Elizondo (1996), in the sense that an environment of opening to international trade diminishes the impulse towards spatial concentration, and the concrete reality of the Portuguese landscape, where the urbanisation in the northwest is much more dispersed than around Lisboa (Portas, 2012; Ferrão, 2011).

This reality is more visible with the picture of the distribution of employment as a whole, both in terms of municipalities and NUTS III regions:

Fig. 13: Employment share 06 (mun.) Fig. 14: Employm. share 06 (NUTS III)
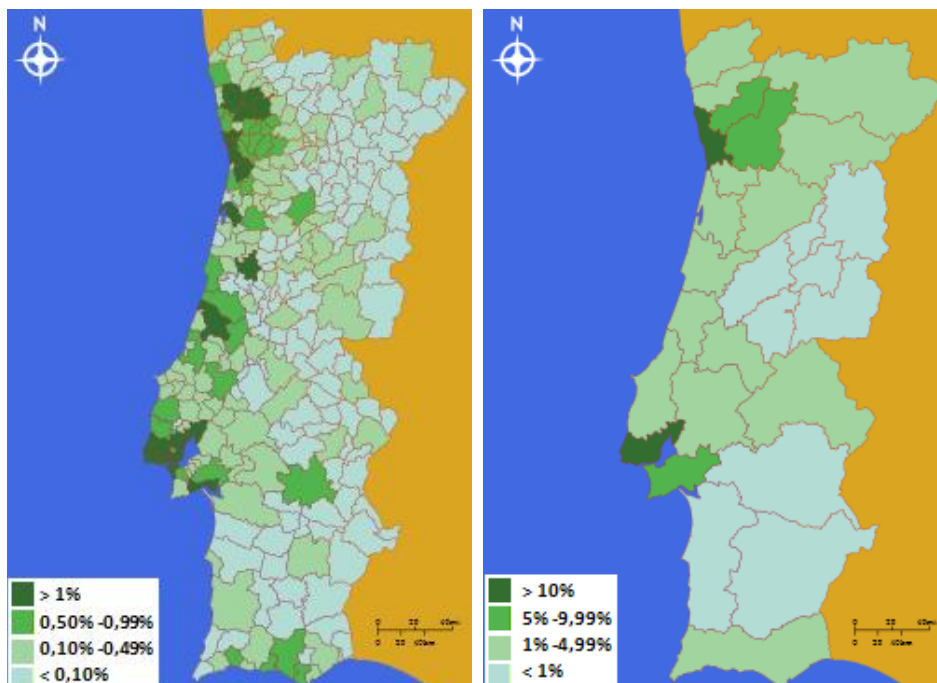
Predictably, these figures are very similar with the map showing demographic concentration. However, they allow the clarification of an important discrepancy between regions that, despite losing some importance, represent a very large portion of total employment, and the ones representing a modest share but still lost relative importance.

If the first set classically fits in dilution effect first presented by Krugman in its NEG model, the second appears to be quite different in nature. In terms of NUTS III statistical units, nine of them individually represent less than 1% of the total job universe (less than 30.000 jobs), a threshold bettered by 21 individual municipalities. They form two clear geographic areas, with three of them in the south and six in the central interior. While the three mentioned southern regions (all in Alentejo, here divided in four) managed to improve their relative standing, the region of Alto Alentejo, despite representing slightly more than 1%, lost some importance between 1995 and 2006.

The picture of the other group is different, as three of them (Serra da Estrela, Cova da Beira and Beira Interior Sul) grew at the slowest pace of all 28 NUTS III, two were slightly better than average (Pinhal Interior Norte and Beira Interior Norte) and one, Pinhal Interior Sul, bettered its share of employment in over 25% – the 5th overall best score. However, this strong improvement has to be tempered with the fact that Pinhal Interior Sul is the least relevant national centre of employment, being responsible for only 8.254 jobs in 2006 – 0,28% of the total.

CONCLUSIONS

In our work we tried to portrayal the major trends of the significant evolution of the Portuguese economic structure, based on empirical evidence and the new economic geography conceptual framework. Consequently, we can name some essential ideas brought by our work.

As a whole, the period between 1995 and 2006 brought greater spatial convergence between the different municipalities of continental Portugal, in a climate of overall growth in terms of employment. This result is coherent with Krugman and Elizondo's (1996) work, as a climate of opening to international trade indeed helped territorial cohesion. It is also in line with other papers that studied specific Portuguese reality (Crespo and Fontoura, 2008a, 2008b).

Also, in terms of the similarity of the regional economic structures, global results pointed to an increasing similarity between most territories and the national average. Besides becoming more balanced in terms of employment shares, the country also seems to have become more equal in terms of the distribution of said employment. Only a very select number of CAE Rev. 2 subclasses can be said to be highly concentrated in spatial terms, all with a reduced weight in terms of number of jobs.

Nevertheless, the essential duality in the spatial distribution of the Portuguese economic fabric, between the highly densified coastal strip between Setúbal and the northern border (part of the larger Lisboa mega-region) and the desertified interior, remains very much present. Despite a reduction in the overall gap, the differences between the biggest and smallest employment hubs are still obvious.

Also, a change of behaviour is visible amongst the two halves of the period of analysis. From 1995 until 2002 the growth in job creation was much stronger, and was also felt in the traditional exporting sectors that enjoyed an economic boom since the 1960s (Silva Lopes, 1996). Hence, the spatial convergence effect was much more clearly felt at this time. The years between 2002 and 2006 presented a much slower overall growth, and these economic activities lost importance as regards the number of jobs, both at a relative and absolute level. On the other hand, business related services and government-related activities heavily increased the number of jobs for which they were responsible. A clear shift towards non-transactional activities is visible, and the increased role of the State as employer is therefore clear.

This change in pattern appears to demonstrate the expiration date of the classic Portuguese development model in face of growing international competition, a trend reinforced by the last available figures. Using the logic proposed by Midelfart-Knarvik et al. (2002), many middle of the road services and industries seem to relocate from major urban centres in favour of their immediate surroundings. Low-technology activities (textiles, leather and furniture, for example) would tend to concentrate first on the peripheral regions and then eventually starting to disappear due to the unbearable cost-based competition of less developed countries, unless they start to produce more high-end products.

In fact, such a pattern can be identified in Portugal. If in the first half the centre of the major metropolitan areas lost relative importance both to their immediate periphery and to most interior regions, in the second this process was severely toned down, with the capital city of Lisboa and its immediate surroundings even managing to recover part of their share of total employment, despite the continual spillover effect to the surrounding areas. In the municipality of Porto, however, the loss of relative importance continued to manifest itself. This situation might resemble the creation of a "black hole" in Lisboa in the last few years, absorbing most of the highly-skilled jobs in detriment of other urban centres, as proposed by Glaeser and Kohlase (2003), and coronating the development of a process of economic specialization by function, instead of sector.

As a consequence of these developments, and despite the overall phenomenon of spatial convergence, the number of interior municipalities that no longer could accompany the national average in the final years of our analysis increased heavily. Importantly, many of them were amongst the localities that scored worst in terms of our measure of accessibility.

Therefore, a relation between accessibility to international trade and the location of economic activities can be made in this way, as interior municipalities that nonetheless present better access to markets usually managed to attract more employment than more isolated ones, as is the case of the interior of the Algarve and bordering municipalities of Baixo Alentejo, located near both an important transport hub and a major border crossing.

Focusing now on the need to promote growth at a time of deep socioeconomic crisis, even if at the cost of territorial cohesion, we believe that the abovementioned results show the need for spatial policies that adapt themselves to the geographic and economic reality in which they are applied. The development of tailor-made measures may indeed provide more

guarantees on to best promote the growth of each region's territorial capital, thus improving their competitiveness.

If these policies should constitute a part of a larger national strategy, they should also develop themselves inside the institutional framework of the EU, not the least because of the current lack of investment capacity by the government. This framework should not only be used for economic motives, but also for stability, transparency and accountability reasons.

In addition, they work towards the cohesion principle of the EU and allow a degree of functional collaboration between cross border regions, ideally both at the level of the Lisboa mega-region and the less densely inhabited border areas. Even if not necessarily provoking absolute spatial convergence, the growing challenge of increasingly globalized markets asks for the maximization of regional resources by means of intelligent tools that play to the strengths of each area, in an effort to promote healthy and sustainable growth.

We hope that this work, the writing of which offered great academic and personal satisfaction, supplied at least some leads into the regional dynamics of the Portuguese territory, in a period of both great transformations and tensions inside its socioeconomic fabric. We also hope that it contributed to the discussion as regards the development of more adequate spatial policies, which may play a vital role in the country's future.

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