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B.6 COMPETITION POLICY

Effects of Deregulation on Competition Policy in Spain
María Jesús Alonso Nuez and Jorge Rosell Martínez
(Discussant: Fernando P. Fonseca)

Dieciocho años de control de concentraciones en España: un análisis empírico de de la actuación del Tribunal de Defensa de la Competencia y de la Comisión de Defensa de la Competencia
Alejandro Casino Martínez and Vicente Jaime Pastor
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The adoption of a regulatory framework for industrial parks network in the Ave valley, Portugal
Fernando P. Fonseca and Rui A.R. Ramos
(Discussant: Vicente Jaime Pastor)

The adoption of a regulatory framework for industrial parks network in the Ave valley, Portugal

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Abstract

Industrial parks are perceived as an integral part of the regional development strategies and are recognized as an effective tool to promote the economic growth, the urban renewal and the spatial organisation. The aim of this paper is to present the main conclusions of a study realised in the Ave valley, a traditional industrial area settled in the North of Portugal, in order to create an industrial park network. The results obtained clearly show the advantages of developing a regional network approach, reducing the impact of certain local debilities. Based on a multi-criteria analysis, some sceneries and measures are described as future challenges to create more innovative and attractive industrial park accommodations in the Ave valley.

1. Introduction

The distribution of economic activities within a geographic area is one of the most debated topics of industrial economics and geography (Elia & Mariotti, 2006). Extensive studies focused on the industrial location and on the factors that influence the industrial investments have been carried out. For instance, there are several studies around the concept of industrial innovation as key issues to strengthen the competitiveness and to polarize the regional development (Abreu *et al.*, 2008). This line of research usually considers the importance of the absorptive capacity of innovation at a firm level based on the knowledge sources and on the partnerships with other external entities. Also representatives are the studies about the role of clusters (Porter, 1998; Enright, 2001; Andersson *et al.*, 2004). Their importance is seen by the growing number of public (national and European) policies driven towards the creation of clusters in strategic sectors (Hajek & Stejskal, 2006; EU, 2008).

However, the researches focused on the role of the industrial parks as a tool of territorial planning are much more reduced. In fact, industrial parks are predominantly analysed in the environmental domain, due to the problems resulting from the concentration of a large number of industries and firms in small areas, which can affect and pose a serious threat to both local and global sustainable development initiatives (Singhal & Kapur, 2002). This concern is reflected in numerous studies around the concepts of *industrial ecology* (Grant, 1997) and *eco-industrial parks* (Park *et al.*, 2008, Fernández & Ruiz, 2009) with the intent of applying ecological principles to achieve greater eco-efficiencies. Despite this analysis, as Ming & Hin (2006) emphasise, the industrial parks remain a relatively under-researched area in the literature. Nonetheless, industrial parks play a very important function. As Chun (2004) states, both in developed and developing countries, industrial parks have been a major strategy, not only in settling industrial activities in one location to satisfy the demand for manufacturing facilities, but also due to planning and environmental reasons. There is some agreement in the literature concerned with the advantages of the industrial parks in providing employment, raising the standard of living, attracting new investments, diversifying the economic basis and increasing the regional development (Beyrard, 1988; Chun, 2004; Silva *et al.*, 2008).

In this context, the article presents and discusses the main conclusions of a project developed in the Ave valley (Adrave, 2008), a traditional and representative industrial area settled in the North of Portugal. The diagnosis and the surveys realised in

the territory highlighted several weaknesses that restrict the potential of Ave parks. Briefly, the lack of qualification, the fragmentation of a high number of parks by each municipality, the spatial disarticulation and the multitude of management structures are the main debilities identified.

The establishment of a regional network of industrial parks suitably linked and combined with some practical improvement measures in targeted parks was identified as the right tool to mitigate the weaknesses diagnosed. Thus, this paper describes the steps and the methodological line undertaken in the construction of the Ave industrial parks network. The experiences and the findings obtained are underpinned in a multi-criteria analysis of the parks. This analysis allows the construction of a regional ranking of industrial parks, important to diagnose the position of each park and to identify the main nodes of the future network. Therefore, the multi-criteria analysis was helpful to simulate different prospective sceneries through changes operated in the existing conditions and to identify which actions are more critical to strengthen the industrial parks at the regional (and municipal) scales, being an important tool to guide future investments and to draw up the strategies related to new industrial parks setting-up.

The paper is organised as follows. Section 2 presents a brief background of the industrial parks origins and typologies. The methodological process adopted and the multi-criteria analysis are discussed in Section 3. Finally, Section 4 provides the main results obtained and some final remarks.

2. Origins, purposes and typologies of industrial parks

According to Beckmann (1999) the most relevant factors considered by the entrepreneurs in their locative decisions include: space available, infra-structures, amenities, accessibility through transportation, low taxes or even subsidies and available labour. An industrial park is identified as a well-located, properly serviced and carefully designed tract of land with facilities suited for industries and businesses that can respond to the majority of those entrepreneurs' requirements. Thus, an industrial park can be defined as an area of land allocated to factory building, which is leased or sold for manufacturing purposes. These areas are equipped with different utilities and amenities necessary to the industrial activities. In this way, an industrial park can be defined as a group of factories built on an economic scale in suitable sites with a whole of utilities, providing special arrangements for technical guidance and common service facilities (Sekhar, 1983).

The industrial park concept was created to solve specific problems essentially in the economic domain. According to Beyard (1988), today's modern park is the evolutionary product of more than 90 years old of development experienced in the United States and abroad. The current industrial parks (designation established around 1950) have different designations as manufacturing district, organised industrial district and industrial estate (Beyard, 1988). In the European case, Bruxelas *et al.* (1973), UKDA (1986) and Gama (2002) argue that the industrial estate concept appeared in the UK in the 1930s to face the serious economic problems related to the 1929/31 crisis, namely in the Team Valley-Gateshead, Northumberland. The first industrial parks were developed by private initiatives. However, the success obtained with these attempts carried out the public intervention in many countries to launch, coordinate and manage industrial parks due to their importance in the industrialisation and regional development. As a result, in the 1930s, the UK government promoted the installation of these parks in the areas that were more affected by the Great Depression. After the Second World War, the number of industrial parks expanded enormously, initially in the most developed countries and later (1970s) in the developing countries. For Gama (2002), the great expansion of industrial parks in the post-war period was a consequence of the economic progress verified. In the UK, specific entities such as the Industrial Estates Corporations (autonomous agencies) and the Board of Trade (dependent on the central government) were created to encourage the expansion of industrial parks. In Italy, the largest public intervention happened in the 1950s through the economic development policy drawn for the Mezzogiorno (less industrialised South territories). As a result, a lot of industrial development areas were defined in the Mezzogiorno region to work as anchors of the territorial growth (Bruxelas *et al.*, 1973). In France, the municipalities had a more active role in the implementation of industrial parks, but the general planning policy was dependent on the central authorities.

In the Portuguese case, the promotion of industrial parks began later when compared to other European countries. The first regulation was introduced by the Law nr 3/72 27th May and by the Decree-Law nr 133/73, 28th March, which define the industrial park as *a planned area of industrial installations, which attempts the industrial promotion* (Bruxelas *et al.*, 1973). Even though the true impetus was given by the institution of municipal master plans, initially created by the Decree-Law nr 208/82, 26th May and strongly impelled by the Decree-Law nr 69/90, 2nd March. Thus, planning

and zoning specific areas to install industries has become a current task performed by the Portuguese municipalities in the early 1990s.

In the developing countries, the rapid economic growth experienced during the 1970s to 1990s (mainly in East Asia) can be traced to the systematic development of its industrial parks and its ability to change and adapt its industrial structure to meet the market needs and the modern business trends (Chun, 2004). According to this author, industrial parks are clearly post-war phenomena in South East and East Asia, being the first parks established only in the 1960s and 1970s. The first industrial park in the ASEAN countries was created in India in 1955 (Sekhar, 1983).

Nowadays, industrial parks are inseparable from the development strategies of many countries. According to Singhal & Kapur (2002), more than 12.000 industrial parks exist worldwide, being a great number (80%) settled in the developed countries. The wide range of complimentary benefits provided by the industrial parks is summarised by UKDA (1986) in the following elements: public utilities (gas, electricity, water, etc.), amenities (several services as banks, hotels, restaurants, etc.), park management services (security centre, estate office, etc.), landscaping, car parking and private services.

The benefits carried out by the industrial parks can be verified in three different but correlated domains: to order the development (according to planning/environmental reasons), to strengthen the economic competitiveness and to reinforce the local entrepreneurship.

In the territorial domain, industrial parks are seen as an important tool to plan and manage rationally the land use. In fact, the regulation of industrial parks allows the definition of specific areas where industries can be installed, avoiding their diffusion through the territory. At the same time, these parks are usually settled in the towns' periphery which prevents potentially harmful manufacturing uses (noises, smokes, smells, traffic, etc.) in urban residential areas, increasing the inhabitants' quality of life. The separation between industry and the residential areas inexistent in the beginning of the industrial era are related to hygiene concerns and new urban policies. Thus, the environmental dimension gained a growing importance during times, both in a local scale (providing infra-structures and more eco-efficient services as well as equipments to treat the industrial residues and effluents) and in a regional scale (protecting environmentally sensible and land areas with other potentialities from this use). At the same time, the concentration of industries in these parks allows an easier environmental

control and facilitates the monitoring actions. Another advantage is related to the lower infra-structure and utilities costs and environmental impacts due to the concentration of industries in one specific location.

The economic benefits are, since the first attempts, one of the most influent drives mainly because clustering industries was seen as an opportunity to obtain efficiency gains, stimulating the firm's competitiveness (Silva *et al.*, 2008). As Beckmann (1999) emphasizes, in an economic point of view, the best chance of survival is gained by maximising profits. The higher rationality in access to common infra-structures and services and its low costs (at least in theory) justify the efficiency gains obtained in these parks. In the last three decades, the industrial parks competitiveness is based on innovative ways of proximity and entrepreneurial and institutional cooperation between public and private entities. According to Silva *et al.* (2008), new typologies of industrial parks have been conceived in the last years trough the integration of advanced services which support and facilitate the firms' management and activity in order to reinforce their productivity. Also the technologic enhancement of the last decades has created new challenges in the arrangement and in the working of the industrial parks, being a fact that the telecommunications networks, mainly the broad band and the optical fibre, gained importance. Another significant change is related to the increasing role of knowledge as a source of innovation, being the entrepreneurial competitiveness more and more dependent on the capacity of developing and applying new knowledge (Mackinnon *et al.*, 2002). These new requirements carry out new kinds of industrial parks, with a strong component of technologic background and institutional involvement to pursuit innovation and the development of new products. These kinds of industrial parks are closely related to the business & innovation centres, common in the UK experience (Silva *et al.* 2008). Thus, the establishment of networks of institutional and territorial cooperation emerges as an innovative tool that takes the common strengths and knowledge as a lever to obtain an additional effect, reversing the limited achievement of the individual actions. For these reasons, the constitution of networks is a very present strategy in the existing documents and policies and is mostly defended by several academics (Ming & Hin, 2006; Abreu *et al.*, 2008; Park *et al.*, 2008; Silva *et al.*, 2008).

Strictly linked with the economic benefits, the regional development was (and still is) an objective followed by the industrial parks. Chun (2004) highlights the most important contributions of these parks in the regional development, namely: the

attraction of foreign investment, to accelerate the pace of development, to channel development to the surrounding areas in order to reduce the regional imbalances, to provide employment opportunities and to create spin-offs in other sectors, such as finance, commerce, logistics, transportation, etc.

Finally and in the last years, the establishment of industrial parks also intends the promotion of local entrepreneurship (Silva *et al.*, 2008). This priority requires changes in the scale and in the means of the industrial parks structures to better accommodate and promote the local initiatives developed by the small and medium enterprises (SMEs), being the most settled in the less dynamic areas. The parks technologically more advanced can strongly contribute to entrepreneurship, innovation, and incubation. Sometimes, these areas are located in the towns under innovation/creative hubs.

3. Industrial parks in the Ave valley

3.1. Geographic description of the case study

Ave is an old industrial area settled in the North of the Oporto metropolitan area. In the second half of the 20th century, manufacturing knew a great development in the Ave valley, mainly due to the establishment of textile and clothing industries. However and since the 1990s, Ave is experiencing an industrial crisis with the exit of several firms. As Barbot (2001) highlights, competition from East European and Asian countries manufactures may have been one of the leading factors of the crisis, together with a wage raise due to a shortage in the labour offer. Gross investments were spent and several studies and plans were made to rehabilitate Ave manufactures. Despite the fall detected in some sectors and in the employment, the region suffered some recovery thanks to the development of trade and services and to a small but increasing industrial diversification, though the re-restructuration occurred mostly in the dominant sectors (textile and clothing).

The territory considered in the study was composed by ten municipalities included in two different NUT 3 (Nomenclature of Territorial Units): Santo Tirso and Trofa belong to the Great Oporto and the rest to the NUT 3 known as *Ave*. This territory has a strategic location in the regional context that is reinforced by the good connectivity with the neighbour and the border regions (Figure 1). In the last years, gross investments were channelled to this region in order to create a network of regional motorways which ameliorated significantly the competitive position of the territory.

According to the last census (INE, 2002), the Ave region had 536.387 inhabitants that were irregularly distributed by the ten municipalities. In fact, 53% of the entire Ave population lived in Guimarães and Famalicão, the two most dynamic municipalities, where a great number of firms were located. Ave exemplifies very well the deep regional asymmetries existent in Portugal, where the inner areas (located in the East) are very depopulated and older, while the coastal regions are economically and demographically much more dynamic.
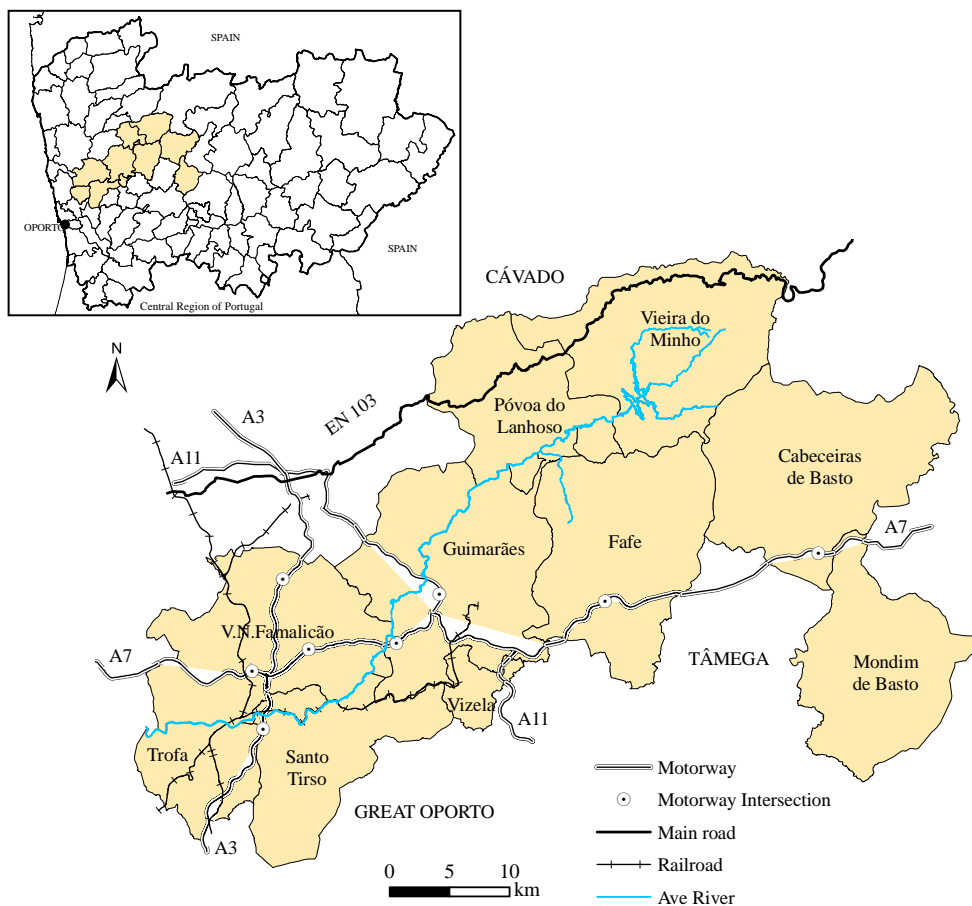

Figure 1: The Ave position in the North region of Portugal

The employment structure is still characterised by a sharp domination of the secondary sector activities which represents 62% of the employees, being 81% of the secondary workers of Ave employed in manufacturing. The Location Quotient (LQ), considering the turnover, employees' and firms' number, undoubtedly highlights the importance of the industrial sector in the Ave valley in comparison to its concentration in the North region of Portugal (Table 1).

Overall, in the three parameters analysed, the results obtained indicate a higher manufacturing weight in the Ave region when compared to the North of Portugal. The data indicate that the textile has an enormous importance in the Ave economy, namely in terms of turnover and employment (textiles employ 68% of all manufacturing workers and generate 54% of the turnover amount). Ave also has an advantage of the rubber and plastic products manufacturing with more prominence in the turnovers obtained due to the location of an important multinational tyres firm in Famalicão. The other sectors have much less importance in the Ave economy.

Table 1: Industrial sectors in the Ave region

Manufacturing typologies	Location Quotient		
	Turnover	Employees	Nr firms
Manufacturing sectors	1.60	1.63	1.49
Food products, beverages and tobacco	0.49	0.68	0.62
Textiles	2.47	1.78	2.00
Leather and leather products	…	…	0.57
Wood and wood products	0.18	0.25	0.50
Pulp, paper and paper products	0.35	0.41	0.68
Refined petroleum prod.+chemical prod.& man-made fibres	0.84	0.32	0.89
Rubber and plastic products	2.18	1.14	1.05
Other non-metallic mineral products	…	…	0.67
Basic metals and fabricated metal products	0.75	0.70	0.76
Machinery and equipments	0.64	0.58	0.68
Electrical and optical equipments	0.40	0.60	0.54
Transport equipments	0.19	0.15	0.29
Manufacturing n.e.c. (non specified)	0.54	0.45	0.36

Source: INE, 2009.

3.2. Methodology used in the study

The goal of the study carried out by the authors was to qualify and rearrange the industrial parks settled in Ave through their articulation in a network structure with the intent of making this region more competitive and more permeable to external investments. These requirements are aligned with the national and the regional policies driven to the industrial accommodation, which aim at the articulation and the constitution of physical and institutional networks between firms and other institutions (universities, R&D centres, science parks, etc.) and the consequent acquisition of economies of scale (CCDRN, 2006).

The initial step of the work was a survey addressed to Ave municipalities. These entities have a wide range of competences in the parks policies, including the territorial delimitation of parks, the infrastructure construction and even their management. Surveys were previously structured and only included closed questions. The

respondents were the municipal services and in some cases work sessions to clarify some doubts took place. The data were collected in the beginning of 2008. Surveys were focused on collecting detailed data related to three great domains: (i) general information about the industrial parks (localisation, surface, firms installed, prices, etc.); (ii) data related to the existent and predicted infrastructures; (iii) and data related to the existent and predicted amenities. Through these data we obtained a rigorous diagnosis of the regional industrial parks that allowed us to draw up a strategy in order to mitigate the weaknesses and to promote the strengths identified. On the other hand, the prospective analysis that we developed to anticipate sceneries was made in strict articulation and debate with a wide range of regional entities (municipalities, regional development agencies, CCDR-N - The North Regional Coordination and Development Commission that is the entity with competences in the development of the North region of Portugal), personnel and experts) through several meetings maintained individually with each municipality and in a general workshop realised to discuss and guide the strategies construction. Thus, the strategic vision and the goals were shared and legitimated by the local and regional entities involved in the study and were validated in the three supervision commission conferences realised during the study.

The methodology used to establish an industrial parks network in Ave was a multi-criteria analysis focused on four main parameters: infra-structures, services, accessibility and distances. With this approach we followed the proposals of McCann (1998) when he argues that industrial location is much more complex than the traditional models, where only the transport factors were incorporated. Thus, in the first two parameters we take into consideration the existence (or not) of necessary infrastructures/amenities to the industrial activity, such as internal roads, water, sewerage, electric energy, natural gas, telecommunications, broad band, wastewater treatment plant, recycling containers, eco-centre, irrigation system, car parking and recreational equipments (infrastructures); and cleanness services, trash collection, service station, infra-structures maintenance, public transport, entrepreneurs association, multi-use building, restaurant, coffee, mail post and bank (amenities). In both these parameters the following weight criteria were used: existent elements: 1; non-existent but predicted: 0.5; non-existent and unpredicted: 0. The accessibility analysis was inspired by Ramos & Mendes (2001) and contemplated the distance to relevant transport and logistic structures presented in Table 2.

The weights used in this category were as follows: 1- excellent access ($D \leq$ (Dmax/2); 0.5 - moderate access (Dmax$\leq$ D <(Dmax/2); 0 - bad access (D>Dmax). Finally, the last parameter evaluated the distances between industrial parks and five important regional and national cities, considering the average distance between the respective city and the centre of each Ave municipality. The cities considered were Braga, Viana do Castelo, Oporto, Lisbon, Vigo (Spain) and also the boarder posts of Valença, Vila Verde da Raia and Vilar Formoso. After this evaluation and considering the distance of 15km as an acceptable tolerance, the next weights were distributed by each industrial park: 1 - excellent distance (D$\leq$Daverage); 0,5 - moderate distance (Daverage<D$\leq$Daverage+15); 0 - bad distance (Daverage+15). Distances were estimated through the site of ViaMichelin.

Table 2: Proximity criteria used in the accessibility evaluation

Distance max. (km)	Accessibilities description	Excellent (1)	Moderate (0.5)	Bad (0)
3.49	National roads proximity	D ≤ 1.745	3.49 ≤ D < 1,745	D > 3.49
27.36	Motorway intersections proximity	D ≤ 13.68	27.36 ≤ D < 13,68	D > 27.36
51.91	Seaport proximity (Leixões)	D ≤ 25.955	51.91 ≤ D < 25,955	D > 51.91
69.9	Airport proximity (Oporto)	D ≤ 34.95	69.90 ≤ D < 34,95	D > 69.90
20.08	Railway proximity (load terminal)	D ≤ 10.04	20.08 ≤ D < 10,04	D > 20.08

Source: Mendes & Ramos, 2001.

After obtaining all these values, the next step was to determine the position of each park in the four parameters, that gave a percentage value for each park in the four parameters (Adrave, 2008). The next stage of the work was to construct eight sceneries through the attribution of different weights to each parameter in accordance to the following criteria: (i) equal weight to the four categories; (ii) higher weight to infra-structures and equal weight to the remaining categories; (iii) higher weight to services and equal weight to the remaining categories; (iv) higher weight to accessibilities and equal weight to the others categories; (v) higher weight to distances and equal weight to the other categories; (vi)) higher weight to infra-structures and lower weight to distances; (vii) higher weight to services and equal weight to the remaining categories; (viii) higher weight to accessibilities and lower weight to distances. The utilisation of these eight sceneries had the purpose of diminishing some critical factors namely the distance that more incisively affects the municipalities located in the East Ave.

In accordance to the sceneries results, each park received a partial score as the following describes: 20 – industrial parks, whose score is higher than the sum of the

general average with the standard deviation; 10 – industrial parks with a lower score than the previous case, but higher than the general average; 5 – industrial parks with scores situated in the interval defined by the difference between the general average and the standard deviation; 0 - industrial parks with a lower score than the last case. The final ranking was based on the sum of the partial scores obtained by each park in the eight sceneries described above.

This multi-criteria analysis was very helpful particularly in two domains. Firstly, it clearly indicates the industrial parks that are more or less attractive at the municipal and regional scales, being this knowledge essential to formulate the network. Secondly, the analysis was an important tool used at the foresight stage of the work, anticipating the dimension of the gains obtained with investments in the amelioration of some parks, as well as indicating the competitive position of the industrial parks predicted by the municipalities. Thus, the multi-criteria analysis was a very useful tool in attempting the regional network structure and to distinguish the parks of regional dimension from the parks of local dominance.

3.3. Results and findings
3.3.1. The Ave industrial parks in review

According to the survey, in the Ave region there are 87 industrial parks that offer a global area of 344hectares. However, industrial parks have a very unbalanced distribution that follows the deep economic and demographic asymmetries (Figure 2). Thus, the largest number of parks is concentrated in Trofa and mainly in Famalicão, where 41% of the parks are settled, while the inner municipalities of the East have a much more reduced number. Without any industrial park, Vizela is an exception where industries traditionally coexist with other land uses. One of the problems detected in the Ave industrial accommodations is related to the high rate of unoccupied area that attains 28% of the industrial area (in Famalicão and Póvoa de Lanhoso, the unoccupied area in the parks represents more than 50% of the global area offered). The industrial lots have an identical problem, because 42% of the 1.631 existent lots are vacant. This problem is particularly serious in Póvoa de Lanhoso, where 72% of them are unoccupied. Different causes, from the unprofessional management of some parks to the bad location and qualification of others that are significantly less attractive than others located in the surroundings, justified this phenomenon. In other words, the municipal strategies have been wrongly favouring an excessive and unqualified offer to the demand verified in the

Ave valley, creating a problem of difficult resolution that requires additional efforts and resources.
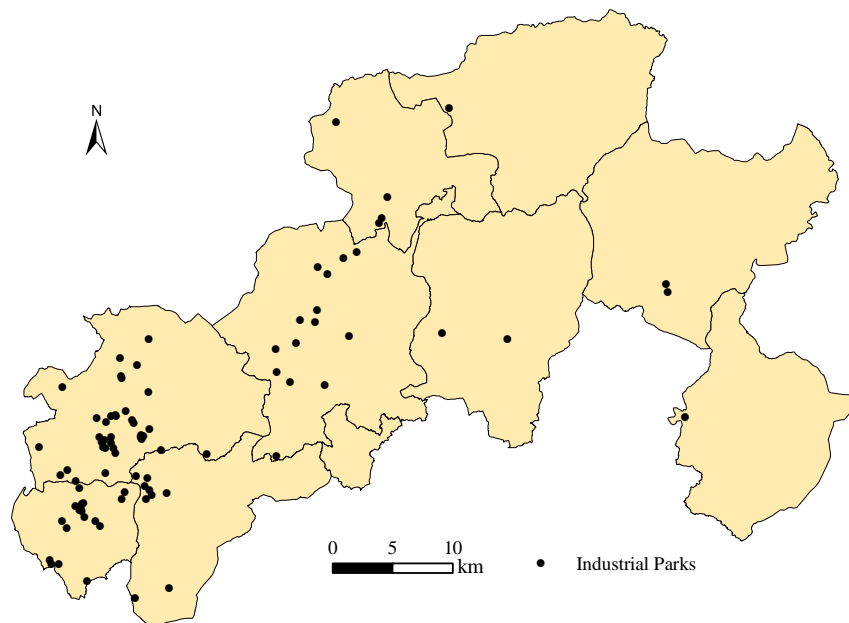
Source: Adrave, 2008.

Figure 2: The industrial parks distribution in Ave

At the survey period 803 firms were working in Ave, being 57% of them installed in the industrial parks of Famalicão. The global average obtained is 9.2 firms by park. The industrial parks management is provided by different entities. In the less attractive areas where private initiatives are weak (East Ave), the management and promotion is assured by the municipalities. In the other areas, the private management is the dominant typology. The costs, that according to McCann (1998) play a major role in the industrial location, comprise the space costs themselves and the space-handling costs of storage and warehouse. The collected data was mostly inconclusive due to the private management of several parks. Despite, the answers obtained confirmed the existence of a high gap in the industrial land prices that alternate between 35€/m2 (in an industrial park of public management in the East Ave) and 493€/m2 (in a well equipped and private park of the West side).

The utilities and amenities are generally poor and far from being the desired, attesting a low level of qualification. In fact, the elementary infra-structures are the most regular (internal roads, water, electric energy, car parking, etc.), but only a few parks are capacitated with more advanced utilities (such as wastewater treatment, recreational equipments and broad band). The lack of qualification is also due to the reduced

presence of services that are limited to some elementary amenities such as public transport, cleaning services and trash collection. Despite, the location of the most unqualified parks in the East Ave, there is a very strong disparity in the utilities and services offered by the other municipalities, where well equipped parks cohabit with others that work like simple firms' repositories. The high fragmentation and diffusion contributes enormously to the reduced qualification of several parks, limiting the investments' attraction.

To face this state of things, the position and the strategies advanced by the municipalities are, at the least, questionable. Excepting Mondim de Basto, the remaining municipalities have specific strategies delineated to industrial parks that could be grouped in two kinds of intentions: the creation of new parks (Figure 3) and the expansion of the existing ones. The intention of constructing new parks is mentioned by eight municipalities. If materialised, these strategies will add 21 new parks to the existent offer. Curiously, ten of these parks are projected by two inner municipalities, namely by Póvoa de Lanhoso, where this strategy can increase even more the parks' unoccupied rate. In terms of surface, the new parks will expand more than 160% of the existent offer. In fact, some municipalities (Trofa and Famalicão) have projects to create greater and more modern areas in order to attract external entrepreneurs and to accommodate other industrial diffused ones in their territories (for instance, the predicted park in Trofa will have 291 hectares). The advanced strategies are in very different stages of maturity, and both include very preliminary intentions (such as the creation of the first park in Vizela) as well as almost concluded projects (such as the Trofa park). On the other hand, the expansion of the existent parks is assumed by three municipalities. The materialisation of this strategy will involve 15 parks and will significantly raise the offer (more 538 hectares), mainly in Famalicão.

Thus, the relevancy and the opportunity of these initial advanced strategies are doubtful because they insist and probably will worsen some structural problems diagnosed (the fragmentation, the lack of qualification and the reduced occupation of the industrial parks). The ranking of the industrial parks, where the predicted parks were included, highlighted the reduced potential of several of these parks. As a consequence of this work, the municipalities had rethought the predicted strategies as described bellow.

3.3.2. The ranking of industrial parks and further approaches

Based on the application of the described multi-criteria analysis, we obtained a ranking of the Ave industrial parks. The scores exhibit great disparities both in the regional and in the municipal scale. The average score obtained in the East Ave municipalities is lower than that acquired in the rest. The worst level of accessibility, the greater distance to the logistic infra-structures and the generally worst qualification of the parks are the main reasons of the bad position reached by these municipalities. On the other hand, the high standard deviation diagnosed in Santo Tirso, Trofa, Guimarães and Famalicão reflects the excessive number of industrial parks with an attractive and very changeable capacity where better positioned parks at a regional scale and some unqualified and bad equipped parks of local coverage are included. This disparity is particularly seen in Famalicão, the municipality with several parks ranked in the first positions, but with many others badly positioned. That is why the municipalities with few parks and regularly ranked occupied a better position in the general ranking (as Fafe). Table 3 summarises relevant statistics related to the industrial parks multi-criteria analysis.

Table 3: Main results obtained with the multi-criteria analysis

Municipalities	Number of Parks	Average	Standard deviation	Parks with better score	Parks with worst score
Cab. de Basto	2	52.50	17.68	65.00	40.00
Fafe	2	135.00	35.36	160.00	110.00
Guimarães	14	55.71	33.62	130.00	0.00
M. de Basto	1	0.00	-	0.00	0.00
P. de Lanhoso	4	1.25	28.59	5.00	0.00
Santo Tirso	9	81.11	41.89	160.00	20.00
Trofa	18	87.50	36.39	160.00	45.00
V. do Minho	1	20.00	-	20.00	20.00
V.N.Famalicão	36	57.08	35.62	160.00	0.00
Vizela	0	-	-	-	-
Ave	87	63.68	43.36	160.00	0.00

Source: Adrave, 2008.

One of the most important effects of this ranking was the discussion, the rethinking and the rearrangement of the industrial parks. Known as an important source of discussion (Bennema *et al.*, 2005), the multi-criteria analysis had the merit of restarting the debate around the industrial parks arrangement at the municipal institutions and at the Amave (the Municipal Association) in order to ameliorate the industrial accommodations and surpass the debilities identified. Thus, Guimarães, Santo Tirso, Trofa and Famalicão redirected their rearrangement policies through the constitution of agglomerations of industrial parks that are composed by several

neighbour parks initially considered alone. This notion makes sense taking into account the short distance between the agglomerations (sometimes lesser than 1 km), the good connections and the proximity to some amenities located in the adjacent urban areas that are shared by all parks. The strategy advanced by the municipalities is the future consolidation of these agglomerations through actions and investments that will stimulate the integration and the articulation at the municipal scale of these parks. As a consequence of this work, the number of industrial parks has significantly declined. The most important reduction happened in Famalicão (from 36 to 16) and in Trofa (from 18 to 8). In the East Ave municipalities this rearrangement wasn't practicable due to the reduced number of parks and the great distances involved among them. This exercise was relevant to diminish the territorial fragmentation of the parks considered initially alone and to improve scale effects.
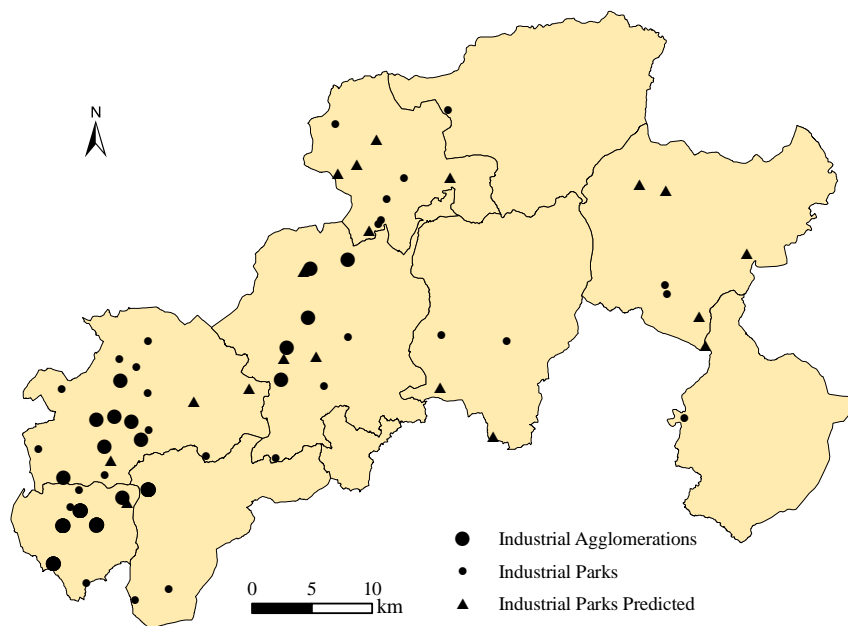
Source: Adrave, 2008.
Figure 3: Industrial agglomerations and predicted parks in Ave

Despite the agglomerations, the prospective analysis intends to anticipate the future effects of a wide range of actions more or less consolidated through a new ranking that will take into consideration some changes. The most critical elements are related to the reinforcement of the existing utilities/amenities and to the establishment of new industrial parks. Both these issues were considered in the foresight developed in the study. As we said, the lack of qualification penalises several industrial parks in Ave. Thus, in a first step, we only evaluated the future impacts of the investments predicted

by the municipalities to ameliorate the parks conditions. In a second step, we defined a minimum provision of infra-structures and amenities extensive both to the more incapacitated existing parks and to the predicted future parks. In comparison to the better positioned parks, we stipulated a range of utilities/amenities that should equip all the industrial parks as basic components to assure their attractiveness, where every categories, except wastewater treatment plants and eco-centres (both indicated to some specific industries), irrigation system, recreational equipments, service station, security service, infra-structures maintenance, entrepreneurs association and multi-use building, were included. With these sceneries, we tried to anticipate how Ave industrial parks will be in the future, how competitive will the less attractive be and how important will the predicted parks be at the municipal and regional scales. Following these purposes, a prospective ranking was developed, whose results are presented in the next Subsection.

3.3.3. The Ave industrial parks foresight

The industrial parks predicted by the municipalities will increase the number and the area of industrial accommodations but their benefits can be very changeable and doubtful. According to the results, the 10 parks predicted to Cabeceiras de Basto and Póvoa de Lanhoso will not bring any gains at a regional scale as it can be verified for their bad position in the prospective ranking. At most, these parks might be important at municipal levels, namely in Cabeceiras de Basto where the present parks are occupied. However, the location chosen for these parks will keep on the fragmentation and the repartition, increasing the installation costs and disregarding the scale effect, mainly in Póvoa de Lanhoso where this problem is more experienced. Despite the provision of minimum infra-structures and amenities, the industrial parks settled in the East sector will continue to face problems to get regional investments and the predicted parks will not emerge as feasible options. Indeed, the classification of all East Ave existing and projected parks in the second half of the prospective ranking highlights that the regional importance of these parks will be also limited in the future. The achieved gains will have a limited impact in their competitiveness at a regional scale. One reason for that is the general better position of the parks located in the West sector that will be increased by the two referential projects predicted by Trofa and Famalicão. In the *conventional* typology, both these parks will be the most advanced in Ave in terms of technological infrastructures and services. They will encompass amenities such as social and recreational equipments and generous areas of green spaces. Further, the excellent score

of these parks is also a reflex of their favourable location taking into consideration the accessibility and the distances criteria described before. The road and railway investments projected to this area, the proximity to the future logistic area of Maia/Trofa and to the Oporto Metropolitan Area also contribute to strengthen the future potential of these parks.

The definition and future work of industrial agglomerations also had implications in the prospective ranking. As we said, the definition of agglomerations originated a significant reduction in the number and fragmentation of the initial parks. This rearrangement improved the scores obtained by several parks considered alone in the previous analysis, since they benefit from the utilities and amenities existent in the adjacent areas. The major gains were achieved in Famalicão, which is the municipality with more parks ranked in the first position (5) and gets the best average (110). Thus, the reinforcement of the articulation of Famalicão parks will be important to strengthen their potential at a regional scale. Guimarães parks can also improve their importance at a regional scale, while the average of Trofa and Santo Tirso is quite identical to the first ranking. On the other hand, the constitution of agglomerations is aligned with the regional (and national) recommendations in order to achieve more critical mass and to promote scale effects. The study had the merit of emphasising the importance in cluster activities and to take up network principles, underlining the wrong way followed by the individual initiatives performed by the municipalities in comparison to the regional guidelines. At the same time, it highlights the need of adopting a more integrated and holistic policy to the industrial parks concerning the municipal and regional scales.

The reorganisation and the investments predicted by municipalities are important measures to ameliorate the parks quality and other factors connected to competitiveness (accessibility, amenities, etc.). Nevertheless, the benefits expected are dual. In Famalicão, Trofa and Guimarães, the gains obtained suggest that some parks can work like anchors of the regional development and main nodes of the future network; while the parks located in the East sector (considering the existent and the future strategies) can hardly have an important function in a regional scale, being more appropriate to ensure complementary activities and stimulate the development at a municipal scale.

3.3.4. The regional network of industrial parks

The industrial parks network proposal follows the regional recommendations (Silva *et al.*, 2008) and the main conclusions of the multi-criteria analysis described.

Thus, the regional network is subdivided in three spatial levels: (i) the regional parks; (ii) the supra-municipal parks; (iii) and the parks of municipal/local incidence. Figure 4 summarises the structure of the regional network proposed.
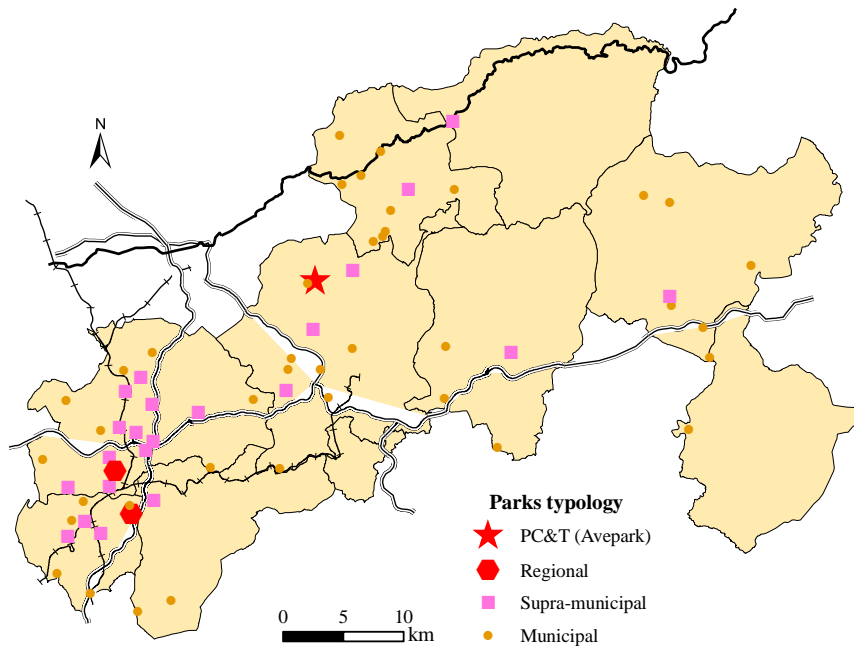
Source: Adrave, 2008.

Figure 4: The industrial parks typologies in the Ave network

The regional level includes two different typologies of parks: the Avepark (a science & technological park) and the predicted parks in Famalicão and Trofa. Strictly related to the Engineering School of the University of Minho, Avepark can be assumed as a regional sponsor of technological entrepreneurship and in the incubation and development of new activities. Whilst the only science park in Ave, the Avepark can be the differentiator and intermediate institution between the university and the firm-related domain in the effort of modernising and making the regional economy more competitive. Integrating an area of 38 ha (expansible until 80 ha) and having the most contemporary equipments and services, Avepark will have (and already has) the presence of relevant R&D international institutions, technological advanced firms and an incubator (Spinpark).

On the other hand, the mentioned parks predicted to Famalicão and Trofa can play an important regional role in the future for two reasons. Firstly, for the dimension and the quality of facilities and amenities planned for these parks will be the most advanced *conventional* parks in Ave. Secondly, the location projected to these parks is very favourable considering the accessibility and distance criteria as well as the

proximity to several amenities and to logistic infra-structures (some of them located in the neighbour Oporto region). Furthermore, the establishment of these parks of regional incidence is in accordance with the instructions promoted by the CCDR-N. The only problem can arise from the relative proximity between both parks that can have an excessive importance in the entire region as the most attractive anchors to firms and investments in detriment of the remaining territory, worsening the regional asymmetries.

The supra-municipal parks appear in a second level. This level is composed by a constellation of well scored parks that have the potential to work as intermediate nodes between the regional parks and the municipal ones. The priority for the supra-municipal parks should be the requalification, particularly the amelioration of the infra-structures and amenities coverage in order to reinvigorate the competitiveness through the regional parks network. As Figure 4 shows, several supra-municipal parks are related to the industrial agglomerations defined. The success both in the agglomerations and in the regional networks strongly depends on the accessibility and communication enhancement to obtain the desirable effect of scale and cooperation.

At least, the third level is constituted by the municipal parks which were less scored in the ranking. In many cases, this level is composed by small and unqualified parks that work like firms depositories frequently without a specific productive activity (warehouses, retail trade, stands, etc.). Thus, these parks can hardly play a significant role in the regional network structure, but still have importance in the liveliness of local economies, creating jobs in areas where the opportunities are scarce, like in the East Ave. Upgrading the municipal parks should be the dominant strategy to take local advantages of the supra-municipal dynamics. CCDR-N itself supports the entrepreneurship revitalisation of these areas. The exploitation of local resources and the investment in thematic parks can also be a good strategy to put East Ave municipalities as complementary to the remaining.

4. Conclusions

Industrial parks undoubtedly have an important role in the socioeconomic development and in the environmental and territorial planning domains. In fact, industrial parks occupy a central position in the national and regional entities agenda as an essential tool to ameliorate entrepreneurship and competitiveness. In Portugal, the constitution of industrial parks networks at a regional scale is proposed and defended as

the right way to diminish the isolation of the municipal strategies to obtain the critical mass needed to strongly sustain the regional development (CCDRN, 2006; Silva *et al.*, 2008).

The article describes the main steps of a study that aim at applying these principles to Ave, a traditional industrial region where a high number of parks is located. Using a multi-criteria analysis, the prominent debilities of the industrial accommodations in Ave were emphasised and the gains linked to the future articulation and rehabilitation of industrial parks were demonstrated. Furthermore, the multi-criteria analysis stands out that the creation of new parks predicted by some municipalities (mainly in the East Ave) will not bring substantial gains at a regional level because these strategies perpetrate mistakes undertaken in the past: the construction and fragmentation of unqualified parks by the municipal areas. Thus, these policies should be reviewed and well examined by the municipalities; otherwise they will deteriorate even more the existing unoccupied rate.

The multi-criteria analysis was also helpful to formulate the regional network structure based on the scores obtained by each industrial park in agreement to the CCDR-N recommendations. Three vertical and hierarchic levels of industrial parks were selected in accordance to the potential of each park from a regional to a municipal/local scale. The purposed network also depends on the reinforcement of horizontal connections in the accessibility and communication domains to ameliorate the articulation between the institutions of different levels and between the parks of the same category. Only this way the reclaimed cooperation and solidarity at a regional scale can be attained.

Despite investments, the future success of this regional network depends above all on the effective interest displayed by the regional entities. One of the greatest merits of this study was to mobilise the regional entities to the need and urgency of adopting common measures of regional cooperation in order to surpass the problems and the asymmetries diagnosed in Ave. Underpinned on this move, the study presents an increased legitimacy that should be considered in the future projects of regional development.

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