Is Central Paris still that rich ?

Frédéric Gilli[*†]

July 8, 2005

Abstract

From 1975 to 1999, employment in Paris metropolitan area has become more and more decentralized. This deconcentration is almost half spread and half clustered.

Parallel to the sprawl of jobs, the growth of a services oriented economy has led to an increase in sectoral concentration. But there are no clear evidences of a vertical spatial desintegration, because by the same time the places tend to diversify.

An explanation might be that the sprawl relies both on endogenous job creations and on job relocations: the relocations tend to increase the specialisation of the clusters but endogenous growth is more diverse and residential.

JEL Classifications: L23 - O18 - R11 - R12

[*]Frédéric Gilli (CERAS-ENPC), 193, rue du faubourg saint-denis, 75010 Paris, frederic.gilli@ensae.org, 33-6.84.32.32.32

[†]This research has been partly undertaken as the author was hosted by the INSEE. It was part of a program funded by the DREIF (Regional authority for infrastructure, transport and spatial planning). The author thanks Jacques-François Thisse for his support. I also thank Hubert Jayet and participants to a CEPR conference in London on *the economics of cities* for thoughtfull comments on previous versions of the paper.

Urban Sprawl is undeniably the major caracteristic of nowadays cities. Low density landscapes surrounding previous center seem to be commun to what we call now metropolitan areas. But, as Garreau (1991) notes it, the suburbs are more than endless fields of individual houses. "Edge cities" rise at cross roads, and they count now more offices, commercial square meters and even employments than the historical CBD. Acording to Glaeser and Kahn (2004), most of the employments were historically located in the center but this share as come down. It has gone down to far less than 50%.

But our knowledge of this evolution is partial. As pointed out by Anas et al. (1998), we do not know if the employment is centralised or not. And if it were to be decentralised, we do not know if it is spread or clustered. This paper focuses on Paris. On the basis of french census from 1975 to 1999, it answers both questions as far as the french capital city is concerned.

Once the employment deconcentration has been set, some questions remain on the economic geography of metropolitan areas. Following Fujita and Thisse (1997, 2002), it is critical to differentiate vertical spatial desintegration from horizontal spatial desintegration. If the activities are vertically desintegrated, the sprawl should lead to a collection of specialized clusters. If they are horizontally desintegrated, there should be identical centers of different sizes all along the metropolitan area.

A city never corresponds exclusively to one type or the other, but there is a theoretical moto behind that issue. If a metropolitan area is to be considered more as a collection of cities of similar economies (horizontal desintegration), it means that it would be some kind of micro region. A Christaller (1933) type of hierarchical model, such as Fujita, et al. (1999), would be more appropriate to caracterize the cities. If the activites concentrate while the employment of a metropolitan area deconcentrates (vertical desintegration), it could mean that the historical von Thünen model (1827) remains valid at another scale. Ogawa and Fujita (1980) or Imai (1982) would thus analyse deep trends of the urban evolution.

The moto of the paper comes from the fact that greater Paris has changed. Its economy has changed. The location and types of the jobs have done so. But when a city such as Paris spreads, the jobs might remain concentrated around the center or leave it, either to sprawl or to cluster. The following sections will deal with the consequences of such an evolution. The section 2 focuses on a definition of the greater Paris Area and draws a panorama of its economy and of its outer boundaries. In section 3, more attention will be paid to the evolution of the job pattern. The section 4 finally concentrates

on the economic analysis of the employment location and relocation in the metropolitan area. It analyses how it comes to a vertical spatial desintegration but with local diversification.

1 The Greater Paris Area

Over the pas three decades, the Greater Paris Area has been a fast growing metropolitan area and has experienced important advances in its economic and geographic organisation. Mostly three changes are to be mentionned. First it moved from an industrial economy to one of the most services oriented in the world (81% of its jobs). Secondly, suburbanisation has been increasing and the metropolitan area has become wider and wider. Some edge cities are now more than 80km away from Notre-Dame. Third, the organisation of the area has changed as well. The jobs that used to be concentrated mostly in Paris have left for the suburbs and secondary employment centers have grown fast. A few SEC have arisen in the immediate vicinary of Paris (La Defense is now the most important CBD in Europe), others in what was once a rich agricultural land (Roissy Airport) or an Impressionnist landscape (Vallée de la Seine and Vallée de l'Oise).

That third phenomenon is the focus of the present paper. But it begins with the changes in the employment and the size of the region.

1.1 A services oriented economy

From 1975 to 1999, Greater Paris has gained 500,000 jobs. By the same time, the major industrial sectors of the region (mechanics, car industry, chemicals, iron industry) have lost from 40% to 80% of their employees. Some of these sectors remain important providers of jobs today (Car industry, Aeronautics and space, Pharmaceutics) but those are mainly R&D and a lot of the factories are gone. Hence, most of the jobs are now services oriented: some activites once marginal have become prominent (Consulting, Financing, Insurance) while existing activies have boomed (Telecommunication, of course, and also Governement, Health and Social activities or Education).

In parallel with the fall of industrial employment, there are fewer and fewer hand workers and more and more office workers and high skilled jobs (fig.1). In 1975, there were 1,660 million hand workers (32% of the total work force) 1,660 employees (also 32%), 1 million office workers (technicians,

intermediate professions, 19%), and 590 thousands high skilled (11%). In 1999, there were hardly 1 million hand workers (38% less than in 1975), still 1,640 million employees (minus 1%), but 1,410 million office workers (41% higher) and 1,165 million high skilled (97% higher). Those trends have been steady for the last twenty five years. In the end, hand workers represent only 19% of the total jobs, whereas office workers represent 25% of this total and high skilled 21% (against 12% in France at a national level).

1.2 Greater Paris: remote outer limits

The city of Paris and its close suburbs are particularly dense. Nevertheless, as in any metropolitan area, suburbanisation has been occuring. Until the mid 1960's, the population growth concerned mainly the existing agglomeration: the suburbs were more and more densily populated. From then on, the growth has jumped to the most remote suburbs. It has reached even historical cities located on the other side of the Greater Paris 'Green Belt'. Today, the population growth consists of a spread to rural landsdcapes rather than densification of the existing urban areas.

There are now two rings of edge cities in the area.

- Historical cities are the most remote ones. They are located on each side of the green belt. On the inner side (50km to Notre-Dame), they include Rambouillet, Meaux, Fontainebleau, Chantilly, etc. On the outer (80km), they are Chartres, Evreux, Dreux, Beauvais, Compiègne, etc. Those cities are located on the outer fringe of the urban area and have gradually become part of its daily system. The working population living there commutes more and more massively to the Greater Paris employment centers. So that those cities are gradually integrated to the regional job market. The closer ones already belong to the region (more than 10% of their population commutes daily to Paris). The remote ones have witnessed a strong increase of the share of their populations attracted to the Paris market.

- The five 'New Towns' (30km) are close to the dense area and more and more a part of it. They were built out of nothing in the early 1970's and all have reached a population around 100 to 150 thousand in 1999. The governement has also developed ex-nihilo employment centers on the same ring : the Airport (Roissy Charles de Gaulle) and a major scientific cluster (the Plateau de Saclay).

The figures and computations of the present article deal with this greater metropolitan area. Paris agglomeration is 9.6 millions people and 4.6 millions

jobs. Greater Paris Area is more than 12 millions people and 5.8 millions jobs.

2 The Spread of the jobs

2.1 Suburbs and clusters: job spread

2.1.1 The employment spreads with distance to the center

Lots of empirical studies prove the existence of a declining density from the center to the periphery. In the Alonso-Mills-Muth model, this is clearly linked to the assumption of the normality of land: the lot size increases with the distance to the center likewise the density decreases. This is clearly verified for the greater paris case when considering the average employment per commune regarding the distance to the center: The average number of jobs per city decreases steadily from the center toward the periphery (fig.2). From 80,000 in the center the number of jobs falls down to 20,000 when moving 4km away from the center and then decreases steadily. There are 15,000 jobs per city between 8 and 12 km from the center and 10,000 jobs between 12 and 16 km and less than 5,000 jobs further away.

This approach however mechanically hides the existence of Secondary Employment Centers (SEC). When moving away from the center, more and more cities come in computation of the average number of jobs. Lets consider a ring at 16km from the center that contains 100 cities. If there are two big employment centers in that ring, their weigth in the average is 2%. Whereas in a closer ring with 10 cities, their weight in the average would be 20% hence resulting in a much higher average, everything else being equal. The analysis with concentric rings hence diminishes the impact of peripheric centers. To counteract this problem, a solution is to use quantile rather than means as Craig and Ng (2001) do. Their non-parametric analysis is not reproduced here but some statistical choices are inspired from it. When considering the 5, 10 or 25% cities that have the highest number of jobs, the shape of the function that links the number of jobs to the distance to the center isn't monotonous anymmore. Overall, it still decreases, of course. But htere are two sparks one between 8 and 12 km and one between 24 and 32 km (fig.2). They correspond to La Défense, an important CBD in the closer suburbs, and to the new towns and to scientific centers or transportations hubs mentioned above. ..

It is precisely those places that witnessed the highest employment growth between 1975 and 1999 (fig.3): the cities that gain the highest number of jobs are located in those two rings, whereas inner Paris loses jobs over that period. Furthermore this growth affects not only the employment centers but all the cities in the periphery since the average growth accross all cities is positive between 8 and 44km from Paris. Further than 50 km from Paris it is neglectible.

2.1.2 The employment spreads over time

Set aside a few centers, employment is more spread out in the suburbs than in the center. The employment suburbanisation that occured over the past three decades must have a part in this spread.

Employment concentration in cities in the Greater Paris Area can be analysed with an Herfindahl index. Let x_c be the employment in one of the 3,373 cities of the region and x be the total number of jobs in the region, $HC = \sum \left(\frac{x_c}{x}\right)^2$ varies from 1/3373 to 1. The higher HC the more the employment is concentrated in a few cities. This index can be computed after each census. The evolution between 1968 and 1999 wil show whether the employment has concentrated over the period or not.

The spatial deconcentration of the job pattern appears clearly considering Herfindahl indices. Such a concentration index based on the local share of total employment decreases regularly from 0.013 in 1968 to 0.007 in 1999 (fig. 4). Over the past 30 years, it has fallen by 50%. The evolution is not only due to the losses of inner Paris : the bigger employment clusters weight less and less in the total employment of the area. Without the inner city, the Herfindhal indices go from 0.013 in 1968 down to 0.007 in 1999. The only remarkable difference between the two series is that when including Paris, the steepest decrease in the index occurs between 1982 and 1999 whereas when excluding Paris, the steepest decrease occurs between 1968 and 1982. This may be due to the building of huge urban infrastructures during these years (the new towns and the airport). In the first period mentionned the employment concentration outside Paris in the historical centers has decreased due to the apparition of these new "competing" centers created ex-nihilo. During the second period, the growth of the new centers has not been at the expense of the historical center anymore. On the contrary, those centers along with the suburbs have taken advantage of the massive employment spread from the center. New centers, historic centers and even remaining cities have thus

benefited from this outward movement that is both spread and clustered.

2.2 The rise of a multipolar city

On the one hand, the spread of employment contributes to urban sprawl and on the other hand it leads to local concentration and to the development of SEC. Between 1975 and 1999, SEC have grown fast. Geographically, they have spread and they have also become more dense. It reflects in the shape of their recrutment areas (Berroir, et al., 2002) as well as in the overall distirbution of jobs.

2.2.1 How to determine employment clusters : a quick survey

Looking for the structuring centers of a territory implies two steps. First the identification of the centers and their borders and then the drawing of areas of influence of those centers.

The determination of centers within an urban area is a topic that has been dealt with in numerous papers over the past fifteen years (Anderson, 1982, 1985, McDonald, 1987, 1989, McDonald and Prathier, 1994, McMillen and McDonald, 1997, 1998, Giuliano and Small, 1991, Small and Song, 1994, Zheng, 1991). The determination solutions mostly rely on both the principle of spatial continuity and the definition of an employment threshold based on a measure that can be either absolute or relative. If one takes into account the distribution of jobs in the whole urban area, the employment threshold will be defined as relative: local employment is measured either as a deviation from an econometric estimate (Alperovitch and Deutsch, 1994, McMillen and Smith, 2003) or with a non-parametric method (McMillen, 2001, Craig a,d Ng, 2001). A SEC is uselly defined as a body of contiguous spaces that have a number of jobs gretaer than a specific threshold and that are grouped close to a core center that is above a greater threshold or that corresponds to a local maximum.

In a particularly dense urban area such as Greater Paris, to use administrative spatial limits raises an issue. Indeed the method makes it impossible to distinguish two SEC if they are contiguous. To avoid those constraints, the outline of the SEC have been defined using a kernel analysis. The method relies on the assumption that the impact of a local concentration of jobs is not contained within the administrative boundaries of a city. Moreover,

agglomeration externalities are assumed to spread the dynamics around the central point of economic concentration [1].

2.2.2 The rise of suburban clusters

The weight of the Secondary Employment Centers increases both because they are more numerous and because they are geographically bigger: there are more clusters and the existing ones spread to their neighbourhood.

First, there is an increase in the number of SEC: there were 38 significant clusters in the greater paris Area in 1975, there are now 54. The number of major SEC remains the same; 39 in 1975 (fig. 5) vs 38 in 1999 (inner paris included). Now, whereas there is an important gap between the major SEC and the smaller local clusters in 1975, this differences has shorten in 1999 (fig. 6). Hence, 16 smaller clusters emerge from the surbuban area. This raises the number of employment centers up to 54 clusters in 1999. Also the clusters surrounding Paris are more dense in 1999 than in 1975 and the difference with the center is thinner.

[1] If the importance of agglomeration and urbanisation externalities is well established now, their extent, their characteristics and their diversity are the object of debates. We assume here that the location of a high number of jobs has an influence over the contiguous spaces. Based on this assumption, we decide to work not with city measures but with a smoothed employment measure. Using a grid for the Greater Paris Area made of hexagones that are 350m long, a kernel method is implemented with a bi-weight function. To each point in that grid a smoothed employment measure is assigned that includes the effect of all the employment located nearby. This leads to a density function that maps the area. Points where the density reaches a local maximum are considered as potential SEC. By definition, all contiguous hexaones have a lower employment and are assigned to the SEC. The limits of a SEC are met when the employment density reaches a partial minimum or falls below a defined threshold. The main advantage of this method is that it allows to specify divisions within an urban area in a relatively objective manner. This way, the evolutions of these divisions between 1975 and 1999 can be analysed.

Thresholds are twofolds. There is a threshold for a local maximum to be considered as a SEC and there is a threshold for a unit to be assigned to a SEC (cities with very low employment density will not belong to any SEC even if they are very close to one). To be able to compare the resulting divisions between different times, the thresholds are defined relatively to the distribution of the local maxima in the Greater Paris Area. The local maxima are ordered by decreasing employment density. local maxima with similar employment densities are grouped into a single category of SEC. If the density falls down by more than 90% from one SEC to the following, there is a threshold. Paris being a SEC of category 1, the following SEC are assigned following categories regarding the local maximum of their employment density. Most of the maxima are gathered in the last group. They have too little a density and they are not considered as SEC.

Second, the clusters are wider, especially those on the border of the dense area of 1975. A cluster can get bigger either because it has more jobs, or because it extends to more areas. Between 1975 and 1999, 78 more 'communes' are included in clusters. Most of these communes belong to fast growing areas. With 270,000 jobs more in 1999 than in 1975, these communes account for more than a half of the job growth in the SEC.

Overall, the growth of the clusters has been important in the past 25 years : they have gained 490,000 jobs (without the losses of Paris), mostly located along the previous edge of the Paris dense area in 1975. But if the figures show fast growing suburbs around existing clusters, it remains that the growth is also significant in previously unnoticed areas.

2.3 Core, clusters and suburban employment

In 1975, there were almost 2 millions jobs in Paris and the city wheighted more than one third of the total employment of the Greater area. In 1999, it is hardly one quarter of it (fig. 7). The city of Paris lost 320,000 jobs and it is not entirely compensated by the gains of the rest of the 'Dense area'. The places located in the great vicinity of Paris have gained only 100,000 jobs. The core of Greater Paris overpasses the strict limits of the cities and extends to this dense area. But even given this enlargment of the core, the losses of the center of greater paris (the city and its closest suburbs) amounts to more than 200,000 jobs over the past 25 years. The core represented two third (64%) of the total employment of the area in 1975, now it represents one half (54%).

At a regional level, the losses of the center are more than compensated by the growth of the surrounding places. They represent now almost half of the regional employment and have gained 700,000 jobs over the period. This growth is not just due to the rise of secondary employment centers in the periphery. The SEC have gained almost 400,000 jobs while the spread suburban areas have gained more than 300,000 jobs. Half of the growth around the central area is due to the dynamic of former rural areas. These places have gained more jobs (322,000) than what the city of Paris has lost!

3 Specialization or diversification in clusters?

As regards the economic activites, a spread of the job pattern entails a spatial deconcentration. If the suburbanisation has an economic logic, it should coïncide with a spatial desintegration of the activites. This desintegration can be either vertical or horizontal. It is horizontal if all the different sectors spread in the same ways. It is vertical if each sector remains clustered and as concentrated it originaly was but changes its location for a more peripheral one. In the second case, the sectoral concentration remains the same but the entire employment concentration decreases.

How the jobs spread from a sectoral point of view raises two questions : first, what are the economic logics lying behind the employment suburbanisation. Second, is there diversity or specialisation within cities.

3.1 Vertical desintegration

3.1.1 Sectoral concentration, general deconcentration

While the overall employment spreads, the sectors can either spread or relocate. Herfindahl indices computed for each sector tend to show that they have relocated. This might induce a vertical rather than horizontal spatial desintegration.

Again, if a Herfindahl indice rises, the sector is more and more concentrated in a small number of communes. On the contrary, if it decreases, it means the employment of the sector spreads more equally among the communes. From 1975 to 1990, the average sectoral concentration index is stable : it comes from 0.040 to 0.039. And from 1990 to 1999, based on a different nomenclature[2], it is stable : 0.022.

So between 1975 and 1999, the concentration at a sectoral level has not changed while the overall employment has spread. Given this general deconcentration of the employment over the same period, one might even consider that the relative concentration of each sector has increased. An Herfindahl index corrected to account for this evolution ($\frac{HC_S - HC}{1 - HC}$, with HC the economy concentration index and HC_S the sectoral concentration index) is stable

[2]In 1993, the way to classify activities has changed to give a bigger place to services oriented activites in the industry. The statistics for the year 1990 are coded both ways. This change has no influence on the total employment, but it has one on the spatial concentration of the sectors because the number and the composition of each sector changes.

from 1975 to 1990 but increases from 0.013 to 0.016 between 1990 and 1999.

This is not due to the strong concentration of a few sectors that would compensate the overall spread of other activites. The standard deviation of the sectoral index among sectors has also strongly decreased. Over the period, there is indeniably an employment deconcentration, but each sector tends to remain as agglomerated in 1999 as it was in 1975. One way to reconcile the two dynamics could be that some sectors have left the center while other have remained there. Overall, the total employment is more evenly spread but each sectors remain concentrated: a vertical desintegration has occured.

3.1.2 Link bewteen spatial concentration and sectoral growth

Economic sectors considered separately show relatively stable concentration levels. The variations one can notice about a few sectors are marginal and all head toward a convergence of the concentration levels. Sectors thatused to be highly concentrated tend to deconcentrate while a few sectors with a low concentration level in 1975 have evolved the other way (fig. 8).

This evolution has to be considered in relation with the development of new economic activites. The sectors that grew fastest have become the main job providers at the end of the period. On the opposite, sectors that used to employ very large populations have lowered their levels of employment over the period. Now the location of a sector in a city is linked with its history and its size.

In 1975 the activities that will grow the most in the following 25 years are at that time the most concentrated as well. The concentration index at the beginning of the period is positively correlated with the employment growth rate of the sector . Starting in 1982, sectors that grow tend to spread in the region whereas regressing sectors tend to concentrate. The correlation between the evolution of the number of jobs of a sector and the concentration index of this sector becomes negative while it was not significant over the first period running from 1975 to 1982. Transition from an industrial economy to a services economy both leads to a spread of the services (especially the services to firms that were once very concentrated) and by a concentration of the industry.

3.2 Diversity and specialisation within cities

If the total employement spreads while the sectoral concentration remains stable, that means that some sectors have relocate. This might have consequences on the local specialisation of the targeted places. If an entire sector relocates in a place that was once a kind of wilderness, it will soon become very specialized. Despite this, there has been a massive diversification of the employment clusters.

3.2.1 Convergence of the employment pattern of the clusters

As well as the concentration of the sectors, the specialisation of the SEC can be tackled with Herfindahl indices. x_i being the local number of jobs in one sector and x being the total employment of the area, the index sets the share of each sector in the employment of the area $HS = \sum \left(\frac{\times_i}{x}\right)^2$. In 1975, the specialisation index of the Greater Paris Area equals 0.0213. It increases to 0.0222 in 1982 and remains quite steady in the 1980's (0.0219 in 1990). Of course, the change in the nomenclatura in 1990 changes the value of the index. With the new sectoral definition, the index equals 0.0161 in 1990. It increases to 0.0183 in 1999. Hence, all along the past 25 years (out of the 1980's), the Greater Paris Area tends to be more specialized. We use a specialisation index for the SEC k that accounts for the specialisation of the region, $\frac{HS_k - HS}{1-HS}$.

The SEC appear less and less specialised relative to the region. According to the former nomenclatura, the average index decreases from 0.0294 down to 0.0226 between 1975 and 1990. The diversification keeps on in the 1990's: the index goes from 0.0203 down to 0.0158. A few cases set aside (Boulogne and Courbevoie-La défense that are specialised CBD) this evolution is observed for all the SEC, including the city of Paris. The standard deviation of the specialisation levels among all SECs decreases steadily over the period.

The increasing weigth of the services in the economy translates into, on the one hand a decrease of the diversity of the sectors at a regional level and, on the other hand in a diversification of each SEC. Considering that by the same time the concentration of the sectors has remained stable, this diversification of the SEC is hard to explain. Maybe the local growth experienced by the SEC over the period has been strong enough to compensate the natural specialisation that should be induced by a vertical spatial desintegration of the employment. Actually, the biggest clusters are the most diverse and

the correlation between size and specialisation of the clusters remains stable along the period (fig. 9). When just considering the industrial activites, the absolute correlation decreases sharply between 1975 and 1990 (from -0.3 down to 0). It becomes again significantly negative between 1990 and 1999 (-0.4 in 1999).

3.2.2 Same socio-economic trend for all the clusters

One hypothesis, is that this convergence might be due to a symetric change in the types of jobs (functions) that has affected all the clusters simultaneously: the rise of high-skilled jobs (fig. 10).

All the employment centers have experienced the same trend. They have lost their hand workers and have gained high-skilled people and technicians. Considering the office employees, the evolutions are different, the center has lost some of its employees while the periphery has gained a lot. In the end, the center still hosts most of the high-skilled jobs, but its share of the total has shrinked from one half to one third. Even if the number of high-skilled has increased by 45% over the past 25 years (+130,000 jobs), the city of Paris weights now almost the same as its close suburbs. The number of high-skilled in the dense area has more than doubled (+140%, +215,000 jobs) and the close suburbs represent also one third of the total. The relative growth has been even bigger in the remote periphery: the clusters have gained 150,000 high-skilled jobs (+160%) and the suburban area has gained 80,000 of them (+155%). The evolution is symetrical for hand workers: there are 575,000 more high-skilled jobs in the Greater Paris Area (+97%) and 625,000 hand workers jobs are left (-40%). The office workers and technicians are still more numerous: while there are 1 million hand workers and 1.1 million high-skilled, there are 1.4 million technicians (+410,000) and 1.6 million office workers (-25,000).

For most of the employment centers, the rise of the services and of the high-skilled jobs has meant a dramatic change in the balance between industry an services, and between hand workers and technicians or office workers. In the suburbs, the decline of the industry and the rise of new types of activities has lead to a more diverse job pattern. On the contrary, the same change has led to a functionnal specialisation of Paris and particularly of Boulogne and La Defense over the last ten years. These places were originally rich in high-skilled jobs and the new trends have reinforced this specialisation. The city of Paris is more diverse in 1999 thanks to the evolution of its sectoral

pattern.

3.2.3 Convergence even for industrial activities only (without Governement or Residential jobs)

One other hypothesis to explain this convergence would be the growth of residential activites everywhere. This could make the industrial differences neglectible. But the same figures remain with or without the residential activities. Take only the industrial and 'professional' activites and there is also a diversification of the local jobs and a convergence of the clusters diversity. This would mean that the local growth has been fast enough in the peripheral clusters that nowhere a single type of activity has pushed up a cluster. There was always at least two professional sectors to monitor the local growth.

Size and Specialisation : There are some slight evidences that there is an influence of the residential activites on the specialisation of the cluster. Considering all the activities, the bigger the cluster, the wider its diversification. On the contrary, this is not true for the industrial activities only: such a correlation is observed in 1975 and also in 1999, but ther is no sign of it between 1975 to 1999

As for an explanation, between 1982 and 1990 there is an agglomerative growth, which means an inforcement of the specialization on the bases of existing activites ; the 'natural' tendancy toward a negative correlation between size and specialization might have been annihilated in the industrial activites because of a cumulative local growth. The history might run as follows: 1975, the geography is the one inherited from the industrial development of the 1960's; 1982-1990 a new organisation based on new activites is rising on a cumulative basis; 1999, the new activites are now well established and developped, they (re-)located out of their initial 'nursery clusters' and spread in the metropolitan area on a 'market power' base. The industrial specialisation of the clusters thus tends to decrease with their size.

At all, a bigger cluster does not mean a stronger industral specialisation or diversification but it comes with a wider range of residential activites. This might partly explain the coexistence of figures inducing vertical spatial desintegration (sectoral concentration remains the same for most of the sectors) and horizontal spatial desintegration (the local Herfindahl index are decreasing): the growth of clusters is based on sectoral advantages and some might reinforce during the period. This growth might be based on one or

several sectors, but when it is important enough it generates and attracts new activites. these activites are mainly residential ones but it can also be the case for industries. When a type of industry has been a fast growing one for long, it can spread and contributes to the diversification of the employment pattern of the clusters, especially the bigger ones.

3.3 The influence of job relocations

Not more than 1.9% of the firms relocate their plants. In spite if their little statistical importance, relocations[3] give strong insights in the dynamics of territories. First with 1 relocation every 5 creation, they represent a significant share of the new located firms. Second a relocation is expensive (Jayet et al., 1999, Pellenbarg et al., 2000, Vicaire and Levasseur 2003). A firm needs to find a new site but also faces specific costs to guarantee that it will not loose anything valuable during the transfer : data or equipments should be preserved, employees might leave the firm as well as clients...

if there is a massive evolution of the job pattern, such as the employment suburbanisation, it should reflect in the relocations of the firms. Indeed, relocations take animportant part in the employment sprawl. If the center exchanges most, it also looses a lot of firms.

3.3.1 How relocations and job spread might be connected

Between 1990-1995 and 1996-2001, the deficit of the SEC at the advantage of the non-agglomerated areas of the Greater Paris Area diminishes but remains important. There were 11,079 exits to these places for 7,447 arrivals in the clusters between 1990 and 1995. There has been 12,007 exits for 9,741 arrivals between 1996 and 2001.

The clusters of the core take the biggets part of the relocations that occur within the Greater Paris Area. Paris and Courbevoie-La Défense both account for almost 8% of the relocation of the area. But Paris weights a lot more in the total employment. If the central clusters have lost numerous

[3]Statistically a relocation is considered only when all the jobs have disappeared on the former location and if the destination is an entirely new location. Of course, in reality, most of the relocations occur piece by piece. A firm usually shoots down a part of a plant to develop another existing plant. These "partial" relocations are not tracked in the data (DADS and SIREN - Insee). However, there is no strong evidence that the partial relocations and the complete relocations are different as far as spatial analysis is concerned.

firms their deficit related to the volume of in and out relocations is less important than the deficit of most of the SEC located in the vicinity of the core (especially in the eastern part). The clusters that most benefit from the relocations are all located on the fringes of the area: Les Mureaux, Cergy, Roissy, Savigny, Nemours, Château-Thierry and Meaux, etc.

But on average the clusters loose firms. At all, the balance of relocations within the Greater paris Area is negative in the center and positive in the suburbs and the SEC of the periphery.

3.3.2 Nursery clusters in nursery cities?

In the Greater Paris Area, the turn-over is higher than anywhere else in France. Beside, the balance of Greater Paris is negative. On average between 1996 and 2001, relocations account for 1.9% of the firms in France (1.6% between 1990 and 1995) whereas it reaches 2.7% in the Greater Paris Area (repsectively 2.3%). But this does not mean that the Greater paris Area progressively loses its activites. By the same time the capital region has also created more firms than the rest of France. The turn over is higher in the Greater Paris Area but it corresponds exactly to a higher rate of creation. In Greater Paris, as in France, there are 21.7 relocations for 100 creations between 1996 and 2001. The nursery cities model, as depicted by Duranton and Puga (2000, 2001) seems to apply to the Greater Paris Area.

According to this model, the big cities are the places where most of the firms are created. But because of high urban costs, the firms progressively relocate outward. As far as Greater Paris is concerned, such a scheme fits to the relations not only among urban areas, but also among clusters within a single urban area.

First, the highest rate of turn over in the area concerns the firms that are 3 to 4 years old. They are older than the french average and this age corresponds exactly to the time when a firm begins to be mature. The 3 years old firms come from the central and south-western clusters, and also from Roissy, Marne la Vallée and Melun. Most of these clusters figure among the high-tech employment centers of the region.

Second, the sectors concerned by the relocations are different in the Greater paris Area and in France. Services to firms account for 31% of the relocations, second the wholesale sector (14%), the building industry (12%) and the manufacturing industry (10%). At a national level, services to firms are first but they account for not more than one quarter of the total. The

building industry is second and represents 15% of all the relocations, the education and social services account for 12% of them and wholesale as well as retail trade both account for 11% of the relocations.

The core of the region thus exports young and mature firms (3 to 6 years) concentrated in industry and services to firms. The most wanted destinations of these firms are the fringes, either the peripheral clusters or the non agglomerated peripheral places. This corresponds to the model of nursery clusters. The question of the links between relocation and local specialisation remains.

3.3.3 Relocations and local specialisation

For a cluster, a simple specialisation index is computed fr each sector. It gives the ratio of the share of the sector in the local employment z_k to the share of this sector in the Greater Paris Area, z_R. Namely, $I = \frac{z_k}{z_R}$. A cluster is known as specialised in a sector if the specialisation index computed for this sector and this cluster is higher than the regional mean (not weighted) plus two times the standard deviation. On the contrary, the cluster will be noticebly averse to a sector if the index is two standard deviations below the regional mean.

The same calculus can be computed on incoming relocations rather than on local employment. It gives the specialisation of the relocations. For a given cluster, the relocations can increase its specialisation. It is the case if the SEC is specialised in (or averse to) some sectors and if the relocations are also specialised in (or averse to) the same sectors. The relocation can also be neutral. For example, a cluster is specialised in some sectors and the relocations show different specialisation but nothing noticeable for the local speciality. Finally, the relocation can decrease the specialisation of the cluster. It is the case if a SEC is specialised in (or averse to) a sector and if on the contrary the relocations are averse to/specialised in the same sectors. In those cases, the employment composition of the SEC rapidly converges toward the regional composition.

Comparing the specialisation of the employment in 1999 to that of the relocations from 1996 to 2001, thirty-four clusters out of fifty-four present non-neutral relations among local jobs and relocated jobs (fig. 11). Among these thirty-four, the relocation of jobs increases local specialisations (or aversions) in twenty-four cases. There is just one cluster that presents only opposite relations. Sens is specialised in agro-industry and relocations show

an aversion for agro-industry in this place. For the nine other clusters, relocations increase the local specialisation (or aversion) in some sectors but there are also opposite relations for other sectors (mostly agro-industry). Opposite relations between local jobs and relocations mostly concerns peripheral clusters of the region and are concentrated on one depressed sector (agro-industry). The central clusters show either neutral or (more often) important specialisation/aversion logics.

As far as Greater Paris is concerned, relocations seem to favor a vertical spatial desintegration. Jobs leave the center to relocate in the periphery, so there is an employment suburbanisation. But they do not relocate anywhere and firms tend to favor the places that are already specialised in their activities, thus increasing the local specialisation.

This reinforces the hypothesis that the local diversification is not due to relocations (there has been a vertical spatial desintegration over the period) but more likely that it is due to local growth, what remains to be tested.

4 Conclusion

From 1975 to 1999, the employment pattern of the Greater Paris Area has changed. The jobs have suburbanised, the local specialisations have evolved and the general balance has changed in the region. On that period, the center of the metropolitan area, the city of Paris, has lost more than 300,000 jobs. By th same time, the rest of the metropolitan area had gained 800,000 jobs: 100,000 of them just arround the ring of the city of Paris and 700,000 in the remote periphery 400,000 clustered and 300,000 spread in places that were rural only 20 years ago.

In 1999, the city of Paris is still prominent, but along these 25 years, jobs have spread, both sprawled and clustered. Hence, the overall employment is less concentrated in 1999 than in 1975. By the same time, the sectoral concentration has remained steady. Among other arguments, this shows a vertical spatial desintegration. But in parallel, the local specialisation of all the clusters has decreased. So there is both a local diversification and a vertical spatial disintegration. This questions how the dynamic of the change has occured.

On this particular point, the paper offers no clear conclusion. It focuses on the relocations of the firms and states that they favor the periphery (clustered and non-clustered places). They mainly leave the center, and some specific

clusters, where most of the firms are created. This draws the picture of nursery clusters, as there might be nursery cities. Considering the effect of the relocation on the local employment, they tend to increase the local specialisations.

All these results confirm the vertical spatial desintegration but none of them succeeds in explaining why the places are more and more diverse. There is a clear contradiction between local diversification and vertical desintegration. if these results are verified on other metropolitan areas, the contradiction needs to be explained.

5 References

Alperovitch G. and J. Deutsch, 1994, Joint estimation of population density function and the location of the CBD, Journal of urban Economics, 36; 239-248.

Anas A., R. Arnott and K. Small, 1998, 'Urban spatial structure', Journal of Economic Literature, 36; 1426-1464.

Anderson J., 1982, Cubic Spline Urban density functions, Journal of Urban Economics, 12, 166-167.

Anderson J., 1985, The changing structure of a city: temporal changes in cubic spline density patterns, Journal of Regional Science, 25; 413-426.

Berroir S., H. Mathian and T. Saint-Julien, 2002, Déplacements domicile-travail : vers le polycentrisme?, Insee Ile de France Regards, 54; 5-8.

Christaller W., 1933, Die Zentrallen Orte in Süddeutschland, Jena, Gustav Fischer.

Craig S. and P.T. Ng, 2001, Using quantile splines to identify employment subcenters in multicentric urban areas, Journal of Urban Economics, 49; 100-120.

Duranton G. and D. Puga, 2000, 'Diversity and specialisation in cities: Why, where and when does it matter?', Urban Studies 37-3; 533-555.

Duranton G. and D. Puga, 2001, 'Nursery cities : urban diversity, process innovation and the life cycle of products', American Economic Review, 91-5; 1454-1477.

Fujita M., P. Krugman and T. Mori, 1999, 'On the evolution of hierarchical urban systems', European Economic Review, 43-2; 209-251.

Fujita M. and Thisse J.F., 1997, Economie géographique, problèmes anciens et nouvelles perspectives, Annales d'Economie et de Statistiques, 45;

37-87.

Fujita M. and J.F. Thisse, 2002, Economics of agglomeration, Cambridge University Press.

Garreau J., 1991, The Edge city ; life on the new frontier, Doubleday.

Giuliano G. and K. Small, 1991, 'Subcenters in the Los Angeles Region', Regional Science and Urban Economics, 21-2; 163-182.

Glaeser E. and M. Kahn, 2004, Sprawl and urban growth, in V. Henderson et J.F. Thisse (eds.), Handbook of Urban and Regional Economics.

Imai H., 1982, 'CBD hypothesis and economies of agglomeration', Journal of Economic Theory, 28-2; 275-299.

Jayet H., R. Bénard and D. Rajaonarison, 1999, L'environnement souhaité par les entreprises, Economie et Statistiques, 326-327; 177-187.

McDonald J., 1987, The identification of urban employment subcentres, Journal of Urban Economics, 21; 242-258

McDonald J., 1989, Econometric studies of urban population densitiy: a survey, Journal of Urban Economics, 26; 361-385

McDonald J. and P.J. Prathier, 1994, Suburban Employment centres: the case of Chicago, Urban Studies, 31; 201-218

McMillen D.,2001, Non-parametric employment subcentre identification, Journal of Urban Economics, 50; 448-473.

McMillen D. et J. McDonald, 1997, A non-parametric analysis of employment density in a polycentric city, Journal of Regional Science, 37; 591-612.

McMillen D. et J. McDonald, 1998, 'Suburban centers and employment density in metropolitan Chicago', Journal of Urban Economics, 43-2; 157-180.

McMillen D. et S. Smith, 2003, 'The number of subcenters in large urban areas', Journal of urban Economics, 53; 321-338.

Ogawa H. et M. Fujita, 1980, 'Land use patterns in a nonmonocentric city', Journal of Regional Science, 20-4; 455-475.

Pellenbarg P., L. van Wissen, J. van Dijk, 2000, Firm relocation: state of the art and reserach prospects, University of Groningen, document de travail.

Small K. et S. Song, 1994, Population and employment densities; structure and change, Journal of Urban Economics, 36; 292-313

Vicaire V. and S.Levasseur, 2003, Les transferts d'établissement sur un territoire : l'exemple du Val-de-Marne, Insee Ile-de-France à la page.

von Thünen J.H., 1827, Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie, Hambourg.

Zheng X.P., 1991, Metropolitan spatial structure and its determinants: a case study of Tokyo, Urban Studies, 28; 87-104.

Function	Share of the employment in 1975	Share of the employment in 1982	Share of the employment in 1990	Share of the employment in 1999	Evolution 1975-1999 / share	/ employments
Shopkeepers	6%	7%	6%	5%	-12%	-7%
High-skilled	11%	15%	19%	21%	+86%	+97%
Technicians	19%	21%	23%	25%	+33%	+41%
Employees	32%	31%	19%	30%	-7%	-1%
Workers	32%	27%	23%	19%	-41%	-38%

Figure 1: Evolution of the professions in the Greater Paris Area

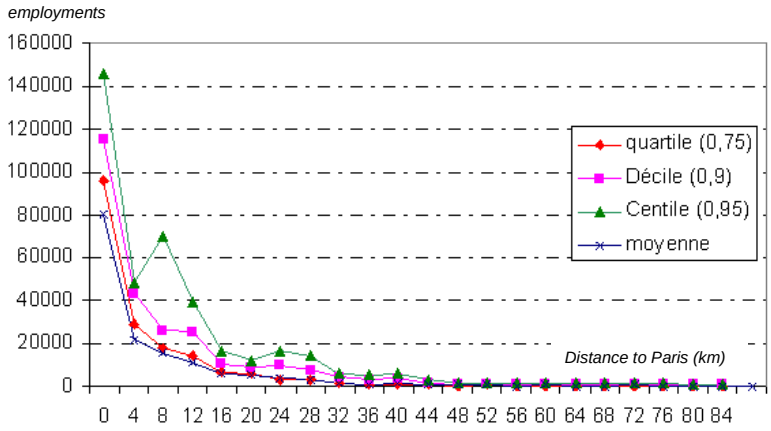

Figure 2: A center-periphery decreasing density with suburban clusters

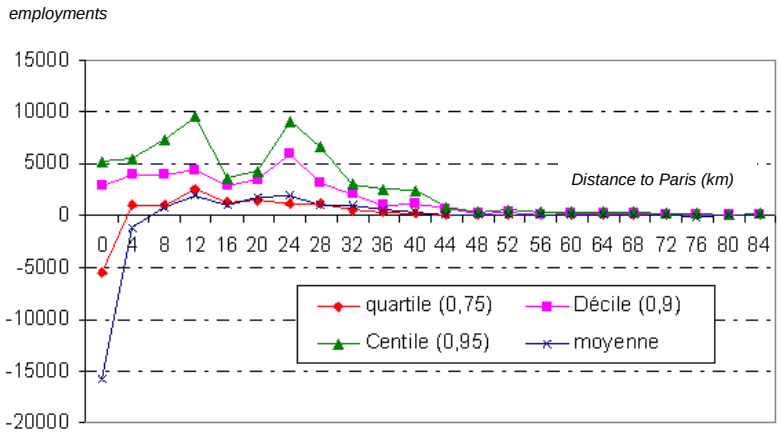

Figure 3: Localized growth in the periphery

Year	Agglomeration index	Evolution	Average sectoral agglomeration index	Evolution	Average sectoral agglomeration index (corrected)	Evolution	sectoral standard-deviation / average	Evolution
1968	0,0132	-	-	-	-	-	-	-
1975	0,0102	-0,0030	0,0400	-	0,0300	-	71%	-
1982	0,0090	-0,0012	0,0400	0,0000	0,0310	0,0010	65%	-6 pts
1990 (Nap)	0,0081	-0,0008	0,0390	-0,0020	0,0300	-0,0010	38%	-27 pts
1990 (Naf)	-	-	0,0220	-	0,0130	-	69%	-
1999	0,0071	-0,0010	0,0230	0,0010	0,0160	0,0020	51%	-18 pts

Figure 4: A vertical spatial desintegration

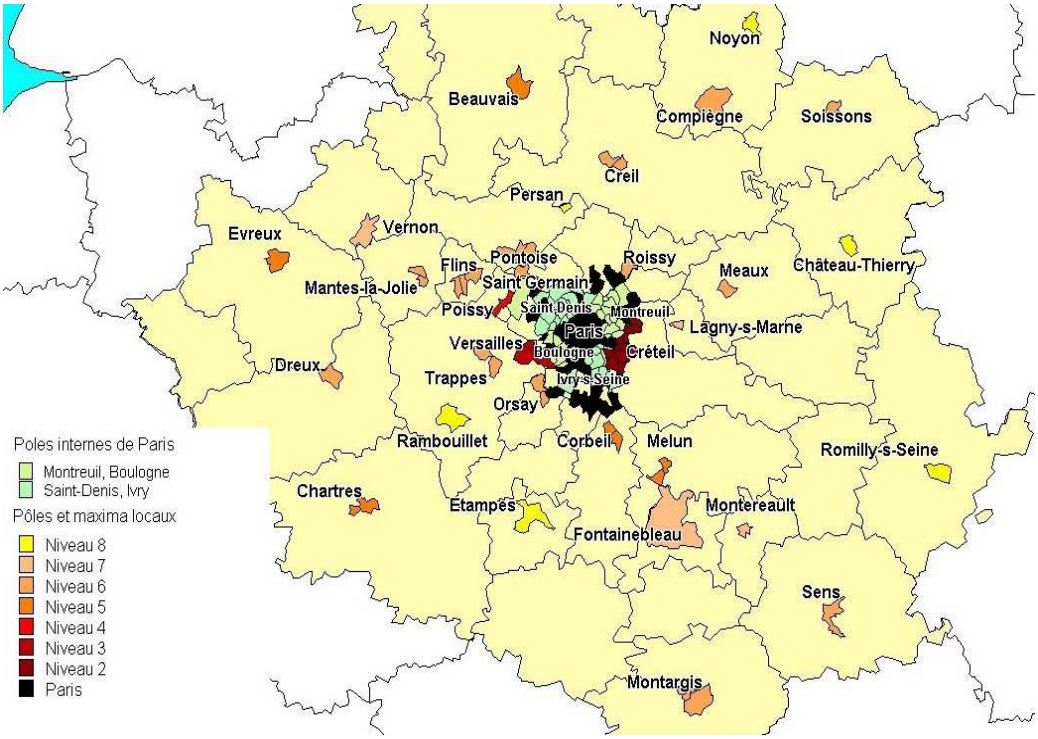

Figure 5: Clusters in the Greater Paris Area in 1975

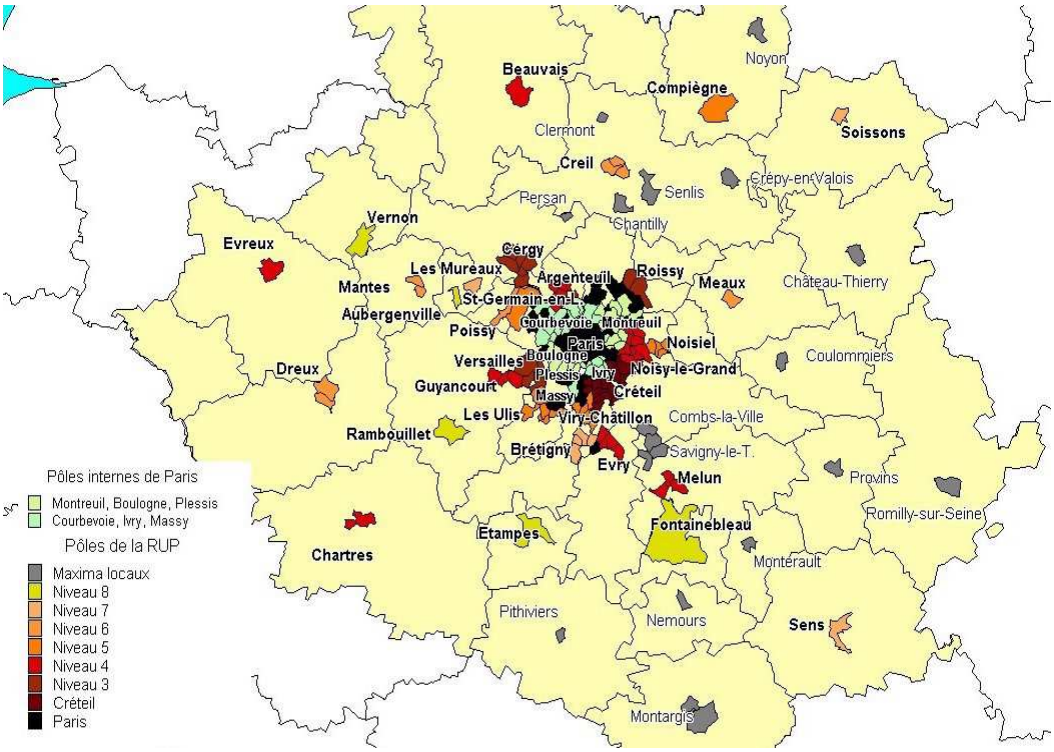

Figure 6: Clusters in the Greater Paris Area in 1999

Place	1975		1982		1990		1999		Ev. 1975-1999	
	employment	share	employment	share	employment	share	employment	share	Abs value	% of 1975
Paris	1918060	**36,3%**	1775993	33,5%	1796378	31,4%	1600815	**27,7%**	**-317245**	**-16,5%**
Suburbs	1437600	**27,2%**	1420356	26,8%	1514782	**26,5%**	1535695	**26,6%**	98095	6,8%
SEC	1032690	**19,5%**	1174172	22,1%	1355403	23,7%	1422404	**24,6%**	389714	**37,7%**
Unclustered	900100	**17,0%**	938068	17,7%	1051876	18,4%	1222140	**21,1%**	322040	35,8%
Greater Paris	5288450	100,0%	5308589	100,0%	5718439	100,0%	5781054	100,0%	492604	9,3%

Figure 7: The center is still denser but weigths less in the region

Rate of sectoral employment growth correlated with…	**1975-1982**	**1982-1990**	**1990-1999**
Employment of the sector at the beginning of the period	0,17	**0,34**	0,49
Concentration index of the sector at the beginning of the period	**0,21**	-0,12	**-0,16**
Concentration index of the sector at the end of the period	0,21	-0,14	-0,22
Rate of evolution of the concentration index over the period	-0,05	-0,41	-0,26
Rate of evolution of the corrected concentration index over the period	**0,16**	-0.12	**-0.26**

Figure 8: sectoral growth and sectoral concentration

Correlation between size and specialization of the clusters	1975	1982	1990 (Nap)	1990 (Naf)	1999
Over all the activities					
Size correlation	-0,12	-0,09	-0,10	-0,11	-0,12
Rank correlation	**-0,53**	-0,51	**-0,49**	-0,62	**-0,62**
Over industrial activities					
Size correlation	-0,10	-0,06	-0,06	-0,06	-0,08
Rank correlation	**-0,29**	-0,15	**-0,01**	-0,07	**-0,38**

Figure 9: Specialisation and size of the clusters

Function	Type of place	1975		1982		1990		1999		Evolution 1975-1999		évolution of the share (points)
		Employment	Share	Employment	Share	Employment	Share	Employment	Share	Abs Value	%	
Shop-keepers	Paris	102409	31%	101980	29%	98522	28%	83898	28%	-18511	-18,1%	-3,7pts
	Suburbs	80989	25%	85444	24%	84161	24%	72941	24%	-8048	-9,9%	-0,8pts
	SEC	59614	18%	67776	19%	68727	20%	61139	20%	1525	2,6%	1,9pts
	Total	*243012*	*74%*	*255200*	*73%*	*251410*	*72%*	*217978*	*72%*	*-25034*	*-10,3%*	*-2,6pts*
	Unclustered	83294	26%	96728	27%	99265	28%	85402	28%	2108	2,5%	2,6pts
	Region	**326306**	**100%**	**351928**	**100%**	**350675**	**100%**	**303380**	**100%**	**-22926**	**-7,0%**	**0,0pts**
High-skilled	Paris	289330	49%	357304	46%	417213	40%	420393	36%	131063	45,3%	-12,9pts
	Suburbs	155910	26%	210680	27%	285631	28%	370946	32%	215036	137,9%	5,4pts
	SEC	95207	16%	135016	18%	191643	19%	245101	21%	149894	157,4%	4,9pts
	Total	*540447*	*91%*	*703000*	*91%*	*894487*	*86%*	*1036440*	*89%*	*495993*	*91,8%*	*-2,5pts*
	Unclustered	50223	9%	66324	9%	139872	14%	128469	11%	78246	155,8%	2,5pts
	Region	**590670**	**100%**	**769324**	**100%**	**1034359**	**100%**	**1164909**	**100%**	**574239**	**97,2%**	**0,0pts**
Technicians	Paris	374961	38%	363920	33%	367708	29%	379925	27%	4964	1,3%	-10,6pts
	Suburbs	299976	30%	325400	30%	326649	26%	401004	28%	101028	33,7%	-1,6pts
	SEC	193723	19%	250088	23%	274772	22%	372941	26%	179218	92,5%	7,0pts
	Total	*868660*	*87%*	*939408*	*86%*	*969129*	*77%*	*1153870*	*82%*	*285210*	*32,8%*	*-5,2pts*
	Unclustered	128392	13%	159044	14%	285043	23%	255395	18%	127003	98,9%	5,2pts
	Region	**997052**	**100%**	**1098452**	**100%**	**1254172**	**100%**	**1409265**	**100%**	**412213**	**41,3%**	**0,0pts**
Employees	Paris	795567	48%	694800	42%	572283	36%	507580	31%	-287987	-36,2%	-16,9pts
	Suburbs	384934	23%	385384	23%	362148	23%	405642	25%	20708	5,4%	1,6pts
	SEC	304397	18%	357428	22%	353984	22%	415586	25%	111189	36,5%	7,0pts
	Total	*1484898*	*89%*	*1437612*	*87%*	*1288415*	*80%*	*1328808*	*81%*	*-156090*	*-10,5%*	*-8,3pts*
	Unclustered	177567	11%	207176	13%	315979	20%	310526	19%	132959	74,9%	8,3pts
	Region	**1662465**	**100%**	**1644788**	**100%**	**1604394**	**100%**	**1639334**	**100%**	**-23131**	**-1,4%**	**0,0pts**
Workers	Paris	358551	22%	289828	20%	247913	19%	170792	17%	-187759	-52,4%	-5,1pts
	Suburbs	515784	31%	412624	29%	337815	26%	252790	24%	-262994	-51,0%	-6,7pts
	SEC	383118	23%	362272	26%	338386	26%	294684	28%	-88434	-23,1%	5,4pts
	Total	*1257453*	*76%*	*1064724*	*75%*	*924114*	*72%*	*718266*	*69%*	*-539187*	*-42,9%*	*-6,4pts*
	Unclustered	399903	24%	354516	25%	364079	28%	316054	31%	-83849	-21,0%	6,4pts
	Region	**1657356**	**100%**	**1419240**	**100%**	**1288193**	**100%**	**1034320**	**100%**	**-623036**	**-37,6%**	**0,0pts**

Figure 10: evolution of the professional structure by places

Cluster	Specialisation		Normalisation	
	Over specialisation (important stocks and relocations)	Under specialisation (weak stocks relocations)	Important stocks, Weak relocations	Weak stocks, important relocations
Paris	Housing, Prof. services			
Courbevoie	Housing, Prof. services			
Saint-Denis	Wholesale	Education		
Boulogne	Housing, Prof. services			
Plessis-Robinson	Professional services			
Orly	Wholesale	Education		
Versailles	Housing, Prof. services			
Roissy-en-France	Wholesale, logistic	Food Industry, Education		
Guyancourt	Professional services	Retail		
Chartres	Domestic services			
St Germain	Professional services			
Les Ulis	Wholesale, Prof. services			
Creil		Housing		
Dreux	Industry, Retail	Housing		
Brétigny	Building			
Soissons		Industry		
Sens			Food Industry	
Amilly	Retail	Professional services		
Aubergenville	Education			
Fontainebleau	Education			
Rambouillet	Housing			
Senlis	Housing	Industry, Building	Education	
Château-Thierry			Food Industry	
Persan	Industry	Professional services		
Nemours	Food Industry			
Noyon		Housing	Food Ind., Dom. services	
Chantilly	Domestic services	Constr.		
Clermont	Educ, Domestic services	Wholesale, Prof. services.	Food Industry	Industry
Romilly-s-Seine	Retail	Transports, Housing	Food Industry	
Combs-la-Ville	Education			
Coulommiers	Retail		Food Industry	
Provins	Food Industry		Retail	
Pithiviers	Domestic services		Food Industry	Housing
Crépy-en-Valois	Education		Food Industry	

Figure 11: Relocations and local specialisation