GROWTH IN COMMUTING DISTANCES IN FRENCH POLYCENTRIC METROPOLITAN AREAS: PARIS, LYON AND MARSEILLE

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Summary

It has frequently been suggested in the literature that a polycentric distribution of employment and people shortens commuting distances because people locate within or close to their employment subcenter (*co-location hypothesis*).

Having studied the three biggest French metropolitan areas over the last decade we have established that co-location affects only a minority of inhabitants, of whom there are fewer in 1999 than there were nine years earlier. Indeed, the majority of people living in a subcenter work outside their subcenter of residence. This situation was even more marked in 1999 than it was in 1990. In addition to this, the majority of jobs located in subcenters are held by non-residents who are generally living further and further from their place of work.

1- Polycentrism and commuting distance

The continuous increase in the average commuting distance (Banister, Watson and Wood, 1997) that characterizes European and North-American metropolitan areas is mainly the consequence of two developments. On one hand, the number of people living in a metropolitan area but working in another is on the increase: this has resulted in an increase in long-distance commutes between metropolitan areas, the most famous example being the Randstad (Clark and Kuijpers-Linde, 1994). On the other hand, people living and working within the same metropolitan area are increasingly living further and further from their place of work: the 1999 and 1990 French censuses emphasize that the average (intra-metropolitan) distance from home to work has grown by 16% over the last decade (Massot and Roy, 2004). In particular, the municipality of residence is becoming increasingly different from the municipality of work (Talbot, 2001).

Such changes in commuting patterns, especially in the development of inter-municipality commutes, are promoting increased regular car use: comparing six French metropolitan areas, A. Aguilera and D. Mignot (2002) have thus shown that approximately 90% of inter-municipality work trips were made by car whereas this proportion was lower than 50% in the case of intra-municipality commutes.

These findings explain the growing interest in the relationship between *urban form* and commuting patterns (Giuliano and Small, 1993; Handy, 1996; Priemus, Nijkamp and Banister, 2001). A first body of research deals with the effects of neighborhood characteristics such as the 3Ds (density, diversity and design) (Cervero and Kockelman, 1997) and more generally, the effects of new types of urbanism (like New Urbanism) on travel behavior.

At another level, given that most metropolitan areas are becoming polycentric (Anas, Arnott and Small, 1998), a second body of research investigates whether polycentric distribution of people and jobs would be likely to re-organize mobility patterns in a more sustainable way (Schwanen, Dieleman and Dijst, 2002). Polycentrism is indeed associated with specific commuting patterns (Levine, 1992): in centralized cities most commutes are into the central city, while in polycentric cities the suburbs attract a significant share of the commuters. L. Van der Laan (1998) has categorized polycentric structures into three distinct groups. In the first, known as decentral, the suburbs attract most of the commuters including those coming from the central city. In the second, cross-commuting, the central and suburban labor markets are quite separate, meaning that the majority of people living in the central city also work in the central city, while most people living in the suburbs have a job in the suburbs. In the

third group, exchange-commuting, a major proportion of the people living in the central city work in the suburbs and vice-versa.

In this context, a key question is whether the development of employment subcenters would be likely to favor the *co-location* of workers and jobs (Gordon, Richardson and Jun, 1991) in the suburbs and then to counteract increasing home-to-work distances. Most polycentric urban models are indeed based on the premise that people tend to locate within or close to their employment subcenter (Sasaki, 1990; Sasaki and Mun, 1996), so the emergence of a polycentric model, either spontaneous or planned by *large agents* (private or public), is an answer to the non-sustainable growth of commuting distances - and costs – that characterize the monocentric city (Richardson, 1988). M. Fujita and H. Ogawa (1982) have thus theoretically demonstrated that when the population increased, one or several subcenters emerged as soon as the transport costs exceeded a certain threshold. This result was recently re-examined by D.P McMillen and S.C Smith (2003) for 62 US metropolitan areas: they emphasized that the number of subcenters was positively correlated with the size of the area and the level of commuting costs. As for commuting distances, other studies tend to be more contradictory: some of them concluded that a tendency towards polycentrism was associated with decreasing commuting distances, though other authors came to the opposite conclusion (Schwanen, Dieleman and Dijst 2002).

The methods and criteria that are taken into account in such empirical studies often differ significantly, therefore two kinds of empirical studies have to be distinguished. An initial body of research compares the average commuting distance in monocentric *versus* polycentric metropolitan areas. In their study of several Dutch metropolitan areas, T. Schwanen, F.M. Dieleman and M. Dijst (2001) concluded that the answer depended on the relationship in terms of commutes between the central city and its suburbs. Based on the study carried out by Van der Laan, (1998), they concluded that in cross-commuting polycentric areas, where the central and suburban employment markets were relatively independent, the average commuting distance was (slightly) lower than in monocentric urban systems. In the two other types of polycentric structures, the average distances were relatively comparable to those observed in monocentric areas. They were higher, however, when the number of commuters between the central city and the suburbs was significant. Nevertheless, the difference between the two remained slight. However, this kind of work is too general to answer the specific question concerning co-location *i.e.* the level of spatial matching between people and jobs within the subcenters, because subcenters are not accurately identified.

In a second body of research, the subcenters are identified and the aim is to compare the average commuting distance of those who work in the central city with those who work in an employment subcenter. R. Dubin (1991) has

thus shown, in the case of Baltimore, that working in a subcenter was associated with longer commuting distances than working in the central city. Studying the San Francisco Bay Area, R. Cervero and K.L. Wu (1997) came to an opposite conclusion however: they found that the average home-to-work distance was shorter for people working in subcenters than for those with a job in the central city. P. Gordon, H.W. Richardson and H.L. Wong (1986) explained nevertheless that in the case of Los Angeles, people living in subcenters experienced a longer average home-to-work distance than those living in the central city, because a minority of those living in a subcenter had very long commutes (especially those who worked in the central city) while the majority of them worked in their subcenter of residence and subsequently had very short commutes, even shorter than the central city residents. The authors thus concluded that polycentrism was associated with shorter work trips for a majority of the inhabitants.

In France, although many recent studies have underlined the development of subcenters inside most metropolitan areas and especially the biggest (Gaschet, 2002), links between polycentrism and commuting patterns have not been widely discussed. Urban sprawl in general is felt to be responsible for the growth of the average commuting distance insofar as the further the people live from the central city, the longer they spend commuting. But the specific impact of polycentrism and in particular the co-location hypothesis,

i.e. the place of residence of those working in a subcenter, have not been questioned.

In this paper[1] two specific questions are raised. Are the people who live in a subcenter also employed in this subcenter? And do the (other) people working in a subcenter live close to this subcenter? If we compare the answers to these two questions in 1990 and in 1999, we can assess whether the situation is better or worse (in terms of proximity to place of work) in 1999 than ten years previously. The empirical work focuses on the three largest French metropolitan areas: Paris, Lyon and Marseille.

After a brief presentation of the data and these three areas of study, we identify and characterize the employment subcenters. We then analyze the location of jobs held by people living in a subcenter, firstly in 1999 and secondly between 1990 and 1999, then the location of people working in a subcenter. We then assess the impact in terms of commuting distance. The conclusion summarizes the main results and suggests some guidelines for future research.

2- Areas of study and data

Areas of study

To compare the metropolitan areas of Paris, Lyon and Marseille we referred to the functional definition of the *urban areas* recently proposed by the French National Institute for Statistics and Economic Studies (INSEE).

Each urban area is composed of a dense zone, concentrating at least 2,000 inhabitants and 5,000 jobs, and of all the municipalities in which at least 40% of the working residents have a job. The boundary of each urban area naturally changes over time, but we needed a fixed boundary so we took 1999 as our boundary.

In each urban area the central city is defined by the INSEE as the most important municipality and is of course located inside the dense zone. The municipalities of Paris and Lyon represent approximately 2% of the surface of their urban area and this proportion increases to 11% in Marseille.

In 1999, the urban area of Paris was composed of 1,583 municipalities and concentrated more than 11 million inhabitants in 5.1 million jobs. Lyon and Marseille are far smaller. 1.6 million inhabitants and approximately 0.7 million jobs are located within the Lyon urban area which has 296 municipalities. In the Marseille urban area there are 82 municipalities and roughly 1.5 million people for 0.5 million jobs.

Data

Data used was taken from the 1990 and 1999 censuses which indicate the municipality of residence and the municipality of work. Calculations of home-to-work distances produced two separate scenarios. Concerning inter-municipality trips, as is often the case in this type of study we have kept the distance between the central nuclei of the municipalities weighted by a

factor of 1.3. Concerning intra-municipality commutes it was necessary to take the size of the municipality into account because of huge differences (the municipalities in the urban area of Marseille in particular are very large). We therefore regarded each municipality as being a circle, taking as commuting distance its radius also weighted by a factor of 1.3.

Given that we focused on the co-location hypothesis at an intra-metropolitan level, only intra-metropolitan commutes have been taken into account, so the number of workers for each urban area equals the number of jobs.

3- Subcenters defined by the polarization of inter-municipality commutes

The three urban areas can be classified in 1990 and in 1999 as *polycentric areas* insofar as the suburbs attract a great share of the commuters: this share reached 38.9% in Marseille, 57.5% in Lyon and even 67.6% in Paris in 1999. Moreover, they are *cross-commuting polycentric areas* (Van der Laan, 1998)*:* approximately 72% of the central city residents in Paris and Lyon and even 91% in Marseille work in the central city while three quarters of the suburban residents work in the suburbs.

Due to suburbanization of both inhabitants and jobs during the last decade (Table 1), the number and the proportion of the central-city residents working in the central city has nevertheless significantly declined, whilst the

number of the central-city-to-suburbs commuters and also the number of suburbs-to-suburbs commuters have both increased (Table 2).

Table 1 and Table 2

Polycentrism also means that most jobs that are located in the suburbs are concentrated within one or more subcenters. The consequence is that the vast majority of trips to the suburbs are in fact to one of these subcenters, the subcenters can therefore be defined as areas that attract a major proportion of the commuters who work outside the central city (Bourne, 1989; Berroir, Mathian and Saint-Julien, 2002). Few studies have used such a criterion however, the most common criterion being the number and/or density of jobs (Mc Donald, 1987 ; Giuliano and Small, 1991).

To identify subcenters in Paris, Lyon and Marseille we referred to the attractiveness of work trips. The method involved two phases. The first identifies those suburban municipalities which are the most attractive to the non-resident workers, *i.e.* people working outside their municipality of residence. We then selected the set of municipalities which in 1999 attracted 85%[2] of these commuters. There is no contradiction between this methodology and criteria based on job numbers: the selected municipalities concentrated 80% of the jobs located outside the central city in Paris, Lyon and Marseille.

In each urban area, these municipalities represented less than a quarter of the municipalities (Table 3): 13% in Paris, 22% in Lyon and 24% in Marseille. However the group of municipalities which alone attracted 50% of the commutes were by far less numerous and represented only 3% of the surface of the urban area in Paris, 9% in Lyon and 13% in Marseille. These municipalities were also mainly located very close to the central city, indicating the high concentration of employment around the central city that characterizes most French metropolitan areas.

In the second phase, given that the selected municipalities formed units of neighboring or close municipalities, we used a functional criterion to group adjacent municipalities: the boundaries of each subcenter were chosen to maximize the inter-municipality commutes that took place within the subcenter. This means that a municipality (selected in phase 1) is grouped with the (selected) municipalities that attracted the largest proportion of its working residents.

Many subcenters were identified in this way in each of the three urban areas (Figure 1 to Figure 3). Only 3 subcenters were identified in Marseille, because of the large municipality of Aix-en-Provence[3] (Figure 3) which prevents the emergence of other independent subcenters. In Lyon, we identified 11 subcenters and 25 in Paris.

Although their number and location have not changed between 1990 and 1999, some new and relatively small adjacent municipalities (22 in Paris, 10 in Lyon and 2 in Marseille) situated along the motorways have emerged in the majority of the subcenters. But the group of municipalities which alone attract 50% of the commutes in each urban area have not changed a great deal over the last decade because a significant proportion of the jobs that have been created in the suburbs during the decade are located in these municipalities.

Furthermore, the boundaries of each subcenter are fixed and we are using the 1999 definition.

Figure 1 to Figure 3

The subcenters are mainly concentrated around the central city, but some are also located further afield and along the motorways, confirming previous findings concerning the importance of access to the main transport links for firms (Aguilera and Mignot, 2003).

We can distinguish two kinds of subcenters based on their location: those located very close to the central city, and which are known as *closer-in subcenters*, and those located further afield and which are referred to as *outlying subcenters* (Table 3). This distinction is important because in France, as mentioned above, the further people live from the central city, the longer their average commuting distance: we can then expect to see outlying

subcenters emerging, following the co-location hypothesis, to offer jobs to the growing number of people who live far from the central city and also far from the closer-in subcenters.

Table 3

4- Subcenters and the co-location hypothesis: the location and commuting distance of people working in a subcenter in 1999

In 1999 the subcenters in Paris, Lyon and Marseille concentrated 80% of jobs and 70% of workers whose place of residence was located outside the central city. In closer-in as well as in outlying subcenters, the number of jobs was greater than the number of working residents: the ratio is 1.1 on average. However, less than half of workers living in a subcenter have a job in the same subcenter (Table 4). This proportion is very similar in the three urban areas and in the two kinds of subcenters except in Marseille where this share is 70% for the outlying subcenters because of the municipality of Aix en Provence where the ratio between residents and jobs is very high, indicating a former central city. Apart from this case, the majority of the workers who live in a subcenter have a job located outside.

About 30% (in Paris) to 42% (in Marseille) of the people living in a closer-in subcenter have a job in the central city, although residents of outlying subcenters depend more upon jobs located in other subcenters (Table 4) and

especially on jobs located in the closer-in subcenter(s) to which they are connected by motorway or by train.

If we now consider the jobs located in the subcenters (Table 5) we note that more than half are filled by non-residents (except in the outlying subcenters of Marseille, where this share is 39% because of Aix en Provence). In Paris jobs are mainly held by people living in another subcenter and also (especially for the outlying subcenters) in the suburban municipalities which do not belong to a subcenter. In Lyon and Marseille the volume of central city residents has more impact, especially for the closer-in subcenters.

We therefore have two types of spatial imbalances between jobs and inhabitants: on one hand the majority of people living in a subcenter work outside and on the other hand the majority of jobs concentrated within these subcenters are filled by non-residents. In other words, co-location is not the rule for a majority of people.

However people living in a subcenter have shorter commutes on average than those living outside (Table 6), because the average commuting distance is very short for the 42% of those working in their subcenter of residence (Table 7). This result confirms the previous findings of (Gordon, Richardson and Wong, 1986). Moreover in closer-in subcenters, a large proportion of residents benefit from proximity to central city jobs: the average commuting distance is then less for those living in closer-in

subcenters compared with outlying subcenters where many residents work in a closer-in subcenter and therefore have longer commutes.

As regards the municipalities situated outside the subcenters: approximately two thirds of residents work in the central city or in a subcenter and the associated commuting distance is long, especially for those who have a job in the central city (Table 7): 37.2 km in Paris, 21.9 km in Lyon and 26.4 in Marseille. When the job is located in a subcenter, the average distance is shorter but remains considerable nonetheless: 22.2 km in Paris, 16 km in Lyon and 17.3 km in Marseille. However, this later result means that the existence of employment subcenters allows a large proportion of inhabitants to live in the suburbs and to have shorter commuting distances than in a monocentric model where they would rely exclusively on central jobs. However, these people do not live very close to their employment subcenter as is often hypothesized in the models.

Our findings also confirm that the central city residents have the shortest average commuting distance because the vast majority of them (70% in Paris and Lyon and even 90% in Marseille) work in the central city while the rest benefit from proximity to the closer-in subcenters.

5- Changes in people and job distribution and growth in commuting distances between 1990 and 1999

Over the last decade, the number of jobs and working residents in the central city has fallen (except for a slight increase for residents in Lyon) while this number has increased in the suburbs (Table 8). Jobs in subcenters but also outside them have increased but the proportion of suburban jobs located in the subcenters has remained stable (80%). However, subcenters, with the exception of Aix en Provence, have lost many working residents whilst numbers of workers has significantly increased outside subcenters: about 27% of workers living in the suburbs were located outside a subcenter in 1990, this compares to 30% nine years later.

The consequence of this increase in jobs and decrease in working residents in the subcenters is the creation of a growing jobs-housing imbalance: the number of jobs per working resident has grown on average from 0.9 to 1.1 over the decade. As a result, subcenters are beginning to specialize as employment areas because more jobs are being created there while more and more people are living in the suburbs but outside these subcenters.

Although there were more jobs per resident in the subcenters in 1999 than there were in 1990, the proportion of people living and working in the same subcenter has fallen during the last decade for both types of subcenters (Table 9). In other words, there were less working residents in the subcenters in 1999 than in 1990 and a higher proportion of them were working outside. The explanation for this lies in the increase in exchange-commutes between the different subcenters but also in commutes from the

subcenters to the municipalities located outside, where we have noted that job numbers have increased significantly. The number (and proportion) of commutes from a subcenter to the central city has in the same time period fallen dramatically because of the diminishing number of jobs located in the central city.

In the subcenters, the proportion of jobs held by the residents has diminished, especially in the urban area of Paris. A growing proportion of the jobs are thus held by people living in another subcenter, outside a subcenter and also in the central city.

In other words, the changes in the distribution of people and jobs has led to a rise in the number of commutes between the subcenters, but also from the subcenters to the other suburban municipalities and from the central city to the subcenters.

These changes partly explain the growth in the average commuting distance that characterized the three urban areas (Table 10): +14.4% in Paris, +13.8% in Lyon and +6.2% in Marseille. Moreover, commutes have become longer regardless of where people live: in the central city, in a subcenter or outside a subcenter.

The average increase was less significant for central city residents however, because most of them have benefited from the proximity of jobs located in the closer-in subcenters. The increase was also less marked for people living

in a subcenter than for those living outside. Indeed between 1990 and 1999 the main change for people living outside the subcenters was the drastic decrease in the proportion of those working outside a subcenter, and particularly those whose job was located in the same municipality, who had very short commutes (Table 7). Over the same period, the average commuting distance for those living outside a subcenter but working in a subcenter (and also for those working in the central city) and who are becoming more and more numerous has risen, especially in the case of Paris.

For people living in a subcenter the first change was the decrease in the number of those working in the central city and especially a decrease in the number of residents living in an outlying subcenter with a central job, whose commutes were very lengthy. This change heralded a decrease in the average commuting distance. However, the second major change was an increase in the number of residents whose job was located outside their subcenter of residence, which led on the contrary to a significant growth in average commuting distances.

6- Conclusion

This paper has investigated the development of population and employment location and its consequences in terms of commuting distance between 1990 and 1999 in the three largest French metropolitan areas, in a context of job suburbanization and concentration in employment subcenters. Indeed, it has

frequently been suggested in the literature that the polycentric urban model could contribute to reducing commuting distance by allowing people to locate within or close to their employment subcenter (*co-location hypothesis*).

However, our findings emphasize that, although there are more jobs than working residents in all the subcenters, most people living in a subcenter work outside their subcenter of residence. This situation was also more marked by 1999 than it previously was in 1990. As a result, average commuting distances have increased for people living in a subcenter. In addition to this, the majority of jobs located in subcenters are filled by non-residents who generally live quite far from their employment subcenter, and indeed further in 1999 than they did in 1990.

Over the last decade, changes in location of jobs and people led to a growth in jobs in the subcenters, but a fall in the number of working residents, whilst resident workers as well as jobs have increased in the other suburban municipalities. Results in terms of commuting patterns showed a growth in the number of commuting trips between the subcenters and also between the subcenters and the municipalities located outside, so the average commuting distance has increased regardless of where people live. Even central city residents rely increasingly on jobs located in subcenters, but also outside them: consequently their average distance to work has also increased over the last decade.

Future research will explore two main areas. The first area will investigate the premise that a growing number of inhabitants cannot live within or close to their employment subcenter because of a growing mismatch between the nature of jobs and type of housing available. Some studies have thus emphasized that long commuting distances were associated with a lack of certain types of housing, especially for people on lower incomes, within or close to most employment subcenters (Levine, 1999; Wachs, Taylor and Levine, 1993).

The second area will analyze commuting time instead of distance. It is indeed possible that the increase in distance from the places of residence to the employment subcenters is also associated with a decrease in commuting time due to increased use of cars, especially in the suburbs where congestion is less marked than in the central city. S. Sultana (2000) has thus showed that in Atlanta, people working in a subcenter had, on average, shorter commuting times than those working in the central city. We will then analyze changes in commuting times and the choices of modes of transport for those living increasingly further away from their employment subcenters over the last ten years.

Notes

[1] These results are based on a research program funded by the ADEME involving the INRETS (French National Institute for Transport and Safety Research) and the LET (Transportation Economics Laboratory).

[2] Three thresholds (80%, 85% and 90%) were tested in the Paris urban area and the findings were compared with other recent studies dealing with the identification of subcenters in this metropolitan area. We thus selected 85% and applied the same threshold to Lyon and Marseille to be consistent.

[3] Many years ago Aix-en-Provence and its closer-ins formed an independent urban area in which Aix-en-Provence was the central city.

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Table 1: Proportion of inhabitants and jobs located in the central city in

1990 and 1999

	Paris	Lyon	Marseille
Inhabitants			
1990	20.8%	36.1%	58.4%
1999	20.0%	35.8%	54.7%
Jobs			
1990	35.3%	48.1%	65.1%
1999	32.5%	44.3%	61.0%

Table 2: Proportion of commuting trips between the central city and the suburbs in 1990 and 1999

Place of residence	Place of work		Paris	Lyon	Marseille
Central city	Central city	1990	16.0%	27.6%	54.7%
		1999	14.1%	24.5%	49.5%
Central city	Suburbs	1990	4.8%	8.4%	3.7%
		1999	6.0%	13.9%	5.1%
Suburbs	Central city	1990	19.3%	20.5%	10.4%
		1999	18.4%	17.9%	11.4%
Suburbs	Suburbs	1990	59.9%	43.5%	31.2%
		1999	61.6%	43.6%	33.9%
Total		1990	100.0%	100.0%	100.0%
		1999	100.0%	100.0%	100.0%

Table 3: Employment subcenters in 1999

	Paris	Lyon	Marseille
Number of subcenters	25	11	3
% of municipalities	13%	22%	24%
Nb of closer-in subcenters	6	5	1
Nb of outlying subcenters	19	6	2

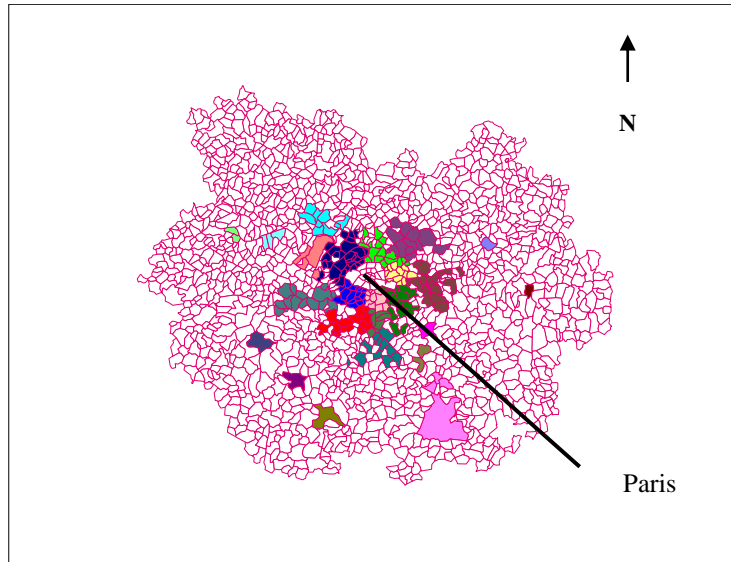**Figure 1:** Subcenters in the Paris urban area (1999)

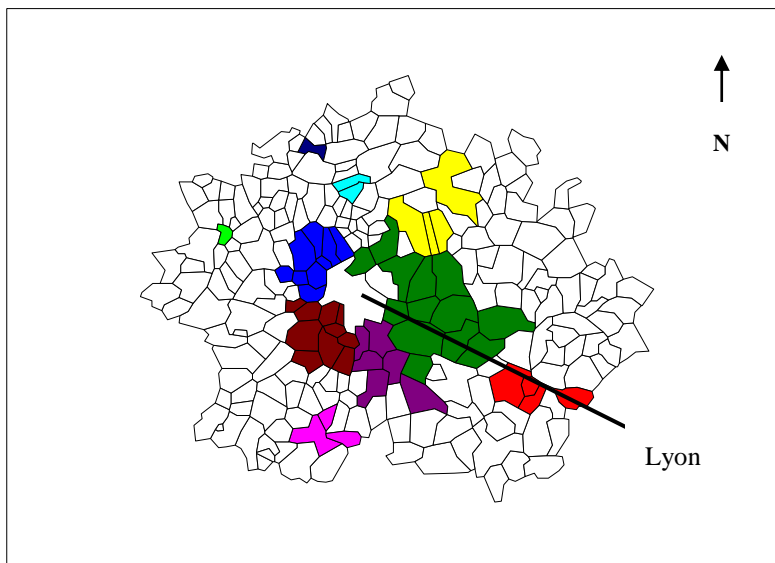**Figure 2:** Subcenters in the Lyon urban area (1999)

Figure 3: Subcenters in the Marseille urban area (1999)
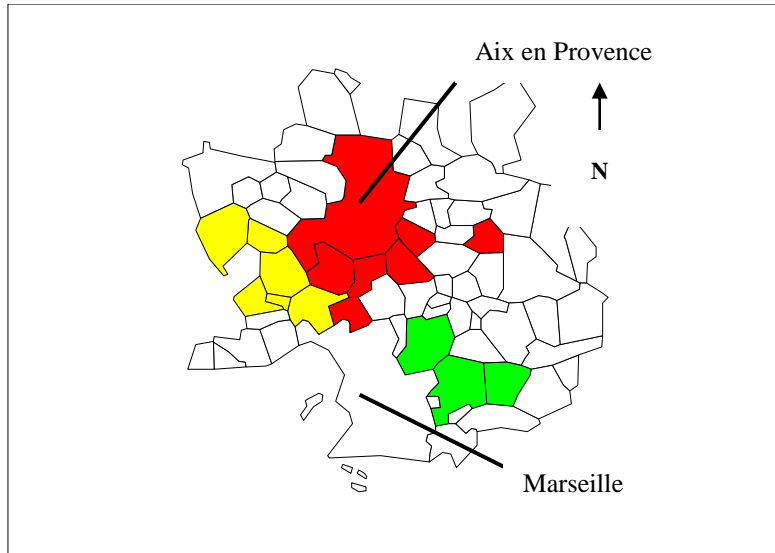
Table 4: Location of jobs held by people living in a subcenter in 1999

	Paris		Lyon		Marseille	
	closer-in	outlying	closer-in	outlying	closer-in	outlying
Central city	29.8%	18.8%	33.9%	17.8%	42.3%	18.0%
Same subcenter	42.2%	42.1%	45.8%	45.7%	48.7%	70.0%
Other subcenter	24.6%	29.9%	16.5%	24.2%	3.6%	8.1%
Other municipality	3.4%	3.2%	3.8%	12.3%	5.4%	3.9%
total	100%	100%	100%	100%	100%	100%

Table 5: Place of residence of people working in a subcenter in 1999

	Paris		Lyon		Marseille	
	closer-in	outlying	closer-in	outlying	closer-in	outlying
Central city	13.1%	5.6%	22.6%	10.4%	25.3%	11.8%
Same subcenter	43.0%	39.9%	43.0%	44.1%	47.3%	61.0%
Other subcenter	28.1%	23.6%	17.2%	14.4%	3.2%	7.0%
Other municipality	15.8%	30.9%	17.2%	31.1%	24.2%	20.2%
total	100%	100%	100%	100%	100%	100%

Table 6: Average distance to work (km) in relation to place of residence in

1999

	Paris	Lyon	Marseille
Central city	9.9	7.0	12.7
Subcenter	12.8	9.0	12.5
Closer-in subcenter	9.9	8.3	12.0
Outlying subcenter	15.2	12.5	12.7
Other municipality	20.2	14.1	16.5
Whole urban area	11.3	9.4	13.3

Table 7: Average distance to work (km) in relation to place of residence

and location of job in 1999

Place of residence	Place of work	Paris	Lyon	Marseille
Central city	Central city	7.5	4.8	11.4
Central city	Subcenter	14.5	11.8	25.9
Central city	Other municipality	33.2	20.8	24.4
Subcenter	Central city	16.9	11.6	22.6
Subcenter	Same subcenter	4.0	4.3	7.7
Subcenter	Other subcenter	18.6	15.3	24.6
Subcenter	Other municipality	15.3	13.5	14.4
Other municipality	Subcenter	37.2	21.9	26.4
Other municipality	Subcenter	22.2	16.0	17.3
Other municipality	Other municipality	8.7	5.6	6.0

Table 8: Changes in the number of jobs and workers in each urban area

between 1990 and 1999

	Central city	Subcenters	Other municipalities
Paris			
workers	-3.6%	-2.9%	+11.5%
jobs	-7.8%	+4.0%	+7.0%
Lyon			
workers	+1.4%	-4.2%	+19.8%
jobs	-6.0%	+8.2%	+17.6%
Marseille			
workers	-6.6%	+2.8%	+8.7%
jobs	-6.5%	+11.5%	+12.2%

Table 9: Changes in the number of people living and working in the same

subcenter between 1990 and 1999

	Paris	Lyon	Marseille
Subcenters	-13.7%	-8.0%	-1.5%
Closer-in subcenters	-15.8%	-9.1%	-1.5%
Outlying subcenters	-9.9%	-2.4%	-1.5%

Table 10: Increase in the commuting distance in relation to place of residence between 1990 and 1999

	Paris	Lyon	Marseille
Central city	6.5%	9.6%	4.0%
Subcenter	10.6%	11.0%	6.0%
Closer-in subcenter	12.8%	9.3%	3.3%
Outlying subcenter	9.6%	12.1%	6.2%
Other municipality	15.6%	15.2%	8.2%
Whole urban area	14.4%	13.8%	6.2%