Location of population-based services in France

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Abstract

The objective of this paper is to analyze the spatial distribution of employment in population-based services as well as their location factors at the functional economic area scale. Two main categories of explanatory factors are studied using statistical methods: market potential and the propensity to consume locally. Estimating tourism employment adds attractiveness and access to facilities as complementary location factors of services across space. Results identify structural factors related to local demand and the most favorable regional conditions for the development of population-based employment.

Keywords

population-based economy; location factors; statistical methods

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Location of population-based services[1] in France[2]

1. Introduction

The increasing weight of the tertiary sector in the national economy has ambiguous impacts in terms of economic geography. On the one hand, the development of services to businesses tends to reinforce the polarization of production activities; on the other hand, the development of services to households tends to distribute those services as close as possible to the population. Since the European population is increasingly locating outside major cities and employment centers, taking account of the population-based economy is becoming a critical issue in terms of regional development and territorial cohesion (Commission Européenne 2008). In a complementary fashion to this "counter-urbanization" flow, which areas under urban influence benefit from (due to metropolis growth), there is a demographic surge in more remote areas. The latter results from enhancing the natural environment as an attractive residential setting, and is becoming a factor for economic growth by developing the demand for population-based services.

This paper has two objectives: to characterize the spatial distribution of population-based services over the French territory; and to explain the observed heterogeneity using household differentiated localized demand. First, we present the geography of population-based services, which is not well known and methodologically tricky. Indeed, available data are scarce and ill-assorted due to a lack of common statistical conventions. The scope of population-based services is based on the following definition: non tradable, tertiary final goods whose destination if household localized demand. The survey is done at the Functional Economic Area (FEA, *bassin de vie*) scale which takes account of household location at the municipality scale as well as commuting patterns towards jobs or services in the neighboring area. In this perspective, the distribution of population-based services is analyzed as a function of local potential demand, be it permanent or temporary. To do so, we account for the impact of tourism demand as a complement to resident population demand; indeed, local services do not satisfy the demand of permanent residents only.

The paper is organized as follows. The next section presents the main stylized facts about the geography of services as well as theoretical references that may be used to explain their location. The third section presents data and methods. In section 4, results first present employment densities in population-based services, then in tourism services (estimated using a specific method) at the FEA scale. Then, the explanatory power of local demand variables is assessed, and regional differences in the location of population-based services are further analyzed. The conclusion sums up the main results; it confirms the critical role of agglomeration factors but also underlines two factors of dispersion: first, fixed assets, which

[1] "population-based services" is the closest translation we could find to the French *services résidentiels*. Indeed, the adjective "residential" mainly pertains to housing (e.g. residential neighborhood) or health (e.g. residential treatment center) issues. Since we focus on services to the population (as opposed to businesses), we chose "population-based".

[2] This paper is based on a research project carried out by Cesaer (Dijon) and Cemagref (Grenoble) as part of DIACT's working group on regions and the service economy (*économie des services et territoires*).

impact tourism destinations; second, the rationale for supplying services that depend upon public action.

2. Location theory and the geography of services

From a regional economics viewpoint, the increasing share of services in the economy tends to result in a spatial homogenization of location structures at the European scale (DIACT 2008). Services tend to spread spatially (Houdebine 1999; Midelfart-Knarvik et al. 2002), or at least they generally do not contribute to the concentration of activities (Gaulier 2003). However their geography is much differentiated according to the type of service, particularly with respect to tradability and knowledge intensity. In this perspective, financial services and services to businesses are more sensitive to agglomeration and spatial concentration, whereas retail trade and transportation services are more scattered (Jennequin 2008).

At the subnational scale, the distribution of services depends upon gravity and scope effects. There is an empirical pattern regarding the product of city size by its rank in the urban hierarchy, which is constant and close to the size of the biggest city (Zipf's [1949] rank-size law). In the French database of facilities (*Inventaire Communal* INSEE 2001), facilities and services are differentiated according to categories that reflect their relation to space: proximity, intermediate and higher. This classification is formally represented by "central places" that show embedded market areas corresponding to the hierarchy of facilities and services (Christaller 1933).

In location theory, economic activities follow agglomeration and accessibility principles; their geography is sensitive to both economies of scale and transportation costs. The former increase agglomeration effects all the more that differentiation limits competition and externalities contribute to increasing returns. The latter tend to increase dispersion, especially if population density is low and production activities use fixed assets.

The formal framework offered by economic geography treats regional effects of farming and manufacturing dynamics, and underlines the dominant character of dispersion forces for the former and agglomeration forces for the latter. The location of tertiary activities is little directly addressed in this framework but may be explained by distinguishing two categories of tertiary goods: firm- or household-related.

First, services to firms may be considered intermediate goods that are used by manufacturing activities. Their location is related to the industrial sector's by upstream relationships (Venables 1996). Taking account of this third sector reinforces the cumulative process that tends to concentrate activities in the central region (Jennequin, 2005). In this type of model, the mobility of skilled labor is critical by acting on production (price decrease, wage increase) and consumption (market size, good diversity) factors.

Second, because they are little tradable, services to households may be integrated in the homogenous sector whose location is dictated by the distribution of demand. Indeed, consumers of population-based services are mainly located in the considered region. From a location theory perspective, population-based services are part of spatial configurations that

are conditioned by household location, i.e. consumers. Indeed, the distribution of households conditions market potentials that contribute to the concentration of services, where transportation costs are borne by households.

Economic geography models indirectly detail the economic processes that drive the location of population-based services. The main factors are demand and labor factors. The logical consequence of Krugman's (1991) classic model is that the agglomeration of activities other than those tied to land (i.e. agriculture) results in a decrease in the price of goods, an increase in real wages and a greater diversity of goods. And since labor migration is the main driver of agglomeration, the model assumes that workers are sensitive to such factors. This calls for several comments. First, the population of consumers does not exactly correspond to the population of workers because of complex relations to activity (retirees, beneficiaries of social transfers, unemployed, etc.). Next, even if the assumption that the labor population equates the consumer population holds, workers may not be as mobile as the theory assumes, i.e. be sensitive to not only monetary variables (wage level, product price) but also other factors. Population-based services do not react homogeneously to location economic processes. Thus, higher services are more sensitive to agglomeration forces, economies of scale, and income elasticity of demand (which is high for these services); whereas everyday services, which are more sensitive to transportation costs, tend to benefit less from agglomeration.

Observations as well as economic analyses of migration underline the sensitivity of households to environmental and amenity factors when they make a decision about a residential location (McGranahan 2008). Though the geographic concentration of employment in cities tends to remain stable or even increase, households tend to choose residential locations that are increasingly distinct and far from employment centers, thus contributing to urban sprawl. Transportation costs play a critical role in these changes, which are significant for North American and European rural areas. It is as if releasing the transportation cost constraint for households opened up their location possibilities so as to satisfy a preference for a non-urban living environment (even for the active workforce that has a job in the urban center). In this case, fixed factors that act as a dispersion counterforce are not tied to production activity but to residential attractiveness: the consideration of location-specific amenities drives households to a relative dispersion across space. As a consequence, localized demand, by itself, becomes a dispersion factor.

For the employed workforce, the disassociation between place of residence and place of work results in daily commutes that emphasize the trip function of households. Its microeconomic basis is given by consumer theory applied to trip decisions (Niedercorn and Bechdolt 1969). Consumers seek to maximize the utility function of their trips. As the origin is given, the utility of trips to a potential destination increases as a function of foreseeable contacts. Consequently, consumption behavior for population-based services is tied to both the distribution of service supply and consumer commuting behavior with respect to, among others, place of work or recreation activities. Then, multiple-destination trips become a critical factor for grouping services in some places, thus yielding gravitational phenomena.

Therefore, for a given area, the agglomerated population plays a critical role in the location of population-based services. Such services are adjusted to the spatial distribution of related

expenditures, whether made by the local or the outside population. This relation is valid for market population-based services but may be assumed more complex for public or strongly administered services. In this case, market factors are combined with spatial planning policies that stress accessibility and equity of access criteria for all citizens regardless of their place of residence.

Location theory leads to favor two explanatory dimensions: market potential and propensity to consume locally. The idea is to combine market area analysis, where firms tend to locate at the center of their market and consumers are attracted to service-supplying poles, with territorial analysis, which mitigates the deterministic character of the urban hierarchy to identify functioning market areas that depend upon localized organization and consumption modes. Accordingly, this paper explores the location factors of employment in population-based services following two explanatory dimensions. First, the location of population-based services is analyzed with respect to urban hierarchy and corresponding market areas. Second, more territorial and outlying patterns of organization of population-based services are analyzed with respect to FEA tourism attractiveness and the location of tourism-related employment.

3. Data and methods

3.1. Defining the scope of population-based services

"Population-based services" are not a common category of activity classification systems. This set of services is classically associated with trade and transportation sectors to constitute the tertiary sector, which is further differentiated into market (transportation, trade, real estate, financial activities, etc.) and non market (education, health, social services, public administration) tertiary services. A second differentiation criterion is between household- and firm-related demand (Table 1). INSEE's work on the definition of Functional Economic Areas (FEAs, *bassins de vie*, INSEE 2003) suggests yet another classification of major activities: those that mainly satisfy the needs of the local population (residential sector) and those that contribute to the production of goods and services for a greater market area than the sole local market (productive sector).

Here the scope of "population-based services" focuses on the service sector and activities that satisfy the needs of the population. Since the distinction regarding population- vs. firm-demand is not systematically easy to make, we also used the analysis by Armand and De Seze (2005). For services whose final demand is not obvious, this study analyzes the coefficient of variation of their density of employment per inhabitant. A low coefficient of variation, which means a fairly homogenous distribution of employment, is a salient feature of population-based services; whereas activities that are not directly related to population density are characterized by high coefficient of variation values and are excluded from the analysis[3].

[3] For example, leasing-purchase, reinsurance, financial intermediation, film production or labor union activities.

Table 1. Employment in population-based services (1999)

Activity typology	Total employment (1999)
1. Classic sectoral breakdown	
• Primary sector	1,570,168
• Secondary sector	3,529,230
• Construction sector	1,322,979
• Tertiary sector	16,378,354
Total	22,800,731
2. FEA typology (INSEE, 2003)	
• Residential economy	12,936,593
• Farm and agrifood economy	1,570,168
• Industrial economy	8,293,970
Total	22,800,731
3. Employment in population-based services (author calculation using INSEE data)	11,480,056

In conclusion, the set of population-based services comprises tertiary sector activities that directly satisfy the needs of the population, i.e. the set of final tertiary goods production activities. Therefore, this definition is restrictive regarding goods production activities such as construction, energy production, or firm-related services, which are excluded from the analysis; but inclusive regarding public services, which are overwhelmingly included in the study[4].

As defined, population-based services comprise diverse activities and jobs, both in the public and the private sectors, both market and non-market in nature, with different location factors. For this reason, the set of population-based services was broken down into four sub-groups that are commonly used at intermediate aggregation levels of activities:
- Trade
- Market services (hotels, restaurants, transportation, financial and real estate activities, recreation activities, personal services)
- Administered services (postal mail and telecommunication, education, health and social services, associations)
- Government services.

[4] The detailed list of study economic sectors (population-based services in NAF 700, NES 36 and NES 114 classification systems) is available from the authors.

3.2. Estimation of tourism employment

Tourism-sensitive activities classically include lodging, café, restaurant and leisure activities as well as travel agencies (MDT, INSEE 2005). Also included in this set are more marginal activities such as cable car and lift activities as well as "personal services" limited to individual care[5].

Using this definition, it is easy to understand that counting all (but only) jobs in these 15 sectors present a risk of overestimation because all employment in these sectors is not related to tourism. Indeed, as much as jobs in hotels may be considered as fully dependent upon tourism, jobs in cafes and restaurant depend upon the local population to a significant extent. But there is also a risk of underestimation because this list of 15 sectors does not take account of other sectors that are impacted by tourism activity; for example, to some extent jobs in retailing (food or not) are impacted by temporary residents (tourists and day travelers).

In this study, the estimation of tourism employment using the minimum requirements technique (Dissart et al. 2009; English et al. 2000; Leatherman and Marcouiller 1996) aims at meeting the objective of both taking account of all tourism-related activities (in addition to the above-described 15 sectors) and counting tourism-related employment only. The rationale of this method is that within groups of homogenous regions from a population-based demand perspective, the region that presents the minimum number of population-based employment per inhabitant is considered satisfying the needs of the permanent resident population only. Within this group, all population-based job values that are higher than this minimum value are considered satisfying the needs of the temporary resident population; it is assumed such demand corresponds mostly to tourism and recreation demand.

This method has been used in the United States to estimate tourism employment at the county scale and requires several steps: 1) creating groups of homogeneous regions (FEAs in this case) from a population-based demand perspective; 2) calculating the minimum requirements value; then 3) estimating tourism employment in each FEA. It is further assumed that tourism employment is mostly related to the market service sector, which implies identifying tourism employment as a subset of trade activities and market services, thereby excluding administered and government services. Last, tourism employment is not estimated directly: the minimum requirements is estimated on the basis of population-based employment density, then it is used to estimate the density of tourism employment, then the number of tourism jobs.

Consistent with explanatory variables of the density of population-based services (see 3.3), the typology of functional economic areas is based on market potential and household

[5] Classified as follows in the French Activity Nomenclature (NAF rev. 1, 2003) (Dissart et al. 2009):
· Lodging: tourism hotels with a restaurant (551A); tourism hotels without a restaurant (551C); other hotels (551E); youth hostels (552A); campgrounds (552C); other tourism lodging (552E)
· Restaurants and cafés: traditional restaurants (553A); fast-food restaurants (553B); *cafés tabacs*6 (554A); bars (554B)
· Other activities: cable cars, ski lifts (602C); travel agencies (633Z); beauty salons (930E); spa and thalassotherapy activities (930K); other body care (930L)

propensity to consume locally, with five clustering criterion variables: 1) household average net income; 2) proportion of blue-collar workers; 3) proportion of retirees; 4) commuter balance rate; and 5) size of the FEA pole. Because of measurement unit differences, variables were standardized (mean 0, standard deviation 1) and their level of correlation observed prior to clustering analysis. The clustering algorithm is a k-means method and the final number of clusters was decided using several empirical criteria (R^2 included). Then, as the minimum value in a given cluster may actually be an outlier and since there is no theoretical justification for using systematically the minimum value (Klosterman 1990), we used the 10th percentile value, a choice that also reflects our intention to get a moderate estimation of tourism employment density in functional economic areas.

3.3. Explanatory variables of population-based and tourism employment density

Location factors of population-based services are analyzed using the density of employment (per 1,000 inhabitants) in those sectors as the dependent variable. The choice of this indicator is both critical and forced. By choosing employment, we make sure that data are available, which makes the assessment of the distribution of activity over the whole territory possible. Numbering jobs, however, does not account for establishment location and labor productivity issues.

As stated before, the geographic scale of analysis is Functional Economic Areas (INSEE 2003). An FEA is the smallest region in which the (permanent) resident population has access to jobs and most of the facilities it needs. There are 1,916 such sub-regional areas that cover the French territory, the majority of which (1,745) are structured around small towns with less than 30,000 inhabitants.

The analysis uses a spatial classification system called ZAUER (*Zonage en Aires Urbaines et aires d'emploi de l'Espace Rural*), which divides the national territory into several categories. First, the rural-dominant space comprises both small urban units and other rural municipalities. Second, three categories make up the urban-dominant space: urban poles, periurban rings (all urban area municipalities except the urban pole), and other periurban municipalities (whose residents commute to several urban areas). Using 1999 census data, the classification of municipalities is based on both the number of jobs and commuting patterns. We adapted this classification to the FEA scale to retain four spatial categories for the analysis: urban pole, periurban, rural job pole, and other rural FEAs.

Statistical data about population-based employment and FEA characteristics were used to understand the location factors of employment in both population-based and tourism services. Two statistical methods were used successively. First, regression analysis (OLS) was used to identify FEA structural characteristics that impact the density of employment in population-based and tourism services. Second, shift-share analysis was used to identify geographic factors that may be associated with specific territorial dynamics (Gaigné et al. 2005).

Explanatory variables of the location of population-based employment

The dependent variable is the density of population-based employment per 1,000 inhabitants. The explanatory variables that measure the two dimensions that impact employment, i.e. market potential and the propensity to consume locally, are the following[6]:

- Regarding market potential:
  - **Market size** (UUPSDC99CAP): number of people living in the pole of the FEA in 1999.
  - **Income** (RNETMOY03): household average net income in 2003.
  - **Consumption structure** (TXOUVR99, TXRETR99): proportion of blue-collar workers and retirees in the total population in 1999.
  - **Potential for temporary attendance** (IND_PRES): tourism lodging capacity, i.e. number of beds in campgrounds (2005), hotels (2005) and second homes (2003) relative to FEA total population in 1999.

- Regarding the propensity to consume locally: daily (work-residence) commute:
  - **Proportion of the FEA workforce that leaves the FEA** of residence to work in an urban area in 1999 (TXBVNAVSORT).
  - **Proportion of the workforce who enters the FEA** urban area in 1999 (TXBVNAVENT).
  - **Commuter balance rate**: ratio between the balance of commuters (BVNAVENT-BVNAVSORT) and the employed workforce per FEA (TXSOLDEBVNAV).

Explanatory variables of the location of tourism employment

The dependent variable is the density of tourism employment in trade and market services estimated by the minimum requirements technique applied to every FEA cluster. The independent variables used for clustering functional economic areas, and consequently for estimating tourism employment, are excluded from regression analysis since their effect has already been taken into account.

The independent variables assumed to influence the local level of tourism employment, hence its distribution over the national territory, are the following:

- **Potential for temporary attendance** (IND_PRES): see above.
- **Fiscal potential** (POT_FIS_HAB): sum of the four local direct taxes (lodging, business, developed land, undeveloped land), each multiplied by its average national rate, divided by the number of inhabitants; this variable proxies a capacity for public action at the multimunicipality scale.
- **Accessibility** (TT_PU99): average access time (in minutes) from the municipalities of an urban area to the urban pole of the same urban area or the closest one (timewise).
- **Population density** (POPDEN) in 1999: also an indicator of the built environment (because of high correlation with artificial surfaces), of tourism attendance (e.g. man-made heritage, museums), and access to services (fast food, etc.).
- **Density of nature-based sports facilities** (DRESSN) (source: RES, Ministry of Health and Sports): number of nature-based sports facilities (e.g. hiking trail, via ferrata, canyoning) per 1,000 inhabitants. These facilities use local natural resources and are more likely to attract external households than other facilities (e.g. soccer field) that are more directly related to meeting the needs of the local permanent population.

[6] For descriptive statistics of these variables, see Appendix 1.

• **Density of farm and agrifood employment** (DEA): number of jobs (per 1,000 inhabitants) in farming and food processing; this variable also reflects a potential positive amenity in terms of landscape maintenance, economic activity support, and more generally rural life.
• **Density of manufacturing employment** (DEI): density of employment in manufacturing activities (except agrifood), which reflects a potential negative amenity because such activities may be negatively perceived in terms of landscape and pollution.
• **Natural amenity index** (NAINDEX2): this index is partially based on previous work by McGranahan (1999; 2008) and uses four climate and landscape feature variables: 1) proportion of water areas (wetland and water body surfaces divided by total FEA area); 2) topographic variation (difference between the FEA maximum altitude and that of the FEA's main municipality's city hall); 3) warm winter (average January temperature); 4) wet summer (average number of rainy days) (source: IGN; Corine Land Cover; Brossard et al. 2006). The index is simply the sum of the 4 variables, capped for extreme values and standardized (0, 1).

4. Results

After a description of population-based and tourism employment in France and its distribution in terms of density across functional economic areas, this section presents econometric estimation and shift-share analysis results regarding employment location factors of the two dependent variables.

4.1. Employment density in population-based and tourism services

As defined in this paper, population-based services comprise a total of 11.5 million jobs, i.e. 50 % of national total employment in 1999. These jobs are mostly located in urban centers (over 75 %) that comprise 61 % of the population, and in particular in the biggest cities (about 2 out of 3 population-based jobs are located in urban areas over 200,000 inhabitants except Paris). The Paris urban area itself comprises about 2.4 million jobs in population-based services, i.e. 20 % of national employment in this sector (vs. 16 % of the national population). Then, periurban areas rank second with over 1.2 million jobs. On the other hand, rural areas comprise less than 1 out of 6 jobs to serve less than 1 out of 5 inhabitants. In these areas, population-based services are particularly concentrated in rural poles (i.e. rural towns and their proximate periphery) with 50 % of the jobs (vs. 30 % of the population) located there.

Among population-based services, administered services (education, health, associations, postal mail) represent by far the highest share of jobs (45 %). Trade and market services rank second (43 %), followed by government services (1.6 million jobs). The balance between market services at large (i.e. including trade) and administered and government services is relatively constant across space. Paris is unique because market service jobs are almost as numerous as administered and government jobs. In contrast, administered and government jobs tend to be more important in other urban poles, particularly in small- and medium-sized cities.

Observing population-based services at the functional economic area scale yields a finer analysis of their distribution (Table 2). An FEA's position in the urban area classification is

given by its main municipality's position in that spatial typology. The 6,000 average of population-based jobs is strongly linearly correlated (R^2=0.93) with the number of (permanent) residents. Outside Paris, urban FEAs comprise an average of 20,000 population-based jobs. Again, this figure is directly related to the size of the urban pole. With about 2,000 population-based jobs, rural pole FEAs are very different from periurban FEAs (an average of 1,350 jobs, but with greater variabililty), though they present similar population levels (11-13,000 inhabitants) and the latter exhibit the highest population growth rate (close to 1 % per year between 1990 and 1999). However, the growth in population-based salaried employment was strongest in periurban areas over the 1999-2005 period, which may indicate that a convergence process in terms of facilities and services is at work in these areas. With fewer than 800 population-based jobs, rural FEAs appear as very small-sized rural markets.

Table 2. FEA employment in population-based services according to spatial category

ZAUER of FEA pole	Jobs in population-based services (1999)	Rate of change in salaried jobs, market population-based services[a] (1999-2005)	Population annual rate of change (1990-1999)
Urban pole (except Paris)	[b]19,936 [c](35,579)	1.76 (1.39)	0.31 (0.53)
Paris	2,374,429	0.78	0.21
Periurban municipality	1,341 (1,345)	2.22 (2.96)	0.98 (0.90)
Rural pole	1,935 (911)	1.81 (2.40)	0.17 (0.68)
Rural municipality	778 (345)	1.50 (3.03)	0.03 (0.74)
Total	5,992 (56,706)	1.82 (2.63)	0.37 (0.83)

Source: INSEE, UNEDIC
[a] Constant scope between 1999 and 2005, whereas the UNEDIC scope of administered and government services has broadened between these two dates.
[b] mean; [c] (standard deviation)

Using the FEA scale enables an analysis of the relative importance of population-based jobs to the considered population (here the permanent resident population). On average, the density of population-based services is 150 jobs per 1,000 inhabitants (Table 3), but there is great variation depending on the spatial category of the functional economic area. FEAs structured around urban poles show an average density that is almost twice as high as that for periurban communes (195 and 116 jobs per 1,000 inhabitants, respectively). This gap is even greater for the biggest urban areas, as exemplified by Paris with an average density that is almost two-thirds higher than the national average. Rural areas exhibit a higher density of population-based services than periurban areas (about 150 jobs per 1,000 inhabitants, which is close to the national average), thus showing their greater capacity to

satisfy the needs of the residing population. Moreover, there is little difference between rural pole vs. other rural FEAs.

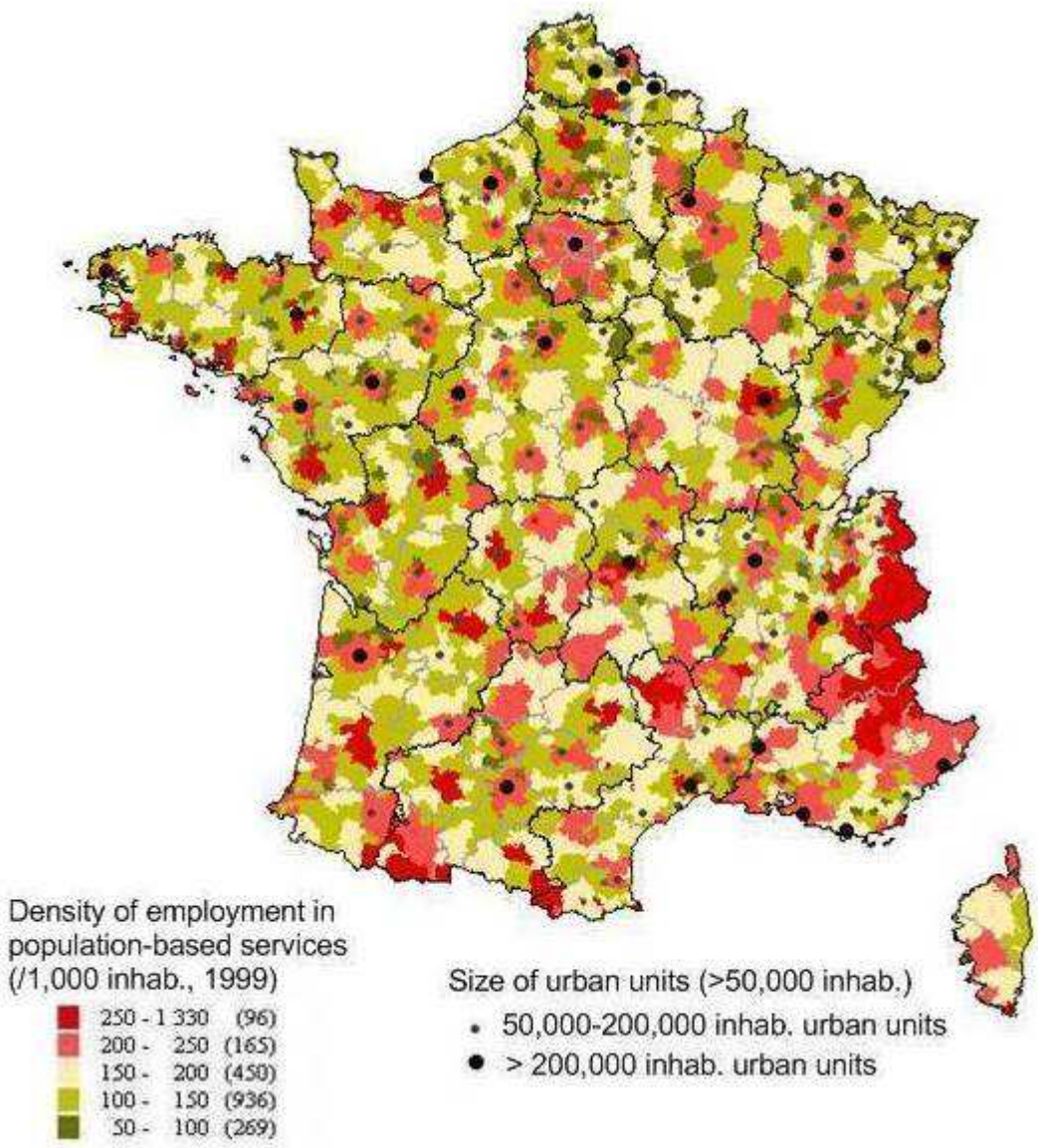
Table 3. FEA employment density in population-based and tourism services according to spatial category (1999)

ZAUER of FEA pole	All pop.-based services	of which trade	of which market services	of which administered services	of which government services	Tourism jobs[a]
Urban pole (except Paris)	[b]195 [c](46)	41 (8)	40 (23)	87 (21)	27 (11)	27 (28)
Paris	242	38	78	88	39	42
Periurban municipality	116 (42)	27 (27)	23 (12)	52 (19)	13 (5)	15 (31)
Rural pole	156 (93)	34 (15)	37 (71)	68 (27)	17 (8)	33 (84)
Rural municipality	146 (73)	29 (12)	36 (52)	64 (29)	17 (8)	26 (61)
Total	150 (73)	32 (18)	34 (48)	66 (27)	18 (9)	25 (58)

Source: INSEE, UNEDIC
[a] estimated by the minimum requirements technique; [b] mean; [c] (standard deviation)

Figure 1 shows that FEAs with low job densities in population-based services are often close to urban poles; such FEAs are mostly located in the northern part of France, from Brittany to Alsace. Functional economic areas with high job densities (> 250) correspond to urban poles (e.g. Caen, Rennes, Vannes, Dijon, Besançon) and significant tourism areas (the Alps in particular).

Figure 1. FEA density of employment in population-based services (1999)



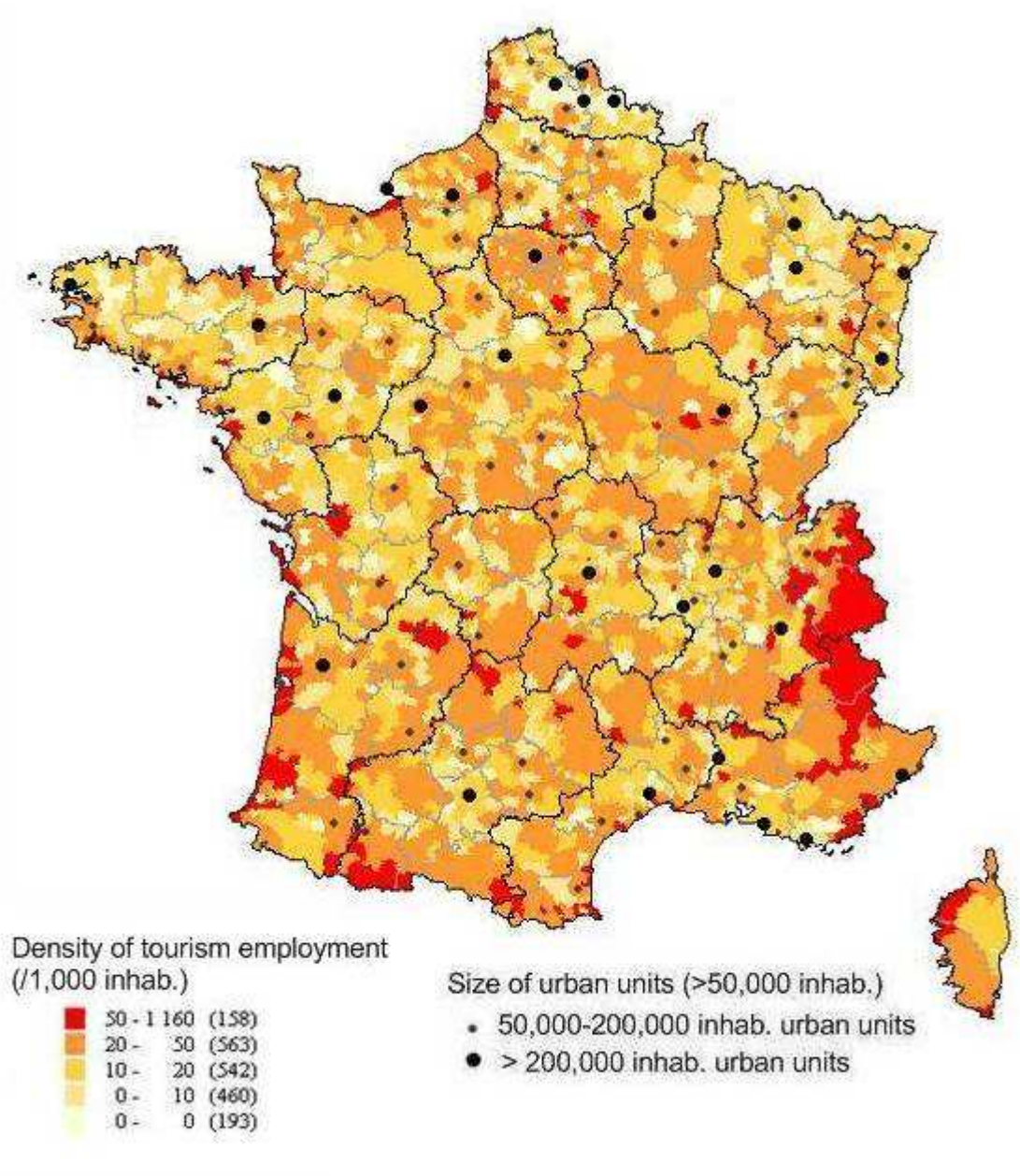
Source: IGN99, INSEE

The estimation of tourism employment using the minimum requirements technique applied to structurally homogeneous clusters of functional economic areas yields a total value of 1,486,794 tourism jobs, i.e. 13 % of all population-based service jobs. This estimation is higher than Baccaïni et al.'s (2006) -894,500 jobs in 2003- but not inconsistent. Indeed, their estimation is based upon more precise data (DADS) but limited to salaried employment, whereas our estimation includes sole proprietorships and uses a different method. The yearly survey of service firms (*Enquête Annuelle d'Entreprise*, INSEE) gives average values for salaried and non-salaried employment in tourism sensitive activities. Using these figures, a ratio of non-salaried to total employment of 21 % (in 2003) may be calculated. Applying this ratio to Baccaïni et al.'s (2006) estimation, we get a non-salaried employment figure of

186,281 for a total employment figure of 1,080,781, thereby reducing the gap with our estimation.

This estimation of tourism employment corresponds to an average density of 25 tourism jobs per 1,000 inhabitants (Table 3), i.e. an average of one sixth of total population-based service employment in functional economic areas. As expected, this density is less related to the FEA spatial position along the urban-rural gradient. Indeed, on average, tourism employment density values are similar or even higher in rural area vs. urban pole FEAs. Paris presents a unique situation given its strong tourism attractiveness (as a worldwide tourism destination).

Figure 2. FEA density of tourism employment in 1999



Source: Author calculation using INSEE, IGN99 data

The highest densities of tourism employment are mostly found in southern France (Figure 2), and more specifically in coastal and mountain areas (including Corsica). To a significant extent this result matches the location of tourism lodging (number of beds in second homes, hotels and campgrounds) which is also mainly located in coastal and mountain areas. Higher-than-average tourism employment densities (20-50) are observed in the hinterland of coastal and mountain areas, but also in many FEAs located in eastern France (Bourgogne, Jura, Champagne-Ardenne) as well as southwestern France and Massif Central (Dordogne, Lot, Corrèze, Cantal, Aveyron, Lozère). The lowest densities of tourism employment are observed in the western part of France, as well as the Nord and Lorraine regions.

4.2. Location factors of population-based and tourism employment

4.2.1. Estimating the role of structural variables in population-based employment density

The variables of market potential and propensity to consume locally (Table 4) significantly explain the density of population-based employment (R^2=0.61). However these variables exhibit a greater explanatory power for trade and market services than for administered and government services (R^2=0.62 vs. R^2=0.39, respectively).

The factors that impact market potential via the population social structure and non-resident attendance have a strong explanatory power. The role of household consumption structure, proxied by the population social structure, is confirmed even though the income variable is not included in the specification. Therefore the level and/or structure of consumption in heavily blue collar FEAs is associated with a lower density of population-based employment.

The propensity to consume locally significantly impacts the density of employment, mainly via work-residence daily commutes. A greater proportion of the workforce that enters the FEA is strongly and positively associated with the density of employment in population-based services, thereby increasing FEA market size for these services; the opposite association is found for the proportion of the workforce that leaves the FEA, thus confirming the role of commuting patterns in explaining the density of population-based employment. This process of capturing some of the peripheral FEA income is significant regardless of the size of the FEA pole. Last, the size of the FEA pole is positively associated with the density of employment regardless of its attractiveness potential for the peripheral FEA workforce.

The location factors of employment in administered and government services are different from those of market services, though they are not explained as well by the selected independent variables. Household social characteristics seem to play a more significant role in the density of administered and government employment, though negatively: a greater proportion of blue-collar households is associated with a lower density of population-based employment. This result seems surprising given policy makers' equity objectives in terms of access to public services. It may nonetheless be explained by the relative social differentiation of functional economic areas: in general, periurban areas offer fewer services and are more "blue-collared". Attractive FEAs in terms of non-resident population attendance tend to have fewer jobs in administered and government services than other

FEAs, and the opposite holds for trade and market services, which confirms the private sector orientation of the tourism economy impacts.

Table 4. Regression analysis of population-based employment density

Variables	All population-based services[a]	Trade and market services	Administered and government services
Intercept	[b]***0.191	***0.051	***0.140
TXOUVR99	***-0.240	0.011	***-0.252
IND_PRES	***0.018	***0.019	***-0.001
TXBVNAVENT	***0.133	***0.083	***0.049
TXBVNAVSORT	***-0.138	***-0.053	***-0.085
UUPSDC99CAP	***0.0001	***0.00001	***0.00007
N	1916	1916	1916
Pr > F	<0.0001	<0.0001	<0.0001
Adjusted R^2	0.61	0.62	0.39
Condition index	11.88		

[a] The income (RNETMOY03) variable was dropped due to high correlation with the rate of entering and exiting commutes, itself due to the strong social differentiation of urban FEAs which concentrate both jobs and "bedroom" areas. Spatial category variables were omitted due to their high correlation with commuting variables upon which the ZAUER typology is partially based.
[b] *p<0.10; **p<0.05; ***p<0.01

4.2.2. Estimating the role of structural variables in tourism employment density

The variables of lodging capacity and fiscal potential are highly correlated with the density of tourism employment (0.75 and 0.73, respectively). A simple linear regression model with each of these independent variables yields a coefficient of determination value of 0.57 (lodging capacity) and 0.54 (fiscal potential). Therefore, the chief result of the analysis is that the location of tourism employment is first and foremost conditioned by tourist demand, which is not limited to high-season because of the increasingly important role of short stays all year long, and the investment capacity of local units of government (Table 5, model 1). Thus, tourism lodging capacity directly reveals tourism attractiveness and induces a large supply of tourism services. Moreover, the explanatory role of fiscal potential shows that tourism attractiveness increases municipalities' fiscal wealth significantly; this should be related to fiscal policy since second homes and tourism-related economic activities extend fiscal bases.

Then, the density of tourism employment is explained by a set of variables regarding the attractiveness of the functional economic area (Table 5, model 2). Thus are tested the influence of FEA accessibility (TT_PU99), density of nature-based sports facilities (DRESSN),

population density (POPDEN), other economic activities (DEA, DEI), and natural amenities (NAINDEX2).

Table 5. Regression analysis of tourism employment density

Variables	Model 1	Model 2
Intercept	[a]***-28.11374	***31.01987
IND_PRES	***0.01214	
POT_FIS_HAB	***0.07753	
TT_PU99		***0.32095
POPDEN		-0.01127
DRESSN		***0.21822
DEA		***-0.06388
DEI		***-0.02269
NAINDEX2		***2.26205
Pr > F	<0.0001	<0.0001
Adjusted R^2	0.6738	0.0469
Condition index	5.09754	5.83760

[a] *p<0.10; **p<0.05; ***p<0.01

The results of the two models are significant overall, but the R^2 drops as soon as neither lodging capacity nor fiscal potential are included in the specification. The condition index, whose value is 5 and 6, indicates a low level of multicollinearity. As compared with simple linear regression models, there is a R^2 gain only if fiscal potential and lodging capacity are included in the specification, otherwise it drops to less than 5 % (R^2 increases to over 60 % as soon as either one of these variables is included in the model), thereby showing the strong explanatory power of these two variables. Indeed the level of correlation between the density of tourism employment and the other structural variables is less than 0.15.

Regarding independent variables: accessibility, density of nature-based sports facilities and natural amenity index are significant and positive; population density is not significant; and employment density in farming and agrifood processing and manufacturing all display a negative sign.

In other words, and caution is in order given correlation levels between these variables and tourism employment density, the positive sign of the natural amenity index seems to point to a link between territorial resources –both mountainous and Mediterranean (where index

values are the highest)- and tourism jobs. The relatively weak character of this relation is partly due to differences between the geography of the index –heavily influenced by southern amenities- and the geography of tourism employment, which is also sensitive to resort effects in mountain areas. The significant, positive sign of the accessibility variable seems to indicate that remoteness positively impact tourism employment density, or at least that the presence of amenities counteracts to some extent constraints associated with the cost of distance; in this perspective, relative isolation may be considered an amenity, though sustainability issues regarding this development path remain. Last, there does not seem to be an activity-related amenity effect: neither farming and agrifood processing employment, though related to landscape maintenance or rural milieu support, nor manufacturing employment are positively associated with tourism employment density.

In conclusion, density of lodging capacity, and to a lesser extent fiscal potential per inhabitant, yield relatively confident estimations of the density of tourism employment in a given functional economic area. Regression models with a more complete specification but not including these two variables significantly lose explanatory power, which calls into question the usefulness of such more complete models. In particular, the density of lodging capacity seems to concentrate several categories of tourism-related information: lodging capacity (market or non-market) reflects the attractiveness of a given geographic area, without assuming the nature of this attractiveness, and such attractiveness results in jobs in trade and market services related to the presence of tourists. Therefore, the rationale seems to be the following: there is lodging capacity because there are interesting resources for tourism, regardless of their nature, and these resources are sufficiently accessible and preserved to keep a significant level of tourism employment.

4.3. Spatial and regional differentiation

The two dependent variables, density of population-based employment and density of tourism employment, exhibit spatial sensitivity since they specifically vary according to the FEA spatial category. The former is particularly impacted by its position on the urban-rural gradient (Table 6): the gap is about 80 jobs per 1,000 inhabitants below the national average in periurban areas, minus 50 in rural areas and plus 20 in urban poles. The latter is clearly more impacted by regional criteria (Table 9): the gap with the national average is higher for tourism type (+ 40 for mountain resorts) than for urban or rural context (+ 4 and - 8, respectively). Shift-share analysis shows how much of the observed difference with the national average is explained by the geographic variable vs. the structural variables identified in previous steps of the analysis.

In the shift-share model of population-based employment density, every structural variable has a statistically significant effect on the dependent variable (Table 6). The balance of commutes has a negative impact in periurban and rural FEAs, as expected, but also in rural pole FEAs. Only urban FEAs benefit from the positive work-residence commuting balance. The effect of income is relatively as expected, with a decreasing impact on the density of population-based employment along the urban-rural gradient.

Table 6. Shift-share analysis of population-based employment density (ZAUER as geographic variable)

ZAUER	Pop.-based job density (/1,000 inh.)	National avg. gap (196.18)	Geographic effect ZAUER	Structural effects Income RNETMOY03	Lodging cap. IND_PRES	Commuting TXSOLDEBVNAV
Urban pole	217.64	+21.46	*+2.35	***+4.23	***+1.70	***+13.18
Periurban	120.86	-75.32	***-31.84	***+2.86	***-2.00	***-44.33
Rural job pole	149.12	-47.06	**+9.82	***-18.84	***-6.40	***-31.63
Other rural	135.64	-60.54	+5.03	***-24.20	***-6.46	***-34.90

Adjusted R^2: 0.91
Condition index: 9.25
Note: the gap between the ZAUER average employment density and the national average employment density is equal to the sum of the geographic effect and the three structural effects. For example, for "urban pole" above: + 21.46 = + 2.35 + 4.23 + 1.70 + 13.18

The same observation is made for lodging capacity, though with a smaller magnitude. Lodging capacity contributes positively, albeit weakly, to the density of population-based employment in urban FEAs only. The unique situation of Paris may largely contribute to this result. Lodging capacity is detrimental to the population-based service economy everywhere else, particularly in rural areas. This result also shows the high concentration of tourism attractiveness in rural areas: the density of population-based employment tends to be less than the national average for most of these FEAs, thereby showing that few rural FEAs benefit from tourism attractiveness.

The geographic effect is mainly observed in periurban areas, where it is very negative (- 32). Therefore, about half the gap with the national average (- 75) would be related to inherent features of these FEAs, after controlling for the stronger propensity of their population to consume services in the nearby urban pole and their structural lack of lodging capacity. This situation may be explained by the significant change these FEAs experience as a result of urban sprawl. The lack of anticipation of decision makers regarding urban, facility and service planning would explain a supply lag in these areas. Rural FEAs structured around a job pole benefit from a slight, positive geographic effect (significant at 5 %) on the density of population-based employment, which partially corrects the negative impacts of structural variables.

To get a finer analysis, we applied shift-share analysis to trade and market services vs. administered and government services. In the case of trade and market services (Table 7), the highest negative gaps relative to the national average are observed, as previously, in periurban and rural FEAs (both rural pole and other rural FEAs). Overall, the ZAUER geographic effect is very weak, periurban FEAs included. Therefore the observed lag in facilities and services in those FEAs seems to mostly apply to administered and government services; the private sector may be more reactive to adjust the supply of market services to changes in local demand. Among structural effects, commuting patterns play a major role, especially in periurban areas (multiple-purpose trips), followed by income in rural areas. On the contrary, lodging capacity has no structural effect on the location of market population-

based employment, probably indicating that each category, from a ZAUER classification viewpoint, comprises contrasted cases (except periurban areas).

Table 7. Shift-share analysis of population-based market (trade and market services) employment density (ZAUER as geographic variable)

ZAUER	Pop.-based job density (/1,000 inh.)	National avg. gap (83.63)	Geographic effect ZAUER	Structural effects Income RNETMOY03	Lodging cap. IND_PRES	Commuting TXSOLDEBVNAV
Urban pole	92.58	+8.95	-0.06	***+2.81	+0.31	***+6.43
Periurban	51.74	-31.89	***-1.08	***+1.86	***-1.31	***-21.66
Rural job pole	64.00	-19.63	***+0.96	***-12.60	-1.24	***-15.40
Other rural	59.26	-24.37	**+0.77	***-15.79	+0.73	***-17.07

Adjusted R^2: 0.84
Condition index: 9.25

Differences between employment density values in administered and government services by spatial category and the national density value follow the pattern previously observed (Table 8). Indeed, commuting plays the most important structural role, which questions the assumption that the location of such services is related to place of residence. Income and lodging capacity present comparable (negative) effects in rural areas. The geographic effect is strongly negative in periurban areas, which seems related to a lag effect for these services in areas that experience strong population growth. In such areas, it is likely that both a smaller (per resident) public financial capacity and a lower level of intermunicipal cooperation limit investment capabilities. On the contrary, a very weak geographic effect is observed in rural areas, whether functional economic areas are structured around a job pole or not.

Table 8. Shift-share analysis of population-based non-market (administered and government services) employment density (ZAUER as geographic variable)

ZAUER	Pop.-based job density (/1,000 inh.)	National avg. gap (112.55)	Geographic effect ZAUER	Structural effects Income RNETMOY03	Lodging cap. IND_PRES	Commuting TXSOLDEBVNAV
Urban pole	125.05	+12.50	***+2.94	***+1.42	***+1.39	***+6.74
Periurban	69.12	-43.43	***-21.07	***+1.00	**-0.69	***-22.67
Rural job pole	85.12	-27.43	+0.22	***-6.25	***-5.16	***-16.23
Other rural	76.38	-36.17	-2.72	***-8.41	***-7.19	***-17.83

Adjusted R^2: 0.89
Condition index: 9.25

Lodging capacity, fiscal potential and natural amenities were retained as structural variables that impact tourism employment (Table 9). Several geographic effects (including ZAUER) were tested to explain the density of tourism employment; the geographic effect of tourism zones yielded the highest R^2. Tourism zones are defined on the basis of both geographic context (coast, mountain, mountain resort, rural, urban) and municipalities' lodging capacity. For instance, a functional economic area is considered part of the "coast" tourism zone if,

among all municipalities that make up the FEA, the greatest lodging capacity is found in municipalities that belong to the "coast" category defined by tourism professionals. Tourism employment is strongly differentiated between tourism zones: mountain resorts display an employment density that is almost four times as high as that of rural areas. These gaps are largely explained by structural effects, but there is a specific dynamics at work in mountain resorts that strongly impacts tourism employment in these areas (about half the density value is explained by the geographic variable). On the contrary, the "rural" zone presents a value for tourism employment that is significantly lower than the national average.

The explanatory power of the four selected variables is fairly good (R^2=0.58). The highest explanatory power of the natural amenity index is found in this specification, even though its effect on tourism employment remains relatively weak as compared with lodging capacity and fiscal potential.

Table 9. Shift-share analysis of tourism employment density (tourism zones as geographic variable)

Tourism Zone	Tourism job density (/1,000 inh.)	National avg. gap (25.9)	Geographic effect Tourism zone	Structural effects Lodging cap. IND_PRES	Fiscal pot. POT_FIS_HAB	Amenities NAINDEX2
Coast	27.7	+1.8	*-4.1	***+7.8	***+1.3	***-3.2
Mountain	23.1	-2.8	***-10.8	***+11.2	***-2.0	***-1.2
Rural	17.4	-8.5	***-6.7	***+2.2	***-4.0	+0.1
Mountain resort	66.1	+40.2	***+30.3	***+8.8	***+3.4	***-2.2
Urban	30.4	+4.5	***+6.0	***-5.3	***+2.6	***+1.1

Adjusted R^2: 0.58
Condition index: 4.77

The geographic effect is significant regardless of the tourism zone and, again, mountain resorts stand out with a high density of tourism employment. Using this typology yields an a priori counterintuitive result, i.e. a negative sign for the "coast" category. Actually this result seems to show that the density of tourism employment in coastal areas is relatively equal to the national average (25.9 vs. 27.7 for coast) and since the lodging capacity structural variable grabs most of the (positive) explanatory power (followed by fiscal potential), the geographic effect (negatively) adjusts (followed by the natural amenity index) to yield the observed employment density.

In conclusion, high tourism employment density is found in functional economic areas where mountain resorts are located, as illustrated by the significant and positive contribution of the "mountain resort" category of the FEA tourism typology. This result matches Baccaïni et al.'s (2006) who showed that the share of tourism vs. total salaried employment is particularly high in mountain resorts.

5. Conclusion

The analysis of the geography of population-based and tourism services at a fine geographic scale (i.e. functional economic areas) shows a very heterogeneous distribution that, at first, follows logically the distribution of the population according to an urban hierarchy model: the number and density of population-based jobs decreases from FEAs structured around major cities to FEAs structured around rural job poles. Two dispersion effects, however, dampen agglomeration effects; the former are related to the presence of resources likely to create tourism attractiveness and political criteria that condition the location of non-market services.

Tourism jobs illustrate dynamics at work in the service sector as well as territorial development issues. Indeed, total demand for population-based services is dependent upon both the residing permanent population and the temporary tourism population. The enhancement of an existing local resource conditions the density of tourism jobs, which is de facto maintained by a circulation of external income. Conversely, the surplus of demand generated by tourism attendance supports a level of supply that is higher than the local consumption potential, which, by crossing certain thresholds, may sometimes ensure the maintenance of proximity services. In terms of jobs, the potential for domino effects of tourism activities and more broadly population-based services on production activities that are not directly dependent upon the local population remains unanswered.

Administered and government service jobs are distributed more evenly across the national territory than market sector jobs. Two factors may explain this situation. On the one hand, non-market services are located according to spatial equity criteria that take account of the population's access to universal services regardless of location and local demand level. On the other hand, a lagging effect could hide ongoing adjustments in public services. Due to inertia, historic locations in old settlement centers, whether rural or industrial, may last even after significant changes in local demographics; whereas periurban areas, characterized by recent population growth, may not experience a short-term adjustment of public services that would be consistent with local demand changes.

Limits and further work on this analysis are two-fold. First, a spatial issue relates to the territorial scale of analysis. The choice of functional economic areas partially endogenizes the relation between service location and population location; but it imperfectly accounts for the boundaries of local public action, which may be critical via local fiscal policies and public service supply, hence critical for population-based services, too. It does not allow either for an analysis of the relations that co-condition population-based and productive activities, which may be done using other types of economic space. Second, a time issue relates to the dynamics of change in location processes. Indeed, household residential and tourism destination choices directly impact localized demand potential. Location processes are also related to the sequence of paths that differentiate development possibilities according to previous choices made by public and private stakeholders. Using indicators of both population and employment change should better explain the situation of periurban areas and improve the analysis of residential dynamics in rural areas.

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Appendix 1. Descriptive statistics per functional economic area

Variables	N	Mean	Standard deviation	Minimum	Maximum
Explanatory variables of the location of population-based employment					
UUPSDC99CAP	1,916	15,746.00	49,807.00	2,000.00	500,000.00
TXBVNAVENT	1,916	0.13	0.18	0.00	2.21
TXBVNAVSORT	1,916	0.32	0.21	0.01	0.88
TXSOLDEBVNAV	1,916	-0.20	0.20	-0.78	1.50
RNETMOY03	1,916	8,418.00	1,541.00	5,006.00	22,846.00
IND_PRES	1,915	0.90	2.30	0.00	37.90
TXOUVR99	1,916	0.14	0.04	0.02	0.29
POT_FIS_HAB	1,916	545.00	318.00	202.00	4,674.00
NBBSI	1,916	1.50	1.00	1.00	8.00
Explanatory variables of the location of tourism employment					
POT_FIS_HAB	1,916	545.00	318.00	202.00	4,674.00
TT_PU99	1,916	27.00	18.00	0.00	126.00
NAINDEX2	1,900	0.00	2.40	-5.17	10.91
POPDEN	1,916	63.00	138.00	2.00	2,484.00
DRESSN	1,916	3.00	16.00	0.00	674.00
DEA	1,916	136.00	130.00	2.00	1,402.00
DEI	1,916	245.00	193.00	15.00	4,705.00
Dependent variables					
TXPOPSERVDIACTRP99	1,916	0.15	0.07	0.06	1.33
BM10DPOPCOMARCHRP99	1,916	25.41	57.70	0.00	1,157.34