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An estimation of tourism dependence in French rural areas

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Abstract

This paper estimates the importance of tourism in the economies of rural areas. Considering previous analyses of rural dynamics, the study 1) focuses on tourism activity, 2) analyzes the situation of Functional Economic Areas (FEAs), and 3) takes into account socioeconomic indicators as well as landscape attributes. Using statistical analysis of secondary data, resource-like regions are defined, the local share of tourism employment is estimated, key results regarding tourism indicators by cluster are presented, tourism-dependent FEAs are identified, and the relation between, on the one hand, tourism indicators and resource variables, and on the other hand, regional growth indicators and tourism dependence, is studied.

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I. Introduction

Tourism activity is characterized by trips with an associated set of goods and services including lodging, transportation, food and beverage delivery, personal and recreation services. This economic sector is difficult to define precisely because some of the related activities are not used exclusively for tourism consumption (*e.g.*, restaurants), and thus depend on the permanent vs. temporary population ratio. Though isolating tourism jobs is not easy, it is acknowledged that this "quasi-sector" plays an increasingly important role in the national economy, and is becoming strategic to the development of some areas. Such is the case of many rural areas where a shift away from traditional extractive and manufacturing activities has enhanced the role of hosting functions in general, tourism functions in particular, in local economic growth.

On the demand side of rural tourism, there is an interest in nature and landscape attributes, which are associated with healthy and quiet living conditions. For instance, including environmental variables in hedonic pricing models shows an impact of site characteristics on the rental prices of rural lodging (Mollard et al., 2006). On the supply side, two models of the tourism firm are usually found in rural areas. One model uses significant low-skilled labour but little capital and technology, while adding value to fixed "natural" assets (Eadington and Redman, 1991). This model matches rural entrepreneurship relatively well because it is based on family capital and labour and creates activities that suit farm diversification and household pluriactivity. A second, capital intensive, high-skilled labour model may be observed in "specialized" tourism resorts. Often found in mountain or seaside areas, this second model is relatively nonexistent in "ordinary" rural areas (except in leisure parks).

Thus, the type of tourism developing in rural areas is mainly extensive and based on local natural features. From a regional development perspective, the analysis of this type of tourism involves three complementary dimensions: i) conditional factors associated with public goods, ii) setting up a consistent tourism offer, and iii) domino effects on the local economy.

First, rural tourism adds value to fixed assets that often have a local public good status. Nature goods are strictly localized; their development and protection management associates rights and uses for which the public sphere plays a major role. Moreover, tourism activity increases consumption of local public services and

may require additional utility capacity to meet the needs of the permanent plus temporary population. These are not strict preconditions for the existence of tourism¹ because a given level of under-development or isolation may attract pioneering activities. However, the development of a significant tourism activity requires that public services and local amenities be available and maintained.

The second dimension pertains to how fragmented smaller projects add up to a consistent local offer. Contrary to resorts, which are planned and built in an integrated manner, rural tourism is made up of aggregated individual initiatives that more or less refer to a common context – a *pays d'accueil touristique*² for instance. Indeed, the issue is to provide a full and consistent array of tourism activities. The supply of primary goods and services (such as lodging and recreation activities) may adjust through competition, but nothing guarantees the implementation of secondary functions (e.g., fairs) over a reasonable time range. Moreover, territorial cohesion implies that user conflicts over access to fixed assets have been solved. Consequently, there is a need for an overall regulation of the local tourism offer, and it is critical to define an appropriate scale for coordinating tourism initiatives.

Third is the question of regional economic impacts of tourism activities. In addition to direct tourism jobs, indirect (in activities that have business relations with tourism activities *per se*) as well as induced (in sectors that benefit from increased demand due to higher local income in tourism activities) jobs must be taken into account. The analysis of indirect jobs requires input-output models to estimate intersectoral relation coefficients for every economic sector in contact with the tourism sector. The analysis of induced effects is based on the estimation of a multiplier that calculates demand changes in the residentiary sector after an exogenous shock changes income flows in the regional system³. These two methods are sensitive to the size of the study region and to the degree of integration of the given economy (Vollet, 1998).

The objectives of the paper focus on identifying the importance of tourism activities in rural areas. First, tourism-related jobs have to be identified, then the level of tourism activity is analyzed with respect to both the role of natural resources and local growth. In order to take regional effects into account, the analysis is conducted at Functional Economic Area (FEA, *bassin de vie*) level. The rest of the paper is organized as follows. Section 2 presents efforts to define rural tourism in the French and North American literatures. Section 3 presents data and methods. The results regarding FEA classification, tourism dependence and regional eco-

¹ Assuming elementary conditions of accessibility

² An area with a multimunicipal organization (e.g., an association) that brings together all stakeholders in order to implement a tourism development project

³ Additional income due to tourist spending is considered exogenous

conomic indicators are presented and discussed in section 4. The conclusion outlines study limits and further research topics.

II. Literature review

The most frequent definition of tourism refers to tourist consumption (*i.e.*, induced by at least one overnight stay for leisure and other purposes). An alternative definition may also be suggested on the basis of the set of goods and services supplied by the tourism branch: "Tourism is the aggregate of all businesses that directly provide goods or services to facilitate business, pleasure, and leisure activities away from the home environment" (Smith 1988, 183). This supply-side approach is more appropriate for regional analyses that differentiate between areas in terms of tourism activity (and employment in particular).

The distinction between rural tourism and other kinds of tourism is vague because the usual rural-urban distinction (e.g., urban area zoning) is not sufficient. It must be extended by a second classification that considers the nature of tourist destinations. Major tourism-related organizations thus make a distinction between city, seaside, mountain, and countryside tourism, the latter comprising leftovers from the first three. According to this typology and data from the Ministry of Tourism regarding trips for personal purposes (Direction du Tourisme 2006), "countryside" tourism is equivalent, in terms of number of nights, to "city" tourism (around 30%), before "mountain" tourism (20%), but after "seaside" tourism (40%)⁴. In terms of full-time equivalent jobs, however, the situation is different (Baccaïni et al. 2006): urban tourism accounts for over 48% of total tourism jobs, followed by seaside (23%), then rural (19%), then mountains (9.5%, including ski resorts). If the share of local employment in tourism is considered, then rural tourism is at the same level as urban tourism: around 3% (Baccaïni et al. 2006). However, in the countryside, tourism tends to be characterized by relatively shorter stays and the importance of family contacts and friends.

More generally, focusing on tourism leads to refine the notion of residentiary (*i.e.*, population-dependent, in an export base theoretical framework) economy. In defining FEAs, INSEE (2003) took the classic primary-secondary-tertiary typology a step further by distinguishing agrifood (agriculture and agrifood processing), manufacturing and residentiary specializations, where the latter (*i.e.*, in which at least 50% of the jobs are in population-dependent activities) is differentiated according to tourism. Using a lodging capacity criterion relative to the resident population (ratio > 1.5), about 10% of FEAs exhibit a residentiary-touristic specializa-

⁴ As several destinations may be reached taking only one single trip, the total is greater than 100%.

tion. Analyzing the situation of rural areas on a municipality basis, Aubert et al. (2006) differentiated between three types of communes for which tourism is significant: "non performing soft tourism", "attractive tourist sites", and "tourism economies with uncertain performance". The differences were related to the spatial organization of tourism activities (spread vs. polarized), and to their economic performance in terms of employment base (*i.e.*, sometimes weak and often precarious). These results match those of other studies that tend to question the impact of tourism activities on rural economic development (Dissart 2005). In this perspective, a comparison of the French vs. American situation is interesting.

Indeed, in order to provide relevant information to policymakers, researchers and public officials, the Economic Research Service of the U.S. Department of Agriculture has created a specific typology⁵. It includes recreation activity among seven overlapping categories of policy-relevant themes: 1) housing stress, 2) low-education, 3) low-employment, 4) persistent poverty, 5) population loss, 6) nonmetro recreation, and 7) retirement destination. The nonmetro recreation category comprises 334 counties, *i.e.*, 16% of rural counties (USDA-ERS, 2005). This designation is based on a combination of factors including the share of employment or share of earnings in recreation-related industries in 1999, the share of seasonally or occasionally used housing units in 2000, and per capita receipts from motels and hotels in 1997.

The "nonmetro recreation" type is actually an update and an extension of the pioneering work of Beale and Johnson (1998) who identified 285 recreational counties using two types of criteria. On the one hand, empirical criteria: 1) share of employment and income in recreation services (lodging for the most part), share of seasonal or occasional or recreation housing, with a value for two of these three variables greater than two-thirds of a standard deviation above the national mean, or 2) lodging revenues per capita greater than US\$100. On the other hand, a context criterion –presence of recreation activity– was used to remove observations with a significant trip activity but without a recreation objective: using guidebooks or maps, Beale and Johnson (1998) removed clusters of motels and restaurants located along major East-West highways where travellers do not stay for recreational activities.

Following Beale and Johnson (1998), but also Leatherman and Marcouiller (1996), English et al. (2000) analyzed tourism dependence and estimated its effects on U.S. rural counties. In order to take account of structural differences in re-

⁵ The typology (USDA-ERS 2005) classifies all U.S. counties according to six non-overlapping categories of economic dependence, primarily established on the basis of the share of annual labor and proprietors' earnings from a given sector over the 1998-2000 period. Thus are distinguished the following dependence categories: farming, mining, manufacturing, government (Federal/State), services, and nonspecialized.

sources, cluster analysis was used to group similar counties with respect to population density, distance from metropolitan areas, and the proportion of county area in cropland, forests, range/pasture, and mountains. Within each cluster, they estimated the share of export employment, distinguishing between tourism stays (based on resources) and other stays (business or family related), by using data on four economic sectors: lodging, eating and drinking, recreation services and retail trade. In particular, the share of export employment in tourism-sensitive sectors was estimated by regression analysis, taking account of recreation resources grouped into four categories (urban, land, water and winter resources) by principal components analysis. Last, they defined tourism-dependent counties as those with more than double the national percentage for tourism jobs and income, and compared them to other rural counties with respect to several indicators (income, population, economic structure and housing). Tourism-dependent counties experienced greater increases in population growth and housing construction than other rural counties.

III. Data and methods

1. Data

Data were collected at Functional Economic Area level (FEA, *bassin de vie*). An FEA is an aggregate of communes and defined as the smallest area over which its population has access to both services and employment (INSEE 2003). Among the 1,916 FEAs defined over the French metropolitan territory, 1,745 correspond to small town FEAs, i.e., rural FEAs (Julien, 2007). FEAs were chosen because they correspond more to economic reality than purely administrative boundaries, and they offer a satisfactory amount of data at a relatively fine scale.

The analysis is based on two major categories of data. First, natural resource data were mainly collected from the European database Corine Land Cover. The CLC2000 database provides a biophysical inventory of land cover that is based on satellite images for the year 2000. Land covers are stratified according to a hierarchical nomenclature arranged in three levels and 44 classes, with 5 major land cover types: artificial surfaces, agricultural areas, forests and semi-natural areas, wetlands, and water bodies. Land cover attributes were overlaid with a commune grid, which yielded area values per commune for every land cover class. These values were aggregated at FEA level, then divided by total FEA area in order to obtain relative values of land cover for all CLC classes.

As topographic variation is a source of attractiveness (see, *e.g.*, McGranahan 1999), a corresponding variable was created using IGN data: the difference between the altitude of the town hall in the FEA's main commune and the maximum altitude in the FEA.

On the other hand, socioeconomic data, including tourism indicators, were collected from several sources. Tourism indicators are of two types: the commune's tourism lodging capacity, and tourism employment. The former was operationalized with three variables: number of hotel rooms and campground spaces (INSEE website) and second-homes (*Direction Générale des Collectivités Locales*); to obtain a relative measure, these variables were divided by total FEA area. Data on tourism employment were collected from the Unedic website. Data on paid employment are available from the year 1993 on, for several geographic scales (from commune to district) and several levels of economic sector nomenclature (from NES 16 to NAF 700). Commune data on total employment and tourism sector employment (see Box 1) were downloaded at the NAF 700 level for the year 2003.

Box X.1. Tourism-sensitive activities

INSEE and the Ministry of Tourism have identified 15 tourism sensitive activities that satisfy tourist needs. In the French Activity Nomenclature (NAF rev. 1, 2003), these activities are classified as follows:

- 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)

Employment in these sectors was aggregated at FEA level, then divided by total area employment in order to obtain a proportion of tourism employment for every FEA. To account for structural differences between FEAs, these values were refined using the minimum requirements method (see next section).

To model the influence of tourism dependence on regional indicators, other socioeconomic variables were retained for the analysis:

⁶ Cafés in which tobacco is sold.

- Dependent variables: population, employment, income. Regarding the latter, there was no information for 1,550 communes (included in the 1,745 rural FEAs) with fewer than 10 (taxable or non-taxable) households.
- Control variables: demographic composition (share of population aged under 20 or over 60); proportion of employment in the three major economic sectors (agriculture and agrifood processing, manufacturing, residential); access time to the closest urban core; and a global score that reflects the presence of jobs and services (see INSEE, 2003). Indeed, five weighted components (with a 0-4 value range) make up a global score for each FEA: 1) score on competing services (*e.g.*, supermarkets), 2) on non competing services (*e.g.*, police force), 3) on education services (*e.g.*, high schools), 4) on health services (*e.g.*, physicians), and 5) on job offers. The latter, which is critical to define the boundaries of the FEA, is given a weight of 8 (out of 20) in the calculation of the global score.

Overall, the analysis used data for the years 1999 (population census), 2000 (Corine Land Cover) or 2003 (tourism indicators), unless otherwise indicated.

2. Methods

The analysis was carried out in several steps: 1) clustering of FEAs according to resources; 2) estimation of tourism employment in clusters (using the minimum requirements technique); 3) identification of formed clusters' key features; 4) definition of tourism-dependent FEAs; 5) estimation of the impact of resources on tourism indicators; and 6) estimation of the impact of tourism dependence on regional development indicators.

First, in order to work with similar FEAs from the perspective of landscape features, a cluster analysis of resources was performed. To obtain a distribution of FEAs over major types of resources and to account for the sensitivity of cluster analysis to variable correlation (implicit weight), CLC classes were grouped. First, an analysis done with the 5 major land covers showed that, in rural FEAs, the vast majority of land is covered by agricultural areas (63.8%) and forests and semi-natural areas (29.9%); the remainder is split between artificial surfaces (5%), water bodies (0.8%) and wetlands (0.5%). To get a finer distribution, a more detailed land cover nomenclature was considered: 1) within agricultural areas, arable land (31%) and other agricultural uses of the land (permanent crops, pastures, heterogeneous agricultural areas: 33%), and 2) within forests and semi-natural areas, forests (24%) and semi-natural areas (scrub, herbaceous, little or no vegetation: 6%). As the analysis showed a high level of correlation between semi-natural areas and topographic variation, the former was dropped, but category 3.3.1 (beaches,

dunes, sands) was added to the wetlands category because of a high level of correlation between the two.

To account for the weight of the residential economy, and because the minimum requirements technique assumes similar economic structures, population was added to the set of clustering criterion variables⁷. As variables were measured in different units, they were standardized to a mean of 0 and a standard deviation of 1.

Cluster analysis used the fastclus procedure in SAS®, which yields disjoint clusters from a large number of observations over quantitative variables. This method, often called k-means, uses Euclidean distances, with a least squares estimation of cluster centres. Each iteration of the algorithm reduces the least squares criterion until convergence is achieved; cluster centres are then the means of the observations that are assigned to each cluster.

The final number of clusters was decided on the basis of several empirical criteria, including pseudo F and cubic clustering criterion values (local or global maximum value, or a significant change in the values of these statistics), value (and change in value, in particular when the gain becomes less than 5%) of the R^2 .

Final clusters were distinguished using the values taken by clustering criterion variables on the coefficient of variation statistic (standard deviation/mean*100). A low value of this coefficient indicates relative non dispersion of the values of a clustering variable, hence a salient feature of the considered cluster.

The second step of the analysis consisted in estimating the share of tourism jobs within clusters. Those are relatively easy to identify whenever corresponding activities depend exclusively on tourism demand (*e.g.*, hotels or ski lifts); but tourism jobs are more difficult to count when activities satisfy the demand of both tourists and the local population (*e.g.*, retail stores or restaurants). Several techniques exist to estimate the level of employment that satisfies tourism demand; it is defined as the surplus of jobs which results from the regular or seasonal presence of tourists (Terrier et al. 2005). One such technique is the location quotient which uses, as a benchmark, a geographic (also economic) scale that is greater than the unit of analysis; for example, the administrative region or the nation, relatively to the FEA.

Another technique is the minimum requirements, which uses as a reference a scale that is identical to the unit of analysis (Ullman 1968). The assumption is that similar regions exhibit similar consumption patterns and export propensities. Within a given cluster, the FEA that presents the minimum employment value in tourism-

⁷ Note that area is correlated with population, and population density is proxied by the share of artificial surfaces within a given FEA.

sensitive activities is assumed to satisfy local demand only, *i.e.*, the value of tourism export employment is considered nil. In other FEAs, the share of export employment is equal to the difference between the share of employment in tourism-sensitive activities and the minimum value observed for the cluster: in other words, all FEAs (except for the minimum) are exporters in order to satisfy non resident demand (Leatherman and Marcouiller, 1996).

Consequently, the formula to estimate the share of tourism export employment for FEA i in cluster j is the following:

$$EX_{ij} = (et_{ij} / eT_{ij}) - \min (et_{ij} / eT_{ij})$$

Where EX_{ij} is the share of tourism export employment for FEA i in cluster j ; et_{ij} is the level of tourism employment for FEA i in cluster j ; eT_{ij} is the level of total employment for FEA i in cluster j ; and $\min(.)$ is the minimum function that identifies the minimum value of the et_{ij}/eT_{ij} ratio for all FEAs i in cluster j .

Cluster key features were identified on the basis of both cluster analysis and the estimation of tourism employment, *i.e.*, values taken by clustering variables and tourism indicators in the formed clusters, including tests for differences between means to assess the statistical significance of observed differences.

Fourth step: the identification of FEAs specialized in "tourism". Following English et al. (2000), we used a value that is greater than twice the national average as an indicator of dependence. Lodging and employment variables were combined with the following decision rule: a rural FEA is identified as tourism-specialized (or -dependent) if it exhibits a value for the proportion of tourism export employment that is greater than twice the national average AND a value for the density of hotel rooms OR campground spaces OR second-homes that is greater than twice the national average. A related dummy variable for tourism dependence (DEPTRSM) was created so that each rural FEA may be considered as specialized in tourism activity or not.

Last steps: regression analysis was used to estimate impacts. On the one hand, in order to assess the relationship between resources and tourism indicators, each indicator (employment, hotel room, campground space, second-home) was regressed on clustering variables. On the other hand, to assess the impact of tourism dependence on regional development indicators, classic indicators (population, employment, income) were regressed on the tourism dependence dummy and a set

of control variables⁸ (demographic composition of the FEA, its economic structure, its distance to the closest urban core, and its score in terms of access to jobs and services). For the last two steps, the chosen estimator was Ordinary Least Squares (OLS).

As a conclusion, Table 1 below summarizes variables and their respective sources.

Table X.1. Variables retained for the analysis

Name	Description	Source
Dependent variables		
PSDC99 ^[a]	Population (1999)	INSEE ^[b]
TOT_EMPL	Number of jobs (1999)	INSEE ^[b]
ERNET99BV	Sum of net taxable income (€, 1999)	b.o.d.f. DGI
DHTCH03	Density of hotel rooms (#/km ² , 2003)	b.o.d.f. INSEE ^[c]
DCPGE03	Density of campground spaces (#/km ² , 2003)	b.o.d.f. INSEE ^[c]
DRSCND03	Density of second homes (#/km ² , 2003)	b.o.d.f. DGCL
MRTRSM03	Share of tourism export employment (% , 2003)	b.o.d.f. UNEDIC ^[d]
Resource (clustering and explanatory) variables		
VARTOPOG	Topographic variation (m, 2000)	b.o.d.f. IGN
PCTARTIF	Share of artificial surfaces (% , 2000)	b.o.d.f. CLC ^[e]
PCTARABL	Share of arable land (% , 2000)	b.o.d.f. CLC ^[e]
PCTOTHAG	Share of other agriculture: permanent crops, pastures, heterogeneous agric. areas (% , 2000)	b.o.d.f. CLC ^[e]
PCTFORET	Share of forests (% , 2000)	b.o.d.f. CLC ^[e]
PCTHUMO2	Share of wetlands and water bodies (% , 2000)	b.o.d.f. CLC ^[e]
Other control (explanatory) variables		
POPAGE	Share of population aged 60 or over (% , 1999)	b.o.d.f. INSEE ^[b]
PCTRES	Share of jobs in residential services (% , 1999)	b.o.d.f. INSEE ^[b]
PCTAA	Share of jobs in agriculture and agrifood (% , 1999)	b.o.d.f. INSEE ^[b]
TT_PU99	Average access time to closest urban core (min, 1999)	INSEE ^[b]
SCORE20	Score on jobs and services potential (over 20, 1999)	INSEE ^[b]
DEPTRSM	Dummy for tourism dependence	Authors

b.o.d.f.: Based On Data From

^[a] also a clustering variable

^[b] ruralbv1 file (http://www.insee.fr/fr/ffc/docs_ffc/bassins_vie/bassins_vie.htm)

^[c] Commune capacity in tourism lodging (http://www.insee.fr/fr/ffc/docs_ffc/tourisme.htm)

⁸ Due to a high level of correlation level between the proportion of senior and young populations ($|\rho| > 0.91$), the latter was dropped from the specification (priority was given to the variable that could reflect the importance of amenity-driven retiree migration). Likewise, the level of correlation between the share of manufacturing employment and the two other sectors (residential services in particular, with $|\rho| > 0.68$) led us to drop this variable from model specification.

^[d] Annual statistics by geographic area (<http://info.assedic.fr/unistatis/index.php>)

^[e] Corine Land Cover (<http://www.ifen.fr/donIndic/Donnees/corine/presentation.htm>)

IV. Results and discussion

1. Cluster analysis

Choosing clusters formed by cluster analysis necessarily implies a tradeoff between depicting the diversity of situations and observing patterns across observations. The final number of clusters is 4; it was determined from values taken by the selection criteria (pseudo F, CCC, R^2) for several runs (choice of the number of clusters formed) of the k-means procedure. This solution presents an R^2 value of 0.44. Results are detailed in Table 2 (standardized variables).

Iterations confirmed that a combination of wetlands and water bodies yielded a better solution from a statistical viewpoint. Relatively recurrent outliers were detected, all located in the *département* of Hérault (especially Marseillan and Palavas-les-Flots, but also Aigues-Mortes, Villeneuve-les-Maguelone, and Le Grau-du-Roi). As these observations are major tourism destinations and did not appear immediately (at least not before the number of clusters was greater than or equal to the number of clustering variables), it was decided to keep them.

Table X.2. Cluster analysis results

Variable		Cluster 1	Cluster 2	Cluster 3	Cluster 4
	N=	606	28	428	683
Population	Mean	0.0842	-0.1054	-0.0777	-0.0217
	Stand. deviat.	1.0159	0.5244	0.9869	1.0050
	Coeff. var.	1,207	-497	-1,271	-4,629
Topogr. var. (m)	Mean	-0.4368	-0.5292	1.1234	-0.2947
	Stand. deviat.	0.1754	0.1673	1.4710	0.3376
	Coeff. var.	-40	-32	131	-115
Artif. surf. (%)	Mean	0.2178	1.8846	-0.3095	-0.0766
	Stand. deviat.	1.1997	2.0225	0.6598	0.7694
	Coeff. var.	551	107	-213	-1 005
Arable land (%)	Mean	1.1012	-0.8300	-0.9230	-0.3646
	Stand. deviat.	0.6478	0.5536	0.3673	0.5610
	Coeff. var.	59	-67	-40	-154

Other agric. land (%)	Mean	-0.7621	-0.1375	-0.4591	0.9696
	Stand. deviat.	0.5224	0.9454	0.6604	0.6450
	Coeff. var.	-69	-688	-144	67
Forests (%)	Mean	-0.4088	-0.9842	1.3065	-0.4156
	Stand. deviat.	0.6178	0.6057	0.7858	0.6204
	Coeff. var.	-151	-62	60	-149
Water area (%)	Mean	-0.1186	6.3893	-0.1047	-0.0911
	Stand. deviat.	0.3642	3.3974	0.3920	0.4274
	Coeff. var.	-307	53	-374	-469

Coefficient of variation < 100

Based on coefficient of variation values that are less than 100 (highlighted in Table 2), the clusters formed may be interpreted as follows:

- Cluster 1 comprises 606 rural FEAs. It is mainly characterized by the absence of topographic variation and other agriculture (permanent crops, pastures), but the presence of arable land (field crops).
- Cluster 2 comprises 28 FEAs. Like cluster 1, it is mostly characterized by the absence of topographic variation. Contrary to cluster 1, though, there is a relative absence of field crops and forests, but presence of water resources (wetlands and water bodies). In a less salient way, cluster 2 also comprises FEAs where the proportion of artificial surfaces is relatively high.
- Cluster 3, with 428 observations, features a deficit of arable land that is counterbalanced by the presence of forests, and to a lesser extent by topographic variation.
- Last, cluster 4 comprises the greatest number of observations (683 FEAs). A greater-than-average presence of pastures and permanent crops, and to a lesser extent a marked absence of topographic variation, field crops and forests, are the salient features of this cluster.

In conclusion and generally speaking, there are four clusters of resources: 1) field crop plains, 2) water, 3) forests and topographic variation, and 4) pastures and permanent crops. Population turns out not to be a discriminant variable in the definition of these resource-like FEAs. In contrast, natural resource and landscape feature variables do enable a statistical differentiation of FEAs and corresponding clusters. Water resources seem to be particularly discriminant: they are the key feature of one of the clusters, though it is the smallest one (28 FEAs).

2. Key features

Tests for differences between means as well as regression analysis were used to analyze the differences between cluster resources and whether they have a differentiated impact on tourism. Results for the means tests regarding clustering and tourism variables are presented in Table 3.

Table X.3. Comparing cluster means of criterion and tourism variables

Variables	Cluster 1 (N=606)	Cluster 2 (N=28)	Cluster 3 (N=428)	Cluster 4 (N=683)	Differences ^[a] between cluster means?
<u>Clustering variables</u>					
Population	12,967	11,150	11,416	11,952	None (except 1-3)
Topographic variation (m)	99.65	52.43	896.91	172.26	All
Artificial surfaces (%)	6.19	15.43	3.27	4.56	All
Arable land (%)	58.49	9.04	6.65	20.95	All (except 2-3)
Other agric. land (%)	17.25	30.62	23.74	54.31	All (except 2-3)
Forests (%)	16.12	5.26	48.49	15.99	All (except 1-4)
Water area (%)	0.84	30.40	0.90	0.96	All (except 1-3/1-4/3-4)
<u>Tourism variables</u>					
Hotel room density (#/km ²)	0.54	9.56	1.35	0.79	All (except 1-4/2-3)
Campground space density (#/km ²)	2.48	79.71	2.85	3.00	All (except 1-3/1-4/3-4)
Second home density (#/km ²)	5.36	164.28	8.95	7.01	All (except 1-4/3-4)
Tourism employ. (%)	3.45	10.88	9.76	4.00	All, except 2-3

^[a] Statistically significant difference between 2 means (p-value ≤ 0.05 ; sample variances assumed unequal)

Formed clusters present values that, in general, are statistically different (even with a conservative test, see Table 3). This result is indeed expected for clustering criterion variables because cluster analysis aims at creating groups of observations such that inter-cluster differences are maximized while minimizing intra-cluster differences. However, means tests on tourism indicators also show statistically significant differences between clusters. Except for campground spaces, which are spatially concentrated in cluster 2 (water resources), hotel room and second-home density and the local share of tourism employment are generally different from one cluster to another. That is to say, differences in natural resources do match differences in tourism intensity.

3. Tourism dependence

Using the criterion of twice the rural national average on the four tourism indicators (share of tourism employment, density of hotel rooms, density of campground spaces, density of second-homes), several groups of FEAs were identified:

- Specialization in hotel rooms ($DHTCH03 > 2*0.98$): 143 FEAs with an average of 9 hotel rooms per km^2 (8.76).
- Specialization in campground spaces ($DCPGE03 > 2*4.01$): 111 FEAs with an average of 48 campground spaces per km^2 (47.83);
- Specialization in second-homes ($DRSCND03 > 2*9.44$): 118 FEAs with an average of 97 second homes per km^2 (96.64);
- Specialization in tourism employment ($MRTRSM03 > 2*5.33$): 173 FEAs with an average share of 23% of tourism export employment (23.21).

When employment and lodging criteria are combined, 102 FEAs are identified as tourism-dependent or -specialized, with the following values on tourism indicators (Table 4):

Table X.4. Characteristics of tourism-dependent FEAs (N=102)

Variable	Mean	Stand. deviat.	Minimum	Maximum
Tourism employment (%)	25.25	15.57	10.82	71.59
Density of hotel rooms (#/km ²)	8.97	16.40	0	110.83
Density of campground spaces (#/km ²)	38.55	99.34	0	871.67
Density of second homes (#/km ²)	88.46	204.00	1.28	1,940.83

On average, tourism-dependent FEAs present a share of tourism export employment of 25%, and 9 hotel rooms, 39 campground spaces and 88 second-homes per km^2 . These FEAs are heterogeneously distributed both from a cluster and a location perspective (see Table A2 in appendix).

From a cluster perspective, most tourism-dependent FEAs are located in cluster 3 (53 FEAs, that is, over half of tourism-dependent FEAs), then in cluster 4 (24 FEAs), then in cluster 1 (15 FEAs), last in cluster 2 (10 FEAs). Therefore, in cluster 3 (forests, topographic variation) the highest count of tourism-specialized FEAs is found, and cluster 2 (water resources) presents the lowest count of such FEAs.

As the number of observations per cluster shows high variation, these results should also be considered in a relative perspective. Then, cluster 2 (water resources) comes first, since a cluster 2 FEA has a probability over 33% ($10/28=0.36$) to be specialized in tourism. In contrast, with 15 tourism-specialized

FEAs out of a total of 606, cluster 1 (field crop plains) FEAs present the lowest probability of being tourism-dependent (0.02). By ascending order, cluster 4 (pastures, permanent crops: 0.03) then cluster 3 (forests, topographic variation: 0.12) are found. In this perspective, water resources and topographic variation (correlated with the absence of field crops) seem to condition, to a significant extent, tourism dependence.

The distribution of tourism-dependent FEAs (see Figure A1 in appendix) from a *département* perspective depicts that Pyrénées-Orientales has the highest number of tourism-dependent FEAs (9), followed by Haute-Savoie (8), then Savoie (7), then Hérault and Morbihan (6 FEAs each), then Var (5). Those 6 *départements* (out of 96 in metropolitan France, i.e., 6%) comprise 40% of tourism-dependent FEAs. By descending order, there are 5 *départements* with 4 dependent FEAs each (Calvados, Gironde, Isère, Haut-Rhin, Vendée), and then 4 *départements* with 3 FEAs each (Charente-Maritime, Finistère, Landes, Puy-de-Dôme). In conclusion, 72% of tourism-specialized FEAs are located in 15 *départements* (that is, 16%).

4. Regression analysis

Regression analysis was used to identify the contribution of various factors to the variation of two groups of variables: tourism indicators and classic indicators of regional growth (population, employment, income).

First, the share of tourism employment, hotel room density, campground space density and second-home density were regressed on clustering criterion variables, except population: topographic variation, share of total FEA area in artificial surfaces, arable land, pastures and permanent crops, forests, and wetlands and water bodies. Population was not included in the final specifications⁹ for two reasons: 1) it was not a discriminant variable in cluster analysis; and 2) we chose to focus on the resource-tourism relationship.

As PCTARABL was correlated with VARTOPOG, PCTOTHAG and PCTFORET ($.46 < \rho < .52$), and its inclusion in the models resulted in a condition index close to 30, it was removed from model specification. Moreover, to some extent, the presence of field crops is an indicator of the "banality" of the landscape (especially in plains). Therefore, the absence of PCTARABL in model specification may be interpreted as a "background" against which less commonplace resources are highlighted. After dropping PCTARABL, no correlation coefficient value was greater than 0.40, and the condition index dropped to less than 8. The results (corrected for heteroskedasticity) are presented in Table 5.

⁹ Previous model specifications included population; results turned out to be very similar.

Table X.5. Regression analysis: Tourism indicators

	Tourism	Hotel room	Campground space	Second home
Independent variables	Employment (%)	density (#/km ²)	density (#/km ²)	density (#/km ²)
Intercept	^[a] ***3,8449	***-1.3225	***-8.1333	***-12.1128
	^[b] (7.457)	(-3.337)	(-3.044)	(-4.199)
Topogr. var. (m)	***0.0088	***0.0014	***0.0025	***0.0098
	(11.223)	(5.989)	(3.931)	(7.644)
Artif. surf. (%)	***0.1342	***0.2594	***1.0985	***1.8304
	(2.668)	(4.308)	(2.657)	(3.728)
Other agric. land (%)	***-0.0369	0.0032	0.0395	0.0326
	(-4.972)	(0.685)	(1.427)	(0.594)
Forests (%)	***-0.0457	0.0043	0.0342	-0.0082
	(-3.631)	(0.718)	(1.621)	(-0.263)
Water area (%)	***0.2150	0.2656	*2.7159	*6.0811
	(5.909)	(1.384)	(1.864)	(1.868)
N	1,745	1,745	1,745	1,745
F	***173.52	***81.22	***162.58	***176.17
R ²	0.3328	0.1893	0.3185	0.3362
Adjust.-R ²	0.3309	0.1870	0.3166	0.3343

^[a] parameter estimate; ^[b] (t value corrected for heteroskedasticity)

*** 1% significance; ** 5% significance; * 10% significance

t critical values: 2.576 (1%), 1.960 (5%), 1.645 (10%)

Table 5 shows that all models display strong overall significance (Fisher test). The value of the coefficient of determination is greater than 31%, except for the hotel room model (19%). Tourism employment and lodging density can probably be related to additional explanatory variables, but collectively resource variables account for about twenty percent (employment) to one third (lodging) of the variation in the dependent variables.

In terms of variable significance, the employment model is different from the three others in the sense that every independent variable is strongly statistically significant (t value > 2.576). In other models, VARTOPOG and PCTARTIF are significant at 1% in the lodging models; water resources range from non significance (hotel room density model) to 10% significance; last, other agricultural land and forests are not significant in the lodging models. In terms of signs, results are consistent across the four models. Thus, artificial surfaces, topographic variation and water resources are systematically positive. PCTOTHAG and PCTFORET are statistically significant in the employment model only, where they are negative.

In conclusion, these results seem consistent and contradictory at the same time. Indeed, water resources and topographic variation variables stand out as positively

associated with tourism indicators, which is consistent with what is known of the attractiveness of these resources. In addition, and perhaps this result is less intuitive regarding rural areas, the proportion of artificial surfaces has a positive impact. As this variable proxies density (be that population or infrastructure), the result seems to indicate that tourism activity is associated with high infrastructure density, which is consistent with mass tourism features (be that seaside or mountains).

A second series of models was used to analyze the relationship between regional growth indicators and several explanatory factors, including demographic and economic composition, accessibility, service level, and tourism dependence.

The highest correlation coefficient value was 0.44, between the POPAGE (share of population aged 60 or more) and PCTAA (share of employment in the farming and agrifood processing sectors) variables; all other values were less than 0.40. Results for this series of models (all with a condition index value under 18) are detailed in Table 6.

Table X.6. Regression analysis: Regional indicators

Independent variables	Population	Employment	Income
Intercept	^[a] ***9,160.5717 ^[b] (8.833)	***3,319.8012 (8.861)	***12,267,586 (10.196)
Population aged 60 or over (%)	***-396.6190 (-12.995)	***-140.4796 (-12.740)	***-509,091 (-14.377)
Jobs in residentiary services (%)	***105.2510 (6.775)	**11.4713 (2.044)	***113,556 (6.301)
Jobs in agriculture and agrifood (%)	***-61.9683 (-3.140)	***-25.5760 (-3.587)	***-99,662 (-4.353)
Access time to closest urban core (min)	***-129.4271 (-12.406)	***-50.6177 (-13.430)	***-126,029 (-10.412)
Jobs and services score (/20)	***1,139.7585 (33.179)	***499.6619 (40.261)	***1,184,694 (29.726)
Tourism dependence dummy	***-6,530.5014 (-8.513)	***-1,510.7290 (-5.451)	***-5,155,377 (-5.792)
N	1,745	1,745	1,745
F	***276.05	***364.35	***237.58
R ²	0.4880	0.5571	0.4506
Adjusted-R ²	0.4862	0.5556	0.4487

^[a] parameter estimate; ^[b] (t value)

*** 1% significance; ** 5% significance; * 10% significance

t critical values: 2.576 (1%), 1.960 (5%), 1.645 (10%)

All regional growth models exhibit strong overall statistical significance (Fisher test, 1% significance level). The value of the coefficient of determination ranges from 0.45 (income model) to 0.56 (employment model).

All variables are strongly statistically significant (1%), except PCTRES in the employment model (5%). Parameter signs are consistent across the three models. They show a negative association between, on the one hand, the proportion of the elderly population, importance of the agrifood sector (both farming and food manufacturing) and tourism dependence, and on the other hand, population, employment and income level. In contrast, the statistical relationship is positive when considering the weight of the residential sector, accessibility (the negative sign of TT_PU99 indicates that the more access time to the urban core is reduced, the more positive the impact on population, employment, and income) and the level of access to job offers and services.

Overall, these results are in line with previous results regarding regional growth factors, such as accessibility. The negative impact of the proportion of the elderly population is also expected: this population has usually reached the age of retirement, hence the negative impact on total employment, with a level of income that is indeed stable but lower than that of the labour force, hence the negative impact on income. The negative association between the level of population and the proportion of elderly people shows that retiree migration is not happening across all rural areas but is probably limited to amenity-rich areas.

The negative results for the agrifood sector may be explained by the fact that, in rural areas, farming certainly predominates over food processing; given the reduction in farm population and farming activity, it is not surprising that PCTAA parameters are negative. Also, this result is consistent with the positive sign of PCTRES in the three models: for several years, the rural economy has been shifting from extractive to service activities. Last, the level of services (and especially when it takes job offers into account) is a factor of attractiveness, hence the positive sign for the parameter of SCORE20, as expected.

The systematically negative sign of DEPTRSM (the tourism dependence dummy variable) still needs to be explained. This result is *a priori* surprising because tourism is often touted as a local development strategy. In this analysis, dependence (or specialization) is based on an employment variable and a lodging variable (be that hotel room, campground space or second-home). Consequently, tourism specialization, *i.e.*, a large share of tourism employment and a high value of lodging capacity, does not seem to lead to higher levels of regional growth indicators. The list of tourism-dependent FEAs tends to highlight traditional locations (seaside and mountains, including resorts). Do observed impacts show negative, induced effects related to mass tourism?

V. Conclusions

1. Summary and result implications

Results demonstrate the possibility of identifying resource-consistent regions with a cluster analysis mostly based on land cover and altitude. In such regions, which are endowed with different resources, tourism indicators also exhibit different values. Topographic variation, artificial surfaces and, to a lesser extent, water resources seem to be most correlated with tourism indicators.

Using tourism employment and lodging capacity, tourism-specialized FEAs can also be identified. We identified 102 such FEAs (out of a total of 1,745 rural FEAs) that are very unequally distributed across the metropolitan territory. Contrary to accessibility and services, tourism dependence does not lead to higher regional growth levels.

These results question the territorialization of tourism public policy as a function of available resources. Moreover, given the negative impact of tourism specialization, and the location of the corresponding FEAs, it seems appropriate to question the induced effects of mass tourism. In this perspective, tourism policy could address the next two issues more precisely.

First, improve the promotion of regions that tend to be underused today in order to deconcentrate tourism activity and distribute it better across the territory. This strategy could rely on promotion campaigns that would highlight the difference and the specificity of an "alternative" type of tourism, even by promoting adjacent FEAs that are not as highly tourism-specialized today and may satisfy different tourist expectations.

Second, make better use of the concentration of tourism in order to stimulate local economic activity and create more jobs and income. This would include several components: 1) attract population and firms on the basis of existing natural amenities; 2) actively convert some second-homes (or hotels) into main residences, which would imply rehabilitation efforts of existing housing (*e.g.*, surface increase) and would stimulate the local housing industry as well as improve the quality of housing supply; 3) offer a range of services so that yearlong residency becomes easier and more pleasant –in a way, deseasonalize community life.

For implementation to be achieved, such policies must involve a minimum amount of political will, multimunicipal planning, and land control. Deconcentrat-

ed state services and local governments should help local decision-makers in their pursuit of tourism activities with larger positive impacts on the local economy.

2. Study limits and further research topics

A number of limits of the analysis suggest further research topics.

First, given the exploratory nature of this paper, tourism-sensitive activities were grouped as a single "tourism employment" set. However, all these activities are not directly dependent on tourism: such is the case of hotels without a restaurant, but not of beauty salons that depend, to a major extent, on the residentiary economy. Other sectors (*e.g.*, retailing) are impacted by tourism but are not included in tourism-sensitive activities. Consequently, a further research topic could consist in providing a more refined estimation of tourism employment, by differentiating sectors and taking into account activities that are not considered tourism-sensitive but nonetheless impacted by tourists, and by better separating the tourism *vs.* residentiary share of local employment.

Next, although the variables used for cluster analysis reflect landscape features, they do not account for all tourism resources in a given area. For example, a landscape diversity index could be added (assuming that the more diversified the landscape, the more attractive the area) as well as climatic condition variables (*e.g.*, to account for warm summers) or information regarding cultural resources (such as built heritage) or sports facilities. Also, information regarding the quality of the environment or biodiversity (*e.g.*, protected areas) could be added. In conclusion, cluster analysis could include a larger set of variables, possibly reduced via principal components analysis.

Two categories were used to define dependence: tourism employment and lodging capacity. Yet, the impacts induced by second-homes are not necessarily the same as those induced by hotels and campgrounds. Therefore, a supplementary analysis could focus on the differential impacts of the type of lodging.

The employment equation features some endogeneity because SCORE20 depends to a significant extent on the employment score, which itself is a function of job offers and the level of labour force employed. Further modelling efforts could use a global score based on all components (competing, non competing, education, and health services) except employment. However, it can be noticed that the estimated parameter of SCORE20 displays similar properties (significant and positive) across the three models.

Last, tourism-dependent FEAs are geographically concentrated, so it may be interesting to analyze the impact of spatial autocorrelation on estimated parameters.

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Appendix

Table X.A1. Descriptive statistics of variables (N=1,745)

Variable	Mean	Stand. deviat.	Minimum	Maximum
Topographic variation (m)	322.86	511.02	0.00	3760.00
Artificial surfaces (%)	4.99	5.54	0.00	65.00
Arable land (%)	30.29	25.61	0.00	97.89
Other agric. land (%)	33.56	21.40	0.00	90.14
Forests (%)	23.83	18.87	0.00	88.86
Water area (%)	1.38	4.54	0.00	77.80
Population	12,160.22	9582.09	270.00	60,700.00
FEA area (km ²)	245.83	231.28	0.40	1,887.00
Jobs and services score (/20)	11.36	5.04	0.00	20.00
Access time to closest urban core (mn)	30.10	16.37	0.00	126.20
Number of jobs	3,962.38	3,722.25	285.00	25,588.00
Sum of net taxable income (€)	12,883,618.10	10,732,241.80	228,165.97	67,032,732.02
Density of hotel rooms (#/km ²)	0.98	4.76	0.00	110.83
Density of campground spaces (#/km ²)	4.01	26.32	0.00	871.67
Density of second homes (#/km ²)	9.44	54.33	0.28	1,940.83
Tourism employment (%)	5.33	7.75	0.00	71.59
Tourism dependence dummy	0.06	0.23	0.00	1.00
Population aged 60 or over (%)	25.56	6.55	5.36	48.21
Jobs in residentiary services (%)	52.38	12.46	16.32	96.25
Jobs in agriculture and agrifood (%)	16.91	10.22	0.46	63.67

Table X.A2. List of tourism-dependent FEAs

FEA code	FEA label	Cluster	FEA code	FEA label	Cluster
01143	Divonne-les-Bains	3	56240	Sarzeau	4
01173	Gex	3	60482	Orry-la-Ville	3
04006	Allos	3	61483	Tessé-la-Madeleine	4
04094	Gréoux-les-Bains	3	62318	Etaples	1
07330	Vallon-Pont-d'Arc	3	62604	Neufchâtel-Hardelot	1
11202	Leucate	2	63047	La Bourboule	4
13022	Cassis	3	63103	Châtelguyon	4
13104	Carry-le-Rouet	1	63236	Mont-Dore	3
14191	Courseulles-sur-Mer	1	64495	Saint-Pée-sur-Nivelle	3
14333	Honfleur	4	65362	Pierrefitte-Nestalas	3
14488	Ouistreham	1	65388	Saint-Lary-Soulan	3
14715	Trouville-sur-Mer	4	66003	Amélie-les-Bains-Palalda	3
17093	Le Château-d'Oléron	2	66008	Argelès-sur-Mer	4
17161	La Flotte	2	66016	Banyuls-sur-Mer	4
17452	La Tremblade	3	66024	Le Boulou	3
22194	Plestin-les-Grèves	4	66037	Canet-en-Roussillon	2
29040	Le Conquet	4	66117	Mont-Louis	1
29058	Fouesnant	4	66124	Font-Romeu-Odeillo-Via	3
29217	Pont-Aven	4	66148	Port-Vendres	4
2A041	Bonifacio	4	66222	Vernet-les-Bains	3
2A065	Cargèse	3	68162	Kaysersberg	3
2B134	L'Île-Rousse	3	68226	Munster	3
31042	Bagnères-de-Luchon	3	68249	Orbey	3
32096	Cazaubon	4	68269	Ribeauvillé	3
33203	Hourtin	3	73006	Aime	3
33214	Lacanau	3	73054	Bourg-Saint-Maurice	3
33394	Saint-Emilion	4	73181	Moûtiers	3
33514	Soulac-sur-Mer	4	73227	Saint-Bon-Tarentaise	3
34003	Agde	4	73257	Saint-Martin-de-Belleville	3
34126	Lamalou-les-Bains	3	73296	Tignes	3
34150	Marseillan	2	73304	Val-d'Isère	3
34192	Palavas-les-Flots	2	74001	Abondance	3
34299	Sérignan	2	74056	Chamonix-Mont-Blanc	3
34344	Le Grau-du-Roi	2	74080	La Clusaz	3
35049	Cancale	1	74191	Morzine	3
38006	Allevard	3	74238	Saint-Jean-d'Aulps	3
38052	Le Bourg-d'Oisans	3	74258	Samoëns	3
38253	Mont-de-Lans	3	74276	Taninges	3

38548	Villard-de-Lans	3	74280	Thônes	3
39470	Les Rousses	3	80688	Rue	1
40046	Biscarrosse	2	80721	Saint-Valery-sur-Somme	1
40065	Capbreton	3	83019	Le Lavandou	3
40310	Soustons	3	83036	Cavalaire-sur-Mer	1
44211	La Turballe	1	83107	Roquebrune-sur-Argens	3
50031	Barneville-Carteret	4	83115	Sainte-Maxime	3
50410	Pontorson	1	83119	Saint-Tropez	3
56034	Carnac	4	85113	L'Ile-d'Yeu	1
56054	Etel	1	85234	Saint-Jean-de-Monts	4
56069	Groix	1	85288	Talmont-Saint-Hilaire	4
56152	Le Palais	4	85294	La Tranche-sur-Mer	4
56186	Quiberon	2	88196	Gérardmer	3

Figure X.A1. Location of tourism-dependent FEAs

See "Dissart-Aubert-Truchet-Fig1.png" file

Acknowledgments

tourism, economic dependence, rural areas, regional development, France, statistical analysis

Acknowledgments

L83; R11; R12; R14