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## They arrive with new information. Tourism flows and production efficiency in the European regions

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# **They arrive with new information**

## **Tourism flows and production efficiency in the European regions**

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### *Abstract*

Firms productivity is crucially influenced by knowledge spillovers generated either by other firms located nearby or by direct contacts with consumers or by foreign demand in the case of traded products. In this paper we propose a new channel of efficiency-enhancing knowledge diffusion, which can be exploited by local firms to extract relevant information on consumer preferences: direct contacts with tourism flows. Tourists have the peculiar feature of being external consumers, who directly arrive to the destination region and this represents a remarkable advantage for the local enterprises, as the latter can exploit the new information and increase the overall efficiency level of the local economy. More specifically, we examine, within a spatial estimation framework, tourism flows as determinants of regional total factor productivity, controlling also for other intangible factors (such as human, social and technological capital) and for the degree of accessibility. We apply the analysis to a sample of 199 European regions belonging to the EU15 member countries, plus Switzerland and Norway. The empirical results show that tourism flows enhance regional efficiency and that a positive role is also played by intangible assets, infrastructures and spatial spillovers.

**Keywords:** tourism, information, customer knowledge, total factor productivity, European regions

**JEL:** L83, D83, O33, R10

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## 1. Introduction

In the modern economy knowledge is commonly recognized as the most important factor in increasing the competition among firms and regions. Thus, a growing attention has been devoted to the mechanisms through which firms acquire information on new products and processes in order to enhance their productivity. Following different theoretical approaches, the literature has identified and analysed several channels of knowledge diffusion. These mechanisms operate, often in a complementary way, through contacts with other firms and final consumers, both at the national and the international level. Knowledge can be conveyed via interactions with suppliers and competitors in the market, trade embodied in goods, foreign direct investment (FDI), direct contacts with customers in the local market and, in the case of exporter firms, in the external ones as well.

It is worth remarking that all these mechanisms may present some shortcomings which, at least for some firms, may limit the possibility of acquiring valuable information. In particular, enterprises operating in closed narrow markets receive a limited amount of useful information because of the small number of localised firms and final consumers and this can negatively influence their efficiency levels. At the same time the fixed costs required to access larger markets prevents them from being exposed to international knowledge spillovers.

In this paper we propose a new channel of knowledge diffusion which can be exploited by local firms to extract information on consumers' preferences beneficial to enhance their efficiency: direct contacts with tourism flows. Tourists have the peculiar feature of being external consumers (national and international) who directly arrive to the destination region and this represents a remarkable advantage for the local enterprises. In this case even firms too small to afford the high fixed costs to enter the external markets can enjoy the information spillovers generated by tourist flows: this exposure produces beneficial effects on their productivity and consequently on the efficiency level of the whole local economy.

To the best of our knowledge, this is the first time that the influence of tourism flows on the regional production efficiency level is formally analysed. At the same time the fact that tourists represent an important channel conveying new ideas which enhance the destination region performance is already part of the policy-makers understanding in Europe (European Commission, 2009).

There are a number of newspaper stories and anecdotic evidence on how local firms have extracted information by direct contact with tourists. The wine sector in Sardinia, a small Italian island in the Mediterranean Sea, which recently specialised in tourism, provides a significant example. Wine production, based on excellent local varieties of grapes, has a long tradition but the product used to be mainly sold in the local market which was characterised by a preference for low-quality, very strong and

thick red wine. On the contrary, incoming tourism flows directly revealed in the local market the international wine demand preference for less strong, smoother and more flavoursome wine; this information on international preferences gave rise, among the local producers, to a rapid change in their products. Today wine is one of the most important exported good in Sardinia and the continuous contact with tourism flows also functions as a significant marketing vehicle.

More generally, the theoretical mechanisms linking tourists information spillovers to firms production efficiency are similar to those analysed in the economic literature on international trade (see the survey by Barba Navaretti and Tarr, 2000) and also in the management literature on customer knowledge (Joshi and Sharma, 2004). The hypothesis is that a local firm by means of continuous interactions with tourists acquires new knowledge related to demand for products and services which can be used to enhance its efficiency and competitiveness. An important feature is that, contrary to international trade, tourists convey information on external consumer preferences to local firms without additional costs for them. Hence, tourists can be seen as an important source of information for generating new products or for increasing the quality of the existing ones and, in general, for improving firms' production efficiency. Consequently, at the aggregate level the presence of sizeable tourism flows bring about a higher level of productivity for the whole region. These mechanisms are reinforced if tourists come from relatively richer countries and, compared to local consumers, exhibit preferences for higher quality goods. For instance, Brau (2008) shows that tourists signal their preferences for high quality natural environment destinations and this may induce firms to adopt environmentally-friendly production processes, which are the ones that make intensive use of the most innovative, efficiency-enhancing production technologies.

More specifically, the paper examines the effects of tourist arrivals on regional efficiency levels, measured by total factor productivity (TFP), controlling also for other specific regional characteristics (such as infrastructures, human, social and technological capital), which are also supposed to have a significant influence on TFP levels (Easterly and Levine, 2001). The analysis is carried out over the period 2002-2004 for a sample of 199 European regions belonging to member countries of the EU15 plus Switzerland and Norway. Moreover, we control for the presence of spatial association among regions by following a spatial model specification approach.

The paper is organised as follows. Section 2 briefly reviews the existing literature. In section 3 we present a detailed description of the data. In section 4 the econometric issues are discussed, while the estimation results are presented in section 5. Section 6 summarises the main findings and section 7 outlines the future research projects.

## 2. Literature background

In this section we shortly review four channels of information diffusion already proposed by the literature and then we suggest a new mechanism of knowledge transmission based on tourism flows.

The first channel focuses on the transmission of knowledge among firms at the local level. A growing body of literature emphasises the local nature of knowledge, which is still costly and difficult to transmit across areas (Jaffe et al., 1993). Extensive empirical evidence suggests that location and proximity are crucial in explaining knowledge spillovers (Audretsch and Feldman, 2004). Evidence of localised knowledge spillovers for the European regions is provided by Bottazzi and Peri (2003) and Moreno et al. (2006). Firms tend to agglomerate in specific places to facilitate the exchange of information and expertise based on two types of externalities. One is the Marshall specialisation kind of externality: the concentration of a particular industry within a given region facilitates the diffusion of technologies and knowledge across similar firms since geographical proximity eases the interaction among individuals sharing similar specific competences. The second is based on Jacobs diversity externalities and considers inter-industry spillovers as the most important source of new knowledge creation since the exchange of complementary knowledge leads to cross fertilisation of ideas, which in turn favours innovation. The management literature has also deeply analysed the role of supplier and competitor firms in the transmission of knowledge (Tseng, 2009) and in general the relationship among firms in local production systems (Albino et al., 1999).

Another view, reinforced by the wide diffusion of internet and e-information, considers knowledge as a public good and therefore information spillovers are not locally bounded but can freely spread over space. However, in a recent analysis of patent citations flows among the European regions, Paci and Usai (2009) show that knowledge flows are still locally bounded. Overall, localised knowledge spillovers constitute an important underpinning for the competitive advantage of the regions (Maskell and Malmberg, 1999).

The second channel of knowledge diffusion is identified at the international level through the trade of goods. The idea is that an economy can enhance its level of total factor productivity through trade flows since it benefits from the stock of knowledge of partner countries embodied in traded goods (Coe and Helpman, 1995). This mechanism may be reinforced in the case of less developed countries as they can extract more valuable information on consumer demand and technology by exchanging goods with richer markets (Nicita and Olarreaga, 2007). However, it has been remarked that trade is costly, especially for small firms located in traditional sectors and in backward regions, which may not afford the fixed costs required to penetrate the external markets.

The third channel of technology transfer is represented by FDI, which is essentially a form of international movements of firms. In this case the local economy can benefit from the knowledge transfer

originated by multinationals through a general contagion and imitation effect (Findlay, 1978) and also via employees' mobility (Glass and Saggi, 2002). Several empirical studies have investigated FDI as a source of international knowledge spillovers (Van Pottelsberghe and Lichtenberg, 2001; Lee, 2006). At the same time multinational firms may locate their plants in a foreign market to take advantage of knowledge spillovers from the local area since they are closed to both local firms and consumers (Cantwell and Iammarino, 2003). In this sense the FDI transmission channel can be seen as a connection between the national and the international channels.

The fourth channel of information diffusion is the contiguity between firms and final consumers. In the so called customer-active paradigm (von Hippel, 1978) firms tend to see in customers and users the most important source of information for innovating, for creating new products and for increasing the quality of the existing ones (Foxall and Johnston, 1987). Recently, the management literature has focussed on customers' knowledge by trying to understand how enterprises absorb information from customers (and in general from the external environment) and how they transform this intangible asset into their own knowledge (Campbell, 2003; Tseng, 2009). In particular, it has been remarked that enterprises need a flexible organisation in order to absorb external knowledge (Claycomb et al., 2005). Thus the strategic problem faced by producers is to elicit preferences and other information from consumers and to incorporate them in their products (Randall et al., 2007).

These four mechanisms present various drawbacks which may prevent some firms from taking advantage of knowledge spillovers. In particular, firms which operate exclusively in the local market are exposed to limited information flows, especially if the local market is relatively poor. At the same time it is not an easy task to operate in large international markets since firms have to face fixed costs, which represent an entry barrier primarily for small enterprises.

In this paper we suggest, and empirically test, a new mechanism of information transmission based on tourism flows. According to this hypothesis, tourists generate a positive effect on local firms as they convey valuable information by revealing their preferences on products and services. This new knowledge allows the local enterprises - or at least part of them - to improve their efficiency and consequently, on the aggregate level, it enhances regional productivity. As a matter of fact, the tourism literature has so far focussed on the effects of tourism, considered as an economic activity, on the economy growth rate (Lanza and Pigliaru, 1994; Hazari and Sgro, 1995; Sinclair, 1998). In particular, the so called Tourism-Led Growth Hypothesis (TLGH) has been supported by significant empirical findings for OECD countries (Lee and Chang, 2008) and for many European ones (Balaguer and Cantavella, 2002 for Spain; Cortes-Jimenez, 2008 for Spain and Italy; Dritsakis, 2004 for Greece; Proença and Soukiazis, 2005 for Portugal). The positive role of tourism on growth appears particularly strong for the case of small economies (Brau et al., 2007). The mechanisms behind such a positive relationship between

tourism and long-run growth are represented by relevant inflows of foreign currency, stimulation of inter-industry linkages, incentive for investment in infrastructure and multiplicative effects on employment.

### 3. Data and descriptive analysis

In this section we present a brief description of the main features of the variables included in the estimation analysis, a summary of the data sources is reported in the Appendix 1.

In defining our geographical unit of analysis we follow the "Nomenclature of Statistical Territorial Units" (NUTS) classification provided by Eurostat. We mainly refer to the NUTS 2 regional level since it is characterized by a good degree of administrative and economic control; due to data availability, Denmark and Luxembourg are considered at the national level and Belgium at the NUTS 1 level (see Appendix 2 for details).

We start with the total factor productivity variable, we will then focus on the tourism flows one and eventually on the control variables at regional level (intangible assets and infrastructures). In describing the characteristics of the data a great deal of attention is devoted to their spatial features. These are depicted in Maps 1-3 and they are formally tested by means of the Moran's  $I$  test, explained in detail in Appendix 3 (Anselin, 1988). This is computed by employing as a spatial weight matrix both the distance and the contiguity matrix. The results are reported, along with some descriptive statistics, in Table 1: evidence of significant positive spatial association is found for all the variables. This means that - consider, for instance, total factor productivity – its level in a certain region is positively affected by the TFP levels of the neighbouring regions according to a distance decay pattern due to the presence of pecuniary or knowledge spillovers or, in general, due to contagion effects. In the case of variables such as human and social capital the pattern of geographical association is mainly determined by institutional and cultural factors, which for their very nature are rarely confined in space, but tend to spread their effects on neighbouring areas.

In the next subsections we discuss each variable in turn.

#### 3.1 Total factor productivity

The measure of total factor productivity for the European regions is based on the estimation of a Cobb-Douglas production function for a panel of 199 European regions over the period 1985-2006. The estimation is carried out within a spatial lag model framework controlling for spatial dependence, time series non-stationarity and production inputs' endogeneity. The derived measure of TFP, which has the nice advantage of not using *a priori* restrictions on the inputs elasticities, is represented by the estimated panel regional intercepts. The estimated Cobb-Douglas model is reported in Table 2, while more details on the estimation procedure can be found in Dettori et. al., 2008. The geographical distribution of the TFP

variable is shown in Map 1, where we report the average values for the period 1986-2006, these are computed as index values with respect to the European mean. Denmark is the leading region, with values nearly triple the European average, followed by Zurich and the capital regions of Luxembourg, Belgium (Brussels) and Norway (Oslo). The TFP index shows very high levels for all Norwegian regions, North Eastern and Eastern Scotland, a cluster of regions in the Southern area of the UK, three Dutch regions (Groningen, Utrecht and Noord-Holland), Lombardia (Italy) and the capital regions of France (Île de France), Sweden (Stockholm) and Austria (Wien). A concentration of high values is observed in the centre of Europe, Switzerland and Western German regions. Good results are also displayed by the Swedish regions, the French regions of Rhône-Alpes, Provence-Alpes-Côte d'Azur and Alsace, the Western regions of Aquitaine and Midi-Pyrenees, and the Centre-North of Italy (Trentino, Lazio, Val d'Aosta and Emilia Romagna). Most of the regions of Portugal, Spain (except for the capital Madrid), Southern Italy and Greece (except for Sterea Ellada) exhibit the lowest values.

### *3.2 Tourism flows*

Tourism is one of the most important service sectors in the European economy and tourist flows are growing at a continuously increasing rate. In the 17 European countries analysed in this study, the total number of nights spent in the year 2007 by tourists (resident and non resident) in total collective tourist accommodation establishments is over 2 billion, with 1.7% annual growth rate over the period 1998-2007. In Map 2 for the year 2002 we present the spatial distribution of tourist flows divided by resident population in order to take into account the different size of the regions. Among the top ten regions (panel (a) of Table 3) we find Isles Baleares and Canarias in Spain, Cornwall in the UK, the Greek islands in the Aegean Sea (Notio Aigaio and Ionia Nisia), the Alpin region of Tirol in Austria and Algarve in Portugal. It is also interesting to notice that the Spanish islands are at the top of the ranking also in terms of absolute values of tourist flows (see also Table 3-panel b): Canarias are in the first place with 84 million of nights and Baleares in the third with 59 millions. A high value is also shown by Île de France with Paris (62 millions) followed by some Spanish (Cataluña, Andalucia) and Italian regions (Veneto, Toscana, Emilia Romagna). Finally, panel (c) in Table 3 reports the ten regions with the highest annual growth rate over the period 1998-2006. In the first four places are the UK regions, which started with quite low flows at the beginning of the period. It is worth remarking that among the top destinations listed in panel (b), only the two Spanish regions entirely specialised in the “sea and sunshine holiday” product (Baleares and Canarias) present negative growth rates, while for the other regions the number of tourists has increased over the period considered.



### *3.3 Regional characteristics*

In this section we briefly examine the three types of intangible capital - social, human and technological capital – and the degree of accessibility, which were included in the estimated equation as they are supposed to improve the level of efficiency by creating a more favourable economic environment for firms.

The literature provides several definitions of social capital (Glaeser et al., 2002); in general, it is considered as a shared set of informal norms and values which increases the level of trust among members of a community and allow them to cooperate (Tabellini, 2008; Guiso et al., 2008). A high level of social capital in a certain area facilitates cooperation, reduces transaction costs for both firms and consumers, promotes a wider diffusion of knowledge and therefore enhances the economic performance (Knack and Keefer, 1997). In this study as a proxy for social capital we adopt the notion of social participation, measured by the share of population that has taken part at least once in the last 12 months in social activities such as voluntary service, unions and cultural associations meetings. The spatial distribution of social capital across the European regions, presented in Map 3.a, appears quite variegated. The regions showing the highest values are located in the Scandinavian Peninsula, in the four regions of Germany's Baden-Württemberg, in the France's Mediterranean and Pyrenees areas and in the South-West of the United Kingdom.

The positive role of human capital on productivity and economic growth has been widely studied in the literature (Mankiw et al., 1992; Benhabib and Spiegel, 1994). At the regional level a higher availability of well-educated labour forces represents an advantage for the localization of innovative firms, thus promoting local productivity (Rauch, 1993). As a proxy for human capital we use the share of population that has attained at least a university degree (ISCED 5-6). The distribution of human capital is represented in Map 3.b. Note the outstanding performance of Norway, Scotland, Finland's Southern regions (Etela-Suomi and Lansi-Suomi) and Eastern Spain (Cataluña, Aragona, Navarra, Pais Basco and Cantabria). Italy stands out for having all regions in the lowest class, while all other nations, with values below the European average, show greater variability and at least one region higher up in the rankings. This is the case for Portugal (with the Lisboa region) and Greece (with Attiki and Kentriki Makedonia).

Following the seminal contribution by Griliches (1979) technological capital has been considered as an important determinant of the economic performance at firms' level and also at regional and country level. The idea is that technology is partly a public good, so that firms benefit from widespread knowledge available in their area and this is likely to result in productivity enhancements. Recent contributions on the knowledge capital model include Madsen (2008) for the OECD countries and Fischer et al. (2009) for the European regions. As an indicator for technological capital we use the number of patent applications at the Patent Cooperation Treaty calculated as the stock in the previous five years over

total population. The distribution of technological capital in Map 3.c shows a high-performance cluster, starting in France from Rhône-Alpes through all Swiss regions and ending at the South-central part of Germany. Detached from this cluster, one finds the capital region of Paris (Île de France). Sweden, Finland and Denmark show top-high innovation performance, suggesting the presence of a Scandinavian cluster. All Southern European regions are characterised by very low levels of technological capital.

Finally, the presence of a good network of public infrastructure is also a key element in influencing the regional efficiency level. Starting from the seminal contributions by Aschauer (1989), the literature has investigated the role of infrastructure, and more generally of public capital, on regional performances. See, among others, Eberts (1990) for the United States, Marrocu and Paci (2010) for the Italian regions; a useful survey is in Gramlich (1994). The positive role of transport infrastructure on tourism flows is analyzed by Khadaroo and Seetanah (2008) within a gravity model framework. As a proxy for infrastructures in this study we use a composite index of accessibility based on the potential accessibility by road, train and air and on the time necessary to reach the market (with a negative sign). It takes the value 1 when the accessibility is very low and reaches the value 5 for a very high accessibility level. Thus, the index values depend on the geographical position of each region, which is an important element in relation to tourism flows. Map 3.d shows the presence of a central European core area consisting of parts of the Netherlands, Belgium, Germany, France and Switzerland with values significantly above the European average. The region with the highest accessibility indicator is Brussels, followed by Düsseldorf, Île de France, London and Utrecht. Countries with low accessibility are Ireland, Greece, Finland and Norway with lowest regional values in Pohjois-Suomi (Finland), Nord Norge (Norway) and Övre Norrland in Sweden.

#### 4. Econometric estimation

In this section we present the econometric analysis carried out to assess the role of tourism flows as total factor productivity determinants. As mentioned in the previous section, our measure of TFP exhibits a significant degree of spatial association, as detected by the Moran's  $I$  test reported in Table 1. Assuming that such dependence is mainly due to the existence of spillovers arriving from neighbouring regions, we estimate a spatial lag model, specified as follows:

$$a_i = c + \beta_1 tf_i + \beta_2 x_i + \delta W a_i + \varepsilon_i \quad \text{with } i = 1, 2, \dots, 199 \quad (1)$$

where small letters indicate values in logs. The dependent variable  $a$  is the value of total factor productivity in each region  $i$  in the year 2004,  $tf$  are tourism flows and  $x$  is the matrix of the other explanatory variables used as controls. These include the main intangible assets, which are supposed to influence the efficiency level of the regional economy, namely social capital, human capital and technological capital; these variables are normalised to population in order to control for different size of

the regions. We also include the accessibility index presented in the previous section to control for regional differences in the endowments of public infrastructures. All right-hand side explanatory variables refer to the year 2002.

The presence of spatial dependence is accounted for by including the spatial lag of the dependent variable,  $Wa$ , where  $W$  is the spatial matrix. The elements of the  $W$  matrix are the spatial weights, given by the square of the inverse of distance in kilometres; the square values are supposed to be more informative and more powerful in discriminating between neighbouring and distant regions as they increase the relative weights of the closest ones. The weight matrix is normalised by dividing each element by its largest eigenvalue to maintain the symmetry of the distances and the interpretation of the spatially lagged term based on a “distance decay”- type of economic behaviour (Anselin, 1988). Note that in estimating model (1) we have to deal with two possible sources of endogeneity; one is typical of spatial lag models, which are characterized by the two-way causality in the neighbour relation in space, while the other is due to the presence of system feedbacks or measurement errors in the explanatory variables. When endogeneity is caused by both sources the 2SLS estimation method has to be applied. We tested for endogeneity of the regressors by applying the well-known Durbin-Wu-Hausman test, which turned out to be highly significant ( $p$ -value=0.0004). Following Fingleton and Le Gallo (2008), in this work the instruments for the explanatory variables are derived by applying the 3-group method proposed by Kennedy (1992). For each variable the instrument takes the value -1, 0, or 1 according to whether the value of the instrumented explanatory variable is in the lower, middle or upper third of its distribution. Spatial lags of the 3-group method instruments are used to deal with the endogeneity of the spatially lagged dependent variable (Kelejian and Prucha, 1999).

## 5. Results

The results of the econometric analysis are reported in Table 4. The first model is a sort of benchmark model based on a simple OLS regression without accounting for spatial dependence or possible endogeneity of the regressors. All the explanatory variables - including tourism - exhibit a positive impact on the dependent variable; however, both the LM test for error spatial correlation and the Moran's  $I$  test carried out on the estimated residuals point out that the regression errors are significantly correlated across regions.

The second model is our preferred one, it accounts for both sources of endogeneity and it does not exhibit evidence of misspecification as far as the spatial pattern of the residuals is concerned, as shown by the value of the Moran's  $I$  test. Note that the reported value of the test is based on the variant proposed by Anselin and Kelejian (1997) for the case of 2SLS residuals. In regression 2 the most interesting result is that tourism flow has an estimated coefficient of 0.09, which is 60% higher than the one associated with

technology, thus confirming the important role played by tourist-transmitted information in determining total factor productivity in the European local economies. All intangible assets display a positive and significant coefficient: 0.19 for human capital, 0.13 for social capital and 0.05 for technological capital. As expected, a positive and significant influence is also exerted by the degree of accessibility.

In regression 3 we evaluate which is the *crucial* distance that allows the benefits of one region to spill over the neighbouring ones by including four different spatially lagged terms: the spatial weight matrices now refer to four 300 kilometre wide non-overlapping ranges, the first (0-300 km) is the shortest distance considered; we then consider the non zero links among the regions in the ranges 300-600, 600-900 and 900-1200. The 300, 600 and the 1200 km distance correspond approximately to the first decile, the first quintile and the median of the distances distribution, respectively. The results point out that the relevant links which allow neighbouring spillovers to have a significant impact on the regional economies are those within the 300 km distance. The coefficient of the first lagged term is estimated in 0.95 and all the other explanatory variables – tourist flows and regional TFP determinants – show estimated coefficients of the same order of magnitude as those obtained for specification 2. The Moran's *I* test for regression 3 does not signal residual spatial autocorrelation.

Overall, the results reported in Table 4 provide relevant evidence supporting the novel idea that tourists' flows represent an important efficiency enhancing channel at the regional level. This can be seen as the macroeconomic outcome of the underlying micro mechanisms through which firms located in the destination economies acquire valuable information on final consumers' preferences from non-local tourists. Local firms can thus engage in the production of high quality goods, introduce innovative changes in their productive and marketing strategies and in so doing increase the level of total factor productivity for the regional economy as a whole. Note that such beneficial effects from tourist flows are not confined to the tourism-specialised regions, but are also transmitted to the neighbouring regions by means of spatial spillovers.

## **6. Discussion and conclusion**

In this paper we provide empirical evidence supporting the new idea that tourists flows can function as a complementary channel in the diffusion of knowledge among firms and regions. It is by now well known that knowledge is one of the most important factors for increasing the competition among firms as it consents to acquire information on new products and processes and thus to enhance overall productivity. Following different theoretical approaches, the literature has identified and provided empirical evidence on a number of knowledge transmission channels, such as those based on direct contact with other firms and customers, both at the national and the international level, or those represented by trade or by foreign direct investments. However, such mechanisms present some

shortcomings which may limit the possibility for some firms, particularly the small ones, to acquire valuable information and this prevents them from exploiting the expected positive effects on their efficiency levels.

On the other hand, the information on external demand preferences conveyed by tourism flows is costless for local firms since tourists are external customers directly coming to the local market. Thus the frequent interactions with tourists allow local enterprises to acquire new information on demanded products and services, which can be used to increase their productivity and, consequently, the efficiency level of the whole region. These mechanisms are reinforced if tourists come from relatively richer countries and exhibit preferences for higher quality goods when compared to local consumers.

The empirical evidence provided in this paper is based on the estimation of spatial lag models for the total factor productivity of 199 European regions, where tourist flows enter as a main explanatory variable, along with other tangible (public infrastructures) and intangible (social, human and technological capital) types of inputs.

The empirical models show that tourism flows generate a positive and significant effect on the regional level of production efficiency. As a matter of fact the estimated coefficient for tourism flows is comparable in size to that of regional technological capital, thus offering support to the novel idea that tourists represent an important channel in transmitting valuable information to the destination economies' firms. The micro channel beneath this macro outcome is that local enterprises can acquire such additional information at no cost, and exploit it in order to improve their individual efficiency level and, consequently, the productivity of the local economy as a whole. The latter, in turn, generates beneficial effects also to neighbouring regions thanks to the presence of spatial spillovers.

In order to identify a positive relationship between tourism flows and aggregate regional efficiency level it is not required a productivity increase for all enterprises. Indeed, the aggregate result can be produced by the efficiency enhancement of only a fraction of the local firms, those more capable of absorbing and exploiting the new information coming from tourists. In addition, a selection process can be generated so that only the most efficient firms survive in the local market.

## **7. Further research**

Several interesting questions arise from this research. Which firms benefit more from tourism flows: small or large firms? In which sectors of the economy? Which kind of tourist characteristics - in terms of income, age, profession, behavioural patterns, origin countries - are more beneficial to transmit information to local firms? To answer these questions, and thus to better qualify the macro results presented in the paper, it is necessary to collect specific data, which are not yet available at the regional

level. In particular a deeper investigation at the micro-firm level on the information transmission mechanisms between external tourist flows and local firms is left to future research.

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## TABLES

**Table 1. Descriptive statistics and Moran's *I* test for spatial association**

<i>Variable</i>	Year	Basic descriptive statistics				Moran's <i>I</i> test			
		Mean	Std. dev.	Min	Max	Distance matrix		Contiguity matrix	
						Z-values	<i>p</i> -value	Z-values	<i>p</i> -value
Total Factor Productivity	2004	1.159	0.334	0.386	3.451	17.02	0.000	8.30	0.000
Tourism flows	2002	7.06	9.53	1.02	66.67	2.33	0.020	3.77	0.000
Social capital	2002	493.8	154.4	105.3	1000.0	21.00	0.000	11.42	0.000
Human capital	2002	128.2	46.7	44.6	338.5	17.05	0.000	8.37	0.000
Technological capital	1998-2002	0.41	0.47	0.00	3.60	13.87	0.000	8.26	0.000

The Moran's *I* test is calculated on the log-transformed variables

**Table 2. Measuring total factor productivity, a spatial Cobb-Douglas model**

Capital stock	0.291 *** (8.0)
Labour units	0.278 *** (11.3)
Spatial lag	0.305 *** (3.6)
Fixed effects	included
Time effects	included
Square correlation	0.98
LM test for spatial error dependence <i>p</i> -value	0.174 0.677
Moran's <i>I</i> test <i>p</i> -value	0.362 0.718

Dependent variable: value added

Estimation method: spatial 2SLS

Sample period: 1985-2006; N=199; N\*T=4378

Spatial weight matrix: square of the inverse of distance in km

Asymptotic *t*-statistic in parenthesis; level of significance: \*\*\* 1%, \*\* 5%, \* 10%

Square correlation is calculated between predicted and actual values

For estimation details see Dettori et al. (2008).

**Table 3. Tourist flows. Top ten regions**

<b>(a) Nights over population, 2002</b>			
1	Baleares	Spain	66.7
2	Cornwall, Isles of Scilly	UK	52.1
3	Notio Ai gaio	Greece	50.2
4	Canarias	Spain	46.7
5	Tirol	Austria	46.6
6	Algarve	Portugal	40.1
7	Salzburg	Austria	33.8
8	Highlands, Islands	UK	32.7
9	Ionian Nisia	Greece	31.6
10	Valle D'Aosta	Italy	27.5
<b>(b) Total nights, million, 2002</b>			
1	Canarias	Spain	84.1
2	Ile De France	France	62.1
3	Baleares	Spain	59.3
4	Catalana	Spain	58.3
5	Veneto	Italy	55.4
6	Andalucia	Spain	44.8
7	Toscana	Italy	38.0
8	Emilia-Romagna	Italy	37.0
9	Provence-Alpes-Cote D'Azur	France	36.4
10	Inner London	UK	34.2
<b>(c) Growth rate, % annual average, 1998-2006</b>			
1	Greater Manchester	UK	13.1
2	Merseyside	UK	11.8
3	Gloucestershire	UK	11.0
4	Tees Valley, Durham	UK	9.6
5	Navarra	Spain	8.8
6	Corse	France	8.7
7	Asturias	Spain	8.4
8	Umbria	Italy	7.8
9	Kentriki Macedonia	Greece	7.6
10	Bedfordshire	UK	7.3

**Table 4. Assessing the role of tourism flows on Total Factor Productivity**

	<b>1</b>	<b>2</b>	<b>3</b>
	<i>OLS</i>	<i>2SLS</i>	<i>2SLS</i>
Tourist flows	0.052 *** (2.90)	0.087 *** (3.94)	0.081 *** (3.53)
<i>Regional characteristics</i>			
Accessibilità	0.132 *** (4.35)	0.099 *** (3.01)	0.069 ** (2.12)
Human capital	0.149 *** (3.48)	0.188 *** (3.33)	0.145 *** (2.63)
Social capital	0.218 *** (5.81)	0.133 ** (1.98)	0.155 ** (2.41)
Technological capital	0.017 ** (2.45)	0.053 *** (3.26)	0.051 *** (3.00)
<i>Spatial dependance</i>			
Spatially lagged dep. variable		0.992 *** (2.86)	
Distances for spatial lag (in km)		all	
Spatial lag - distance 0-300 km			0.952 *** (2.74)
Spatial lag - distance 300-600 km			0.312 (1.14)
Spatial lag - distance 600-900 km			0.059 (0.17)
Spatial lag - distance 900-1200 km			0.170 (0.45)
Square correlation	0.472	0.495	0.507
LM test for spatial error dependence	444.12	--	--
<i>p-value</i>	0.000		
Moran's <i>I</i> test	21.25	-1.640	-1.599
<i>p-value</i>	0.000	0.101	0.110

Dependent variable: total factor productivity, 2004

For tourist flows, human capital, social capital and technological capital the values refer to the 2002 year

N=199; all variables are log-transformed; all regressions include a constant term

In 2SLS regressions instruments are constructed by applying the 3-group method (Kennedy, 1992)

Spatial weight matrix: square of the inverse of distance in km

Asymptotic *t*-statistic in parenthesis; level of significance: \*\*\* 1%, \*\* 5%, \* 10%

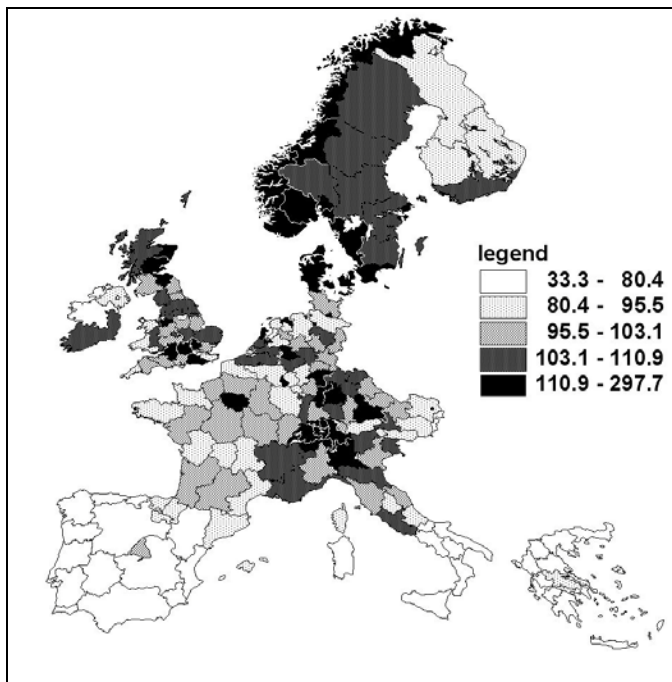
*t*-statistics are computed on the basis of White heteroskedasticity consistent standard errors

Square correlation is calculated between the predicted and actual values

For 2SLS regression the Moran-*I* test is the variant proposed by Anselin and Kelejian (1997) for 2SLS residuals.

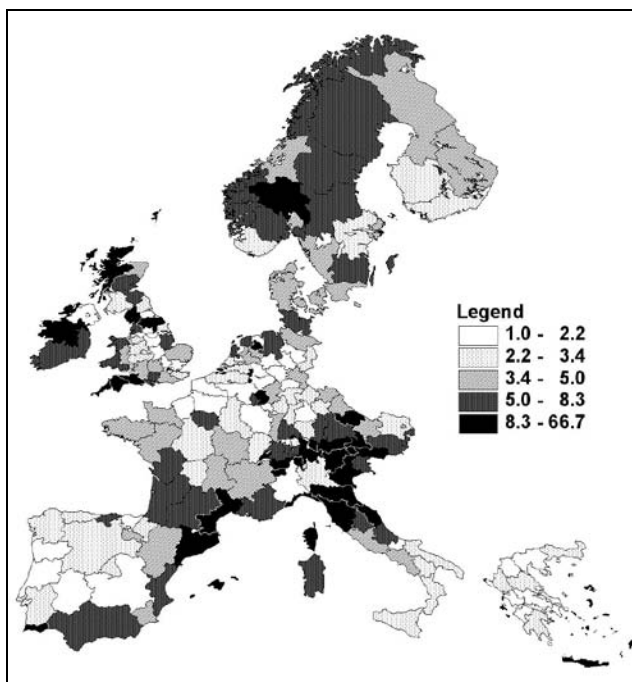
## MAPS

**Map 1. Total Factor Productivity in the European regions**



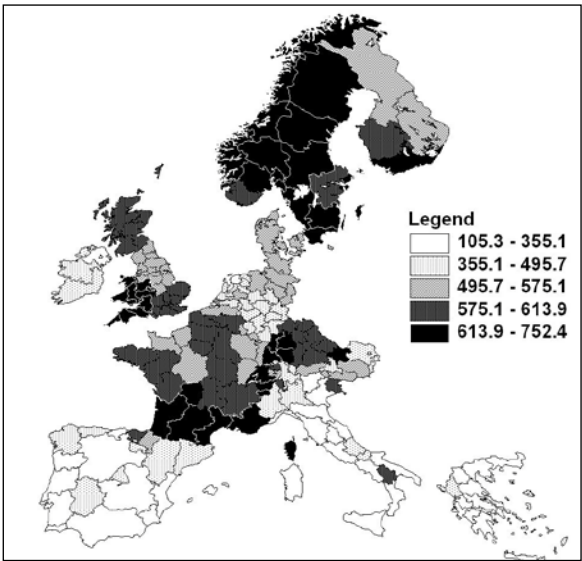
Index, Europe = 100, 2004

**Map 2. Tourist flows in the European regions**

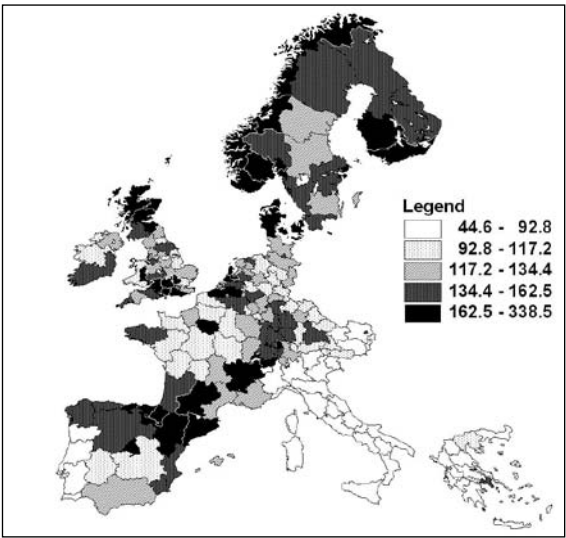


Nights spent by resident and non resident in collective tourist accommodation establishments.  
Per capita values, 2002

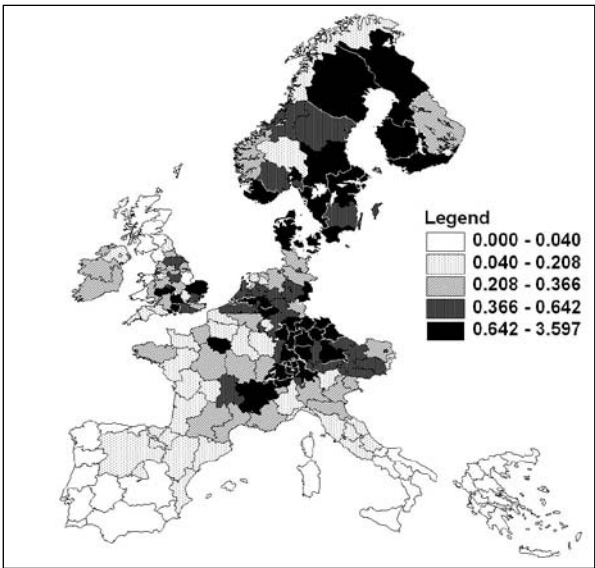
### Map 3. Regional characteristics



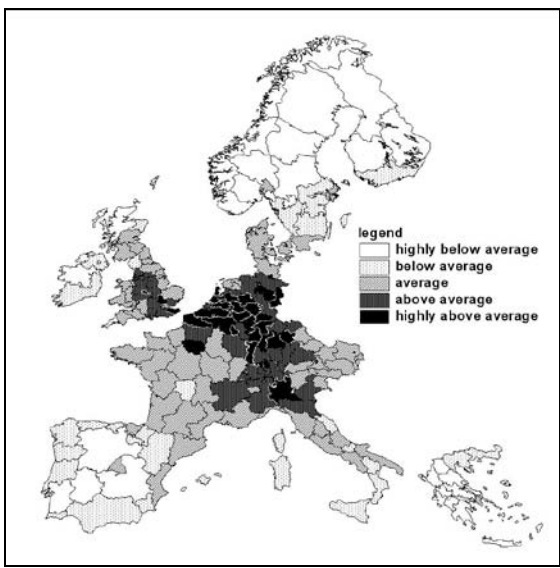
**(a) Social capital.** Participation to social activities per thousands population, 2002



**(b) Human capital.** Inhabitants with a degree per thousands population, 2002



**(c) Technological capital.** Patents per thousands population, 1998-2002



**(d) Public infrastructure.** Accessibility index. 2001

## APPENDICES

### Appendix 1. Data sources and definition

Variable	Source	Years	Description
TFP	Own estimation	2004	Computed from regional fixed effects of production function estimation over the period 1985-2006.
Tourism flows	Eurostat	1998-2006	Total nights spent by resident and non resident in total collective tourist accommodation establishments.
Accessibility	Espón, Project 2.4.2	2001	Regions are classified into five groups (from 1= very low, to 5= very high) according to their potential accessibility by road, train, air and time to the market.
Human Capital	Eurostat	2002	People with a degree (ISCED 5-6).
Social capital	European Social Survey, Round 1	2002	Population that have taken part at least once in the last 12 months in social activities such as voluntary service, unions and cultural associations meetings.
Technological capital	OECD, REGPAT database	1998-2002	Patent applications at PCT (Patent Cooperation Treaty), stock for the previous 5 years.

### Appendix 2. Regions and NUTS level

Country	NUTS	Regions
Austria	2	9
Belgium	1	3
Denmark	0	1
Finland	2	5
France (a)	2	22
Germany (b)	2	30
Greece	2	13
Ireland	2	2
Italy (c)	2	20
Luxembourg	0	1
Netherlands	2	12
Norway	2	7
Portugal (a)	2	5
Spain (a)	2	17
Sweden	2	8
Switzerland	2	7
United Kingdom	2	37

(a) Territories outside Europe are not considered

(b) Berlin and East Germany regions are not considered

(c) Autonomous provinces of Trento and Bolzano are aggregated

### Appendix 3. Moran test

The Moran's  $I$  test for a given variable  $x$  is calculated as follows:

$$I = \frac{N}{S_0} \frac{\sum_{i=1}^N \sum_{j=1}^N w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_{i=1}^N (x_i - \bar{x})^2}$$

where  $w_{ij}$  is the weight between region  $i$  and region  $j$  and  $S_0$  is the sum of the all weights,  $S_0 = \sum_{i=1}^N \sum_{j=1}^N w_{ij}$ . The standardized version of  $I$ , under the null hypothesis of no spatial correlation follows a standard normal distribution.