CONTRIBUTI DI RICERCA CRENOS

CRENOS
CENTRO RICERCHE
ECONOMICHE NORD SUD
Università di Cagliari
Università di Sassari

AGGLOMERATION ECONOMIES AND GROWTH
THE CASE OF ITALIAN LOCAL LABOUR SYSTEMS, 1991-2001

Raffaele Paci

Stefano Usai

WORKING PAPERS

CUEC

2006/12

CENTRO RICERCHE ECONOMICHE NORD SUD
(CRENOS)
UNIVERSITÀ DI CAGLIARI
UNIVERSITÀ DI SASSARI

Il CRENoS è un centro di ricerca istituito nel 1993 che fa capo alle Università di Cagliari e Sassari ed è attualmente diretto da Raffaele Paci. Il CRENoS si propone di contribuire a migliorare le conoscenze sul divario economico tra aree integrate e di fornire utili indicazioni di intervento. Particolare attenzione è dedicata al ruolo svolto dalle istituzioni, dal progresso tecnologico e dalla diffusione dell'innovazione nel processo di convergenza o divergenza tra aree economiche. Il CRENoS si propone inoltre di studiare la compatibilità fra tali processi e la salvaguardia delle risorse ambientali, sia globali sia locali.
Per svolgere la sua attività di ricerca, il CRENoS collabora con centri di ricerca e università nazionali ed internazionali; è attivo nell'organizzare conferenze ad alto contenuto scientifico, seminari e altre attività di natura formativa; tiene aggiornate una serie di banche dati e ha una sua collana di pubblicazioni.

www.crenos.it
info@crenos.it

CRENOS – CAGLIARI
VIA SAN GIORGIO 12, I-09100 CAGLIARI, ITALIA
TEL. +39-070-6756406; FAX +39-070- 6756402

CRENOS - SASSARI
VIA TORRE TONDA 34, I-07100 SASSARI, ITALIA
TEL. +39-079-2017301; FAX +39-079-2017312

Titolo: Agglomeration economies and growth-The case of Italian local labour systems, 1991-2001

ISBN 88 – 8467 – 355-0

Prima Edizione Dicembre 2006

Via Is Mirrionis, 1
09123 Cagliari
Tel./Fax 070291201
www.cuec.it

Agglomeration economies and growth

The case of Italian local labour systems, 1991-2001

Raffaele Paci
University of Cagliari and Crenos

Stefano Usai
University of Cagliari and Crenos

Via S.Ignazio 78
09123 CAGLIARI
tel: 070-6753766
fax: 070-6753760
email: stefanousai@unica.it

Summary

The main objective of this paper is to assess the role of a large set of factors which potentially relate agglomeration economies to local growth. Such a relationship is analysed thanks to an ample database on the case of Italy which refers to 784 Local Labour Systems and 34 sectors (21 manufacturing and 13 services) over the period 1991-2001.
Econometric results show that local growth in Italy is characterized by significant differences across sectors. It is worth mentioning the positive influence of diversity externalities, human and social capital and the negative influence of specialisation externalities and competition. Spatial association is also detected.

JEL: R11, R12, L60, O52
Keywords: Agglomeration externalities, Local growth, Spatial dependence, Italy.

Acknowledgments:
We thank Margherita Meloni and Barbara Dettori for excellent research assistance. Participants to ERSA conference at Amsterdam and CEPR workshop at Cagliari have given useful suggestions. We also thank Frank van Oort for helpful comments on a previous version of the paper.

1. Introduction*

Economists and geographers have recently refocused their attention on the contribution of agglomeration economies on the process of local economic growth. This phenomenon entails several issues which have been deeply examined by the economic literature from both a theoretical (Baldwin and Martin, 2004) and an empirical point of view (Rosenthal and Strange, 2004).

This paper contributes to the empirical stream of literature by assessing the role of those forces which induce firms co-localisation and may generate different growth patterns both for sectors and for local areas. It is argued that such patterns have to be studied together with the structural change process which characterises modern economies. Indeed, these transformations have insightful implications for the analysis of the spatial distribution of economic activities which are highly affected by the process of de-verticalisation and de-localisation of mass production industries and the concurrent development and diffusion of service activities. These trends are modifying both the economic geography of local production systems and the manner by which these are linked to the global economy. Economic landscapes are increasingly being shaped by a complex mixture of forces operating simultaneously worldwide as much as at the regional level but with a common denominator: the structural shift from manufacturing to services. The main effect of such phenomenon in space being the fact that, on the one hand, urban areas lose manufacturing to become more service oriented and, on the other hand, peripheral areas become more favourable location both for manufacturing and service.

The main aim of this paper is to analyse local economic performances, as expressed by employment dynamics, both in the service and in the manufacturing sectors. As in most theoretical and empirical literature, we refer not only to the presence in a certain area of traditional production factors (capital, labour and natural resources) but

* We thank Margherita Meloni and Barbara Dettori for excellent research assistance. Participants to ERSA conference at Amsterdam and CEPR workshop at Cagliari have given useful suggestions. We also thank Frank van Oort for helpful comments on a previous version of the paper.

also to several types of "local externalities". We focus on the usual distinction among specialisation-Marshall externalities, diversity-Jacobs economies and competition-Porter effects. Moreover we analyse the potential influence of firm size, population density, human and social capital.

Another goal of the paper concerns the use of spatial econometric techniques to take into account the possibility of some cross-border externalities, that is neighbourhood factors affecting local growth. This allows us to avoid considering geographical units as isolated closed economies and therefore placing artificial bounds to agglomeration economies as it is sometimes done in previous literature especially in the United States (Glaeser *et al.*, 1992; Henderson *et al.*, 1995).

The empirical analysis is applied to the case of the 784 Local Labour Systems in Italy over the period 1991-2001 and 34 manufacturing and services sectors. The present contribution builds on our previous work on this topic (Usai and Paci, 2003; Paci and Usai, 2005), since it includes the entire market economy over a longer time period while including some important additional factors among the set of explanatory variables.

The paper is organised as follow. The next section presents the databank along with a descriptive picture of the employment dynamics at the local and sectoral level. In the third section we briefly survey the literature background. In the fourth section the empirical model is presented. Section five discusses the main econometric results. In the last section some concluding remarks are proposed.

2. Data and descriptive analysis

The empirical analysis is applied to the case of the 784 Local Labour Systems (LLS) in Italy identified by the Statistical Office (ISTAT) on the 1991 population census. LLS are groupings of municipalities with a high degree of self containment of workers commuting. This high level of geographical breakdown appears particularly fruitful for the analysis of local growth since it facilitates the identification of the agglomeration forces at the local level and of the spillover effects arising from contiguous areas. As for the sectoral breakdown, we consider 34 sectors at the 2 digit ATECO91 - ISIC3 level: 21 industrial sectors (including building) and 13 service sectors (excluding the public sector).

The employment dynamics in Italy in the decade from 1991 until 2001 is positive, with a gain of more than one million units of

labour and an average annual increase of 0.7% (see Figure 1a). It should be noticed that employment in Italy in the nineties has been characterised by a clear divide: until 1995 there has been a long crisis, started in 1992[1], whilst in the second period Italy experienced a long expansion which allowed to move along a convergence path towards the European standard, especially in terms of labour participation.

The positive trend in employment for the whole country is confirmed in all geographical areas but for the Islands (Sicily and Sardinia), which report a slightly negative variation of -0.01% each year. The highest aggregate increase is, on the contrary, achieved in the North East and in the Center-South, contributing to the reinforcement of the long-lasting mismatch between the area of North and Centre, which experiences a 0.8% annual average growth rate, and the South associated with the Islands which move at just half of that pace with a mere 0.4%[2].

Most importantly for the scope of this paper is to notice that these aggregate trends conceal opposed patterns for macro-sectors (see Figure 1b and 1c): the industrial sector shows an average employment fall of 0.2% per year, whilst the service sector increases by 1.5% per year. These divergent performances are obviously related to the process of structural change common to most OECD countries with manufacturing employment constantly decreasing and services activities becoming the primary source of employment growth. Such process is due to many reason. One is that labour productivity growth allows the combination of an increase in manufacturing output associated to a fall in employment. This is due, among many other reasons, to the process of re-localization of manufacturing where operating costs are lower but also to the practice of outsourcing, which implies that industrial firms, in order to improve

---

[1] This is one reason which makes this contribution original with respect to previous studies in the same vein (see Usai and Paci, 2003; Paci and Usai, 2005) but with a focus on employment dynamics from 1991 until 1996. In those papers it was argued that some results were possibly caused by the global negative cycle in the economy.

[2] If one considers the experiences of individual LLS it turns out that, very often, extreme performances are the result of idiosyncratic shocks affecting specific sectors prevalent in certain areas. Therefore among the top ten best performing LLS we find areas both in the South (mainly in Puglia and Basilicata) and in North (especially in Veneto). For instance, the highest employment growth is recorded at Melfi, in the southern region of Basilicata, where the multinational car maker Fiat built a plant thanks to the financial and fiscal incentives available to the Objective 1 regions of the EU.

their productivity in the core business, move auxiliary internal activities to external service firms (i.e. cleaning, accounting, engineering, marketing, security, etc.). Nonetheless, it should be noticed that relocation of service activity is accelerating too. Especially internationally tradable sectors, which are ICT intensive and require low levels of face-to-face interaction are being moved abroad. Both low and high skilled jobs are affected due to the fact that most relocation of services occurs between developed countries and is driven not only by cost but also by quality and market access reasons. Italy does not prove different: the process of expansion of employment is mainly due to the process of so called "terziarizzazione", that is the increase of services which, as a matter of fact, from 1995 to 2001 expanded its quota of total labour from 63 to 66 per cent.

Looking at the maps we can see a clustering of growing LLS's in the North-East, both in industrial and service sectors. The one of the North-East is a recent story of industrial and service development based on local networks of small and medium firms and plants scattered throughout the area, which follows the model of the "industrial districts". On the contrary, the North-West, traditionally based on large heavy industries, presents over the nineties the deepest fall in industrial employment compensated by the highest grow in the services. As regards the other macroregions the performance is always characterised by a positive dynamics for the service sector and a negative one for manufacturing. The combination of these two contrasting trends often gives rise to a positive global performance.

Besides, when one looks at single sectors as in table 1, employment dynamics appears as much variable from sector to sector as from one area to another one. The best performing sectors are among services, above all *Real estate activities* (10% annual average growth rate) and the *Computer services* (6.7%). Some services have, nevertheless a negative dynamics: *Retail trade* (which is the most important sector in terms of quota of employees) and *Post and telecommunication*. The worst performing sectors are among manufacturing, primarily *Wearing apparel* (-3.4%), the upward related sector of *Textiles* (-2.6%) and also the two transport industries. Only few manufacturing sectors have shown a positive performance: *Rubber and plastic* (+1.9%), and *Metal products* (+1,3%). The employment dynamics in the *Building* sectors is also positive (1.4%).

Table 1 reports also the Moran test for spatial dependence in the employment growth rates among the 784 LLS. At the global and macro-sectors level we find evidence of the presence of spatial autocorrelation

already perceived from the visual inspection of the previous maps. The Moran index for the whole country and for the industrial and service sectors indicates that employment dynamics in a LLS is influenced by the performance of nearby areas. At the same time, when employment growth is disaggregated by sectors, the occurrence of spatial dependence is differentiated too. As an example, one can see in Figure 2 the contrasting patterns of *Clothing apparel* where employment dynamics clearly show a tendency to cluster in contiguous areas; and that of *Chemicals* which is clearly more scattered over space. Spatial association is, therefore, reported only in the former case, while in the latter the index is not significant. More generally, there appears a positive and significant spatial dependence in 21 sectors out of 34 (12/21 in industry and 9/13 in services). In one sector, *Coke and petroleum products*, a negative significant spatial dependence is detected, due to the extremely dispersed and polarised structure of this industry.

In conclusion, two main findings emerge from the descriptive analysis of employment dynamics. Firstly, a highly differentiated pattern among sectors; secondly, the presence of spatial association among contiguous areas in the employment growth rates. In the econometric estimation these stylised facts are directly taken into account.

3. Literature background

In the last decade, the influence of agglomeration and other forms of local externalities on economic growth has been under recurrent investigation. Glaeser *et al.* (1992) is the first contribution to focus on employment growth as a proxy for local economic performance and to study its dynamics at both the city and the sectoral level. Their empirical analysis is based on the distinction between static externalities, associated with cost efficiencies, and dynamic externalities, related to knowledge spillovers. Both types of externalities are potentially related to Marshall-Arrow- Romer (MAR)[3] localisation economies which encourage growth thanks to industrial specialisation. In fact, Glaeser *et al.* (1992) included also Porter's (1990) and Jacobs's (1969) hypotheses that competitition and industrial diversity, respectively, enhance local growth. Since then, the debate about dynamic externalities has mainly focused on

[3] The usual references are Marshall (1890), Arrow (1962) and Romer (1986), respectively.

three competing theories which have different predictions on the relationship between agglomeration phenomena and economic growth. These predictions have been summarised by Van Oort (2004) and reported in table 2.

The main difference between these theories concerns the effects of industrial concentration (the degree to which a location specializes in one industry), diversity (the variety of sectors in a location) and competition (the local market structure). The MAR framework maintains that most spillovers occur among firms within the same industry. Specialized locations with high levels of industry concentration should, therefore, experience more innovation and faster growth. In contrast, Jacobs suggests that positive externalities arise across different industries and predicts that industries innovate more and grow faster in locations with greater diversity and competition. Porter accepts the idea of localisation economies but, in accordance with Jacobs, asserts that local competition induces more innovation and therefore local economic growth.

Empirical tests addressing this debate have produced conflicting results. The seminal contribution of Glaeser *et al.* (1992) finds that both competition and diversity foster industry growth measured by employment dynamics, while specialization discourage them. As for Porter effects, the indicator of local market structure (the firm dimension) is unsatisfactory. The evidence collected for other countries, mainly in the European Union, seems to support these findings. For example in the case of Italy, Usai and Paci (2003), at the local labour system level, find a positive effect on growth played by diversity and a negative one by specialization. In the Netherlands, Van de Soest *et al.* (2002) find similar results at the city level.

These results conflict with those of Henderson *et al.* (1995) who reported positive effects for both diversity and specialization externalities for high tech industries whilst for mature industries just MAR spillovers are found. The importance of taking into account the existence of relevant differences across sectors is raised also by Forni and Paba (2002), who find that in Italy specialization and variety matter for growth in most manufacturing sectors even though they show that each industry

needs its own variety in terms of input-output relations[4]. In this vein Combes (2000b) for France, Almeida (2002), for Portugal, Paci and Usai (2005) in Italy and Blien and Suedekum (2005) in Germany have tried to improve the analysis by examining both the manufacturing and the service sector. Such a choice is insightful given that, although on average, there is a positive role for diversity and a negative one for specialization, such externalities prove to be rather different across sectors.

As far as the Porter effect is concerned, this is correctly measured by Combes (2000b) who finds a negative effect on growth in industry and no significant effect in service[5]. Moreover, effects are differentiated across sectors: being always negative in manufacturing sectors and positive only in a handful of service sectors.

The contribution of Dekle (2002) and Cingano and Schivardi (2004) are particularly important because they remark that employment growth cannot be used as a valid proxy of productivity growth unless four conditions hold. These conditions concern the constancy of local capital stock, the demand elasticity, the effects of agglomeration on labour supply and the degree of substitutability among factors. In the light of such considerations, Cingano and Schivardi (2004) for Italy, and more recently Almeida (2005) for Portugal, show that within the same sample, results are different when employment growth is substituted for another more correct proxy for economic growth (TFP and wages). In particular, specialization effects became positive. Similar results are found by De Lucio *et al.* (2002), who report no effect of diversity on labour productivity growth and an interesting U-shaped curve for specialisation effects. Finally, Henderson (2003), through the estimation of plant level production functions in a panel context, finds that MAR externalities have strong productivity effects in high-tech but not in machinery industries. He also finds no evidence of urbanization

[4] This interesting outcome (as the one in Glaeser *et al.*, 1992) are, though, subject to Combes' critique (2000a), according to which the simultaneous inclusion of a specialisation index and total employment among the regressors introduces a positive bias on the specialisation coefficient. The positive effect of specialisation is therefore questioned.

[5] Cingano and Schivardi (2004), with the same indicator used in this paper, find a negative influence of competition on employment growth whilst a positive one is found on productivity growth.

economies from the diversity of local economic activity outside the own industry and limited evidence of urbanization economies[6].

The use of TFP measures (or other similar proxies for economic growth) is an obvious notable improvement by these studies, which, however, have to accept some inconvenience in terms of data availability. In particular, Dekle (2002) and De Lucio *et al.* (2002) have to move to a more aggregated geographical level (i.e., administrative regions) where the effects of local externalities are difficult to be assessed. On the contrary, Henderson (2003) and Cingano and Schivardi (2004) are able to keep a very disaggregated spatial level of analysis at the cost of relying on samples of plant data which bring about serious problems of selection bias.

Another interesting issue raised in the literature is whether the role of externalities varies with respect to some concurrent economic phenomena. Glaeser *et al.* (1992), for instance, suggested that there might be an industry life cycle in which externalities are only important in the early development stages. Similarly, Krugman (1991) indicates that as an industry develops, it might become less dependent on pooled labor, specialized inputs and knowledge spillovers. Moreover, externalities that foster the initial development of a location might not be the same that affect its subsequent growth (Duranton and Puga, 2001). In other words, the nature of externalities is not independent from product cycle: experimental activity is initially found in large diverse urban areas (Jacobs externalities) with a large number of small economic enterprises (Porter externalities); conversely, traditional production, which is more standardized, can be more decentralized in smaller specialized urban areas with lower costs (Marshall externalities) where large plants can operate more efficiently.

Most importantly, for the purposes of this paper, the role of externalities may vary across industries and, most of all, between the two macro-sectors: manufacturing and service. The reason is, as argued by Krugman and Venables (1995), that goods which are essentially non-tradable (such as service) have to be produced close to customers, leading activities to remain spread out. On the contrary, tradable goods, such as manufacturing, can enjoy agglomeration economies by locating

---

[6] He also studies the spatial extent of externalities and finds that they are quite localized within the own county, so that there are not external benefits from plants in other counties in the MSA.

where it is more convenient and therefore be more concentrated in space. This view, according to Desmet and Fafchamps (2003), may have interesting dynamic implications. As transport costs fall, goods became tradable, allowing production to take advantage of agglomeration economies in the first place. Later, however, if transport costs continue to drop, those agglomeration economies may go beyond a threshold where activities start spreading back out to less congested areas.

Finally, the dynamics of the service sectors is linked to the evolution of the economy and in particular of the manufacturing compound. One can distinguish two possible effects linking the dynamics of the two macro-sectors. On the one hand, service firms may substitute manufacturing firms as the latter rely more and more on the market, due for instance, to decreasing transaction costs. There is, therefore, an inverse relationship. On the other hand, as long as the two macro-sectors are complementary, especially because the manufacturing sector is a buyer of service sectors, the two dynamics may be positively related. However, one should bear in mind that service sectors are extremely heterogeneous: for example business services may follow an altogether different localisation process from family services. On the one hand, business services are, on average, locally concentrated near the firms to which they sell their products. This is usually explained by referring to intangible aspects of localised knowledge which need daily and face to face contacts to facilitate exchanges of essential information. On the other hand, family services are usually more spread out. As regards their dynamics, however, we may also find important differences according to other characteristics. For example, some services may prove to have some inferior goods characteristics, as for example transport goods which are substituted by durable goods, such as private cars. Their diffusion being decreasing with income as a result. Conversely, some other services have a luxury goods nature, such as insurance or culture, and their general consumption increases with income and become more and more scattered across space. The complexity of the nature of the two macro-sectors and of their relationship is bound to be reflected in our results especially those devoted to single sector analysis.

4. The estimation framework

Factors affecting employment dynamics of a certain industry in a certain area can be decomposed into three major groups: (1) local industry level, (2) local level, (3) industry level. Let us now discuss in

some details the various phenomena which have a potential effect on the performance of local sectoral employment.

Local industry level

The first group of determinants are those which are considered idiosyncratic for both area and industry. At the local industry level we consider the most debated factors: specialisation or Marshall externalities (*SE),* diversity or Jacobs externalities *(DE)*, competition or Porter effects (*CP*) and, finally, firm size (*FS*).

Specialisation externalities (*SE*), measured by an index of relative production specialisation, should capture the consequences of producing in an area surrounded by firms which belong to the same sector. This variable covers both static and dynamic externalities. The former include pecuniary and localisation externalities such as the availability of suitable supplies of labour force, primary and intermediate goods (Ellison and Glaeser, 1999), the provision of specific goods and services (Bartelsman *et al.,* 1994) and the availability of specific infrastructures and networks. The latter take into account dynamic spillovers coming from the intra-industry flows of localised knowledge which occur among similar firms located in the same area (Henderson *et al*., 1995; Audretsch and Feldman, 2004 for an up to date survey).

Diversity externalities **(***DE***)** are measured by the inverse of the Herfindhal index applied to employment in all sectors except the one considered. Such externalities are expected to positively influence local growth under the hypothesis that a firm located in a certain area can benefit from the presence in the same area of a wide range of other firms operating in different sectors since it can enjoy profitable inter-industries interactions and cross fertilisation. Further, diversity can be seen as a portfolio strategy which protects the regional economy, especially local employment, from sectoral idiosyncratic shocks (Frenken *et al*., 2005).

The degree of local competition (*CP*) is assessed by means of an Herfindhal index based on employees distribution over plants following Lafourcade and Mion's (2004) methodology . The predicted effect is uncertain since we may have a positive effect on employment dynamics coming from a higher incentive to innovate but also a negative one coming from demand pressures on inputs and intermediate goods.

Finally, we consider firm size (*FS*) measured in terms of employees, which may affect labour dynamics either because of internal economies of scale or because of different dynamics towards optimal size by firms of different size (O'hUallachàin and Satterthwaite, 1992). In

such a way we are able to distinguish between the two effects – competition and scale economies - defining two different indicators and including both of them in the estimated equation (as in Combes, 2000b).

Local level

Employment changes at the local industry level may be due to some features which characterise the whole local labour system. Local factors may refer to a large set of socio-economic phenomena which influence firms performance in the area.

The first variable focuses on the supply side by taking into account the presence of small firms (*SF*) within the local economy. The idea is that a larger share of small plants may induce firms to find their optimal production scale through cooperation and integration with other firms at the local level while stimulating the creation of local network externalities (Brusco, 1982). The opposite happens with large firms which are more vertically integrated and therefore are less involved in local networks.

The second variable takes into account the influence of the size of the economic system, measured by the population density (*PD*) in each LLS where a firm is located (Ciccone and Hall, 1996). A positive effect on local growth is expected when a larger population density implies, among others, a higher local demand and the availability of a wider supply of local public services. The closeness of buyers may have both a static and a dynamic effect, the latter being related to the fact that this may facilitate early perception of market needs. At the same time, the increasing size of the local economy may imply congestion effects giving rise to pollution and other local diseconomies.

The role of human capital in facilitating innovation activities and information spillovers and therefore growth is considered by looking at the presence in the local area of labour forces with high levels of education (measured by the share of population with a university education, *HK*). The hypothesis is that a higher availability of a well educated labour forces represents an advantage for the localization of firms thus fostering local growth (Rauch, 1993; Moretti, 2004).

Another important local element which may encourage innovation activities and smooth the process of knowledge diffusion is social capital. In this case it is not an easy task to find the proper indicators for such a complex and intangible phenomenon (Helliwell and Putnam, 1995). To measure the degree of trust in the local society we include an index of the propensity to cooperate among firms based on

the number of inter-firms agreement and participations in consortia surveyed by the industrial census at the provincial level (*SK*). The assumption is that a higher degree of propensity to cooperate among firms in a certain area helps local growth since it facilitates knowledge diffusion, decreases transaction costs and enables firms to take advantage of local externalities.

Finally, we follow the idea that externalities may affect labour supply (Cingano and Schivardi, 2004) and therefore we try to include this potential effect by inserting an indicator (*LS*) of the labour force size (labour forces over population age 15-65).

Industry level

The growth rate of employment in a local industry may also be affected by factors which are idiosyncratic to each production sector while they are common to all areas. These factors can capture, for instance, different levels of technological opportunities within each industry at the national level or sectoral demand shocks. In our econometric estimation they are proxied by the sectoral fixed effects in the panel regressions while they are, obviously, redundant in the sectoral estimates.

Spatial analysis

As we have remarked before, one interesting feature in the analysis at the local level is that the employment growth in a region may be influenced by factors which are outside the region. In other words, economic growth in the nearby areas may influence employment dynamics in a certain region and this introduces a possible bias in regressions which do not take into account this possibility. In order to deal with the problem of spatial association in the sectoral regressions[7] we apply the following estimation procedures:

i. OLS estimation to assess for the presence of spatial autocorrelation based on the LM tests;

[7] In the panel estimations it is not feasible to deal with the problem of spatial association due to technical storage limits imposed by both Spacestat and Matlab for such large datasets and with a unbalanced panel due to the presence of several missing values in a number of sectors.

ii. if there is no autocorrelation, then the least squares estimates are efficient and consistent. In such a case we use the OLS White-robust estimation which allows to correct for potential heteroschedasticity;

iii. if spatial autocorrelation is detected, one needs to correct the estimation procedure by including the spatial lag of the dependent variable. In such a case it is necessary to use Maximum Likelihood (ML) estimation introducing spatial lag dependent variables up the contiguity level necessary to correct for the presence of spatial autocorrelation.

5. Econometric results

We attempt to consider simultaneously different factors which potentially affect local employment dynamics. The same general specification is applied to sub samples, identified with respect to sectoral features, to establish if there is any difference in the value, sign and significance of the estimated coefficients and thus in the role of the explanatory factors. The econometric analysis is therefore based on a simple reduced form where the employment growth rate at the local industry level is affected by the three sets of phenomena described in the previous section:

$$log(L_{ijt+1}/L_{ijt}) = \chi_1 SE_{ijt}+\chi_2 DE_{ijt}+\chi_3 COMP_{ijt}+\chi_4 FS_{ijt}+\beta_1 SF_{it} +\beta_2 PD_{it} +\beta_3 HK_{it}+\beta_4 SK_{it}+\beta_5 LS_{it}+ FE_j$$

We have tried to control for potential causes of distortion by excluding all local industry observations with a zero number of firms either in the initial or in the final year because this gives rise to extreme values with typical outlier characteristics. It is important to remark that all our regressors are exogenous to the local industry employment growth rate since they refer to the beginning of the period considered.

Standard spatial econometric techniques are applied in order to assess the existence of spatial autocorrelation and, if this is present, to implement the appropriate estimation methodology.

Table 3 reports the aggregate estimations based on a dataset with two-dimensions (geographical and sectoral) and with cross section weights and fixed effects to control for sectoral differences while the results of sectoral regressions are reported in Table 4.

Specialisation

The first important result is the absence of specialisation externalities: the coefficient of *SE* is negative and significant in all panel estimations and in most service sectors. This outcome confirms previous

studies for the US (Glaeser *et al.*, 1992), France (Combes, 2000b) and Italy (Cunat and Peri, 2001, Forni and Paba, 2000; Usai and Paci, 2003).

Specialisation has no effect in most manufacturing sectors, since coefficients are often not significantly different from zero, whilst it has a positive effect in two of the most traditional sectors, *textiles apparel* and *leather and footwear*. These two sectors are among those which are losing more employees and it seems that this global dynamic is stronger in those areas where specialisation was relatively weak whereas local specialised districts manage to preserve some of the past strength in terms of work force. One possible explanation of the negative effect of specialisation in services refers to the fact that probably these sectors are becoming more and more diffused across space possibly closer to consumers and local firms.

Diversity

We find robust evidence for the positive and significant role played by diversity externalities (*DE*) both for the panel estimates and in most sectors (both among manufacturing and service). This may be due to several externalities at work. On the one hand pecuniary externalities due to the fact that firms benefit from the presence of a wide ranging local availability of supply and demand linkages. On the other hand, externalities may be due to knowledge spillovers which move across sectors.

As for this indicator, we believe that more evidence should be collected in order to disentangle those effects which are truly cross-fertilisation spillovers (and therefore more dynamic in nature) and those which are due to input-output relationships (and therefore with more static consequences). Finally, it would also be interesting to investigate further the role of diversity as a portfolio strategy which defend local areas from sudden demand and supply shocks which hit only some sectors.

Competition

The competition index (*CP*) is mostly (except for four sectors) positive and significant signalling that a competitive environment discourages growth of the local industry and that Porter's idea does not apply for employment dynamics in Italy.

This may reflect, on the one hand, dispersive effects due to local price competition on inputs, provided these markets are local and segmented (see Combes, 2000). This is certainly the case for immobile

inputs, such as land and to some respect also skilled labour, which is not very mobile in Italy. On the other hand, market power, that is low competitive environment, may have positive effects on firm ability to grow thanks to extra-profits which can be invested in innovation (as in the MAR view). Competition has a positive effect on employment growth only in the service sector of *motor vehicles trade and repair*.

Size

As far as the average firm size (*FS*) is concerned, results show that there is a negative influence of economies of scale both in the global regression and in most sectors.

We should remember that this negative influence is not to be interpreted necessarily as the absence of internal economies of scale since we are not measuring effects on productivity but on employment. One way to interpret this result is suggested by Combes (2000) who finds the same result for France. Since average size is referred to the initial period one may think that the presence of small firms is bound to increase employment growth since these firms grow faster than big firms which are closer to their optimal dimension.

Interestingly, a positive role is found only in retail trade, where a process of strong concentration has been carried out in the last decade. Moreover, knowledge spillovers and flexibility may be higher in small firms which are therefore more able to adapt to difficult periods, such as in the nineties.

Local determinants

This reading is confirmed when we turn to local specific determinants where we find a positive role on local growth of the presence of small firms (*SF*) in the global regressions and in some sectors. These results are in accordance with the Italian production structure characterised by systems of small and medium sized firms.

The size of the local system, measured by population density (*PD*), is statistically significant in the aggregate samples while there appear ambiguous some differences between macrosectors, that is manufacturing and services. As a matter of fact, the positive and significant coefficient prevails only for services where urbanisation economies seems stronger.

The indicators referring to the different qualities of capital (human, social) show interesting and composite results. First, university education (*HK*) emerge as relevant and positive determinants of local

growth (Lodde, 2000) for the whole country and for service sectors on the whole but not for manufacturing. On the other hand, in the manufacturing sectors there are several negative signs which indicate, given the traditional composition of the Italian industry, a less strategic role played by a well educated labour forces.

Similarly, social capital, represented by the variable which measures cooperation among firms (*SK*), is positive and statistically significant, as expected, in the whole country and in the service sectors on the whole but it is not statistically significant in manufacturing. At the sectoral level the effect of social capital is in general not statistically significant: a negative but insignificant coefficient prevails in the manufacturing sectors whilst a positive and significant value is detected in most service sectors.

Finally, the presence of a large labour supply (proxied by the participation rate) exerts a positive influence on global employment dynamics, and also in some service sectors.

Spatial analysis

The last but not less important result to remark is that spatial autocorrelation is detected in 16 out of 34 sectors and therefore a ML estimation has been performed with the inclusion of first order contiguity spatial lag dependent variable. Thanks to this procedure spatial autocorrelation has been controlled for in all sectors. The spatial lagged variables have proved positive and significant in 12 sectors which implies that employment dynamics is positively influenced by what is happening in terms of employment in contiguous areas. In two more sectors (*Chemistry* and *Coke*) the spatial lag is negative and significant which implies that this type of districts are quite polarised.

6. Concluding remarks

This paper tries to put the issue of local economic performance in a scenario of an ongoing process of structural change which is transforming modern economies from manufacturing to service ones. It is argued that such a process has insightful implications for the analysis of the geography of economic activities.

The main contribution of this paper is, therefore, the analysis of local economic performance, as expressed by employment dynamics, both in the service and in the manufacturing sectors. Thanks to a large set of variables and data we attempt to explain some of the differences in

the economic performance of sectors by assessing the role of several potential determinants of local economic dynamics.

Results confirm the existence of a multifaceted picture when it comes to agglomeration forces operating at local geographical level. Overall, we find that specialisation has negative effects on employment growth possibly due to a process of reorganization which substitute labour with capital and other factors but also to the diffusion process of services across space. This suggests that local employment, especially in developed countries, can benefit from a local production system characterised by a diversified network of small flexible firms willing to cooperate and characterized by well educated labour forces. Moreover, the presence of some market power seems to imply less competition on inputs or more resources (due to extra-profits) for investments and therefore positive effects on firm growth. Finally, the presence of spatial association indicates that the growth process in a specific area benefits from the positive performance of the surrounding regions.

Furthermore it is interesting to contrast these results with those obtained by Paci and Usai (2000) for Italy and Moreno *et al.* (2005) for Europe who investigate on the working of agglomeration economies on local innovative performances. They find that specialisation rather than diversification externalities are important in the localisation of innovative activity. Our interpretation is that in the developed world specialisation economies, as long as they are related to pecuniary externalities, are no longer a factor which reinforces local industrial district but only local technological enclaves, as long as they are due to pure technological spillovers. In other words, factor costs appear to be the main determinant of localisation strategies by firms concerning their productive structure whilst knowledge spillovers are pivotal in innovative performances.

Differentiated local production systems together with specialised scientific and technological areas appear to be the best way to support both employment dynamics and innovative performance in the Italian industrial districts in the new century.

References

Almeida R. (2002), Local characteristics and growth in Portuguese regions, *mimeo*, Universitat Pompeu Fabra, Barcelona.

Almeida, R. (2005), Local economic structure and growth, *Policy Research Working Paper Series 3728,* The World Bank.

Arrow K. J. (1962), The Economic Implications of Learning by Doing, *Review of Economic Studies* 29, 155-73.

Audretsch D. and M, Feldman (2004) Knowledge spillovers and the geography of innovation in Henderson V. and J.F. Thisse (eds.) *Handbook of Regional and Urban Economics: Cities and Geography*. Amsterdam: Elsevier.

Baldwin, R. E. and P. Martin (2004). Agglomeration and regional growth, in: Henderson J. V. and J. F. Thisse (eds.), *Handbook of Regional and Urban Economics*, Elsevier

Bartelsman E., R. Caballero and R. Lyons (1994), Customer- and Supplier- Driven Externalities, *American Economic Review*, 84, 1075-1084.

Brusco S. (1982), The Emilian Model: Productive Decentralisation and Social Integration, *Cambridge Journal of Economics*, 6, 167- 184.

Ciccone A. and Hall R. (1996), Productivity and the density of economic activity, *American Economic Review*, 86, 54-70.

Cingano F. and Schivardi F. (2004), Identifying the Sources of Local Productivity Growth, *Journal of the European Economic Association,* 2, 720-742.

Combes P. (2000a), Marshall-Arrow-Romer Externalities and City Growth, *CERAS wp* 99/06.

Combes P. (2000b), Economic Structure and Local Growth: France, 1984-1993, *Journal of Urban Economics,* 47, 329-355.

Combes P. and H. Overman (2004), The Spatial Distribution of Economic Activities in the European Union, in Henderson V. and J.F. Thisse (eds.) *Handbook of Regional and Urban Economics: Cities and Geography*. Amsterdam: Elsevier.

Combes P., T. Magnac and J. Robin (2004) The dynamics of Local Employment in France, *Journal of Urban Economics*, 56, 217-243.

Cunat A. and G. Peri (2001), Job creation: Geography, Technology and Infrastructures, *Giornale degli Economisti,* 61, 23-54.

De Lucio J.J, J.A. Herce and A. Goicolea (2002), The Effects of Externalities on Productivity Growth in Spanish Industry, *Regional Science and Urban Economics*, 32, 241-258.

Dekle R. (2002), Industrial Concentration and Regional Growth: Evidence from the Prefectures, *Review of Economics and Statistics*, 84, 310-315.

Desmet K. and M. Fafchamps, (2003), What are falling Transport Costs doing to Spatial Concentration Across US Counties?, *CEPR Discussion Paper* 3853.

Duranton G. and D. Puga (2001) Nursery Cities. Urban Diversity, Process Innovation, and the Life Cycle of Products, *American Economic Review*, 91, 1454-77.

Ellison G. and E. Glaeser (1999), The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration?, *American Economic Review Papers and Proceedings*, 89, 301-316.

Forni M. and S. Paba (2000), The sources of local growth: evidence from Italy, *Giornale degli Economisti e Annali di Economia*, 59, 1-49.

Forni M. and S. Paba (2002), Spillovers and the Growth of Local Industries, *Journal of Industrial Economics,* 50, 151-71.

Frenken K, F.G. van Oort, T. Verburg and R. Boschma (2005), Variety and Regional Economic Growth in the Netherlands, *Paper in*

Evolutionary Economic Geography 05.02. forthcoming in *Regional Studies*.

Glaeser E.L., Kallal H.D., Sheinkman J.A. and Sheifler A. (1992), Growth in Cities, *Journal of Political Economics*, 100, 1126-1152.

Helliwell J. and R. Putnam (1995), Economic growth and social capital in Italy, *Eastern Economic Journal*, 21, 295-307.

Henderson V. (2003), Marshall's scale economies*, Journal of Urban Economics,* 53, 1–28.

Henderson V., A. Kunkoro and M. Turner (1995), Industrial Development in Cities, *Journal of Political Economics,* 103, 1067-1090.

Jacobs J. (1969), *The Economy of Cities*. London: Jonathan Cape.

Krugman P. (1991), *Economic Geography and Trade*. Cambridge, MA: MIT Press.

Krugman P. and T. Venables (1995), Globalisation and the inequality of nations, *Quarterly Journal of Economics*, 110, 857-880.

Lafourcade M. and G. Mion (2004) Concentration, spatial clustering and the size of plants: disentangling the sources of co-location externalities, *mimeo*, Core-UCL.

Lodde S. (2000), Education and Growth: Some Disaggregate Evidence from the Italian Regions, *Rivista Internazionale di Scienze Economiche e Commerciali*, 47, 267-293.

Marshall A. (1890), *Principles of Economics*. London: Macmillan.

Moreno R., R. Paci and S. Usai, (2005), Innovation Clusters in the European Regions, *Working Paper CRENoS* 2005/12,

Moretti E. (2004) Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions, *American Economic Review*, 94, 656-690.

O' hUallachàin B. and M. Satterthwaite (1992), Sectoral growth patterns at the metropolitan level: an evaluation of economic development incentives, *Journal of Urban Economics*, 31, 25-58.

Paci R. and S. Usai (2000) Technological enclaves and industrial districts. An analysis of the regional distribution of innovative activity in Europe, *Regional Studies*, 34, n.2.

Paci R. and S. Usai (2005) Spatial externalities and local employment dynamics, in Vertova G. (ed) *The Changing Economic Geography of Globalization*. Routledge.

Porter M. (1990), *The Competitive Advantage of Nations*, Free Press, New York.

Rauch J. (1993) Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities, *Journal of Urban Economics*. 34, 380-400.

Romer P. (1986), Increasing Returns and Long-run Growth, *Journal of Political Economy* 94, 1002-37.

Rosenthal S. and W. Strange (2004), Evidence on the nature and sources of agglomeration economies, in Henderson V. and J.F. Thisse (eds.) *Handbook of Regional and Urban Economics: Cities and Geography*. Amsterdam: Elsevier.

Usai S and R. Paci (2003) Externalities and local economic growth in manufacturing industries, in Fingleton B. (ed.) *European Regional Growth*. Berlin: Springer-Verlag.

Van Oort F.G. (2004), *Urban growth and innovation. Spatially bounded externalities in the Netherlands*, Aldershot: Ashgate

Van Soest D.P., S.D. Gerking and F.G. van Oort (2002), Knowledge externalities, agglomeration economies and employment growth in Dutch cities, *CentER Discussion paper* 2002-41 Tilburg University.

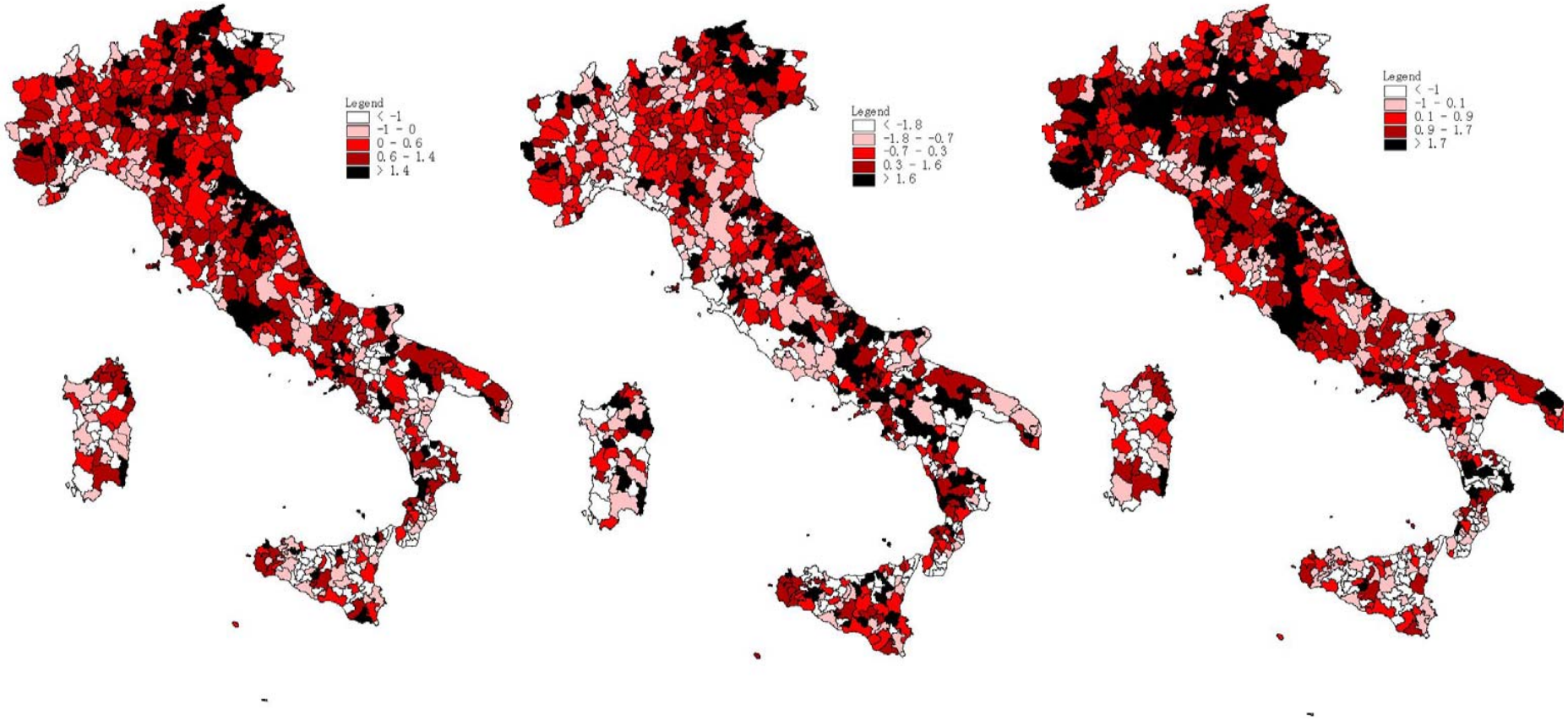
Blien U. and J. Suedekum (2005), Local Economic Structure and Industry Development in Germany, 1993-2001, *Economics Bulletin*, vol. 15(17), pages 1-8

Appendix. Variables description and sources

	Index	Level of aggregation		Sources
		area	Sector	
Dependent variable				
- *Local industry growth*	annual average growth rate of employment	LLS	2-digit ateco91	1991-2001 Industrial Census
Local and sector specific variables				
- *Specialisation externalities*	index of employment relative specialisation	LLS	2-digit ateco91	1991 Industrial Census
- *Diversity externalities*	inverse of Herfindhal index computed on sectoral employment	LLS	2-digit ateco91	1991 Industrial Census
- *Competition*	Herfindhal index computed on employees distribution over plants	LLS	2-digit ateco91	1991 Industrial Census
- *Firm Size*	average number of employees over number of plants	LLS	2-digit ateco91	1991 Industrial Census
Local specific variables				
- *Small firms*	quota of workers in firms with less than 50 employees	LLS	-	1991 Industrial Census
- *Population density*	number of resident population (100000) / Km^2	LLS	-	1991 Population Census
- *Human capital*	population with university education / pop age > 24	LLS	-	1991 Population Census
- *Social capital*	quota of firms with inter-firms agreements	NUTS 3	-	Industrial Census Long Form
- *Labour supply*	labour forces over population age 15-65	LLS	-	1991 Population Census

All independent variables has been standardised with respect to the national index

Figure 1. Employment Dynamics in Local Labour Systems in Italy (% annual average growth rate, 1991-2001)

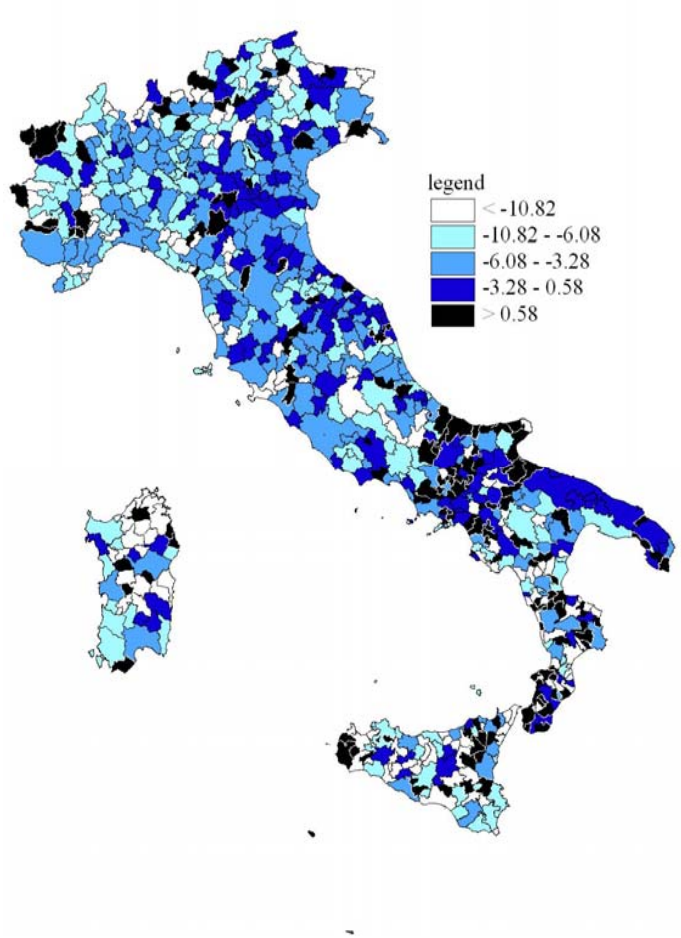


A. Total	
North-Centre	0,80
South-Islands	0,42
Total	0,73

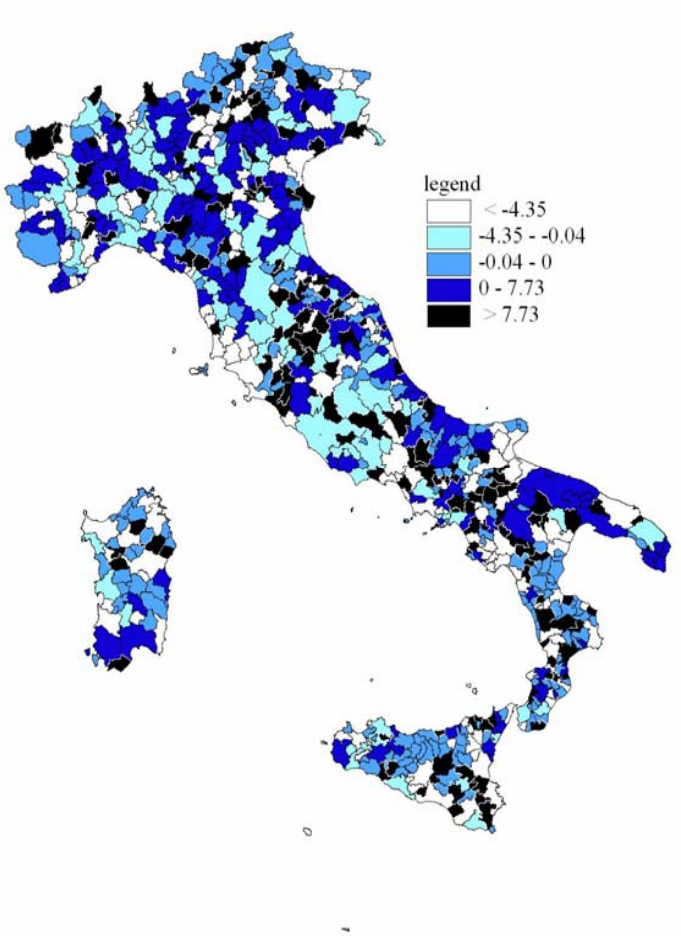
B. Industry	
North-Centre	-0,22
South-Islands	-0,01
Total	-0,19

C. Services	
North-Centre	1,75
South-Islands	0,69
Total	1,52

Figure 2. Employment growth rate and spatial association in selected sectors (% annual average, 1991-2001)



A. Wearing apparel Moran test, 1° contiguity	
Stand. value	Probability
4.0	0.0



B. Chemicals Moran test, 1° contiguity	
Stand. value	Probability
-0.9	0.3

Table 1. Employment growth and spatial autocorrelation at the sectoral level, 1991-2001

	Sectors	*Annual average % variation 1991-2001*	*Moran test, 1° spatial contiguity*		*Share on total employment, % 2001*
			Standardized Z values	*Probability level*	
01	Food, beverages, tobacco	-0,52	3.9	0,0	3,1
02	Textiles	-2,65	2.6	0.0	2,1
03	Wearing apparel	-3,41	4.0	0.0	2,1
04	Leather and footwear	-1,69	3.1	0.0	1,4
05	Wood products	-0,38	7.7	0.0	1,2
06	Paper	-0,58	2.0	0.0	0,6
07	Printing, publishing	-1,13	0.8	0.3	1,2
08	Coke, petroleum products	-1,48	-1.7	0.0	0,2
09	Chemicals	-1,49	-0.9	0.3	1,4
10	Rubber, plastic	1,93	0.5	0.6	1,5
11	Non metallic mineral products	-0,83	3.6	0.0	1,7
12	Basic metals	-2,01	1.4	0.1	1,0
13	Fabricated metal products	1,31	2.7	0.0	4,8
14	Machinery	1,02	1.3	0.1	4,1
15	Office, computing, electrical machinery	-0,09	2.3	0.0	1,6
16	Radio, tv, communication equipment	-2,60	1.4	0.1	0,7
17	Precision, medical instruments	0,66	0.8	0.3	0,9
18	Motor vehicles	-2,17	-0.3	0.7	1,2
19	Other transport equipment	-2,88	0.3	0.6	0,7
20	Furniture, recycling and other	0,00	2.9	0.0	2,2
21	Building	1,38	12.6	0.0	10,5
	Industry (subtotal)	**-0,19**	**7.2**	**0.0**	**44,3**
22	Motor vehicles trade, repair	-0,70	0.7	0.4	3,2
23	Wholesale trade	1,24	3.8	0.0	7,0
24	Retail trade	-1,32	7.1	0.0	11,6
25	Hotel, restaurant	1,57	9.3	0.0	5,9
26	Transport services	-0,10	3.0	0.0	4,0
27	Auxiliary transport , travel agencies	5,45	0.3	0.7	2,2
28	Post and telecommunication	-1,82	1.8	0.0	2,0
29	Financial intermediation, insurance	0,34	4.3	0.0	4,1
30	Real Estate activities	10,36	7.6	0.0	1,6
31	Renting of machinery, personal goods	4,05	-0.0	0.9	0,2
32	Computer and related activities	6,74	2.1	0.0	2,4
33	Research and development	2,46	0.9	0.3	0,4
34	Other professional services	6,04	7.6	0.0	11,1
	Services (subtotal)	**1,53**	**16.6**	**0.0**	55,7
	Total	**0,73**	**10.9**	**0.0**	100,0

Table 2. Agglomeration effects and economic growth: expected impacts according to main theories

	MAR	Porter	Jacobs
Concentration	+	+	-
Diversity	-	-	+
Competition	-	+	+

Source: Van Oort (2004)

Table 3. Econometric results for macroregions

Dependent variable: employment growth in the local industry; annual average 1991-2001
Estimation method: GLS (cross section weights) with industry fixed effects;
White robust standard error
Panel estimation by LLS and sectors Level of significance: a=1%; b=5%; c=10%

Variables			***Italy***	**Italy industrial sectors**	**Italy services sectors**
Local and industry specific variables	*SE*	*specialisation externalities*	-0,45 [a]	-0,19 [a]	-0,81 [a]
	DE	*diversity externalities*	1,89 [a]	2,70 [a]	1,36 [a]
	MP	*market power*	0,20 [a]	0,50 [a]	0,07 [b]
	FS	*firm size*	-0,76 [a]	-0,95 [a]	-0,89 [a]
Local specific variables	*SF*	*small firms*	0,37 [a]	0,40 [c]	0,42 [a]
	PD	*population density*	0,05 [b]	0,00	0,07 [a]
	HK	*human capital*	0,46 [a]	-0,08	0,79 [a]
	SK	*social capital*	0,14 [a]	0,08	0,15 [a]
	LS	*labour supply*	0,70 [a]	0,49 [a]	0,73 [a]
		n. observation	21344	12052	9292
		Adj. R2	0,10	0,06	0,13
		S.E of regression	6,89	7,84	5,28

Note: we have excluded local industry with zero employees in 1991 or 2001

Table 4. Econometric results for sectors

Dependent variable: employment growth in the local industy. Annual average 1991-2001 Cross-section estimation by LLS Level of significance: a=1%; b=5%; c=10%
Estimation Method; ML: Maximum Likelihood, OLS-W: Ordinary Least Squares Estimation-White robust Standard Error Constant is included

				ispns	div	herstb	dm	pimp	dens	lau	assoc	attiv	
Code	Sector	Estimation method	Obs.	Specialisation externalities	Diversity externalities	Market Power	Scale effect	Small firms	Population density	Human capital	Social capital	Labour supply	Spatial lag 1st order
01	Food, beverages, tobacco	OLS-W	783	-0,83 [a]	0,05	0,24 [c]	-0,50	0,18	-0,01	-0,18	-0,01	-0,44	
02	Textiles	OLS-W	644	0,03	1,23	1,53 [a]	-0,98 [a]	1,54	0,31	-0,19	-0,26	0,40	
03	Wearing apparel	ML	731	1,22 [a]	4,04 [b]	1,82 [a]	-2,77 [a]	1,79	0,40	1,21	-0,17	0,99	0,11 [b]
04	Leather and footwear	OLS-W	472	0,33 [a]	-6,25 [b]	1,12	-2,99 [a]	1,05	0,15	0,95	0,07	-2,92 [b]	
05	Wood products	ML	783	-0,05	1,76 [b]	0,01	0,21	-1,28 [a]	-0,08	-0,58	0,10	0,88 [b]	0,25 [a]
06	Paper	ML	391	-0,06	1,04	1,76 [b]	-0,72 [a]	1,25	0,05	1,06	-0,22	5,24 [c]	0,18 [b]
07	Printing, publishing	OLS-W	683	-0,52	5,20 [a]	1,37 [a]	-1,52 [c]	1,19	-0,06	0,42	0,23	-0,87	
08	Coke, petroleum products	ML	196	-0,05	-7,03	7,17 [a]	-0,30	-7,55 [c]	0,40	3,62	-0,11	12,03 [b]	-0,31 [a]
09	Chemicals	ML	455	-0,75	5,20 [c]	2,24 [a]	-1,19 [a]	-1,08	-0,26	-1,10	0,09	-0,07	-0,23 [a]
10	Rubber, plastic	OLS-W	529	-0,18	7,38 [a]	1,55 [a]	-1,67 [a]	2,91 [c]	0,41	-1,49	0,11	3,53 [a]	
11	Non metallic mineral products	OLS-W	768	-0,07	5,06 [a]	0,81 [a]	-1,83 [a]	1,59 [c]	-0,27	-0,34	0,13	1,10	
12	Basic metals	OLS-W	332	-0,41	-1,96	2,65 [c]	-0,15	3,16	-1,25 [a]	0,14	1,00 [c]	8,83 [c]	
13	Fabricated metal products	ML	784	-0,63 [a]	4,24 [a]	0,34 [a]	-0,80 [a]	-0,50	-0,09	-0,89	-0,06	0,64	0,15 [a]
14	Machinery	ML	652	-0,42	3,31	0,14	-1,29 [b]	2,00	-0,03	-1,21	0,13	0,90	0,11 [b]
15	machinery	OLS-W	563	-1,20 [c]	7,12 [b]	0,59	-2,44 [a]	-2,35	-0,04	-1,50	-0,39	-1,17	
16	Radio, tv, communication equipment	OLS-W	550	-0,84	3,05	3,95 [a]	-0,88	1,34	-0,11	4,71 [a]	0,12	-0,59	
17	Precision, medical instruments	OLS-W	646	0,19	10,75 [a]	2,55 [a]	-1,01 [a]	3,43 [a]	-0,01	0,47	0,00	1,03	
18	Motor vehicles	OLS-W	242	-0,01	5,64	4,30 [a]	-1,05	0,34	-0,59	2,36	0,43	-0,82	
19	Other transport equipment	OLS-W	337	-0,45	-0,45	2,57 [b]	-1,30 [a]	5,00 [c]	0,00	3,24	0,13	-2,86	
20	Furniture, recycling and other	ML	727	0,27	6,72 [a]	1,81 [a]	-2,16 [a]	2,38 [b]	-0,03	2,06 [c]	-0,13	0,04	0,04
21	Building	ML	784	-2,60 [a]	-0,38	0,06	-0,73 [b]	0,64 [c]	0,02	-0,06	0,08	-0,16	0,21 [a]
22	Motor vehicles trade, repair	OLS-W	784	-0,84 [a]	0,23	-0,22 [a]	-0,54	0,66 [b]	-0,09	0,53 [c]	0,02	0,49 [b]	
23	Wholesale trade	OLS-W	783	-4,01 [a]	3,59 [a]	0,22 [b]	-0,23	1,44 [a]	0,33 [a]	0,94 [c]	0,13	0,58	
24	Retail trade	ML	784	-0,79 [a]	0,59	-0,06	1,63 [a]	0,84 [a]	-0,01	0,66 [a]	-0,02	0,52 [a]	0,12 [b]
25	Hotel, restaurant	ML	784	-0,24 [a]	1,76 [a]	-0,15 [c]	0,13	0,64 [b]	0,04	0,89 [a]	0,00	0,72 [a]	0,29 [a]
26	Transport services	OLS-W	784	-3,86 [a]	0,04	-0,09	0,15	1,09	0,31	0,29	0,10	0,21	
27	Auxiliary transport , travel agencies	OLS-W	668	-1,96 [a]	8,44 [a]	1,30 [a]	-2,44 [b]	1,77	0,16	4,23 [a]	0,78 [b]	1,49	
28	Post and telecommunication	ML	784	-1,07 [a]	-0,25	0,22 [b]	0,06	0,01	0,16 [a]	0,15	0,15 [b]	-0,19	0,04
29	Financial intermediation, insurance	OLS-W	782	-4,37 [a]	1,87 [a]	0,03	0,06	-0,65 [c]	0,03	1,39 [a]	0,23 [b]	0,58 [c]	
30	Real Estate activities	ML	639	-2,36 [a]	6,80 [a]	0,64 [a]	-5,83 [a]	-0,91	-0,03	2,64 [a]	0,82 [a]	3,01 [a]	0,14 [a]
31	Renting of machinery, personal goods	ML	588	-0,49 [c]	6,90 [a]	2,45 [a]	-4,03 [a]	2,71 [b]	0,14	4,04 [a]	0,83 [a]	2,14 [b]	-0,14 [b]
32	Computer and related activities	OLS-W	711	-7,49 [a]	6,38 [a]	1,24 [a]	-3,20 [a]	0,85	0,19	6,40 [a]	0,50 [b]	0,98	
33	Research and development	ML	417	-0,73 [a]	-0,66	4,53 [a]	-0,69	0,44	0,21	7,22 [a]	0,33	-1,62	0,19 [a]
34	Other professional services	ML	784	-5,58 [a]	2,03 [a]	-0,03	0,52	0,15	-0,01	4,09 [a]	0,11	0,19	0,13 [a]

Note: we have excluded local industry with zero employees in 1991 or 2001

Ultimi Contributi di Ricerca CRENoS

I Paper sono disponibili in: http://www.crenos.it

06/11 *Fabrizio Ariani, Luca G. Deidda* "The Monopolist's Blues"

06/10 *Bianca Biagi, Dionysia Lambiri, Vicente Royuela* "Quality of life in the economic and urban economic literature"

06/09 *Manuela Pulina, Bianca Biagi* "Tourism, environmental quality and economic growth: empirical evidence and policy implications"

06/08 *Gianfranco E. Atzeni, Oliviero A. Carboni,* "Regional disparity in ict adoption: an empirical evaluation of the effects of subsidies in Italy"

06/07 *Isabel Cortés-Jiménez*, "Tourism and economic growth at regional level: the cases of Spain and Italy"

06/06 *Maria Gabriela Ladu*, "Total Factor Productivity Estimates: some evidence from European Regions"

06/05 *Gerardo Marletto*, "La politica dei trasporti come politica per l'innovazione: spunti da un approccio evolutivo"

06/04 *Elisabetta Strazzera,* "Application of the ML Hausman approach to the demand of water for residential use: heterogeneity vs two-error specification"

06/03 *Silvia Loddo,* "Structural Funds and Regional Convergence in Italy"

06/02 *Fabio Cerina,* "Tourism specialization and environmental sustainability in a dynamic economy"

06/01 *Emanuela Marrocu, Raffaele Paci e Francesco Pigliaru,* "Gli effetti del capitale pubblico sulla produttività delle regioni italiane"

05/14 *Rinaldo Brau and Davide Cao,* "Uncovering the macrostructure of tourists' preferences. A choice experiment analysis of tourism demand to Sardinia"

05/13 *Barbara Dettori, Raffaele Paci and Stefano Usai,* "Technological activity in European regions"

05/12 *Rosina Moreno, Raffaele Paci and Stefano Usai,* "Innovation clusters in European regions"

05/11 *Luca Deidda and Bassam Fattouh,* "Bank, financial markets and growth"

05/10 *Fabio Cerina and Francesco Pigliaru,* "Agglomeration and growth in NEG: a critical assessment"

05/09 *Maurice Kugler and Rossella Oppes,* "Collateral and risk-sharing in group lending: evidence from an urban microcredit program"

05/08 *Adriana Di Liberto,* "Convergence and divergence in neoclassical growth models with human capital"

05/07 *Maria Gabriela Ladu,* "Growth and employment: a survey on the demand side of the labour market"

05/06 *Maria Gabriela Ladu,* "Total factor productivity growth and employment: a simultaneous equations model estimate"

05/05 *Silvia Balia,* "Health and economic behaviour: a critical survey of the literature"

05/04 *Gianna Boero, Tiziana Laureti and Robin Naylor,* "An econometric analysis of student withdrawal and progression in post-reform Italian universities"

05/03 *Vittorio Pellagra,* "Banking with sentiments. A model of fiduciari interactions in micro-credit programs"

05/02 *Margarita Genius and Elisabetta Strazzera,* "Modelinf elicitation effects in contingent valuation studies: a Monte Carlo analysis of the bivariate approach"

05/01 *Fabio Cerina,* "Marshall's *ceteris paribus* in a dynamic frame"

04/20 *Rinaldo Brau and Carlo Carraio,* "The economic analysis of voluntary approaches to environmental protection. A survey"

04/19 *Cristina Murroni,* "ICT and local development: a case study of the metropolitan area of Cagliari"

04/18 *Adriana Di Liberto,* "Convergence clubs and the role of human capital in Spanish regional growth"

04/17 *Stefano Usai and Marco Vannini,* "Banking structure and regional economic growth: lessons from Italy"

04/16 *Silvia Balia and Andrew M. Jones,* "Mortality, lifestyle and socio-economic status"

04/15 *Rosina Moreno, Raffaele Paci and Stefano Usai,* "Geographical and sectoral clusters of innovation in Europe"

04/14 *Gianfranco Atzeni and Oliviero Carboni,* "ICT productivity and firm propensity to innovative investment: learining effects evidence from Italian micro data"

04/13 *Fabrizio Ariani and Luca G. Deidda,* "Few bad apples or plenty of lemons: which makes it harder to market plums?"

04/12 *Giovanni B. Concu,* "A choice modelling approach to investigate biases in individual and aggregated benefit estimates due to omission of distance"

04/11 *Giovanni B. Concu,* "Effects of distance aon non-use values"

04/10 *Antonio Sassu and Sergio Lodde,* "Le tecnologie dell'informazione e della comunicazione nelle piccole imprese dei settori maturi"

04/09 *Riccardo Marselli e Marco Vannini,* "L'efficienza tecnica dei distretti di Corte d'Appello italiani: aspetti metodologici, benchmarking e arretrato smaltibile"

04/08 *Rinaldo Brau, Matteo Lippi Bruni and Anna Maria Pinna,* "Public vz private demand for covering long term care expenditures"

04/07 *Matteo Bellinzas,* "Dinamiche demografiche, agglomerazione e determinanti economiche. Il caso italiano"

04/06 *Giuseppe Medda, Claudio Piga,* "R&S e spillover industriali: un'analisi sulle imprese italiane"

04/05 *Adriana Di Liberto, Roberto Mura, Francesco Pigliaru,* "How to measure the unobservable: a panel technique for the analysis of TFP convergence"

04/04 *Vittorio Pelligra,* "How to incentive Who? Intr-personal and inter-personal mechanisms"

04/03 *Domenica Giovanna Dettori, Antonello Paba, Manuela Pulina,* "European rural Tourism: agrotouristic firms in Sardina and their life cycle"

04/02 *Giovanni Sulis,* "Wage dispersion and Equilibrium search models: some evidence from Italy"

04/01 *Silvia Loddo,* "Old and new intervention policy: A survey of empirical studies for the Mezzogiorno"

03/13 *Raffaele Paci, Ernesto Batteta,* "Innovation Networks and Knowledge Flows across the European Regions"

03/12 *Antonio Sassu, Sergio Lodde,* "Piccole imprese e tecnologie della comunicazione: un'indagine empirica"

03/11 *Antonio Sassu, Sergio Lodde,* "Tradizione e innovazione nel settore vinicolo in Sardegna"

03/10 *Rosina Moreno-Serrano, Raffaele Paci, Stefano Usai,* "Spatial distribution of innovation activity. The case of European Regions"

03/09 *Rinaldo Brau, Alessandro Lanza, Francesco Pigliaru,* "How fast are the tourism countries growing? The cross-countries evidence"

03/08 *Margarita Genius, Elisabetta Strazzera,* "The copula approach to sample selection modelling: an application to the recreational value of forests"

03/07 *Guido Ascari, Emanuela Marrocu,* "Forecasting inflation: a comparison of linear Phillips curve models and nonlinear time series models"

03/06 *Alessandro Lanza, Matteo Manera, Massimo Giovannini,* "Oil and product price dynamics in international petroleum markets"

03/05 *Rinaldo Brau, Gianluca Fiorentini, Matteo Lippi Bruni, Anna Maria Pinna,* "La disponibilità a pagare per la copertura del rischio di non autosufficienza: analisi econometrica e valutazioni di policy"

03/04 *Gianfeanco Atzeni, Claudio Piga,* " Credit Rationing in High-Tech Firms and Sample Selection"

03/03 *Manuela Pulina,* "Quantitative forecasting for tourism: OLS and ARIMAX approaches"

03/02 *Gianna Boero, Riccardo Pinna,* "Durata degli studi e voto di laurea: un'indagine econometrica su alcune facoltà dell'Università di Cagliari"

03/01 *Anna Maria Pinna, Miriam Manchin,* **"**Border Effects in the Enlarged EU Area. Evidence from Imports to Applicant Countries"

02/12 *Gianna Boero, Riccardo Pinna,* "La performance esterna dell'Università di Cagliari: il caso delle facoltà del polo giuridico-economico"

02/11 *Sergio Lodde,* "Patti territoriali e specializzazione produttiva nel Mezzogiorno"

02/10 *Maria Grazia Curreli, Sergio Lodde,* "Saperi tradizionali e sviluppo locale: il comparto della produzione del miele in Sardegna"

02/09 *Gianna Boero, Jeremy Smith, Kenneth F. Wallis,* "The properties of some goodness-of-fits tests"

02/08 *Gianna Boero, Emanuela Marrocu,* "The performance of SETAR models: a regime conditional evaluation of point, interval and density forecasts"

02/07 *Anna Maria Pinna, Carla Fancello,* "How far do we trade intermediate inputs?"

02/06 *Sonia Deidda, Raffaele Paci, Stefano Usai,* "Spatial Externalities and Local Economic Growth"

02/05 *Elisabetta Strazzera, Rinaldo Brau, Silvia Balia, Simone Atzeni,* "La disponibilità a pagare e le preferenze dei turisti per i siti del Parco Geominerario della Sardegna: il caso di Porto Flavia"

02/04 *Rinaldo Brau, Massimo Florio,* **"**Privatisations as price reforms: Evaluating consumers' welfare changes in the UK"

02/03 *Luca Deidda, Fabio Cerina,* "Do we need more time for leisure?"

02/02 *Luca Deidda, Bassam Fattouh,* "Concentration in the Banking Industry and Economic Growth"

02/01 *Raffaele Paci, Silvia Saddi,* "Capitale pubblico e produttività nelle regioni italiane"

01/14 *Gianfranco E. Atzeni, Oliviero A. Carboni,* "The Economic Effects of Information Technology: Firm Level Evidence from the Italian case"

01/13 *Stefano Usai, Raffaele Paci,* "Externalities and Local Economic Growth in Manifacturing Industries"

01/12 Ma*rzio Galeotti, Alessandro Lanza, Matteo Manera,* "Rockets and Feathers Revisited: An International Comparison on European Gasoline Markets"

Finito di stampare nel mese di Dicembre 2006
Presso Editoria&Stampa
Zona Industriale Predda Niedda str. n. 10
07100 Sassari