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TERRITORIAL CAPITAL AND THE ECONOMIC CRISIS: THE ROLE OF SPATIAL EFFECTS

Iolanda Lo Cascio * , Fabio Mazzola*, Giuseppe Di Giacomo° and Rosalia Epifanio*

ABSTRACT

The paper aims at analysing the impact of territorial capital endowment on the economic growth process measured by exports and employment growth for the 103 italian provinces over the period 1999-2012. A broader concept of territorial capital has been used (Camagni, 2009) which takes into account goods and services on the basis of different degrees of appropriability and rivalry (public or private) and of the material or non-material physical content. Our goal is to identify strategic elements of territorial capital that might help to enhance the absorption capacity of provinces or macro-areas in the most recent recession and the possibility of resilience in the future. By making use of a very large data set on Italian provinces consisting of more than 30 indicators of territorial capital, we firstly estimate a 3-periods panel growth model for exports and a 2-periods for employment (due to restrictions on data availability). The model takes into account the differential role of territorial capital indicators before and during the crisis period. Our results, robust to several model specifications, point at social fixed , natural and human capital indicators as the driving forces of the growth process at a provincial level. Aware of the potential misleading results that could arise from neglecting externalities across territorial units, we have also applied spatial econometrics tools (Elhorst, 2010a) to test for the importance of spatial externalities and to discriminate the effects of spatial dependence from that of spatial heterogeneity and of omitted variables.

JEL Classification: R11, R58, O49, C33

Keywords: territorial capital, crisis, spatial effects

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1. Introduction

In a previous paper (Mazzola, Di Giacomo, Epifanio e Lo Cascio, 2012) we analysed how the territorial capital components had a role in fostering the Italian economic growth process and in influencing the reaction to crisis at a NUTS-3 level. We looked at how the different elements of territorial capital have enhanced the absorption capacity of local economies during the Great Recession and may influence the possibility of resilience in the future.

For that purpose we considered sub-regional NUTS-3 (provincial) performance over the period 1999-2012, which includes the crisis period, in the attempt to highlight those components which have played an important role in determining the local performance over the crisis, by focusing on export and employment growth. We referred to the Camagni taxonomy (2009) as a conceptual guide to choose among the different proxies of *territorial capital* which are liable to act in different ways before and after the crisis.

This paper modifies the previous analysis in two different ways. First, we extend the provincial coverage to northern Italy thus looking at local growth over the whole country. At the same time, we include the year 2012 in the final period thus giving a more complete picture of the crisis period. Second, we bear in mind that a better understanding of the causes of spatial disparities across territories can be achieved only by looking at the causal spatial linkages among economic variables describing performance of a certain area in terms of its own characteristics and those of its neighbours. Needless to say the observations belonging to sample data collected for units in space are characterized by a certain degree of dependence. As Tobler (1970) observed, '*Everything is related to everything else but near things are more related than distant things'* . Therefore, aware of the potential misleading results that could arise from neglecting externalities across territorial units, we have applied spatial econometrics tools (Elhorst, 2010b) to the previous analysis in order to test for their presence and to discriminate the effects of spatial dependence from that of spatial heterogeneity and of omitted variables.

2.The global crisis and its spatial impact on local economies: a brief literature review

Territorial areas react in different ways as regards the impact of international crisis on their economies .The different capacity of recovering after an economic shock (as a crisis) is referred as *resilience*. Reggiani, de Graff and Nijkamp (2002) argued that the notion of *resilience* could be used to explain how territorial systems respond to shocks[1]. Another strand of literature relates the idea of resilience to the growing importance of an evolutionary perspective within economic geography (Boschma and Martin, 2010; Simmie and Martin, 2010), and the recognition that major shocks may give useful insight over how the territorial economies change over time.

These dynamics are also confirmed in the Italian case: some territorial areas are proving to be more resilient and adaptive to the latest economic downturn. The exogenous shocks provoked by the recent great recession hit also the territorial economies that are less dependent on foreign demand. A recent empirical work (Di Giacinto, 2011) underlines that southern Italian regions in the aftermath of the global financial crisis have undergone a recession almost as bad as the one incurred by more industrialized areas of the North because of the effect on territorial output growth via trade linkages on the domestic market. During the subsequent sovereign debt crises of Eurozone, Italian regions experienced a sharp output decline due to the subsequent fiscal adjustment. In this context, the risk of facing further spatial polarization is very high.

At the same time, the global crisis may have had an impact on the economic and social structure of territorial systems. All these aspects, to the best our knowledge, have so far been poorly in-depth disentangled in the literature and are considered very often as a black box by empirical models. For a long period of time, economic theory has tried to explain the problem of regional disparities, by considering as the determinants of growth only human capital and the infrastructure endowment of a given region. This approach, however, has not been able successful in explaining regional disparities and in identifying the most suitable policies to foster a process of convergence among regions.

The territorial capital concept, introduced by Camagni (2009) can be a useful tool in order to investigate the quantitative and qualitative factors that allow regions to move faster out of economic downturn. Indeed, the definition of territorial capital encompasses all the material and immaterial resources, the production factors, collective learning, knowledge and skills and, also, the set of norms, social and relational skills accumulated through time in a specific territory. In this perspective the territorial capital can be considered one of the most relevant determinants of territorial competitiveness in the long run and also the cause of a differential regional ability connected to reaction to changes in demand. At the same time, territorial capital can help to identify which elements in economic structures and policy responses make a difference to regions' resilience. In our work, we consider how the performance variable, measured in terms of export growth and employment growth, reacts to the shock caused by the crisis according to the role

[1]For regional economic analysis, the conceptual meaning of economic resilience is the ability of a regional economy to maintain or return to a pre-existing state (typically assumed to be an equilibrium state) in the presence of some type of exogenous (i.e., externally generated) shock.

played by some of the components of territorial capital endowment. The first dependent variable considered (exports) is the main channel from which the propagation of the crisis originates while the second is a good proxy of economic recovery or resilience of sub-regional areas. It is important to stress that the link between exports and economic growth has been widely explored in the literature (Balassa, 1978; Feder, 1983; Awokuse, 2008). Though the findings are not unanimous, a substantial amount of literature supports the export-led growth (ELG) hypothesis, both on theoretical and empirical grounds[2].

We believe that any kind of growth process in sub-regional areas is unequivocally related to spatial effects in the form of spillovers. Fingleton (2003) argues that spillovers might give rise to spatial dependence territorial growth which has to be dealt with by spatial regression models. Therefore, neglecting spatial correlation produces biased estimated coefficients. Spatial econometric methods enable us to analyze the implication of new theoretical approaches in this respect. For example Arbia and Basile (2005) suggest a new specification for the growth equation which takes simultaneously into account spatial dependence and multiple spatial regimes. They control for spatial interaction in an indirect way, by means of spatial dependent models such as the SAR (where a spatial lag of the dependent variable is included on the right-hand side of the model) or by means of a spatial error model such as the SEM (Anselin and Bera, 1998; Arbia, 2006). Though the convergence literature has identified some explanatory factors for the growth process, using as dependent variable the GDP per worker, very little has been said about employing different growth measure better suited to grasp the dynamics of the crisis. The details of these econometric specifications are given in Section 5.

As already highlighted, two economic indicators particularly important in assessing the effects of the crisis are foreign demand and the dynamics of labor market. Among them, spatial dependence play a particular role. "Local export spillover" hypothesis (Aitken et al. 1997, Greenaway and Kneller 2008) suggests that the likelihood of a firm being engaged in exports is positively associated with the local presence of many export firms. Moreover, similar levels of performance in an export market might depend not only on the proximity of exporting unit to export markets but also on the level of knowledge spillovers, industry agglomeration, or other similarities between proximate economic units[3]. Many empirical work find spatial autocorrelation for sub-regional employment development. For example Pagnini (2003) finds that a

[2]Regions with more diversified exports (diversity externalities) generally experienced higher economic growth rates (Herzer and Nowak-Lehnmann ,2006; Matthee and Naudé, 2007)

[3]Entry costs associated with entry on foreign markets may be interpreted as informational transactions costs.Spatial proximity to exporters may reduce such costs in two main ways: non-market interactions (e.g. spatial information spillovers ; 2) market interactions (e.g. commercial linkages)

province's employment growth rate is closely related to that of nearby provinces but spatial spillovers, however, are weaker in relatively large geographical units. Niebuhr (2003) finds distance-dependent growth relations regarding employment development, based on technological spillovers. Strong spatial interdependencies for the development of regional employment and unemployment rates are also found by Kosfeld and Dreger (2006).

3. The territorial capital dimensions and their impact on growth

It is well known that in the taxonomy proposed by Camagni (2009), the different features of territorial assets are differentiated according to their degree of materiality and rivalry. For each dimension a positive relationship with growth and performance is usually hypothesized although in the literature, authors do not always agree with the relevance of the impact. Our companion paper (Mazzola, Di Giacomo, Epifanio and Lo Cascio, 2012) reports the relevant literature concerning the relationship between the dimensions of territorial capital and regional growth.

The evidence is quite robust for the *material* capital endowment (both private and social, i.e infrastructures) and also extends to cultural and natural endowments, which are often referred as *amenities* (Glaeser *et al*., 2001; Deller *et al*., 2008), though the evidence on the role of amenities on employment growth is mixed.

In the case of *non material* assets, the endogenous growth models attributes an important role to knowledge accumulation and human capital but the relation between knowledge and economic growth depends on the presence of *capabilities* and other institutional factors. Human capital and infrastructures play an important explanatory role for the dynamics of regional productivity but regional spillovers are very important in this case since the presence of infrastructures in neighbor regions positively influence the productivity of an area (Bronzini and Piselli,2009).

The role of the public dimensions of territorial capital, such as institutions, trust or, more generally, social capital, in fostering economic growth is nevertheless widely acquired as well as the negative effects of criminal activities on the economic performance.

The dimension of territorial capital which combine *material and non material* elements are less studied. Knowledge spillovers and spin-offs, often related to FDI, increase the local endowment of knowledge, the diffusion and creation of new knowledge and the probability of openness to exports (Greenaway and Kellner, 2008). At an intermediate level of public content, the existence of public-private partnerships can also be considered as a proxy for the local functioning of efficient mechanisms of financial resource transfers among private and public entities.

As in the previous paper, we used the explanatory variables with the intent of considering different dimensions of the territorial capital such as those with high level of materiality (fixed social capital, natural capital and private physical capital), non material components, such as human capital, institutional-relational capital and social capital, and the dimensions characterized by an intermediate level of materiality, such as entrepreneurial-relational capital, agglomeration economies and public-private capital. The variables chosen to represent each dimension were:

- an index capturing the endowment in economic infrastructure, separately considering the road, rail, maritime and airport infrastructures (source: Istituto Tagliacarne);
- the per capita average rate of staying in hotels by tourists to capture natural and cultural attractiveness (source: ISTAT);
- the provincial total capital stock divided by value added, derived from the series of the provincial gross fixed investments by means of the perpetual inventory method (source: ISTAT data);
- the number of graduates divided by the total population of age 20-24 (source: Italian Ministry of Education and University);
- the number of social cooperatives per inhabitant (source: ISTAT);
- the total number of crimes of all types per inhabitant (source: ISTAT);
- to capture inter-firm linkages, the amount of foreign direct investments, both inward and outward (source: Ufficio Italiano Cambi);
- to capture localization economies, the provincial average specialization index in manufacturing constructed from two-digit industries, given by the ratio between the provincial employment in a specific sector and the provincial total employment divided by the corresponding ratio at the national level (source: Italian Census of manufacturing);
- to capture private-public initiatives, the amount of provincial investments in *project financing* divided by the total fixed investment in the province (source: Italian Observatory for Project financing).

We chose this nine indicators after analyzing a very large data set on Italian provinces consisting of more than 30 indicators of territorial capital. We restricted the analysis to the above indicators mainly for reasons related to data availability at a provincial level. The estimation of a 3-period panel growth model for the exports and a 2-period for employment (due to restrictions on data availability on the dependent variable) allowed us to take into account the different effects of these indicators before and during the crisis period. The details of the different specifications are given in Section 5.

4. The empirical strategy

The aim of the paper is to evaluate the impact of territorial capital endowment on the performance of the 103 Italian provinces measured in terms of total export (non-oil) rate of growth and employment growth for the periods 1999-2012 and 2004-2012 respectively. For that purpose we have firstly chosen, among the variables belonging to the dimensions analysed in the previous section, one explanatory variable for each dimension of territorial capital. To sum up, the unrestricted model for the export equation included road infrastructure, airport infrastructures, the average rate of staying in hotels, the number of graduates of age 20-24 over the total population, the average specialization index, the number of per capita crimes, the number of per capita social cooperatives, the capital stock over value added, the inflow and outflow FDI over total investment. For employment we started with the same unrestricted specification with the addition of investments in project financing.

The first step of our analysis consists in providing an estimate for the export growth and the employment growth based on a balanced panel of 103 provinces observed, along three periods (1999-2002, 2003-2007, 2008-2012) and two periods (2004-2007, 2008-2012), respectively.

The model estimated is $y_{it} = \mathbf{x}_{it}\beta + \mu_i + \varepsilon_{it}$ where $i = 1.....103$ is the index for the cross-sectional dimension and $t = 1,2,3$ denotes the time dimension. Here y_{it} represents the change in exports (employment) for province i at time t and $\mathbf{x}_{it}$ is a $1\times K$ vector of observations on the different territorial capital dimensions, with the associated parameters β's contained in a $K\times 1$ vector, μ_i is the fixed effect and ε_{it} are iid normally distributed errors with zero mean and constant variance. In the case of random effects model μ_i is substituted by $\mu_i + \lambda$ which is a stochastic variable with zero mean ,constant variable and uncorrelated with the error term.

Differently from the added value, the performance variables enable us to use a wider set of observations for the post 2007 crisis period and, therefore, to evaluate a distinct temporal effect for the crisis period. In particular, the first period (1999-2002) has been characterized by a positive cyclical phase which has been followed (2003-2007) by a phase of substantial stationarity of the main economic variables and, lastly, by the crisis period (2008-2012). In the case of employment, the lack of consistency in the definition of the series in the official statistics, led us to concentrate on the period 2004-2012 which has been divided into the pre-crisis period (2004-2007) and the post-crisis one (2008-2012).

Our interest is twofold: on one hand we are interested on if and how the crisis has changed the relation between territorial capital and growth performance. For that purpose the analysis which follows starts from the estimation of a general model, simplified into a restricted version of it and then enriched by the introduction of a dummy for the crisis period and of the interactions of the crisis dummy with some of the territorial capital proxies. On the other hand, aware of the fact that a better understanding of the causes of spatial disparities across territories can be achieved by looking at the causal spatial linkages among economic variables describing performance of a certain area in terms of its own characteristics and those of its neighbours, we integrate our analysis by using spatial econometric techniques which are presented in the next section.

5.The econometric model

A better understanding of the causes of spatial disparities across territories can be achieved by looking at the causal spatial linkages among economic variables describing performance of a certain area in terms of its own characteristics and those of its neighbours.

Needless to say that observations belonging to sample data collected for units in space, such as provinces, regions, individuals and so on, are characterized by a certain degree of dependence.

For that reason, the assumption of spatial independence, which is typical of OLS estimation, is incorrect and leads to biased and inconsistent parameter estimates if the true data generating process is of a spatial nature.

Panel data models are designed to deal with individual heterogeneity which can also be of spatial nature, but not with individual interactions or spatial autocorrelation. The demeaning procedure, typical of the fixed effect framework, deals with heterogeneity among others absolute geographical localization due to individual characteristics. However, the form of heterogeneity arising from differentiated feedback effects coming from cross-section interaction and based on the relative geographical position of individuals with respect to each other, requires explicit modelling of spatial dependence. Spatial panel models are designed to deal with both forms of heterogeneity.

Spatial dependence among observations in a panel framework can be modelled in different ways. The choice should be made on the basis of which type of spatial interaction effect should be accounted for.

We test for the presence spatial dependence (an autoregressive residual pattern due to the omission of a spatial lag) or a nuisance form of spatial dependence (in the form of an autoregressive error structure) in order to understand if the chosen model needs to be extended to include spatial interaction effects. For this purpose we have used the robust LM test (Debarsy and Ertur (2010)) adapted to a spatial panel setting, which were firstly produced by Burridge (1980), Anselin (1986) and Anselin (1988) for the cross-sectional case, to test for the presence of one of the two forms of spatial dependence conditional on the other. Debarsy and Ertur (2010) test for the presence of a spatially lagged dependent variable and/ or spatial autocorrelation in a model with spatial fixed effects.

More specifically, a spatial panel model may contain a spatially lagged dependent variable (*spatial lag model* or *spatial autoregressive model*, Anselin et al. 1998) or the dependent variable may relate to a set of observed covariates and a spatially autoregressive process is postulated for the error terms (*spatial error model*). In a panel setting (Baltagi et al., 2003), the spatial lag model (SLM), firstly introduced by Ord (1975), is described by the following equation:

$$y_{it} = \delta \sum_{j=1}^{N} w_{ij} y_{jt} + \alpha + x_{it}\beta + \mu_i + \lambda_t + \varepsilon_{it} \tag{1}$$

where y_{it} is the dependent variable (export growth) for unit i (province) observed at time t. The first term on the RHS denotes the interaction effect between the dependent variables in neighbouring units; more specifically, $\sum_{j=1}^{N} w_{ij} y_{jt}$, it is a linear combination of dependent variables from related locations. w_{ij} is an element of a non-negative row-stochastic spatial weight matrix W of dimension n*n , such that $\sum w_{ij} y_{jt}$ are values constructed by taking averages of neighbouring observations. The matrix W serves to specify the spatial dependence structure among observations. The elements of W are zero in the main diagonal (a location cannot be neighbour to itself) and non-zero if two locations share a common boundary or are within a certain distance[4] . In equation (1) δ is the strength of the spatial dependence, x_{it} is a vector of exogenous variables μ_i and λ_t are optional and denote the spatial and the temporal fixed effects, respectively. In order to avoid the dummy trap the two effects must fulfil the condition $\sum_i \mu_i = \sum_t \lambda_t = 0$ . .

Following Anselin (2006), one can consider the SLM as the formal specification for the equilibrium outcome of a spatial or social interaction process where the dependent variable for one agent is jointly determined with that of neighbouring agents.

The assumption underlying spatial error model (SEM hereafter) is that the error term of an observed unit depends on the error terms of the neighbours units and on an idiosyncratic component according to:

[4] Distance is not only geographical. It can be economic (Case, Rosen and Hines, 1993); it can also be based on the degree of similarity among units.

$$y_{it} = \alpha + x_{it}\beta + \mu_i + \lambda_t + \phi_{it}$$
$$\phi_{it} = \rho\sum_{j=1}^{N} w_{ij}\phi_{it} + \varepsilon_{it} \qquad (2)$$

Here ρ is the spatial autocorrelation coefficient. The SEM does not embed a theoretical model for a spatial process; instead it can be considered as a special case of model with non-spherical error covariance matrix[5].

A third model, introduced by LeSage and Pace (2009), is the so-called Spatial Durbin Model (SDM hereafter) that includes, among the independent variables, the spatially lagged independent variables besides the spatially lagged dependent variable:

$$y_{it} = \delta\sum_{j=1}^{N} w_{ij} y_{jt} + \alpha + x_{it}\beta + \sum_{j=1}^{N} w_{ij} x_{ijt}\theta + \mu_i + \lambda_t + \varepsilon_{it} \qquad (3)$$

Here, θ is a $K \times 1$ vector of fixed but unknown parameters. In such a way, the economic performance of unit i at time t depends, not only on its own characteristics but also on the economic performance of the neighbouring units and on their characteristics. A strong argument in favour of the SDM is that it produces unbiased coefficient estimates also if the true DGP is a SL or a SEM.

The SDM reduce to the spatial lag model if $H_0 : \theta = 0$ is accepted; on the other hand, if $H_0 : \theta + \delta\beta = 0$ holds, the spatial error model is valid. These tests follow a chi squared distribution with K degrees of freedom and are in the form of LR tests if also these two models are estimated, otherwise they only take the form of Wald tests.

If both tests are rejected, the model that best describes the data is the SDM. If the first hypothesis cannot be rejected, the appropriate specification is the spatial lag, provided that also a robust version of the LM test points to the spatial lag model. If the second hypothesis cannot be rejected, then, the spatial error model best describes the data, provided that also the robust LM test points to it. If it does not happen, in other words the robust LM test is in favour of a different model than the Wald/LR tests, then the SDM must be adopted because it generalizes the other two models.

Spatial econometric models are usually estimated by maximum likelihood and by IV/GMM techniques. IV/GMM do not rely on the normality assumption for the error; however both

[5] In model (1) and (2) stationarity requires that $1/\omega_{min} < \delta < 1/\omega_{max}$ and $1/\omega_{min} < \rho < 1/\omega_{max}$, where ω_{min} and ω_{max} are the smallest and the largest characteristic roots of the matrix W. It is often suggested to constrain the spatial lag and spatial autocorrelation parameters to the interval (-1,+1); this turns out to be highly restrictive. However, for row-normalized spatial weights, the largest characteristic roots is, anyway, +1.

estimators assume independent and identically distributed error terms. A shortcoming of the IV/GMM approach compared to the ML principle is the possibility of getting coefficient estimates for ρ and δ outside the parameter space. Moreover, by using ML estimation techniques, we are endowed with tools to compare different models in terms of different weight matrices and set of explanatory variable via likelihood ratio tests.

The coefficients of the non-spatial models cannot be compared with those belonging to the spatial ones unless one considers the distinction made by LeSage and Pace (2009) among direct and indirect effects of a change in an independent variable in a SDM. They consider a partial derivative approach. By construction, the OLS specification makes it impossible to quantify spatial spillovers, because of the independence assumption of outcomes among units

The SDM can be written in a vector form in the following way:

$$Y_t = (I - \delta W)^{-1}\alpha \iota_N + (I - \delta W)^{-1}(X_t\beta + WX_t\theta) + (I - \delta W)^{-1}\varepsilon_t^* \quad (4)$$

with ε_t^* covering the error term and, whenever included, spatial and/or time effects. The matrix of the partial derivatives of the dependent variable in the different units with respect to the k^{th} explanatory variable in the different units at a particular point in time is:

$$\left[\frac{\partial Y}{\partial x_{1k}} \cdots\cdots\cdots \frac{\partial Y}{\partial x_{Nk}}\right] = \begin{bmatrix} \frac{\partial y_1}{\partial x_{1k}} & . & \frac{\partial y_1}{\partial x_{Nk}} \\ . & . & . \\ \frac{\partial y_N}{\partial x_{1k}} & . & \frac{\partial y_N}{\partial x_{Nk}} \end{bmatrix} = (I - \delta W)^{-1} \begin{bmatrix} \beta_k & w_{12}\theta_k & . & w_{1N}\theta_k \\ w_{21}\theta_k & \beta_k & . & w_{2N}\theta_k \\ . & . & . & . \\ w_{N1}\theta_k & w_{N2}\theta_k & . & \beta_k \end{bmatrix} \quad (5)$$

From (5), one can discriminate among *direct* and *indirect* effects of a change in a particular variable. If an explanatory variable in a particular unit changes, not only will the dependent variable in that unit itself change but also the dependent variable in other units. The first effect is the *direct effect* and the second one is the *indirect effect* or *spill-over effect*. Every diagonal element of the matrix in (5) is a direct effect and every non-diagonal element is an indirect effect. Moreover, if there are K explanatory variables in the model, there will be K N*N matrices of direct and indirect effects and these effects will be different for different units.

For that reason, to ease the interpretation of the results, LeSage and Pace (2009) report only one direct effect (calculated as the average of the diagonal elements of the matrix on the RHS of (5) and representing the effect of changing an independent on the dependent of a particular spatial unit) and one indirect effect (calculated as the average of either the row sums or column sums of the non-diagonal elements of the matrix[6] . The direct effect takes into account feedback effects (impacts passing through neighbouring units and back to the unit where the change started). These feedback effects are partly due to the coefficient of the spatially lagged dependent variable and partly due to the coefficient of the spatially lagged value of the explanatory variable itself (Elhorst, 2010b). The indirect effect gives a more accurate measure of spatial spillovers. This effect is the average of either the row sums or the column sums of the non-diagonal elements of that matrix and it measures the impact of changing an independent variable in a particular unit on the dependent variable of all the other units or the effect of changing a particular element of an exogenous variable on the dependent variable of all other units

The reason why direct and indirect effects are different for different units of observations rests, in the case of direct effects, on the diversity of the diagonal elements of the matrix $(I-\delta W)^{-1}$ provided that δ is different from zero; in the case of indirect effects, the reason lies on the diversity, for different units, of both the non-diagonal elements of the matrix $(I-\delta W)^{-1}$ and of W, provided that δ and/or θ_k are different from zero (see the descriptive box below).

In the SEM, given that $\theta_k = -\delta\beta_k$, the matrix on the RHS of (5) is diagonal with all elements equal. It means that the direct effect of the k^{th} explanatory variable in a SEM will be β_k and the indirect effect will be zero, both just as in a non-spatial model. In the SLM $\theta_k = 0$. As a consequence, the extra-diagonal elements of the matrix are again zero. Although all the non-diagonal elements of the matrix become zero as a result, the direct and indirect effects in the spatial lag model do not reduce to one single coefficient or to zero as in the SEM.

In order to draw inference on the direct and indirect effects, we need to know also their distribution. LeSage and Pace simulate their distribution by using the variance-covariance matrix implied by the maximum likelihood estimates. Donald Lacombe has provided a Matlab routine for the estimation of these effects and for their statistical assessment, which is incorporated in the Matlab software for spatial panels written by Paul Elhorst (Elhorst ,2012) and used in our empirical application.

[6] It does not matter which sum is used because the numerical values are the same. By considering the averaged row sum, one is measuring the effect on the dependent variable for a particular unit in consequence of a unit change in all elements of an exogenous variable, while the average column effect represents the effect of changing a particular element of an exogenous variable on the dependent variable of all other units (Elhorst, 2012)

Model	Direct Effect	Indirect (spillover) Effect
OLS/SEM	β_k	0
SLAG	Diagonal elements of $(I-\delta W)^{-1}\beta_k$	Off-diagonal elements of $(I-\delta W)^{-1}\beta_k$
SDM	Diagonal elements of $(I-\delta W)^{-1}[\beta_k + W\theta_k]$	Off-diagonal elements of $(I-\delta W)^{-1}[\beta_k + W\theta_k]$

6. Empirical results

6.1 Export growth equation

We first examine the results for the export growth performance. Table 1 shows the results for both the unrestricted and the restricted version of the model, obtained by omitting the variables that were not significant and with ambiguous impact across the pooled, fixed and random effects cases.

The first thing to note is that the fixed effect model is never appropriate. None of the variables is significant both in the unrestricted and in the restricted models, the same holds for the fixed individual effects, tested through the LM test. This can be easily motivated by the fact that we are dealing with slowly-changing variables that can be considered almost time-invariant[7] and, for that reason, highly collinear with the fixed effects . Moreover, any variable of such a kind is totally wiped out by the demeaning procedure (this is the main reason why many studies do not consider the spatial fixed effects).

The random effect model (both in the restricted and unrestricted versions) is more appropriate; the random effects are significant and the Hausman test confirms the lack of validity of the fixed effect (FE) specification when tested against the random effect (RE) counterpart. FE estimates and RE estimates are very different and this is due to the very limited temporal dimension (T=3). It is useful to remember that the random effect estimator is appropriate when the data can be considered as extracted from a bigger population, whereas in the context of this paper the sample coincides with the population of the Italian provinces.

[7] Spatial fixed effects control for all location specific, time-invariant variables whose omission could bias the estimates in a cross-sectional study; time fixed effects control, instead for all time-specific and location-invariant variables whose omission could bias the estimates in a time-series study (Baltagi, 2005).

Tab.1 The effect of territorial capital on export growth- Italy - 1999-2012

Variable	Unrestricted Model (Pooled OLS)	Unrestricted Model (Fixed Effects)	Unrestricted Model (Random Effects)	Restricted Model (Pooled OLS)	Restricted Model (Fixed Effects)	Restricted Model (Random Effects)
Road Infrastructure	0.001391 (0.162)	0.03693 (1.060)	0.00233 (0.232)			
Airport Infrastructure	-0.00009 (-0.032)	0.00078 (0.116)	-0.00023 (-0.076)			
Graduates Percentage	1.14547 (4.417)***	1.7367 (3.744)***	1.4194 (5.632)***	1.1491 (4.634)***	1.8118 (4.063)***	0.7102 (1.8115)**
Crimes per inhabitant	-0.21984 (-0.383)	-0.2901 (-0.148)	-0.2925 (-0.444)			
Social cooperatives per inhabitant	-0.08791 (-1.194)$^{\circ}$	-0.1219 (-0.574)	-0.1050 (-1.268)$^{\circ}$	-0.0961 (-1.374)$^{\circ}$	-0.1325 (-0.634)	-0.1149 (-1.437)$^{\circ}$
Rate of staying in hotels	0.72852 (2.139)**	0.03168 (0.019)	0.7480 (1.863)*	0.6945 (2.120)**	0.0232 (0.014)	1.4275 (5.804)***
Average specialization index	1.80276 (1.798)*	0.5977 (0.106)	1.8756 1.564)*	1.8034 (1.831)**	0.5766 (0.104)	1.8796 (1.586)*
Capital stock	-1.6753 (-1.707)*	3.5272 (0.355)	-1.7863 (-1.507)$^{\circ}$	-1.6395 (-1.711)*	3.1946 (0.331)	-1.7386 (-1.491)$^{\circ}$
FDI (inflows)	0.00122 (0.753)	0.1335 (0.004)	0.00122 (0.712)			
FDI (outflows)	-0.00028 (-0.583)	0.0111 (0.476)	-0.00025 (-0.606)			
Loglikelihood	-1017,193	-967.381		-1017.57	-968.50	
Adj R^2	0,06774	0.3466		0.080	0.3418	
LM		99.624 (0.55)	4.59*** (0.03)		98.142 (0.60)	4.53** (0.03)
H			4.94			4.03

The unrestricted version of the model does not add anything to the restricted one in terms of improvements in the log-likelihood or in the R-squared .

As expected, the rate of staying in hotels, th3e graduate percentage and the specialization index have a positive and significant effect on export growth. Crimes negatively affects the performance but did not prove to be significant in none of the estimated models. The coefficient for the number of per capita cooperatives (a measure of institutional relational capital) has a different sign from what expected but is weakly significant. Inflows and outflows of FDI (entrepreneurial relational capital) are not significant and, in the case of outflows, the sign is ambiguous and often negative. This peculiarity can be justified in terms of a substitution effect between domestic and foreign production generated by FDIs. We maintain for the next step of our analysis also the capital stock which is negatively significant between 10 and 20 percent.

We can note that the pooled and the random effect models are similar both in terms of parameter estimates and significance of them. We find an explanation for that, and a justification for the use of the pooled model, later in this section.

In table 2 we considered the specific effect of the crisis in modifying the relationship between territorial capital and export growth. When only individual effect is considered, a dummy for the crisis is negative but not significant. The crisis does not change the slope of the relevant variables but the dummy crisis however interacts with social and institutional capital (crimes and social cooperatives) both with negative effects which may determine the overall negative effect in the original model.

Also, for the variables that are significant in the model of table 1, the variables capturing the interaction with the crisis period turn out to have a negative sign thus diminishing the positive effect over the whole period. The net effect for the rate of staying in hotels is negative while it remains positive for graduate percentage and specialization index. It is worth to mention that the role of airport infrastructure seem to improve in the crisis period as shown by the positive sign of the interaction term.

Tab.2 The effect of the crisis on the relationship between territorial capital and export growth- Italy – 1999-2012- Restricted model – Random effects

Variable	Model 2.1	Model 2.2	Model 2.3	Model 2.4	Model 2.5	Model 2.6	Model 2.7
Graduates Percentage	0.8249 (2.534)***	1.0102 (3.550)***	0.7408 (2.354)***	0.8401 (2.668)***	0.7286 (2.314)***	0.89164 (3.180)***	0.9667 (3.231)***
Rate of staying in hotels	0.5908 (1.525)$^{\circ}$	0.5889 (1.516)*	0.8149 (2.134)***	0.5928 (1.533)$^{\circ}$	0.8579 (2.230)***	0.6518 (1.697)*	0.6405 (1.655)*
Average specialization index	1.8516 (1.584)$^{\circ}$	1.8731 (1.601)*	1.7877 (1.539)$^{\circ}$	2.3772 (2.039)**	1.8073 (1.554)$^{\circ}$	1.7655 (1.510)$^{\circ}$	1.8901 (1.612)*
Dummy crisis	-2.3886 (-2.554)***						
Crisis*Graduate percentage		-0.4381 (-2.444)***			-		
Crisis* Rate of staying in hotels			-0.8201 (-3.123)***		-0.9067 (-3.285)***		
Crisis* Specialisation index				-2.1458 (-2.671)***			
Crisis* Airport infrastructure					0.0040 (1.019)		
Crisis* Crimes per inhabitant						-1.8574 (-3.335)***	
Crisis*Social cxooperatives per inhabitant							-1.2841 (-2.366)***
Loglikelihood							
Adj R^2							
LM	5.43 (0.02)***	5.39 (0.02)***	5.40 (0.02)***	5.43 (0.02)***	5.21 (0.02)***	4.16 (0.04)**	5.11 (0.02)***
H	3.78	3.03	3.99	3.73	3.45	2.60	3.90

Next, we test for the presence spatial dependence (an autoregressive residual pattern due to the omission of a spatial lag) or a nuisance form of spatial dependence (in the form of an autoregressive error structure) in order to understand if the chosen model needs to be extended to include spatial interaction effects (OLS estimates are biased if we do not take into account spatial dependence whenever it does exist). For this purpose we have used the robust LM test (Debarsy and Ertur (2010)) adapted to a spatial panel setting, which were firstly produced by Burridge (1980), Anselin (1986) and Anselin (1988) for the cross-sectional case, to test for the presence of one of the two forms of spatial dependence conditional on the other.

Tab.3 Tests of spatial dependence (Debarsy and Erthur, 2010) for the export growth equation

RESTRICTED MODELS	**POOLED OLS**	**FIXED EFFECT**
ROBUST LM TEST NO SPATIAL LAG[8] (P-VALUE)	5.8711 (0.015)	1.7070 (0.191)
ROBUST LM TEST NO SPATIAL ERROR (P-VALUE)	6.0426 (0.014)	2.6776 (0.102)

When we test whether the spatial lag or the spatial error model is more appropriate, on the basis of the OLS residuals, we find evidence in favor of both models (Table 3). When the test is applied to the fixed effect specification the evidence is poor and we are almost led to accept the absence of spatial dependence. This is a quite common regularity in empirical studies. In facts, when one estimates panel models with country/region/provinces fixed effect, it seems that there is not much spatial autocorrelation left in the residuals.

It is, therefore, advisable to estimate, through maximum likelihood, the Spatial Durbin model (SDM) which incorporates both types of spatial dependence and, then, to test if the SDM can be simplified to the SLM or the SEM. The advantage of using maximum likelihood methods of estimation consists not only in producing consistent parameter estimates but also in the ability to compare models both in terms of different sets of explanatory variables and of different specifications for the spatial matrix W through the likelihood ratio tests.

The SDM, which produces unbiased estimates even if the true data generating process is of SLM or SEM nature, is firstly produced for the random effects specification.

As we can see from table 4, the random effects model converges to a model without control for spatial effects (fixed/random) because the parameter theta which is the weight attached to the cross section, is virtually one[9]. For that reason we do not take the previous estimate as valid but we concentrate on a pooled version of the spatial models (Table 5) which excludes the capital stock variable resulting not significant in the three models, perhaps due to the high collinearity with human capital.

The first thing to note is that the SDM does not simplify into neither the SLM nor the SEM because we fail to reject both restrictions.

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[8] We have used a binary contiguity matrix with elements $w_{i,j}=1$ for units sharing a common border and zero otherwise

[9] $\theta^2=\sigma^2/T\sigma_\mu^2+\sigma^2$ and $\phi=\sigma_\mu^2/\sigma^2$. The transformation in the RE model is : $y^*_{i,t} = y_{i,t} - (1-\theta)\frac{1}{T}\sum_{t=1}^{T} y_{i,t}$.

Tab.4 Random Effects Spatial Models for the export growth equation

VARETYN	**SDM RE EFFECTS**	**SLAG RE EFFECTS**	**SEM RE EFFECTS**
Rate of staying in hotels (PERALB)	0.5613 (1.5525)$^{\circ}$	0.5883 (1.9774)**	0.6963 (2.1720)**
Graduates Percentage (LAUPO)	0.5792 (1.5433)$^{\circ}$	1.0463 (4.6106)***	1.1229 (4.6891)***
Average specialization index (SPULME)	1.4784 (1.5130)$^{\circ}$	1.4265 (1.6645)*	2.0243 (2.2226)**
Social cooperatives per inhabitant (COOPAB)	-0.0082 (-0.1050)	-0.1125 (-1.7296)*	-0.1483 (-2.1939)**
Capital stock (STOCK)	-1.0532 (-1.0499)	-1.9797 (-2.4092)***	-1.66298 (-1.7776)*
W_EXPGROWTH	-0.0589 (-0.0612)	0.0199 (0.2188)	
W_PERALB	-0.1551 (-0.2043)		
W_LAUPO	0.8282 (1.7080)*		
W_SPULME	2.2503 (1.3179)$^{\circ}$		
W_COOPAB	-0.3292 (-2.3331)***		
W_STOCK	-1.4491 (-0.91709)		
θ	0.9971 (11.71)***	0.9971 11.71)***	
rho			-0.05039 (-0.5202)
φ			0.0000 (0.9999)
Corr-squared	0.1197	0.0952	0.0942
Log-likelihood	-1636.141	-2287.975	-1018.627

All variables have the expected sign except, as before, for the social cooperative variable but there is an interesting explanation for that and we shall explore it.

As we explained in the previous section, by using these models we are enabled to distinguish between direct effects and spillover effects. We can observe that, apart from the spatial lag of the dependent variable and of the natural capital, all the other spatial lags are significant. This has an effect on the parameter estimates. The differences between the point estimates in the first part of the table and the direct effects displayed in the second part can be ascribed to the presence and significance of spatial spillovers.

Tab.5 Spatial models without spatial effects for the export growth equation

VARETYN	SDM NO EFFECTS	SLAG NO EFFECTS	SEM NO EFFECTS
Rate of staying in hotels (PERALB)	0.5619 (1.5665)*	0.7484 (2.3014)***	0.6794 (1.9060)**
Graduates Percentage (LAUPO)	0.5578 (1.5010)*	1.0283 (4.1439)**	1.1651 (4.3891)***
Average specialization index (SPULME)	2.0154 (2.0450)**	1.9338 (1.9845)**	2.4215 (2.2594)***
Social cooperatives per inhabitant (COOPAB)	-0.0096 (-0.1252)	-0.0917 (-1.3161)$^{\circ}$	-0.1509 (-1.9703)***
W_EXPGROWTH	-0.0749 (-0.7758)	0.0299 (0.3285)	
W_PERALB	-0.0985 (-0.1295)		
W_LAUPO	0.9615 (1.9636)**		
W_SPULME	4.7518 (2.3526)***		
W_COOPAB	-0.2487 (-1.5793)*		
rho			0.0049 (0.05260)
PERALB			
Direct	0.5643 (1.5785)*	0.7411 (2.2254)**	
Indirect	-0.1177 (-0.1646)	0.0223 (0.2755)	
Total	0.4465 (0.6917)	0.7635 (2.1867)**	
LAUPO			
Direct	0.5334 (1.4161)$^{\circ}$	1.0281 (4.0297)***	
Indirect	**0.8927 (1.8704)****	0.0299 (0.2850)	
Total	1.4260 (4.5340)***	1.0581 (3.9637)***	
SPULME			
Direct	1.9591 (2.0036)**	1.9057 (1.9690)**	
Indirect	**4.3213 (2.2541)****	0.0682 (0.3099)	
Total	6.2804 (3.0762)***	1.9740 (1.9085)**	
COOPAB			
Direct	-0.0116 (-0.1465)	-0.0916 (-1.3415)$^{\circ}$	
Indirect	**-0.2378 (-1.5283)$^{\circ}$**	-0.0023 (-0.2081)	
total	-0.2434 (-1.8023)*	-0.0940 (-1.3267)$^{\circ}$	
LR_spatial_lag (Prob)	12.2953 (0.015)***		
LR_ sem (Prob)	12.2491 (0.015)***		
R^2	0.1238	0.087	0.0921
Loglikelihood	-1012.85	-1019.003	-1048.31

The rate of staying in hotels, to start, has only a direct impact on the average export growth. It means that a positive change in that rate for a given province will have a positive impact on the export growth of that province. This impact incorporates the feedback effects arising from a change in that variable in a given province on the export growth of neighboring provinces in the system of spatially dependent provinces. Indirect effects are not significant.

Graduate percentages and specialization index are very significant especially in terms of indirect effects, which are also stronger than the direct ones. It means that, not only a change in these variables for a given province causes a positive change in the export growth for that province (acting through feedback effects) but also that a change in all the other provinces causes a positive change in the export growth of province *i*.

It seems that an increase in the number of cooperatives in all the neighboring provinces enhances the export performance of them; however, the presence of good neighbors might worsen the export performance of province *i* , due possibly to a negative correlation between the export growth in the two provinces. Therefore, as in the non spatial model, the coefficient for the social cooperative variable has a negative sign but its significance can be motivated entirely by the role played by indirect effects.

6.2 Employment growth equation

We have repeated the above analysis also for the case of employment growth. We have selected the same set of variables for the unrestricted model plus a measure of the public-private dimension of territorial capital, *i.e.* the amount of provincial investments in project financing. Due to the discontinuity of the employment series we were forced to consider a shorter panel spanning the period 2004-2012. We divided the sample into pre-crisis (2004-2007) and post-crisis (2008-2012) periods.

By its nature the employment variable, besides being mainly related to the production and the added value dynamics, is more stable than the exports and, for that reason, adds a more "structural" character to the relation between provincial performance and territorial capital. The first thing to note is the significance of the provincial fixed effect (both the LM and the Hausman tests are significant).

The fixed public capital (road and airport infrastructures), the natural capital (rate of staying in hotels), the social capital (number of crimes per capita), the institutional relational capital (number of social cooperatives per capita), the local cognitive (specialization index) dimensions of territorial capital do not play a role in the explanation of the employment performance. On the contrary, human capital and entrepreneurial relational capital captured by FDI (both inward and outward) are strongly relevant. A less important role is played by the capital stock and by the investments in project financing which result significant at 20 percent of probability but an increase in any of them (*ceteris paribus*) determines an improvement in terms of employment performance (Table 6) .

Tab.6 The effect of territorial capital on employment growth- Italy - 2004-2012

Variable	Unrestricted Model (Pooled OLS)	Unrestricted Model (Fixed Effects)	Unrestricted Model (Random Effects)	Restricted Model (Pooled OLS)	Restricted Model (Fixed Effects)	Restricted Model (Random Effects)
Road Infrastructure	-0.00079 (-0.45)	0.004081 (0.464)	-0.00094 (-0.515)			
Airport Infrastructure	-0.00001 (-0.022)	-0.000287 (-0.187)	0.00002 (0.032)			
Graduates Percentage	0.43196 (7.349)***	0.6598 (5.807)***	0.45702 (7.745)***	0.42600 (7.842)***	0.71875 (7.637)***	0.45321 (8.274)***
Crimes per inhabitant	0.01624 (0.127)	0.37857 (0.594)	0.00991 (0.075)			
Social cooperatives per inhabitant	-0.00970 (-0.604)	-0.05533 (-0.926)	-0.01230 (-0.742)			
Rate of staying in hotels	-0.03111 (-0.402)	0.42911 (0.779)	-0.02039 (-0.254)			
Average specialization index	0.03735 (0.151)	0.42254 (0.171)	0.05296 (0.206)			
Capital stock	0.13897 (0.611)	3.52263 (1.219)	0.12643 (0.535)	0.15641 (0.725)	3.6891 (1.343)$^{\circ}$	0.13910 (0.617)
FDI (inflows)	0.00037 (0.807)	0.01290 (1.507)$^{\circ}$	0.00036 (0.809)	0.00039 (0.861)	0.01386 (2.084)**	0.00038 (0.868)
FDI (outflows)	-0.00012 (-1.0279	-0.001016 (-1.621)*	-0.00012 (-1.060)	-0.00012 (-1.050)	-0.00109 (-2.224)**	-0.00012 (-1.094)
Private-Public initiatives	0.00007 (0.0906)	0.00150 (1.586)$^{\circ}$	0.00019 (0.281)	-0.000006 (-0.008)	0.00130 (1.453)$^{\circ}$	0.00010 (0.157)
Loglikelihood	-323.5471	-237..24		-323.97	-240.13	
Adj R^2	0.2749	0.6863		0.2719	0.6774	
LM		172.61 (0.0000)***	1.50 (0.2206)		167.69 (0.0000)***	1.72 (0.1901)
H			40.40			36.45

In the models which analyse the effects of the crisis (table 7), the intercept dummy is negative as well as the interaction terms with road infrastructures, social cooperatives and specialization index. This indicates that the crisis period may be responsible for a non positive or null effect of the variable inside the original model.

Tab.7 The effect of the crisis on the relationship between territorial capital and employment growth- Italy – 1999-2012- Restricted model – Fixed effects

Variable	Model 7.1	Model 7.2	Model 7.3	Model 7.4	Model 7.5	Model 7.6
Graduates Percentage	0.06328 (0.305)	0.4622 (2.828)***	0.6949 (3.632)***	0.366 (2.275)**	0.2319 (1.434)°	0.7147 (6.952)***
Capital stock	2.7656 (1.058)	3.7288 (1.375)°	3.7073 (1.341)°	3.1848 (1.192)	2.3350 (0.891)	3.6872 (1.335)°
FDI (inflows)	0.1191 (1.886)*	0.0109 (1.620)*	0.0138 (2.076)**	0.0118 (1.818)*	0.0126 (2.012)**	0.0139 (2.075)**
FDI (outflows)	-0.0009 (-2.002)**	-0.0008 (-1.776)*	-0.0011 (-2.216)**	-0.0009 (-1.953)**	-0.0009 (-2.143)**	-0.0014 (-2213)**
Private-Public initiatives	0.0016 (1.871)*	0.0014 (1.534)	0.00137 (1.450)°	0.0016 (1.884)*	0.0014 (1.698)*	0.0013 (1.447)°
Dummy crisis	-1.4084 (-3.503)***					
Crisis*Road infrastructures		-0.0051 (-1.908)**				
Crisis* Airport infrastructures						-0.0001 (-0.100)
Crisis* Rate of staying in hotels			-0.0149 (-0.143)			
Crisis*Social cooperatives per inhabitant				-0.0534 (-2.662)***		
Crisis* Specialisation index					-1.0013 (-3.604)***	
Loglikelihood						
Adj R^2	-227.86	-236.34	-240.11	-232.86	-227.19	-240.11
LM	0.7136	0.69	0.6775	0.6993	0.7155	0.6774
H	149.74 (0.0000)***	151.08 (0.000)***	145.70 (0.002)***	155.04 (0.0003)***	153.63 (0.0005)***	163.38 (0.00006)***
	9.75	18.53	12.60	19.24	12.77	32.62

We have then tested for the presence of spatial dependence (Table 8) and we failed to reject the absence of the two forms of it.

Tab.8 Tests of spatial dependence (Debarsy and Erthur) for the employment growth equation

RESTRICTED MODELS	POOLED OLS	FIXED EFFECT
ROBUST LM TEST NO SPATIAL LAG[10] (P-VALUE)	30.95 (0.000)***	9.17 (0.002)***
ROBUST LM TEST NO SPATIAL ERROR (P-VALUE)	15.31 (0.000)***	8.26 (0.004)***

[10] We have used a binary contiguity matrix with elements $w_{i,j}=1$ for units sharing a common border and zero otherwise

Finally, we estimated the Spatial Durbin Model and we verified the restrictions leading to the two simplified versions of the model. Given the rejection of the restrictions , we have only produced here the parameter estimates of the general model (table 9).

Tab.9 Spatial model without spatial effects for the employment growth equation

EMPL_GROWTH	**SDM FE EFFECTS**
Graduate percentage (LAUPO)	0.24880 (0.9544)
Italian FDI abroad (IDITIN)	-0.00129 (-2.8584)***
Foreign FDI in Italy (IDESIN)	0.01613 (2.6409)***
Private-public initiatives (PPPINV)	0.00073 (0.8888)
Capital stock (STOCK)	3.15344 (1.2750)°
W_EMPL_GROWTH	-0.1309 (-1.0991)
W_LAUPO	0.36379 (1.1586)
W_IDITIN	-0.00214 (-1.8032)*
W_IDESIN	0.02583 (1.6074)*
W_PPPINV	-0.00708 (-2.7013)***
W_STOCK	-0.26405 (-0.0463)
LAUPO	
Direct	0.24554 (0.8732)
Indirect	0.29803 (0.9224)
Total	0.54357 (3.9743)***
IDITIN	
Direct	-0.00123 (-2.8276)***
Indirect	-0.00181 (-1.6793)*
Total	-0.00304 (-2.5163)***
IDESIN	
Direct	0.01543 (2.5990)***
Indirect	0.02184 (1.4965)°
total	0.03728 (2.2725)***
PPPINV	
Direct	0.00089 (1.0892)
Indirect	-0.00643 (-2.6143)***
Total	-0.00554 (-2.106)***
STOCK	
Direct	3.10444 (1.2234)
Indirect	-0.7284 (-0.1344)
total	2.3760 (0.4121)
LR_spatial_lag (Prob)	34.94 (0.00000)
LR_ sem (Prob)	35.80 (0.00000)
R^2	0.7298
Loglikelihood	-242.05

We can observe that, except for the capital stock, which becomes negative due to spillovers, the average total effect of each variable is significant at 5 percent of probability. There is a very significant effect of the inflows and outflows of FDI both in terms of direct and indirect effects on the employment performance of the 103 Italian provinces. Moreover, the indirect effects also play a role for private-public initiatives. The total average effect of this variable turns out to be negative and very significant due to the strong importance of the negative indirect effects which can be justified as in the cooperatives variable case for the export growth equation. If all the other provinces increase the amount of investments in project financing, the employment performance of province *i* will decrease if the provinces are competing in the same market. It should be kept in mind that the reason why the indirect effects are often larger than the direct ones is because the average indirect effect is a scalar summary of the indirect effects averaged over all the provinces. It is the cumulating of the spatial spillovers over all provinces that leads to relatively larger indirect than direct effects (Lesage and Fisher, 2008).

7. Conclusions

Overall, our analysis shows the utility of decomposing territorial capital in order to disentangle the relative effect of each dimension on the performance during the crisis.

It appears that some dimensions of territorial capital (human capital and infrastructure) are more strongly related with (export) performance. The relevance or other less material and traditional dimensions (such as social capital, relational capital, agglomeration economies and natural and cultural capital) depends on the model specification

The impact of some dimensions is strongly related with the crisis while for other dimensions the crisis has reduced the role of specific territorial capital assets.

When using employment as a performing variable, most results are confirmed but the impact of the crisis offsets the role of some dimensions. A strong impact of FDI emerges.

The consideration for spatial models allows to stress the role of spatial spillovers in different fashions. The spatial Durbin model comes out to be the preferred one also because it enables us to discriminate between direct and indirect effects. This, in turn, may shed light onto the complementary or substitution effects across provinces for each territorial capital dimension thus giving a possible explanation to some counterintuitive signs of the explanatory variables.

A possible extension of tour analysis would include the estimation of a spatial Durbin model allowing for the possibility of two regimes (Elhorst and Freret , 2009). Such analysis would include in the equation a binary variable taking values 1 or 0 according to the regime considered. This would allow the computation of the interaction effects of the dependent variable with the dependent variable in the neighbouring provinces in the two regimes (pre and post-crisis) as well as of the degree of interaction between the two regimes.

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