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Related variety and employment growth in Italy[1]

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Abstract

The aim of the present research is to investigate, for the Italian case, the role and importance of Related variety to foster employment growth. The Related Variety approach received increasing attention in the literature, as it tried to identify the key drivers for economic development at regional and national level.

This work supports the study of economic and local development from a related-variety approach's perspective, focusing on the need to have some degree of cognitive proximity at local level to foster innovation and economic development covering the period 1991-2011 for the Italian case.

The results underline that variety has a positive impact on employment growth, and related variety matters even more.

Keywords: related variety, unrelated variety, employment growth.

JEL: R11, O10.

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1. Introduction

In recent literature, the need to integrate the two disciplines of industrial economics and economic geography is increasing all the more insistently. It is clear that the benefits associated with the concentration of activities in space are no longer sufficient to explain the growing search for recombination processes, along with the transformation and change of economic activities in the presence of new competitive models.

This is even more important for those systems without strong high-tech specializations, which have to face a fragmented economic system in terms of specialization and firm size.

Even the concept of diversity economies is not useful anymore, as the concept of industrial diversity or variety has a certain relevance only if involving the concept of proximity and complementary abilities present in a specific area.

The *Evolutionary Economic Geography* (EEG) (Boschma and Martin, 2010) explores the theme of diversity in terms of sectors and activities with complementary skills that foster the exchange of information and technological contamination through knowledge spillovers.

In the most recent literature on agglomeration, knowledge-based theories are developing. In particular, the studies of the last two decades are emphasizing on the evolution of the process of collective learning and knowledge spillovers (Capello and Faggian, 2005). Following this approach, it is necessary to refer both to the interesting studies of Porter (1998), in which the cluster' advantage is based on the proven ability of the companies taking part in it to compete on the ability to innovate and to invest in knowledge, and on studies centred on the relationship among the different components of an innovative system defined *Regional Innovation System* (Cooke et al., 1998).

The related variety approach (Frenken et al., 2007) can also lead to overcome the policy based on districts or sectors, favouring interventions that can enhance the cross-relations between the actors in the territory.

In this context, this work supports the study of economic and local development from a related variety approach's perspective. In particular, it aims at investigating the role and importance of related variety to foster employment growth in Italy. The related variety approach received increasing attention in the literature (Frenken et al., 2007; Boschma and Iammarino, 2009; Quatraro, 2010; Cortinovis and van Oort, 2015), as it tried to identify the key drivers for economic development at regional and national levels, focusing on the need to have some degree of cognitive proximity at local level to foster innovation and economic development.

The research question that we answered is: what is the role and the impact of related variety on Italy's economic growth?

This work presents some novelties in the field of EEG as it covers a long-term time frame (twenty years) and, by surveying also data for 2011, it allows to make some evaluations in the context of a serious economic crisis (2001-2011).

The structure of the paper is as follows. Section 2 presents the theoretical background on related variety, while section 3 illustrates the research design, the sources of data and the methodologies applied. Section 4 investigates the role of related variety in employment growth in Italy, presenting the variables, the model and the estimations. Section 6 concludes the work.

2. An overview of the related variety approach

The knowledge-based approach, developed from the 1990s to the present day, concentrates on the process of collective learning and exchanges of knowledge between companies as a competitive factor for the local system's firms. These theories start from the work of Porter (1990) where the competitive advantage of clusters depends on the sizes of the 'diamond' and points to the rivalry between the companies in the cluster as a driver of knowledge and innovation.

Lundval et al. (1994) indicate knowledge as a strategic resource, and learning as the fundamental process to compete on in the modern economy, and focus their attention on the concept of *learning by interacting* within the local system. Few years later, Cooke et al. (1998) introduced the concept of *Regional Innovation System* seen as a particular combination of institutions aimed at technological development, generation of learning processes and local economic growth. Recently Malmberg et al. (2006) defined *localized learning regions* as regions in which learning is a cumulative and path-dependent process determined by constant control and cross referencing between actors; later, when the regional specialization has passed its embryonic stage, tends to reinforce itself.

Glaeser et al. (1992), referring again to knowledge spillover theories and externalities in local contexts, distinguish three different types of dynamic externalities. The first type, which stems from the contributions of Marshall, Arrow and Romer, is related to knowledge spillovers between companies belonging to the same sector. The second type, which develops from the debate on industrial districts and clusters, put emphasis on how dynamic externalities are maximized in geographical areas characterized by a strong presence of small and medium-sized specialized firms (Porter 1990); the idea is that specialized sectors operating in competitive local markets are able to promote a faster flow of ideas. Finally, the third type concerns Jacobs' theory (1969), according to which, in addition to agglomeration economies associated with a particular production sector or chain, it is evident that more positive externalities arise from the concentration in a territory of enterprises belonging to different industries. These economies of scope, called *Jacobs externalities* (1969), are based on the idea that the diversity and variety of firms close together in space can promote transfer of knowledge and growth of productivity.

This theory also highlights how geographical areas with a high degree of technological diversification get better results thanks to the transfer of innovations and knowledge between companies belonging to different sectors. What matters then is the process of cross-fertilization that derives from the interchange of ideas from different technological trajectories.

Which are then the origins of this approach and from which theories does it arise? In recent years, literature in regional sciences is focusing more and more frequently on diversity rather than on specialization as a factor that explains the specific performance of local systems (Boschma and Frenken, 2009).

As is well known since the writings of Marshall (1890), the benefits of agglomeration arise from positive externalities that, with regard to innovative processes, are associated with knowledge spillovers occurring between companies operating in the same field.

If local companies are engaged in not enough diverse activities or they are too similar to each other, the spillovers tend to produce mostly incremental innovations, to improve portfolio products or production processes.

The generation of radical innovations within the local system requires that the production system should be composed of companies sufficiently different from each other, since diversity allows the exchanges of knowledge that flows from the different sectors.

Thanks to this variety, the generation of new ideas is stimulated (Bishop and Gripaios, 2010); in fact, the spillover of knowledge between different sectors fosters growth and encourages the innovation that favours radical innovations, whereas, by contrast, knowledge spillovers within the same sector, typical of local systems, favour incremental innovations.

The concept of variety that we have just outlined can also be used for regional economies, when the focus is developed at local or regional level. It is possible and indeed necessary to shift the focus from the variety of products to the variety of sectors, i.e. the industrial composition of the area. There exists an ideal level of variety that maximizes economic growth, but at present the problem has not been sufficiently addressed so as to determine which is this level.

In the recent literature on economic development, a growing attention is devoted to the role of diversity, more than to that of specialization, as one of the performance and competitiveness determinants of clusters, districts and metropolitan areas. In the most recent literature on agglomeration, large space is given to the development of knowledge-based theories, in particular with studies led in the last twenty years that draw attention to the evolution of the processes of collective learning and knowledge spillover. Among others, Jacobs (1969) and Glaser et al. (1992) explain how urban environments, rich in terms of variety, have a strong ability to generate knowledge spillovers and foster innovation and growth. The recent theoretical approach of related variety renewed the interest on the role played by *diversity* as a driver of economic development.

In particular, the concept of proximity used in the related variety approach (Frenken et al., 2007), which includes all the five dimensions indicated by Boschma (2005) – cognitive, organizational, social, institutional and geographical – becomes crucial for developing a learning capacity and an ability to exchange knowledge between firms, institutions and networks. The first four dimensions appear to be disconnected from physical proximity, because they express a relational proximity related to the interactions between actors (Amin and Cohendet, 2003).

In a recent work, Broekel and Boschma (2012) studied the effects of the interaction between different types of proximity – geographical, cognitive, social and organizational – on the levels of innovation in research collaborations between companies and academia.

The most interesting results, with regard to both growth, innovation and learning, are achieved when the local system's firms and plants have a level of variety that allows exchange and cross-connection also at the level of technological knowledge bases.

Some interesting studies in this area analyze, on the basis of data disaggregated by type of product at enterprise level, the presence of close or distant correlations to assess the impact on firms' growth and competitiveness in many European countries, such as the Netherlands (Frenken et al., 2007), Germany (Bracher et al., 2011) and Spain (Boschma et al., 2012) as well as at European level (van Oort et al., 2014).

There are some works using the related variety concept and methodologies also for the Italian case, for instance: Boschma and Iammarino (2009), who use export and import data to compute regional variety and find that related variety affects regional growth; Quatraro (2010) who employs patent data to calculate regional knowledge variety and how it affects productivity growth; Antonietti and Cainelli (2011), who estimate a structural model of research, productivity, innovation and export on a sample of large manufacturing firms, including variables – like related variety – that measure local knowledge spillovers, and find a strong relationship between related variety and R&D; and finally, Cainelli and Iacobucci (2012), who investigate the role of agglomeration forces in vertical integration choices by analyzing the effect of different forms of variety.

These works find empirical evidence also for the Italian case of how variety matters for productivity, employment and R&D. Our aim is to contribute to this strand of literature covering a long time span, which none of these works does, and adding data from the last 2011 census, which reflect the economic crisis and so allow us to make some evaluations also in this particular situation.

We are not yet in possession of enough empirical evidence to apply the concept of related variety for a clear interpretation of the industry's performance, but thanks to this concept we can set out new methods of analysis at regional or local system level and derive some policy recommendations.

3. Data sources and methodology

This study concerns the totality of the Italian provinces[4] and avails itself of the ISTAT census data per province, corresponding to the NUTS-3 classification of the European Union.

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4 We decided to use NUTS 3 as basis for the units of analysis instead of the Local Labor Systems (LLS) because it allows to make comparisons with other works that study related variety at provincial level in Italy (Boschma and Iammarino, 2009; Cainelli et al., 2012). This unit of analysis is in line with the largest part of other works using this approach for Europe with analyses usually performed at NUTS-3 or NUTS-2 level. Besides, at the time of data

The main data consist in the number of employees subdivided by ATECO code, up to the 4-digit level of detail, gathered from the ISTAT Census of Industries and Services for the years 1991, 2001 and 2011.

Therefore, the period under study covers the whole twenty years from 1991 to 2011, a rather long time span, characterized by many changes at all levels.

Among the main methodologies applied to the relatedness studies, we considered the followings:

- the creation of an *ad hoc industrial space* to calculate the relatedness density of the area (Hidalgo et al., 2007);
- the use of entropy indexes to calculate variety and break it up into *related* and *unrelated variety* (Frenken et al. 2007).

As to the first method, many studies have recently applied to development and technological diversification, for example Hidalgo et al. (2007), Neffke et al. (2011), Rigby (2012), Boschma et al. (2013), Boschma et al. (2014). Following the methodology of Hidalgo et al. (2007) for the creation of the *product space*, it is necessary to work out an *industrial space* among the industrial categories, and determine which are related and which are not related to each other.

The second method is about the use of entropy indexes. To calculate the industrial variety of the area, and then break it up into *related* and *unrelated variety.* We chose to use this second method as it is the most used in the European context and can allow us to make some comparisons with other studies.

In the following section, we will go deep into the chosen method and explain how we measured the variables of interest using the entropy measure, following for this case the rules adopted in Frenken et al. (2007), and Hartogh et al. (2012).

The *variety* that will be then broken up into a related and an unrelated part is computed as the sum of the entropy at the chosen digit level, where high levels of this variable are associated to areas highly diversified in terms of industrial composition:

$$Variety = \sum_{g=1}^{G} Pi \log \left(\frac{1}{Pi}\right)$$

The *unrelated variety* is measured as the total amount of entropy at 2-digit level, being assumed that sectors that do not share the same 2-digits are unrelated to each

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collection it was not possible to use LLS as data at 4-digit level for the 2011 census were not available. The use of the provincial level also allows us to better focus on metropolitan areas, which are characterized by a high diversification.

other. It explains the degree of unrelatedness between industries in the area, which means that low knowledge spillovers will occur there (Frenken et al. 2007) Unrel. Var. is measured as follow:

$$Unrel.\ Var = \sum_{g=1}^{G} Pg\ log_2\left(\frac{1}{Pg}\right)$$

where *Pg* represents the 2-digit shares, calculated summing the 4-digit shares *Pi* already used for the variety index.

The other part in which variety is decomposed is related variety, which is computed as the weighted sum of entropy within each 2-digit sector and is calculated as follow:

$$Rel.\ Var\ \ \sum_{g=1}^{G} Pg\ Hg$$

and *Hg* measures the degree of variety within the 2-digit class for each Italian provinces.

As already seen in literature, we assume that sectors that belongs to the same 2-digit class are technologically related to each other (Frenken et al., 2007; Hartog et al., 2012) and they can learn through knowledge spillovers.

In this work some control variables are included in the models. The first one is population density, used to control for urbanisation levels and measured as the population and area ratio of provinces.

The human capital variable is calculated as the percentage of residents with degree education level or higher; this method of measuring the level of education of an area is in line with most of the literature on human capital in regional growth studies.

We used also dummy variables to control for different level of industrialization in the four Italian macro-regions.

4. Related variety and growth in Italy

4.1. Variables and descriptive statistics

In this study, we resort to the data collected by ISTAT in the ten-year censuses of 1991, 2001 and 2011, and employ the number of employees by ATECO classification at 4-digit level, calculating the indexes relative to 297 industrial categories, after exclusion from the 4-digit classification of the activities related to mining, agriculture, energy production and trade.

Table 1 Variables included in the regression

	Model 1	***Model 2***	***Model 3***	***Model 4***
Emp. Growth	emp_{11}/emp_{91}	emp_{11}/ emp_{91}	emp_{01}/emp_{91}	emp_{11}/emp_{01}
Variety	$\sum_{g=1}^{G} Pi \, log_2 (\frac{1}{Pi})$			
Rel. Var		$\sum_{g=1}^{G} Pg \, Hg$	$\sum_{g=1}^{G} Pg \, Hg$	$\sum_{g=1}^{G} Pg \, Hg$
Unrel. Var		$\sum_{g=1}^{G} Pg \, log_2 (\frac{1}{Pg})$	$\sum_{g=1}^{G} Pg \, log_2 (\frac{1}{Pg})$	$\sum_{g=1}^{G} Pg \, log_2 (\frac{1}{Pg})$
Pop. Density	$ln(pop_{91}/sup.)$	$ln(pop_{91}/sup.)$	$ln(pop_{91}/sup.)$	$ln(pop_{01}/sup.)$
Human Cap.	$Graduat._{91}/pop_{91}$	$Graduat._{91}/pop_{91}$	$Graduat._{91}/pop_{91}$	$Graduat._{01}/pop_{01}$
Macro regions	*Dummy*	*Dummy*	*Dummy*	*Dummy*

Table 1 illustrates the variables that are included in the regression analysis. The variable *employment growth* is calculated as the difference between the initial and the final values for the period under study, and it corresponds to Δ (1991-2011) in Models 1 and 2, to Δ (1991-2001) in Model 3, and to Δ (2001-2011) in Model 4.

The other variables are determined on the basis of the 1991 census data, except from Model 4 that refers to the data of 2001 census.

Now we can depict the evolution of the related variety indexes from 1991 to 2011, and find a strong variation between the minimum and the maximum values of *Variety, Rel. Var.* and *Unrel. Var.*

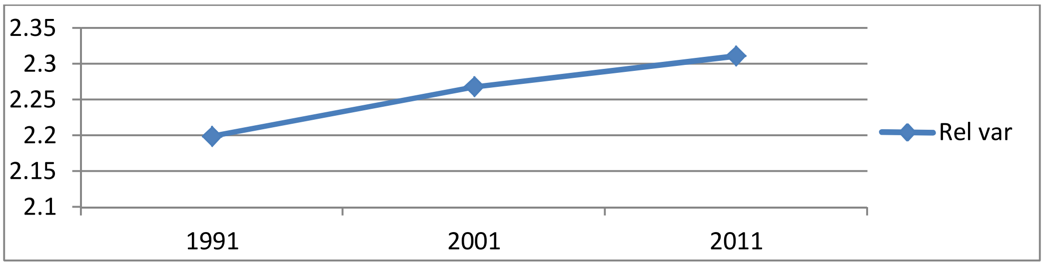
Table 2 Descriptive statistics. Evolution from 1991 to 2011

Variables	*Mean*	*Min.*	*Max.*	*Std. Dev*
Emp. Grow.	0.124	-0.304	0.457	0.12
Variety	5.802	4.057	7.063	0.55
Rel. Var.	2.199	1.135	2.879	0.29
UnRel. Var.	3.603	2.214	4.184	0.36
Pop Density	240.9	35.5	2575.6	328.6
Hum Cap.	0.033	0.015	0.069	0.0086

Source: our elaboration on ISTAT data.

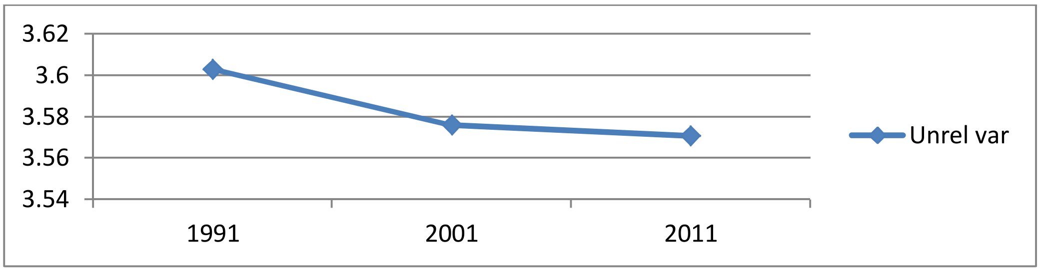
Analysing the evolution over time of the average degrees of related and unrelated variety in the Italian provinces (Figg. 1 and 2), we see that the progression is very slow for both set of indexes and, interestingly, their trends are opposite; in fact, within the twenty-year period, while related variety grows, unrelated variety decreases slowly but constantly. This proves that the variation in the industrial composition of a certain area is a very slow and gradual process.

Figure 1 Average values of Related variety



Source: our elaboration.

Figure 2 Average values of Unrelated variety

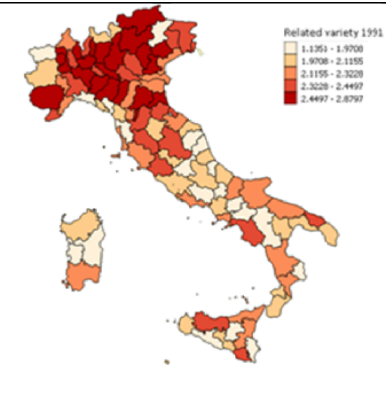
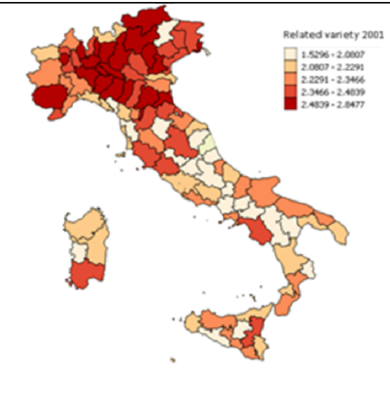
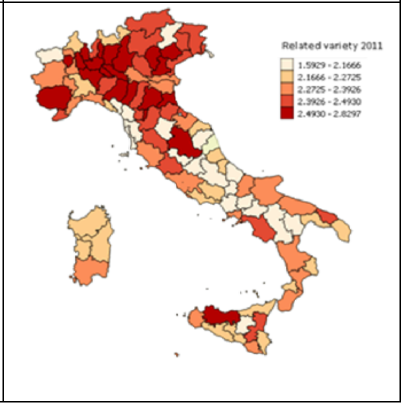


Source: our elaboration.

Figures 3, 4 and 5 show the distribution of related variety per province and compare its evolution from 1991 to 2011. Without entering into details for the single provinces, which is beyond the scope of this work, we can make some general considerations about their geographical distribution.

The provinces with the highest values of related variety are mainly localized in Northern Italy, which confirms the higher level of industrialization of the north-eastern and north-western parts of the country. Moreover, it is interesting to observe the evolution of the provinces presenting the higher values for this variable: their dynamics present a slow and gradual variation, with a progressive decrease of related variety in the provinces of Northern Italy, and a slow but noticeable increase for the provinces of Central and partly Southern Italy. While it should be noted that in Figure 1 this same indicator slowly increases. So, these maps allow to examine the evolution of different geographical locations.

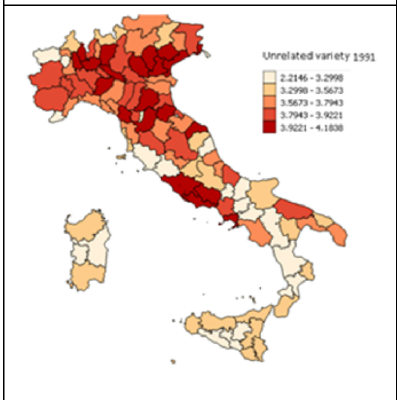
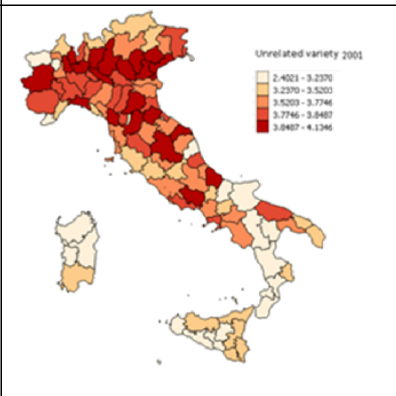
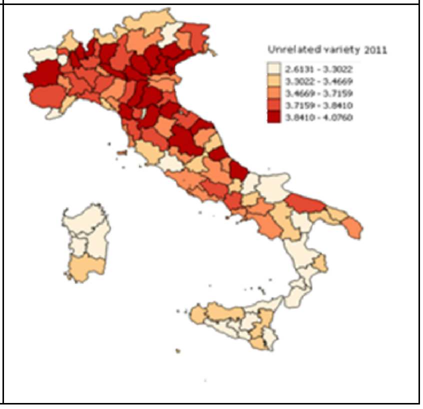
Figure 3, 4 and 5 Related variety in 1991, 2001 and 2011

1991	**2001**	**2011**
		

Source: our elaboration.

As regards the maps of unrelated variety, the corresponding values have a more homogeneous distribution, but still present a concentration in Central-Northern Italy. The distributions in the values of related and unrelated varieties are partly correlated, as proved by the level of positive correlation (0.3297) between the two variables presented in Table 3.

Figure 6, 7 and 8 Unrelated variety in 1991, 2001 and 2011

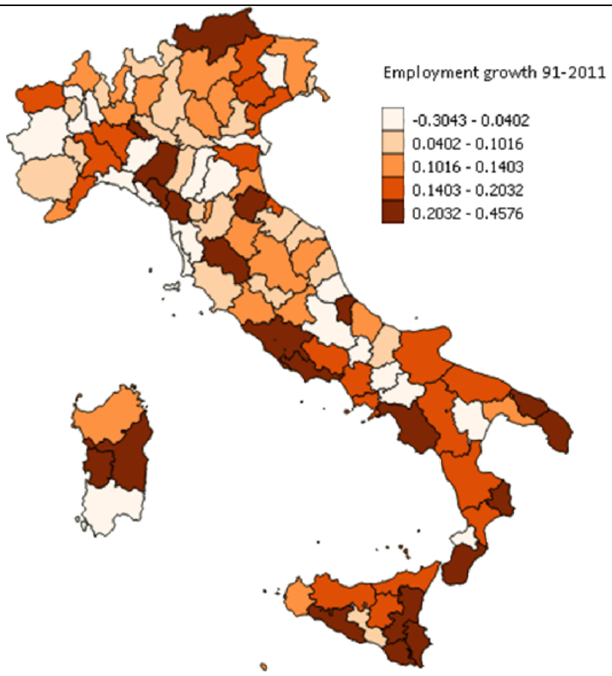
1991	2001	2011
		

Source: our elaboration.

In what concerns employment growth for the period 1991-2011, we can notice how its higher levels are not concentrated in a single area but distributed along the whole Italian peninsula, with a thicker distribution in the southern areas, at least compared to the other variables described so far.

Comparing the maps of related and unrelated variety with Figure 9, which shows the map of employment growth, we observe that, even if there is no match between the provinces reporting high levels of related variety and those registering a high rate of growth within the period 1991-2011, it is possible to see a slow change process in the levels of related variety in the direction of employment growth, a fact which signifies the existence of a relationship between the two indexes.

Figure 9 Employment growth, 1991-2011



Source: our elaboration.

For the other variables that will be used in the regression, we do not present the corresponding maps, but only give some indications. As for the variable *Variety*, the provinces with the higher levels in this indicator are mainly concentrated in the North. Instead, weighing up the population density of the provinces, we find that it is more unevenly distributed, having higher values mostly for the regional-capital provinces, as expected, and reaching the greatest levels in the proximity of the Italian metropoles. In what regards the distribution in the percentage of graduated population, we find a strong concentration in the central part of the country.

Table 3 presents the correlation values between variables. As can be seen, the correlation value between *Variety*, *Rel. Var.* and *Unrel. Var.* is very high, which leads us to assume the existence of a multicollinearity problem. At all events, these values will not be included at the same time in the regression analysis.

Table 3 Correlation matrix

	Emp. Growth	*Variety*	*Rel. Var*	*Unrel. Var*	*Pop. Density*	*Human Cap.*
Emp. Growth	1					
Variety	0.0419	1				
Rel. Var	0.1373	0.7629	1			
Unrel. Var	-0.0465	0.8619	0.3297	1		
Pop. Density	-0.1077	0.3469	0.2469	0.3129	1	
Human Cap.	0.3435	0.1983	0.1841	0.1451	0.1284	1

Source: our elaboration.

4.2. Estimation results and discussion

In this work, according to other studies on related variety and employment growth (Freken et al., 2007; Boschma and Iammarino, 2009), an Ordinary least squares baseline models is used to compute the multiple linear regressions, and employment growth is used as dependent variable in all the sectors for all the four models.

Table 4 present the results of our models. The dependent variable is employment growth for the period 1991-2011 in Models 1 and 2, for 1991-2001 in Model 3 and for 2001-2011 in Model 4.

The results of Model 1, in which only *Variety* is included as variable of interest, show its significant and positive relation with employment growth, which leads us to affirm that a general diversification of the area's industrial composition can promote growth.

In what concerns Model 2, the independent variables included are *Rel. Var.* and *Unrel. Var.*, while it was not possible to keep *Variety*, given that, as already mentioned above, placing them all in a same model would have caused collinearity problems due to its high correlation with the other two variables.

The results of Model 2 indicate a significant and positive value of *Rel. Var.*, while no significance is to be found for *Unrel. Var*. This outcome reveals that employment growth has no relation with the diversification of cognitively distant firms, while it has a positive relation with an area's industrial composition characterized by the presence of technologically related firms, able to foster joint learning processes and mutual learning from knowledge spillovers.

As already said for Models 3 and 4, employment growth is included as dependent variable for the two distinct periods. The results show that *Rel. Var.* has no relation with growth in the period 2001-2011, while this relation is confirmed for the period

1991-2001. It is possible to assume that in the period 2001-2011, the effect of the world economic crisis hit our country so badly as to change completely the dynamics of economic growth. Turning to the control variables, we can establish a positive relation between employment growth and the localization in the South of Italy. These results are confirmed in literature, that describes how starting from the mid-1900s Southern regions registered a higher productivity growth than the other regions (Barca, 2006; Boschma e Iammarino, 2009).

Table 4 Estimation results

	Model 1		***Model 2***		***Model 3***		***Model 4***	
	1991-2011		***1991-2011***		***1991-2001***		***2001-2011***	
Dependent Var.	Employment growth in Italy		Employment growth in Italy		Employment growth in Italy		Employment growth in Italy	
	β	*Std-Err*	*β*	*Std-Err*	*β*	*Std-Err*	*β*	*Std-Err*
Constant	-.0491 (-.38)	.1299	-.0410 (-.32)	.1286	-.1595 (-1.14)	.1404	-.0292 (-.23)	.1286
Rel. Var.			**.1163*** (2.60)	.0448	**.0938*** (2.38)	.0394	.0465 (1.38)	.0336
UnRel. Var.			.0322 (1.02)	.0317	-.0004 (-.02)	.0235	.0331 (1.63)	.0203
Variety	**.0672*** (2.59)	.0259						
Control Var.								
Pop. Den. (Ln)	-.0312* (-1.97)	.0158	-.0297 (-2.02)	.0147	-.0067* (-.52)	.0128	-.0245* (-2.59)	.0095
Human cap.	.2678 (.17)	1.5782	.3324 (.21)	1.5840	-.0770 (-.06)	1.3515	.3854 (.78)	.4941
NorthW	-.1362*** (-3.92)	.0347	-.1416*** (-4.04)	.0350	-.0480* (-1.87)	.0256	-.0992*** (-4.38)	.0226
NorthE	-.0883** (-2.96)	.0298	-.0895** (-3.07)	.0291	-.0166* (-1.54)	.0304	-.0784*** (-3.50)	.0224
Center	-.0727* (-2.33)	.0312	-.0665* (-2.20)	.0301	.0082 (.41)	.0201	-.0747*** (-4.19)	.0178
Obs.	103		103		103		103	
R2	.1931		.2087		.1109		.2817	

Note: *t-values* in parentheses; variable *South* excluded. Significant at: *p<0.05, **p<0.01, ***p<0.001. Source: our elaboration on ISTAT data.

In all the models, safe Model 3, there appears to be a negative relation between growth and population density, which means that the areas with higher levels of urbanization have experienced a weaker economic growth in the period under study. On the other hand, the variable human capital, relative to the number of graduated, has no significance in any model.

In this study we offered results concerning growth in all industrial sectors from a far-reaching perspective, since they apply to the relation of three different indicators of industrial diversification with job creation in the corresponding industrial sector.

We can establish that the results shown so far point to a relationship between industrial variety and employment growth. It is also possible to say that variety plays a role in the growth of employment, and takes a special one when it is related variety.

5. Concluding remarks and future research

This work is intended to contribute to the present debate on the role of knowledge, and cognitive and geographical proximities in sustaining economic growth locally and at the country-system level. A special attention has been paid to the competitiveness disparity of firms.

Given the present socio-economic context, in which international competition is more and more linked to localization advantages and the resulting ability to develop innovation processes, we have asked ourselves how the Italian industrial system will manage to evolve and be competitive, and which competencies and skills should be encouraged and implemented in order to sustain growth.

The results achieved in this work reveal that the ability to grow of territories, investigated here at provincial level, depends on the level of the area's industrial variety, and particularly related variety.

The results emphasize that cognitive proximity is a key factor for innovation and local economic development in Italy. In particular, they stress the importance of the presence in a specific place of a fair degree of variety, of diverse knowledge and resources to promote the innovation process. As shown, the provinces with a higher level of related variety present a higher employment growth for the whole twenty-year span of time, whose final period has seen a serious economic crisis. This proves that such advantages are more stable and replicable over time than those associated to the co-existence of firms whose knowledge is unrelated. Then, it should be advisable to identify the prevailing, specific features of local industry, and sustain them for all the sectors further down the line, rather than diversify the sectors that are not denoted by dominant characteristics.

Besides, a fact that should be taken into account in the present competitive setting is that there are few cases of firms that can afford to support internally the whole process of innovation. On the contrary, most firms need collaboration to advance innovation processes, and this is particularly true for the Italian context, where the majority of firms are small, and so industry is fragmented. It is obvious, in fact, that collaboration is easier when people share a common, or at least a contiguous knowledge, even though only a certain amount of dissimilarity can allow each participant to effectively contribute to the innovation process.

Therefore, the conclusions drawn in literature for other countries, the Netherlands in Frenken et al. (2007), Germany in Brachert et al. (2011) and Spain in Boschma et al. (2012), appear to be confirmed for the Italian case.

For the future, our aim is to go on with the examination of this research issue, by applying the same methodologies at local labour system level, and thus try and compare the results obtained with different units of analysis. We would also try to use other relatedness measure, like the one proposed by Hidalgo (2007), so as to evaluate the different approaches that should allow us to better understand the role of cognitive proximity.

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