University competition and local development: a spatial approach

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Abstract

This paper argues that the contribution of university competition to local economic development is much richer than that generally reported by "knowledge spillover" studies. Using the population of 77 Italian universities and all 8,088 municipalities, our results indicate that there is a positive relationship between university competition and the employment rate at a municipality level. Specifically, using a gravity measure, we note that the closer are the universities to an area the greater is the effect of their level of competition on the local economic development. We also find that the quality and the diversity of such institutions increase the employment rate at a local level. Thus, this research indicates that the recent government policies to increase the level of competition among universities can have an impact on the economic growth of regions.

Key words: University competition; Local development; Italian universities; University diversity

JEL classifications: R10, J24, O18

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1. Introduction

At the end of the Nineties, universities were increasingly seen as a part of the social and economic development of the society in relation to industry and government (Etzkowitz and Leydesdorff 2000). Academic institutions are recognized as engines of local development since they provide highly skilled human capital and they support ongoing knowledge creation, that result in positive spillovers to the local environment in terms of innovation and economic growth (e.g. Audretsch and Feldman 1996). Scholars have particularly focused on the positive externalities that firms benefit in positioning close to a university (Abramovsky and Simpson 2011), being affiliated with it (Meoli et al. 2012) or jointly collaborating in research projects (Fontana et al. 2006). Nevertheless, less attention has been paid to the important changes that universities have faced because of massification and competition.

In the last decades, mobility of students has largely increased to large an extent that universities have fallen into a fierce competition, both inside national and across international borders (Del Rey 2000). The rationale why universities compete for students is twofold since they represent both the inputs and the clients of educational services. Students justify the production of education and provide funds by paying tuition fees and allowing financial transfers from the government. As a consequence, students' attractiveness has become a primary objective for higher education institutions' sustainability. This task primary requires universities to improve their quality, as well as the range of educational fields they offer. A high level of competition may even contribute to stimulate private institutions to diversity

they programmatic offer in fields which are far from their main initial expertise (e.g. Health courses) (Texeira et al. 2012).

This paper aims to investigate the effects of university competition on local development. Based on the assumptions that the amount of highly-skilled human capital is a strong predictor of economic development (Florida et al. 2008) and the fact that universities are propitious sites in raising local human capital levels (e.g. Etzkowitz 2003), we argue that the higher is the competition among academic institutions the larger are the benefits for the local environment. In this regard, it is also acknowledged that a higher level of university competition increases the productivity of students (Gu et al. 2012). This work would contribute to two distinct but interrelated strands of literature. First, it offers an analysis of the still under-investigated factors that drive the differences human capital accumulation across space (Abel and Deitz 2012). Second, the study provides an empirical investigation of university competition, a field that has been too often addressed from a mere theoretical point of view (Agasisti 2009). Moreover, literature investigating the role played by universities in the local economic, usually focus on the country, regional economic impact, mainly because of data constraints and the public relation needs of the schools (Steinacker 2005). Universities are, on the contrary, valuable contributors to a city's economy, being immobile institutions, resistant to economic-financial market fluctuations and having a steady presence in the community. We here aim to shed light on this quite neglected issue wondering whether the role that universities tend to have as "catalyst" of local development increases when they face a higher level of competition.

This work relies on the population of 8,088 Italian municipalities and 77 Italian universities (we do not consider long distance learning institutions). In Italy, the higher education system is highly heterogeneous. The largest number of universities aim to attract more students in order to acquire more tuition fees, while few others limit the acceptance of

students. Each year, the Ministry has the power to define the amount of financial resources that will be allocated in a competitive way, whereas one of the key drivers to distribute them is related to the number of students.

This paper is organized as follow. Section 2 is dedicated to the literature review and the development of the testable hypotheses. Section 3 describes the research design and Section 4 shows the results. Section 5 concludes.

2. Literature review

2.1. Regional development and universities

It is a complex issue to define what is local/regional development and its proxies (Florida et al. 2008). Different variables have been used to address this issue, such as per capita GDP growth, increase in productivity, number of jobs created and new investment projects secured or new firms established.

In this respect, technology – i.e. startup/spinoffs rate, patents, has been identified as a key of economic development. Places like the Silicon Valley and the Route 128 corridor around Boston indeed show how tech clusters of research and entrepreneurial universities are engines of the local economic development in the current knowledge-based economy. Others says that the employment is the crucial constituent of economic development. When a place is able to create/attract new jobs, it consequently provides more economic wealth fostering the development of the economic and social structure of a local area. In this paper, we investigate the role of universities in increasing the employment rate of municipalities in Italy. Studies in regional economics have already suggested that higher levels of human capital foster the increase in the employment growth, wages and income (e.g. Glaeser et al. 1995, Carlino et al. 2007, Florida et al. 2008).

Nevertheless, a future development of the present work should go beyond the mere definition of economic development when dealing with regional development. Recently, part

of the literature on regional economics (e.g. Pike et al. 2010, Geddens and Newman 1999) has wondered what really is local/regional development. While this phenomenon has been historically observed by quantitative measures such as per capita GDP growth, increase in productivity, number of jobs created or safeguarded, new investment projects secured or new firms established. In order to provide new insights, a qualitative perspective should be taken into account. The latter for instance relates to the sustainability (economic, social, environmental) and forms of growth, the type and "quality" of jobs, the embeddedness and sustainability of investments, and the growth potential, sectoral mix and social diversity of new firm (Pike et al. 2010).

Universities may influence the employment rate of an area in two different ways: *direct* and *indirect.*

Direct – the presence of a university implicates the establishment of other associated services in that specific local area. In their vicinity universities primary foster the local economy providing more work to restaurants, hotels (accommodations) and revitalizing the real estate market thanks to the higher demand of teachers and students housing.

Indirect - Academic institutions play a crucial role in the development of the local environment, because of the knowledge spillovers they are able to locally transfer. Universities, and especially those which deal with natural sciences, have a significant impact on the development of the local environment. Their presence on the local environment ensure positive externalities that contribute to attract external economic resources, fresh knowledge and also the interest of young entrepreneurs with successful business ideas. They may add values to firms making them available ongoing knowledge and physical resources, such as libraries and laboratories, the improvement of R&D flexibility through the on-going contact with emerging technologies and knowledge and the reduction of the costs of developing new capabilities when jointly collaborating on innovative research projects.

Several studies has already found evidence that geographic proximity between firms and universities is a key determinant of knowledge spillovers in improving firms' innovation (e.g. Jaffe 1989; Feldman and Florida 1994; Fischer and Varga 2003; D'Este and Iammarino 2010; Laursen et al. 2011). As a matter of fact, the proximity to academic institutions may stimulate licensing activities and provide advantages for firms in geographically bound areas especially ensuring up to date scientific developments and radical innovations, facilitating interpersonal contacts and providing qualified human capital. As highlighted by Saxenien (1994), the most important mechanism to facilitate knowledge spillover involves the mobility of human capital, embodied by graduated students. The educational investment contributes to stimulate local innovation and creativity and has been identified as a central factor for economic development. It is indeed shown from scholars that human capital levels are diverging, and the differences are growing larger and more pronounced across regions with evident differences in their economic development. Highly skilled and well educated people, which are the well-known output of higher education institutions, are the ultimate driver of economic development (Florida et al. 2008).

Literature has also provided evidence that the geographical localized and spatially bound influence of knowledge spillovers may even affect the choice of establishment of technological-based firms (Audretsch et al. 2005). Indeed, these have the tendency to localize closer to academic institutions in order to better exploit universities' resources. In this way, proximity may facilitate the transfer of both knowledge and technological solutions increasing firms' propensity towards innovation. In this regard, the area in which universities are embedded is more attractive for firms, enhancing local entrepreneurial and therefore a higher number of jobs.

According to the benefits that arise from universities localization in terms of economic development we argue that the presence of a university at a municipality level should have a significant effect on the local economic development – i.e., employment rate, of the latter.

H1. The presence of a university in a municipality may positively influence its employment rate.

2.1. University competition

From a theoretical point of view, the competition among universities must be examined from the point of view of the "quasi-market" models (Le Grand 1991): 'markets' because universities move from monopolistic form of structure, 'quasi' because they differ from conventional markets conditions. On the *supply side*, producers (academic institutions) are not necessarily in competition to maximize their value, they are generally non-profit organizations and must be accredited and recognized by the government to enter the higher education industry. On the *demand side*, consumers (students) power of acquisition is not defined in terms of cash, but occurred in terms of fees, public subsidies following individual students, vouchers and future expected incomes.

A further theoretical framework is of help to describe university competition in the Italian framework, that of yardstick competition (Shleifer 1985). The higher education market consists of a natural oligopoly, where a regulatory scheme defines the rules for organizations that are going to be rewarded on the basis of a comparison with other institutions. Governments funding are indeed made available to those universities that yearly increase their performance and compete successfully. In Italy, universities compete for a limited amount of resources. At the beginning of each ear the Ministry of University and Research provides

resources at universities based on their performance, which they must both improve with respect to the performance of the previous year and those of other competitors.

Therefore, the 'market' for higher education is very different from the commercial one. Besides, universities are different from each other, they focus on different missions, they have different level of quality and rely on different financial resources. Because of this heterogeneity in objectives and structures, competition is far from being a well-investigated issue, specifically from an empirical point of view (Agasisti 2009).

2.1 Competition for students

A more active market for attracting students is establishing in higher education systems. At a global level, world-class universities compete for the best students to maintain and increase their prestige. These student-magnet universities do not have difficulties in attracting talents. Students are driven by a higher positional good that the courses taken at those universities are able to offer in the labour and academic markets. At the same time, these universities can select only the brightest students imposing the *numerus clausus* to improve the quality of the education provided.

On the other side, non-leading research universities compete for students too, since they represent the inputs needed to produce education and to receive more financial resources both through tuition fees and government transfers. As a consequence, students' attractiveness becomes a primary objective for higher education institutions and drive local competition. In these terms, one theme to be investigated is the competition in students' attractiveness as viewed spatially.

2.2 University competition and regional development

University competition appears to have a geographical-space dimension in addition to the product-space one (Rothschild and White 1995). As a matter of fact, universities are likely to contend human resources at a local/regional level. Students choices are indeed made in a hierarchical fashion and this highlight the presence of institutional competition among universities (Sà et al. 2003).

From a theoretical perspective, we argue that in both the cases – i.e. the best and/or the largest number of students, university competition has an impact on local development. First, when universities aim to attract the best students, they generally feature the best academics, highly equipped laboratories and libraries, and more valuable programs (e.g. courses taught in English). Moreover, students have also the opportunity to learn better because of the interaction with other abler students (e.g. Epple et al. 2003). As a direct consequence, a more competitive university may offer the bests students to the local environment, also amplifying their skills and productivity thanks to the resources made available.

Second, non-leading universities compete for the higher number of students to attract more fess and financial transfers from the government. In this regard, they make consequently available highly skilled human resources to the industry. Students have been already identified as crucial for regional development because they contribute to the virtuous cycle of entrepreneurialism in regions being conduit between universities and industry (Bramwell and Wolfe 2008).

Drawing upon the spatial analysis theory, we expect that the closer the universities are to a specific area (municipality) the greater is the effect of the level of universities' competition on the economic development of that specific area. Fig. 1 is of help in better explaining this issue. Black points represent municipalities, while cycles (the areas in which academic institutions is competitive) symbolize the spillover area of each university. In this

respect, we argue that the municipalities included in the small area in dark grey, which is subject to the effects of three different universities, benefit from the higher level of competition that arises among academic institutions.

[INSERT SOMEWHERE HERE FIGURE 1]

H2. The closer are universities to a municipality the higher is the employment rate of the latter

We further consider the quality of the universities that are supposed to compete at a local level. If the proximity to different universities contributes to generate more economic development for a single municipality, this is stronger with more eminent institutions. The main underlying assumption is that high quality-level universities may provide to more qualified resources, in terms of graduate students, academic staff and physical resources such as laboratories or business incubators. One the one side, this allows to increase the amount of highly skilled human capital that may contribute to increase the local economy.

H3. The higher is the quality of universities closer to a municipality the higher is the employment rate of the latter

Finally, a further important university feature is here considered, that of diversity. Diversification of activities has been one of the most discussed theme in industrial organization debates (e.g. Porter 1980). Organizations tend to diversify when they attempt to compete with other players on the market, both for proactive and defense reasons.

Nevertheless, the theoretical link between diversity and competition is not unanimous in the higher education literature (Teixera et al. 2012).

Nowadays, higher education institutions seem to be subject to a significant force, that of globalization. In order to compliance with international demands, they adapt themselves to global standards corroborating the new institutional theory of isomorphism (DiMaggio and Powell 1983). Literature accounts for both the divergence and the convergence perspective. On the one side, early studies argue that universities are characterized by an intrinsic propensity towards diversification and increasing level of diversity (e.g. Parsons and Platt 1973, Clark 1978). On the other side, the de-differentiation thesis has been empirically demonstrated for specific higher education systems (e.g. Rhoades 1990, Birnbaum 1993). Most recently, these opposite university behaviors are integrated in a twofold perspective wherein the isomorphic pressure of globalization is countered by the need to respond to environmental forces and to consider the specific cultural characteristics that each universities inherited from the past (Vaira 2004).

In spite of the trend of homogenization, the diversity of universities is not abolished in European countries (Guri-Rosenblit and Sebkova 2004). The UNESCO (2003) report suggests that diversity is a crucial factor that will be preserved in the future with respect to convergence forces. Actually, the heterogeneity of various higher education institutions is also highlighted by the U-Multirank project, carried out by the European Commission and the Consortium for Higher Education and Research Performance Assessment (CHERPA). This project aims at a new ranking which explicitly considers universities' multiple dimensions (Teaching & Learning; Research; Knowledge transfer; International orientation; Regional engagement), overcoming the difficulties of current international rankings. Vertical and horizontal diversity of universities, in addition to the increased number of missions, are

indeed identified as the main critical factors when comparing university performance (Saisana et al. 2011).

In the university market, the offer of different programs may be a crucial factor to attract new students. Tighter competition may even contribute to stimulate private institutions to diversity they programmatic offer in fields which are far from their main initial expertise (e.g. Health courses) (Texeira et al. 2012).

H4. The higher is the diversity of universities closer to a municipality the higher is the employment rate of the latter

3. Research design

3.1 Data and Sources

In order to assess the impact of university competition on local development i.e. - municipalities, we analyse a sample of 77 Italian universities and 8,088 Italian municipalities. Different datasets were used to collect information for the year 2010.

Concerning the data on universities, such as the number of students and professors and their diversity we rely on the public data provided by the MIUR (Ministry of University and Research). On the other side, all information at a municipality level were gathered from ISTAT (Istituto Nazionale di Statistica) and Urbistat. In particular, the former provides the "Atlante Statistico dei Comuni Italiani" which collects data on the characteristics of municipalities (e.g. altitude, etc..), and other features like the level of education, health and transportation. On the other side Urbistat (http://www.urbistat.com/en), a geomarketing platform, provides data on the employment rate at a municipality level.

With respect to the distance between universities and each municipality we build up with a matrix W (8,088 x 77), using a testing tool, IMacros, (http://www.iopus.com/imacros/), which helps us to automatically replay and record the results of our query to calculate the distance using Google Maps.

3.2 Measurements of variables

In order to measure the local economic development at a municipality level we consider as dependent variable the employment rate. As exposed such proxy represents one of the main concept when dealing with this type of analysis.

Regarding the independent variables, we first create a dummy variable equals to 1 for those municipalities in which at least a university is locally established[2]. In this respect, we directly measure the impact of a university on each territory, without consider the impact of different institutions. To deal with this last issue, we secondly introduce a different independent variable, which is related to traditional accessibility indices from spatial interaction theory (e.g. Weibull 1975, Anselin et al. 1997). We create a gravity measure. For each municipality we consider only the closer 5 universities and we use an exponential function to model the university–municipality distance. According to Anselin et al. (1997):

$$GRAV = \sum_{i=1}^{n} U_i e^{-d}$$

We consider three different specifications for U_i: (1) University distribution, (2) University quality, (3) University diversity.

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[2] Considering as a robustness check the number of universities per municipality, our results are similar and still consistent.

(1) University distribution = The distance from the closer 5 universities to each municipality.

(2) University quality = The student-ratio is here considered as a well-known indicator of quality of higher education institutions (Sà et al. 2003).

(3) University diversity = We use the Herfindahl-Hirschmann index. This indicator is generally used to measure industry concentration but it is becoming also popular to measure diversity in different other fields, such as technological diversity (e.g. Garcia-Vega 2006). Specifically, we consider the following form of the Herfindahl-Hirschmann index: 1-HHI in order to have a measure of diversification than of concentration. We focus on the range of educational fields offered by each university as a measure of programmatic diversification (Teixeira et al. 2012). Different courses indeed define separate markets. "Programmatic diversity" refers to five different subjects: *Arts and Humanities, Engineering and Technology, Clinical medicine and pharmacy, Natural sciences, Social sciences*. Each university can be involved in different areas. The diversity index weights each area for the sum of subjects covered by each university. When the value is equal to 1 it means that a university is involved in all five education fields.

We include a set of control variables in all our regressions to consider the differences in the municipalities' employment rates. Specifically, we include different determinants of employment drawing upon the labor economic theory, such as the GDP per capita, the population density, the percentage of foreigners and the migration rate. Furthermore, we control for the economic structure of each municipality considering the number of firms pro-capite, their profitability and size.

3.3 Descriptive statistics

Table 1 reports average values for the variables included in the regression analysis. We split the sample with respect to the presence of a university in a municipality and the median value of the distribution of the closer 5 universities to a municipality, the quality of these universities and their level of diversity. Significant levels base on t-statistics (mean) reveals that municipalities wherein at least a university is established (53) have a higher employment rate (at a 1% significant level). This is also the case when considering those municipalities that can benefit from the proximity to different academic institutions (at a 1% significant level). Moreover, the same level of significance have been found when evaluating the impact of university quality and university diversity, where each of these variables is weighted for the distance from municipalities.

[INSERT SOMEWHERE HERE TABLE 1]

4. Econometric Results

Using OLS regressions we investigate (1) the relationship between the employment rate and the presence of a university in a municipality, (2) the distribution of the closest 5 universities to any specific municipality, (3) the quality of the closest universities and (4) their diversity.

[INSERT SOMEWHERE HERE TABLE 2]

Table 2 reports the results of our regression analyses. After controlling for some determinants of the employment rate, as the income pro-capite, the migration rate and the percentage of foreigners, and the economic/services structure of a municipality, as the number of firms pro capite, their size (sales) and their profitability, Model (1) shows that the presence of a

university positively and significantly affects the employment rate (at a 1% significant level). Model (2) documents that the greater is the interaction among universities on a specific area the higher are the benefit for the latter. The coefficient of our gravity variable is positive and highly significant (at a 1% significant level).

Model (3) notes how this positive impact on the local employment rate is also positively affected by the quality of an academic institutions, which is supposed to provide more skilled human capital. Finally, Model (4) suggests that the higher is the diversity of the universities closer to a municipality the higher is the employment rate in that area. In particular, the more diversified is a university the higher is the probability that is able to fulfill different needs of the local context. Universities indeed contribute to the local and the economic development in a significant way. They do not only provide commercializable knowledge and qualified researchers, but they foster social integration, they generate and attract talent on the local economy and they provide technical support to the local industry (Bramwell and Wolfe 2008).

Among control variables, we find that the higher is the population density the lower is the employment because of the large number of people that should find a job in the same area. The per capita income and the other economic indicators are positive and highly significant across all Models (at a 1% significant level).

Our results document a positive link between the intensity of competition and local development. When universities are competing in the same catchment area, it is likely that more students are travelling to and from that area boosting its development. In particular, we find that universities might act as catalysts of local development and that this increases when they face a higher level of competition in a local area.

5. Conclusions

In this paper we investigate the role played by university competition in boosting local development. The analysis is based on the population of 77 Italian universities and 8,088 municipalities. Results show that, *ceteris paribus*, an increase of university competition positively influence local development, which is measured by the employment rate, because this contributes to increase the quality of the resources that each university may locally provide, as high skilled human capital and scientific results. Therefore, in addition to the well-known role that universities play as innovators in knowledge-based societies, this paper notes that the recent changes affecting their behavior may have an impact on local growth.

Our work contributes to prior knowledge on university competition offering policy insights. Governments could indeed decide to increase the amount of financial resources that are allocated in a competitive way with respect to the number of students. In this way, increasing the level of university competition, policymakers may indirectly act on the development of the society. Actually, the global financial recession is likely to results in higher unemployment for some time in many European, and not only, countries. Therefore, investments in education could be an important policy response to overcome this critical situation.

This analysis is a first attempt to investigate the effect of university competition at a local level. Nevertheless, some limitations should be noted and addressed in future developments. First, according to the most recent literature on regional studies, it should be interesting to consider other form of local development, more inclined to measure some qualitative aspects (e.g. the health and the satisfaction of citizens).

Second, the concept of university competition is not the same in different countries, because of the level of autonomy that each government provide to the higher education system. For instance, Anglo-Saxon higher education systems are completely different. Future development should consider different higher education systems, or a comparative approach.

Finally, a panel data analysis could be of help to evaluate the contribution that universities and, especially their level of competition, have generate over time in the Italian context in terms of employment growth.
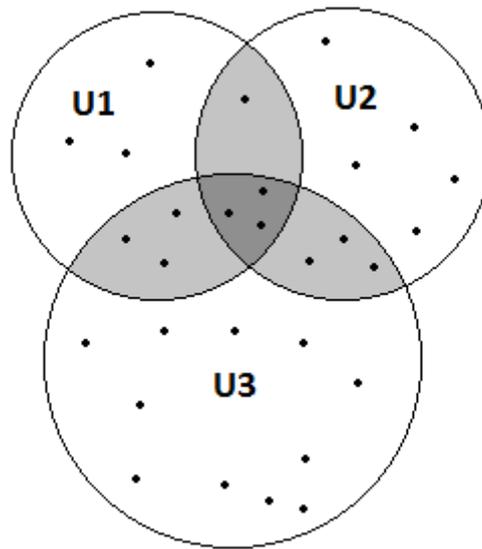
Fig. 1 University competition

Table 1. Descriptive statistics
Table report average data. Statistical tests compare two groups, municipalities with universities and municipalities without universities, in the University presence case. In the other cases the two groups, below an above the median value of university quality and diversity, are statistically compared Significance levels at 1% (***), 5% (**), and 10% (*) are based on t statistics (mean).

University presence		University distribution	
No	Yes	< Median	> Median
89.53	94.76***	88.72	90.41***
8035	*53*	*4042*	*4046*
University quality		**University diversity**	
< Median	> Median	< Median	> Median
89.39	89.74***	89.32	89.81***
3995	*4093*	*4037*	*4051*

Table 2. Ordinary least squares (OLS) regressions on university research performance

	1	2	3	4
Per capita income	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Population density	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
% Foreigners	31.652***	31.484***	31.511***	31.663***
	(1.316)	(1.318)	(1.316)	(1.317)
Migration rate	-0.003	-0.004	-0.004	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)
No. of firms pro capite	18.557	22.544*	23.752*	17.657
	(13.269)	(13.275)	(13.258)	(13.309)
Firms' profitability pro capite	12.871**	12.698**	12.833**	12.873**
	(5.560)	(5.569)	(5.561)	(5.565)
Firms' size pro capite	0.011**	0.010**	0.010**	0.011**
	(0.005)	(0.005)	(0.005)	(0.005)
University dummy	3.168***			
	(0.540)			
GRAV_Univ distribution		5.608***		
		(2.126)		
GRAV_Univ quality			0.332***	
			(0.061)	
GRAV_Programmatic diversity				4.373***
				(0.989)
Constant	76.880***	76.831***	76.838***	76.863***
	(0.157)	(0.157)	(0.157)	(0.157)
Observations	8,088	8,088	8,088	8,088
R-squared	0.539	0.537	0.539	0.538

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