

TRIPLE HELIX XI

The Triple Helix in a context of global change: continuing, mutating or unravelling?

7. *Place based innovations*

KNOWLEDGE BASED DEVELOPMENT IN UNIVERSITY TOWNS

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1. Introduction

In recent years, universities have become more and more active in playing new roles which have been added to the most traditional ones of being *knowledge factories* and *human capital factories*. This has led to a number of changes, among which an evolution of their role within urban and regional contexts and, in particular, an increase in their impact on the development of mid-sized university towns.

Universities have progressively opened more towards the external world and have paid a lot of attention to the diffusion and economic exploitation of research results (from this perspective, universities are considered as *technology transfer factories*); at the same time they have started to embrace a new mission, which consists in the animation of economic and social development processes and the generation of new capacities and innovative projects, starting from the regions and cities in which they are present (that is, universities as *territorial development factories*) (Lazzeroni e Piccaluga, 2003). Through a number of initiatives and actions, such as incubators, new services for technology transfer, participation to local development agencies, etc., universities nowadays interact with firms in a number of new ways and are considered as important actors in innovation policies, thanks to their efforts in promoting knowledge transfer and contributing to the processes of clustering, including small territorial systems (Lawton Smith, 2007).

Within this kind of an evolution, the present paper aims at analysing the relations between universities and territorial contexts. In particular, it highlights how universities can play a role in knowledge and economic development, especially in the case of medium sized university towns, also considering social and cultural components and their effects on urban identity. In fact, the contribution of the university to the development of cities, especially small and medium-sized ones, is very complex and cannot be analysed only through economic parameters and knowledge indicators. In fact, beyond the direct economic impact on the surrounding areas, universities affect the cultural and creative

level of cities and their ability to open up, becoming a platform able to create and absorb innovation and a driver of urban development.

2. The theoretical state of art

2.1 The contribution of the university to regional development

The starting point of our work is the literature about the relationship between university and territory. Since the early '90s some studies have begun to emphasize the role of the university in the production and diffusion of knowledge and have advocated an increase in the relations between universities and firms, also through the implementation of policies at central and local levels. The Triple Helix model is the synthesis of these studies which highlight how the knowledge economy should be based on the interaction among university, industry and government (Etzkowitz and Leydesdorff, 1997).

Alongside this growing awareness about the importance of the university as an engine for development, the academic literature has studied the impact - including the territorial one - of the university and its research laboratories on the industrial trajectories of a region and its ability to produce and absorb knowledge, transforming it into a "learning region" according to the definition introduced by Morgan and other authors (Morgan, 1997).

Among the most significant studies on the geographical impact of the university, we can include those on research spillovers, which highlight not only the effects on industrial sectors, but also their geographical and temporal extension (Acs, Audretsch, Feldman 1994; Anselin, Varga, Acs 1997). The results of some of these studies emphasise the role of proximity: the university activity causes spillovers which in many cases are mostly local and regional (Bottazzi, Petri 2003); for part of the literature, this is determined by the presence of informal networks and face-to-face communications between individuals, which facilitate the transmission of knowledge, especially the tacit, complex and systemic one, which is harder to transmit.

The diffusion of knowledge from the university to the surrounding area is also assured by the training of qualified human resources who, through their integration in existing activities and the creation of new start-ups, are the main holders of scientific and technological competences and the major vectors in the circulation processes of this knowledge. As demonstrated by Breschi and Lissoni (2009), the qualified human capital is one of the main components of the transfer of inventions from the university and of the agglomeration dynamics regarding research and high-tech activities: its limited mobility in space determines the spread of predominantly localized spillovers, which benefit the local system, but often limit the potential development which could be triggered by a wider circulation.

However, the university does not contribute to the development of the surrounding area only through spontaneous scientific spillovers or through the attraction and training of qualified human resources, who concentrate in a specific area and generate new ideas, innovations, entrepreneurship. The openness of the university and its transformation into an institution which pays particular attention to technology transfer and to the interaction with the surrounding area have been supported by two other solicitations, one exogenous, the other endogenous.

The first is linked to the emergence of a model of economic development which is no more linear but rather based on openness and interactivity (Open Innovation model, Chesbrough, 2006), so that the contribution of the university and its interaction with the industrial world also become crucial; for these reasons governments at central level, but also at regional and local ones, stimulate the process of knowledge transfer from university to the production system context, for example by funding the creation of new firms (Chiesa and Piccaluga, 2000) or supporting platforms and tools for the exchange and sharing of knowledge between different institutions (Lanzara and Lazzeroni, 2001).

The second solicitation is inwards, towards the university environment. In fact, to implement the change and also to find alternative forms of funding (beyond public funds), the university has set up new functions and activities, which Youtie and Shapira (2008) defined as “boundary spanning”: people, practices, discourses, behaviours that facilitate the interaction with the outside world and create bridges between the boundaries of different actors. Within this kind of bridges we can mention the establishment of technology transfer offices and links between universities and firms, the definition of protocols and organizational practices for the protection and exploitation of research results, the emergence of new behaviours among researchers, more open to the interaction with the industrial and institutional actors.

In more recent years, the literature has increasingly emphasised the cultural role of the university as a centre of production of new ideas, as an important actor in local networks, as a relevant presence in the community and as a place of expression of original and critic positions (Chatterton, 2000). The originality, the freedom of expression and the openness to novelty all impact on the levels of innovation, not only in the university, but also on the territory as a whole, which raises its cosmopolitan attitude and its ability to absorb ideas and innovations from the outside and to combine them in a creative way with the internal and contextual knowledge (Cooke, 2005).

2.2 The role of small and medium-sized cities in the knowledge economy

Together with the literature on the relationships between universities and the surrounding territories, we have taken into account urban studies about the role of small and medium-sized cities (SMCs) within a development paradigm based on knowledge and creative and innovative activities. In fact, in the recent scientific debate on urban competitiveness,

specific attention is given to small and medium-sized cities and to their opportunities to grow and enter the international circuits of production and dissemination of knowledge.

If we consider some diffused economic indicators, the role of large cities in the dynamics of economic development at global level emerges because they have the critical mass necessary to receive qualified human resources, to strengthen and expand technologically advanced activities, to attract external investment and to promote new businesses, to exercise control functions on the financial flows and on the centres of power, to offer high cultural services and amenities (Sassen 2001; Glaeser and Gottlieb, 2006).

However, we must keep in mind two aspects that can re-evaluate the role of SMCs in the urban hierarchies. First, the definition of SMCs is related not only to the contextual components, but also to the relational dimension: "small cities are what they are though the relations they have and develop" (Van Heur, 2011), both at the local level, but also at the translocal level, that is the ability to connect with other territories and to enter the international circuits. Such connection capability is particularly relevant in the current dynamics of production and dissemination of knowledge, in which technological progress is increasingly linked to the ability to integrate internal and external knowledge resources, to exploit tacit knowledge and to absorb the codified knowledge, which circulates globally. Secondly, some studies (Lazzeroni, 2010) have shown that, although the large cities or the advanced technological districts are always the main centres of generation of the majority of new knowledge, smaller urban centres, specialized in specific fields of knowledge, are also able to enter and to be recognized in the national and international circuits. We can define these cases as "territorial niches", that is, smaller urban systems that are able to enhance their advanced and distinctive skills in a specific field of science and technology and to make them an engine of local development.

Consequently, enhancing research and advanced training, small and medium cities can increase on the one hand their ability to collaborate with the external environment and to enter into international networks of knowledge, increasing their position in the urban hierarchies; on the other hand they can raise their cultural heritage and skills platforms stratified in the local system, making them more recognizable and attractive (Lazzeroni *et al.*, 2013).

2.3 The university towns: what economic and cultural development?

In this framework regarding the emergence of the knowledge economy and the search for new models of urban development, the university may generate changes in small and medium-sized cities, becoming a major player of transformation and growth.

The first contribution which the university produces in the urban system is certainly of an economic nature, since the university in small and medium cities becomes an important employer; many studies have focused the attention on defining methods for measuring the economic impact of the university through the identification of a multiplier index, able to

provide an overall estimate of spillovers (Siegfried *et al.*, 2007). These estimates include salaries for direct employment, investments in equipment, supplies and services, construction costs; spending to the local community by faculties, administrative staff and students, etc., factors which strongly influence the urban economy of a university town.

Universities in medium and small size cities make a positive contribution both economically and culturally, even going to condition their resilience, that is, the ability to resist in front of economic scenarios of crisis, to adapt to changes and self-regenerate reinventing themselves, to keep pace with technological change (Dawley *et al.*, 2010). They also contribute to the attraction of young and qualified human resources, who otherwise would not be present in small cities and can represent an important asset for the formation of new start-ups, specialized in advanced sectors. These high-tech companies would unlikely be active in urban context of this size without the presence of universities, with the consequent advantage of helping to open up new technological trajectories in areas where some industrial sectors are approaching maturity or even obsolescence.

In addition, the university plays an important role for urban growth, especially if it becomes a relational vector, that is, an urban actor and a connection node between local and global level, playing the role of knowledge gatekeeper, that is, a cross organization active in transferring the results of its research both internationally and in the regional context (Altbach, 1987; Lazzeroni, 2004). While large cities have different organisations which play this role, universities located in small and medium-sized cities can instead represent the most significant actor, if they can develop, as well as good results from scientific point of view, connections skills, that is, abilities to build bridges with external institutions, which are formed not only by knowledge and technologies, but also by new forms of organization, regulatory practices, behaviors, etc.

Universities may also play a very important role in the construction of urban identity, in particular for small and medium-sized cities. While the contribution of the university in the large city is present, but it is dispersed or integrated with that of other actors so that the identity which emerges is often multifaceted, the presence of the university in small cities greatly affects their identity, formed by material and immaterial components and marked by visible signs and symbols.

Considering the material components of identity, we can include "historical" places of the university presence, new structures dedicated to research and teaching, old buildings and spaces restored for other uses, incubators for new start-up, etc. We can also consider part of the university town identity the "traces" associated with the presence of young students, many of whom come from outside, who represent a significant portion of the population: the places of study, meeting, entertainment, etc. With regard to intangible components, the cultural contribution of the university may be even more evident in small and medium-sized cities: its presence and activities can ensure the attraction of young talents; influence the openness to differences and to inclusion by the local community; stimulate new initiatives

in the surrounding area; make the city smarter, more reactive to changes and more careful to the quality of life and to territorial sustainability. At the same time, the university can be an important partner in the planning of the city and it can play a civic role, providing support to the construction of social spaces for public and pluralist discussion and to the definition shared development visions of city (Navowsky, 2006).

3. The methodologies of analysis

On the basis of the cited literature and in order to define an appropriate methodology, the contribution of universities to urban development can be analysed from five different perspectives:

- 1) *a cognitive perspective*, according to which universities contribute to the development of new fields of knowledge and new technological sectors and to the integration between tacit knowledge, which is produced at local level, and codified knowledge, which circulates at the global one; the mobility of qualified human resources represents the main vector of knowledge diffusion processes;
- 2) *an economic perspective*, according to which universities are important economic actors, especially for small and medium sized cities, since they offer many highly skilled jobs; they also produce direct and indirect economic impact (from qualified research services to elementary ones connected to the use and the maintainance of structures and spaces); the scientific activity and the training of young graduates generate a favourable context for the creation of scientific spin-off companies, supported by incubators and technology transfer activities;
- 3) *a social perspective*, according to which university activity involves the presence of physical and virtual facilities, such as libraries, laboratories, telematic facilities, which can have a positive impact on all urban contexts and on the cultural level of the local community; universities can therefore partially assume a civic role, supporting the construction of places and occasions for public and pluralist debate; for instance, some studies show the relation between the presence of a university in a territorial context and the propensity of the residents to collaborate for the collective good, to participate actively in political events, to promote a sustainable quality of life;
- 4) *a relational perspective*, according to which universities are important actors and can play a central role in the local networking and in the dynamics of urban governance; at the same time, they guarantee the internationalization process of a territorial context, playing the role of *knowledge gatekeeper*, through the mobility of human resources, the circulation of knowledge through publications, conference communications, patents;

- 5) *a cultural perspective*, according to which the presence of the university leaves traces on the entire urban landscape, in terms of research and high-tech infrastructures and living spaces of the student population and researchers, which become visible signs and symbols of the city. The cultural perspective highlights the role of the university in relation to the construction of the urban identity and to its attitude to be open and inclusive.

Considering these perspectives, the paper analyzes cases of European medium sized university towns, i.e. medium sized towns in which the presence of one or more universities represents the most relevant economic and cultural player. The case studies are Oxford in England, Leuven in Belgium and Pisa in Italy. In particular, the history of the relation between the university and the urban development in these towns is described, considering both material and immaterial components; we then discuss the relevance of universities as actors of urban transformation, hubs for the production of knowledge as well as technological innovation, centres for new cultural and innovative projects (not only from a technological point of view), considering them as actors of urban governance as well as relevant players in international relations.

From the empirical point of view, we will use some quantitative data to assess and compare the impact of the universities and such analysis will be enriched by some qualitative tools, obtained through interviews with some opinion leaders or experts, existing reports and sources of visual analysis used to explain the visible signs of the presence of the university and its significance for the urban identity.

More precisely, the analysis of the three towns and the relationship between the university and the urban environment has been characterized by three phases:

- the reconstruction of the evolution of the university and its presence in the city, becoming an engine for development and an agent of urban transformation. The approach used is the narrative one, which tends to "tell" the stages of the development of the university and to identify the elements of continuity and discontinuity, applying the techniques of the life stories to a place (Viteritti 2000). In this phase of the research, we used information from existing reports and, in the case of Pisa, completed it with interviews with opinion leaders or experts in this subject;
- the synthesis of the consistency of research, training and technology transfer activities in order to highlight the transformation of the university missions, which have developed from simple knowledge factories to real nodes of innovation development and landmarks for the surrounding territory, also in relation to the global economy. In this part of the research, quantitative data were collected not only about the classical parameters of the university, but, above all, those which give rise to the novelty (patents, spin-off companies, etc.) and recent models of development and interaction with the outside (individuals, practices, behaviors of boundary spanning, etc.) (Lazzeroni and Piccaluga 2003; Piccaluga et al. 2012).

- the focus on the relationship between universities and cities, emphasizing how the material components of the university in the city (buildings, places of aggregation, libraries, leisure centers, etc.) become an integral part of the urban structure and its own identity. To highlight this aspect, we have drawn from the methods of visual analysis (Rose, 2001, Bignante 2011): more precisely, photographs, taken by others or self-produced, are used in order to capture not only the visible traces of the university presence, but also the meanings behind these tangible elements, which are going to affect urban identity (Lazzeroni 2013). At an advanced stage of research, the most significant photographs will be collected from opinion leaders and experts who will provide their view on the city and on the university's contribution to urban development; they will also be able to identify symbols which they consider the most relevant to indicate the link between the university and the town.

4. The presentation of case studies of university towns

The cases which have been analyzed can be considered homogeneous since they concern universities of ancient foundation in medium-sized towns. The case studies show that universities can really influence and have a positive impact on the development of medium-sized towns and on their ranking in urban hierarchies; although the presence of the university is pervasive and characterised by material marks, the relationship between university and town reveals different in the various cases.

Oxford was founded, according to the first available documents, in 1096, but the formal recognition as university took place only in 1571, after a few centuries of activity. It is one of the oldest and most prestigious universities in the world, counting among its graduates 47 Nobel Prizes. Around 22,000 students are enrolled at the University of Oxford; a third of whom are foreigners, which indicates the high degree of internationalization of the university and consequently of the town, which has a population of 150,000 inhabitants. The university staff consists of 1589 units, who can count on 4100 collaborators and technicians. 41% of academic staff come from almost 100 different countries. The international character of Oxford University is also confirmed by the presence of various centres and institutes for the study of globalisation processes and for specific countries and regions. Oxford has developed many areas of research, reaching levels of excellence in the fields of medicine, life sciences, biotechnology and human and social sciences. These advanced research activities have led to the development of high-tech activities, operating in close connection with the university, and to the clusterisation phenomenon in the Oxford high-tech city region (Lawton Smith, 2011). The University of Oxford is organised around colleges (38 colleges and 6 permanent private halls) scattered throughout the city, which represent the characteristic features of the Oxford urban

identity. The college system is one of the elements of the success of this university because it creates a very interesting environment for academics as well as for the interdisciplinary students community, with the result of a strong sense of belonging to the place and to the institution.

Leuven, 30 Km. from Brussels, in the Flanders region, is a town of 98,000 inhabitants, which hosts KU Leuven, which was founded in 1425 and is the oldest existing Catholic university in the world and the oldest university in Belgium. After periods of expansion and setbacks, the University of Leuven grew in the 19th and 20th centuries until 1968, when it was involved in a further change: the French-speaking part broke away and was located in a new area, around which a new city rose (Louvain-la-Neuve). The Flemish part remained in the historic city and has since then continued to expand in terms of research output and students attraction. It has educated prominent intellectuals, especially in the 16th century, a period characterised by the growth of humanities and great scientific and geographical discoveries; among such intellectuals, who are clearly present in specific landmarks in the town and in university promotion material, we can cite the humanist Erasmus, the anatomist Visalium, the geographer and cartographer Mercator.

At present, 41,255 students are enrolled at KU Leuven. The academic staff consists of 1022 professors and about 5000 junior researchers and PhD students, supported by technical and administrative staff (3219). The scientific and technological areas where the university is investing to facilitate relationships with industry and the impact on the local production system are four: life sciences, cleantech, nanotechnology, mechatronics & smart systems. The university was initially concentrated in the center of the city, where even now the humanities departments and the buildings which are considered symbols of the university are located; recently, the university system has been enriched by two other campuses (the first one for the schools of science and technology, the second one for medicine and the hospital).

The university presence in Pisa has always been an important component for the town (located in Tuscany, in central Italy, with a population of 85,859 according to 2011 census data) and has always, but especially since the Second War, attracted generations of students, especially from Southern Italy. The University of Pisa, which was formally created in 1343 and which includes Galileo Galilei among its most famous professors, currently has 53,466 students, 1,552 academic members and 1,467 administrative and technical staff. The main areas of specialization are the scientific and technological ones, especially mathematics and physics; such specializations started to strengthen since the 17th and 18th centuries, making Pisa one of the most significant places for national scientific meetings. It is also important to remember that in Pisa the first Italian electronic calculator (CEP) (1955-1961) was built and the first Italian university course in Computer

Science (1969) was started, proving the orientation of the system towards advanced science and the rising research field on the ICT (Information and Communication Technology).

In Pisa there are two other prestigious universities which offer the college life style to a limited number of highly selected students: the Scuola Normale Superiore and the Scuola Superiore Sant'Anna. The first one was founded in 1810 by Napoleon in order to form a new generation of school teachers; later it has become a university college, oriented not only to high level teaching, but also to scientific and research education; among its graduates it includes two Nobel Prizes: Enrico Fermi and Carlo Rubbia. The establishment of the Scuola Superiore Sant'Anna is more recent and took place through the merge of various pre-existing colleges. Scuola Normale Superiore is specialized in the humanities and basic scientific disciplines; Scuola Superiore Sant'Anna operates in the experimental and social sciences.

The presence of the university in Pisa has gradually generated other related activities: from the beginning of the '60s many research institutes of the National Research Council, working in partnership with the university, were developed in Pisa; the scientific specialization in computer science and electronics favoured, in a first phase, the attraction of companies from the outside and then the birth of research spin-offs, consolidating the territorial vocation towards the ICT. However, despite the presence of very advanced research and training institutions, the economic and social context of Pisa and its province do not seem to adequately support the relationship with the university, and some areas of possible collaborations are still relatively unexplored. From a spatial point of view, the research activities were mainly located in the Pisa town centre, where they are still present, and some of them were gradually moved to suburban areas, where new buildings and laboratories were built.

5. Preliminar interpretations of the empirical findings

5.1 The knowledge and economic impact

The University, including the colleges and Oxford University Press, is the largest employer in Oxford and according to estimates of the university itself it involves more than 16,500 people throughout the county of Oxfordshire. Oxford is an emblematic example of academic success and it has also produced relevant economic results in terms of the impact of research activity on both established companies and on start-up creation processes. Oxford, which has started earlier than Leuven and Pisa in the promotion of technology transfer actions, has also taken advantage of its geographical proximity to London.

In fact, the history of the university shows, since world war II, a progressive involvement of the institution in the dynamics of local development (Lawton Smith, 2011). However, the acquisition of a role as the main engine of development takes place mostly since the end of the 80s, when the Oxford University Research and Development Office (later renamed Isis Innovation) was established. The main contribution of these technology transfer activities has been the support to entrepreneurship processes, also through the setting up of incubators, which led to the creation of 80 spin-off companies based on academic research generated within and owned by the University; such a number can be also expressed as a ratio of 5 spin-off companies for every 100 professors. Considering the data about patents, the University of Oxford has 470 patent applications; the relationship between patents and academic staff is high: 29.6 patents every 100 professors. The presence of the University of Oxford has certainly contributed to the emergence and consolidation of a technological district, defined as the concentration of activities and high-tech companies in the area, with about 600 companies operating in the town for a total of 8,000 employees.

Leuven is also a town strongly oriented towards the production of knowledge, which has along the years also invested in exploiting the results of scientific research and in fostering the creation of spin-off companies. The K.U. Leuven Research & Development (LRD), the technology transfer office of KU Leuven, was established in 1972 as one of the first technology transfer offices in Europe. 98 are the spin-off companies created by the KU Leuven (9.6 every 100 professors), employing a total of approximately 3,000 employees. Regarding patents, KU Leuven counts 496 active patent families, 29 of which are granted; comparing the data to the number of academic staff, we can estimate about one patent every two professors. Advanced research activities, which rank KU among the most prestigious universities in Europe, and a long tradition in the field of technology transfer, have made Leuven an innovative urban environment, favourable to the creation and attraction of high-tech companies, and strengthened by the international openness and the existence of investment funds for start-up companies.

The University of Pisa is an important center for the production of knowledge, with strong research collaborations at both international and national level. The specific promotion of technology transfer activities has been started in 2003, when a Technology Transfer Office was formally opened. Since then, 25 spin-off companies have been established, mainly by young researchers, most of which in collaboration with public and private entities. The activity of these companies is concentrated in the life-sciences, ICT and aerospace industries. With regard to the patenting activity, by the end of 2012 the University of Pisa holds 96 national applications, including 54 issued patents, 14 U.S. applications, including 7 granted patents; 12 EPO applications, among which 4 issued patents.

The Scuola Superiore Sant'Anna, also present in Pisa, has been promoting since a longer period of time the creation of spin-off companies, inspired by the most advanced models of "entrepreneurial universities" at international level. Its TTO was formally established in 2005, but activities in this field were present since the early 1990s. In these years 41 spin-off companies have been set up; this number is particularly relevant if compared to the small number of Sant'Anna professors (the ratio is 3.7 spin-offs every 10 teachers) and to science and technology ones in particular. Scuola Superiore Sant'Anna holds 99 patent applications families, with an average of almost one per each professor.

Concerning the economic and social impact linked to the presence of students, the ratio between the number of students and residents is very high in the three cases, mainly due to the good/excellent quality of teaching and to the favourable environmental conditions. Pisa, for example, has a ratio of 62 students per 100 inhabitants, Leuven 42 and Oxford 15. These data show the high potential of the presence of "young brains" in such small size towns, which can determine a significant impact from the knowledge and economic point of view. However, the capacity of retaining the students in town after graduation and the promotion of new entrepreneurship are both very strong in Oxford, but weaker in the two other cases, especially in Pisa, even if this latter almost represents a best practice in the Italian context.

Table 1 – Figures about universities in Oxford, Leuven and Pisa

	University of Oxford	KU Leuven	University of Pisa
Year of foundation	1096*	1425	1343
Inhabitants (2012)	150,200	98,002	85,859
Students (total) (2012)	22,177	41,255	53,466
Students (foreign) (2012)	8,463	6,724	1,605
% foreign students	38.2	16.3	3.7
Students/inhabitants	14.8	42.1	62.3
University Departments (2012)	70	50	20
Academic Staff (2012)	1,589	1,022	1,552
Patent applications (2012)	470**	493***	122****
Spin-off companies (2012)	80	98	25
Patents/academic staff	29.6	48.5	7.9
Spin-offs/academic staff	5.0	9.6	1.6

Source: www.ox.ac.uk; www.ku.leuven.be and KU Leuven Research & Development; www.unipi.it, Social Balance of the University of Pisa and Statistic Observatory of the University of Pisa.

* The formal recognition took place in 1571, but the first documents about the University of Oxford date back to 1096.

** Patent application families.

*** Active patent families.

**** Sum of the national, EPO and US patent applications.

5.2 *The relational role*

Undoubtedly, the university is, in all three cases, an important *global player*, especially from the research point of view, even if Oxford University occupies a higher position in international rankings in comparison with the Catholic University of Leuven and the University of Pisa. In particular, the University of Oxford occupies the 5th place in the QS World University Rankings 2012-2013 (2nd place in the UK); this university climbs to 2nd place at the international level if we consider the Economics and Social Sciences and to 3rd place with regard to medicine and life sciences. Looking at another international ranking, the *Academica Ranking of World Universities (ARWU)*, compiled by Shanghai Jiaotong University, we Oxford is 10th at the international level (6th with regard to mathematics), while still achieving second place in the UK. These rankings are interesting if compared with the position of Oxford in the English ranking for population size, where it occupies the 122nd place.

The KU Leuven reaches the 82nd position in the QS World University ranking, rising to 60-70th position if we consider Arts/Humanities, Engineering/Technology and Life Science/Medicine. Leuven drops below the 100th position if evaluated with the parameters of the Shanghai ARWU classification (2nd in Belgium, together with the "twin" Catholic University of Louvain, only behind Ghent University), although it stands out in higher ranks in Engineering/Technology, Computer Science and Clinical Medicine. If we compare these results with the classification of cities in Belgium, based on the population size, Leuven is the 10th city with 97,656 inhabitants: also in this case the results in scientific and university field make the city recognizable at international level, independently from the size of its population.

Finally, if we consider the QS World University Rankings, Pisa does not occupy a very high position: in fact, it is 314th on a global level, but 5th at the national level after very large universities such as Bologna, La Sapienza in Rome, Polytechnic of Milan, Milan State University, Padua, even though, considering Natural Science and Art&Humanities, the University reaches respectively the 126th and the 157th ranking. Far better is the evaluation according to the indicators of the ARWU, which places Pisa between the 101st and the 150th position, with the highest position in the fields of Mathematics and Physics. The location is not too high at the international level, but at national level Pisa occupies the first place together with the University of Rome. In this case, the impact of the two universities on the demographic aspect of the cities is very different: Rome is the capital and the most populous city of Italy, while Pisa is a medium-sized city and is ranked 58th in the national demographic ranking.

Another indicator of the degree of the internationalization process is the attraction of foreign students and teachers. Just like the ability to attract foreign students, Oxford has a

very strong status at global level: a third of the students have foreign origins, and this allows the city to be a real “cultural melting pot”, which attracts talents from around the world, increasing the scientific and innovative capacities of the area. Leuven also shows a good ability to attract foreign students: they are almost 7,000, approximately 16% of the total number. Pisa, like other Italian universities, shows a lower degree of internationalization in comparison to other European structures: although growing, foreign students, enrolled at the University of Pisa are around 1600, approximately 3% of the student population. The international openness of the University of Pisa appears more related to scientific sphere and publications, rather than in education.

Concerning the relational role at local level, the importance of the university in the dynamics of economic and social development of the urban system is without a doubt. In Oxford and Leuven, the University is an important actor in the local networks, but probably at a first look it doesn't play a strategic role in urban planning. Pisa, despite the contribution in some projects of territorial innovation, seems to show a limited presence of the university in defining a vision of the development of the city.

5.3 The cultural perspective

The analysis of existing and new infrastructures and the analysis of social behaviours of university people (students, researchers, etc.) have also led to a first evaluation about how universities can contribute to the building up of a specific urban identity and to the definition of original development models based on scientific research, innovation and high-tech activities: all three case studies can be considered historic university towns for their ancient foundation and town campus, for the distribution of many old university buildings within the urban area.

In particular, the identity of Oxford is closely linked to the university, so that it constitutes the main element of identification and attraction also by outsiders. The urban landscape is strongly characterized by the presence of historic buildings of the university and of the colleges, which represent the symbol on the one side of the history of Oxford and England itself (one of the slogans for the city is: “Oxford: the historical heart of England”) and on the other of the present as city oriented to high-level research and training. At the same time, there are also new symbols of the university and knowledge city, consisting of two science parks and incubators. In the case of Oxford, we find the strict combination between research and innovation and a medium-sized urban context, characterized by a high quality of life and the stratified historical and cultural heritage¹.

Old and new symbols of the university are also found in the city of Leuven, considered as a campus town since management structures and some departments continue to be

¹ In fact, the brochure, which presents the characteristics of Oxford, exalts the values of community, location, flexibility, lifestyle, amenities.

concentrated in the center. For example Naamsestraat, where the University Hall is also located, can be considered "the university's mainstreet." Recently, the expansion and renovation of the university has led to the growth of new campus in Arenberg, situated in green areas at the periphery of Leuven, which houses the departments of Science and Technology, and campus Gasthuisberg, home to the hospital and the activities related to it. Other science parks and incubators are present in the town and in close areas: Haasrode Science Park, Leuven Noord Science Park, Waterschei - Genk Science Park, Tienen Science Park, Ubicenter, Remy Campus, Leuven Business Centre, Leuven Bio-Incubator. Both in Oxford and in Leuven, there is an attitude of conservation and enhancement of historic buildings as a sign of identity and symbols of recognition from the outside. If for Oxford this is a result of a spontaneous process, also determined by the organization of the universities in colleges, in Leuven it appears more responsive to target goals, aimed at strengthening the identity of the university town and the quality of life in the context, in order to attract students and researchers from abroad.

The University of Pisa, together with the Scuola Normale Superiore and the Scuola Sant'Anna, has headquarters and many buildings for research and teaching in the city center: some of them are important components of the urban landscape, both for insiders and outsiders, who are attracted by the historical and cultural heritage inherent in these structures. The life in Pisa is highly integrated with the university, as students and researchers daily walk through the city streets, where not only the university buildings are located, but also residences for students and meeting places. However, if the economic point of view the university is an important resource, the city has difficulty in recognizing it as the main identifying characteristic of urban identity. Furthermore, the community does not seem to identify with these parts of the city and also at the level of recognition abroad Pisa is best known as a city of the Leaning Tower, rather than as a university and knowledge town.

Figure 1 - The main symbols of university town of Oxford: the colleges and the Science Park of Oxford



Figure 2 - Old and new buildings of research activities: the library of KU Leuven and the Gasthuisberg campus

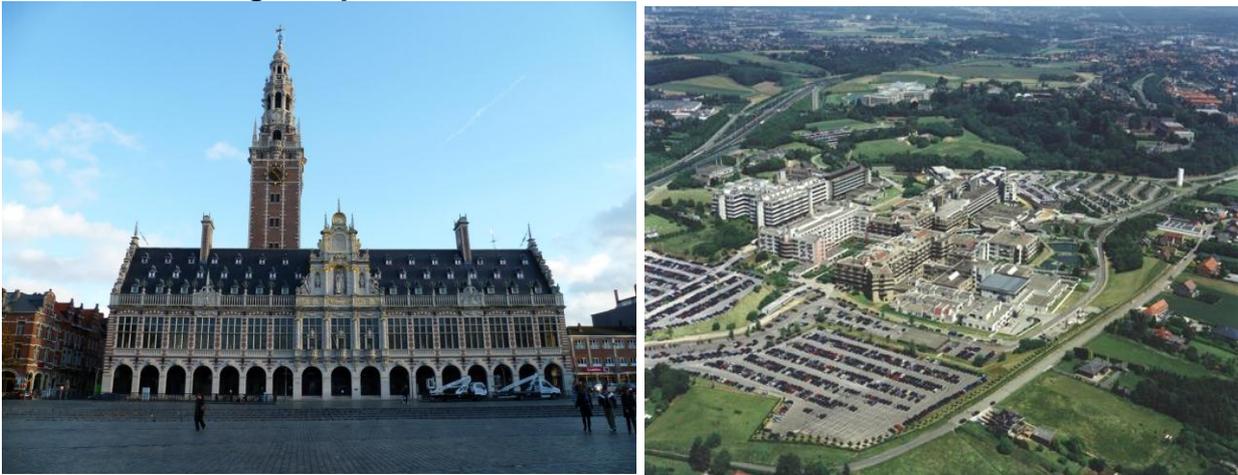


Fig. 3 - Centre and periphery in the location of university structures in Pisa



6. Conclusions

The theoretical and empirical findings, as well as the comparison among the three cases, have emphasised the importance of the university role in economic development processes in small-sized towns. The case studies are emblematic because, despite the small size of the three towns, the universities which are present have very old traditions and have maintained and strengthened a high level of research and teaching level; this is especially the situation of Oxford and Leuven, whereas Pisa is a bit slower in reaching international standards, for example with regard to the attraction of foreign students and perhaps professors.

Someone might argue about the difficult replicability of such models in other small size contexts, characterised by the presence of universities and research centres with minor traditions and reputation. As a matter of fact, the analyses presented in this paper have had the objective of discussing all potentialities linked to the presence of a university in a

certain territory which are not adequately explored, with the consequence of not exploiting the university capacity of increasing the resilience of small and medium sized towns in relation to the risk of being marginalised by larger centres, which are more often the main players in the knowledge economy.

Moreover, the recent increase in attention towards technology transfer processes has brought universities to better exploit their research results and this has determined more important spillovers towards the surrounding territory, both from an economic and a cultural point of view. Such spillovers favour the strengthening of a dynamic and creative environment, which is open to innovation and capable of absorbing knowledge and thus able to generate positive feedbacks for the university itself.

As a consequence, local policies, beyond strengthening university-industry relations and technology transfer processes, should also aim at having an impact on contextual conditions. These should include the objectives of increasing the presence and attractiveness of the university, improving living conditions, building adequate spaces and incubators for innovative companies, offering better housing and other services to young talents, promoting a town identity concretely based on scientific and technological knowledge as the main driver, considering the university as the main asset.

On the other side, the university should be more involved in the town's development processes and increasingly represent an important actor in urban governance, especially with a gatekeeping role. This includes bringing the town in international knowledge circuits and at the same time be active at local level, with tangible and intangible innovation traces. Also, in order to become an important reference point for the local community, it should become a social space where a variety of talents can express themselves, in order to generate new ideas and new models for economic development and urban governance.

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