

Enhancing the innovation based urban competitiveness

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1. Introduction

The situation of the studies on city or urban competitiveness (the two entities do not exactly overlap but we keep them as the same concept) through economic innovation is very complicated and not stably delineated yet.

Against an ever increasing interest by governments, public institutions, universities, research centres, scholars and the now huge mass of scientific and not scientific publication on the matter, joined to the formation of organisms and events specifically devoted to the topic, such as the Global Urban Competitiveness Project, as well as the elaboration of indicators by many more or less specialized organisms and bodies and the compilation of cities or urban areas competitiveness rankings, it is recognized the lack of a systematization of the matter, and, above all, of a scientific framework on which to firmly base the research and the rankings.

As a consequence, increasing attention is paid to urban competitiveness enhancement, as a way of attracting, people, investments, attention.

Perhaps, it is now the time to try to set up some steady points and approach the topic in a more comprehensive way in order to take account of all the subject involved in the many operations; in other words, to model the enhancement of urban competitiveness through innovation, based on the achievements got so far.

This is what we intend to do in this paper, after analyzing the state of art of

innovation and competitiveness in Europe and Italy.

Competitiveness should not be pursued whatever the cost: this is a basic point we want to put on the table and stress. Competitiveness must be balanced, consistent, eco-compatible, efficient, and sustainable.

The subjects involved in competitiveness are: enterprises, public and private organisms, institutions and bodies, school, households.

In Section 2 we analyze innovation and competitiveness and namely we define them. In Section 3 the state of art of innovation as a prerequisite for competitiveness is discussed in European Union (EU) framework, whereas in Section 4 the same is done for Italy. In Section 5 the innovation based competitiveness will be modelled in an ad hoc Computable General Equilibrium (CGE) models framework. Section 6 will conclude the paper with some remarks and indications for further analysis.

2. Innovation and Competitiveness

Defining Innovation

There is a widespread belief among economists, statisticians, geographers, as well as institutions, international organizations and entrepreneurs that innovation is a prerequisite for urban competitiveness and that the urban competitiveness enhancing passes through innovation.

An approach that might be commonly shared is that urban innovation can be specified as (i) economic or productive, (ii) political-administrative, (iii) social, and (iv) structural.

Urban economic-production innovation basically means innovation in enterprises.

Urban political-administrative innovation refers to the positive changes introduced in local government system, activity and policy and in the

administrative-bureaucratic organization.

Urban social innovation can be retraced in households' behaviour and attitudes improvement and updating to reach the commonly recognized high level standards.

Urban structural innovation relates to the amelioration in the tertiary sector, i.e., the education system, the environment (air and water pollution, waste management, natural resources preservation, cultural and monuments heritage defence and preservation), the logistic services (transportation, communication, information network, etc.), the tourism, the health system, the social atmosphere, in other words, all the elements, basically quantitative, that is, measurable, but in some cases also qualitative, intangible and non measurable, that, put together, form what is commonly called "living conditions" or "quality of life".

Innovation and namely economic innovation, results in enhancing urban competitiveness. As a matter of fact, innovation in enterprises transforms into economic improvements that in turn reflect on the increasing of basic economic aggregates such as Gross Domestic Product (GDP) or households' disposable income.

These increasing in turn impact in a chain on the growth of other economic aggregates to flow into an overall improvement of the living conditions of the urban population.

Lastly, if regarded in relative terms, that is, in a cross urban areas comparison framework, economic innovation produces a richer community and therefore a more competitive urban area.

However, not only economic innovation. There are the other above defined meanings for innovation that, although without resulting in direct economic improvement increase competitiveness, or. At least, do improve the quality of life, and therefore, finally also competitiveness, if for competitiveness one refers to a general

concept: better air, better gardens, better schools, better water, relaxed interpersonal mood and social atmosphere, all elements that make the urban area on the whole better and therefore, more competitive, if not in the sense of attracting more tourists, more persons who wants to go there to live, more investments.

How to measure this competitiveness is a question of setting up suitable indicators that then can be utilized to grading urban areas or cities.

We do not proceed in the direction of grading more or less competitive urban areas, our aim being to discuss innovation based competitiveness instead, typically, innovation in enterprises, i.e., economic innovation.

Defining Competitiveness

According to Buzzigoli and Viviani (2009), competitiveness is a dynamic concept, defining a behaviour pursuing a definite objective. Depending on the field of utilization, either international trade, or industrial organization or business economics or the like, different definition have been tried. Globalization further contributed to the proliferation of definitions and indicators.

Some economists, above all Krugman (1996), have warned against a generalized abuse of the concept. Just to give a rough idea, competitiveness is often confused with comparative advantage, attractiveness, performance (including the notions of profitability and productivity). Moreover, the definition should be adjusted to the level of economic analysis, macro, meso (the level of urban competitiveness) or micro levels.

Some definitions refer to a whole country or nation. Among them, it's worth quoting that given in 1996 by The World Economic Forum, Global Competitiveness Report as "the ability of a country to achieve sustained high rates of growth in GDP per capita".

Some refers to firm or industrial level and can be summarized in “a firm is competitive if it can produce products and services of superior quality and lower costs than its domestic and international competitors. Competitiveness is a synonym of a firm’s long-run profit performance and its ability to compensate its employees and provide superior returns to its owners”.

Some others are more general, such as “a basic means to raise the standard of living, provide jobs to the unemployed and eradicate poverty” or describing the multidimensional nature of the concept, like the one by OECD (1996) “supporting the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels”.

Finally, some definitions try to stress the relativity of the concept: “competitiveness is relative and not absolute. It depends on shareholder and customer values, financial strength which determines the ability to act and react within the competitive environment and the potential of people and technology in implementing the necessary strategic changes. Competitiveness can only be sustained if an appropriate balance is maintained between these factors which can be of conflicting nature”.

From a statistical point of view, the search of a proper definition of competitiveness cannot be separated from the definition of the measurement method and from the associated data generation process.

The manifold nature of competitiveness can be described by a series of characteristics:

- multi-defined;
- multi-measured;

- multi-layered (it can be applied to different levels);
- dependent (it depends on the objectives of the stakeholders);
- relative (evaluated by means of a comparison);
- dynamic (changing over time and context);
- related to processes.

The most natural concept of competitiveness is at firm level: a competitive firm is the one which is able to remain in business. It is often identified with the classical productivity, profitability (the ratio between revenue and cost), and performance (which integrates productivity and profitability with efficiency, effectiveness and adaptability) measures.

If it is true that innovation is a multifaceted concept, it is as true that the state of art of the debate and of the analyses, notably in Europe and Italy, innovation is a concept closely linked to enterprises, therefore, a typically economic concept.

Thus, also modelling competitiveness through innovation, that is the overall objective of this paper, is a question that concerns the production sphere essentially.

3. The EU Innovation Framework

In Europe, innovation specifically concerns the Small and Medium Enterprises (SME), along with the high-tech enterprises and the micro enterprises, including the household enterprises, represent the majority of the European enterprises

According to OECD (2000), for SMEs in the OECD, economic globalisation has created new competitors, especially in low labour cost countries, but also greater incentives and opportunities to access the various markets and knowledge sources needed to build lasting competitive advantage through continuous innovation.

SMEs are a heterogeneous population of firms whose contributions to the innovation system are wide ranging and include not only R&D based new products and services, but also improved designs and processes and the adoption of new technologies.

Strategies to enhance the global competitiveness of innovative SMEs should take into account that:

- (i) new information and communication technologies facilitate global reach and help reduce the disadvantage of scale economies which small firms face in all aspects of business;
- (ii) flexible specialisation has proven to be a particularly successful model of industrial organisation: through close co-operation with other firms SMEs can take advantage of knowledge externalities and rapidly respond to market changes;
- (iii) despite economic globalisation and the ability to transmit information rapidly and cheaply, geographic boundaries still matter. Clustering is particularly important to gain access to new ideas and tacit knowledge, especially in young industries;
- (iv) specialisation in a market niche compensates for some of the disadvantages of small scale;
- (v) while there are more hurdles to overcome for a small firm setting up affiliates abroad, the benefits in terms of access to new markets and knowledge can be immense.

Despite the fact that globalisation reduces the degrees of freedom governments have in their policy responses, they can still play an important role in encouraging SMEs to innovate and to implement the strategies required to effectively meet the globalisation challenge, through appropriate regulation, incentives, and institutional learning.

However because of the heterogeneity of the SME population, any policy to increase their innovative capacities must be targeted to meet the needs of a variety of user groups, have different objectives, and use multiple approaches and tools.

For “High-tech” SMEs (the technology developers or lead technology users), which make up less than 15% of the total SME population, the most important goals are to promote the development of the private venture capital industry and associated services, and to adjust accordingly the management and objectives of public R&D granting programmes.

For the vast majority of SMEs (the technology followers), novel technology and innovation policies should better address their needs, especially in regards to: non-financial innovation advice such as consulting services; recruitment of university graduates and skilled personnel; awareness of new ideas and technologies; and incentives and institutional frameworks for improving collaborations within networks and clusters, including local technical centres or technical colleges.

To the aim of pursuing the objective of the Lisbon strategy and, therefore, of favouring the growth and the employment increasing in Europe, the European Union (EU) Parliament and Council have adopted in 2006, for period 2007-2013, a frame programme for innovation and competitiveness (ICP). This programme favours actions to the benefit of competitiveness and of innovation capability inside EU. It will focus on the utilization of the information technology (IT), of the eco-technology and of the sustainable energy sources.

The programme is composed by three specific sub-programmes:

(i) the programme for innovation and entrepreneurship, which specifically concerns the SMEs, the high-tech enterprises and the micro enterprises, including the household enterprises. In this context, innovation is defined as the renewal and the

enlargement of the range of products and services, the application of new methods for planning, production, supplying and distribution, the introduction of management changes, the labour organization;

- (ii) the programme for the adoption and the exploitation of the IT;
- (iii) the programme for “intelligent energy – Europe” aiming at accelerating the realization of the objectives of the sustainable energy sector.

4. The Italian Innovation Framework

In Italy, like in the EU, innovation concerns the SME. According to the Italian National Statistical Office, Istat (2006), in the three-year period 2002-2004, 36.4% out of the industry enterprises and 27.1% out of the services enterprises have introduced either market innovation or in their own production process (Table 5.1).

Table 5.1 Main innovation indicators in Italian enterprises with at least 10 employees by macro-sector and class of employees - Years 1998-2000 and 2002-2004 (% of all enterprises)

MACRO-SECTORS CLASSES OF EMPLOYEES	% over all enterprises				Innovation expenditure (thousands of Euro)*	
	Innovator enterprises	Product innovator enterprises	Product and process innovator enterprises	Process innovator enterprises	Total	By employee

	YEARS 1998-2000					
INDUSTRY						
10-49 employees	35,1	8,0	16,1	11,0	4.453.758	7,6
50-249 employees	56,9	14,4	29,4	13,0	3.571.328	6,0
250 employees and more	73,9	13,7	49,3	10,9	11.998.221	12,4
Total	38,1	8,8	18,1	11,2	20.023.307	9,3
SERVICES						
10-49 employees	19,7	5,3	8,6	5,9	1.165.172	5,0
50-249 employees	31,0	7,0	13,9	10,2	1.288.554	6,4
250 employees and more	45,1	6,6	26,9	11,6	2.882.080	2,8
Total	21,2	5,5	9,4	6,4	5.335.806	3,6
	YEARS 2002-2004					
INDUSTRY						
10-49 employees	33,1	5,7	10,3	17,1	5.099.880	9,5
50-249 employees	54,9	9,7	25,2	20,1	5.020.495	8,1
250 employeesd and more	71,8	13,0	42,5	16,3	9.095.966	10,2
Total	36,4	6,3	12,7	17,4	19.216.341	9,4
SERVICES						
10-49 employees	25,9	4,5	7,9	13,5	2.556.831	7,3

50-249 employees	32,8	4,9	11,4	16,4	1.831.221	6,9
250 employees and more	47,1	8,1	21,2	17,7	6.041.695	4,4
Total	27,1	4,6	8,6	13,9	10.429.747	5,2
* The innovation expenditure refers to the last year						

Innovative enterprises represent, then, on average one third of enterprises operating in Italy; however, in 2004 they absorb more than a half of the employees and of total turnover.

As regards the three-year period 1998-2000, the incidence of the innovative enterprises over the total number of enterprises records a slight reduction in any dimensional class on industry (except construction) and a considerable increasing in services, that basically concentrates in the size 10-49 employees (from 19.7% to 25.9%).

As regards the typology of innovation, the Italian enterprises show a clear preference for the innovations of process only (17.4% in industry and 13.9% in services).

They are followed by the strategies aiming at innovating contextually products and productive processes (12.7% in industry and 8.6% in services), whereas modest is the share of innovative enterprises that tries to achieve new products only (6.3% in industry and 4.6% in services).

In 2004, the whole financial commitment supported by the Italian enterprises for innovation introduction total about 30 billion Euro, with nearly two third concentrated on industry. As regards 2000, the expenditure for innovation in industry decreases by

about 4%, even though the innovative intensity, expressed by the per employee expenditure, remains roughly stationary. Instead, the whole expenditure in services does double by exceeding 10 billion Euro, whereas the per employee expenditure increases from 3,600 to 5,200 Euro.

The innovation diffusion

The technological innovation diffusion significantly varies as regards the size and the economic activity of enterprises.

In the period 2002-2004, in industry, 33.1% of enterprises with 10-49 employees, 54.9% of those with 20-49 employees and 71.8% of those with 250 employees and more have innovated. In services also, the percentage of innovative enterprises increases from the lower level of 25.9% in the group of enterprises with 10-49 employees, to 32.8% in that with 50-249 employees, up to 47.1% in large enterprises.

The expenditure for innovation

In 2004, the Italian industry enterprises have invested 19,216 billion Euros for innovation activities, equivalent to 9,400 Euro per employee.

The expenditure for innovation is highly concentrated in enterprises with 250 employees and more, which, even though they represent 1.9% of the total only, contribute for 50% to the whole expenditure for innovation.

It does not emerge, instead, a clear relationship between innovative intensity (measured by the innovative expenditure per employee) and enterprise size: large enterprises, which have supported a financial commitment accounting for 10,200 Euro per employee, are followed by the small enterprises with an expenditure of 9,500 Euro and by the medium enterprises with 8,100 Euro per employee.

The government support to innovation

In the three-year period 200-2004, the enterprises which have benefitted with at

least a financial incentive for innovation represent 43.9% of the innovative enterprises in industry and less than one fourth (24.4%) of those innovative in services.

The hindrance factors to innovation

As occurred in previous three-year period, for the majority of enterprises (either innovative or not), the innovation activity is inhibited or slowed down by economic-financial factors. Too high innovation costs and lack of internal financial resources or of other financial sources have represented the main constraint to the introduction of innovation in the three-year period 2002-2004.

The technological innovation

The “non technological” innovation is broadly spread over the enterprises which have introduced technological innovation.

In industry, 56.9% out of innovative enterprises have introduced non technological innovation as well.

In services, the innovative enterprises that have introduced non technological innovation account for 56.1%.

This contrasts the recommendation by Kresl (2009), who identifies in technological innovation and consequent cost reduction or in new products introduction the only chance the Italian urban system, as well as all the other western urban systems, has to delay some years the difficulties.

Some overall remarks

Innovation and competitiveness in Italian enterprises: what is needed is courage and structural measures.

There is evidence the Italian enterprises on average innovate scarcely, or, at least, not enough to keep the country updated to the EU level. The trend in innovation is negative, as witnessed by the evidence that the already low level of innovation in

enterprises with 10 employees or more recorded in the three-year period 2002-2004 is in turn lower than that recorded in the previous three-year period 2000-2002.

As far as the typology of innovation is concerned, the enterprises, contrary to what is commonly believed, have shown a greater propensity to innovation in process, whereas modest is the share of enterprises that innovate exclusively products and services. Thus, it becomes unavoidable to make resort to measures that force a structural turning-point to the policy set up so far (Capitani, 2007).

Despite the complexity of the innovative process claims for an ever increasing cooperation with the other innovator subjects, both private and public, the Italian enterprises are reluctant to set up agreements on innovation (Capitani, 2007).

A further constraint to innovation is represented by the lack of adequately trained staff.

The lack of an innovation system is the main responsible of the low score in innovative counties ranking published by the Global Innovation Scoreboard Report (2006) by the EU, where Italy keeps the 27th place.

According to Kresl (2009), the challenges that the Italian enterprises (actually he refers to cities/urban areas) are, besides the above technological innovation, the energy and raw material cost increasing as well as the population aging.

5. Modeling the Innovation Based Competitiveness Enhancement

The enhancement of urban competitiveness through innovation can better be achieved in a CGE framework, as guided by the macroeconomic theory and inserted in a statistical background.

The more suitable GE model can be derived from the structure of a regional GE model, by introducing opportune adjustments, or can be directly elaborated. In this field there is now an increasing literature that can help much (see, for example,

Ferrari-Secondi, 2009; Ferrari, Laureti, Secondi, 2010).

Irrespective to the method used, it is so possible to obtain an urban GE model. This model should in principle be composed by certain blocks of equations to reproduce the economic functions and spheres:

1. Production and trade block. This is composed by a series of behavioral equations for accounting for: (i) the production functions, all of them of the Constant Elasticity of Substitution (CES) type, whose paradigm is

$$y_i = \gamma_i [\delta_i X_{1i}^{-\rho_i} + (1 - \delta_i) X_{2i}^{-\rho_i}]^{-1/\rho_i} \exp e_i; i = 1, \dots, N$$
, with y the output, X_1 and X_2 production factors (inputs) and all the remaining parameters; (ii) factor demands and factors aggregation, of the Leontief type; (iii) Constant Elasticity of Transformation (CET) functions for output transformation; (iv) CES type Armington functions for imported goods, for taking account of non substitutability.

2. Institutional block. This is composed by (i) a series of behavioral equations for household and government consumption demand, of Linear Expenditure System (LES) or Almost Ideal Demand System (AIDS) types; (ii) a group of equalities and identities describing intra-sectors income transfers and investment demand.

3. Price block. This is composed by all the prices.

4. System constraints block. This is composed by all the balancing and closure equalities and identities.

The above model blocks must be supplemented with complementing equations, equalities and identities to take account of eco-compatibility, that is, of all the elements that connote quality of life, i.e., good environmental conditions (abatement of land, water and air pollution), good and harmonious society, efficient and not

expensive education and health systems, friendly relationships among people, in order to achieve the enhancement of the innovation based competitiveness in an economically satisfactory, consistent, efficient and well balanced sustainable framework.

This model can be computed, i.e., solved on the base of an urban Social Accounting Matrix (SAM) purposively elaborated based on an available urban Input-Output (I-O) Table. An example of a possible urban SAM is given at Table 5.2 below.

Model computation needs to previously calibrate and estimate the behavioral parameters. This is precisely what can be done through the urban SAM.

Finally, equilibrium at a price level is reached that can be used as a benchmark for simulations, basically policy simulations.

These simulations concern innovation and consist of setting up an objective innovation should reach in quantitative terms – which is to be carefully discussed, specified, and properly quantified - consistently with the whole system and then to use the benchmark as the reference situation to measure the related level of sustainable competitiveness.

Table 5.2 A Schematic Urban SAM

	Production (1)	Factors (2)	Institutions (3)	Accumulati on (4)	RoC (5)	RoW (6)
Production (1)	Intermedi ate inputs		Consumpti on	Gross Investmen t	Export to RoC	Export to RoW

Factors	Factors			Factor	Factor
(2)	Payment			Incom	Incom
				e from	e from
				RoC	RoW
Institutions		Income to	Transfer	Net	Transf
(2)	Depreciati	institutions	Institution	Government	Saving
on	on		al saving		Saving
(4)				from	from
RoC				RoC	RoW
(5)	Import	Factor	Transfer to		
	from RoC	Income to	RoC		
		RoC			
RoW					
(6)	Import	Factor	Transfer to		
	from RoW	Income to	RoW		
		RoW			

6. Concluding remarks

Urban competitiveness is a relevant question that is being increasingly debated by economists, statisticians and more widely, social scientists, as well as public and private institutions, organizations, organisms and that reflects on economic and political life.

Globalization has contributed to strengthen its importance due to the new and nearly unexplored interrelations and complementarities among countries and people, with the related migration flows, industry displacements and employment movements.

Thus, it is very important for urban areas to be capable to compete with other urban areas, to offer more appealing production, investment, profitability, income,

living conditions.

This involves local governments, enterprises, households and heavily impacts on their well-being and as a whole, on their lives.

Enhancing urban competitiveness is therefore a no longer avoidable task and urban governments must confront with it.

A prerequisite for urban competitiveness enhancement is innovation. In turn, innovation is regarded as basically involving enterprises. But innovation is a more variegated concept and implies other economic and social subjects in an overall view that should be accounted for.

Enhancing urban competitiveness based on innovation can be approached in various ways. It can be regarded in the usual perspective of elaborating sets of indicators that allow to compare the different areas and to make rankings. This is a very useful and fruitful way of looking at the question.

In this paper we try to make the approach more general by putting it in a macroeconomic framework, so to provide the matter with a theoretical frame that allows taking account of all the economic subjects and transactions in an equilibrium situation.

In fact, innovation based urban competitiveness enhancement cannot be achieved whatever cost, cannot be undertaken without constraints. These are represented basically by the environmental conditions fulfillment, and also by the basic households' living conditions respect, all those questions that makes life more acceptable and livable. It is better to live in a good atmosphere, relaxed relationships, good and clean gardens, schools, roads, in other words, it is better to have a good quality of life than to have a high urban competitiveness without an at least acceptable quality of life. Of course, it is a question of cost-benefits evaluation, but we think that

it is an undeniable question.

Moreover, the fulfillment of the above constraints make competitiveness enhancement sustainable, which is in turn an inescapable condition.

Therefore, it is suggested to deal with the enhancement of urban competitiveness based on innovation in a GE model computation framework, which allows to account for the above general economic equilibrium and to set up political decisions and plans by the urban policy makers based on useful quantitative simulations involving innovation.

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