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THE KNOWLEDGE-DRIVEN ECONOMY AND URBAN POLARIZATION: THE CASE OF THE METROPOLITAN CITY OF MILAN

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ABSTRACT

There is widespread opinion within academic circles that the technological progress and the connected process of globalization are exacerbating socioeconomic disparities between and within countries. Consistently with some influential scholars, this paper suggests that (a) the primary and general cause of increasing social disparities lies in the pairing of rent-seeking and support by the political power and (b) the city plays a basic role in triggering and sustaining this pairing. With specific reference to the knowledge-driven economy, the paper hypothesizes that the peculiarities of the urban milieu allow a new kind of network monopoly and related opportunities for rent seeking to take shape within cities. If so, a correlation would be observable between the development of knowledge intensive activities and increasing urban polarization. An empirical inquiry is then performed to test this hypothesis on the Metropolitan City of Milan, the main metropolitan area and the most advanced knowledge-driven system in Italy, by taking the Index of Social and Material Vulnerability, as defined by ISTAT, as the indicator of inequalities. Since the outcomes corroborate the hypothesis, important implications follow for urban policies. First, urban planning must support the development of the knowledge-driven economy while controlling its socio-spatial negative implications, essentially by widening the city effect around the core city. Secondly, in so far as other demographic and social factors turn out to reinforce urban polarization, the need also arises for interventions at their respective scale of working (urban, metropolitan, national).

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Any opinion expressed in this paper are those of the author and not those of ISTAT.

1. Introduction

There is a broad consensus within academic circles that the technological progress and the connected process of globalization are exacerbating socio-economic disparities between and within countries. Questioning the modernization theory according to which trickling-down mechanisms are at work at any scale in the development processes, structuralist scholars maintain that the world stratification between core, semi-peripheral and peripheral countries has remained unchanged after the second WW, though with some adjustments within strata, and mostly the intermediate stratum (Arrighi, Drangel, 1986). Their claim rests on the idea that the technological progress allows core countries' economies to command the global chains of value by both influencing the final demand and displacing their mature productions towards the peripheral countries.

In a somehow complementary way, functionalist scholars ascribe the widening disparities to the increasing substitution of human capital by artificial capital (chiefly, artificial intelligent systems) and the connected job destruction in the intermediate labor class (Rifkin, 2000). This trend is causing the polarization between a restricted élite of high-skilled/high-paid jobs and number of low-skilled/low-payed jobs (Autor *et al.*, 2003; Goos, Manning, 2007)[6], to such an extent of pushing these latter not rarely into the informal sector (Sassen, 1988, 2001). At a more detailed level, Cozzi, Impullitti (2016) show that openness to the global competition in highly innovative contexts widens wages disparities, mainly between high-skilled and medium-skilled workers rather than low-skilled jobs, because these latter enjoy rising demand for personal services that allow high-skilled workers to free more labor time. Though stricter employment protections and redistributive polices show to lessen socio-economic disparities, as it occurs in Europe[7], they have however only contingent effects. As Naticchioni *et al.* (2014) show, the reforms some countries have introduced to ease flexibility in the labor market have actually had negative effects in the lower segments of the wages distribution.

Marginalization if not exclusion from the labor market have the effect of amplifying wage polarization on households' incomes. In the U.S.A., the incidence of "marginally attached workers"[8] on the labor force rose from .8 to 1.1 percent between 2000 and 2016 (+38 percent), after having got 1.7 percent on 2011. In the same period, that incidence rose at lower pace on average across OECD countries, from 1.6 to 2.0 percent (+25%), even if in several countries, like Australia, Estonia, Finland, Italy, Luxemburg, Portugal and Spain, it stayed higher than 4 percent[9].

Wage disparities do not fully explain income disparities, however, because an important if not the main contribution comes from capital gains and urban rents. To sum up, Cingano (2014) and OECD (2015) show that from the late 1970s to the late 2000s, the household income Gini Index rose by 10 percent on average across OECD countries, and even more in those countries that started from lower levels of inequality, like Sweden, Finland, Denmark. The 2008 crisis had the effect of exacerbating disparities: whilst the 2010 average income of the top decile in the OECD countries was comparable to that in 2007, the average income of the bottom decile lessened by 2 percent a year (OECD, 2013, 2017). Finally, as regards the impact of the crisis on wealth distribution, findings are not univocal across a sample of OECD countries (Murtin, D'Ercole, 2015), though allowing these authors to argue that the recovery of financial assets in the middle 2010s boosted inequality in favor of wealthier classes[10].

[6] With reference to the U.S.A., where this phenomenon is of extreme magnitude, Stiglitz (2013) reports that, over the preceding three decades, the average salary of the top 1 percent workers has risen about 150 percent, while the salary of the bottom 90 percent workers has risen ten times less.

[7] The index of "Strictness of employment protection for individual and collective dismissals" is about 2 on average across OECD countries, and only .26 in the U.S.A. (Source: http://stats.oecd.org).

[8] "Marginally attached are persons aged 15 and over, neither employed, nor actively looking for work, but are willing/desire to work and are available for taking a job during the survey reference week. Additionally, when this applies, they have looked for work during the past 12 months." (http://stats.oecd.org).

[9] Source: http://stats.oecd.org.

[10] As regards Italy, Banca d'Italia (2018) found that, between 2006 and 2016, the Gini Index of households net wealth remained substantially unchanged, at about .61, after having risen up to .64 in the four-year period just after the crisis.

Whilst no significant dissent is about the main mechanisms of income and wealth concentration, important differences remain about their possible impact on growth, between those authors who remark their propulsive role (the top classes are more inclined to invest, while the bottom classes are more concerned with their material living conditions), and the others who emphasize the twofold risk for devaluation of the human capital and dropping of investment propensities in the disadvantages classes[11]. Important dissent is also about the connection between inequality and poverty, between those who maintain that "inequality matters for poverty" (Naschold, 2002), and those others who maintain that "the real distributional problem is not inequality but poverty" (Feldstein, 1998: 1), as if the two facets would be unrelated each other.

Not being this paper the suitable place for dealing with this many-sided debate, it starts by opting for some critical hypotheses, which are as follows:

a) inequality matters by itself insofar as it advantages certain social groups systematically and, worse, at the detriment of other groups. In these conditions, it induces social discontent, with negative effects on both the political and the economic domain (Alesina, Perotti, 1996; Stiglitz, 2013);

b) inequality has cumulative effects. Since the disadvantaged people meet it difficult to keep up the heading groups in learning abilities and skills, as well as in the connected innovative capacities, they are doomed to shift into a condition of rising precariousness and dependency, with serious consequences on their propensities towards risk and real capabilities to invest (Wilson, 1987; Florida, 2017);

c) space reinforces the cumulative effect of inequalities because rich and poor tend to cluster into distinct areas within cities, and this socio-spatial polarization respectively enhances the chances of further betterment and deepens the prospect of deterioration respectively for the two classes. The social outcome of rising polarization is social fragmentation between the *haves* and the *have-nots*, and finally urban fragmentation (Curtis *et al.*, 1994; Wresch, 1996; Nevez-Bouchanine, 2002)[12], with its institutional implications (Cusinato, 2014).

d) accordingly with Rodríguez (2004) and Stiglitz (2013), the main cause of rising inequality lies on the joint of rent seeking increasing opportunities and governmental support to them. While sharing this view, this paper maintains however that a third component intervenes in making that joint effective, viz. the city. More specifically, it maintains that the city is the basic *dispositif*[13] of rent seeking.

On the basis of this theoretical frame, the paper aims at enquiring into how the city works as the *dispositif* for rent in the present-day techno-economic paradigm, characterized by the driving role of the knowledge creation processes, as well as into the possible effects of that working on socio-spatial polarization. The starting the idea is that the city is allowing a new kind of monopoly –specifically, a network monopoly – to take shape in the knowledge-driven economy (KE). Were this hypothesis to hold plausible, policies aimed at coping with social polarization require policy interventions in the connection between KE dynamics and the urban domain, in order to drive those milieu factors that fuel the vicious circle between rent seeking and socio-economic inequality.

The paper is organized as follows. After having outlined how the city has worked as the *dispositif* for rent seeking in the main historical techno-economic paradigms (Section 2), the paper provides a theoretical frame to specify the above idea about the formation of a new kind of network monopoly (within and through the urban milieu) in the KE, with important effects on socio-economic polarization (Section 3). In order to test the soundness of this theoretical frame, Section 4 performs an econometric analysis on a selected set of

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Since that index was only about .42 on 1992 (Banca d'Italia, 2014), it follows that the 1990s and the 2000s have been periods of important wealth concentration. Also in this case, the variations in the financial assets seem to have had a driving role.

[11] For a critical review on the relationships between inequality and growth, see Aghion *et al.* (1999).

[12] Unlike urban fragmentation, Florida (2017) speaks about the "locational divide" or "big sorting" between rich and poor within U.S. cities. Though admitting that this divide is closely associated with race in that context, he found that "[it] is greater in bigger, denser metros with large concentrations of high-tech industries, college graduates, and members of the creative class" (ibid.: 99-100).

[13] With the generative and power-related connotation which Foucault (1980) endowed this term with.

possible factors of socio-economic polarization (among which KE development) with reference to the main Italian Metropolitan City and KE regional system – Milan. Section 5 will draw conclusions on both the interpretive and normative sides.

To conclude these introductory lines, it is not redundant mentioning that this work is an additional step on a long-lasting research project on the KE and its spatial rationales carried out within the Università IUAV of Venice, which characterizes by having espoused a hermeneutic approach to the KE itself (Cusinato, Philippopoulos-Mihalopoulos, 2016). Whilst the previous works emphasized KE's bright side on the regional, urban and intra-urban scales, this work aims deliberately to deal with its possible dirty side.

2. The city as the *dispositif* for rent seeking

Rent is "a return in excess of a resource owner's opportunity cost" (Tollison, 1982: 575) that causes a net transfer of wealth at the advantage of the rent earner through market transactions. Its market filiation makes it possible to distinguish rent from other means of drawing wealth from others, be they lawful, like taxes, or criminal in nature, like fraud, bribe, racket, theft, robbery, pillage. Its etymological tie with "to rend" – "to tear asunder with force" (Donald, 1872) – reminds us that it relies upon a power disparity between the parts involved. Though taking economic appearances – the power of setting prices higher than costs – this disparity entails State support for getting both legitimization in people's eyes and enforcement against those who fail to pay. This support is not extraneous to State's rational, in that the State establishes normally its power over a certain territory by imposing the tribute on the people involved, so that its alliance if not collusion with rent seekers (who impose a similar toll through market) turns out to be quite natural. The circumstance that, on history, the State allowed firstly the Landlords and successively the entrepreneurs[14] to draw rent only mirrors the passage from a pure redistributive to a market-based form of social integration, but in no way it diminishes the power-based character of rent seeking.

It was just on the inauguration of that power that *the city* emerged as a specific entity from the set of urban agglomerations at large. Let us follow Marx in this connection, with reference to the Asian [Middle East] mode of production:

> Cities in the proper sense arise by the side of these villages only where the location is particularly favourable to external trade, or where the head of the state and his satraps exchange their revenue (the surplus product) against labour, which they expend as labour-funds. […] Asian history is a kind of undifferentiated unity of town and country (the large city, properly speaking, must be regarded merely as a princely camp, superimposed on the real economic structure). (Marx, 1965/1857-8: 71 and 77-78).

According to him, external trade (which entails monopolistic practices[15]) and tribute lie at the basis of the city, but further down there is the State power. A power that allows some people to exploit natural scarcities at their own advantage (and the detriment of the social surplus), while allowing other people to create and similarly to exploit artificial scarcities. Without that support, no kind of rent would be possible, simply because scarce natural resources would be ruled as commons, and activities aimed at creating artificial scarcities within a community would be resolutely banned[16].

Thus, the key question is if the city is merely the theater where rent seeking practices take shape and flourish or if it concurs to cause them. Looking at it in a a-historical prospect, like individual methodology does, the answer is univocal in favor of the first horn of the dilemma, but on a historical viewpoint the two horns connote the different ways by which rent seeking and the city have related each other. Consistently with the above quotation by Marx, the early city *followed* the emergence of the political power: it was "merely […] a principle camp", namely a village that, thanks to certain locational advantages, became the seat of an over-ordered power – the State – which imposed the tribute on the surrounding villages, and/or

[14] It is rather possible arguing that it was precisely that empowerment by the State that allowed the 'adventurer' or 'undertaker' – two terms that allude to the swindler or the speculator (Landstrom, 2005) – to get the more decent designation of 'entrepreneur', which served inter alia to dissimulate their propensity for rent into propensity for profit, as the right reward for their innovative abilities, to such an extent of labelling 'extra-profits' the connected rent margins (Hanlon, 2014).

[15] See Curtin (1984).

[16] The *Deuteronomy, 23: 19-20* is paradigmatic in this connection.

drew rents from long-distance trade. In this view, the early city appears as the outcome of the political power, and the *place* of the ensuing power of drawing systematically rent, firstly from one's own community.

Once the city appeared, however, it developed certain agglomeration economies in favor of rent seekers, as Cantillon (1959/1755) portrayed in his admirable urban geography with reference to an agriculture-based market system:

> Landlords who have several large estates have the means to go and live at a distance from them to enjoy agreeable society with other Landowners and Gentlemen of the same condition. If a Prince or Nobleman who has received large grants of Land […] fixes his residence in some pleasant spot, and several other Noblemen come to live there to be within reach of seeing each other frequently and enjoying agreeable society, this place will become a City. (pp. 13-15).

According to him, Landlords' delight of living together in certain pleasant places is the reason why they agglomerate, and what allows this agglomeration to become a city is their power of collecting land-rents. What escaped however to Cantillon (or he omitted to say) is the circumstance that Landlords took directly part to the political power[17], on which they established their right to be 'Lords', i.e. 'domineers', and to draw rents from their domains. In actual fact, it was not only the working of 'agreeable agglomeration economies' to lie at the basis of the pairing rent/city, but also a much harsher kind of agglomeration economies, namely proximity to the political power, and involvement into it as well. Moreover, insofar as these agglomeration economies enjoy increasing marginal returns, a cumulative dynamics starts, which works independently on any individual deliberate intervention, and rather superimposes to them.

It becomes thus possible arguing that, whilst the appearance of the early city followed an exogenous factor (State's rise)[18], from then on the city acts as an endogenously reinforcing device of rent seeking, thanks to the cumulative effects of the related agglomeration economies, so that its intimate nature has to be find into that device itself. Questioning into the city peculiarity in comparison with other kinds of urban agglomerations (mainly villages and burgs, accordingly with Cantillon's taxonomy), requires therefore investigating into the possible working of cumulative effects in rent seeking practices, be they deriving from scale, agglomeration or urban economies. In this view, the economic history of the city turns out to be the history of the different forms of rent seeking agglomeration economies and their cumulative effects, on time and space: a history which has remained unachieved after that the economic science has left aside the classical in favor of the neoclassical approach[19].

Let us take up again in outlining the successive main steps of this history. At the beginning of the first industrial revolution, two main forces drove urban agglomerations – scale and agglomeration economies internal to manufacturing – though not being enough to characterize the city. According to Adam Smith (2007/1776), it was rather the practice of the unequal exchange between the city and the countryside to typify it :(a practice that manufacturing would have magnify by widening its markets thanks to the lessening in transportation costs made possible by the technological progress). Thanks to physical proximity, city dwellers can actually combine and set prices of their products higher than their intrinsic value, whereas countrymen cannot reciprocate because of their spatial dispersion. Though not explicitly mentioning the role of the political power, and being rather compliant with the *providential* social order of the then British society, and primarily Lords' status[20], Smith, unlike Cantillon, was actually aware of institutions' classist role[21]. Anyway, also in his view the city is a city insofar as it allows rent seeking practices to appear and to thrive.

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[17] At Cantillon's times, the House of Lords was the pre-eminent Chamber within the Great Britain Parliament, except for financial matters (on which the House of Commons exerted the major power). (House of Lords, 2015).

[18] For a vivid, though mythical representation of this exogenously-driven process, see Mumford's (1996) pages on the foundation of Uruk.

[19] In fact, the neoclassical approach is unable analytically to distinguish the city, as a proper analytical entity, within the set of urban agglomerations at large. On this subjects, see Scott, Storper (2015) as a recent unsuccessful attempt to characterize the city "in the strict sense" (p. 9) according to the neoclassical approach, and Cusinato's (2016a) criticism to them.

[20] Smith's opinion about Landlords was indeed ambivalent. Whilst considering them a fruit of the Providential divide into a class of "a few lordly masters" and a multitude of lacklands (Smith, 1759: 350-351), he used harsh words elsewhere against their indolence and ignorance (Smith, 2007/1776).

[21] Let us quote him again, when he remarks that "Civil government, so far as it is instituted for the security of property, is in reality instituted for the defense of the rich against the poor, or of those who have some property against those who have none at all" (Smith, 2007/1776: 562).

The second industrial revolution only amplified the role of scale economies in fostering monopolistic rents. The true discontinuity in this course of things was systematic recourse to innovation by entrepreneurs, whose champion was the Schumpeterian solitary and heroic entrepreneur within monopolistic competition conditions. With respect to the previous kinds of rent (land and pure monopolistic rents, both which smell of parasitism), the gains over costs deriving from innovation were given a positive ethical value, in that they have been considered as the (temporary) price for entrepreneur's ability of exploiting otherwise unperceived resource recombinations (Kirzner, 1973)[22]. Not by accident, this kind of revenue was labelled as something placed midway between profit and rent, as 'extra-profit' or 'quasi-rent'. The direction of the possible disambiguation depends however on the conformity or not of the real market with the ideal-type of monopolistic competition. It is only the lack of barriers that actually allows scarcities and connected rents stemming by innovation to be viewed as temporary/local contingencies within a path of general growth, being destined to vanish with the entry of new competitors. Otherwise, insofar as natural or artificial barriers are at work, the market inclines towards the first side of monopolistic competition, and quasi-rents turn into genuine rents.

With reference to the nowadays pattern of development, based on the governance of the knowledge creation-and-innovation processes at any scale (the enterprise and its networks, the local and regional systems, the chains of value, and so on), the key question becomes if important barriers are at work to the entry in the KE core (i.e. its generative devices) and, more importantly, if those barriers take shape endogenously to the KE itself. If so, the KE has a dirty side beside the other celebrated side of its successes and prospects of unlimited progress, in that it entails losses of social surplus, due to monopolistic practices, along with increasing social disparities, due to the possible cumulative effects of those same practices[23]. Let us now make a focus on this last issue.

3. Rent seeking and the city in the knowledge-driven economy

That the information sector suffers from monopolistic practices and connected sub-optimal resource allocation owing to indivisibilities and low levels of appropriability, is a well-known condition since Arrow (1962). In his (static) approach, the intervention of public or no-profit institutions, along with the provision of appropriate incentives, are the suitable ways to compensate such failures. The additional circumstance that information 'production' enjoys increasing marginal returns (at least within a given epistemic paradigm) strengthens such view, but also lays the foundations of an endogenous theory of development (Romer, 1986; Lucas, 1988).

Both depictions abide however by a micro-economic approach, according to which the only, though crucial, mechanism working at the macro level are the spills-over ensuing from the low level of information appropriability. At a deeper level, they abide by a cognitivist approach, according to which learning is an individualistic affair and occurs through collecting information from the environment, combining them according to a like-Turing machine, and selecting the useful outcomes from that combinatory work among the countless ones it yields, which finally result into new information, and so on. In this portrayal, the other (individual) knowers are mere sources of spills-over and, insofar as they succeed in appropriating the outcomes of their own learning activity, they become possible sellers of information. Finally, but not least, since the market is the normal mechanism for exchange in that vision, the focus shifts inevitably to the failures which the information sector is doomed to suffer from.

Relaxing this cognitivist and market-centered view, the representation of information production and exchange changes importantly. If the mind is no more conceived as a mere logical/combinatory machine, which converts data/stimuli according to some pre-established and maybe innate rules, but is also inclined to reflect on how it *selects and extracts* data from the environment, if not projects its schemata on it, non-

[22] Galunic, Rodan (1998) label these two kinds of rent respectively as "scarcity-based" and "innovation-based". We maintain that any kind of rent is based on scarcity, so that the possible differences stem from the nature of the scarcity itself: if natural of artificial and, when artificial, if created by shortening the supply of certain existing goods (monopoly) or by introducing new combinations (innovation).

[23] It is very telling that also Richard Florida, the cantor of the creative class, has recently admitted that the growing social disparities caused by the nowadays pattern of development have induced him seriously to face the "the dark side of the urban revival I had once championed and celebrated" (Florida, 2017: XVII).

market relationships with other learning people become imperative. In fact, not being possible excluding that every individual mind is idiosyncratic in nature, especially as regards its perceptive sphere, and is consequently exposed to fallacies, it becomes compulsory admitting that comparison with other mindsets is the only way to copy (or, more softly, to deal) with them (fallacies).

This shift from the relationship between mind and the external sources of data, which is intrinsic to the cognitivist approach, to the ways by which the mind establishes such relationship entails that, first, data cannot anymore be considered as given once and for all, but as contingent constructions, if not projections of the mind itself and, second, information and consequent knowledge and learning are social constructions. It follows that, being creative and, mainly, dealing proficiently with creative processes, entail interacting with the others, and since this interaction affects participants' perceptive attitudes, it redesigns also their informational baggage, thus further boosting the need (and opportunity) for interrelating each other. It follows that the critical resource for creativity and, especially, the governance of the related processes, lies within the network of relationships between knowers, inside which perceptive attitudes matter primarily, whereas in the cognitivist view that critical resource resides in mind's logical abilities.

The notions of "distributed knowledge" (Nowotny *et al.*, 2003), "distributed creativity" (Miettinen, 2006), "learning community" (at large), "epistemic community" (Marx, Holzner, 1979) and other similar ones rest precisely on the idea that, while the individual mind is the source of information production, the network between minds that share a "primary commitment to epistemic criteria in knowable production and application" (Marx, Holzner, 1979; quoted in Haas, 1990: 40) is the place where and the way through which minds learn to look at the their own (idiosyncratic) learning attitudes: in a few words, that network is the privileged locus for the hermeneutic practice, which lies at the very basis of creativity (Cusinato, 2016b). Inasmuch as that network becomes autonomous from individual minds thanks to learning cumulative effects and network economies, it becomes a generative device (Moretti, 2013), belonging to the same family of Durkheim's (1895) *milieu* or Foucault's (1980) *dispositif*.

What matters regarding this paper's aims is that these cumulative effects along with the idiosyncratic character of the related outcomes create a rising barrier to both the entry into the related network and exit from it. Not only increasing levels of specialization and sophistication actually follow, but also tacit local conventions take shape among participants on the ethical, epistemological, methodological and lexical domains, in that some aspects of the real world are privileged rather than others, and some verbal and non-verbal expressions take specific semantic nuances inside the community, which remain obscure to the extraneous and even change on time, thus increasing both the entry costs to the possible new competitors or partners and the exit costs to adherents, in terms of the necessary apprenticeship in a new community. Number of network monopolies are therefore expected to take rise in the KE, each of them is equipped of a peculiar/idiosyncratic way of exploiting learning complementarities and synergies between participants to creative ends. It is thus possible arguing that the interactional mode of knowledge 'creation' (rather than 'production'), which is crucial in the KE (Nowotny *et al.*, 2003), allows wide margins for rent seeking to be exploited, with predictable effects on socio-economic inequalities.

Finally, since major cities and metropolitan areas are, not only the privileged place for knowledge-creating services but also their seedbed (Cusinato, Philippopoulos-Mihalopoulos, 2016; Compagnucci, Cusinato, 2017), it is expected that KE's bright and dirty sides are first and better observable inside them[24]. This is the issue which next Sections will deal with, with reference to the Metropolitan City of Milan (Italy).

[24] Similarly, Florida (2017) argues that "Superstars cities and knowledge hubs are not just the theaters where inequality is most on display; their success is inextricably tied to the very clustering of talent and firms that shapes the widening gap between rich and poor" (p. 82). The data he reports on the higher levels of inequality of the U.S. metro areas in comparison with the rest of the country are very impressive: whereas the Gini coefficient is 0.450 on average across the country, it reaches 0.504 in the Large Metropolitan Area of New York-Northern New Jersey-Long Island and values higher than 0.468 in other nine Large Metros. What is more, inequality rises furthermore within those same metros, especially in their urban cores.

4. The case study

4.1. Premises

As discussed above, the issue of increasing economic inequality is one of the most discussed topics, in both the academic and the political debate, especially after the 2007 crisis (Autor *et al.*, 2008; Piketty, 2013; Alvaredo *et al.*, 2017; Stiglitz, 2017). Such a concern had already grown substantially in the mid-1980s, however, a period characterized by an unprecedented growth in R&D investments and rising use of technology in the production process (David *et al.*,1992; Kim, Nelson, 1999; McConnell, Perez-Quiros, 2000; Méndez *et al.*, 2016), which caused a structural change in the most advanced countries, towards more hi-tech and knowledge-driven economies (Gabe *et al.*, 2012; van Winden *et al.*, 2007; Raspe, Van Oort, 2006; Florida, 2017).

Acemoglu (1999) argues that such technical change had an important impact on wage and income distribution. In fact, since the "technical change over the past sixty years, or even over the past century, has been skill-biased" (p. 3), it mostly benefited the skilled and educated workers, while replacing the routine jobs, performed by unskilled and low-educated workers, with machines[25]. Providing a more nuanced representation, Autor *et al.* (2003) show that wage polarization is rather occurring between non-routine cognitive or interactive jobs, on the one hand, and non-routine manual jobs and routine (cognitive or manual) jobs, on the other[26]. Changes in the wage structure affect importantly households' permanent income and consumption distribution, as Cutler and Katz (1992) demonstrated for the U.S..

These evidences have important spatial implications. Urban and metropolitan areas are, indeed, the engines of modern knowledge-driven economies and societies, where the highest amounts of educated people and high-paid jobs live and work, along with important amounts of linked non-routine but low-paid manual jobs, such as personal services (Hudson, 2006; Krätke, 2007; Florida, 2017; OECD, 2018; Moretti, 2013) whereas non-urban areas generally host routine and low-paid jobs. Within this urban/non-urban dualism, skill-biased differences arise at three spatial scales: a) between different sized cities; b) between same sized cities having different economic bases; and, more importantly, c) between different parts of the same city or metropolitan area.

With regard to the first point, Baum-Snow and Pavan (2012) show that the overall raise in wage inequality occurred between 1979 and 2007 in the U.S. was significantly affected by city size. Explanations ground on the higher increase in productivity and, consequently, in wages of high-skilled workers, which has taken mainly place in larger urban areas. This approach is consistent with Glaeser *et al.* (2008) and OECD (2018), who both found higher nominal wages, housing prices and productivity in larger cities, and with Glaeser and Gottlieb (2009) and Davis and Dingel (2012), who maintain that the higher productivity depends on the better opportunities for skilled workers of exchanging ideas in larger and denser cities. At the same time, larger cities turn out to be more unequal than smaller towns. According to Behrens and Robert-Nicoud (2013), this is due to the circumstance that they offer greater market opportunities, thus being more attractive for new enterprises and, consequently, more selective, with the final result of widening the gap between the winners and the losers.

Comparing similar sized cities, substantial differences arise because of their different economic specialization. Moretti (2013) notes that larger cities in the U.S., such as San Francisco, Seattle, Austin and Boston, but also smaller cities, such as Ann Arbor, Fort Collins-Loveland and Iowa City, which are knowledge and innovation-based cities, show the highest shares of creative and educated people and wage levels. On the contrary, former industrial cities, such as Detroit, Cleveland or Flint, are characterized by the smallest percentage of workers with a college degree and affected by depopulation and falling wages. With specific regard to inequality, Hudson (2006) found that the presence of financial and business services is significantly and positively correlated with inequality, whereas the manufacturing sector shows a significant

[25] See Katz, Autor (1999) for a survey on literature on the skill-biased technological change.
[26] See also Goos, Manning (2003); Breau *et al.* (2014).

negative correlation. Breau *et al.* (2014) corroborate this view by proving that this relationship becomes positive in case of deindustrialization, whereas higher shares of employment in government services led to more equal income distribution.

Finally, there is broad consensus about the importance of the knowledge-driven economy, and specifically KIBS, in enhancing inequality (Hudson, 2006: Krätke, 2007; Lee, 2011; Breau *et al.*, 2014; Florida, 2017) and even segregation. In this regard, Berkes and Gaetani (2018) find that innovation is responsible for income segregation not only between, but also within cities. They argue that segregation is mainly caused by the clustering choices (in terms of residence) of the creative and high-educated classes. In turn, this process is triggered by the need for spatial proximity of the knowledge- and innovation-oriented companies, particularly those aimed at maximizing the cross-fertilization and exchange of ideas, and further reinforced by their high-educated and high-paid workers' propensity to live close to their job places in order to minimize commuting costs. Edlund *et al.* (2015) corroborate this view, by showing that mainly time scarcity "has propelled centrality to the top of the local amenities list" (p. 3). Social and spatial segregation within cities is also conducive to poverty concentration (Massey, Tannen, 2016; Musterd, 2005), which takes often the form of ethnic segregation, mainly, though not exclusively, in the U.S. cities (Wilson, 1987, 1996; Massey, Denton, 1993; Quillian, 2012).

Furthermore, the intra-urban geography of affluent and poor classes changes continuously, because of the gentrification and urban regeneration processes, which produce new bourgeois quarters while expelling the lower and middle classes (Florida, 2017). As Florida (2002) and Diamond (2016) argue, the concentration of high-income workers causes increasing demand for localized expensive amenities, thus further enhancing gentrification, and forcing relocation of low-income households.

As mentioned in the Introduction, socio-economic inequality, but also spatial segregation, are not necessarily negative. For example, when socio-economic inequality derives from the improvement in the living conditions of some individuals or social groups without worsening the conditions of other people, we are faced with a Pareto improvement (Feldstein, 1998). In the same way, when segregation allows the people concerned to take advantage from proximity, this is not necessarily a problem. The problem rather arises when the disadvantages of spatial segregation, regarding, for instance, the access to socio-economic opportunities and the lack of variety in social relationships (OECD, 2018), outweigh its advantages. Especially when public goods (schools, parks, street furniture, security, etc.) are funded at a local level, the segregation of disadvantaged people can lead to a vicious circle, with heavy impacts on education, health and intergenerational mobility (Berkes, Gaetani, 2018).

With these premises, it is possible to outline a theoretical framework for an econometric analysis aimed at finding out the relationship(s) between inequality and some economic, social, spatial and urban variables. The empirical exercise is carried out with reference to the Metropolitan City of Milan (MCM), which is, not only the most populated and richest Italian Metropolitan City, but also the most advanced 'region' in the national knowledge-driven economy (Compagnucci, Cusinato, 2017). In doing so, the paper assumes that rent is the main factor of inequality, be it urban land rent, monopolistic rent, or another kind of rent. Nowadays, there is wide consensus that the rent stemming from innovation plays a major role in that connection (Berkes, Gaetani, 2018; Florida, Gaetani, 2018). As noted in Section 3, the ceaseless innovation process within monopolistic competition generates *quasi*-rents at the enterprise level, since these they disappear insofar as new competitors enter the market. Owing to the network economies of the KE urban systems, the related quasi-rents become however full rents, as a consequence of the rising barriers to enter (and to leave) the networks of the knowledge intensive activities, on which innovation grounds. These rising barriers depend not only on the higher degree of complexity of the knowledge intensive activities, but also on their evolutionary character, which results from ceaseless internal and external interactions among them (Lambooy, 2002; Glückler, 2007). It follows that these networks become exclusive (if not esoteric; Alvesson, 1993) circles, and eventually, they become knowledge-and-innovation monopolies.

Of course, it is well-known that also urban land rent plays a key role in driving the geography of urban inequality. Urban rent, in fact, is the price households and firms are willing to pay to benefit from net urban

agglomeration economies. This means that households choose their residential location on the basis of their different levels of income (ceteris paribus), implying a positive relationship between income level and urban land rent. Moreover, there is a second kind of competition for urban land, between households and economic activities, in that there is a positive correlation between urban rent and the density of the knowledge intensive activities (Florida, 2017, Lee, 2011; Breau et al., 2014; Compagnucci, Cusinato, 2018).

Given the importance of urban rent in driving urban inequality within the knowledge-driven economy, one of the main goals of this paper is assessing the level of this correlation in the MCM. On the normative side, if a certain level of inequality triggered by the knowledge economy is normally expected to be within an urban context, an excessive level could lead to negative consequences on the urban performances. Several case studies, regarding, for example, the cities of Munich, Lyons and Hamburg, suggest that the implementation of targeted public polices can mitigate the exacerbation of the inequalities inherent to the knowledge economy (Ranci, 2010; Mazzoleni, 2013, 2016; Mazzoleni, Pechman, 2016). Symmetrically, as the case of Milan suggests, the lack of public policies and, specifically a deficit in urban design and connected regulatory policies, widens social and spatial polarization (Mazzoleni, 2016).

4.2. Econometric analysis

The below econometric analysis aims at assessing the statistical relationship between an assumed measure of inequality (the Index of Social and Material Vulnerability – ISMV) and a set of socio-economic, demographic and urban potentially explicative factors within the MCM. ISMV is a composite index that quantifies people's risk of incurring severe deterioration of personal economic and social conditions, that do not necessarily will turn into actual situations of deprivation. The index synthetizes different situations of distress: the material deprivation is associated with a low level of education, unemployment, non-decent housing, whereas critical family conditions, care needs of the elderly people and conditions of inactivity of young people integrate the risk of vulnerability from a social point of view (Tronu, 2017)[27]. Although ISMV is not an index of inequality, its geography renders possible conditions of socio-spatial inequality, and the comparison between its geographies on different times provides evidence about possible trends of socio-spatial polarization, and this is precisely the way this paper aims to deal with.

The index has been widely used in important national and local contexts, especially for the analysis of vulnerability at the sub-municipal level, confirming its potential for measuring socio-economic inequalities in urban areas. Among its most important applications, it is worth mentioning its insertion into the set of indicators used either for an enquiry on fourteen Italian metropolitan cities for the Parliamentary Commission of Inquiry on suburbs' state of degradation[28] (ISTAT, 2017a); the definition and socio-economic description of the new constituencies for the election of the Republican Chamber and Senate[29] (https://www.istat.it/it/archivio/208278) and the implementation, in collaboration with *Casa Italia*, of an information system on the natural risks of Italian municipalities[30].

ISMV was first disseminated by ISTAT at the municipal level. Successively, ISTAT (2017a) focused on the Metropolitan Cities, as defined by the law 7 April 2014 n.56, and adopted sub-municipal areas (urban quarters, as defined by the municipalities concerned) as spatial units of analysis. Focusing on these kinds of sub-municipal partitions represents an important refinement, since it improves capacities to explain the

[27] The elementary indicators used for the construction of ISMV are: incidence of adult illiterate and literate population without an educational qualification; incidence of families with 6 and more members; incidence of young or adult single parent families; incidence of households with potential assistance distress; incidence of the population suffering from severe housing overcrowding; incidence of young people out of the labor market and from an education or training path; incidence of households with potential economic distress. The methodology (Mazziotta, Pareto, 2014) used for the transformation and aggregation of the elementary indicators is based on the hypothesis of non-substitutability of the different components (the deficit in one component cannot be compensated by a surplus in another) and makes it possible to produce a synthetic "non-compensating" index comparable over time in absolute terms for each spatial unit (municipality) and for any other territorial level. See also http://ottomilacensus.istat.it/documentazione.

[28] Rome, 31 May 2017 (https://www.istat.it/it/archivio/202052).

[29] https://www.istat.it/it/archivio/208278.

[30] https://www4.istat.it/it/mappa-rischi.

spatial dimension of socioeconomic vulnerability within cities, along with to implement policies aimed at mitigating if not reversing its possible negative effects. Rome and Milan case studies (ISTAT, 2017b) actually show that the sub-municipal areas are far from being homogeneous in terms of vulnerability, as demonstrated by ISMV's substantial variance among different neighborhoods. It follows that considering ISMV at the municipal level, as we were obliged to do in this work owing to the lack of data at a lower scale, represents a limit, which could be overcome insofar as ISTAT will make sub-municipal Census data openly available.

The choice of the set of explanatory factors/independent variables, as reported in Table 1, follows from the proposed theoretical framework, according to which rent – in particular the rent arising from KE's innovation processes – has become the driving factor of socio-economic inequality, whereas personal, social and urban features concur as inertial or reinforcing factors. As regards, in detail, the weight of the knowledge-driven economy, it was assessed on the basis of the employment location quotients. Following Eurostat (2013), we split the knowledge-intensive services into two main breakdowns, KIS (kis) and Less Knowledge Intensive Services (l_kis), depending on whether knowledge is their main production factor and the main good they offer. We further disaggregated the former breakdown by distinguishing between Private and Public KIS, according with the circumstance that they mostly work in the market or not (viz. through price or not). Private KIS have been identified by subtracting from KIS "Public administration and defense", "Compulsory social security", "Education and Human health" and "Social work activities". Separating the Public from the Private KIS in a country such as Italy matters, because of the still important share of public employment on the total workforce and because private- and public-based activities follow different spatial rationales, which are driven respectively by profit-seeking and equity-seeking criteria.

Finally, regarding the kind of the regression model, we opted for an OLS. The spatial character of the analysis would have suggest to use a spatial-econometric model, but the scale of the spatial unit of analysis (municipality) and the relatively narrow area of investigation (the MCM) induced to think that such a model (which includes spatial collinearity) is not fit. In fact, at that scale, the contiguity effect could be affected and ultimately distorted by the presence of buffer zones (such as rural areas and natural parks) between the municipalities, whereas such a drawback occurs to a lesser extent inasmuch as the scale of investigation lessens. Anyway, for doubt's shake, the Moran Index of spatial autocorrelation was calculated and the LAG analysis was performed beside the OLS, the synthetic results of which will also appear here below.

4.3 Outcomes

Before discussing the OLS outcomes, it is worth providing an overview of the ISMV general trends and geography, from 2001 to 2011 After an improvement in 2001 (98.8 compared to the 1991 base value = 100), the index, at the national level, increased, becoming 99.3 in 2011. The Lombardy, although remaining in 2011 one of the less exposed Italian regions to socioeconomic vulnerability (after Veneto and Friuli-Venezia Giulia) and having shown a trend of ISMV similar to the national one, suffered however from one of the highest increases of the index (from 96.8 to 97.9) between 2001 and 2011. Chart 1 shows the ISMV values in the MCM, at the municipal scale, in 2001 and 2011, whereas Chart 2 illustrates the variations occurred between the two dates. Three stylized facts arise from those charts:

a) the core city (Milan) has the highest values of vulnerability both in 2001 and in 2011;
b) a general increase in the level of vulnerability occurred between 2001 and 2011 in almost all the CMC municipalities;
c) this increase has been stronger in the municipalities surrounding the core city, as well as in a few peripheral municipalities.

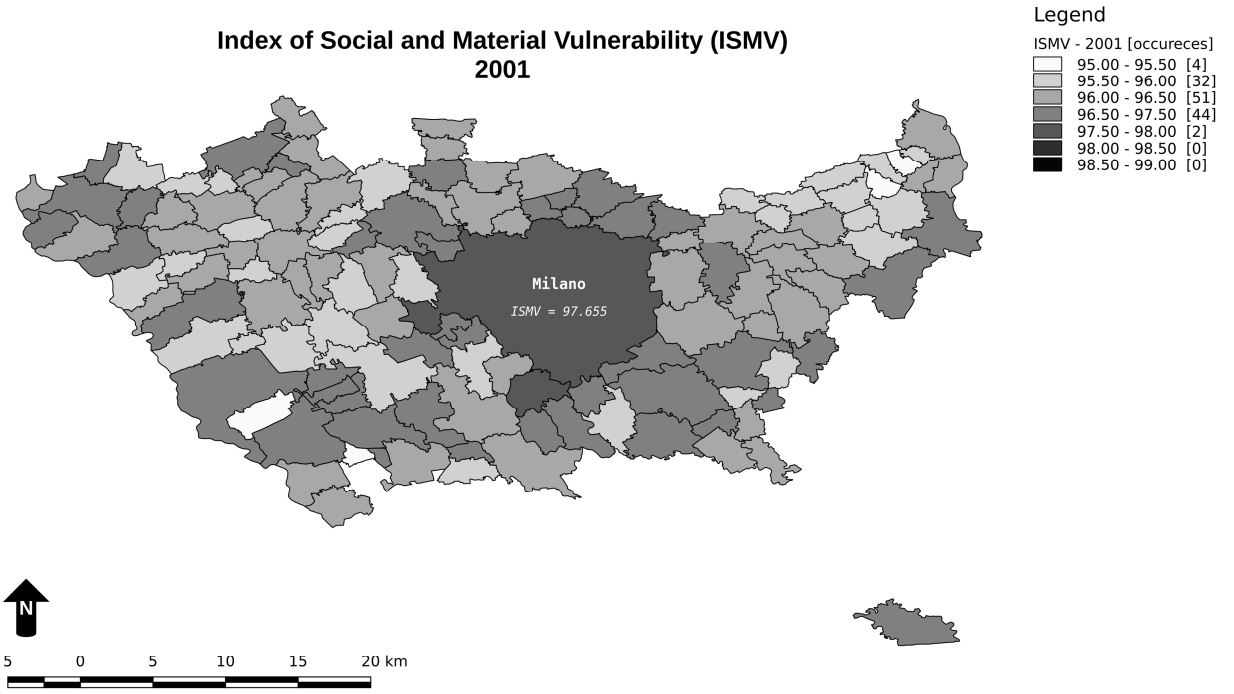
The hypothesis that social and material vulnerability is correlated with urban centrality and, specifically, with certain features of this centrality, like demographic and/or urban density, rent levels, innovative capacities, appears therefore to be realistic, and it will be statistically tested here below.

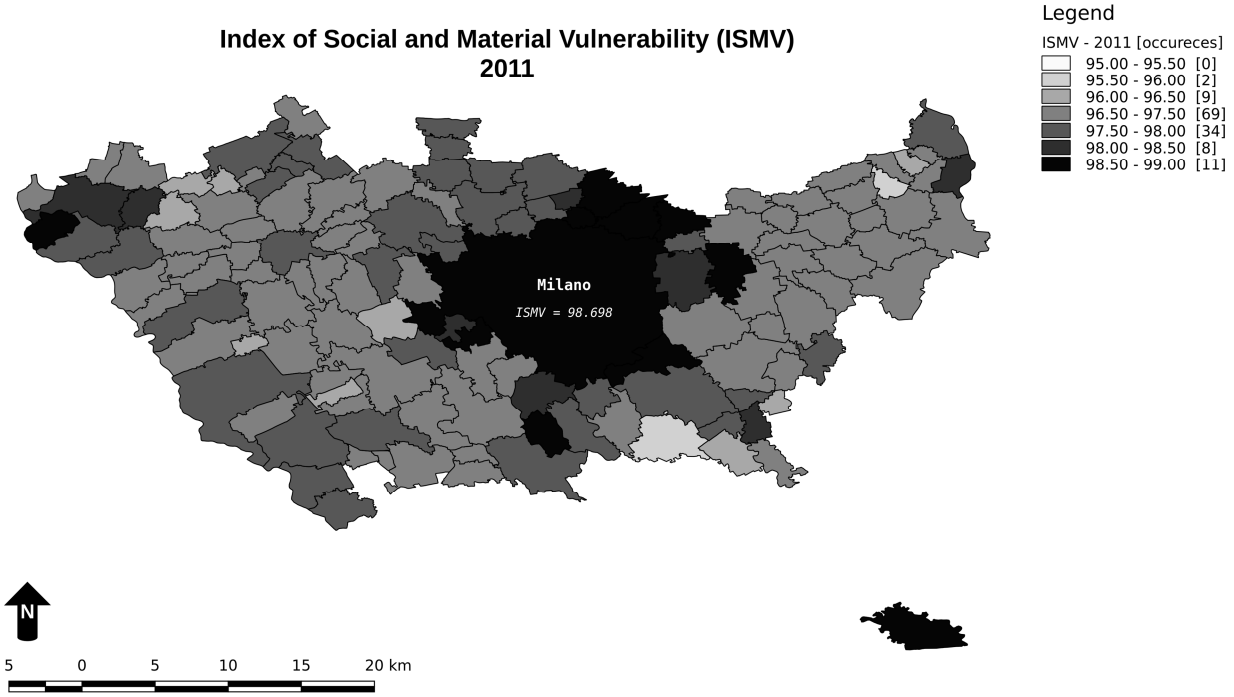
T*able 1 – OLS dependent and independent variables*

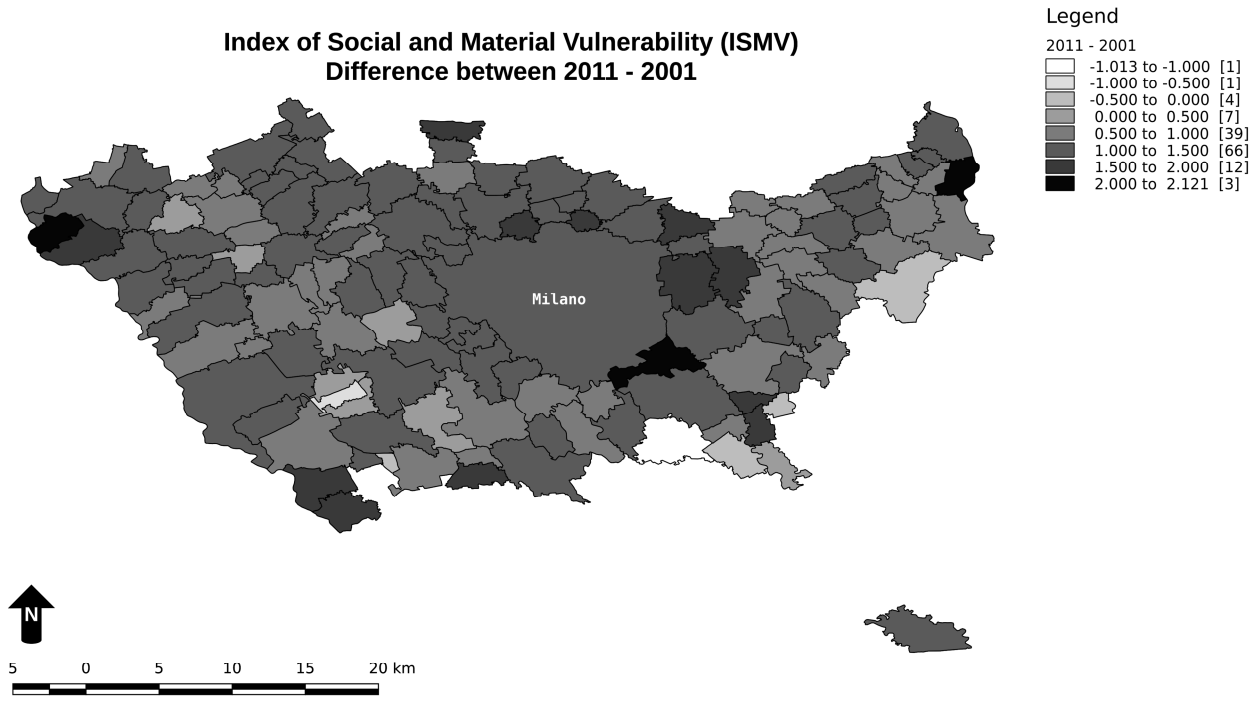
Name	Code	Type	Description	Source
Index of social and material vulnerability	ISMV	Multidimensional	Unweighted and corrected[31] arithmetic mean of the indicators listed in footnote 27	Istat, 8milaCensus
Population density	pop_den	Sociodemographic	Ratio between resident population and the municipal area	Istat, 8milaCensus
Share of population aged 75 years and over	pop≥75	Sociodemographic	Ratio between population aged 75 years and over on the total resident population.	Istat, 8milaCensus
Share of foreign residents	res_imm	Sociodemographic	Ratio between foreign and Italian residents	Istat, 8milaCensus
Share of low-skilled employees	emp_low	Sociodemographic	Ratio between low-skilled employees and total employees	Istat, 8milaCensus
Share of commuters by private means of transport	priv_mob	Spatial	Ratio between resident population (student and worker) daily commuting by private means of transport (auto and motorcycle) and total resident commuters	Istat, 8milaCensus
Students' average commuting time	stu_tpl_out	Spatial	Average travelling time of students commuting outwards their municipality of residence by public transport means (bus, metro and train).	Our elaboration from Istat, 14th and 15th Population and Housing Censuses
Workers' average commuting time	emp_tpl_out	Spatial	Average travelling time of workers commuting outwards their municipality of residence by public transport means (bus, metro and train)	Our elaboration from Istat, 14th and 15th Population and Housing Censuses
Private Knowledge-Intensive Services	pri_kis	Economic	Location quotient of the Private Knowledge Intensive Services as defined by Eurostat (NACE Rev. 2): divisions 50 to 51, 58 to 66, 69 to 75, 78, 80, 90 to 93	Our elaboration from Istat, 8th and 9th Industry and service Census
Public Knowledge-Intensive Services	pub_kis	Economic	Location quotient of the Public Knowledge Intensive Services as defined by Eurostat (NACE Rev. 2): divisions 84 to 88	Istat, 8th and 9th Industry and service Census
Less Knowledge-Intensive Services	l_kis	Economic	Location quotient of the Less Knowledge Intensive Service as defined by Eurostat (NACE Rev. 2): divisions 45 to 47, 49, 52 to 53, 55 to 56, 68, 77, 79, 81 to 82, 94 to 99	Istat, 8th and 9th Industry and service Census
Dwellings area per inhabitant	dwe_pop	Urban	Ratio between total dwelling area and resident population	Our elaboration from Istat, 14th and 15th Population and Housing Censuses
Urban rent	rent_sm	Urban	Average weighted rent cost per square meter of the most common building typology in the most widespread quality conditions over the urbanized area	Our elaboration from Observatory on Real Estate Market (OMI) – Italian Revenue Agency. Second semester 2002 and 2011
Share of centers and settlements areas	cen_set	Urban	Share of urbanized areas on the municipal area	Istat, 8milaCensus

[31] In case of non-substitutability or partial substitutability of the elementary indicators in a "non-compensating" index, the compensative average effect is corrected by adding to the unweighted arithmetic mean of the normalized indicators a factor (penalty coefficient) that depends on the variability of the normalized values of each unit (horizontal variability).

Chart 1 – Index of Social and Material Vulnerability in the Metropolitan City of Milan 2001, 2011, and variations







. The following OLS model was therefore performed on the 133 municipalities of the MCM using the above illustrated normalized variables:

ISMV = pop_den + pop≥75 + emp_low + res_imm + priv_mob + stu_tpl_out + emp_tpl_out + dwe_pop + rent_sm + pub_kis + l_kis + pri_kis + ε

Tables 2 and 3 show the OLS results, regarding respectively 2001 and 2011. As regards the overall significance of the outcomes, the adjusted r^2 values are 0.4574 and 0.6439 on the two years (with $F_{13,\ 119}$ values of respectively 9.559 and 19.36[32]), thus indicating that the OLS specifications have acceptable explicative capacity, especially as concerns 2011[33]. More in detail, considering the 2011, the most significant results (at 99,9%) regard the relationships between ISMV and the presence of Private KIS, the shares of older people and low-skilled workers, along with the share of private mobility. Among these results, it is worth noting the remarkable value (12.1200) of the estimated coefficient linked with the location quotient of Private KIS, which confirms the hypothesis about the leading role of the knowledge-driven economy in enhancing monopolistic rents and causing social vulnerability at the urban and metropolitan scales. For the same reason, and precisely because of the KE polarizing effects on wages, we find a positive, although weaker, relationship between ISMV and the location quotient of low-skilled workforce (estimated coefficient = 2.3099, at a significance level of 99,9%).

With an estimated coefficient close to 2.95, the share of population aged 75 years and over, along with the above mentioned share of low-skilled workforce, are the sociodemographic factors with the most important impact on vulnerability. In the MCM case, they are more important than other factors that are usually

[32] The critical value of $F_{13,\ 119}$ is about 3.02 (p =.001).

[33] Performing the LAG model, we obtain higher adjusted values of r^2, respective equal to .5541 and .7372 in 2001 and 2011, which means that the contiguity effect (spatial autocorrelation) explains about 10 percent more of the ISMV variability than the OLS (a-spatial) model.

considered by the literature on socioeconomic segregation, such as the share of foreign residents and population density, both which, however, affect urban vulnerability positively, although at a lower significance level (respectively 99% and 95%). The positive relationship between the average dwelling surface per inhabitant and vulnerability suggests a twofold interpretation, which deserves however further investigation: on the one hand, larger-sized apartments, especially in the core of a metropolitan area, could relate to the presence of more affluent people which, in turn, enhances social polarization and segregation; on the other hand, regarding peripheral municipalities, it could reflect a pairing between vulnerability and availability of cheaper dwelling solutions.

Table 2 – OLS results – 2001

Coefficients:

	Coef. Est.	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.79954	0.21562	-3.708	0.000319	***
pop_den	0.35130	0.11188	3.140	0.002132	**
pop ≥ 75	-0.26377	0.67797	-0.389	0.697930	
emp_low	2.57070	0.67593	3.803	0.000227	***
res_imm	4.06409	0.97874	4.152	6.22e-05	***
priv_mob	0.29794	0.21779	1.368	0.173879	
stu_tpl_out	0.32507	0.16887	1.925	0.056620	.
emp_tpl_out	-0.01603	0.17028	-0.094	0.925170	
cen_set	-0.03569	0.08982	-0.397	0.691785	
dwe_pop	0.21464	0.10479	2.048	0.042735	*
rent_sm	-0.01469	0.13671	-0.107	0.914584	
pub_kis	5.74531	1.85786	3.092	0.002474	**
l_kis	12.28713	2.88500	4.259	4.13e-05	***
pri_kis	3.88445	2.90340	1.338	0.183481	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.09869 on 119 degrees of freedom
Multiple R-squared: 0.5108, **Adjusted R-squared: 0.4574**
F-statistic: 9.559 on 13 and 119 DF, p-value: 2.42e-13

Table 3 – OLS results – 2011

Coefficients:

	Coef. Est.	Std. Error	t value	Pr(>|t|)	
(Intercept)	-0.511058	0.236917	-2.157	0.033007	*
pop_den	0.263588	0.128501	2.051	0.042437	*
pop ≥ 75	2.951479	0.678728	4.349	2.91e-05	***
emp_low	2.309819	0.638616	3.617	0.000439	***
res_imm	1.764242	0.625679	2.820	0.005632	**
priv_mob	0.816192	0.269031	3.034	0.002966	**
stu_tpl_out	0.005769	0.200792	0.029	0.977127	
emp_tpl_out	-0.783620	0.210857	-3.716	0.000309	***
cen_set	-0.060090	0.099634	-0.603	0.547585	
dwe_pop	0.339550	0.134927	2.517	0.013183	*
rent_sm	-0.052332	0.121902	-0.429	0.668484	
pub_kis	3.355506	2.492337	1.346	0.180755	
l_kis	1.374742	3.271348	0.420	0.675070	
pri_kis	12.120027	3.296215	3.677	0.000356	***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1078 on 119 degrees of freedom
Multiple R-squared: 0.679, **Adjusted R-squared: 0.6439**
F-statistic: 19.36 on 13 and 119 DF, p-value: < 2.2e-16

Finally, the positive relationship between private mobility and vulnerability can be interpreted in relation with the average commuting time of workers towards a different municipality from that of residence, which, on the contrary, is negatively related to vulnerability. The combination of these two relationships indicates that, unlike the U.S. where carless people are more likely to suffer from socioeconomic segregation (Cervero *et al*. 2002, Grengs 2010; Florida 2017), the use of private means of transport (basically cars) in the MCM reflects the lack of an efficient and spatially balanced public transport system. This lack compels people to have recourse to private cars, with a negative impact on households' economic conditions, especially for lower social classes, which is eventually supposed to have a negative effect on vulnerability. This interpretation is corroborated by the counterintuitive evidence that workers' travelling time by public means of transport is negatively correlated with vulnerability. If we suppose that commuters' travelling time mirrors the distance they cover, it is possible to argue that the higher the distances workers cover by means of public transport, the lesser their opportunity cost and, above all, the wider the range of job opportunities they benefit from, with positive effects on socio-economic vulnerability.

The unexpected outcome is the statistical insignificance of urban rent (rent_sm). Unexpected, because of both the theoretical premises, according to which any kind of rent has effects on socio-economic inequality, and previous empirical results (Compagnucci *et al.*, 2018), in proportion to which a strong positive correlation is between the location quotient of the most sophisticated knowledge-intensive services and urban rent levels at the OMI zone[34] level in the MCM. We argue that the discrepancy relates to the complicatedness of calculating the values of urban rent at the municipality scale, as the arithmetic mean of the OMI zone values. The wide range of building categories and their quality conditions with reference to which the Italian Revenue Agency provides such values, along with the lack of information about their respective stocks make it unavoidable to assume some simplifying hypotheses in the formulation of the algorithm for calculating the arithmetic mean.

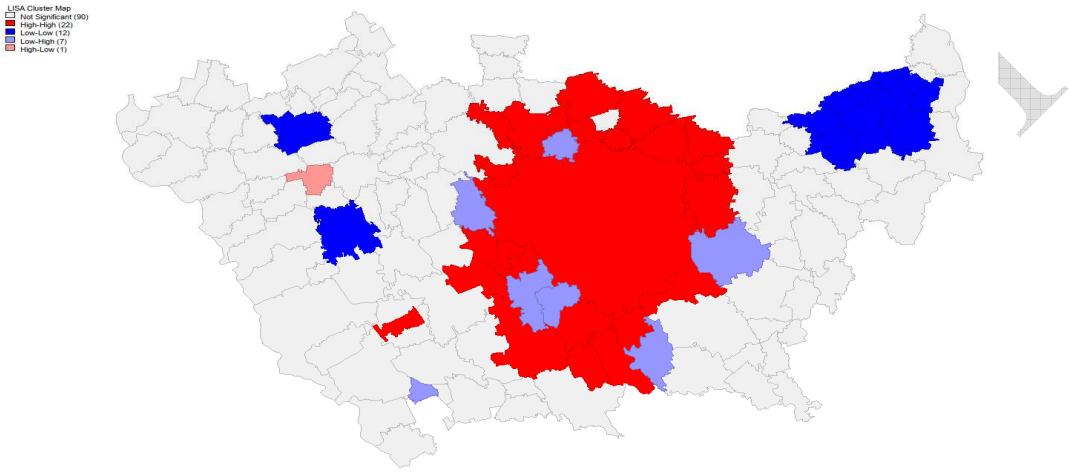
Finally, when comparing the 2011 with the 2001 OLS results, four main evidences arise, signaling important structural changes:

1. increasing significance and weight of the aging population on urban vulnerability. Unlike the other sociodemographic variables (population density, share of low-skilled workforce and share of foreign residents), this factor was not significant in 2001, whereas it shows the highest correlation with vulnerability in 2011. Remembering that the incidence of households with only aged components is part of ISVM, a-correlation is possible between ISVM and the share of the aged population in general. However, whilst in 2001 the simple correlation was only .1176, to indicate substantial independence between the two variables, it jumped to .5455 in 2011, thus revealing a severe aggravation of elder people's segregation process;
2. public transports, unlike private cars, are supposed to play an increasing role in mitigating socioeconomic segregation, given their insignificance with respect to vulnerability in 2001, as opposed to their negative and significant correlation in 2011. Symmetrically, whereas mobility by private means of transport was not significant in 2001, it affects positively and significantly ISMV in 2011. Third, whilst in 2001 vulnerability was importantly and positively associated with l_kis, in 2011 it is basically Private KIS-driven, further corroborating our theoretical approach;
3. the role of Public KIS has become insignificant between 2001 and 2011. It is thus possible arguing that an important shift in the socio-economic structure of the main Italian Metropolitan City has occurred in the observed decade. From the one hand, the MCM has strengthen its role as the most innovative and knowledge-driven Italian metropolitan area, capable to compete with the most advanced European cities. From the other hand, precisely this process seems to be the main responsible for the increase of socioeconomic vulnerability, because of its aptitude to trigger rents and subsequent polarization effects. This dualism leaves broad scope for the application of public policies;

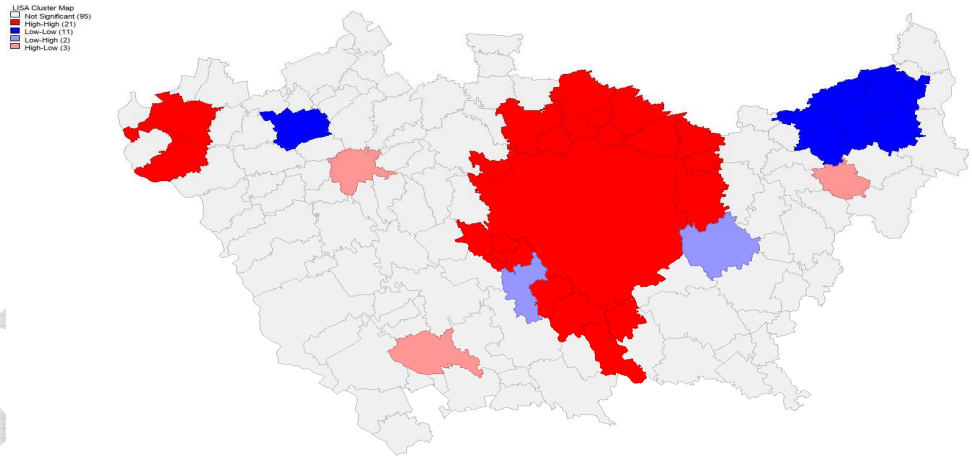
[34] An OMI Zone is a continuous portion of the municipal area, where the local real estate market can be considered homogeneous (http://www.agenziaentrate.gov.it/wps/content/nsilib/nsi/documentazione/omi). See also ISTAT (2018).

4. a process of increasing socio-spatial polarization is also observable[35]. In actual fact, the *Moran I* of ISMV's , though not being so much high, rose from .3158 in 2001 to .4076 in 2011[36]. Charts 2a and 2b well render this trend, by showing that, first, the capital city and surrounding municipalities form the main cluster of High-High ISVM; second, the compaction of this cluster has risen on time, in that its initial internal situations of Low-High clustering have disappeared from 2001 to 2011; third, a High-High cluster is rising in the north-western boundaries of the MCM, which might be joint to an external cluster.

Chart 2 – ISMV clusters



a. 2001



a. 2011

5. Conclusions

The fact that cities are the transformers of societies is a well-established belief in social sciences. Whether they succeed in doing so through rent – any kind of rent – is a less professed belief, especially in mainstream economics. Actually, admitting that rent lies at the foundation of *the* city and is its typical mean of support

[35] The Municipality of *San Colombano al Lanbro* was not considered, because of its physical separateness from the rest of the MCM.
[36] With *p-values* of respectively 6.199e-09 and 1.433e-13,

would entails also admitting that the social and the political dimensions play an important role within the economic domain, since systematic rent seeking practices affect the social fabric as a whole. In fact, the raising concern for the increasing social inequality and polarization within advanced countries is not only due to its potential negative impact on the sole economic system, or to social fairness, but also (if not firstly) to the (tacit) fear of possible traumatic social and political discontinuities. After all, Saint-Just's warning that "*les malheureux sont la puissance de la terre*" (quoted in Arendt, 1990: 59) is not so much far in the past to be disregarded with nonchalance.

On this background, there is broad consensus in social sciences and among heterodox economists that the KE is causing increasing inequality. The new pattern of economic development, indeed, is a powerful driver for rent seeking, thanks to ceaseless innovation. This situation is somehow paradoxical, since innovation, although being supposed to address quasi-rents, allows them to turn into true rents when stemming from restricted circles of high-skilled networks, which tend to become exclusive circles thanks to increasing and evolving entry barriers.

The enquiry this work carried out on the main and most advanced Italian metropolitan area – the Metropolitan City of Milan – corroborated that idea. From 2001 to 2011, Private KIS took the place of Low KIS and Public KIS in driving the geography of the social and material vulnerability. In this connection, two crucial questions arise, both which go beyond this work aims. The first question relates to the nature of the causal link, if one, between KE's development and increasing socio-spatial inequality. Whereas it seems amply reasonable sharing the widespread opinion that KE's development entails a shrinkage in the middle-class jobs, while broadening the wage gap between high-skilled and low-skilled workers, a lateral and subtler issue is worth being investigated, which regards the role of the city, intended as a socio-spatial entity endowed with certain specific factors, in generating or widening inequalities. Here, reference is, essentially, to the milieu effect, which enhances people's creative attitudes and entrepreneurs' innovative inclinations (Rémy, 2000; Cusinato, 2007a, 2016b), thus strengthening the above effects of KE's development, and/or to the more basic circumstance that, being the city the biggest repository of rents, it attracts people like honey for bees, either people who will actively to engage themselves in making rent (the aspiring upper class) or people who simply hope more or less passively to enjoy some byproduct or waste from the existing rent flows (the lowest class), as it happens at an amazing scale in less-developed countries (and it also happened in the nowadays advanced countries before industrialization).

The second question regards the possible trends of the increasing levels of inequality triggered by the KE. Are they destined to be a lasting phenomenon and, maybe, to exacerbate in the future, or to be reversed thanks to the enlargement of the economic base and/or the improvement of the general economic conditions made possible by the development of the KE itself? The answer depends on the future working of rent seeking mechanisms in the KE along with the long-term effects they will have on the labor market. As to the first aspect, in case such mechanisms are self-reinforcing, social inequalities are doomed to rise over time. Being impossible (and inconceivable) to hamper innovation propensities, a possible way to control those mechanisms is handling KE's geography through urban and regional policies and according to a spatial equity criterion. Since KIS show to have very high propensity towards central places, a more equitable geography can be pursued by widening the city effect around the core city, by planning more effective and distributed infrastructures for mobility and transport services (especially public transport services, at least with reference to the examined case study), along with the improvement of urban quality in the peripheral settlements: in a few words, by achieving a true condition of metropolitan city, where specialization rather than hierarchy between its parts is the true connective principle.

The most advanced European cities in the knowledge-driven economy have been moving in that direction since the 1990s, by implementing different processes of strategic governance on the metropolitan scale, by allocating economic and financial resources aimed at rebalancing territorial inequalities, thus affirming the role of governmental institutions as important agents of economic development and social regulation. On the contrary, in the MCM, during the same period – when the changes induced by the post-industrial transition were already evident with regard to the economic base and the population structure of the city at both the

municipal and the metropolitan levels – the ruling elites and public institutions favored a process of market-driven social and spatial transformation. In actual fact, the neo-liberal impulses have intensified rather than mitigated, undercapitalization in the MCM, with the consequent increase of socio-spatial inequalities. What appears to be no longer delayable is therefore a major change in public policies, aimed at devising an alternative to a consolidated spatially selective political strategy, and facing the tensions caused by the dynamics of the KE.

As regards the labor market, the literature is almost unanimous in acknowledging that wage polarization will widen progressively in the KE, because of both the shrinkage of the middle job classes and faster turnover in material production jobs, due to the increasing competition between enterprises. In these circumstance, it seems that the public sector can play a buffer role, without forgetting, however, the old but still relevant Baumol's (1967) caveat about the detrimental effects of such a policy on the overall productivity trends[37]. What appears to be more difficult to cope with is lessening the share of low-skilled workers, which proves to be importantly correlated with social and material vulnerability: not so much because of the technical impracticality of upgrading/updating their competences and skills, but because the KE also needs low-skilled workers (beyond high-skilled workers), be they manual (like personal services) or cognitive (like routine data processing) to free labor time (and minds) to the high-skilled and creative workers.

Finally, with reference to the demographic and social factors (in our case, the share of elder and immigrated population), effective policies are not available, especially at the local scale, to drive their effects on vulnerability. Practicable interventions are the regeneration and relaunch of social housing, the strengthening of the social services and infrastructures, the mitigation of personal and social distress through public help and, what now appears to be more promising, fostering social innovation through the same people concerned, maybe by having recourse to the Third Sector (Bureau of European Policy Advisers, 2011).

Given the statistical significance and substantial relevance of the above results, further work is recommended on this topic. Refining the spatial scale by adopting a smaller spatial unit of analysis than municipality appears to be the first suitable move, not only for getting a more detailed geography of socio-spatial inequality and polarization, but for applying the spatial econometric analysis appropriately. The Census area, as defined by ISTAT[38] or the OMI zones[39] appear to be the suitable candidates (in Italy) for this purpose. Widening the investigation area from the MCM (which is an administrative spatial entity) to the Metropolitan Area of Milan (which is a socio-economic spatial entity) by at least incuding the province of Monza-Brianza, will also likely improve the significance of this kind of investigation[40]. Another aspects that deserves more attention in future work, is including other variables into the spatial-econometric analysis, especially to control the role of the 2008 crisis.

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[37] See also Cusinato (2007b) too see how the KE can circumvent that caveat.

[38] According to ISTAT, the Census Areas (ACE) result from the spatial aggregation of contiguous census sections, within municipalities with almost 20,000 inhabitants or provincial capitals. The aggregation follows administrative (sub-municipalities), infrastructural (main streets and railways), physical (rivers, channels, ridges, etc.), demographic (about 13-15,000 inhabitants) and social criteria, along with the suggestions by the municipalities involved.

[39] See footnote 34.

[40] See Compagnucci, Cusinato's (2017) explorative work.

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