



# A spatial econometric analysis of land use efficiency in large and small municipalities



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## ABSTRACT

We estimate the relationship between urban spatial expansion and its socio-economic determinants in Lombardy, the most urbanised region of Italy (and one of the most of the European Union), at the municipality level. Test results suggest that this relationship varies significantly among municipalities of different size and findings support the hypothesis that larger ones are more efficient in managing land take. In particular, we find that the marginal land consumption per new household is inversely related to the size of the municipality and we link this evidence to the fact that, since more space is often available, small municipalities pay less institutional attention to the issue of land take and consequently internalise less the environmental externalities. This evidence calls for a reflection on the role of planning policies and the effectiveness of undifferentiated measures to contain land take, especially in the case of Italy, where the municipalities, more than 99% of which have less than 50,000 inhabitants, decide on land use transformations.

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## 1. Introduction

Is the inefficient land use related to city size? With about 7.6% of land classified as *artificial*, against the European Union (EU) average of 4.6%, Italy is among the countries in Europe where the problem of land take is most severe. Like in many other countries, urbanisation – meaning industrial, commercial, and residential land use and transport infrastructures – is the main responsible of this land take, which primarily realises at the expenses of agricultural land. According to the last report of soil consumption in Italy (ISPRA, 2015), infrastructures and urban fabric account in fact for 41% and 30% of total land consumption respectively, hence the conversion of land from mainly agricultural (60%) and natural (20%) uses to urbanised area. Italy is a highly fragmented country from the administrative standpoint: large municipalities, with more than 50,000 inhabitants, represent less than 2% of the total (about 8000) municipalities. With more than 30% of the Italian population, large municipalities concentrate less than 20% of the total artificial area: this means that medium-size and small munic-

ipalities, where the average population density is lower, are also mainly responsible for land take. For instance, more than 30% of the artificial area concentrates in municipalities with less than 5000 inhabitants. The urbanization-driven land use change often impacts the environment and the ecosystems significantly. Hence, it is regarded as socially undesirable, especially by civic and political groups wishing to preserve the territory from soil sealing, as well as from noise and pollution generated by the transport system. Larger cities imply longer average commutes, more substantial air pollution and road congestion and, in turn, the deterioration of the environmental quality and the quality of life of individuals and communities. Studies documented also the effects on the ecological equilibrium (Alberti, 2005) and the potential for rural development, primarily through the direct effects on farmland loss and indirect effects on farmland prices (Delbecq et al., 2014; Guiling et al., 2009; Karlsson and Nilsson, 2014; Livanis et al., 2006).

Urban economists traditionally mitigated this strong negative sentiment against urban expansion upholding a rational justification for it, connected to the increased demand for housing generated by higher income, growing population, and the decline in transport cost (Brueckner, 2000). Grounding on the Mills-Muth theory of monocentric urban development (Mills, 1972;

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Muth, 1969), the economists' view advocates the predominant role of market forces in determining the optimal allocation of land across alternative uses, which benefits the households to the largest extent. Building on the comparative static analysis elaborated by Wheaton (1974), Brueckner and Fansler (1983) propose a regression approach to testing if some exogenous variables influencing the demand and supply of housing can explain the spatial size of cities. Their results provide support and justification for the economists' view, implicitly rejecting the hypothesis of sprawl, intended as a consumption of land not explained by a utility-based economic rationale. McGrath (2005), Paulsen (2012), Spivey (2008), and Wassmer (2006) extend this stream of empirical research on different samples of US cities. US-based evidence suggests that the variables of the Mills-Muth model, namely population, income, transport costs and agricultural rents, explain about 80% of the spatial variation in the urban city size (Paulsen, 2012). Results are similar in some European countries (Hortas-Rico, 2014; Oueslati et al., 2015; Pirotte and Madre, 2011) and in developing countries such as China (Deng et al., 2008; Song et al., 2014) and India (Brueckner and Sridhar, 2012).

Despite the robust empirical evidence endorsing the role of markets, the optimal land allocation is still influenced by externalities that may prevent the correct functioning of market mechanisms, impacting both the average and the marginal land consumption as well as the geographical distribution of urbanisation. For instance, landscape is a public good and its value is not considered an economic loss in the conversion of agricultural (or natural) land for real estate purposes. Congestion likewise causes negative externalities that the commuters are not asked to pay for in the cost of their trip. In theory, the cost of externalities could be internalised, as suggested by Brueckner (2000), but in fact, the use of a system of fiscal incentives as a remedy to market failures can be very difficult to implement and to manage in the case of land use (Knaap et al., 2007). As a partial result of market inefficiency, urban spatial expansion occurred even in circumstances of declining population and number of households (Haase et al., 2013). Often, in the past, local municipalities planned urban spatial expansion through greenfield building in response to a growing population. Less often, and more recently, some attention converged to the practices of residential densification (brownfield building), the process of urban restructuring functional to accommodate the increase in the demand for houses within the existing urban space (Broitman and Koomen, 2015). Densification is associated to a regain in residential attractiveness and occurred primarily in few inner-cities (Haase et al., 2010). Hence the cities become larger and their density lower, especially in the peripheries, for reasons that are weakly related to the socio-demographic trends. In contrast, evidence indicates that people value the high fragmentation of residential land use (Kuethe, 2012), which increases the demand for houses in the peripheries. Consequently, the controversial dispute about the call for urban planning practices is still unresolved, opposing those who believe that densities at the urban fringe are remarkably low to the detriment of agricultural and natural land and that the urban densification should be encouraged, and the expansion discouraged, to those who consider that the restrictions about land-use will only narrow people's utility by limiting housing supply.

The divergences in the definitions of sprawl and the methods to assess the relevance for urban expansion of market-related factors contribute to fuelling this controversy. On the one hand, in defining sprawl, many (usually *land-take opponents*) refer to the mere increase in urbanised area (Patacchini et al., 2009), which is seen as a bad result independently from the extent to which is effectively driven by a growing demand for housing. Others refer more specifically to the fragmentation of the built-up area

(Oueslati et al., 2015). In contrast, economists define sprawl as a land take that is excessive with respect to the optimal amount of urbanised area, and specifically to housing demand (Brueckner, 2000). In line with this approach, the OECD suggests measuring sprawl as the growth in built-up area adjusted for the growth of population (OECD, 2013). Furthermore, the economists' view recognise the peculiar character of urban sprawl, outlined primarily by declines in housing unit density and by increases in marginal land consumption per new household (Paulsen, 2014). On the other hand, regarding methodology, the Brueckner and Fansler (1983) approach only shows that urban size is related to market variables but does not reveal to what extent this relationship leads to consumption of land that could be defined excessive. To evaluate this point, consider the case of population, which probably has the largest impact on housing demand. Some cities respond to population growth encouraging densification and planning only small, and very dense, expansions; some other cities promote low-density building beyond the urban fringe. In both cases, the increase in urbanised area can be linked to population growth, but only in the second case the expansion takes the characters of sprawl, hence declining density and increasing marginal land consumption.

In this work we argue that the Brueckner and Fansler (1983) approach provided so far clear indications in favour of the economic rationale behind urban spatial growth, and implicitly against the hypothesis of excessive land take, since focused on large cities and metropolitan areas, while excluding the low-density peripheries (see Paulsen (2014)), and neglecting medium and small cities. In particular, we suggest that the price of land in large cities better internalises the negative externalities implicit in the process of land use change. Oppositely, unnecessary land take and sprawl phenomena likely appear in small cities, where the availability and the low price of land often lower the institutional attention on its efficient allocation and on the necessity to balance the negative environmental externalities. For instance, the countryside, which supplies open spaces and rural and natural amenities, is readily available in cities of limited size, and the urban landscape is hence less valuable. Moreover, the increase in commuting is not perceived as a problem, since urban traffic is still at levels which do not cause excessive congestion and air pollution. More available space and less institutional attention lower the competition for land use with two most important implications. First, an increase in income makes people more willing to leave their apartments in the city centre to buy larger houses in the periphery, determining an increase in urbanised area which is not motivated by the demographic dynamics. Second, relatively lower land prices translate into more substantial profits for the building sector, stimulating the speculative behaviours of agents that also leverage on the lower fiscal capacity of the municipalities and on their need to use land conversion charges to finance their budgets.

We assess the structural differences in the behaviours of large and small municipalities using the case study of Lombardy region, the most urbanised region in Italy (and one of the most urbanised in the EU). We build the analysis at the municipality level, because each municipality – regardless of the size – can decide (substantially) by itself on land transformations affecting its territory, and show that large municipalities are relatively more efficient in managing land use compared to medium-size and small ones. This evidence of relative inefficiency provides little support for an economic rationale behind the urban spatial expansion. On the contrary, the findings in this paper call for a deeper understanding of the territorial determinants of urban expansion, especially in those areas traditionally marginalised by the sprawl debate, to provide more effective policy instruments.

In the next section, we discuss the features of the Italian administrative structure, justifying the attention to the municipality level.

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