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BE (AND HAVE) GOOD NEIGHBOURS! MULTI-HAZARD VULNERABILITY IN A SPATIAL PERSPECTIVE

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ABSTRACT

Disaster risk is usually considered as a function of hazard, exposure and vulnerability, but also what happens in the neighbouring space matters. Unfortunately, the role of geographical and spatial relationships has been too often neglected by the economic literature on disasters. This work uses updated statistics on natural hazards at a municipality level in Italy and, by means of an exploratory spatial data analysis (ESDA), it explicitly tackles the issue of the neighbourhoods' features. According to a set of clusters of municipalities, which show different levels and types of hazard (earthquake, landslide, and food), both exposure and vulnerability to adverse events is assessed in a spatial perspective. In particular, it is observed the correlation between hazard, on the one hand, and spatially-lagged exposure and spatially-lagged vulnerability, on the other. Results suggest that also the characteristics of the neighbouring space should be included into new definitions of vulnerability, not being ignored by policymakers.

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1. Introduction

Promoted and supported by the United Nations International Strategy for Disaster Risk Reduction (UNISDR), the Sendai Framework for Disaster Risk Reduction 2015-2030 aims to reduce disaster risk worldwide by 2030, mitigating the impact on the population of natural events (earthquakes, tsunamis, cyclones, volcanic eruptions, landslides and climate change). This is of utmost importance also for developed countries, such as Italy. In the European Union, Italy is the country with the highest probability of a disaster and related economic losses (Beck *et al.*, 2012; Frigerio and De Amicis, 2016; Valensise *et al.*, 2017), and the need to overcome unpreparedness appears to be particularly urgent.

Actually, according to the Disaster Risk Reduction (DRR) framework, 'natural' disasters are not expected to exist (Pagliacci and Russo, forthcoming). While the "forces of nature" play a key role (Costanza and Farley, 2007: 249), a disaster is always the outcome of human (and economic) decisions as well (UNISDR, 2015). Thus, since the 1990s, the socio-economic discourse on disasters has focused on the statistical tools to properly assess risks (Cutter *et al.*, 2003; Cardona, 2005; Frigerio and De Amicis, 2016, Birkmann, 2007; Bollin and Hidajat, 2006; Peduzzi, 2006; Schumacher and Strobl, 2011). These contributions rely on a common economic principle, according to which disaster risk is the compound function of natural hazard (namely, a threat of a naturally occurring event will have a negative effect on humans), exposure (which includes all the elements at risk, e.g. people and their economic assets), and vulnerability (i.e., all those physical, social, economic and environmental factors that may increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards[3]) (Wisner *et al.*, 2004; UNISDR, 2004; 2015; Frigerio and De Amicis, 2016).

In order to assess and compare risk across different communities (or areas), empirical strategies (Dao and Peduzzi, 2003; Peduzzi *et al.*, 2009; Cardona *et al.*, 2012) have adopted the following mathematical formulation (UNDRO, 1979):

$$\text{Risk} = \text{Hazard} \times \text{Exposure} \times \text{Vulnerability} \qquad (1)$$

However, Pagliacci and Russo (forthcoming) suggest the ineffectiveness of this formulation, because of two main issues: i) the general lack of data at the appropriate time-space granularity; ii) the proper (economic) meaning given to the operators combining risk's determinants. This does not alter the importance of such a formulation, which rests on the idea that to reduce risks to zero, either hazard, or exposure, or vulnerability should be equal to zero. However, while neither hazards can be eliminated nor exposed persons and assets can be removed – the only feasible way to implement DRR is reducing vulnerability, increasing an exposed population's awareness of natural events (prevention) and reducing their burden of suffering from adverse effects when impacted by an event (mitigation). This process calls for social innovation, to enhance the role of local communities and institutions in designing tailor-made solutions (Pagliacci et al., 2017).

If local communities must represent the core of systemic actions needed to reduce vulnerability and to activate processes of social innovation, local heterogeneity is expected to matter. Unfortunately, economic literature has too often neglected – or misconsidered – the issue of the territorial implementation of general policies, only focusing on the nation-wide level of interventions. In fact, both local-level vulnerability and the variety of socio-economic conditions even in neighbouring territories matter. In addition, preparedness interventions have different outcomes, given the characteristics of the places involved: to some extent, large cities behave – and perform – differently from rural or remote regions. Moreover, what also matters is quality of institutions, which may differ also across a single country[4].

Thus, within this analytical framework of resilience, a solid and shared knowledge-base on hazards at local level is necessary but not sufficient condition to improve prevention and mitigation. Actually, it should couple with two additional assessments: firstly, an appropriate identification of the local levels of exposure and vulnerability (driven by socioeconomic characteristics of places); secondly, a wider analysis of all the

[3] Latest definitions of vulnerability are no longer related to physical fragility only, as it was in the 1970s and the 1980s (Birkmann, 2007).

[4] See Barone and Mocetti (2014) for a comparative analysis about Italian earthquakes, occurring in different regions over the last 40 years.

geographical and spatial relationships, which also involve neighbouring municipalities. This work exactly aims to answer this research question. Grounded on the previous results by Pagliacci and Russo (forthcoming), who return an empirical analysis of the territorial distribution of hazards, vulnerability and exposure across Italy, this paper explicitly focus on the role of neighbouring territories and their features, in terms of exposure and vulnerability. The analysis is carried on at municipality-level data, and by referring to Exploratory Spatial Data Analysis (ESDA), according to alternative spatial weight matrices, spatially-lagged variables are returned and commented. This latter issue represents the major novelty that characterises this analysis. Accordingly, this paper shows a strong policy focus and it aims to be of use to Italian decision makers, as any DRR measure could largely benefit from a more spatially-tailored approach.

The rest of the paper is structured as follows. Section 2 describes the case study (Italy and its long lasting history of disasters), explaining why it is important to assess the role of the neighbouring areas when considering adverse natural events. Section 3 is a methodological section, which firstly defines some indicators for tackling this issue. In particular, it returns the key elements that characterise the implementation of ESDA on this topic. Section 4 returns the main results, and Section 5 discusses them under the light of well-consolidated territorial imbalances in the country, also providing some possible policy implications. Section 6 concludes the work, pointing out future research strands.

2. The case study: which role for neighbouring space?

2.1. Italy: a country prone to adverse events

In the World Risk Report (Beck *et al.*, 2012), Italy is the fifth EU country in terms of probability of a disaster, due to its geographical location (Valensise *et al.*, 2017). Although Italy is prone to natural hazards and it has suffered a long history of catastrophic events, only the dramatic earthquake events of 2016 in Central Italy (causing more than 300 human losses and considerable damage to the economic, productive, artistic and social fabric), have brought back to the centre of general attention the importance of implementing actions to reduce risks (Pagliacci and Russo, forthcoming).

The launch of the "Casa Italia" Plan – an extraordinary plan promoted by the Italian Government, in line with the priorities of the Sendai Framework (UNISDR, 2015) – represents a “comprehensive proposal aimed at protecting Italy’s public buildings, homes and cultural sites over the next decades” (Pagliacci et al., 2017, 92). Such a plan actually stresses the importance of implementing 'building back better' actions and building safer buildings (Pagliacci *et al.*, 2017). Moving from the need for risk assessment, the plan has also encouraged the creation of an integrated information framework on the main hazards in Italy. Thus, in August 2017, Istat (the Italian National Institute for Statistics) made available a dataset on hazards from earthquakes, volcanic eruptions, landslides and floods, on a municipality basis. Actually, detailed information (namely, municipality-level data) is crucial to highlight local heterogeneity, and to strengthen the capacity of exposed local governments and communities to reduce their own vulnerability (Russo and Silvestri, 2017).

In particular, Pagliacci and Russo (forthcoming) focus on three hazard types: earthquakes, landslides and floods hazards.

2.2. Territorial heterogeneity and spatial effects: a tale of two cities

As suggested by Cardona et al. (2012), a catastrophic disaster is not the inevitable consequence of a hazard event. Much has to do with exposure and vulnerability of local communities living in hazard-prone areas. Although socioeconomic features matter (Frigerio and De Amicis, 2016), they are just part of the story: also vulnerability of each municipality’s neighbours plays a role.

Let’s imagine that an adverse natural event hit two municipalities with similar socioeconomic features, e.g. both of them are two tiny rural communities, with limited presence of manufacturing activities, with a low level of local technical skills, lacking essential governance competences, because of their small size. Let’s imagine that these municipalities also share similar hazard levels, and similar hazard types. Since the seminal

contribution from UNDRO (1979), both of them should experience a similar (large) disaster risk, because of high vulnerability. Let's now introduce, as a difference between the two municipalities, the characteristics of their neighbours: one municipality being close to a larger and wealthier urban area, the other one being surrounded only by remote and vulnerable local communities. If so, would these municipalities experience similar effects after the occurrence of an adverse natural event? Probably, no one would say a yes. Everyone would say that the former municipality could take advantage, both in the aftermath and in the reconstruction process, of the presence of the larger city in its surroundings, because of stronger governance competences, larger availability of tangible and intangible assets, that could be made accessible both for households and for economic agents, hit by the event.

This analysis calls for the importance of a proper assessment of the territorial heterogeneity along many dimension. In Italy, this has always represented a widely debated topic. Italian post-WWII socioeconomic literature stressed the North-South divide, then the changed conditions emerged in the 1970s highlighted the emergence of the so-called 'Third Italy' (Bagnasco, 1977). Lately, new territorial imbalances have been analysed across Italy. For instance, Bertolini et al. (2008) stress the urban-rural divides in socioeconomic performances of territories. In particular, rural areas have suffered from socioeconomic weakness and negative demographic trends since the mass urbanization process (Bertolini et al., 2008; Copus et al., 2015), which today make them more vulnerable also to adverse natural events. SNAI has also assessed this issue (Barca et al., 2014).

To a broader extent, local-level territorial heterogeneity is likely to also affect DRR implementation, even though economic literature has too often neglected – or misconsidered – it. In fact, it is true that nation-wide interventions differ from local-level ones. Nevertheless, as far as DRR recommendations are concerned, they usually target the national/supranational level. This is mostly due to the fact that only few data for economic analysis are available at sub-national level. Thus, most of studies only return cross-country analyses, to stress the weak conditions characterising developing countries (see, for instance, Strömberg, 2007; Cavallo and Noy, 2011; Kahn, 2003).

With the specific aim of overcoming such a major lack of knowledge at a local level, UNISDR has recently launched a 'Disaster resilience scorecard for cities' (UNISDR, 2017). It is aimed at providing a set of assessments to allow local governments to monitor and review progress and challenges in the implementation of the Sendai Framework. The fact that its main focus rests on cities is not a case. The discourse on DRR has traditionally focused on large cities and metropolitan areas, due to the number of people they host and the pivotal role generally acknowledged to them. However, also other rural and remote municipalities deserve proper attention. In particular, urban-rural relationships, across neighbouring spaces, are expected to play a key role in the implementation of DRR policies.

3. Methodology

Since the 1990s, an extensive strand of literature has developed, tackling the problems of measuring risks, local resilience and social vulnerability to natural hazards (Briguglio, 1995; Cutter *et al.*, 2003; Cardona, 2005; Beccari, 2016; Frigerio and De Amicis, 2016, Valensise *et al.*, 2017). While, most of these works have also adopted a territorial approach, most of them have ignored spatial interrelationships and the role for neighbouring territories. Not even Pagliacci and Russo (forthcoming), which assess multi-hazard heterogeneity by means of a cluster analysis, at municipality level and which introduce a synthetic multi-hazard indicator – to account for the combination of hazards for each Italian municipality – assess the role of neighbouring municipalities. This work aims to fill this gap, by referring to Exploratory Spatial Data Analysis (ESDA). After having returned some details about the methodology from Pagliacci and Russo (forthcoming), this section discusses the methodological choices behind the ESDA approach suggested here.

3.1. Assessing hazard, exposure and vulnerability

Pagliacci and Russo (forthcoming) have adopted a hierarchical cluster analysis (Kaufmann and Rousseeuw, 1990) to tackle the issue of multiple hazards at municipality level (7,983 observations in total, according to the

2016 administrative partition), by considering maximum PGA (seismic hazard); share of the municipality area under landslide hazard; share of the municipality area under flood hazard[5]. Their analysis returns eight different clusters. Moreover, in order to rank clusters, a synthetic Multi-Hazard Indicator (MHI) is computed on the same inputs, by taking the average of their normalised squares. As these inputs follow an inherently spatial distribution, even a non-spatial cluster analysis (such as the one suggested by Pagliacci and Russo, forthcoming) has returned seven clusters that follow a spatial structure, because of the fact that hazard shows specific spatial patterns. Moreover, in accordance to the UN definition (Cardona, 2005), Pagliacci and Russo (forthcoming) also assess exposure and vulnerability in Italian municipalities. With regard to exposure, they consider: total population (year 2015); number of residential buildings (year 2011); total employment (year 2015); total employment in manufacturing activities (Section C of the NACE Rev. 2) (year 2015); agricultural holdings with utilised agricultural area (year 2010)[6]. With regard to vulnerability, alternative ways exist to assess it. Frigerio and De Amicis (2016) have insightfully assessed social vulnerability across Italian municipalities: through a Principal Component Analysis on socioeconomic and demographic factors, their analysis identifies spatial patterns across Italy. Pagliacci and Russo (forthcoming) adopt a simpler indicator of vulnerability, recently made available by Istat (2018): the Index of Social and Material Vulnerability (ISMV), which provides a synthetic measure of the level of social and material vulnerability for each Italian municipality, combining together seven elementary indicators[7].

In addition to those input variables, in this paper we consider that also the characteristics of neighbouring places and of the spatial relationships among them matter. Either being a remote municipality or having other remote municipalities as neighbours may represent additional sources of vulnerability.

3.2. Modelling the neighbouring space

When considering exposure and vulnerability, patterns of spatial association are more blurred, thus specific statistical methodologies have to be adopted, in order to highlight them. Actually, it is possible to measure the degree of dependency among observations within a given geographic space, by means of Exploratory Spatial Data Analysis (ESDA) (Anselin, 1988; Bivand et al., 2008). Here, ESDA is applied to the main variables describing exposure and vulnerability: according to Moran (1950) and Cliff and Ord (1981), global Moran's I statistic tests for the presence of spatial dependence, by considering a (*n x n*) row-standardized spatial weights matrix (**W**), whose generic element w_{ij} is defined as follows:

$$w_{ij} = \frac{w_{ij}^*}{\sum_{j=1}^{7983} w_{ij}^*} \qquad (2)$$

In (2), w_{ij}^* can take two different values. It is equal to 1, when $i \neq j$ and $j \in N(i)$. It is equal to 0, when $i = j$ or when $i \neq j$ and $j \notin N(i)$. N(i). Here, N(i) represents the set of neighbours of the *i*-th region. According to Anselin (1988), no univocal preferable specifications exist to identify *N(i)*, hence **W**. Here, **W** is defined according to two alternative matrices: both a first-order queen contiguity matrix and a 5-nearest (according to centroid location) neighbour contiguity matrix. In the former cases, island municipalities (14 in Italy[8]) have no

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5 The software R is adopted (R Core Team, 2015). Dissimilarity matrix is computed by means of the Euclidean distance, while the Ward's method is used to assess distances between clusters (Ward, 1963).

6 For the whole set of variables, the data source is Istat (http://dati.istat.it).

7 They are: i) % of illiterate population (25-64 years old); ii) % of households with 6 and more components; iii) % of single parent families; iv) % of households with potential hardship, to indicate the share of families only composed of elderly people (65 years and older) with at least one 80-year-old component; v) % of the population in condition of serious crowding, given by the dwelling surface/inhabitants ratio; vi) % of NEET young people (15-29 years old); vii) % of households with potential economic disadvantage, indicating the share of families with children in which all members are unemployed, or have withdrawn from work (Istat, 2018).

8 With the only exception of Campione d'Italia (CO), namely an Italian exclave in Switzerland, the remaining municipalities are all small islands, and in particular: Capraia Isola (LI), Isola del Giglio (GR), Ponza (LT), Ventotene (LT), Isole Tremiti (FG), Procida (NA), Lipari (ME), La Maddalena (SS), Carloforte (CA), Ustica (PA), Lampedusa e Linosa (AG), Favignana (TP), Pantelleria (TP).

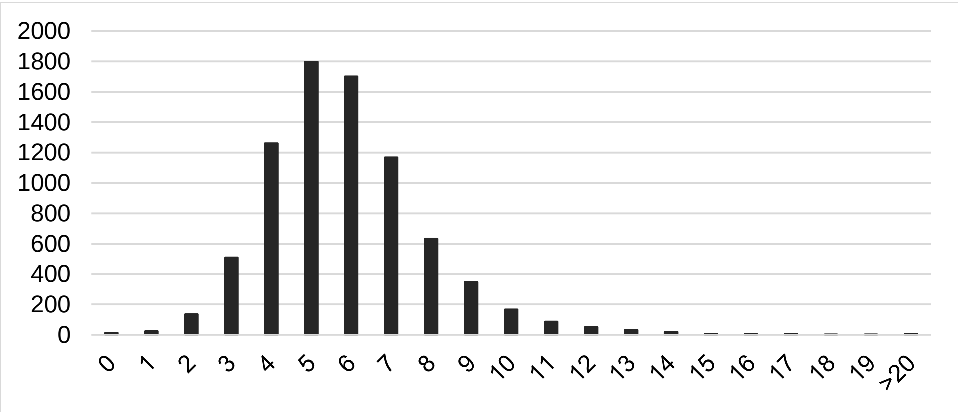
neighbours. In the latter case, the matrix of neighbours is asymmetric neighbours, but it ensures that all municipalities have the same number of neighbours (Bivand *et al.*, 2008).

Secondly, bivariate ESDA is applied as well. By referring to the same spatial weight matrices (**W**), also the correlation between hazard, on the one hand, and spatially-lagged exposure and spatially-lagged vulnerability is assessed as well. Such a bivariate analysis is actually intended to test which are the main characteristics of the neighbouring municipalities, in case of an adverse natural event.

4. Results: the neighbouring space

Additional information characterising Italian municipalities refers to the characteristics of the neighbouring space. To assess it, two contiguity matrices have been introduced: a first-order queen contiguity matrix and a 5-nearest neighbour contiguity matrix. With regard to the former matrix, some additional characteristics describing it should be returned: according to it, Italian municipalities show 5.9 neighbours, on average. However, despite the matrix is symmetric, a large variance in the number of neighbours occur (Figure 1).

Figure 1 – Municipalities, by number of respective neighbours

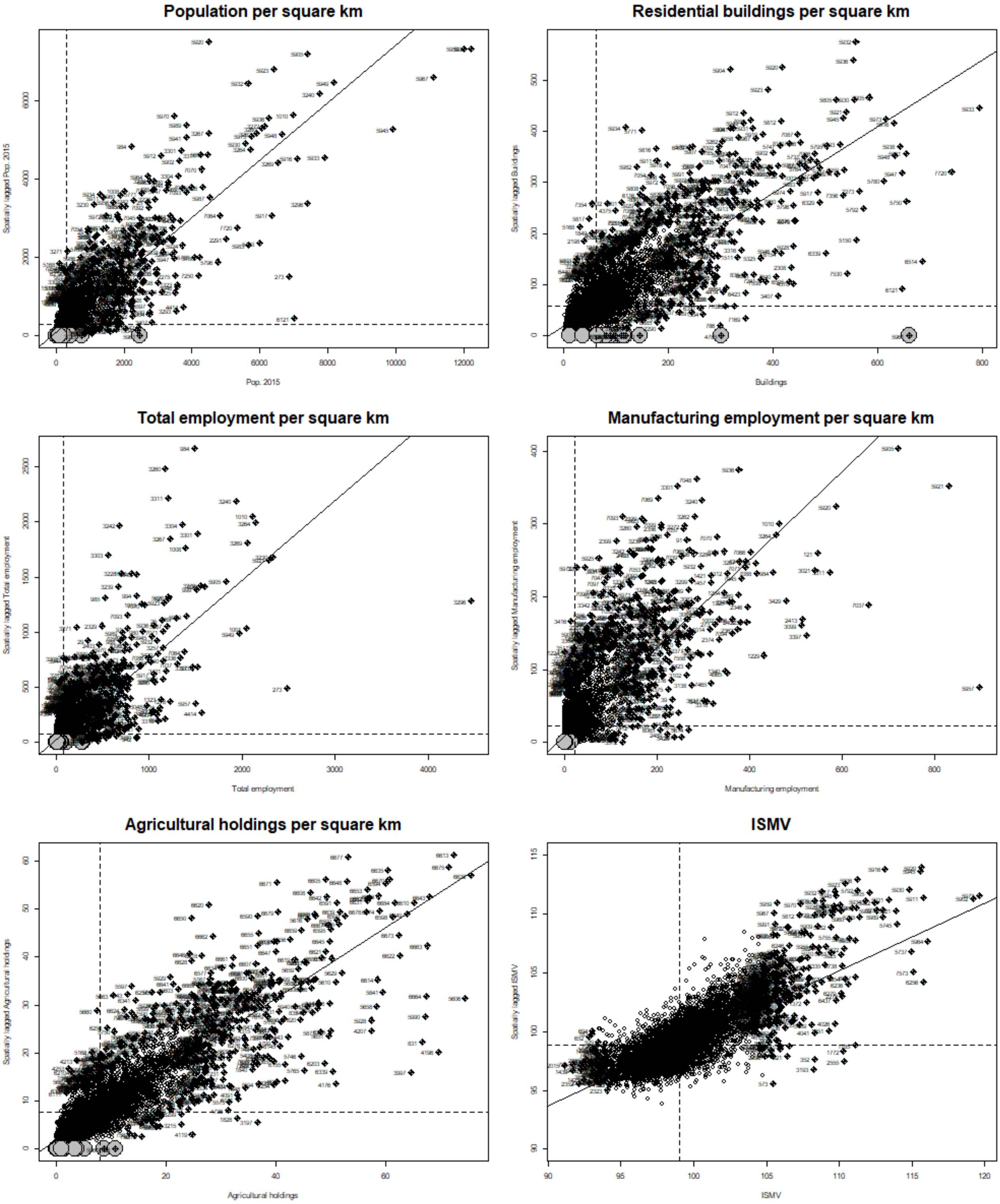


Source: authors' elaboration

According to both matrices, global Moran's I are returned first. In particular, exposure and vulnerability variables are considered and Figure 2 returns main results, by using the first-order queen contiguity matrix to compute global Moran's I. Due to the fact that Italian municipalities largely differ in terms of their own territorial area, exposure indicators have been considered in relative terms, by taking their respective density (per square kilometre).

As clearly indicated by each of the plots, Moran's I is always significant for both exposure variables and for the indicator of local vulnerability (ISMV). This finding is of utmost interest, as it indicates that – on average, at national level – each of the aforementioned variables shows a clear tendency to clustering. As both exposure and vulnerability affect risks (UNDRO, 1979), effects of an adverse natural event tend to amplify in neighbouring space. Actually, not only high-exposure municipalities are located close to other high-exposure municipalities but also high-vulnerability municipalities are located close to other high-vulnerability municipalities.

Figure 2 – Moran scatterplots: exposure and vulnerability variables



Each plot returns, on the x-axis, the variable of interest and, on the y-axis, the same spatially-lagged variable. Here, first-order queen contiguity matrix is used. Circles indicate municipalities with no neighbours in the first-order queen contiguity matrix, for which the value of the spatially-lagged variable is zero.

Source: authors' elaboration

However, more insightful results emerge when considering correlation coefficients among different variables of hazard, exposure, and vulnerability, on the one hand, and additional spatially-lagged variables on the other. To this regard, Table 1 returns the Pearson correlation coefficient among single hazards and the

MHI, on the one hand, and spatially-lagged exposure and spatially-lagged vulnerability, on the other. Data suggests that MHI is positively correlated to spatially-lagged residential buildings, and agricultural holdings, while it is negatively correlated to total employment. Moreover, higher levels of MHI also correlate with higher levels of spatially-lagged ISMV: this means that no benefit from less vulnerable neighbours may help. When distinguishing by type of hazard, main findings - already suggested in literature - appear to be confirmed, such as the fact the floods tend to associate with less vulnerable areas as well as less vulnerable neighbours (Pagliacci, 2017).

Table 1 Pearson correlation coefficients

Hazard	Lagged Exposure					Lagged Vulnerability
	Total Population	Residential buildings	Total employment	Employment in manufacturing	agricultural holdings with UAA	ISMV
MHI	-0.017	0.053	-0.028	0.007	0.085	0.140
	(0.131)	(0.000)	(0.011)	(0.556)	(0.000)	(0.000)
Earthquake	0.004	0.080	-0.023	-0.025	0.172	0.199
	(0.719)	(0.000)	(0.036)	(0.024)	(0.000)	(0.000)
Landslide	-0.064	-0.104	-0.062	-0.124	-0.048	0.051
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Flood	0.014	0.059	0.025	0.151	-0.043	-0.045
	(0.204)	(0.000)	(0.025)	(0.000)	(0.000)	(0.000)

Source: authors' elaboration on Istat data

5. Discussion and policy implications

The analysis presented in this paper sheds new light on the implementation of DRR policies at a local level, asking for a proper awareness of the territorial distributions of hazards, exposure and vulnerability. A result of the paper is that empirical analyses should be implemented not only at municipality-level, but also encompassing neighbouring areas, which are likely to share socioeconomic relationships (embedded in people relationships, in local portions of value chains, in face-to-face business interactions) and institutional settings. The need to define local units of analysis is well known in the economic debate on local development and regional innovation systems (Brusco, 1982; Russo, 1996; Becattini et al., 2009): the analytical framework presented in this paper highlights the specific need of defining the territorial unit of policy intervention. Due to the fact that the occurrence of each specific hazard is geography driven – and often locally-bounded – national-level intervention plans should assess local-level exposure and local-level vulnerability as well as their interplay, which could dramatically affect the outcome of an event, hence risk. This is the reason why nation-level DRR implementation policies are rarely effective, even in developed countries.

Taking Italy as an example, there is no doubt that the country as a whole is prone to natural multi-hazards, hence it would largely benefit from urgent interventions. However, vulnerability differs across the country. Thus, national-scale prevention plans should take specific local conditions into account. In this respect, let us consider "Casa Italia" Plan, which is expected to target the whole country. In its implementation, it builds on ten pilot municipalities[9], which encompass both large cities (Catania and Reggio di Calabria, both with more than 100,000 inhabitants) and smaller rural municipalities (e.g. Sora and Piedimonte Matese, in the Southern Apennines). These pilots could support an opportunity to address also the creation (or the consolidation) of stronger interrelationships across the neighbouring space of each of them. It should be noticed that poor connections with neighbours (as in the case of remote areas) not only negatively affect the generalised vulnerability to economic shocks (Barca *et al.*, 2014), they also turn out to be key components of vulnerability with regard to adverse natural events.

In the local implementation of these nation-wide interventions, policy makers would largely benefit from a specific knowledge of the "more socially vulnerable zones against hazards in order to identify appropriate cost-effective risk reduction strategies to be implemented at national and at the local level" (Frigerio and De Amicis,

[9] They have been preliminary selected (Catania, Feltre, Foligno, Gorizia, Isernia, Piedimonte Matese, Potenza, Reggio di Calabria, Sora and Sulmona).

2016: 194). This is exactly in line with the UNISDR’s (2015) suggestions in enhancing local and community-level preparedness, for instance in the implementation of specific risk mitigation measures. Moreover, also Civil Protection could largely benefit from such an efficient tool, during "pre and post-disaster activities such as communication of emergency procedure" (Frigerio and De Amicis, 2016: 195). In particular, the creation of multi-hazard territorial authorities could support Italian municipalities to integrate systemic plans to implement an effective preparedness at local level (Pagliacci and Russo, forthcoming).

Clearly, all these interventions call for a more general question on the spatial granularity of available information on hazard, exposure, and vulnerability. In several cases, information is not consistent with the available data on population, economic activities and social infrastructures. As a consequence, only dealing with municipality-level aggregated data makes any econometric analysis less accurate, hence less effective for policy-makers.

With regard to policy implications, a complementary issue refers to the need of setting priorities. At country level, the extent of exposed assets is extremely large: medium-high hazard municipalities account for 65% of people and residential buildings in Italy. Such a large scale of intervention needs decades to be realised, a huge amount of available private and public resources, and specific technical and administrative competences. All these elements fuel a process of change that cannot be started and maintained without enhancing local communities’ awareness. Setting priorities in territorial interventions cannot be avoided. To some extent, it is also desirable, as it could support emulation across communities.

6. Conclusions

This paper has focused on the importance of addressing local-level heterogeneity of the neighbours, when dealing with vulnerability to adverse natural events. In addition to those studies that stress the importance of exposure and vulnerability of local communities living in hazard-prone areas, this paper also singles out the need to address the characteristics of the neighbouring space. It is argued that a small municipality surrounded by other remote areas is expected to be much more vulnerable than a similar municipality close-by a larger urban pole, endowed with tangible and intangible assets that could support a smoother reaction to an external shock. When considering the mix of multi-hazard, exposure, and vulnerability, a clear tendency to spatial clustering has emerged: high-high and low-low values tend to be spatially associated, even when considering different dimensions under analysis. Because of the interplay of these features, an adverse natural event may have amplified effects, in specific parts of the country.

Then, further analysis is needed to actually map in which municipalities specific characteristics (in terms of the exposure-vulnerability mix with regard to their own neighbours) occur. With regard to the whole country, there is a need for both new sources of data at a greater spatial granularity and new and more refined indicators of local vulnerability, which would include multidimensional information on the neighbouring space. In our future work, these strands of research are under exploration. A more immediate contribution could be drawn on spotting out some outliers, namely some very vulnerable municipalities which actually could benefit by the presence of less vulnerable neighbours.

In addition, it would be extremely important to capitalise on the experience that could be implemented by "Casa Italia" Plan in the neighbours of each pilot. This could contribute in outlining the broader socioeconomic processes that are activated by specific interventions on material assets, i.e. the buildings targeted by the Plan. As a result, locked-in paths could be deliberately abandoned: those not already having good neighbours could benefit from new policies enhancing processes that make neighbours behaving proactively. Such positive impact of a greater cooperation among neighbouring municipalities has been already tested in the aftermath of the 2012 Emilia earthquake, when also small and rural municipalities benefited from less damaged neighbours, with whom they had already practiced strong institutional connections.

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