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Spatial economic resilience and accessibility: A joint perspective

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ABSTRACT

In most studies of economic resilience, much effort is attributed to the development of factors and measures representing economic and related resilience. In this context, a great deal of attention is devoted to the role of regions and to their abilities to withstand an economic shock. Usually, however, less attention is given to the size, distribution and interaction of the regions containing the underlying statistics used in the calculation of resilience factors. In this article, we argue that more attention should be devoted to choosing spatial units to increase the potential of resilience measures. In particular, we consider a smaller spatial unit, such as the municipality level, to better visualize resilience's variations. In addition, by complementing measures of resilience with a measure of accessibility, we try to depict the municipality's economic functioning. We have carried out experiments with reference to the system of the 290 municipalities in Sweden.

Our municipality-level analyses reveal that (a) proxies of resilience and accessibility, in general, are positively and significantly correlated and that the municipalities estimated to be most resilient and accessible are also the major economic centers in Sweden, and (b) classifying the municipality position in ranks of proxies for resilience and accessibility is more useful for the classification of municipalities with differential resilience than classifying municipalities using proxies for resilience alone. For example, whereas high proxy values for resilience and high accessibility municipalities often are both job- and population-rich, municipalities with low resilience estimates and high accessibility indices can typically be depicted as suburban and commuting municipalities in metropolitan areas. While municipalities with estimates of poor resilience and poor accessibility can in general be used to categorize remote municipalities experiencing population loss, estimated low resilience and high accessibility are characteristics of municipalities increasing in population. This analysis combining estimates of resilience and accessibility can be considered a suitable tool for providing a more complete insight into the economic investigation and measurement of resilience.

1. Introduction

Both resilience and accessibility can be described as amenities that are highly sought after and economically important. This is because high resilience indicates that the location in question has a better chance of withstanding an economic shock, and high accessibility (in this case to surrounding jobs) means that it is possible to reach a good number of jobs within a reasonable commuting time. Usually, resilience is evaluated by measuring or estimating regional assets in terms of diversity in industries and skills; proximity to learning institutions and financial institutes; modern infrastructure; open-minded, innovative and creative workers; good health; female empowerment; integration into the global economy; and a lack of lock-ins and negative path dependence (see, for example, Chapple & Lester, 2010; Christopherson, Michie & Tyler, 2010; Simmie & Martin, 2010; Wilson, 2010).

The above list makes up a sample of typically included factors, but it is not complete. An important point to be made about these and other commonly used factors is that they represent counts or shares of amenities available in any local region *i*. However, today's economies are integrated through transactions, flows of merchandise and skilled workers and companies. This means that resilience factors will be exchanged not only within each region but also between regions. In general, measures of resilience make use of geography only as the spatial container in which studied factors are contained. This means that the size and distribution of the spatial container—spatial interaction in other words—will largely determine how high or low the estimated resilience will become

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because its borders may contain or exclude locations and flows of increasing or decreasing resilience. Expanding the borders does not eliminate the problem but instead moves it to the new borders. In addition, overly large geographical units will disregard the within-regional variability, and resilience indices will become more similar to national averages. On the other hand, too small geographical units will underestimate resilience due to their inability to comprise spatial sorting of activities at a larger scale and cannot therefore effectively be used to study resilience. In cases where the spatial units are more restricted in size than the activity spaces of their inhabitants, high-amenity dwelling areas or areas containing major industrial plants risk being listed as non-resilient simply because all the *ingredients* needed for *cooking* a resilient region are not contained within its borders.

Using larger spatial units for analysis is commonplace in many scientific papers, usually because disaggregate statistics are not available for analysis. In economic resilience research, this becomes apparent when using statistics aggregated on the Metropolitan Statistical Area (MSA)-level in the U.S. For example, studies of regional economic resilience in the U.S. suggest that several of the very largest MSAs are significantly resilient and transformative (see, for example, Chapple & Lester, 2010; Lin, 2012). However, using regions such as the MSA of New York, which had a population of approximately 18.9 million individuals in 2010 (U.S. Census), for the study of regional economic resilience makes less sense. With a population almost twice as large as that of Sweden, shocks to the economy will almost inevitably be absorbed by the sheer size of the region. At the same time, economies at the sub-regional level may be less resilient. Similarly, results stating that the Detroit MSA is one of a few positively transformative regions in the US miss the points that the Detroit MSA has a dwindling population and staggering racial segregation (Galster, 2012). Substantial variations in the economy and resilience within the Detroit region are being hidden using levels of statistics that are too aggregated.

As noted, a drawback in many studies of economic resilience is that spatial economics is not given enough attention (Pendall, Foster, & Cowell, 2010). For example, at what spatial scale is resilience preferably studied – is it on a political and administrative level, urban/rural level, county level or at some functional level denoting economic regions? Regardless of the choice, choosing the size and distribution of an economic region also means excluding surrounding areas from the region. A dichotomous, spatial delineation of economy has little resemblance to how economic activities are arranged spatially because it generalizes interaction within the region and disregards interaction with other regions (Amcoff, 2009; Östh, 2007). The related questions are as follows: (a) with what periodicity should regional data be collected, and (b) what is the consequence of using data from different scales and times because they are not available for the same time and place? Questions such as these indicate that comparisons between regions are difficult to conduct and that precise guidelines for the measurement of resilience will be difficult. One way of approaching these issues is to consider job accessibility as the glue that binds places together. By using spatially disaggregate resilience-proxy statistics in combination with accessibility estimates for corresponding spatial units, job accessibility can be seen as a means for alleviating differences in resilience between smaller and adjacent spatial units. Relationships similar to that between resilience and accessibility have been observed before. For example, Rouwendal and Rietveld (1994) showed that there is a positive correlation between GDP and commuting distance. In addition, Östh and Lindgren (2012) showed that individuals having weaker ties to the labor market were more responsive in terms of adjusting commuting distances to changes in GDP than others. Similar responses were recorded for rural dwellers and individuals in metropolitan areas. These results suggest that variation in socio-economic resilience may be better understood if spatial interaction, in terms of accessibility (i.e., economic variables weighting cost/distance connectivity), is also taken into account. In summary, the RCI (Regional Capacity Index) measure considers only socio-economic variables and not mobility/connectivity factors, as do most of the resilience measures in spatial economics (for a review, see for example: Modica & Reggiani, 2014). To identify the role of connectivity factors vs. socio-economic resilience, we considered the accessibility measure. Accessibility, although simple, is a powerful measure because it embeds socio-connectivity network elements in its economic formulation (see Section 2). In this way, we can identify nonlinear emerging patterns between stationary and mobility measures. Given these premises, we will estimate RCI – a measure designed to function as a proxy of economic resilience – at the municipality level because this spatial unit can provide analyses at a more spatially disaggregate level than enabled at conventional geographical levels such as counties or NUTS-2 & -3. Municipalities were chosen for this study because Sweden can be described as a sparsely populated country with small polycentric structures. Most Swedish municipalities consist of small to mid-sized towns with surrounding rural areas, except for municipalities in the greater Stockholm region, where some municipalities lack rural surroundings (Johansson, 2002). Factual economic resilience is impossible to measure because it is a compound of everything that has an effect on the economy. When a region's degree of economic resilience is estimated, measureable factors from a range of resilience-influencing fields are often aggregated to a composite proxy of resilience. The included factors usually consist of the regional shares of the population that are well-educated and healthy, the local industrial mix, and similar factors, but the statistics used are typically generated for administrative levels, a fact that flattens the geography in which the factual economic resilience is being played. As an effect of how public statistics are generated, proxies of resilience therefore measure things that are stationary and contained within administratively distinguishable borders, while factors that are mobile (such as commuting, spread of ideas and capital) are disregarded. Because commuting statistics (flows and distances) between and within municipalities are available, for estimation of job accessibility, we are able to explore the relationship between proxies of resilience and accessibility, answering the following research question: are the most resilient centers also the most accessible (and vice versa)?

Consequently, we argue two main issues in this work:

(a) A functional approach for the construction of a better proxy of resilience is to categorize activities as stationary (conventional proxies of resilience) or mobile (spatial interaction factors). We argue that by combining a resilience measure created from a spatially disaggregate dataset with a measure of accessibility on the same disaggregate level, we combine stationary activities (socio-economic resilience factors) with mobile activities (in particular, accessibility, because this indicator embeds interaction within and between disaggregate regions).
(b) Bringing together proxies for resilience and accessibility will have positive policy implications.

The rest of the paper is arranged as follows. In Section 2, we define regional economic resilience and accessibility theoretically. In Section 3, we introduce the data sources used in analyses and the methods for estimating resilience and accessibility. In Section 4, results from analyses in which estimates of resilience and accessibility are brought together are presented. Finally, our findings are summarized and discussed in the concluding Section 5.