Quality of government and regional resilience in the European Union. Evidence from the Great Recession

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Abstract

This paper examines the relationship between quality of government and regional resilience in the European Union during the Great Recession. The results show that the quality of government is an important factor when shaping the regional reaction to the crisis. Our estimates reveal that a higher quality of government is associated with a better labour market performance at the regional level during the Great Recession. This is partly due to the role played in this context by spatial spillovers induced by the quality of government in neighbouring regions. The observed link between governance and regional resilience is robust to the inclusion in the analysis of different explanatory variables that may affect both government quality and regional resilience. Likewise, our findings do not depend on the specific dimension of governance considered, the estimation method or the econometric specification employed to capture the nature of spatial spillovers.

Keywords: quality of government, regional resilience.

JEL classification: H11, R12.

1 Introduction

The Great Recession that started in 2008 has affected Europe more severely than any other crisis since the end of the Second World War (Capello and Caragliu, 2016). Although the roots of this major economic downturn have to do with the collapse of the United States housing bubble and the excessive expansion of credit, its consequences immediately spread across the whole of Europe. By mid-2009, GDP per capita in the European Union (EU) had already decreased by 5% compared with the fourth quarter of 2007, whereas unemployment increased from 7 to 11% between 2007 and 2013 (Fratesi and Rodríguez-Pose, 2016). Nevertheless, the impact of the crisis has been highly uneven across Europe, both between countries as well as between regions within countries (e.g. Groot *et al.*, 2011; Capello *et al.*, 2015; Christopherson *et al.*, 2015). Taking into account he long-lasting economic and social effects of the Great Recession, it is especially important to examine what might account for this geographical variation. To address this issue, one should investigate the factors behind regional economic resilience, which can be defined as "the capacity of a regional or local economy to withstand or recover from market, competitive and environmental shocks to its developmental growth path, if necessary by undergoing adaptive changes to its economic structures and its social and institutional arrangements, so as to maintain or restore its previous developmental path, or transit to a new sustainable path characterized by a fuller and more productive use of its physical, human and environmental resources" (Martin and Sunley, 2015, p. 13).

The literature on regional economic resilience has considerably grown in recent years.[1] From an empirical perspective, this literature has highlighted the relevance of different factors in shaping regional reactions to external shocks, including the sectoral composition of economic activity and its degree of diversity, the endowment of human

[1] For a recent survey, see the 2018 special issue of The Annals of Regional Science on "Regional determinants of economic resilience".

capital, the intensity of innovation activities, labour market characteristics, urbanization patterns, or national macroeconomic conditions (e.g. Martin, 2012; Brakman *et al.*, 2015; Crescenzi *et al.*, 2016; Giannakis and Bruggeman, 2017). However, as far as we are aware, the potential influence of the quality of government on regional resilience has received no attention in this literature. This omission is especially disconcerting, given that, as we will see below, there are several reasons to assume that the way in which governments fulfill their obligations and administer public services should affect the ability of regions to withstand recessionary shocks. In order to fill this gap, the present paper aims to examine the relationship between quality of government and regional resilience in the EU during the Great Recession, using data on 255 NUTS2 regions from 27 different countries.[2] In particular, we are interested in finding out to what extent governance outcomes can contribute to mitigating the impact of the Great Recession at the regional level.

A second main contribution of the paper has to do with the methodological approach adopted to investigate the link between quality of government and regional resilience. Unlike previous studies on the determinants of regional resilience in the European context, in our paper the sample regions are not treated as isolated units that evolve independently of the rest, and spatial effects are formally incorporated into the analysis by means of spatial econometric techniques. This approach allows us to explore the role played by spatial spillovers in explaining the effect of the quality of government on regional resilience in the EU and to consider the existence of spatially correlated shocks driving the evolution of regions during the the period of the Great Recession. Thus, our analysis explicitly takes into account the possibility that the impact of the Great Recession in any given region is influenced by the conditions in neighbouring regions.

[2]NUTS is the French acronym for "Nomenclature of Territorial Units for Statistics", a hierarchical classification of subnational spatial units established by Eurostat according to administrative criteria. In this classification, NUTS0 corresponds to the country level, while increasing numbers indicate increasing levels of territorial disaggregation.

The results of the paper show that the quality of government is an important factor when shaping the regional reaction to the crisis in the EU. Our estimates reveal that a higher quality of government is associated with a better labour market performance at the regional level during over the Great Recession. This is partly due to the role played in this context by spatial spillovers induced by the quality of government in neighbouring regions. The observed link between governance and regional resilience is robust to the inclusion in the analysis of different explanatory variables that may affect both government quality and regional resilience. Likewise, our findings do not depend on the specific dimension of governance considered, the estimation method or the econometric specification employed to capture the nature of spatial spillovers.

The remainder of the paper is structured as follows. After this introduction, section 2 discusses from a theoretical point of view why the quality of government should affect regional resilience. Section 3 describes the measures of governance and regional resilience used in the paper. In turn, section 4 presents the results of the empirical analysis carried out to investigate the connection between quality of government and regional resilience. The final section offer the main conclusions from the paper.

2 Why should the quality of governance affect regional resilience?

Nowadays, there is the widespread view that institutions modulate and shape economic growth paths in the long run defining and bounding the context in which the agents of the economic system operate, mainly through the definition of incentives to behave in a certain way (Acemoglu *et al.*, 2005; Laporta *et al.*, 2008; Rodríguez-Pose, 2013). Acemoglu *et al.* (2005) define institutions as "the set of rules and policies able to deliver a level playing field for all economic actors and ensure that sound economic incentives are in place for encouraging people to invest, innovate, save and solve problems of collective action, and for ensuring the efficient provision of public goods". Among the most central elements of the institutional setting of a country or a region we find the quality of government. In general, the quality of government will be higher the less corrupt is the government, the higher its degree of impartiality and the higher the quality of the public services provided (Rothstein and Teorell, 2008). Although the link between the quality of governance and resilience has not been explored yet, there are reasons to believe that the quality of governance may have direct and indirect effects on both, ex-ante resilience (the vulnerability to severe shocks) and ex-post resilience (the capacity to absorb and overcome the shocks).

First, the quality of government may exert an effect on the type, frequency and intensity of the shocks. Financial shocks such as the one in the origin of the 2008-2013 crisis, have been occurring cyclically since the development of money and financial markets (Bigos *et al.*, 2013). As a result of financial shocks, leveraged firms find themselves in the position in which their liquidity is called back by the lender, which in turn has a direct effect on firms ability to run and manage existing jobs (Boeri *et al.*, 2012). Consequently, firms may be forced to cut their investments, shut down part of their business activity and destroy jobs. The quality of government can play a crucial rule minimizing the vulnerability to adverse financial shocks hitting labor markets given that well-regulated capital markets are likely to experience a lower frequency and less intense crisis (OECD, 2017). Corruption, which is a central element of the quality of government, can undermine financial stability given that practices such as related lending are more likely to happen, which reduces the quality of the loan portfolio of banks and increase concentration risk (Laporta *et al.*, 2003). In this regard, impartial institutional settings that remove policy distortions favoring debt over equity financing and promote a greater diversification of financing instruments, may strengthen resilience through increased financial stability (Caldera Sánchez and Gori, 2016). The evidence provided by Ahrend and Goujard (2012) is supportive of this line of argumentation as they show that larger debt bias in cross-border flows are associated with a greater incidence of financial crises. Additional evidence in this line is provided by Sonderman (2016) who shows that the quality of government tends to reduce the probability crises. In a similar vein, Honing (2008) shows that if quality of government is high, the likelihood of sudden stop of capital inflows decreases.

Additionally, the quality of governance is likely to affect the level of systemic uncertainty, which could have sizeable effect on vulnerability by determining the dynamic path of investment and employment rates (Acemoglu *et al.*, 2003; Bloom, 2009). The intuition is that the institutional environment drives systemic uncertainty and systemic uncertainty also exerts an impact on economic performance and resilience. The link between the quality of government and resilience in this regard, is mainly operated through the "depressive macroeconomic uncertainty effect", which usually leads to the "wait-and-see" behavior that is typical during periods of crisis, where investment rates fall, labor demand and employment decrease and economic growth drops. Supportive evidence between the negative link of low quality of government and uncertainty is provided by different authors. Calderón *et al.* (2016), find evidence showing that in economies with low quality of government, the implementation of policy is procyclical, which exacerbates fluctuations driving up overall uncertainty. On the other hand, evidence in line with the fact that economies with low quality of government due to high corruption could experience systemically lower investment rates, lower return and lower total factor productivity is found in the work of Mauro (1996), Tanzi and Davoodi (1997), Dreher and Herfeld (2005) and Aidt (2009).

Second, the quality of government may also affect resilience indirectly due to its impact in trade and financial connectivity given that low levels of institutional quality can be conceived as a barrier in the destination. Levchenko (2007), Yu *et al.* (2015) and Alvarez *et al.* (2018) show that high quality institutions have a positive impact of trade flows whereas Benaceck *et al.* (2014), Benassy-Quere *et al.* (2007) and Rodríguez-Pose and Colls (2017) show that the quality of government is a relevant determinant of the distribution of FDI flows across countries. The evidence suggests that both trade openness and FDI flows have positive effects on long run growth (Dollar and Kray, 2003; Frankel and Romer, 1999). However, the effect of the quality of government on resilience in this regard is ambiguous. On one hand, reducing barriers to trade and foreign direct investment (FDI) increases the exposure to external shocks, which in the cases of small open economies could substantially increase vulnerability. Additionally, trade openness may increase instability as shown by Di Jovanni and Levchenko (2009). On the other hand, increased trade and FDI openness are likely to increase competition, strength the incentives for firms to make better improvements and better integrated global value chains, accelerate technology diffusion and create positive knowledge spillover (OECD, 2017). Therefore, if the quality of government increases financial and trade links across interacting economies, it could also have a positive effect on developmental robustness decreasing its vulnerability to shocks.

Third, the quality of government can affect the response of to the shock by shaping the dynamism of the private sector, through its effects on the recovery capabilities of a region and its potential to develop new growth paths. The idea is that the quality of government is likely to have a positive impact on dynamism, which means more entrepreneurs, more start-ups and more innovation, and therefore, a higher capacity to absorb and adapt to shocks. Impartial legislations and regulations that permit and promote private sector development can strengthen antitrust enforcement, minimize barriers of entry and decrease privileges of stablished firms (OECD, 2010). These characteristics in the institutional framework are crucial in turbulent times. Following Schumpeter (1943), Aghion and Saint-Paul (1998) among others, show that periods of recession where creative destruction is likely to be at work can have a potentially beneficial effect on growth paths if old technologies are replaced by newer ones. Nevertheless, the "creative-destruction process" may not work if entry barriers are high and if government regulations instead of promoting a fair competition favor and privilege certain agents. In this regard, Campos *et al.* (2010) show that corruption can represent an important barrier for new firms, enhancing monopoly power and rents earned by incumbent firms. Additional evidence in this regard, is provided by Sutherland and Hoeller (2013), who show that stringent product market regulations reduces ex-post resilience by increasing the persistence of economic downturns. Taken together, the existing empirical evidence supports the view of the quality of government as a driver of private sector dynamism at the regional level as it has been shown that it (i) shapes competitiveness (Anoni and Dijkstra, 2013) and that (ii) corrupt and/or inefficient governments undermine regional potential for innovation (Rodríguez-Pose and Di Cataldo, 2015; Marinello *et al.*, 2015) and entrepreneurship (Nistotskaya *et al.*, 2015).

Another channel through which the quality of government may affect resilience is that of the strength of contract enforcement and the overall efficiency of the judicial system. As far as the quality of government is linked to high quality in the provision the public services, such as the case of justice, it can contribute to resilience by improving bankruptcy procedures/insolvency regimes. Efficient bankruptcy regulations are crucial to allow for low-cost exit of less productive and insolvent firms and therefore, improving resource allocation (OECD, 2017). The speed of resource re-allocation is determined by the time and financial resources needed for the completion of legal procedures. Hence, by strengthening market selection and the process of resource reallocation, an impartial and efficient judicial system can increase the capacity of the economy to absorb shocks. Another relevant point here, is that the quality of government, minimizing discrimination between lenders/borrowers in the resolution of bankruptcies may help to address the negative effect of non-performing loans in periods of crisis, by developing a suitable debt restructuring framework and thus providing the incentives of the banks to invest rather than freezing capital movements, which in periods of crisis creates a feedback on the overall downward spiral.

Finally, the quality of governance may help resilience by improving policy responses, in particular, in what refers to the efficiency of public investment. At the European regional level there is evidence that shows that good institutions have affected the returns of European cohesion policies (Rodríguez-Pose and Garcilazo, 2015) and the decisions on the type of public good investment (Crescenzi *et al.*, 2016). The results of these analysis suggest that economies with low levels of quality of government tend to have a composition of public spending biased towards opaque unproductive activities that have no positive effects on growth. The intuition is that members of a corrupt government have incentives to adjust and allocate spending in favor of projects that allow them to obtain bribes, extract rents and keep them hidden (Rose-Ackerman, 1999). Therefore, by displacing resources from productive public and private investments to these budget items, corrupt governments are likely to set the composition and the investment in rates in levels that are not optimal affecting negatively the capacity to overcome the shocks.

3 Measuring regional resilience and the quality of government

Our study requires data on the degree of resilience of EU regions during the Great Recession. Although the number of papers on regional resilience has significantly grown in recent years, there is not an unanimous agreement about how to measure this concept and different approaches have been applied in the literature (Martin and Sunley, 2015; Doran and Fingleton, 2016). The majority of authors use univariate indices capturing changes in the level of economic activity (e.g. Fingleton *et al.*, 2012; Martin, 2012; Crescenzi *et al.*, 2016), even though there are also studies based on the information provided by composite indicators (e.g. Rizzi *et al.*, 2018). Against this background, and taking into account the nature of our study, we resort to a widely used measure of regional resistance to recessionary shocks (Lagravinese, 2015; Martin *et al.*, 2016; Giannakis and Bruggeman, 2017):

$$RES_i = \frac{\Delta E_i - \Delta E_{EU}}{|\Delta E_{EU}|} \tag{1}$$

where ΔE_i is the change in the employment rate in region i between the turning points into recession and into recovery. In turn, ΔE_{EU} stands for the average variation in the employment rate in the EU regions. A positive value of this index means that region i exhibits greater resistance to a recessionary shock than the EU average, while a negative value implies that region i is less resistant than the EU average. RES equals to zero when there is no difference the variation in the employment rate in region i and the EU average. As is usual in the literature, this measure of regional resilience concentrates on the capacity of regional labour markets to adapt to adverse shocks. We consider that this approach is more informative in this context than focussing on output changes, as variations in employment better reflect the social impact of the Great Recession (Giannakis and Bruggeman, 2017). Although output is undoubtedly important from an economic perspective, the employment rate is often more relevant for the welfare of ordinary citizens than the creation of value added. This argument is particularly relevant nowadays in view of the situation of many countries of the European periphery, where the recovery from the Great Recession has often been jobless (Fratesi and Rodríguez-Pose, 2016).

We calculate the index of regional resilience just described for 255 NUTS2 regions in the EU27, using data drawn from Eurostat for the crisis period 2008-2013 (see Figure 1 in the Appendix).[3] The results are displayed in Figure 1. As can be observed, the impact of the Great Recession has been far from homogeneous across the EU, and there are important geographical differences. The countries in the Southern periphery

[3]NUTS2 regions are used instead of other possible alternative for two reasons. First, NUTS2 is the territorial unit most commonly used in the literature on regional resilience in the EU (e.g. Brakman *et al.*, 2015; Giannakis and Bruggeman, 2017; Rizzi *et al.*, 2018), which facilitates the comparison of our findings with those obtained in earlier studies. Second, NUTS2 regions are the basic unit for the application of cohesion policies in the EU.

of Europe (i.e. Portugal, Spain, Italy, Greece and Cyprus) have been particularly hard hit (Fingleton *et al.*, 2014; Fratesi and Rodríguez-Pose, 2016). Likewise, the labour markets of Ireland and Bulgaria have shown relatively low levels of resistance to the economic downturn. On the contrary, Germany, where employment continued to grow during the crisis, exhibits the best performance. Austria, Belgium, Finland and Sweden also show relatively high values of the resilience index. The observed differences between countries, however, not hide the existence of important within-country disparities (Groot *et al.*, 2011; Capello *et al.*, 2015; Giannakis and Bruggeman, 2017). This is the case, for example, of France, Italy, the Netherlands, Romania or the United Kingdom.

INSERT FIGURE 1 AROUND HERE

In order to carry out our research, we also need information on the quality of government in the EU regions. To that end, we resort to the European Quality of Government Index (EQI), which has recently been constructed with the aim to provide scholars and policy makers with a comparable and homogeneous measure of governance at the regional level that can be used to make comparisons within and across countries in Europe (Charron *et al.*, 2014, 2015). The EQI is based on survey data about the perceptions and experiences of European citizens on the quality, impartiality and level of corruption in education, public health care and law enforcement. In order to obtain the EQI score for the various regions, the information provided by the survey data is combined with four of the six Worldwide Governance Indicators (WGI) developed by Kaufmann *et al.* (1999): Voice and accountability, Government effectiveness, Rule of law, and Control of Corruption.[4] So far, the EQI is available for three years: 2010, 2013 and 2017. Given that we are interested in examining re-

[4]See Charron *et al.* (2014, 2015) for further details on the methodology used to construct the EQI.

gional performances during the Great Recession, we employ as our main independent variable the average values for years 2010 and 2013.[5]

Figure 2 provides a graphical illustration on the association between quality of government and regional resilience in the EU during the Great Recession.[6] The scatter plot suggests the existence of a positive relationship between governance outcomes and regional labour market performance during the crisis. This means that regions with better quality of government tend to be more resilient, while those regions with worse governance outcomes are characterized on average by a lower resistance to the Great Recession. The link is statistically significant (t-value is 7.01), and the measure of quality of government alone explains around 16% of variation in regional resilience across the EU. Nevertheless, when interpreting the information provided by Figure 2, it should be noted that it is very likely that regional resilience does not depend exclusively on the quality of government. This implies that the empirical evidence displayed in Figure 2 should be considered with some caution, as omitted variables could ultimately affect the perception of the connection between governance and regional resilience. In view of this problem, in the next section we develop a more appropriate statistical analysis on the link between quality of government and regional resilience.

INSERT FIGURE 2 AROUND HERE

[5]The EQI is available for all EU27 countries at NUTS2 regional level, with the exception of Belgium, Germany, Greece, Hungary, Sweden and the United Kingdom, for which the data are provided at NUTS1 level. For these six countries we follow Rodríguez-Pose and Di Cataldo (2015) and Ketterer and Rodríguez-Pose (2018), and assign the same EQI score to all NUTS2 regions nested within the bigger NUTS1 regions.

[6]In order to facilitate the interpretation, the various variables used to construct the graphic were normalized to make them range from 0 to 100. This transformation of the measures of regional resilience and quality of government is also used in the regression analyses in the next section.

4 Econometric approach

4.1 Model specification and estimation procedure

When considering the choice of an econometric specification to investigate the connection between quality of government and regional resilience, it is important to note that Figure 1 suggests that the capacity of resistance to the Great Recession is not randomly distributed across space in the EU. On the contrary, there seems to be spatial clusters of regions with similar levels of resilience to the crisis, while there are relatively few cases in which a region shows a markedly different performance from its neighbours. This is consistent with the evidence provided by Figure 3, which reveals the existence of a positive and strong link between own resilience and the average of neighbouring regions.[7] In fact, the pairwise correlation between the two is 0.89 with p-value = 0.000. In order to confirm this spatial pattern, we calculate the Moran's I test of spatial autocorrelation. The result (0.766 with p-value = 0.00) leads to the rejection of the null hypothesis of absence of spatial autocorrelation in the the distribution of regional resilience. The implications of this issue are potentially important from an econometric perspective (Anselin, 1988). For this reason, we consider the following cross-sectional model:

$$\mathbf{RES} = \alpha\iota_n + \lambda\mathbf{WRES} + \beta\mathbf{QG} + \mathbf{X}\boldsymbol{\gamma} + \mathbf{u} \tag{2}$$

with

$$\mathbf{u} = \rho\mathbf{W}\mathbf{u} + \boldsymbol{\epsilon} \tag{3}$$

where **RES** and **GQ** are, respectively, $n \times 1$ vectors consisting of one observation for each region in the sample ($i = 1, \ldots, n$) on the measures of regional resilience and

[7] The definition of neighbouring regions used here is based on physical contiguity.

quality of government described in section 3. $\mathbf{X}$ is a $n \times k$ matrix of a set of variables that control for different factors that are assumed to have an influence on regional resilience. $\mathbf{W}$ is a $n \times n$ spatial weights matrix with non-negative elements indicating how the regions in the sample are spatially interconnected. Its diagonal elements are equal to zero by assumption, since no region can be viewed as its own neighbour. In turn, $\mathbf{u}$ is a $n \times 1$ disturbance vector, while $\boldsymbol{\epsilon}$ is the corresponding $n \times 1$ innovation vector. Given the nature of our data, the innovations are assumed to independent but heteroskedastically distributed, where the heteroskedasticity is of unknown form. Our main interest throughout the paper is in coefficient β, which captures the effect of the quality of government on regional resilience.

INSERT FIGURE 3 AROUND HERE

This model is a fairly general specification that includes two different spatial processes potentially relevant in our context. The first one, captured by the spatial lag of the dependent variable (**WRES**), has to do with the possible presence of direct spatial spillovers between neighbouring regions related to their capacity of resistance to recessionary shocks, which would be consistent with the preliminary evidence provided by Figure 3. The second one, captured by the spatial autoregressive process in the disturbance term, additionally allows us to consider spatial spillovers between specific features of the environment that may affect regional resilience. Given that neighbouring regions tend to share many of these specific features, the inclusion of the spatial autoregressive process in the model is necessary for consistent estimation of standard errors (Kelejian *et al.*, 2013). This spatial autoregressive model with autoregressive disturbances of order (1,1) is often known as a SARAR (1,1) model (Anselin and Florax, 1995).

The inclusion of the spatial lag of the dependent variable in the list of regressors in equation (2) implies that the OLS estimator will not be consistent (anselin, 1988). In view of this, we resort to the generalized spatial two stage least squares (GS2SLS) estimator derived by Kelejian and Prucha (1998, 1999, 2010) and extended by Arraiz *et al.* (2010) and Drucker *et al.* (2013), which implements a multistep estimation strategy based on the generalized method of moments (GMM) and instrumental variables (IV) to estimate the parameters of the model.[8] This estimator provides consistent estimates even when the innovations of the disturbance process in equation (3) are heteroskedastically distributed over the observations. This is especially relevant in our context, as the sample regions are heterogeneous in important characteristics (e.g. size). which causes one to suspect the the innovations of the disturbance process are hetorskedastic.

4.2 Control variables

On the basis of a review of the recent literature on regional resilience, our SARAR (1,1) model incorporates various controls related to the sectoral composition of economic activity and regional specialization, human capital and innovation activities, degree of regional autonomy, and regional labour markets. We now describe these controls and provide a brief conceptual justification for their inclusion in the analysis.[9]

The sectoral composition of economic activity and regional specialization

The sectoral composition is often considered as a key factor in explaining why regions differ in their resilience to economic downturns such as the Great Recession (e.g. Brackman *et al.*, 2015; Martin *et al.*, 2016). Some economic activities are more vulnerable to changes in the business cycle than others, and as such suffer the most

[8] See Arraiz *et al.* (2010) or Drucker *et al.* (2013) for further technical details on the estimation method.

[9] Table 4.2 in the Appendix presents the detailed definition and sources of all the control variables used in the paper. Several descriptive statistics are included in Table A1.

from recessionary shocks. This is the case of manufacturing and construction, which traditionally are the most affected sectors during an economic crisis (Martin, 2012). Conversely, other activities are more impervious to fluctuations in the business cycle. For example, regions with higher levels of public employment are more protected from downturns in the cycle, since they experience less job destruction during economic crisis. Likewise, the degree of protection and regulation of agricultural markets in the EU implies that regions with relatively large agricultural sectors tend to be less exposed to changes in the business cycle (Rodríguez-Pose and Fratesi, 2007; Lagravinese, 2015; Fratesi and Rodríguez-Pose, 2016). In view of this, we control for the shares of regional employment in agriculture, manufacturing, and non-market services.[10]

In addition to the sectoral composition of economic activity, its degree of diversity may also be relevant in this context (Martin *et al.*, 2016). The neoclassical trade model suggests that regions should specialize in those activities in which they enjoy a comparative advantage over their trade partners. Indeed, the existence of external economies also leads to specialization at the industry level. At the same time, a region with an excessive reliance on a small number of activities is potentially more vulnerable and unstable in case of a downturn, as it has much less scope to provide some measure of buffering against the perturbation (Malizia and Ke, 1993; Trendle, 2006). On the contrary, a diverse economic structure should allow a regional economy to "spread risk", thus reducing the intensity of cyclical fluctuations and increasing regional resilience (Baldwin and Brown, 2003; Ezcurra, 2011). Accordingly, our baseline model also incorporates a Herfindahl index to capture the degree of sectoral diversification in the sample regions. This specialization index is as follows:

$$SPE_i = \sum_{s=1}^{S} e_{is}^2 \tag{4}$$

[10] In order to minimize any potential problem of reverse causality, the values of all the time-varying controls described in this section refer to the year 2007. This is consistent with the approach adopted in earlier studies on the determinants of regional performance in Europe during the Great Recession (e.g. Groot *et al.*, 2011; Crescenzi *et al.*, 2016; Giannakis and Bruggeman, 2017).

where e_{is} is the employment share of region i in sector s. The value of the Herfindahl index ranges from $\frac{1}{S}$ when employment is evenly distributed across the S sectors, to 1 when all the employment is concentrated in the same sector. Therefore, the higher the value of SPE_i, the less sectorally diverse is the region in question.

Human capital and innovation

Among the determinants of regional competitiveness, the endowment of human capital and innovation activities play a key role in explaining the ability of a region to react to a recessionary shock (Chapple and Lester, 2010; Di Caro, 2015). This has to do with the close connection between both factors and the capacity of regional economies to absorb externally generated new ideas and generate new knowledge (Creszcenci, 2009; Crescenzi and Rodríguez-Pose, 2011). Although this is important in all phases of the economic cycle, its relevance increases during a crisis. For example, as pointed out by Crescenzi *et al.* (2016), an innovation-prone regional environment can contribute to alleviating the negative consequences of the crisis not only by developing new products and/or new technologies, but by organizational innovation and the reduction of production costs to maintain regional competitiveness . Furthermore, regions with high levels of human capital and innovation activities are in better position to attract the most sophisticated and high-value-added functions of multinational firms, thus increasing the regional resistance to adverse economic disturbances (Crescenzi *et al.*, 2014). For this reason, we include in the list of regressors in equation (2) the population share with tertiary education and the number of patents per inhabitant, as proxies for the endowment of human capital and the intensity of innovation activities in the sample regions.[11] At this point it is important to note that these variables may be correlated with the quality of government at the regional level (Rodríguez-Pose and Di Cataldo, 2015). Consequently, their inclusion in our baseline model is partic-

[11]The main results of the paper hold whether we use R&D expenditure instead of the number of patents to capture the degree of innovation capacity.

ularly necessary in order to estimate the impact of governance on regional resilience independently of the effect of these covariates.

Decentralization

The degree of fiscal and political decentralization may also be related to regional resilience. In fact, the transfer of resources and powers from central to subnational governments is often justified as a means to improve economic performance, both at the local and at the aggregate level, pushing the traditional arguments of safeguarding local identity or culture into the background (Rodríguez-Pose and Sandall, 2008). This supposed economic dividend is based on the so-called "decentralization theorem", which states that subnational tiers of government are more capable than central governments to tailor the provision of public goods and services to the needs of citizens due to the existence of informational advantages and a better insight into the preferences of the local population (Tibebout, 1956; Oates, 1972). This implies that, in the absence of interjurisdictional spillover effects and large scale economies, decentralization can lead to efficiency gains in the allocation of resources at the local level (Ezcurra, 2017). Moreover, decentralization should allow subnational governments to adopt specific policies in order to mitigate the effects on the local economy of adverse shocks.

Nevertheless, the literature also warns about the potential risks of decentralization for economic performance. Thus, the needs and preferences for public goods and services may not differ significantly across regions within a country, which casts doubts on the validity of the decentralization theorem. At the same time, capacity constraints may limit the ability of subnational governments to make the most from devolution. Furthermore, poorer regions often must face an additional disadvantage in the provision of public goods and services due to the lack of suitable human resources to develop an efficient administration (Treisman, 2007). Additionally, subnational governments may be more vulnerable to capture by local interests, generating greater corruption, clientelism and nepotism (Rodríguez-Pose and Ezcurra, 2011). This latter point is especially relevant in our context, as it suggests the possible existence of a connection between decentralization and quality of government (Fisman and Gatti, 2002; Enikolopov and Zhuravskaya, 2007). This raises the possibility that the measure of governance used in our analysis is really capturing the effect on regional resilience of decentralization. In order to test whether this is the case, we should control for the degree of decentralization in the sample regions. To do this, we resort to an indicator of regional economic self-rule proposed by Sorens (2011), which captures the degree of authority exercised by a regional government over those who live in its territory. The indicator is constructed using data drawn from the Regional Authority Index (RAI) developed by Hooghe *et al.* (2016), and combines information on the degree of fiscal and political decentralization in the sample regions (see Table 4.2 in the Appendix for further details). Bearing in mind the previous discussion, we consider the possible presence of a non-linear link between between decentralization and regional resilience. To that end, we include in the list of regressors the indicator of regional self-rule and its square.

Other factors

Apart from institutional and socio-economic structural features agglomeration economies and the demographic structure might also have effects on resilience.

Regional and urban economics literature has considered that one of the key factors for economic development is the size of the population (agglomeration) and the level of urban development (Duranton and Puga, 2014). Authors such as Cicone (2002) or Fujita and Thisse (2002) argue that agglomeration economies arise when people and firms locate near one another together in cities and industrial clusters, which generally implies higher population or employment density. Agglomerations ultimately imply transport costs savings, lowering the difficulties in exchanging goods, people, and ideas. However, the impact of agglomeration in regional resilience is not clear beforehand given that it presents effects that may work on opposite directions. On the one hand, highly urbanized and dense areas may increase the probability of matching job seekers and firms, which should improve the functioning of labor markets. However, negative effects and (dis) agglomeration economies may arise if the time spent by workers to collect information about the vacancies on the job market rises or if problems of crowding and congestion increase excessively (Rios, 2017). Using a sample of European regions Brakman *et al.* (2015) analyze the relationship between the patterns of spatial allocation of a region's population and resilience during the Great Recession, finding that regions with a larger share of population living in commuting areas were relatively more resistant than regions where most of the population lived in cities or in rural areas. To control for the potential effect of agglomeration we include in our specification an indicator of employment density.

The demographic composition, is directly related to the availability of adequate labor supply for the different labor markets and to the degree of social vulnerability (Greenwold, 1997; Bigos *et al.*, 2013). The expected effects of the demographic structure on resilience are theoretically ambiguous. On one hand, regions with elder populations are at higher technological risk than younger ones due to the skill obsolescence effect and the skills miss-match implied by the rapid technological progress (Dixon, 2003). Moreover, elderly populations are likely to be less flexible and mobile than younger ones, which should amplify the skills miss-match between labor demand and supply along the geographical dimension, thus increasing regional labour market vulnerability. In addition, the empirical evidence shows that elder populations are less prone to innovation (Aksoy *et al.*, 2015) and less productive (Lovasz and Rigo, 2013; Romeu Gordo and Skirbekk, 2013) which should have a negative effect on the ability to develop new growth paths once a region has been hit by a shock. These arguments suggest older populations might have lower levels of resilience than younger ones. However, there are also arguments that suggest the opposite might also be true. If different cohorts have different levels of productivity it is likely that age structure may affect economic development paths. At this point, the literature stresses that a workers productivity systematically varies over his or her working life, for reasons such as the accumulation of experience over time, depreciation of knowledge, and age-related trends in physical and mental capabilities (Aiyar *et al.*, 2016). In this regard, a more mature labor force may have higher average levels of work experience, with potentially positive effects in productivity (Disney, 1996; Burtless, 2013). In addition, a large young cohort relative to the parental cohort results in higher competition for jobs, lower opportunities for promotion, and higher tightness of the labor market (Easterlin, 1978). In fact, a younger populations might be trapped in the lower end of the labor market with less on-the-job training, lower wages and worse career prospects, experiencing long spells of joblessness and high risk of exclusion and vulnerability to shocks. To control for the role of age structure we include the share of population aged between 15-24 years old and the share of population aged between 55 and 64 years old.

Country dummies

Figure 1 shows that regional resilience in the EU is clearly affected by national patterns (Crescenzi *et al.*, 2016; Giannakis and Bruggeman, 2017). In view of this, our baseline specification also incorporates country dummies to ensure that the observed link between quality of government and regional resilience is not simply capturing the latent influence of institutional, economic and/or historical factors at the national level. Accordingly, our analysis focuses on the ability of the quality of government to explain variations in regional resilience within the EU countries.

4.3 The spatial weights matrix

The estimation of the SARAR (1,1) model described above requires to define previously a spatial weights matrix. Given that this is a critical issue in spatial econometric modelling (Corrado and Fingleton, 2012), we consider a broad range of alternative specifications of **W**. Thus, we begin by constructing a spatial weights matrix based on the concept of first order contiguity, according to which $w_{ij} = 1$ if regions i and j are physically adjacent and 0 otherwise. We next consider several matrices based on the k-nearest neighbours ($k = 5, 10, 15, 20, 25$) computed from the great circle distance between the centroids of the various regions (Le Gallo and Ertur, 2003). Additionally, we construct various exponential decay and inverse distance matrices whose off-diagonal elements are defined by $w_{ij} = exp(-\theta d_{ij})$ for $\theta = 0.01, 0.05$ and $w_{ij} = \frac{1}{d_{ij}^{\alpha}}$ for $\alpha = 2$ with cut-offs at the first, second and third quartile of the geographical distance between regions. As an alternative we also consider inverse linear distance weight matrices with cuff-offs at the 750, 1,000 and 1,500 kilometers.

As can be observed, the different matrices described above are based in all cases on the geographical distance between the sample regions, which in itself is strictly exogenous. Furthermore, as is common practice in applied research, all the matrices are row-standardized, so that it is relative, and not absolute, distance which matters.

In the literature there are different criteria to determine the spatial weights matrix that best describe the data. One of the most widely used approach is to compare the log-likelihood function values. Nevertheless, this approach has been criticized because it only finds a local maximum among competing models and it may be the case that the correctly specified **W** is not included (Vega and Elhorst, 2014). As an alternative criterion, Elhorst *et al.* (2013) suggest to select the model with the lowest parameter estimate of the residual variance. Table 1 shows that, according to these criteria, the most appropriate matrix in our context is that based on the 15-nearest neighbours.

Therefore, this is the spatial weights matrix used in the rest of the paper.[12]

INSERT TABLE 1 AROUND HERE

5 Empirical findings

5.1 Main results

Table 2 presents the results obtained when different versions when the SARAR (1,1) model in equations (2) and (3) is estimated by GS2SLS for the case of heteroskedastic innovations of unknown form in the disturbances process. The estimated coefficient of the spatial lag of the dependent variable is in all cases positive and statistically significant at the 1% level, indicating the existence of strong spatial dependence in regional resilience. In other words, the capacity of resistance to the Great Recession for a given region is positively affected by resilience in neighbouring regions. This is in line with the information provided by Figure 3, and highlights the need to take into account spatial effects when modelling regional resilience in the EU. Focussing on the major aim of the paper, the main finding is that the coefficient of the measure of quality of government is in all cases positive and statistically significant at the 1% level. This means that higher quality of government is associated with greater regional resilience, which is consistent with most of the arguments laid down in section 2 and the preliminary evidence displayed in Figure 2. In fact, this result is not affected by the

[12]Formally, the 15-nearest neighbours matrix employed to perform inference is defined as:

$$W = \begin{cases} w_{ij}\,(k) = 0 \quad if \quad i = j \\ w_{ij}\,(k) = 0 \quad if \quad i \neq j, j \notin nbd(i)_k \\ w_{ij}\,(k) = \frac{1}{k} \quad if \quad i \neq j, j \in nbd(i)_k \end{cases}$$

where w_{ij} terms denote the spatial weights connecting i and j, $nbd(i)_k$ denotes the neighborhood of i given $k = 15$.

inclusion in the analysis of the different controls described in section 4.2, confirming its robustness and showing that the observed connection between quality of government and regional resilience is not simply a spurious correlation resulting from the omission of these covariates.

INSERT TABLE 2 AROUND HERE

In any case, the information provide by Table 2 should be treated with caution because the presence of the spatial lag of the dependent variable in the list of regressors complicates the interpretation of the coefficient estimates. As shown by LeSage and Pace (2009, pp. 33-42), in this type of spatial model a change in a particular explanatory variable in region i has *direct effect* on the dependent variable in that region, but also an *indirect effect* on the remaining regions. In our context, the direct effect reflects the average change in the measure of resistance to the crisis in a particular region caused by a one unit change in that region's explanatory variable. In turn, the indirect effect can be defined as the aggregate impact on resilience in a specific region caused by the change in an explanatory variable in all other regions or, alternatively, as the impact of changing an explanatory variable in a particular region on resilience in the remaining regions.[13] Finally, the *total effect* is the sum of the direct and indirect effects.

Table 3 shows the direct, indirect and total effects calculated from the SARAR (1,1) model with the full set of controls (column 6 of Table 2). The results confirm the existence of a positive and statistically significant relationship between quality of government and regional resilience, thus reinforcing our previous findings. In particular, our estimate of the total effect reveals that increasing the measure of quality of

[13] LeSage and Pace (2009) show that the numerical magnitudes of these two calculations are identical due to symmetries in computation.

government by one standard deviation is associated with an increase in the indicator of resilience of around 4.7 points, which is, for example, the difference between Franche-Comté (FR43) and Åland (FI2). As can be observed in Table 3, most of this total effect is due to the direct effect of governance on regional resilience. However, the indirect effect is also positive and statistically significant. This implies that the ability of resistance to the crisis of a particular region depends partly on the quality of government in neighbouring regions, which highlights again the empirical relevance of spatial spillovers in this context.

INSERT TABLE 3 AROUND HERE

With respect to the various control variables included in our baseline model, Table 2 shows that the employment share in agriculture is positively associated with regional resilience. This seems to indicate that regions with a relatively important presence of farming activities are more resilient, which may be related to the high degree of protection that characterizes agricultural markets in the EU (Rodríguez-Pose and Fratesi, 2007). At the same time, the endowment of human capital appears as an important factor in explaining the ability of regional labour markets to react to recessionary shocks. This result is consistent with previous findings on the determinants of regional resilience (e.g. Di Caro, 2015; Giannakis and Bruggeman, 2017), and confirms that human capital is key in providing a generally innovation-prone environment that allows regional economies to identify creative solutions to external disturbances (Crescenzi *et al.*, 2016). Interestingly, spatial spillovers also affect the connection between human capital and regional resilience. In fact, our estimates reveal that the reaction to the Great Recession of a particular region is positively influenced by the endowment of human capital in neighbouring regions. Furthermore, the information provided by Table 3 shows the existence of a U-shaped relationship between regional autonomy and resilience. This implies that the transfer of resources and power from central to subnational governments first exerts a negative impact on regional resilience. However, beyond a certain level, the relationship becomes positive, indicating that the degree of self-rule increases regional resilience. The remaining covariates are not statistically significant at conventional levels.

5.2 Robustness checks

The analysis performed so far reveals the existence of a positive association between quality of government and regional resilience. In this section we investigate the robustness of this finding.

Endogeneity of government quality

A potential concern with our previous results has to do with the possible endogeneity of governance in this context. Regional resilience may by determined by the quality of government, but the quality of government may , in turn, be affected by regional economic performance, giving rise to a reverse causality problem. In view of this, we now treat the measure of quality of government as endoegenous. Speficifically, we follow the suggestions in Kelejian and Prucha (1998, 1999) and use as instruments the linearly independent columns of ($\mathbf{X}$, $\mathbf{WX}$, $\mathbf{W}^2\mathbf{X}$), which provide a reasonable approximation of the ideal instruments under plausible assumptions (Arraiz *et al.*, 2010). Table 4 presents the effects on regional resilience of the different variables included in our baseline model when we use the set of instruments just described in order to address the potential endogeneity of the quality of government.[14] As can be seen, the different effects of the quality of government on regional resilience continue to be positive and statistically significant in all cases, in line with our previous findings. In fact, the quantitative impact of government performance on the dependent variable

[14] The different effects calculated in this section are derived from the estimates in column (6) of Tables A1-A1 in the Appendix.

appears to be somewhat higher than in the estimates in Table 3, which suggests that our baseline results may indeed be underestimating the effect of government quality on regional resilience.

INSERT TABLE 4 AROUND HERE

Alternative estimation strategies and spatial models

We now examine whether the results in section 5.1 are robust to the employment of an alternative method to estimate the SARAR (1,1) model in equations (2) and (3). With this purpose, we repeat the previous analysis using a quasi-maximum likelihood (QML) estimator in lieu of the GS2SLS estimator used so far. Table 5 shows that the observed relationship between quality of government and regional resilience remains unaltered when we use this alternative estimation strategy. That said, it is important to recall that these estimates should be treated with caution, since if the innovations in the disturbance process in equation (3) are hetoroskedastic, the QML estimator can produce inconsistent results (Kelejian and Prucha, 2010). In any case, the magnitude of the impact of the quality of government on regional resilience is very similar to that obtained when the GS2SLS estimator is used (Table 3).

INSERT TABLE 5 AROUND HERE

We also explore to what extent our results depend on the specific spatial model used to investigate the link between quality of government and regional resilience. As discussed in section 4.1, in our particular context there are various reasons to justify the employment of a first-order SARAR model as our baseline specification. However, in view that the results in Table 2 reveal that the spatial autocorrelation coefficient is not statistically significant, we now proceed to estimate a spatial autoregressive model. Furthermore, as an additional robustness check, we also consider the possibility that regional resilience may be directly affected by conditions in neighbouring regions rather than indirectly by the effect of these conditions on the resilience of neighbouring regions. In order to examine this issue, we add spatial lags of the various explanatory variables as additional regressors in equation (2), which leads to the so-called spatial Durbin model. The results in Table 6 reveals that our main findings still hold, regardless of the spatial model considered. In all cases there is a positive and statistically significant association between quality of government and the ability of regional labour markets to react to the crisis. Nevertheless, it is interesting to note that in the spatial Durbin model, the indirect effect of governance on regional resilience is statistically significant only at the 10% level (see also Table A1 in the Appendix for further details). This seems to suggests that the spatial spillovers induced by the quality of government mainly operate in an indirect way through the impact of governance on the resilience of neighbouring regions, which supports the employment of a SARAR model in this context.

INSERT TABLE 6 AROUND HERE

Alternative dimensions of the quality of government

As stated in section 3, our measure of the quality of government, the EQI, is based on different surveys whose questions are centred on three concepts related to different aspects of governance: the quality, impartiality and level of corruption in education, public health care and law enforcement. Nevertheless, although they are positively correlated, it is not clear a priori that these three dimensions of governance affect regional resilience in the same way. For this reason, and in order to complement our previous analysis, we now resort to the information provided by the EQI to examine separately the role played in this context by the quality, impartiality and degree of corruption in the public services mentioned above. The results displayed in Table 7 show that these three aspects of the quality of government exert a positive and statistically significant effect on regional resilience, in line with our previous findings. In fact, according to our estimates, the quantitative impact is very similar in all cases, which indicates that the observed connection between governance and regional resilience is not driven by a particular dimension of the quality of government.

INSERT TABLE 7 AROUND HERE

6 Conclusions

This paper has examined the relationship between quality of government and regional resilience in the EU during the Great Recession. The results show that the quality of government is an important factor when shaping the regional reactions to the crisis in the EU. Our estimates reveal that a higher quality of government is associated with a better labour market performance at the regional level during over the Great Recession. This is partly due to the role played in this context by spatial spillovers induced by the quality of government in neighbouring regions. The observed connection between governance and regional resilience is robust to the inclusion in the analysis of different explanatory variables that may affect both government quality and regional resilience. Likewise, our findings do not depend on the specific dimension of governance considered, the estimation method or the econometric specification employed to capture the nature of spatial spillovers.

The results of the paper raise potentially important policy implications, especially at a time in which there is an active public debate about what are the most appropriate instruments to reduce the impact of recessionary shocks on regional economies. Our analysis suggest that improving the quality of government may contribute to increasing the ability of regions to react to economic downturns. Accordingly, when designing effective development strategies, policy makers should pay particular attention to the way in which authority is exercised by regional governments. However, improving the quality of government at the regional level may not be an easy task in the European setting. Thus, it is likely that public intervention in this context cannot be based on a "one size fits all" policy framework. Moreover, it is important to recall that the quality of government depends in turn on historical and cultural factors, which cannot be easily modified in the short run.

Additional extensions to our work are not difficult to conceive. For example, it would be interesting to extend the study period to the post-crisis years. Lack of regional data has prevented us from pursuing this issue, but addressing it may provide a more complete perspective about the nature of the relationship between governance and regional resilience. Further research will also have to pay special attention to the need to identify and study the various transmission channels which explain ultimately the effect of governance on regional economic performance. Only by addressing these strands, we will be able to have a more detailed understanding about the way in which the quality of government affects regional resilience.

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Figures and Tables

Figure 1: The Geographical Distribution of Regional resilience

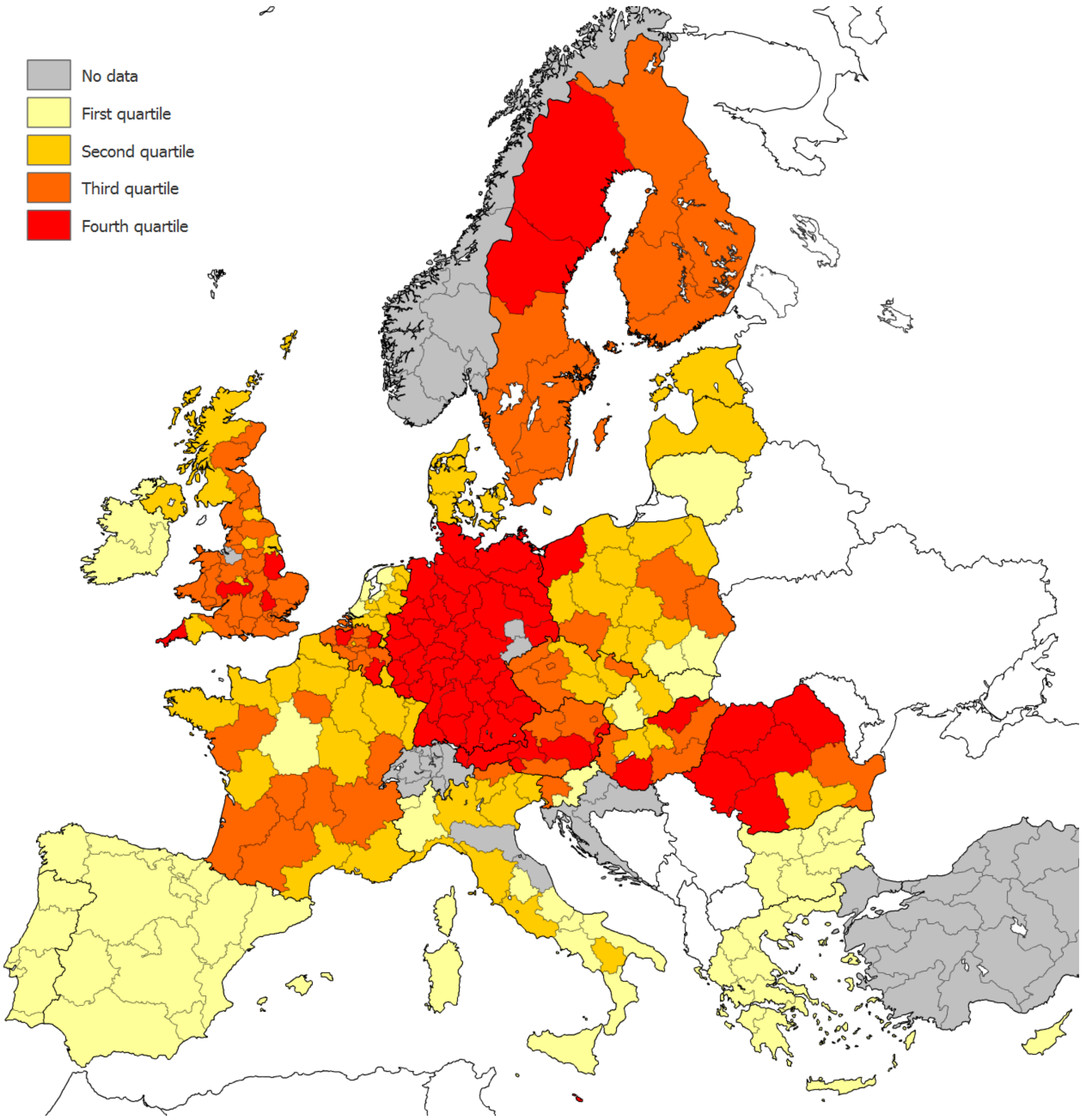

Figure 2: Quality of government and regional resilience.

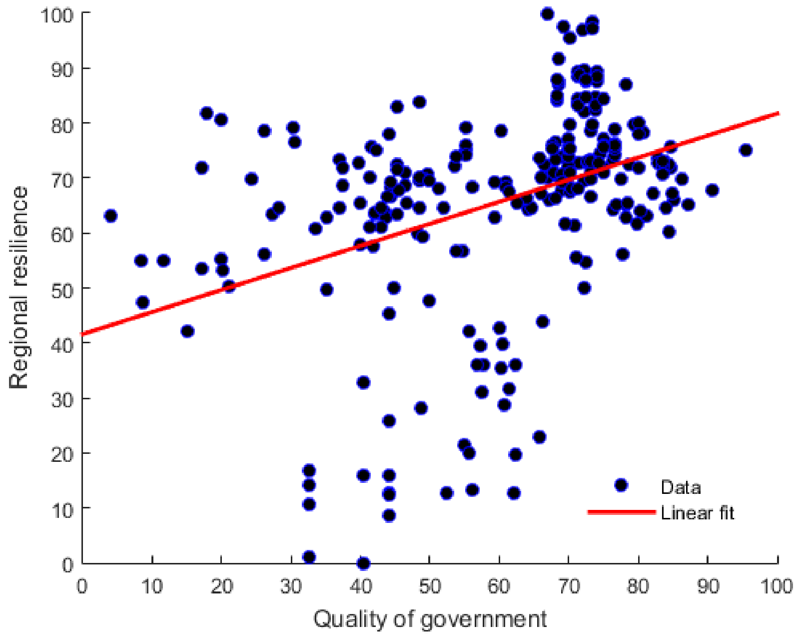

Figure 3: Regional resilience: Do neighbouring regions matter?

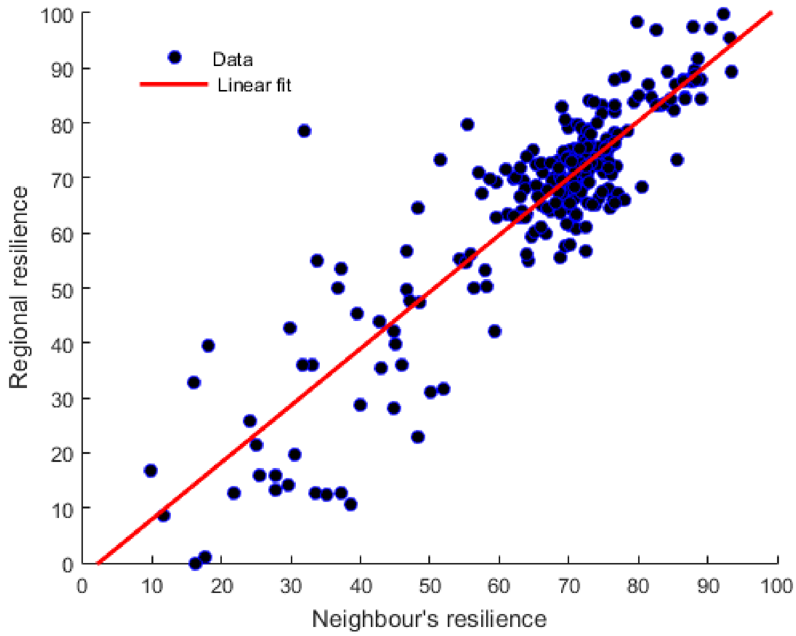

Table 1: Spatial Weights Matrix Selection.

	Log-likelihood function value	Residual variance
First order contiguity	-687.973	29.590
K-nearest neighbors ($K = 5$)	-683.698	28.593
K-nearest neighbors ($K = 10$)	-683.688	28.593
K-nearest neighbors ($K = 15$)	-679.254	27.184
K-nearest neighbors($K = 20$)	-680.946	27.542
K-nearest neighbors($K = 25$)	-681.140	27.520
$1/d^{\alpha}$. $\alpha = 2.00$	-688.883	29.869
$1/d^{\alpha}$. $\alpha = 2.00$ & Cut-off at Q1	-686.949	29.315
$1/d^{\alpha}$. $\alpha = 2.00$ & Cut-off at Q2	-685.957	29.043
$exp-(\theta d)$. $\theta = 0.01$	-689.139	29.497
$exp-(\theta d)$. $\theta = 0.01$ Cut-off at Q1	-689.145	29.491
$exp-(\theta d)$. $\theta = 0.01$ Cut-off at Q2	-689.123	29.528
$exp-(\theta d)$. $\theta = 0.05$	-688.617	29.315
$exp-(\theta d)$. $\theta = 0.05$ Cut-off at Q1	-688.645	29.313
$exp-(\theta d)$. $\theta = 0.05$ Cut-off at Q2	-688.624	29.320
$1/d^{\alpha}$. $\alpha = 1.00$ Cut-off at 750 km	-685.513	28.961
$1/d^{\alpha}$. $\alpha = 1.00$ Cut-off at 1000 km	-682.945	28.355
$1/d^{\alpha}$. $\alpha = 1.00$ Cutt-off at 1500 km	-691.549	27.306

Notes: Bayesian Markov Monte Carlo Chain (MCMC) routines developed by James LeSage are employed to carry out the estimation of the SARAR model under different W specifications. Log-likelihood values reported in column (1) are obtained evaluating the likelihood of the SARAR model at the posterior mean of the estimated parameter vector after 5,000 MCMC draws. All W's are row-normalized.

Table 2: Quality of government and regional resilience: Baseline results.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.341***	0.393***	0.378***	0.330***	0.357***	0.407***
	(0.082)	(0.078)	(0.078)	(0.081)	(0.080)	(0.075)
Quality of government	0.162***	0.159***	0.184***	0.149***	0.173***	0.144***
	(0.049)	(0.053)	(0.052)	(0.049)	(0.053)	(0.055)
Agriculture		0.121*				0.171*
		(0.072)				(0.091)
Manufacturing		-0.157*				-0.100
		(0.086)				(0.115)
Non-market services		-0.086				-0.077
		(0.143)				(0.162)
Regional specialization		0.207				0.127
		(0.274)				(0.273)
Human capital			0.296***			0.252**
			(0.085)			(0.112)
Innovation			-0.981*			-0.488
			(0.567)			(0.636)
Regional autonomy				-1.008***		-0.993***
				(0.206)		(0.199)
Regional autonomy squared				0.023***		0.022***
				(0.005)		(0.005)
Employment density					0.153	-0.807
					(0.565)	(0.605)
Young people					-0.524	-0.418
					(0.358)	(0.313)
Old people					0.558*	0.131
					(0.303)	(0.275)
Spatial autoregressive	-0.192	-0.062	-0.418	-0.417	-0.334	-0.489
coefficient	(0.284)	(0.313)	(0.320)	(0.283)	(0.286)	(0.330)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.927	0.927	0.928	0.928	0.935
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 3: Baseline results: Direct, indirect and total effects.

	Direct effects	Indirect effects	Total effects
Quality of government	0.146***	0.097**	0.243***
	(0.056)	(0.041)	(0.090)
Agriculture	0.174*	0.115	0.289*
	(0.093)	(0.073)	(0.161)
Manufacturing	-0.101	-0.067	-0.168
	(0.117)	(0.083)	(0.198)
Non-market services	-0.078	-0.052	-0.131
	(0.164)	(0.112)	(0.276)
Regional specialization	0.129	0.086	0.215
	(0.276)	(0.186)	(0.461)
Human capital	0.255**	0.169*	0.424**
	(0.113)	(0.093)	(0.198)
Innovation	-0.494	-0.328	-0.822
	(0.645)	(0.449)	(1.087)
Regional autonomy	-1.006***	-0.669	-1.675***
	(0.202)	(0.255)	(0.411)
Regional autonomy squared	0.022***	0.015	0.037***
	(0.005)	(0.006)	(0.010)
Employment density	-0.818	-0.543	-1.361
	(0.613)	(0.459)	(1.055)
Young people	-0.424	-0.282	-0.705
	(0.317)	(0.223)	(0.530)
Old people	0.133	0.088	0.222
	(0.279)	(0.186)	(0.464)

Notes: The different effects are calculated from the estimates in column (6) of Table 2. The dependent variable is in all cases the index of regional resilience described in section 3. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 4: Robustness analysis: Endogeneity of the quality of government.

	Direct effects	Indirect effects	Total effects
Quality of government	0.203***	0.125**	0.328***
	(0.072)	(0.050)	(0.111)
Agriculture	0.159*	0.097	0.256*
	(0.092)	(0.065)	(0.153)
Manufacturing	-0.086	-0.053	-0.139
	(0.119)	(0.077)	(0.196)
Non-market services	-0.051	-0.031	-0.083
	(0.169)	(0.106)	(0.275)
Regional specialization	0.131	0.080	0.211
	(0.275)	(0.171)	(0.444)
Human capital	0.264**	0.162*	0.426**
	(0.115	(0.087)	(0.194)
Innovation	-0.584	-0.358	-0.942
	(0.658)	(0.427)	(1.076)
Regional autonomy	-0.998***	-0.611**	-1.609***
	(0.205)	(0.239)	(0.401)
Regional autonomy squared	0.022***	0.014**	0.036***
	(0.005)	(0.005)	(0.009)
Employment density	-0.660	-0.404	-1.065
	(0.633)	(0.426)	(1.048)
Young people	-0.328	-0.201	-0.528
	(0.321)	(0.205)	(0.520)
Old people	0.250	0.153	0.402
	(0.290)	(0.181)	(0.467)

Notes: The different effects are calculated from the estimates in column (6) of Table A1. The dependent variable is in all cases the index of regional resilience described in section 3. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 5: Robustness analysis: Alternative estimation method (QML estimates).

	Direct effects	Indirect effects	Total effects
Quality of government	0.169***	0.088***	0.257***
	(0.055)	(0.034)	(0.081)
Agriculture	0.143*	0.075	0.217*
	(0.080)	(0.051)	(0.128)
Manufacturing	-0.103	-0.054	-0.157
	(0.090)	(0.050)	(0.139)
Non-market services	-0.055	-0.029	-0.084
	(0.126)	(0.066)	(0.192)
Regional specialization	0.083	0.043	0.126
	(0.238)	(0.123)	(0.361)
Human capital	0.252**	0.131*	0.383**
	(0.099)	(0.069)	(0.160)
Innovation	-0.542	-0.283	-0.825
	(0.667)	(0.371)	(1.031)
Regional autonomy	-1.087***	-0.567**	-1.654***
	(0.291)	(0.231)	(0.479)
Regional autonomy squared	0.024***	0.013**	0.037***
	(0.007)	(0.005)	(0.011)
Employment density	-0.649	-0.339	-0.987
	(0.663)	(0.364)	(1.017)
Young people	-0.434	-0.227	-0.661
	(0.310)	(0.178)	(0.480)
Old people	0.148	0.077	0.225
	(0.307)	(0.162)	(0.468)

Notes: The different effects are calculated from the estimates in column (6) of Table A1. The dependent variable is in all cases the index of regional resilience described in section 3. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 6: Robustness analysis: Alternative spatial models.

	Spatial autoregressive model			Spatial Durbin model		
	Direct effects	Indirect effects	Total effects	Direct effects	Indirect effects	Total effects
Quality of government	0.133**	0.092**	0.225**	0.175***	0.930*	1.105**
	(0.056)	(0.043)	(0.093)	(0.057)	(0.542)	(0.549)
Agriculture	0.198**	0.137*	0.335*	0.163*	-0.264	-0.102
	(0.096)	(0.083)	(0.172)	(0.088)	(0.661)	(0.684)
Manufacturing	-0.098	-0.068	-0.166	-0.138	0.385	0.247
	(0.124)	(0.092)	(0.214)	(0.117)	(0.684)	(0.706)
Non-market services	-0.107	-0.074	-0.182	-0.074	2.184	2.110
	(0.174)	(0.126)	(0.300)	(0.141)	(1.969)	(1.970)
Regional specialization	0.213	0.147	0.360	-0.090	-6.505	-6.595
	(0.298)	(0.212)	(0.507)	(0.270)	(5.875)	(5.937)
Human capital	0.248**	0.172*	0.420***	0.166	-1.362	-1.196
	(0.117)	(0.101)	(0.209)	(0.126)	(1.344)	(1.423)
Innovation	-0.356	-0.247	-0.603	-0.060	-5.197	-5.257
	(0.665)	(0.475)	(1.136)	(0.750)	(4.308)	(4.542)
Regional autonomy	-0.903***	-0.624**	-1.527***	-1.270***	-8.679	-9.948
	(0.209)	(0.265)	(0.434)	0.295	(5.878)	(6.078)
Regional autonomy squared	0.020***	0.014**	0.034***	0.029***	0.246	0.274
	(0.005)	(0.006)	(0.010)	(0.007)	(0.165)	(0.170)
Employment density	-0.996	-0.689	-1.686	0.116	22.904	23.020
	(0.629)	(0.512)	(1.114)	(0.743)	(16.143)	(16.611)
Young people	-0.390	-0.270	-0.660	-0.056	-0.561	-0.617
	(0.325)	(0.236)	(0.552)	(0.302)	(1.872)	(1.996)
Old people	0.098	0.068	0.165	0.278	4.068	4.347
	(0.278)	(0.192)	(0.469)	(0.306)	(3.056)	(3.160)

Notes: The different effects are calculated from the estimates in column (6) of Tables A1 and A1. The dependent variable is in all cases the index of regional resilience described in section 3. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table 7: Robustness analysis: Different dimensions of the quality of government.

	Direct effects	Indirect effects	Total effects	Direct effects	Indirect effects	Total effects	Direct effects	Indirect effects	Total effects
Quality	0.116**	0.082**	0.198**						
	(0.049)	(0.040)	(0.084)						
Impartiality				0.139**	0.094**	0.230**			
				(0.058)	(0.042)	(0.094)			
Control of corruption							0.124**	0.084**	0.208**
							(0.055)	(0.039)	(0.088)
Agriculture	0.203**	0.144*	0.347**	0.162*	0.109	0.271*	0.173*	0.117	0.291**
	(0.096)	(0.083)	(0.173)	(0.094)	(0.075)	(0.164)	(0.093)	(0.075)	(0.163)
Manufacturing	-0.107	-0.076	-0.183	-0.116	-0.079	-0.195	-0.102	-0.069	-0.172
	(0.119)	(0.090)	(0.207)	(0.116)	(0.084)	(0.198)	(0.115)	(0.083)	(0.197)
Non-market services	-0.084	-0.06	-0.144	-0.091	-0.061	-0.152	-0.100	-0.068	-0.168
	(0.165)	(0.121)	(0.285)	(0.162)	(0.113)	(0.273)	(0.161)	(0.113)	(0.274)
Regional specialization	0.13	0.092	0.222	0.084	0.057	0.141	0.167	0.113	0.279
	(0.279)	(0.201)	(0.479)	(0.280)	(0.191)	(0.470)	(0.275)	(0.189)	(0.462)
Human capital	0.229**	0.163*	0.392**	0.254**	0.172*	0.425**	0.268**	0.181*	0.449**
	(0.111)	(0.095)	(0.198)	(0.114)	(0.095)	(0.201)	(0.112)	(0.098)	(0.201)
Innovation	-0.237	-0.168	-0.405	-0.457	-0.309	-0.766	-0.656	-0.444	-1.099
	(0.631)	(0.457)	(1.086)	(0.647)	(0.455)	(1.096)	(0.656)	(0.475)	(1.119)
Regional autonomy	-1.036***	-0.735***	-1.771***	-1.027***	-0.694***	-1.721***	-0.966***	-0.654**	-1.620***
	(0.202)	(0.273)	(0.426)	(0.202)	(0.261)	(0.415)	(0.202)	(0.258)	(0.416)
Regional autonomy squared	0.023***	0.017***	0.040***	0.023***	0.016**	0.039***	0.022***	0.015**	0.036***
	(0.005)	(0.006)	(0.010)	(0.005)	(0.006)	(0.010)	(0.005)	(0.006)	(0.010)
Employment density	-0.889	-0.631	-1.519	-0.859	-0.581	-1.44	-0.936	-0.633	-1.569
	(0.574)	(0.467)	(1.019)	(0.645)	(0.489)	(1.115)	(0.624)	(0.487)	(1.089)
Young people	-0.475	-0.337	-0.813	-0.432	-0.292	-0.724	-0.496	-0.335	-0.831
	(0.318)	(0.241)	(0.546)	(0.316)	(0.227)	(0.532)	(0.316)	(0.230)	(0.532)
Old people	0.008	0.006	0.014	0.104	0.07	0.174	0.125	0.085	0.210
	(0.277)	(0.196)	(0.473)	(0.274)	(0.186)	(0.459)	(0.284)	(0.193)	(0.476)

Notes: The different effects are calculated from the estimates in column (6) of Tables A1, A1 and A1. The dependent variable is in all cases the index of regional resilience described in section 3. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Appendix

Figure 1: Employment rates during the recession 2008-2013

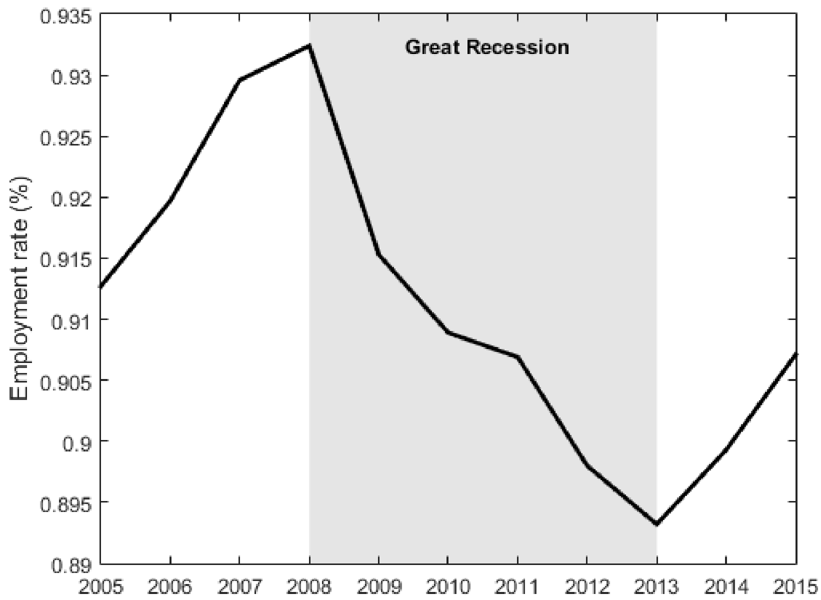

Table A1: Control variables: Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max	Obs
Agriculture	7.739	8.922	0.080	49.200	255
Manufacturing	18.771	6.660	5.210	36.880	255
Non-market services	28.574	6.065	12.000	46.460	255
Regional specialization	23.003	2.106	18.900	31.400	255
Human capital	21.459	7.805	7.170	45.980	255
Innovation	3.558	1.795	-1.833	6.650	255
Regional autonomy	12.824	14.220	0.000	48.000	255
Regional autonomy squared	365.845	512.708	0.000	2304	255
Quality of government					
Employment density	0.178	0.611	0.001	7.894	255
Young people	12.097	2.719	4.550	21.070	255
Old people	10.864	2.973	5.190	20.010	255

Table A1: Control variables: Definition and Sources.

Variable	Definition	Source[1]
Agriculture	Share of employment in the agriculture sector (%)	CE
Manufacturing	Share of employment in the manufacturing sector (%)	CE
Non-market services	Share of employment in the non market services sector (%)	CE
Regional specialization [a]	Herfhindal index calculated over the employment shares in 6 different sectors	CE
Human capital	Share of population with tertiary education attainment	(%) ES
Innovation[b]	Innovation index measuring the share of small and medium firms introducing a new product and/or a new process in the market	RIS, CIS
Regional autonomy[c]	Regional autonomy index based on the indicators of policy scope (PS), fiscal autonomy (FA) political representation (PR) and institutional depth (ID)	Sorens (2014)
Quality of government	Regional quality of government index based on the indicators of corruption regulatory quality, and impartiality	QOGI
Employment density	Ratio of employment (in millions) to the regional area (in squared kilometers)	ES
Young people	Share of population aged between 15-24 years old (%) ES	
Old population	Share of population aged between 55-65 years old (%) ES	

Notes: (1) CE denotes the Cambridge Econometrics Database. ES denotes Eurostat, RIS refers to the Regional Innovation Scoreborad and CIS to Innovation Community Survey. (a) The sectors $s = 1, \ldots, S$ considered to obtain the Herfindahl Index are agriculture, manufactures, construction, distribution, non-market services and financial services. (b) The innovation index is constructed as the average of country (CIS) and regional (RIS) data: $I = \frac{I_{r,t}+I_{c,t}}{2}$ for the period 2000-2008, where each innovation index was previously computed employing a max-min normalization. (c) The Regional autonomy Index is constructed using RAI sub-indicators as follows:

$$RA_i = [PS_i \times FA_i \times PR_i] \forall ID_i = 3$$
$$RA_i = \frac{[PS_i \times FA_i \times PR_i]}{2} \rightarrow ID_i \neq 3 \quad (5)$$

where: PS denotes policy scope, FA fiscal autonomy, PR political representation and ID stands for institutional depth.

Table A1: Robustness analysis: Endogeneity of the quality of government.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.324***	0.374***	0.356***	0.314***	0.340***	0.387***
	(0.082)	(0.078)	(0.078)	(0.081)	(0.079)	(0.074)
Quality of government	0.202***	0.204***	0.241***	0.186***	0.222***	0.201***
	(0.065)	(0.070)	(0.066)	(0.064)	(0.068)	(0.071)
Agriculture		0.118*				0.157*
		(0.072)				(0.090)
Manufacturing		-0.154*				-0.085
		(0.087)				(0.118)
Non-market services		-0.065				-0.051
		(0.148)				(0.167)
Regional specialization		0.218				0.129
		(0.272)				(0.271)
Human capital			0.305***			0.261**
			(0.086)			(0.114)
Innovation			-1.113*			-0.577
			(0.576)			(0.650)
Regional autonomy				-0.998***		-0.986***
				(0.208)		(0.202)
Regional autonomy squared				0.023***		0.022***
				(0.005)		(0.005)
Employment density					0.278	-0.653
					(0.562)	(0.625)
Young people					-0.449	-0.324
					(0.361)	(0.317)
Old people					0.634**	0.247
					(0.300)	(0.287)
Spatial autoregressive	-0.187	-0.079	-0.415	-0.402	-0.324	-0.499
coefficient	(0.282)	(0.313)	(0.323)	(0.282)	(0.286)	(0.335)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.927	0.927	0.928	0.928	0.935
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). See section **??** for further details on the instruments used to deal with the potential endogeneity of the quality of government. * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Alternative estimation method (QML estimates).

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.261***	0.304***	0.303***	0.261***	0.283***	0.349***
	(0.070)	(0.073)	(0.071)	(0.069)	(0.069)	(0.069)
Quality of government	0.181***	0.179***	0.202***	0.166***	0.189***	0.167***
	(0.054)	(0.054)	(0.052)	(0.052)	(0.055)	(0.055)
Agriculture		0.096				0.142*
		(0.071)				(0.079)
Manufacturing		-0.146*				-0.102
		(0.082)				(0.089)
Non-market services		-0.092				-0.055
		(0.119)				(0.125)
Regional specialization		0.236				0.082
		(0.241)				(0.236)
Human capital			0.302***			0.249**
			(0.082)			(0.098)
Innovation			-0.924*			-0.538
			(0.541)			(0.661)
Regional autonomy				-1.066***		-1.077***
				(0.296)		(0.289)
Regional autonomy squared				0.024***		0.024***
				(0.007)		(0.007)
Employment density					0.202	-0.643
					(0.598)	(0.656)
Young people					-0.559*	-0.430
					(0.298)	(0.307)
Old people					0.521*	0.146
					(0.280)	(0.304)
Spatial autoregressive	-0.256	-0.224	-0.578**	-0.468**	-0.429*	-0.775***
coefficient	(0.218)	(0.218)	(0.240)	(0.232)	(0.230)	(0.250)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.927	0.928	0.928	0.928	0.935
Observations	255	255	255	255	255	255

Notes: Quasi-maximum likelihood (QML) estimates. The dependent variable is in all cases the index of regional resilience described in section 3. Robust standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Spatial autoregressive model.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.353***	0.408***	0.384***	0.334***	0.366***	0.417***
	(0.086)	(0.081)	(0.084)	(0.085)	(0.084)	(0.080)
Quality of government	0.160***	0.151***	0.178***	0.150***	0.170***	0.131**
	(0.050)	(0.053)	(0.054)	(0.051)	(0.055)	(0.056)
Agriculture		0.131*				0.195**
		(0.072)				(0.094)
Manufacturing		-0.157*				-0.097
		(0.087)				(0.122)
Non-market services		-0.104				-0.106
		(0.148)				(0.172)
Regional specialization		0.227				0.210
		(0.281)				(0.294)
Human capital			0.261***			0.245**
			(0.085)			(0.116)
Innovation			-0.838			-0.352
			(0.576)			(0.656)
Regional autonomy				-0.909***		-0.890***
				(0.211)		(0.205)
Regional autonomy squared				0.021***		0.020***
				(0.005)		(0.005)
Employment density					0.064	-0.983
					(0.581)	(0.620)
Young people					-0.469	-0.385
					(0.360)	(0.321)
Old people					0.553*	0.096
					(0.304)	(0.274)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.923	0.926	0.927	0.927	0.927	0.934
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Spatial Durbin model.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.335***	0.451***	0.381***	0.319***	0.465***	0.696***
	(0.088)	(0.107)	(0.081)	(0.089)	(0.102)	(0.130)
Quality of government	0.157***	0.164***	0.181***	0.161***	0.130**	0.151***
	(0.055)	(0.060)	(0.058)	(0.059)	(0.054)	(0.058)
Agriculture		0.114				0.169**
		(0.077)				(0.086)
Manufacturing		-0.176**				-0.148
		(0.085)				(0.116)
Non-market services		-0.063				-0.129
		(0.138)				(0.150)
Regional specialization		0.018				0.074
		(0.247)				(0.280)
Human capital			0.286***			0.200*
			(0.079)			(0.109)
Innovation			-0.880			0.071
			(0.590)			(0.733)
Regional autonomy					-0.998***	-1.051***
					(0.212)	(0.225)
Regional autonomy squared					0.023***	0.023***
					(0.005)	(0.005)
Employment density				0.088		-0.462
				(0.545)		(0.587)
Young people				-0.437		-0.042
				(0.361)		(0.289)
Old people				0.540*		0.176
				(0.306)		(0.293)
Neighbours' quality	0.014	-0.081	0.016	0.060	0.052	0.185
of government	(0.084)	(0.125)	(0.116)	(0.098)	(0.088)	(0.161)
Neighbours' agriculture		-0.177				-0.200
		(0.186)				(0.213)
Neighbours' manufacturing		0.091				0.223
		(0.182)				(0.228)
Neighbours' non-market		0.549				0.771
services		(0.362)				(0.479)
Neighbours' regional		-1.605				-2.081*
specialization		(1.209)				(1.253)
Neighbours' human capital			0.109			-0.564*
			(0.220)			(0.294)
Neighbours' innovation			-0.420			-1.670
			(1.016)			(1.410)
Neighbours' autonomy					-0.963**	-1.976***
					(0.384)	(0.611)
Neighbours' autonomy	-0.186	-0.199	-0.446	-0.270	0.030***	0.061***
squared	(0.285)	(0.329)	(0.336)	(0.291)	(0.011)	(0.018)
Neighbours' employment				1.587		7.465**
density				(1.411)		(3.146)
Neighbours' young people				-0.551		-0.146
				(0.384)		(0.601)
Old people				0.030		1.147*
Neighbours' old people				(0.418)		(0.594)
Spatial autoregressive	-0.186	-0.199	-0.446	-0.270	-0.486*	-0.939**
coefficient	(0.285)	(0.329)	(0.336)	(0.291)	(0.274)	(0.378)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.929	0.928	0.929	0.928	0.943
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Quality of public services and regional resilience.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours resilience	0.361***	0.415***	0.396***	0.346***	0.379***	0.423***
	(0.081)	(0.078)	(0.078)	(0.078)	(0.080)	(0.075)
Quality of public services	0.153***	0.142***	0.151***	0.149***	0.140***	0.114**
	(0.045)	(0.048)	(0.046)	(0.044)	(0.047)	(0.049)
Agriculture		0.136*				0.200**
		(0.074)				(0.095)
Manufacturing		-0.141				-0.105
		(0.088)				(0.117)
Non-market services		-0.099				-0.083
		(0.143)				(0.163)
Regional specialization		0.204				0.128
		(0.277)				(0.275)
Human capital			0.260***			0.226**
			(0.084)			(0.109)
Innovation			-0.676			-0.234
			(0.541)			(0.622)
Regional autonomy				-1.057***		-1.021***
				(0.207)		(0.199)
Regional autonomy squared				0.024***		0.023***
				(0.005)		(0.005)
Employment density					0.009	-0.876
					(0.525)	(0.565)
Young people					-0.569	-0.469
					(0.367)	(0.314)
Old people					0.437	0.008
					(0.315)	(0.273)
Spatial autoregressive	-0.232	-0.055	-0.420	-0.499*	-0.364	-0.496
coefficient	(0.296)	(0.319)	(0.323)	(0.297)	(0.296)	(0.335)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.926	0.926	0.928	0.927	0.934
Observations	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Impartiality in public services and regional resilience.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours resilience	0.347***	0.398***	0.381***	0.334***	0.363***	0.411***
	(0.082)	(0.079)	(0.078)	(0.080)	(0.080)	(0.075)
Impartiality in public services	0.163***	0.150***	0.186***	0.153***	0.167***	0.138**
	(0.052)	(0.054)	(0.054)	(0.052)	(0.055)	(0.058)
Agriculture		0.104				0.160*
		(0.073)				(0.092)
Manufacturing		-0.169*				-0.115
		(0.087)				(0.114)
Non-market services		-0.102				-0.090
		(0.141)				(0.159)
Regional specialization		0.152				0.083
		(0.279)				(0.277)
Human capital			0.300***			0.250**
			(0.087)			(0.112)
Innovation			-0.895			-0.451
			(0.569)			(0.638)
Regional autonomy				-1.017***		-1.013***
				(0.211)		(0.199)
Regional autonomy squared				0.024***		0.023***
				(0.005)		(0.005)
Employment density					0.102	-0.848
					(0.608)	(0.635)
Young people					-0.557	-0.426
					(0.354)	(0.312)
Old people					0.510*	0.103
					(0.297)	(0.271)
Spatial autoregressive	-0.171	-0.051	-0.386	-0.389	-0.324	-0.480
coefficient	(0.285)	(0.317)	(0.319)	(0.283)	(0.288)	(0.331)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.924	0.926	0.927	0.928	0.928	0.935
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Table A1: Robustness analysis: Corruption in public services and regional resilience.

	(1)	(2)	(3)	(4)	(5)	(6)
Neighbours' resilience	0.353***	0.400***	0.388***	0.346***	0.360***	0.411***
	(0.085)	(0.080)	(0.080)	(0.084)	(0.082)	(0.076)
Control of corruption	0.116**	0.126**	0.153***	0.099**	0.143***	0.123**
	(0.049)	(0.053)	(0.052)	(0.049)	(0.055)	(0.054)
Agriculture		0.126*				0.171*
		(0.071)				(0.092)
Manufacturing		-0.167**				-0.101
		(0.085)				(0.114)
Non-market services		-0.101				-0.099
		(0.142)				(0.159)
Regional specialization		0.236				0.164
		(0.275)				(0.271)
Human capital			0.311***			0.264**
			(0.086)			(0.111)
Innovation			-1.124*			-0.647
			(0.606)			(0.647)
Regional autonomy				-0.984***		-0.953***
				(0.204)		(0.198)
Regional autonomy squared				0.023***		0.021***
				(0.005)		(0.005)
Employment density					0.094	-0.924
					(0.593)	(0.615)
Young people					-0.591*	-0.489
					(0.356)	(0.312)
Old people					0.575*	0.124
					(0.311)	(0.281)
Spatial autoregressive	-0.173	-0.040	-0.419	-0.391	-0.316	-0.462
coefficient	(0.276)	(0.302)	(0.312)	(0.276)	(0.277)	(0.318)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.923	0.926	0.927	0.926	0.927	0.934
Observations	255	255	255	255	255	255

Notes: The estimation method is GS2SLS with heteroskedastic innovations of unknown form in the disturbance process. The dependent variable is in all cases the index of regional resilience described in section 3. Standard errors in parentheses. All regressions include a constant (not shown). * Significant at 10% level, ** significant at 5% level, *** significant at 1% level.