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Economic resilience in Great Britain: an empirical analysis at the local authority district level[1]

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INTRODUCTION

Since the 2008 crisis, economic resilience as a term has come to the forefront of academic research in regional economics and economic geography with significant contributions at the theoretical and empirical level. This chapter focuses on the empirical analysis of economic resilience and its determinants, with an emphasis on Great Britain's (GB) 380 Local Authority Districts (LADs) (Kitsos, 2018; Kitsos and Bishop, 2018). It first discusses the concept's meaning and measurement, before presenting the empirical investigation, results and further avenues of research. The findings suggest that in the 2008 recession, past performance, skills and demographics are among the most significant determinants of the crisis's impact. The policy implications of the research indicate the importance of graduate production, retention and attraction. It is also suggested that further research should focus

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on clarifying the role of entrepreneurship, local industrial and socio-economic structure, agency and institutions.

CONCEPTUALIZATION AND OPERATIONALIZATION

Any empirical examination of economic resilience warrants a discussion on the conceptualization of the notion. This is because to date, economic resilience is lacking a universally accepted definition. Part of the explanation for this is that the term has emerged in ecological studies (Holling, 1973) and found its way into economics, regional economics and economic geography through multiple interpretations (Arrow *et al*., 1995; Friedman, 1993; Martin and Sunley, 2014; Perrings, 1998). It is not by chance that Brand and Jax (2007) find ten different understandings of resilience in environmental and social sciences alone.

The definitions of economic resilience can be placed on a spectrum according to their approach and treatment of equilibria (Table 11.1). More equilibrist approaches suggest that resilience is a movement to a previously determined or a new equilibrium point. These conceptualizations measure resilience as the speed of return to a previous state and/or the amount of force counterbalanced (single-equilibrium approaches). Alternatively, they consider the size of the forces sustained before a system changes its structural characteristics (multiple-equilibria approaches). Representative definitions are those of Friedman (1993) 'plucking model' and Hill et al. (2010):

<quotation>

> We conceptualize regional economic resilience as the ability of a region […] to recover successfully from shocks to its economy that throw it substantially off its prior growth path and cause an economic downturn. (Hill et al., 2010, p. 2)

At the other end of the spectrum are definitions that refute the notion of equilibria and view resilience as a dynamic process with multiple feedback loops where the crucial element is the capacity to adapt and create new development paths. They advance the evolutionary aspects of the concept and consider regions as complex systems (Bristow and Healy, 2014; 2015). This approach is reflected in definitions such as that by Martin and Sunley (2014) where resilience is conceived 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, 2014, p. 13)

Table 11.1 Perspectives of resilience

Perspective	**Meaning**	**Measurement**
Resilience of ecosystems (Engineering resilience)	Movement back to equilibrium (Single equilibrium approach)	Speed or amount of force counterbalanced
Ecology (Ecological resilience)	Movement to new equilibrium point or stability domain (multiple equilibria with adaptation perspectives)	Amount of force sustained until a change of structural characteristics

Resilience as a dynamic process	Adaptation to continuously changing environments	Capacity to adapt and create new development paths

Source: Kitsos (2018).

Before outlining how resilience is operationalized here, the measures and methods used so far to represent economic resilience are briefly reviewed.

The multifaceted nature of resilience means that composite indicators could be an insightful way to understand and measure it. Such measures have been adopted by several studies (Briguglio et al., 2009; Psycharis et al., 2014) which find significant differences in resilience performance among countries and regions. Composite indicators allow the representation of multidimensional concepts in one outcome variable of significant policy interest, which is comparable over time and easy to understand. However, they are subject to significant drawbacks since their construction involves several (producer-dependent) decisions about the data to be included, as well as the aggregation and weighting methods which introduce a degree of arbitrariness in the results (Giovannini et al., 2008).

As a result, most empirical examinations of economic resilience use single proxies of resilience (Di Caro, 2015; Fingleton et al., 2012; Lee, 2014; Martin, 2012; Modica and Reggiani, 2014). The most prominent measures of economic resilience are labour market indicators such as employment and unemployment figures (see for example Di Caro, 2017; Faggian et al. 2018; Lee, 2014; Martin, 2012). The reasons for this are both practical and theoretical.

At the firm level, labour is one of the production inputs that are easier to adapt in the face of adversity. This becomes more relevant in the UK case during the 2008 crisis, since the country has one of the most flexible labour market structures in the EU. In addition, labour market performance correlates to other socio-economic conditions such as happiness, psychological scarring and other health effects, as well as criminality and family breakdowns, and hence can reflect more than

economic output (Arulampalam, 2001; Bell and Blanchflower, 2010; Brinkley et al., 2010; Clark and Oswald, 1994; Clayton, 2011; Fingleton et al., 2012). In terms of practicality, labour market indicators are regularly updated and are more reliable than output measures (i.e. GVA) at the lower geographical scales (Gripaios and Bishop, 2006).

A range of studies have adopted these indicators to represent resilience performance across different countries and geographies. Reggiani et al. (2002) borrow Lyapunov exponents from physics to identify either attracting forces that lead to engineering resilience or chaotic forces that destabilize a system under examination. Martin (2012) and Faggian et al. (2018) use a 'peak to trough' comparison between regional and national labour market performance, whilst Lee (2014) examines unemployment differentials between a pre-recession period and a period during the recession. Similar to these approaches but defining the crisis for each individual region, Sensier et al. (2016) suggest a more holistic methodology suitable for cross-country examination which, beyond the impact of the crisis, also considers the time dimension of a shock. Fingleton and Palombi (2013) use the difference between actual and counterfactual wage growth, whilst Rocchetta and Mina (2019) use employment growth measures.

Similar proxies are used in this study, building on the 'peak to trough' approaches. Examining local labour markets in a more holistic way, a range of labour market indicators is used including employment, full-time equivalent employment, unemployment and Job Seekers Allowance (JSA) metrics (Kitsos, 2018). The reason for using multiple measures is the flexibility of the UK labour market and the definition of employment in national and international surveys, which includes anyone who has done some paid work during the reference week (NOMIS, 2016). This, combined with estimates that between 2007 and 2014 the number of employees on 'zero hour' contracts has quadrupled (ONS, 2015), suggests that the binary measure of employment rates may mask significant changes in markets where labour hoarding and work-hour flexibility are prevalent. To alleviate such concerns, the

econometric examination developed here uses an approximation of full-time equivalent employment as well as data on the unemployed via measured unemployment benefit claimants.

In order to account for the differential temporal aspects of the recession impact on local economies, as well as the increased uncertainty and noise in survey data for lower geographical levels, a modified 'peak to trough' method is used. Thus, instead of using a single point in time for the peak and the trough of labour market indicators, the method uses the average of 2004–2007 as the pre-recession condition and the four worst performing rates for the period 2008–2014.

The result of this exercise is a series of variables that allow for the comparison of labour market conditions before and after the crisis for each local area, subject to conceptual differences between employment and unemployment related indicators (Table 11.2). These variables reflect the maximum crisis impact in a LAD and will serve as the dependent variables in the econometric examination to follow.

Table 11.2 Mathematical expressions of dependent variables

Measure	Mathematical Expression	Xj	Xi	Crisis impact is greater when variable is…
EMIMPACT	Xj-Xi	Average employment rate of a LAD for 2004-2007	Average of the four minimum employment rates of a LAD for 2008-2014	positive
FTEIMPACT	Xj-Xi	Average FTE employment rate of a LAD for 2004-2007	Average of the four minimum FTE employment rates of a LAD for 2008-2014	positive
UNIMPACT	Xi-Xj	Average unemployment rate of a LAD for 2004-2007	Average of the four maximum unemployment rates of a LAD for 2008-2014	positive
JSAIMPACT	Xi-Xj	Average JSA rate of a LAD for 2004-2007	Average of the four maximum JSA rates of a LAD for 2008-2014	positive

Source: Kitsos (2018).

The descriptive statistics (Table 11.3) are indicative of the different concepts and measurement methods for the indicators, whilst the correlations table (Table 11.4) suggests that employment and unemployment related resilience measures reflect different facets of the crisis impact.

Table 11.3 Descriptive statistics of the dependent variables

Variable	Obs	Mean	Std. Dev.	Min	Max
EMIMPACT	378	3.12	2.43	-7.33	11.38
FTEIMPACT	378	3.85	2.59	-5.48	10.87
UNIMPACT	366	3.16	1.49	-1.45	8.51
JSAIMPACT	380	1.42	0.63	0.05	3.55

Source: Kitsos (2018).

Table 11.4 Correlations between the dependent variables

Variable	EMIMPACT	FTEIMPACT	UNIMPACT	JSAIMPACT
EMIMPACT	1.00			
FTEIMPACT	0.87	1.00		
UNIMPACT	0.46	0.44	1.00	
JSAIMPACT	0.16	0.22	0.63	1.00

Source: Kitsos (2018).

THE DETERMINANTS OF RESILIENCE

Before the empirical examination of the determinants of economic resilience, it is worth reviewing the information we have so far as to the factors that may affect resilience performance. This review focuses on path dependency, the local industrial structure, specialization and diversity, entrepreneurship, human capital and agglomeration economies, and considers how they could affect

resilience. The discussion will inform the independent variables of the econometric examination to follow.

Pre-existing Conditions

The uneven distribution of resource endowments and the differential dynamism and performance in the run-up to the crisis may have placed local areas on different paths and influenced their capacity to mitigate the downturn (Lee, 2014; Martin and Sunley, 2014). Hence, when we examine local economic resilience, it is important to consider the pre-existing conditions in an area. The empirics to date are somewhat inconclusive on whether better performing places were hit harder or not. Berthoud (2009) finds no clear relationship between pre and post-recession unemployment. Clayton (2011) suggests that the highest increases in unemployment were in places with already high unemployment rates when JSA claimant count data is considered. Lee (2014) agrees with this finding but also finds that places with higher unemployment rates have had smaller increases in unemployment during the recession. These mixed outcomes highlight the sensitivity of results to the methodologies, countries and measures used, as well as the need for further research to clarify the impact of initial labour market conditions.

Industrial Structure

Downturns tend to affect sectors and industries in different ways (McConnell et al., 2017). This is due to the particular characteristics of both different industrial dynamics (e.g. demand, supply, competition, location) and different crises (nature, origin, propagation mechanisms) (Canova et al., 2012; Martin et al., 2016). In the UK, this is evidenced by Martin (2012) who shows the differential impact of the 1980s, 1990s and 2000s crises on production and services.

The nature and origin of the 2008 financial crisis suggested that service industries alongside construction would bear the brunt of the downturn. However, the literature is ambiguous as to

whether the crisis hit manufacturing or services more severely. Although finance and business services showed the largest decrease in jobs since Q2 of 1978 (ONS, 2009), the largest immediate fall of output was in manufacturing and this was accompanied by a drop of 8–10 per cent in employment (Gregg and Wadsworth, 2010). At the EU regional level, Davies (2011) finds that places with low employment in manufacturing have performed better during the crisis, whilst the rebound stage had mixed results in relation to local economic structure. Concurrently, the ESPON project on regional economic resilience in Europe found mixed results on the manufacturing sector's contribution to employment resilience and a positive relationship between employment in financial services and regional economic resilience (Bristow et al., 2014).

In explaining these mixed results and ambiguity, there are three interesting avenues. First, the studies above examine different time periods within the 2008 crisis period. The temporal element is significant as most of these examinations took place as the crisis was unraveling and there may be significant time differences in the propagation of the downturn. The second is the role of the public sector. In both the UK and the EU studies, high employment in the public sector appears to alleviate the initial impact of the crisis (Bristow et al., 2014; Carrascal Incera, 2017; Gregg and Wadsworth, 2010; Lee, 2014; ONS, 2009). Irrespective of active counter-cyclical policies, this is in accordance with expectations since the demand for public sector services is expected to either remain the same (e.g. education) or increase (e.g. unemployment benefits) during a recession. However, due to the austerity measures adopted in the period 2009–2011 and beyond, the local dominance of the public sector has deepened the crisis impact in different places.

Finally, it is suggested that it is the qualitative characteristics of local industrial structures that matter rather than the sectoral composition. Martin et al. (2016), in particular, suggest that the influence of the industrial structure on local economic resilience performance has reduced since the 1970s. At the same time, the increased interconnectedness of different industries suggests that even non-systemic crisis events could affect a greater number of industries than before. As a result, it is

proposed that what is of interest are the relationships between industries in local economic structures rather than the local types of industries. This is touched upon in the next section on specialization and diversity.

Specialization and Diversity

The qualitative characteristics of industrial structure that can affect resilience performance refer to the link between positive externalities such as knowledge spillovers and growth. Given that these positive effects are likely to arise from Marshall–Arrow–Romer (MAR) or localization externalities (Arrow, 1962; Marshall, 1890; Romer, 1986), it would be expected that specialization leads to better growth outcomes. On the other hand, if spillover effects come from Jacobian externalities (Jacobs, 1970), then more diversified local economies will have better growth outcomes.

Numerous studies empirically examine these externalities, again finding mixed results ranging from support for specialization, to no effect, to support for diversification (Bishop and Gripaios, 2010; De Groot et al., 2016; Deidda et al., 2006; Van Oort, 2007; Van Soest et al., 2006). Portfolio theory suggests that industrial variety could reduce the exposure of local economies to shocks. Greater diversification in terms of supply and demand, as well as industry-specific structural characteristics could shield economies from sector-specific shocks and potentially reduce the impact of systemic crises (Frenken et al., 2007). The results of examining the link between resilience and specialization/diversification are thus mixed. Whilst Martin (2012) and Fingleton and Palombi (2013) find evidence of a link between increased specialization and vulnerability to shocks in the UK, Lee (2014) finds no statistically significant relationship between specialization and the 2008 crisis in UK cities.

Entrepreneurship

Entrepreneurship is linked to economic growth by the exploitation of market opportunities, increase in innovation and the creation of jobs (Audretsch et al., 2015; Bunten et al., 2015). The entrepreneurial characteristics of flexibility and adaptability, the generation of employment and the renewal of business bases with new, more dynamic firms are features that can particularly assist local areas at times of economic distress (Bishop and Shilcof, 2016; Williams and Vorley, 2014). However, entrepreneurship levels vary geographically in a time-persistent pattern (Audretsch and Keilbach, 2007; Bishop, 2012; Fotopoulos, 2014). This means that any benefits to local economic resilience performance will also be spatially variant and disproportionately affect certain localities. Until recently, few studies have examined the relationship between entrepreneurship and resilience however, hence the need for further examination.

Human Capital

Human capital is an engine of economic and employment growth (Arrow, 1962; Barro, 2001; Lucas, 1988; Romer, 1990). The increase in demand for skills, whether due to skill-biased technological change or labour market polarization (see Lee, 2014; UKCES, 2014), coupled with greater adaptation characteristics (Gregg and Wadsworth, 2010; Schultz, 1975) suggest that human capital could be a significant driver of local economic resilience. This could be either through labour hoarding or by improved adaptation capabilities of those highly-skilled employees. Empirical results support the idea that greater stocks of qualifications (used as a proxy for human capital) have a positive effect on mitigating the impact of crisis (Glaeser, 2005; Hill et al., 2010; Lee, 2014).

However, besides the stock of skills in an area it is important to test for the existence of firm-specific human capital created with on-the-job training (Bristow et al., 2014; Hashimoto, 1981). Training has been associated with lower probabilities of staff turnover but it has also been linked to

less technologically advanced businesses (Molina and Ortega, 2003). These opposing attributes require further examination in order to identify the role of training on resilience.

Agglomeration Economies

Agglomeration economies encompass factors such as the demographic structure, level of urbanization and geography, which can affect the resilience performance of different localities. Demographics is one of the factors least examined in economic resilience studies. The literature supports an inverted U-shape relationship between age and human capital, productivity and/or growth measures (Brunow and Hirte, 2009; Feyrer, 2007; Gutiérrez Posada et al., 2018; Poot, 2008; Skirbekk, 2004). This is partly driven by human capital obsolescence and the increased frequency of technological advances, which put more emphasis on mental agility and adaptability rather than experience (Baltes and Lindenberger, 1997; Prskawetz and der Wissenschaften, 2006; Skirbekk, 2004). These effects, coupled with increased job mobility for younger aged workers (Dixon, 2003), suggest that the local demographic structure can play a significant role in determining the resilience performance of different places.

Moreover, whether it is due to increased amenities (Florida et al., 2008; Glaeser and Resseger, 2010) or urbanization externalities (Bishop and Gripaios, 2010; Essletzbichler and Rigby, 2005), cities and agglomerations offer several attributes promoting growth. Concurrently, urbanization can lead to negative externalities such as increased transport costs and crowding out due to congestion (Bishop and Gripaios, 2010). The existing evidence suggests that urban areas in Europe have had better resilience performance on average compared to less urbanized areas (Brakman et al., 2014; Bristow et al., 2014).

Furthermore, the UK's uneven regional development (Gardiner et al., 2013), the differential impact and hysteresis of past recessions (Champion and Townsend, 2013; Cross et al., 2009; Martin, 2012) and the geographical stickiness of factors such as entrepreneurship (Fotopoulos, 2014), suggest

that regions in the UK may differ in their capacity to respond to the 2008 downturn. Due to the origin of the crisis, it was expected that the greatest impact would be in places with a high concentration of employment in financial services such as in the South East of England. However, the evidence suggests that the impact was more severe in the north of the UK (Lee, 2014).

ECONOMETRIC ESTIMATION

Following the discussion of Sections 2 and 3, this part outlines the dependent and independent variables used and the results of the econometric analysis. The analysis investigates the impact of the above factors on the performance of local authorities in the UK during the 2008 crisis. The general model is:

$$Impact = a + \beta_i X_i + \varepsilon \qquad (11.1)$$

Impact denotes the dependent variable (Table 11.2) measuring the crisis impact in a local authority and X_i is a vector of independent variables representing the determinants discussed above. Multicollinearity considerations dictated the use of the demographics and industrial structure variables in separate specifications as in Table 11.6, whilst regionally clustered robust standard errors were used to account for cluster correlation between local authorities in the same region. The results relating to the employment rates dependent variable are discussed in detail whilst those relating the rest of the dependent variables are presented in a cumulative table to allow the identification of similarities and differences among different resilience measures[2].

The independent variables used to represent the above determinants are as follows (see Table 11.5):

[2] The detailed regression tables for the rest of the dependent variables are available from the author upon request.

- The employment, full-time equivalent employment, unemployment and JSA rates for the year 2007 (EMP_2007, FTE_2007, UNEMP_2007, JSA_2007);
- The share of employment in manufacturing (MANF), total services (TS), business, insurance and finance services (BIF) and construction (CON);
- The share of employment in the private sector (PRIVATE);
- The inverse of a Herfindahl–Hirschman Index (INV_HHI) to reflect specialization and/or diversification of employment;
- The average firm birth rates in the pre-recession period 2004–2007 (ENTR);
- The shares of the population that received workplace training (TRAIN), have a degree level qualification or above (DEGREE) or no qualification at all (NO_QUAL);
- The age groups 20–34, 35–49, 50–64 to control for demographics;
- The natural logarithm of population density in different LADs (LN_DENSITY); and
- Regional dummy variables NOE (North East, North West, Yorkshire and the Humber), MIDLANDS (East and West Midlands), SCOTLAND and WALES.

Table 11.5 Independent variables' descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	CV
EMP_2007	378	60.40	4.84	45.60	71.90	0.080
FTE_2007	378	55.46	5.23	38.79	69.83	0.094
UNEMP_2007	354	5.06	2.07	1.60	12.10	0.409
JSA_2007	380	1.70	0.89	0.30	5.00	0.524
MANF	377	12.48	5.02	1.90	29.60	0.402
TS	379	75.44	6.20	56.70	93.80	0.082
BIF	376	14.27	6.40	2.80	72.50	0.448
CON	376	8.87	2.52	1.50	18.30	0.284
PRIVATE	379	76.64	5.49	53.00	100.00	0.072

INV_HHI	378	0.55	0.056	0.38	0.7	0.102
ENTR	380	7.65	11.10	3.00	218.82	1.451
TRAIN	378	10.72	1.56	5.90	14.60	0.146
DEGREE	379	19.32	8.65	5.90	75.80	0.448
NO_QUAL	378	12.74	4.51	2.00	29.90	0.354
AGE_20_34	380	18.40	4.98	10.70	38.20	0.271
AGE_35_49	380	22.21	1.39	18.00	26.80	0.063
AGE_50_64	380	18.75	2.55	9.00	23.70	0.136
LN_DENSITY	380	6.31	1.47	2.20	9.51	0.233

Source: Kitsos (2018).

In Table 11.6, EMIMPACT is the difference between the four worst performing years in terms of employment rates between 2008 and 2014 and the average employment rate 2004–2007. The higher the EMIMPACT, the higher the crisis impact in an area. Therefore, positive coefficients suggest a deepening, whilst negative coefficients imply a mitigating effect of an independent variable.

Table11.6 Results to alternative specifications for EMIMPACT

	(1) **EMIMPACT**	**(2)** **EMIMPACT**	**(3)** **EMIMPACT**	**(4)** **EMIMPACT**
EMP_2007	0.245***	0.225***	0.252***	0.232***
	(0.0381)	(0.0325)	(0.0376)	(0.0310)
MANF	0.00561	0.00212		
	(0.0300)	(0.0311)		
BIF	-0.0211	-0.0216		
	(0.0334)	(0.0352)		
CON	-0.00235	0.00187		
	(0.0387)	(0.0454)		
TS			0.0316	0.0403
			(0.0304)	(0.0272)
PRIVATE	-0.00236	0.000399	0.000584	0.00262
	(0.0335)	(0.0377)	(0.0238)	(0.0277)
INV_HHI	-0.0809	0.402	1.512	2.392
	(4303.8)	(4406.7)	(4064.7)	(3921.6)
ENTR	0.135**	0.0874	0.100*	0.0482
	(0.0515)	(0.0586)	(0.0479)	(0.0471)

TRAIN	0.187*	0.197*	0.201*	0.212*
	(0.0977)	(0.0995)	(0.0978)	(0.0998)
DEGREE	-0.0558*	-0.0621**	-0.0634**	-0.0708***
	(0.0290)	(0.0271)	(0.0226)	(0.0207)
NO_QUAL	0.0868*	0.0894**	0.0859*	0.0900**
	(0.0479)	(0.0397)	(0.0466)	(0.0384)
AGE_20_34	-0.212***		-0.222***	
	(0.0374)		(0.0325)	
AGE_35_49	-0.318**	-0.161	-0.334***	-0.173*
	(0.109)	(0.107)	(0.0917)	(0.0878)
AGE_50_64		0.422***		0.447***
		(0.0950)		(0.0871)
LN_DENSITY	0.322***	0.362**	0.303**	0.342**
	(0.0914)	(0.124)	(0.100)	(0.123)
NOE	0.625**	0.406	0.850***	0.633***
	(0.278)	(0.299)	(0.187)	(0.194)
MIDLANDS	0.764**	0.515	1.073***	0.831***
	(0.296)	(0.339)	(0.208)	(0.230)
SCOTLAND	0.845**	0.359	0.969***	0.471
	(0.322)	(0.335)	(0.299)	(0.329)
WALES	-0.0892	-0.336	0.230	-0.00739
	(0.401)	(0.419)	(0.324)	(0.347)
_cons	-5.604	-19.95***	-9.013**	-24.89***
	(4.456)	(5.056)	(3.563)	(3.618)
N	373	373	378	378
r2	0.304	0.299	0.311	0.307

Notes:
* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets. Ordinary Least Squares estimators. The dependent variable is the difference in the average employment rates 2004–2007 and the four worst rates for the period 2008-2014 (EMIMPACT).

Table 11.7 shows the cumulative results using employment (EMIMPACT), full-time equivalents (FTEIMPACT), unemployment (UNIMPACT) and JSA (JSAIMPACT) as the dependent variables. *D* denotes a detrimental effect of the independent variable on the crisis impact, whilst *M* indicates a mitigating effect. Four specifications (similar to Table 11.6) are used for each dependent variable and the number of statistically significant coefficients is shown in brackets. Using the initial conditions (*STARTING POINT*) in a local authority as an example, it can be seen that pre-recession employment has had a detrimental effect on EMIMPACT in all the specifications examined. For FTEIMPACT, *STARTING POINT* denotes the FTE employment rate in 2007, in line with the dependent variable and similarly for UNIMPACT and JSAIMPACT.

Table 11.7 Cumulative results

Variable	EMIMPACT	FTEIMPACT	UNIMPACT	JSAIMPACT
STARTING POINT	D (4/4)	D (4/4)	M (4/4)	D (4/4)
MANF			D (2/2)	D (2/2)
BIF			D (2/2)	D (2/2)
CON			D (2/2)	
TS				
PRIVATE				D (4/4)
INV_HHI				
ENTR	D (2/4)			M (1/4)
TRAIN	D (4/4)	D (3/4)		D (4/4)
DEGREE	M (4/4)	M (4/4)	M (4/4)	M (4/4)
NO_QUAL	D (4/4)	D (3/4)	D (4/4)	D (4/4)
AGE_20_34	M (2/2)	M (2/2)	M (2/2)	M (2/2)
AGE_35_49	M (3/4)	M (4/4)		
AGE_50_64	D (2/2)	D (2/2)	D (2/2)	D (2/2)
LN_DENSITY	D (4/4)	D (4/4)	D (4/4)	D (4/4)
NOE	D (3/4)	D (2/4)		D (4/4)
MIDLANDS	D (3/4)	D (4/4)		
SCOTLAND	D (2/4)	D (2/4)		
WALES				D (4/4)

Notes:
Cumulative results denote D for a detrimental effect on resilience performance and M for a mitigating effect. In brackets are the regressions in which an independent variable has provided statistically significant results out of the specifications in which it was used.
Source: Adaptation from Kitsos (2018).

Several interesting results arise from the two tables. First, better initial employment performance has a detrimental effect on the crisis impact whilst places with higher unemployment rates have seen

smaller increases in their unemployment during the crisis. One explanation of this could be that inefficient firms may have been able to survive in booming places during the years of prosperity but failed to meet the high operational costs (e.g. rents, labour and local taxes) in these areas during the crisis period. In addition, if at the onset of the crisis workers had moved to previously booming places that did not manage to generate jobs at the same pace, this would also explain the results of Table 11.7. The only disagreement with these results is for JSAIMPACT where higher pre-recession rates of JSA claimants have led to deeper crisis impacts. This result, together with the one for UNIMPACT, supports the findings of Lee (2014) who suggests that there is a potential spatial bias of JSA. This is due to greater knowledge of the benefits system as well as fewer alternatives to support income between jobs (Beatty and Fothergill, 2005; Beatty et al., 2000).

Moreover, some of the most persistently significant results are observed for the human capital variables. Both *DEGREE* and *NO_QUAL* have the expected effects on the crisis impact. In other words, they support the findings of Lee (2014), Di Caro (2017) and Doran and Fingleton (2016) among others in suggesting that transferable skills, flexibility and the potential for hoarding have helped local areas mitigate the crisis impact. Employee training, on the other hand, provides some counterintuitive results with the effect of *TRAIN* being detrimental to the crisis impact where the results are statistically significant. Reflecting on this, it could be that formal and structured employee training schemes are usually pursued by companies with lagging productivity (Bartel, 1994) and/or with significant skills gaps (Molina and Ortega, 2003). If that is the case, then greater shares of employee training would signal a higher concentration of firms that are more vulnerable to a crisis.

Demography also emerges as a significant factor. LADs with higher concentrations of younger aged populations have had lower crisis impacts, whilst those with greater shares of the 50–64 age group have seen greater losses of employment and rises of unemployment. This highlights the impact of the flexibility and dynamism of the local population on the response to external shocks. Concurrently, population density exhibits some counterintuitive results, having a detrimental effect

on the crisis impact. One explanation of this result could be that the positive relationship between urbanization and resilience is an outcome of the individual characteristics accounted for in the specifications examined.

The recession's spatial footprint suggests that, in employment terms, the crisis impact was more severe in the North, Midlands and Scotland, compared to the rest of the UK. This is in agreement with Lee's (2014) findings that despite the expectations of a 'Southern' recession, most of the impact was felt in the North. The spatial results are more obscure when unemployment related variables are used to reflect the crisis impact. This could be related to spatially varying rates of labour market drop-outs through early retirement.

The industrial structure variables also provide a mixed picture. When we use employment-based measures of the crisis impact, *MANF*, *BIF*, *CON*, *TS*, *PRIVATE* and *INV_HHI*, these do not provide statistically significant results and hence suggest that the local industrial structure was not a crucial determinant of the crisis impact. This is in line with Martin et al.'s (2016) finding that the local industrial structure is less important now than it was in previous recessions since the increasing focus on services has aligned regional dynamics in terms of the business cycle (Jackman and Savouri, 1999; Martin et al., 2016). In addition, the fact that the crisis originated but was not contained in the banking sector meant that its propagation was far-reaching and that the recession hit many different sectors with similar severity. It is worth mentioning that even in the case of statistically significant results (*MANF*, *BIF*, *CON* for UNIMPACT and JSAIMPACT) the F-tests do not provide evidence of differentiation in the magnitude of the coefficients, further supporting the evidence of a more systemic crisis with respect to local industrial structures.

Finally, entrepreneurship does not provide any consistently significant results. In fact, when *EMIMPACT* is examined, higher firm formation rates are associated with deeper crisis impacts. These results echo those of Rocchetta and Mina (2019) and could be the outcome of two opposing forces. On the one hand, entrepreneurship could lead to employment generation and the replacement of less

productive firms with more dynamic and flexible enterprises. On the other hand, most of the newly formed firms are small in size and with limited access to finance. As a result, they are in a more precarious position in times of reduced credit availability. This evidence suggests that entrepreneurship could indeed be detrimental during the impact stage of a crisis whilst it may positively affect the recovery stage.

Overall, the results suggest that individual characteristics (skills, demographics) are more significant than the industrial structure (expressed by sectoral shares of employment) in shaping local resilience performance during the 2008 crisis. The policy implications relate to the production, retention and/or attraction of graduates. For example, the creation of attractive environments, in terms of appropriate jobs, housing and amenities becomes central in generating resilience through attracting and retaining skilled individuals locally. The results also challenge those local growth strategies that do not explicitly address resilience and as such, affirm Bristow's (2010) call for a contextualization of generic competitiveness policies.

DISCUSSION

The examination above is far from a definitive exercise in identifying the determinants of economic resilience. It is rather the beginning of a discussion and a contribution to research currently underway and focuses on previously counterintuitive results and new factors which have not been considered before due to lack of indicators or other reasons. This section will outline research avenues pursued to address these gaps and expand upon the findings of this chapter.

Entrepreneurship

The unexpected results on entrepreneurship have prompted further research into the topic. As a result, in collaboration with Colorado State University, we propose the concept of *entrepreneurial*

dynamism based on local information spillovers by Bunten et al. (2015). This takes into consideration the effects of both firm births and deaths on two different stages of the 2008 crisis, the recession and the recovery stage. The data used in the examination refer to plant-based information in the US and firm-level openings and closures in the UK. Preliminary analysis shows that in the US, greater dynamism meant greater loss of employment during the recession stage, whilst in the UK places with more firm births and deaths have seen no statistically significant differences in their resilience performance. In both countries however, greater dynamism has translated into better recovery performance, supporting the idea that newly formed firms need further support during the recession stage if places are to benefit from them during the recovery stage.

Industrial Structure and Embeddedness

Another significant finding of this chapter is that the industrial structure, measured by the employment shares of different industries is not sufficient in explaining the differential resilience outcomes of places. In this respect, several avenues are open to further investigate the nuances of industrial structure. One of these avenues is the use of advanced specialization and/or diversification indices such as those of Krugman or Duranton and Puga (Di Caro, 2017; Lee, 2014). Another, is for further research to examine the role of related variety (Frenken et al., 2007) and technological coherence (Rocchetta and Mina, 2019). A final one is to study regional economic embeddedness and its impact on resilience. Initial results, using sub-national input-output tables suggest that embeddedness has an inverted u-shaped relationship to economic resilience (Kitsos et al., 2019). In essence, these approaches recognize that there is a need to increase the quality of information in representing the industrial and economic structure of an area. This information includes the relationships and flows of people, products and ideas between industries in the same location. It could also utilize information on firm behaviour, risk attitudes and positioning in global value chains.

Social Factors and Conditions

Similarly, it is necessary to look at more closely at the structure of local societies. Social conditions have been largely ignored in resilience studies to date or constrained to labour market performance. This is partly due to the lack of reliable data at the local level (Putnam, 2001), as well as the long-term policy perspective required for change (Sissons et al., 2018). However, there is evidence that the depth of social ties and extent of inequality, for example, both vary within countries and affect the economic performance of local areas (Crescenzi et al., 2013; Glaeser et al., 2009). Having a more inclusive economy could mean it is easier to move jobs either through social contacts or through increased mobility. These aspects would affect local resilience performance measured either in labour market and/or in income terms. Hence, beyond the effects of the industrial structure, we need to better understand the effects of inclusiveness on local economic resilience.

Agency and Institutions

It is important for resilience research to look into the effects of agency and institutions. Institutions have been found to be crucial for socio-economic development at both the country level (Acemoglu and Robinson, 2012) and the regional level (Rodríguez-Pose, 2013; 2018). With regards to resilience, there is an evolving case study literature evidencing the effects of particular agents such as local leaders on the socio-economic fate of their areas (Beer and Clower, 2014; Bristow and Healy, 2014; Glaeser, 2005). Provided appropriate metrics are developed, this literature could be complemented by empirical studies to quantify the effect of agency and institutions on economic resilience.

CONCLUSIONS

In conclusion, this chapter has presented empirical research on local economic resilience in the UK. After discussing the development of the concept and its measurement, skills and demographics were found to be significant determinants of the 2008 crisis impact. This indicated the need for designing policies with a resilience-building component that will increase the presence of highly skilled, young individuals in different areas either through upskilling or by offering the right opportunities to attract talent. The research has also opened up numerous avenues for future investigation. The role of entrepreneurship requires further examination that can lead to improved calibration of policies in order to better support newly born firms during the recession period of a crisis. In addition, further insight is needed to clarify the role of the local industrial and socio-economic structure, as well as the role of agency and institutions in improving resilience outcomes which have thus far proved difficult to model.

REFERENCES

Acemoglu, D. and Robinson, J. (2012), *Why Nations Fail: The Origins Of Power, Prosperity, and Poverty*. New York: Crown Business.

Arrow, K., Bolin, B., Costanza, R., Dasgupta, P., Folke, C., Holling, C.S., Jansson, B.-O., Levin, S., Mäler, K.-G., Perrings, C. and Pimentel, D. (1995), 'Economic growth, carrying capacity, and the environment', *Ecological Economics*, 15 (2), 91–95.

Arrow, K.J. (1962), 'The economic implications of learning by doing', *The Review of Economic Studies*, 29 (3), 155–173.

Arulampalam, W. (2001), 'Is unemployment really scarring? Effects of unemployment experiences on wages', *The Economic Journal*, 111 (475), 585–606.

Audretsch, D.B., Belitski, M. and Desai, S. (2015), 'Entrepreneurship and economic development in cities', *The Annals of Regional Science*, 55 (1), 33–60.

Audretsch, D.B. and Keilbach, M. (2007), 'The theory of knowledge spillover entrepreneurship', *Journal of Management Studies*, 44 (7), 1242–1254.

Baltes, P.B. and Lindenberger, U. (1997), 'Emergence of a powerful connection between sensory and cognitive functions across the adult life span: a new window to the study of cognitive aging?', *Psychology and Aging*, 12 (1), 12–21.

Barro, R. (2001), 'Human capital and growth', *The American Economic Review*, 91 (2), 12–17.

Bartel, A.P. (1994), 'Productivity gains from the implementation of employee training programs', *Industrial Relations: A Journal of Economy and Society*, 33 (4), 411–425.

Beatty, C. and Fothergill, S. (2005), 'The diversion from "unemployment" to "sickness" across British regions and districts', *Regional Studies*, 39 (7), 837–854.

Beatty, C., Fothergill, S. and Macmillan, R. (2000), 'A theory of employment, unemployment and sickness', *Regional Studies*, 34 (7), 617–630.

Beer, A. and Clower, T. (2014), 'Mobilizing leadership in cities and regions', *Regional Studies, Regional Science*, 1 (1), 5–20.

Bell, D.N.F. and Blanchflower, D.G. (2010), 'UK unemployment in the Great Recession', *National Institute Economic Review*, 214 (1), R3–R25.

Berthoud, R. (2009), 'Patterns of non-employment, and of disadvantage, in a recession', *Economic and Labour Market Review*, 3 (12), 62–73.

Bishop, P. (2012), 'Knowledge, diversity and entrepreneurship: a spatial analysis of new firm formation in Great Britain', *Entrepreneurship and Regional Development*, 24 (7–8), 641–660.

Bishop, P. and Gripaios, P. (2010), 'Spatial externalities, relatedness and sector employment growth in Great Britain', *Regional Studies*, 44 (4), 443–454.

Bishop, P. and Shilcof, D. (2016), 'The spatial dynamics of new firm births during an economic crisis: the case of Great Britain, 2004–2012', *Entrepreneurship and Regional Development*, 1–23.

Brakman, S., Garretsen, H. and van Marrewijk, C. (2014), *The Crisis and Regional Resilience in Europe: On the Importance of Urbanization and Specialization*. Center for Economic Studies and the IFO Institute (CESifo) Working Paper No. 4724, Leibniz Institute for Economic Research at the University of Munich.

Brand, F.S. and Jax, K. (2007), 'Focusing the meaning (s) of resilience: resilience as a descriptive concept and a boundary object', *Ecology and Society*, 12 (1).

Briguglio, L., Cordina, G., Farrugia, N. and Vella, S. (2009), 'Economic vulnerability and resilience: concepts and measurements', *Oxford Development Studies*, 37 (3), 229–247.

Brinkley, I., Levy, C. and Morris, K. (2010), 'The jobs gap: a statement from The Work Foundation'. London: The Work Foundation.

Bristow, G. (2010), 'Resilient regions: re-'place'ing regional competitiveness', *Cambridge Journal of Regions Economy and Society*, 3 (1), 153–167.

Bristow, G. and Healy, A. (2014), 'Regional resilience: an agency perspective', *Regional Studies*, 48 (5), 923–935.

Bristow, G. and Healy, A. (2015), 'Crisis response, choice and resilience: insights from complexity thinking', *Cambridge Journal of Regions, Economy and Society*, 8 (2), 241–256.

Bristow, G.I., Healy, A., Norris, L., Wink, R., Kafkalas, G., Kakderi, C., Espenberg, K., Varblane, U., Sepp, V., Sagan, I., Masik, G., Sensier, M., Harding, A., Swash, A. and Carey, H. (2014) 'ECR2. Economic crisis: regional economic resilience. [Project Report]. ESPON,' pp. 1–110.

Brunow, S. and Hirte, G. (2009), 'The age pattern of human capital and regional productivity: a spatial econometric study on German regions', *Papers in Regional Science*, 88 (4), 799–823.

Bunten, D., Weiler, S., Thompson, E. and Zahran, S. (2015), 'Entrepreneuship, information and growth', *Journal of Regional Science*, 55 (4), 560–584.

Canova, F., de Portugal, L.A.L.J., Coutinho, S., Kontolemēs, Z.G. and Kommission, G.W.u.F.E. (2012), 'Measuring the macroeconomic resilience of industrial sectors in the EU and assessing the role of product market regulations'. Brussels: Publications Office of the European Union, 1-84

Carrascal Incera, A. (2017), 'Drivers of change in the European youth employment: a comparative structural decomposition analysis', *Economic Systems Research*, 29 (4), 463–485.

Champion, T. and Townsend, A. (2013), 'Great Britain's second-order city regions in recessions', *Environment and Planning A*, 45 (2), 362–382.

Clark, A.E. and Oswald, A.J. (1994), 'Unhappiness and unemployment', *The Economic Journal*, 104 (424), 648–659.

Clayton, N. (2011), 'The spatial impacts of the recession', in Bailey, D. and Chapain, C. (eds) *The Recession and Beyond:Local and Regional Responses to the Downturn*. New York: Routledge, 27–44.

Crescenzi, R., Gagliardi, L. and Percoco, M. (2013), 'Social capital and the innovative performance of Italian provinces', *Environment and Planning A*, 45 (4), 908–929.

Cross, R., Grinfeld, M. and Lamba, H. (2009), 'Hysteresis and economics', *Control Systems, IEEE*, 29 (1), 30–43.

Davies, S. (2011), 'Regional resilience in the 2008–2010 downturn: comparative evidence from European countries', *Cambridge Journal of Regions, Economy and Society*, 4 (3), 369–382.

De Groot, H.L., Poot, J. and Smit, M.J. (2016), 'Which agglomeration externalities matter most and why?', *Journal of Economic Surveys*, 30 (4), 756–782.

Deidda, S., Paci, R. and Usai, S. (2006), 'Spatial externalities and local economic growth', Centre for North South Economic Research, University of Cagliari and Sassari, Sardinia. No. 200206.

Di Caro, P. (2015), 'Recessions, recoveries and regional resilience: evidence on Italy', *Cambridge Journal of Regions, Economy and Society*, 8 (2), 273–291.

Di Caro, P. (2017), 'Testing and explaining economic resilience with an application to Italian regions', *Papers in Regional Science*, 96 (1), 93–113.

Dixon, S. (2003), 'Implications of population ageing for the labour market', *Labour Market Trends*, 111 (2), 67–76.

Doran, J. and Fingleton, B. (2016), 'Employment resilience in Europe and the 2008 economic crisis: insights from micro-level data', *Regional Studies*, 50 (4), 644–656.

Essletzbichler, J. and Rigby, D. (2005), 'Competition, variety and the geography of technology evolution', *Tijdschrift voor economische en sociale geografie*, 96 (1), 48–62.

Faggian, A., Gemmiti, R., Jaquet, T. and Santini, I. (2018), 'Regional economic resilience: the experience of the Italian local labor systems', *The Annals of Regional Science*, 60 (2), 393–410.

Feyrer, J. (2007), 'Demographics and productivity', *The Review of Economics and Statistics*, 89 (1), 100–109.

Fingleton, B., Garretsen, H. and Martin, R. (2012), 'Recessionary shocks and regional employment: evidence on the resilience of UK regions', *Journal of Regional Science*, 52 (1), 109–133.

Fingleton, B. and Palombi, S. (2013), 'Spatial panel data estimation, counterfactual predictions, and local economic resilience among British towns in the Victorian era', *Regional Science and Urban Economics*, 43 (4), 649–660.

Florida, R., Mellander, C. and Stolarick, K. (2008), 'Inside the black box of regional development: human capital, the creative class and tolerance', *Journal of Economic Geography*, 8 (5), 615–649.

Fotopoulos, G. (2014), 'On the spatial stickiness of UK new firm formation rates', *Journal of Economic Geography*, 14 (3), 651–679.

Frenken, K., Van Oort, F. and Verburg, T. (2007), 'Related variety, unrelated variety and regional economic growth', *Regional Studies*, 41 (5), 685–697.

Friedman, M. (1993), 'The "plucking model" of business fluctuations revisited', *Economic Inquiry*, 31 (2), 171–177.

Gardiner, B., Martin, R., Sunley, P. and Tyler, P. (2013), 'Spatially unbalanced growth in the British economy', *Journal of Economic Geography*, 13 (6), 889–928.

Giovannini, E., Nardo, M., Saisana, M., Saltelli, A., Tarantola, A. and Hoffman, A. (2008) *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Paris: OECD.

Glaeser, E.L. (2005), 'Reinventing Boston: 1630–2003', *Journal of Economic Geography*, 5 (2), 119–153.

Glaeser, E.L., Resseger, M. and Tobio, K. (2009), 'Inequality in cities', *Journal of Regional Science*, 49 (4), 617–646.

Glaeser, E.L. and Resseger, M.G. (2010), 'The complementarity between cities and skills', *Journal of Regional Science*, 50 (1), 221–244.

Gregg, P. and Wadsworth, J. (2010), 'The UK labour market and the 2008–9 recession', *National Institute Economic Review*, 212 (1), R61–R72.

Gripaios, P. and Bishop, P. (2006), 'Objective one funding in the UK: a critical assessment', *Regional Studies*, 40 (8), 937–951.

Gutiérrez Posada, D., Rubiera Morollón, F. and Viñuela, A. (2018), 'The determinants of local employment growth in Spain', *Applied Spatial Analysis and Policy*, 11 (3), 511–533.

Hashimoto, M. (1981), 'Firm-specific human capital as a shared investment', *The American Economic Review*, 71 (3), 475–482.

Hill, E., Clair, T., Wial, H., Wolman, H., Atkins, P., Blumenthal, P., Ficenec, S. and Fiedhoff, A. (2010), 'Economic shocks and regional economic resilience', *Paper to Conference on Urban and Regional Policy and Its Effects: Building Resilient Regions,* Washington DC, pp. 0–87.

Holling, C.S. (1973), 'Resilience and stability of ecological systems', *Annual Review of Ecology and Systematics*, 4 (1973), 1–23.

Jackman, R. and Savouri, S. (1999), 'Has Britain solved the "regional problem"?' in Gregg, P. and Wadsworth, J. (eds) *The State of Working Britain*. Manchester: Manchester University Press, pp. 25–48.

Jacobs, J. (1970), *The Economy of Cities*. New York: Random House.

Kitsos, A. (2018), *Economic resilience in Great Britain: an examination of the determinants of the 2008 crisis impact on GB's local authority districts*. University of Plymouth.

Kitsos, A. and Bishop, P. (2018), 'Economic resilience in Great Britain: the crisis impact and its determining factors for local authority districts', *The Annals of Regional Science*, 60 (2), 329–347.

Kitsos A, Carrascal-Incera A and Ortega-Argilés R. (2019), 'The Role of Embeddedness on Regional Economic Resilience: Evidence from the UK', *Sustainability* 11(14).

Lee, N. (2014), 'Grim down South? The determinants of unemployment increases in British cities in the 2008–2009 recession', *Regional Studies*, 48 (11), 1761–1778.

Lucas, R.E., Jr. (1988), 'On the mechanics of economic-development', *Journal of Monetary Economics*, 22 (1), 3–42.

Marshall, A. (1890), *Principles of Economics*, vol. 1. New York: Macmillan and Company.

Martin, R. (2012), 'Regional economic resilience, hysteresis and recessionary shocks', *Journal of Economic Geography*, 12 (1), 1–32.

Martin, R. and Sunley, P. (2014), 'On the notion of regional economic resilience: conceptualization and explanation', *Journal of Economic Geography*, 1–42.

Martin, R., Sunley, P., Gardiner, B. and Tyler, P. (2016), 'How regions react to recessions: resilience and the role of economic structure', *Regional Studies*, 50 (4), 561–585.

McConnell, C.R., Brue, S.L. and Macpherson, D.A. (2017), *Contemporary Labor Economics*. New York: McGraw-Hill Education.

Modica, M. and Reggiani, A. (2014), 'Spatial economic resilience: overview and perspectives', *Networks and Spatial Economics*, 1–23.

Molina, J.A. and Ortega, R. (2003), 'Effects of employee training on the performance of North-American firms', *Applied Economics Letters*, 10 (9), 549–552.

NOMIS (2016) 'Definitions and Explanations'. Date accessed: 23-5-2016www.nomisweb.co.uk.

ONS (2009), *The Impact of the Recession on the Labour Market*. Newport: Office for National Statistics, 14 May 2009.

ONS (2015), *Analysis of Employee Contracts that do not Guarantee a Minimum Number of Hours*. Newport: Office for National Statistics, 2 September 2015.

Perrings, C. (1998), 'Resilience in the dynamics of economy-environment systems', *Environmental and Resource Economics*, 11 (3–4), 503–520.

Poot, J. (2008), 'Demographic change and regional competitiveness: the effects of immigration and ageing', *International Journal of Foresight and Innovation Policy*, 4 (1–2), 129–145.

Prskawetz, A. and der Wissenschaften, Ö.A. (2006), *The Impact of Population Ageing on Innovation and Productivity Growth in Europe.* Österreichische Akademie der Wissenschaften, Institut für Demographie.

Psycharis, Y., Kallioras, D. and Pantazis, P. (2014), 'Economic crisis and regional resilience: detecting the "geographical footprint" of economic crisis in Greece', *Regional Science Policy and Practice*, 6 (2), 121–141.

Putnam, R. (2001), 'Social capital: measurement and consequences', *Canadian Journal of Policy Research*, 2 (1), 41–51.

Reggiani A, De Graaff T and Nijkamp P. (2002) Resilience: An Evolutionary Approach to Spatial Economic Systems. *Networks and Spatial Economics* 2: 211-229.

Rocchetta S and Mina A. (2019) Technological coherence and the adaptive resilience of regional economies. *Regional studies*: 1-14.

Rodríguez-Pose, A. (2013), 'Do institutions matter for regional development?', *Regional Studies*, 47 (7), 1034–1047.

Rodríguez-Pose, A. (2018), 'The revenge of the places that don't matter (and what to do about it)', *Cambridge Journal of Regions, Economy and Society*, 11 (1), 189–209.

Romer, P.M. (1986), 'Increasing returns and long-run growth', *Journal of Political Economy*, 94 (5), 1002–1037.

Romer, P.M. (1990), 'Human capital and growth: theory and evidence', *Carnegie-Rochester Conference Series on Public Policy*. Elsevier, pp. 251–286.

Schultz, T.W. (1975), 'The value of the ability to deal with disequilibria', *Journal of Economic Literature*, 13 (3), 827–846.

Sensier, M., Bristow, G. and Healy, A. (2016), 'Measuring regional economic resilience across Europe: operationalizing a complex concept', *Spatial Economic Analysis*, 11 (2), 128–151.

Sissons, P., Green, A.E. and Broughton, K. (2018), 'Inclusive growth in English cities: mainstreamed or sidelined?', *Regional Studies*, 1–12.

Skirbekk, V. (2004), 'Age and individual productivity: a literature survey', *Vienna Yearbook of Population Research*, 2, 133–153.

UKCES (2014), *The Labour Market Story: The UK Following Recession*. London: UK Commission for Employment and Skills.

Van Oort, F.G. (2007), 'Spatial and sectoral composition effects of agglomeration economies in the Netherlands', *Papers in Regional Science*, 86 (1), 5–30.

Van Soest, D.P., Gerking, S. and Van Oort, F.G. (2006), 'Spatial impacts of agglomeration externalities', *Journal of Regional Science*, 46 (5), 881–899.

Williams, N. and Vorley, T. (2014), 'Economic resilience and entrepreneurship: lessons from the Sheffield City Region', *Entrepreneurship and Regional Development*, 1–25.