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ECONOMIC RESILIENCE IN GREAT BRITAIN: AN EXAMINATION OF THE DETERMINANTS OF THE 2008 CRISIS IMPACT ON GB'S LOCAL AUTHORITY DISTRICTS

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ECONOMIC RESILIENCE IN GREAT BRITAIN: AN EXAMINATION OF THE DETERMINANTS OF THE 2008 CRISIS IMPACT ON GB'S LOCAL AUTHORITY DISTRICTS

By

ANASTASIOS KITSOS

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Author's Declaration

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Abstract

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ECONOMIC RESILIENCE IN GREAT BRITAIN: AN EXAMINATION OF THE DETERMINANTS OF THE 2008 CRISIS IMPACT ON GB'S LOCAL AUTHORITY DISTRICTS

In 2008, a severe economic crisis hit economies around the world. Its effects included a significant loss of GDP and employment which led to several social ills associated with recessions. However, the crisis did not impact all places with the same severity. This thesis investigates the crisis impact across GB Local Authority Districts during 2008-2014 within a framework that utilises the concept of economic resilience. However, this concept does not have a universally accepted definition or methodology of investigation. Hence, the study adopts an operational definition, comparing the conditions in local labour markets before and after the start of the recession. Using this method, a wide variation in resilience performance is identified across spatial areas. To identify the determinants of these differences, the study critically examines existing empirical studies and relevant theories. The factors identified range from past labour market performance to industrial structure, skills, demographics and other variables. The thesis then adopts an empirical method of investigation utilising a cross-sectional model. The results indicate that places which performed well before the start of the crisis have suffered deeper crisis impacts. However, the share of younger aged population and degree level qualification holders has mitigated the impact. The results are confirmed by robustness checks concerning the influence of outliers, migration and exploring the use of a composite indicator of resilience. It is the first time that a study of the crisis has focused on GB Local Authority Districts and comprehensively examined local labour markets. Moreover, the study makes a contribution by providing an operational definition and methodology for measuring resilience and empirically testing the impact of a range of determinants of resilience performance. The policy implications suggest a greater focus on skills and the attraction of younger aged workers through increased embeddedness of anchor institutions such as universities, as well as the inclusion of resilience as a core element of place-based policies.

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List of Abbreviations

ABI	Annual Business Inquiry
APS	Annual Population Survey
BIF	Banking, Insurance and Finance
BRES	Business Register and Employment Survey
CAS	Complex Adaptive Systems
CI	Confidence Intervals
CICI	Composite Indicator of Crisis Impact
CLES	Centre for Local Economic Strategies
CSGR	Centre for the Study of Globalisation and Regionalisation
CV	Coefficient of variation
FTE	Full-time equivalents
GB	Great Britain
GDP	Gross Domestic Product
GOR	Government Office Region
GP	General Practitioner
GVA	Gross Value Added
HDI	Human Development Index
HHI	Herfindahl-Hirschman Index
ILO	International Labour Organisation
JSA	Job Seekers Allowance
LAD	Local Authority Districts
MAR	Marshall-Arrow-Romer
MRW	Mankiw, Romer, and Weil
OLS	Ordinary Least Squares
SES	Socio-Economic Systems

TS	Total services
TTWA	Travel to Work Areas
VIF	Variance Inflation Factors

Chapter 1 - Introduction

The 2008 economic downturn was one of the most acute and widespread crises in modern times. Starting with the collapse of the housing bubble in the U.S. and the subprime mortgage crisis in 2006 (Shiller, 2012) the first impact was on investment banks and portfolios containing high risk mortgages. Due to the interconnectedness and global linkages of financial systems, the crisis was transmitted to commercial banks and economies across the world. The central position of financial systems in enabling economic activities and fueling growth allowed the downturn to impact on the real economy and expectations, evolving from a sectoral business cycle to a worldwide economic crisis. By 2016, some national and local economies have weathered the tides of the downturn. However, a great number are still battling their way out of low growth rates or stagnation.

This is not the first economic crisis that the UK has seen and a comparison of the recessions of 80s, 90s and 2000s reveals how their different characteristics had varying effects across the UK. The 1980s downturn originated in manufacturing and hence hit, with particular severity, regions in the North and the Midlands which depended heavily on production. The 1990s recession was different. This time it was the housing market collapse in the South where the crisis originated and its effects were exacerbated by high interest rates (Audas & MacKay, 1997; Green, Owen & Winnett, 1994; Lee, 2014; Martin, 2012). Hence, unemployment increases during the 90s recession were higher in places with low unemployment rates in contrast to the 1980s where the places

which suffered the most were those experiencing chronic structural problems of deindustrialisation.

National labour markets may take 8 to 10 years to return to pre-recession levels (Brinkley, 2009). For example, unemployment and claimant count rates continued to increase and remained high for several quarters after positive Gross Domestic Product (GDP) growth returned during the 1980s and 1990s recessions. Unemployment in the 80s recession did not return to pre-recession levels before the 1990s recession and, in the 90s downturn, it took until 1997 to return to pre-crisis levels (ONS, 2009). At the individual and household level, a period of unemployment can have significant knock-on and long-term effects on wellbeing, employment and earning prospects (Arulampalam, 2001; Bell & Blanchflower, 2010; Clayton, 2011). Ills such as family breakdowns as well as criminality have been associated with joblessness, whilst rising unemployment levels reduce household incomes and demand for local goods and services (Bell & Blanchflower, 2010; Brinkley et al., 2008; Clayton, 2011).

During the 2008 downturn, the UK lost approximately 6% of its GDP (Gregg & Wadsworth, 2010) through a combination of three different effects: recession specific effects, reductions in demand, and multiplier effects on local economies due to decreased local demand. These effects combined to affect output and employment levels (Bell & Blanchflower, 2009; Lee, 2014). By the third quarter of 2009, the country experienced its largest fall in output since the 1930s compared to the 1980s and 1990s recessions which saw a drop of GDP by 4.7% and 2.5% respectively (Clayton, 2011; ONS, 2009).

The labour market lagged the fall of output and was less severely hit than GDP (ONS, 2009). The 2008 crisis led to a drop in employment of 2.3% and an increase in unemployment of 2.8% between 2007 and 2011. These effects were of a smaller magnitude compared to the 80s and 90s downturns but they were more sudden. Unemployment levels in the three first quarters of the 2008 recession increased 1.7 times more than the increase in the first three quarters of the 1990s recession and 1.2 times more than in the 1980s (ONS, 2009).

It is possible that labour markets have not been hit as hard as in previous recessions due to labour hoarding, involving forms such as cutting hours and wages instead of losing jobs (Bell & Blanchflower, 2010). To this end, a substantial increase of employment contracts not guaranteeing minimum hours of work has been observed (Bell & Blanchflower, 2010; ONS, 2015). High firm profitability before the crisis may also have allowed firms to retain staff instead of trying to immediately cut jobs in attempting to weather the recession (Gregg & Wadsworth, 2010). The move towards more knowledge-based, skill and human capital intensive processes means that it is more crucial to hold on to staff than in previous recessions (Clayton, 2011). Highly skilled individuals are considered assets and together with the polarised labour market in the UK, related to the hollowing out thesis of the loss of middle skilled jobs, makes those highly skilled, less liable to lose their job (labour hoarding) and more likely to find one (Brinkley, 2009; UKCES, 2014). The recession also had a differential impact on different age groups with job losses concentrated on those under 25 years old whilst those over 50 increased their employment rates (Clayton, 2011).

The initial brunt of any recession is usually borne by the sectors more closely associated with its origins. In the case of the 2008 downturn, professional services, manufacturing and construction were initially hit hard with job losses concentrated on manual and less skilled occupations (Clayton, 2011). Finance and business services showed the largest decrease during 2008-2009 (Q4 of 2008 was the largest employment decrease in the sector since Q2 of 1978) whilst education, health and public administration kept growing. This may be due to the fact that a number of public services such as jobcentres etc. face increased demand during a recession, whilst there is continued and growing need for health services and education. However, manufacturing jobs have been on a downward trend in recent years so it is difficult to distinguish whether the employment declines in the sector were due to the recession or a continuation of the previous trend (or a combination to the two) (ONS, 2009). However, the loss of output in manufacturing for Q3 and Q4 of 2008 and Q1 2009 was the largest in the last 30 years (ONS, 2009).

The differences in the impact of the 2008 crisis amongst sectors have translated into a differential geographical impact of the recession. Despite the expectation that, since the origin of the crisis was in the financial services sector, it would mostly impact on the South and South-East where there is a higher concentration of these activities (Lee, 2014), it was manufacturing which lost most output and jobs. Hence, it might be expected that regions with a high degree of dependence on production would suffer the greatest effects (Clayton, 2011). In reality, the North East, West Midlands, Yorkshire and the Humber, Northern Ireland and Wales appear to have borne the brunt of the downturn (ONS, 2009). These are the same areas which benefited the least from recent

growth and already exhibited high unemployment from previous recessions (Clayton, 2011).

The nature of the crisis and its differential impact has re-kindled academic and policy interest in numerous strands of research which can be usefully grouped into two categories. The first involves the identification of why, how and where the crisis originated and how it has been transmitted (Crotty, 2009; Financial Crisis Inquiry Commission, 2011), as well as the analysis of policies that can prevent it from recurring (Financial Crisis Inquiry Commission, 2011; Levine, 2012). The second focuses on identifying the factors behind the differential impact of the crisis across various areas and whether it is possible to influence these factors (Capello, Caragliu & Fratesi, 2016; Fingleton, Garretsen & Martin, 2012; Lee, 2014; Martin & Sunley, 2014).

From a historical point of view, it appears that economic crises and business cycle fluctuations occur regularly, despite significant post-crises reflection and attempts to improve regulatory frameworks. This is not to diminish the value of understanding the causes of recessions and improving institutions to prevent similar downturns from happening again but rather to direct focus into building communities, societies and economies that are better able to mitigate the negative impacts of future economic slowdowns. In this respect, the concept of resilience, broadly defined as the ability of a system to withstand or overcome a shock - economic or otherwise - provides one useful framework to study the determining factors in preparing for downturns (Fingleton, Garretsen & Martin, 2012; Lee, 2014; Martin & Sunley, 2014).

The renewed interest in the notion of resilience has seen a number of studies examining the varying impact of the 2008 crisis on different places and a significant contribution directed towards developing a theoretical concept of resilience (Fingleton, Garretsen & Martin, 2012; Fingleton & Palombi, 2013; Martin, 2012; Martin & Sunley, 2014; Martin et al., 2016b). However, the research to date is subject to a number of shortcomings:

a) Conceptualisation. Despite current progress, there is no consensus on the precise meaning of the concept of resilience. The use of the term in many alternative fields allows for fuzziness in meaning and it is interchangeably used to signal sensitivity to crises, adaptability, adaptation, return to a pre-achieved development path or movement to a new one.
b) Operationalisation. The lack of robust conceptualisation is translated into a variety of operationalisations. A number of methods and indicators have been used to measure resilience but there is no consensus and a very limited number of studies comparing different indicators such as Cellini et al. (2017).
c) Identifying the factors behind the differential responses to the crisis. A number of studies have established the uneven impact of the crisis on different areas. However, very few studies have examined the determinants of this uneven impact (Lee, 2014).
d) Time periods and data. Since the 2008 crisis is a relatively recent event, most studies investigating it gauge the crisis impact by using data for the period 2008-2010. However, with the double dip of the UK economy in 2011, these studies fail to examine the full extent of the 2008 downturn.

e) Geography. The majority of studies in the UK examine the crisis at the broad regional level. Whilst this is useful, a more detailed geographical analysis is required to fully understand the spatial impact of the crisis.

This thesis aims to contribute to the discussion of these issues. It focuses on examining the differential impact of the 2008 economic crisis on Local Authority Districts (LADs) in Great Britain (GB) and the factors associated with the success or failure of places in mitigating the effects of the crisis using data for the period 2004-2014. In doing so, the thesis adopts an operational definition of economic resilience which compares labour market performance before and after the start of the crisis and proposes a new measurement method for resilience which accounts for temporal variations and considers multiple labour market indicators. Beyond identifying differences in the performance of GB LADs, the thesis undertakes a quantitative examination of the factors affecting this differential performance. Factors such as the industrial and demographic structure; and human capital endowments of each place are considered and offer numerous interesting results.

Consequently, the main contributions of this study revolve around:

a) The provision of an operational definition of resilience and a new method of measuring it. In essence the definition compares labour market indicators before and after the 2008 crisis. The measurement method involves an averaging approach in order to alleviate the impact of year to year fluctuations and/or sampling errors at the LAD level (chapter 5).
b) A holistic consideration of the crisis impact in local labour markets. To the author's knowledge, this is the first study to concurrently examine

employment and unemployment related measures, as well as their absolute and relative difference between the pre and post-2008 rates. As a result, eight different measures and a composite indicator of the crisis impact are considered and their differences examined in detail (chapters 5 and 7).

c) Testing a wide set of potential resilience determinants. The study reviews the literature on resilience and growth (chapter 3) and identifies numerous potential determinants for the performance of LADs during the crisis. Some of these factors such as entrepreneurship and demographics are examined for the first time within a framework of resilience.

d) The econometric examination of the relationship between the resilience measures and the determining factors (chapter 6). The examination has highlighted the importance of individual characteristics in mitigating the crisis impact on GB LADs. The study finds that greater shares of population with degree level qualifications as well as a younger aged demographic profile are among the most consistent contributors for increased resilience. It also finds that places that performed better before the start of the 2008 recession have had deeper crisis impacts and that the industrial structure of different LADs did not play a significant role in the size of this impact.

e) The series of robustness checks undertaken (chapter 7). These checks confirm the results found in chapter 6 and show that they have not been influenced by potentially outlying observations or the effects of migration. They also identify differences between international and domestic

migration and clarify the reasons behind some of the counterintuitive outcomes of the econometric examination.

The analysis focuses on LADs in Great Britain since they represent the lowest administration policy-making level. Local authorities are currently faced with a number of significant challenges relating to maintaining growth and the welfare of their residents (Gordon, Travers & Whitehead, 2009). There have been significant variations in the performance of different areas; for example, during the period 2007-2011, Tamworth in Staffordshire lost 11.8% of its employment whilst Hackney in London gained 5.6%. These wide variations lend credence to the arguments of a number of researchers that economic downturns impact on localities in significantly different ways and with varying levels of severity (Capello, Caragliu & Fratesi, 2016; Fingleton, Garretsen & Martin, 2012).

In terms of conceptualisation, as will be seen in chapter 2, resilience emerged as ecosystem resistance to shocks and has been translated to economics in its ‘engineering’ sense. In this respect, resilience was seen as the ability to bounce back and return to a pre-determined equilibrium and growth path. The criticism of these normative models gave rise to evolutionary perspectives where resilience was seen as a process of continuous adaptation. However, so far, the latter approaches have proved hard to operationalise in a broad scale (beyond case study approaches).

In this study, resilience is used to refer to the ability to mitigate the crisis impact on a locality. In particular, the smaller the size of the crisis impact (if any) in a LAD’s labour market the more resilient the LAD is considered to be (see chapter 5 for the outline of measuring resilience). To this end, the terms resilience and

crisis impact will often be used interchangeably in the analysis that follows. This treatment of the notion of resilience focuses on an operational definition which stresses the difference between the pre and post-recession positions. It is thus arguing that, irrespective of the ‘engineering’ or the evolutionary underpinnings of the term, any short or long-term strategy of resisting or exiting the crisis should produce results in the short to medium term.

The focus on labour market measures of resilience is related to both conceptual and methodological factors. Employment and unemployment can reflect wider social conditions at the local level, with joblessness having numerous negative consequences such as health deterioration and increases in crime. Additionally, labour market statistics are more readily available compared to Gross Value Added (GVA) measures which can lag for up to two years. Hence the operationalisation of resilience and the focus of the empirical analysis in this thesis revolve around labour markets. Contrary to most of the work in the field which use either employment or unemployment related measures, the current study examines employment, unemployment, Job Seekers Allowance (JSA) and full-time equivalent employment rates. In this way, it is possible to have a holistic view of the labour markets. In addition, the use of data up to 2014 ensures that the study incorporates both of the dips at the national level and reaches a period where the economy appears to return to an upward trend.

Beyond identifying the differential performance of various areas during the recession, the study examines the determining factors associated with these differences. A number of potential determinants are tested. Some of these, such as industrial structure or human capital have already been used in similar studies. However, there are several factors such as demographics and

employee training which have not appeared before. Data limitations and the operationalisation of resilience dictates that the study primarily examines the determining factors of the crisis impact using a cross-section model and Ordinary Least Squares (OLS) estimation rather than alternative panel data or time series approaches. The results provide interesting insights both for the determining factors and the differences among the various measures of the crisis impact in local areas.

The next section introduces and discusses the concept of resilience, together with its historical evolution and criticism. The evolutionary trajectory of the term from ecosystem studies to economics means that the concept has many of the pros and cons of multi-disciplinary concepts. Its pros include the ability to bring together academics from different fields in examining resilience at a holistic level whilst its cons revolve around the fact that the term may suffer from Markussen's (1999) characteristics of fuzzy concepts.

The discussion of regional resilience is followed by the consideration of existing studies and the identification of potential determining factors. Being in its initial stages of development, economic resilience lacks a clear and robust theoretical framework. In addition, resilience to economic crises is likely to be the outcome of numerous factors at play. Thus, chapter 3 looks at a wide range of potential factors, mainly arising from the limited research on resilience as well as the more extensive economic (and employment) growth literature.

Chapter 4 considers the paradigm of inquiry for the study and outlines the research strategy. The quantitative nature of the study is undertaken in a post-positivist/empiricist framework which attempts to falsify hypotheses with regards

to the determining factors of the crisis impact. This is complemented by the operationalisation chapter (chapter 5) which discusses the dependent variables of the analysis and the introduction and descriptive examination of the independent variables. The operational definition of economic resilience is analysed in greater detail together with the characteristics of the dependent and independent variables.

Following this, the results chapter (chapter 6) provides an overview of the results which are analysed cumulatively to assist the comparison between different dependent variables. Numerous interesting results arise with human capital and the demographic structure of LADs emerging as the most consistent determinants of the crisis impact. Finally, a number of robustness checks are incorporated (chapter 7) in order to test the results to potential biases such as the existence of outliers as well as the effects of migration. The robustness checks clarify and confirm the results of chapter 6 and lead to the final part (chapter 8) which concludes and discusses policy implications and future research.

Chapter 2 - Regional Resilience

2.1 Introduction

In recent years, the concept of economic resilience has entered the research agenda in social sciences and gained significant popularity. Swanstrom (2008) and Janssen (2007) argue that the increasing research interest in resilience and associated concepts, such as vulnerability and adaptation, is linked to environmental change and the growing inter-connectedness of research fields across various disciplines. Holling (1996; 1973) was amongst the first to introduce the concept of resilience within ecological studies. By resilience, he referred to the capacity of a system to withstand change before it transforms or becomes extinct. In economics, the foundations of resilience can be traced to Levin et al. (1998), Perrings (1994; 1998), Arrow et al. (1995) and Farber (1995). These authors assisted the transfer of the concept from environmental studies to economics via the treatment of societies as systems comprising economy and environment. Reggiani et al. (2002) have taken the concept a step further by analysing it as a dynamic process of socioeconomic spatial analysis which makes use of economic indices and mathematical processes to identify levels of resilience.

In addition to the interest of researchers, evidenced by the growing number of academic publications (Janssen, 2007), the concept of resilience has drawn attention from a wide range of civic stakeholders and government bodies. This is partly due to the deliberate attempts of organisations and academics to bring the issue of resilience to the policy realm (Longstaff et al., 2010). As a result, numerous organisations have focused on resilience due to its multi-disciplinary

nature and importance for people and places. For example, the Resilience Alliance (http://www.resalliance.org/) examines social-ecological systems, the Institute of Governmental Studies in the University of California Berkeley (http://brr.berkeley.edu/) and the MacArthur Foundation (http://www.macfound.org/about/) in the U.S. as well as the British Centre for Local Economic Strategies (CLES, http://www.cles.org.uk/about/) have examined the economic resilience of places and communities and ways of improving it.

This chapter explains and assesses the concept of resilience. It starts with a discussion of the importance of the term in economics as well as its definition and historical evolution. The latter two aspects are crucial as the concept was originally developed in a different scientific field and hence, it is important to see how it has transformed to accommodate the characteristics of socio-economic studies and theories of economic growth. Being a contested concept, resilience is subject to substantial criticism. The chapter examines critiques that have been both "constructive" (Martin, 2012; Pendall, Foster & Cowell, 2010; Pike, Dawley & Tomaney, 2010; Simmie & Martin, 2010) – in terms of clarifying the concept – and "destructive" (Cellini & Torrisi, 2014; Hanley, 1998; Hassink, 2010) – in suggesting that the concept should be discarded. The section ends with a review of empirical studies using different measures of resilience and some concluding remarks identifying gaps in resilience research.

2.2 On the importance of economic resilience

The question of resilience (of places, systems or individuals) has been examined in a number of scientific fields such as psychology, environmental sciences and, more recently, in economics (Brand & Jax, 2007; Maru, 2010).

Understanding the process of resistance to shocks can assist decision makers to develop policies that may assist places to grow more sustainably and be better prepared to face natural or man-made adversities. In economics, the work of Cerra et al. (2012), Cerra and Saxena (2008), Groot et al. (2011) and Duval et al. (2007) has shown that economic disturbances can potentially have time-persistent effects on economies, whilst economic and other policies, as well as the institutional framework, can have a differential impact on both resilience and recovery. At the subnational level, a growing body of literature points to the varying impact of exogenous shocks on regional economies and the differential ability of places to cope with hardship (Brakman, Garretsen & van Marrewijk, 2014; Davies, 2011; Fingleton, Garretsen & Martin, 2012; Groot et al., 2011; Psycharis, Kallioras & Pantazis, 2014).

The question of why some regions do better than others both in terms of growth and in overcoming adversities is a relatively old research question but remains at the forefront of research (Christopherson, Michie & Tyler, 2010; Hassink, 2010). The recent growth of interest in the topic comes from a number of sources including:

a) The increasing frequency of natural and man-made disasters which has directed attention to the ability of places to recover after a shock (Hill et al., 2010; Levin et al., 1998; Martin, 2012; Rose, 2004; Rose, 2009; Swanstrom, 2008).
b) The influence of ecology and panarchy which study the ability of ecosystems and socio-ecological institutions to return to their previous condition after sustaining a shock (Levin et al., 1998; Martin, 2012; Perrings, 1994; 1998).

c) The link between resilience and the study of evolutionary economic geography which includes the concept of hysteresis where significant downturns permanently influence regional performance (Boschma & Frenken, 2011; Boschma & Martin, 2007; 2010; Fingleton, Garretsen & Martin, 2012; Martin, 2012; Martin & Sunley, 2007; Simmie & Martin, 2010).

d) The magnitude and differential impact of the recent economic crisis (Cerra, Panizza & Saxena, 2012; Davies, 2011; French, Leyshon & Thrift, 2009; Martin, 2012; Pendall, Foster & Cowell, 2010).

e) The simultaneous occurrence of environmental and economic crises (Bristow, 2010; Hudson, 2010; Pike, Dawley & Tomaney, 2010).

f) The flexibility of the term, which allows it to mean different things to different audiences (Christopherson, Michie & Tyler, 2010).

g) Its potential to be measured and facilitate quantitative analysis (Briguglio et al., 2006; Briguglio et al., 2009; Fingleton, Garretsen & Martin, 2012).

h) The fact that it brings together the academic and political realms as well as local stakeholders by its widespread use in local political discourse (Bristow, 2010; Martin & Sunley, 2014).

At the same time, the flexibility and popularity of the concept, as well as the fact that the term was not developed within economics, raises concerns such as Markusen's (1999) comment on conceptual fuzziness and other critical arguments noted below. Many of the criticisms stem from its definition and historical evolution. Hence, it is important to examine how the term developed to

its current form to better understand the criticisms and identify potential answers to the questions raised.

2.3 Definition/ historical evolution

The notion of resilience appears in ecological studies with Holling (1973) and finds its way into economics through the writings of Levin et al. (1998), Perrings (1994; 1998), Arrow et al. (1995) and Farber (1995) who stressed the importance of environmental factors to economic development. Ever since these original contributions, a multitude of studies using different definitions of resilience have emerged. Some treat resilience in terms of a return to a single equilibrium; others as a multiple-equilibria approach, while more recently some view it in the form of an evolutionary process (Fingleton, Garretsen & Martin, 2012; Hill et al., 2010; Martin, 2012; Martin & Sunley, 2014; Pendall, Foster & Cowell, 2010; Reggiani, De Graaff & Nijkamp, 2002; Simmie & Martin, 2010). To date, even though progress has been made, there is no commonly accepted definition within economics and this may be the concept's greatest disadvantage.

Resilience has multiple meanings in different scientific fields (Brand & Jax, 2007; Fingleton, Garretsen & Martin, 2012; Maru, 2010; Pendall, Foster & Cowell, 2010; Simmie & Martin, 2010). Reggiani et al. (2002) argue that fields such as biology, ecology and sociology have focused on dynamic frameworks which include interactions among agents and adjustments to shocks. Maru (2010) finds at least eight different interpretations in psychology, social studies, ecology and social-ecological studies while Brand and Jax (2007) identify ten different definitions among ecological and social sciences alone. The latter suggest that, whilst conceptual vagueness can assist multi-disciplinary studies,

it reduces the clarity of the concept. As a result, they argue for a differentiation of the concept into *ecological resilience or ecosystems resilience* to be used as a concrete concept in ecological studies and *socialecological resilience* to be used as a vague inter-disciplinary term in the study of socio-ecological systems (Brand & Jax, 2007).

The definitions of resilience in economics and economic geography (mainly but not exclusively) can be grouped into two (non-mutually exclusive) broad categories, representing three distinct notions of the concept (Hill et al., 2010; Martin & Sunley, 2014; Pendall, Foster & Cowell, 2010) (table 2.1). The first group consists of the equilibrist approaches involving one or multiple-equilibria (Fingleton, Garretsen & Martin, 2012; Hill et al., 2010; Martin & Sunley, 2014). Most of these definitions view resilience as a rebound to a previous condition or a move towards a new one and attempt to operationalise the concept on that basis. One of the most explicit definitions within this approach is that of Hill et al. (2010):

> *"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).

The initial definitions of resilience in the study of ecosystems were related to locally stable equilibria and exogenous shocks. Resilience was linked to a movement back to the equilibrium point measured in terms such as the speed of return or the amount of force that can be counterbalanced (Holling, 1996; Modica & Reggiani, 2014; Reggiani, De Graaff & Nijkamp, 2002) (table 2.1). In environmental studies "engineering resilience" was connected to the ability of a system to maintain or return to its original condition after being subjected to a

shock (Fingleton, Garretsen & Martin, 2012; Holling, 1996; Modica & Reggiani, 2014; Pimm, 1984). In economics, the “engineering resilience” concept is represented by Friedman's “plucking model” (Fingleton, Garretsen & Martin, 2012; Friedman, 1993; Simmie & Martin, 2010) where economic growth follows an upward path along which there are ups and downs. However, there is always a mechanism that pushes an economy back to the predetermined growth path. The size of a recession predicts the size of the rebound but the size of the rebound does not predict the size of the next recession (Martin, 2012). The model suggests that any recession will be a temporary phenomenon that will not have permanent effects on the region and that there is a growth ceiling that is unaffected by these shocks (Fingleton, Garretsen & Martin, 2012).

The rigidity of single equilibrium approaches has led to conceptualisations that treat resilience as a process of multiple equilibria (Table 2.1). This form of resilience is called “ecological resilience” and is the second notion of the term (Fingleton, Garretsen & Martin, 2012; Holling, 1996; Holling, 1973; Modica & Reggiani, 2014; Simmie & Martin, 2010). The structural change is considered permanent in this approach (Holling, 1996; Holling, 1973; Martin, 2012; Walker et al., 1981). This definition of resilience allows for a more adaptive view of the term with multiple equilibria and links to evolutionary approaches (Reggiani, De Graaff & Nijkamp, 2002; Simmie & Martin, 2010). Attached to this perspective is the notion of “hysteresis” (Cross, Grinfeld & Lamba, 2009; Fingleton, Garretsen & Martin, 2012; Martin, 2012; Simmie & Martin, 2010) which describes the move to a new equilibrium state after being subjected to a shock. The new equilibrium state is permanent and incurs changes to the “plucking model’s” growth ceiling (Fingleton, Garretsen & Martin, 2012; Friedman, 1993). Hysteresis can be both

positive and negative and is complementary to economic resilience. Endogenous growth theory can accommodate hysteretic effects with a permanent loss of productivity, even in the case where growth and employment bounce back (Martin, 2012).

Table 2.1 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 change of structural characteristics
Resilience as a dynamic process	Adaptation to continuously changing environments	Capacity to adapt and create new development paths

Source: Author's treatment.

The second group of definitions comprises adaptation or evolutionary approaches where a variety of factors interact to influence the capacity of a region to adapt to changing conditions. In these approaches, resilience is treated as a dynamic process of continuous adaptation and regions are regarded as systems of economy-environment or Complex Adaptive Systems (CAS) (Boschma, 2015; Bristow & Healy, 2013; Martin, 2012; Martin & Sunley, 2014; Modica & Reggiani, 2014; Simmie & Martin, 2010) (table 2.1).

This dynamic approach emerged after a number of researchers criticised the static or distinct outcome view of equilibrium based approaches. Simmie and

Martin (2010), for example, disagree with the approach that sees resilience as the ability of a system to resist change or swiftly move to a new equilibrium state. First, they dispute whether urban and regional economies are ever in equilibrium. Second, they posit that equilibrist approaches to resilience are ambiguous in terms of their analysis of change. Aiming to return a region to a predefined point results in it being considered resilient if its structure is hard to change, and this is not always the most preferred position in the face of external shocks. This lack of consideration to evolution leads to equilibrist approaches with a static, short-term view which does not accommodate the transformation and adaptive capacity of a region that may improve its economic and functional structure over time (Simmie & Martin, 2010).

Similarly, Pike et al. (2010) criticise equilibrium based views on the basis of their methodological perspective. They argue that the leap of the concept of resilience from the national scale to the subnational level has been made without consideration of whether resilience means the same thing at different spatial scales. The same holds for path dependency approaches which originate at the individual level and are used at the regional level without the adaptation of concepts and behavioural expectations. As a result, equilibrist approaches suffer from a distinct lack of consideration of space, geography and the impact of agency at the subnational level (Pike, Dawley & Tomaney, 2010).

One response to these criticisms is the introduction of a conceptual framework which views growth as a dynamic and evolutionary process where regions continually adapt to challenges. In these approaches attention is centred on evolution, change and transformation rather than the speed of return to a predetermined equilibrium or the magnitude of force required to switch from one

equilibrium to another. These approaches treat regions as individual socio-economic systems where resilience is a dynamic process rather than a miniature of a country. Martin & Sunley (2014) provide an example of such a definition where resilience is treated 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 & Sunley, 2014, p.13).

In evolutionary approaches, resilience is seen as adaptation to a continuously changing environment rather than a move from one equilibrium point to another (Carpenter et al., 2001; Pendall, Foster & Cowell, 2010; Pike, Dawley & Tomaney, 2010; Simmie & Martin, 2010; Walker et al., 2004). Some studies, such as Longstaff et al. (2010), are focused on the policy and social realms, arguing that resilience depends on the characteristics and availability of resources and the capability of a community to adapt to changing circumstances, while others are linked to evolutionary economic geography (Boschma, 2015; Boschma & Martin, 2007; Martin, 2012; Martin & Sunley, 2007; Simmie & Martin, 2010) and the study of ecosystems, Socio-Economic Systems (SES) (Carpenter et al., 2001; Walker et al., 2004) or Complex Adaptive Systems (Bristow & Healy, 2013; Martin & Sunley, 2014; Simmie & Martin, 2010).

In order to add the evolutionary perspective, the concept of adaptation is included in the meaning of resilience such that a more resilient system is one that adapts well in the presence of shocks and disturbances (Simmie & Martin,

2010). This third perception of resilience is linked to the potential for positive hysteretic reactions which refers to the ability of an economy to adapt to different economic conditions and seize potential opportunities (Glaeser, 2005; Martin, 2012; Martin & Sunley, 2007). Resilience is considered a dynamic process of change where the actions of individual stakeholders can make a system adaptive, through their decision making. As a result, resilience is treated as an ever continuing process of adaptation through changes in the structure of the economy, the skill base etc. that responds to continuous external changes in the economic environment, rather than the movement from one equilibrium to another (Simmie & Martin, 2010).

According to Simmie and Martin (2010), four different frameworks can be used to add the evolutionary aspect to the notion of resilience:

1) Generalised Darwinism: this stresses the importance of diversity and the decrease of vulnerability. A recent study by Fingleton and Palombi (2013) provides evidence of increased vulnerability to shocks when places are highly specialised in a limited number of industries rather than diversified. The literature review on industrial diversity which follows provides an insight as to how portfolio diversification could potentially assist a locale to mitigate the pressures of the economic crisis.
2) Path dependence: this could have a multitude of interpretations when it comes to resilience. One interpretation would be in terms of a positive 'lock-in' where regions are resilient to forces trying to move them away from a stable condition. However, for Simmie and Martin (2010), a 'lock-in' may not always be a positive phenomenon since it could pose a hindrance to adaptation (Martin & Sunley, 2014).

3) Complex adaptive systems theory: this treats regions as complex systems comprised of multiple relationships among key factors or components. Related to resilience is the feature of high connectedness among components of a system. Connectedness refers to the multitude of interrelationships and dependencies amongst different parts of the same system. Although high connectedness can lead to a robust system structure able to resist change, it may also reduce flexibility and hence adaptation to changing environments.

   Bristow and Healy (2013) suggest the treatment of regions as CAS. They argue that systems are never in equilibrium and that they should be considered as dynamically evolving entities with non-linear interdependencies between their components and with links to their environment (Bristow & Healy, 2013; Simmie & Martin, 2010).

   > *"Regional economic resilience from this perspective is thus defined as the capacity of a regional economy to adapt to the changing technological, market and competitive pressures and opportunities facing it"* (Bristow & Healy, 2013, p.926).

4) The “panarchy” model: this tries to reconcile the tension between connectedness and adaptive capacity and treats regions as constantly evolving collections of adaptive systems. Simmie and Martin (2010) utilise the “panarchy” model where regional transformation and change take the form of four consecutive stages. These stages represent different phases that regions go through in order to reorganise and differ in three variables: the potential for increasing the stock of resources such as skills and institutions etc.; the interlinkages among the parts of the system such as traded or untraded interdependences, and, resilience as

a proxy for the successful and innovative adaptation to change which includes the innovation capacity of individuals and institutions etc. The ability to sustain stress is different at each stage and the level of resilience is a dynamic process which changes together with the stage at which the region is located (Pendall, Foster & Cowell, 2010; Simmie & Martin, 2010). Hence, resilience mediates this process in order to maximise the benefits and minimise the negative consequences during this cycle. The four stages are (Pendall, Foster & Cowell, 2010; Simmie & Martin, 2010):

1) Exploitation: where there is a low stock of established resources and interrelations are undergoing transformation. Available inputs such as specialised human capital relevant to the needs of the local sectors and an effective local innovation system may not be fully formed/rigid yet due to the previous re-organisation stage. This implies that the region is fairly flexible with low costs of change and hence highly resilient.
2) Conservation: where there is a high stock of resources and stable relations of stakeholders that reduce flexibility and resilience.
3) Release: this stage represents the outbreak of a crisis. The stocks of resources are running low because of depletion, connections between actors break loose and resilience is on the increase together with the ability of the region to flexibly respond to changes.
4) Reorganisation: where resilience is high together with increasing new relationships between the generators of resilience and the stocks of resources. This reorganisation creates new development paths and relationships to be pursued at a new exploitation stage.

In addition, Bristow & Healy (2013) argue for the greater consideration of the role of individuals (agents) and their decision making and adaptive capacity, in order to better understand the processes and mechanisms involved in regional resilience. They suggest that agents have an active interest and influence on the developmental trajectory of a place. In addition, individuals tend to learn from observation and adapt their behaviour. The consideration of such agency enhances and complements the evolutionary perspectives of path dependency and self-organisation. Thus, a place with decision makers with high adaptive capacities will be better able to adapt in time than a place with stakeholders who have a low adaptive capacity (Bristow & Healy, 2013).

In a similar vein, Pike et al. (2010) examine the notions of adaptation and adaptability. They argue that these two concepts can be both conflicting and complementary in different empirical cases and evolutionary approaches. Adaptation refers to the short term response to a shock which would be in agreement or tension with a wider framework of adaptability in the long-run. In conjunction with path dependence, adaptation and adaptability have the potential to explain the time, form, speed and extent of change in a region (Pike, Dawley & Tomaney, 2010).

> *"… we distinguished adaptation as the geographically uneven ways in which strong and tightly connected social agents in places respond, cope with and shape movements towards pre-conceived paths in the short run. Interrelated and in tension or complementary with adaptation, we interpreted adaptability as the geographically differentiated capacity of loosely and weakly connected social agents in places to interpret, frame and effect multiple evolutionary trajectories over time."* (Pike, Dawley & Tomaney, 2010, p.67).

Examples of resilience as adaptation (not necessarily successful) would involve areas which resorted to a new form of a previously successful growth path such as attempts to move within the same industrial structure. An example of this is offered by Hudson (2005) for the North East of England. The region has remained locked-in in the coal, ship-building and steelworks industries since the 19th century and has navigated through different business cycles before collapsing in the last quarter of the 20th century. On the contrary, adaptability would mean that local agents devise new development trajectories and longer term paths. An example of such process is the re-orientation of the textile industry in Massachusetts, USA towards a high technology agglomeration in Route 128, turning the rustbelt into a sunbelt (Harrison, 1984; Pike, Dawley & Tomaney, 2010).

The authors further suggest that a framework of adaptation and adaptability needs to be comprehensive in order to consider all aspects of resilience. It needs to take account of local and national level political institutions and actors as well as other stakeholders. In addition, it should consider the mechanisms at play, the variety and particularities of places and the interrelations and interactions between them, across different spatial levels (Pike, Dawley & Tomaney, 2010).

The criticism of adaptive frameworks such as those outlined by Pendall et al. (2010) and Simmie and Martin (2010) is that they appear highly restrictive and canonistic and have been developed for the study of ecosystems. Hence, they may not account for all the factors influencing regional resilience. In addition, they do not offer a solid methodological ground for the empirical investigation of economic resilience (Pendall, Foster & Cowell, 2010; Simmie & Martin, 2010;

Swanstrom, 2008). However, Pendall et al. (2010) argue that these approaches allow for the human and other factors such as natural endowments to act in order to counterbalance or exacerbate both negative and positive forces, hindering or enhancing local growth. As a result, for example, an individual leader can pursue policies that alleviate the impact of an exogenous shock or make the most of a rise in demand for local products etc.

Even though the two categories of definitions seem to share common ground in their views of resilience, definitions such as the one by Martin and Sunley (2014) add an evolutionary perspective in which resilience includes the change of a region's development path through resource re-orientation (Bristow & Healy, 2013). This is a more holistic definition but it is also worth mentioning that it has not been operationalised yet in studies (in contrast to the first approach).

This thesis understands resilience as the ability of a place to avoid or mitigate the impact of a shock such as the 2008 crisis. This is not a binary attribute but a continuous one and it focuses on the measurable outcomes of the mechanisms at play rather than the processes themselves. In this regard, the way a locality achieves the mitigation of the crisis impact (return to equilibrium, new equilibrium or adaptation) is secondary to this study since it measures labour market performance before and after the downturn to gauge the resilience of places.

2.4 Resilience in development theories

In economics, resilience is related to the behaviour of a place (country, region or other locality) after being subjected to a shock (economic or not). Shocks represent a sudden disruption on the supply or demand side of an economy

with potential knock-on effects which depend on the viewpoints of the different development theories. Martin and Sunley (2014) assess the meaning of resilience in four different strands of development theories including New Economic Geography, Evolutionary, Schumpeterian and Marxist regional theories, as well as path dependence approaches. This analysis can be extended to examine resilience within cumulative or circular development theories and endogenous growth approaches. The differences amongst these views mainly concern the understanding of the meaning and the processes for resilience as well as the influential factors behind it rather than the impact of shocks on localities.

New Economic Geography would treat resilience as the ability of a system to maintain its equilibrium spatial pattern after sustaining a shock in a multiple equilibria framework. A Schumpeterian approach would focus more on technology and envisage resilience as the ability to successfully navigate through the ‘gales’ of creative destruction. In Marxist theories, shocks are mostly attributed to over-accumulation and resilience would concern the ability to withhold capital outflows from one place to another with better returns. In path dependence views, shocks are considered to ‘unlock’ locked-in regions. However, it is still contestable whether resilience in these approaches is a positive or a negative attribute (Hassink, 2010; Martin & Sunley, 2014).

It is clear that resilience emerges as an overarching attribute similar to the notion of growth or development. What most approaches agree on is the existence of at least two stages in the process of resilience (Béné et al., 2012; Cutter et al., 2008; Modica & Reggiani, 2014): the impact or recession stage associated with resistance and the stage of recovery or re-orientation. However,

the various development theories attach different properties to the notion and hence, identify different determining factors which can influence the resilience of places. As discussed below, there is a long list of these factors which primarily contribute to resilience due to their connection to regional growth. However, the direct link between these factors and resilience is relatively underexplored.

2.5 Criticism

A concept with so many alternative meanings is easily subject to criticism. Beyond the critique of the equilibrist approaches noted above, and which led to more dynamic and evolutionary interpretations of resilience, the main strands of criticism revolve around:

a) The fuzziness of the concept, its meaning, measurement and applicability since it has been used in many different scientific fields, as well as whether it represents a positive or negative attribute (Christopherson, Michie & Tyler, 2010; Hanley, 1998; Hudson, 2010; Martin, 2012; Pendall, Foster & Cowell, 2010; Rose, 2004; Walker et al., 2004).

b) The fact that the notion of resilience has been developed in different fields implies that its transferability and applicability raises conceptual and methodological concerns (Carpenter et al., 2001; Martin, 2012; Maru, 2010; Swanstrom, 2008; Walker et al., 2004).

c) Empirical studies find it difficult to identify signs of resilience in data. Cellini and Torrisi (2014), examine the growth levels of Italian regions between 1890-2009 and argue that regional resilience does not explain the differential real per capita income among Italian regions. The authors find little sign of divergence in regional response to shocks and conclude

that regional resilience cannot explain the different development levels of regions in Italy.

d) A final criticism considered by some researchers is that the term can be used for arguments in support of neo-liberal flexibility (Hassink, 2010; Hudson, 2010; Pike, Dawley & Tomaney, 2010).

Resilience could be subjected to Markusen's (1999) line of criticism of fuzzy concepts. Markusen (1999) suggests that a number of studies in regional development suffer from unclear definition of concepts, a focus on case studies approaches (although this is not a negative aspect per se (Peck, 2003)), a lack of solid and commonly accepted methodology as well as a lack of concrete evidence/measurement. For this reason, she calls for more attention to conceptualisation and methodological processes in order to allow for better concept operationalisation, comparability and understanding. The above negative characteristics are evident in the resilience literature (Fingleton, Garretsen & Martin, 2012; Hassink, 2010; Pendall, Foster & Cowell, 2010; Pike, Dawley & Tomaney, 2010; Treado & Giarratani, 2008; Wolfe, 2010). However, as noted below, there has been some progress on both the conceptualisation and operationalisation of the notion (Fingleton, Garretsen & Martin, 2012; Hill et al., 2010; Martin & Sunley, 2014).

While some authors argue that the multiple uses and meanings of the term, an unclear definition, as well as the seemingly arbitrary choice of spatial focus are drawbacks which can be overcome (Christopherson, Michie & Tyler, 2010; Pendall, Foster & Cowell, 2010; Pike, Dawley & Tomaney, 2010), others consider these issues to fatally undermine the concept (Hanley, 1998; Hassink, 2010). Hassink (2010), rejects the idea of resilience on the basis of it leading to

confusion on the processes that cause regional change and failing to examine the long term effects of regional adaptation. He argues that the concept of resilience focuses more on the recovery of already established industries rather than adaptation and re-orientation of regional economies. It is considered a fashionable but fuzzy term which adds too little to the research on spatial differences in adaptive capacity and detracts attention from research with greater potential. After all, most of its contribution is already made by other concepts of evolutionary economic geography without the term's significant shortcomings (Hanley, 1998; Hassink, 2010).

Linked to the above and also to the origins of the notion of resilience, is a criticism related to the omission of the policy realm and political structures from much research on the topic. Having originated in the fields of ecology and environmental studies, the resilience framework does not account for the influence of politics, policies, agency and institutions at different spatial levels in explaining the capacity of a region to adapt (Bristow & Healy, 2013; Carpenter et al., 2001; Hassink, 2010; Martin, 2012; Maru, 2010; Pike, Dawley & Tomaney, 2010; Swanstrom, 2008; Walker et al., 2004). In addition, Hassink (2010) argues that resilience does not include the power of community relations and social capital which, if it is too strong, can even hinder change and adaptability and lead to lock in. Even though the validity of these arguments is not contested, current research on resilience is beginning to tackle the issues of agency and leadership (Beer & Clower, 2014; Hambleton, 2014; Sotarauta & Beer, 2016) by examining the characteristics of effective place based leadership from both an institutional angle concerning the leadership structures in place and, from a behavioural aspect, of individual decision making processes.

2.6 Empirical studies

Given the different theoretical approaches to resilience, it is not surprising that there is a wide range of different methodologies and measures used to operationalise and examine the concept in empirical studies (Maru, 2010; Modica & Reggiani, 2014; Reggiani, De Graaff & Nijkamp, 2002). In terms of research methods, Reggiani et al. (2002) use mathematical tools, and, in particular, Lyapunov exponents to examine the most resilient sectors of employment in West Germany. Wolfe (2010), Treado and Giarratani (2008), Simmie and Martin (2010) and Foster (2007) are among those who use more qualitative approaches such as surveys and case studies, while Martin (2012) and Fingleton et al. (2012) utilise quantitative methodologies involving forecasting and regression analysis. Finally, some researchers, such as Davies (2011) and Hill et al. (2010) utilise both quantitative and qualitative methods.

The wide range of research methods are a testament to the complexity and flexibility of the resilience concept. Whilst, in one sense, this creates a problem – for example, different conclusions may emerge from different approaches – it also represents a strength, as different approaches are required to shed light on different aspects of this complex socio-economic concept. Given the quantitative focus of this study, the review of the existing literature will focus on the econometric examination of the crisis impact and resilience. However, a number of the following observations also hold for qualitative studies and the latter type of study provides invaluable information for the discussion of the determining factors of resilience which follows.

Despite the methodological pluralism, there is growing consensus among empirical studies on resilience that there is significant geographical variation in

the response to crises (French, Leyshon & Thrift, 2009). This variation is evident both at the country level (Briguglio et al., 2009; Cerra, Panizza & Saxena, 2012; Duval, Elmeskov & Vogel, 2007) and at lower spatial levels (Davies, 2011; Fingleton, Garretsen & Martin, 2012; Martin, 2012) and there have been calls for the investigation of this differential behaviour of places against adversity at a range of spatial levels. Most of the initial empirical studies focused on examining the differential impact of the crisis in different localities rather than the determining factors behind it which are currently the focus of recent research (Brakman, Garretsen & van Marrewijk, 2014; Capello, Caragliu & Fratesi, 2015; Davies, 2011; Di Caro, 2015; Di Caro, 2017; Martin & Sunley, 2014).

One of the first issues to be tackled in economic resilience studies is operationalisation. Irrespective of different researchers' theoretical standpoint, the attributes of vulnerability, resilience, resistance, adaptability, recovery and other associated terms should be evident and measurable. Due to the multifaceted nature of resilience, a number of researchers use composite indicators to represent the concept in disaster (Cardona et al., 2008; Cutter et al., 2008) and socio-economic resilience studies (Briguglio et al., 2009; Östh, Reggiani & Galiazzo, 2015; Psycharis, Kallioras & Pantazis, 2014). Briguglio et al. (2009) construct a resilience index based on data on macroeconomic stability, microeconomic market efficiency, good governance and social development at the national level. At lower spatial levels, Psycharis et al. (2014) construct a composite index of resilience for NUTS II and III in Greece for the period 2006-2010 and find that the impact of the crisis was different between regions.

Composite indicators offer a variety of advantages including: the ability to reflect the different dimensions of a concept in one outcome to assist interpretation and comparability over time, increased informational value compared to single measures and enabling discussion on a common basis amongst stakeholders with different agendas (Giovannini et al., 2008). They also suffer from a number of drawbacks related to the robustness of their construction. The choices of aggregation and weighting methods, even when clearly laid out, entail a degree of arbitrariness, whilst data availability often restricts the choice of variables included. The increase of statistics and development of robustness checks however, provide promising potential for composite indicators to represent complex concepts such as resilience in the future.

Several studies have focused on analysing the impact of downturns on single proxies of performance (Davies, 2011; Fingleton, Garretsen & Martin, 2012; Fingleton & Palombi, 2013; Groot et al., 2011; Martin, 2012). Lee (2014), for example, examines the crisis impact on British cities using changes in unemployment rates and claimant counts, whilst Fingleton, Garretsen and Martin (2012) investigate the employment performance of GB regions. Davies (2011) focuses on changes in rates of unemployment in a number of EU countries, Di Caro (2015; 2017) examines the differential resilience of Italian regions in terms of labour markets, whilst Groot et al. (2011) and Hill et al. (2010) focus on both employment/unemployment and output measures in the EU and US respectively. In discussing the choice between income and employment measures, Cellini et al. (2017), examining Italian regions, find significantly different results when ranking local areas according to their resilience measured by income and employment. The authors suggest that the

two variables are influenced by different factors and fail to identify a relationship between the movement of employment and income in different crises. As a result, they conclude that the resilience of regions is shock and measure specific and suggest that the two measures provide complementary information (Cellini, Di Caro & Torrisi, 2017).

Most research has focused upon measuring aspects of the labour market (Di Caro, 2017; Fingleton, Garretsen & Martin, 2012; Lee, 2014). The rationale for this focus is related to both practical and theoretical considerations. Labour market data tend to be more readily available and reliable at lower geographical levels than output measures such as GVA for which the method of calculation at the subnational level has been subject to a number of criticisms (Gripaios & Bishop, 2006). Di Caro (2015) opts for the use of employment data on the basis of greater variation at the regional level compared to GDP and the fact the data do not require deflating. Fingleton et al. (2012) argue that labour market adjustments are one of the main options available for firms to reduce costs during a recession and hence the impact of a crisis may manifest itself particularly strongly in the labour market. In addition, a number of researchers and policy analysts express concerns of a potential jobless recovery primarily involving an increase of working hours rather than numbers of employees (Bell & Blanchflower, 2010; Brinkley, Levy & Morris, 2010).

Labour market conditions also reflect wider social problems in local areas. Joblessness has been positively associated with loss of skills and human capital (Bell & Blanchflower, 2010); unhappiness both for the unemployed (Bell & Blanchflower, 2010; Clark & Oswald, 1994; Winkelmann & Winkelmann, 1998) and for those fearing unemployment (Bell & Blanchflower, 2010; Di Tella,

MacCulloch & Oswald, 2001; Di Tella, MacCulloch & Oswald, 2003); long lasting psychological and health effects (Arulampalam, 2001; Beale & Nethercott, 1987; Bell & Blanchflower, 2010; Blakely, Collings & Atkinson, 2003; Goldsmith, Veum & Darity Jr, 1996; Goldsmith, Veum & Darity Jr, 1997; Pritchard, 1992); the creation of a vicious cycle of criminality and further unemployment (Bell & Blanchflower, 2010; Carmichael & Ward, 2000; Carmichael & Ward, 2001; Falk, Kuhn & Zweimüller, 2011; Thornberry & Christenson, 1984) as well as family breakdowns (Brinkley et al., 2008; Clayton, 2011).

In examining labour markets, a number of studies identify a consistently differential impact of crises on different economic sectors and localities. One of the first attempts to measure resilience by Reggiani et al. (2002) uses Lyapunov exponents to examine the most resilient sectors of employment in West Germany. Lyapunov exponents are used in physics in order to identify forces which lead to chaos. In this particular study, the Lyapunov exponents point at attracting forces that lead either to engineering resilience or indicate chaotic forces that destabilise the system under examination. In their analysis, they are able to identify resilient and less resilient sectors in the engineering sense of resilience and, in some cases, they also identify rural/urban variations in conjunction with the nature of the sectors. At the country level, Briguglio et al. (2009) investigate vulnerability and policy induced resilience for 86 countries around the world, Groot et al. (2011) investigate the heterogeneity of the crisis impact on European countries and regions and Duval et al. (2007) study the response of 20 OECD countries to economic shocks. All these studies agree on

the heterogeneous response of different countries to business cycle fluctuations and economic crises.

At the subnational level, a similar pattern emerges. Martin (2012) and Fingleton et al. (2012) discuss the resilience of UK regions during the 1980s, 1990s and late 2000s recessions. Using employment data and measuring the difference between employment levels at the start and end of a shock, the authors identify significant differences at the impact stage. This means regions differ in the way they have resisted the crisis. In addition, both these studies identify hysteretic effects which mean that crises permanently affect employment growth, long after the end of the initial impact stage.

Fingleton and Palombi (2013) examine resilience in terms of wages in 19 British towns during Victorian times. Using a spatial panel regression for the period 1871-1890, the authors forecast post-1890 wage growth, without considering the 1890 crisis. The gap between the forecasts and the actual wages is considered the effect of differential resilience to the shock. In terms of determinants, the study finds that the industrial structure of different places was crucial to their resilience performance with more specialised places being more susceptible to deeper crisis impact due to their inability to adapt and their lack of flexibility in times of economic distress.

Lee (2014), on the other hand investigates unemployment increases in 60 UK cities during the 2008 recession and finds that it is the specific industry a place is specialised in that is important and not specialisation per se. The main determinant of resilience performance in his study is skills, followed by the industrial structure of places. Places with higher shares of skilled individuals

exhibit lower unemployment increases, whilst places with greater employment rates in financial services and manufacturing experienced larger unemployment increases during the crisis.

In studies outside the UK, Di Caro (2015; 2017) examines regional resilience in Italian regions from 1977 to 2013 and finds significant heterogeneity in the resilience performance of regions in the country whilst Fratesi & Rodriguez-Pose (2016) and Davies (2011) use employment or unemployment data to investigate the resilience performance of EU regions to the 2008 downturn. Again, the main common finding of these studies is the differential response of localities to economic shocks as well as highlighting the need to examine economic resilience and the crisis impact at a variety of spatial levels.

2.7 Conclusions

This chapter has critically assessed the concept of economic resilience. The origins and evolution of the term have been discussed and analysed together with its definitional pluralism. Its connection to economic development theories has been considered and the criticisms of the concept investigated. The chapter finished by examining resilience in various empirical studies.

Resilience is a term borrowed from environmental sciences to describe the ability of an entity (country, region, locality etc.) to overcome the negative consequences of a shock. It is indicative that the term did not emerge from development theories but had to be adapted for use within these new areas. The transition from resilient ecosystems to resilient places came in the form of equilibrium approaches and, in time, has moved to accommodate evolutionary perspectives.

Economists and economic geographers are yet to agree on a common definition of resilience, whilst some researchers contest its usefulness altogether. However, the term is useful in offering a different perspective, from traditional approaches, on how regional performance is regarded and measured. Moreover, resilience is not the first contestable notion in economic geography. Martin and Sunley (2006; 2007) argue that path dependence and complex adaptive systems also require further examination within the framework of evolutionary economic geography. The present study agrees with the literature promoting this argument regarding the notion of regional economic resilience (Pendall, Foster & Cowell, 2010; Pike, Dawley & Tomaney, 2010; Reggiani, De Graaff & Nijkamp, 2002). More theoretical and empirical research is needed on the resilience of places to both clarify and refine the resilience framework. The notion of resilience traverses spatial as well as professional borders and hence the potential benefits of this kind of analysis are significant.

Bristow (2010) and Pendall et al. (2010) argue that the concept of resilience has the potential to bring together academics, politicians and practitioners into a domain using the same language and allowing meaningful discussion in order to promote the development of places. Even though it is not flawless, "*…the question of regional resilience represents a rich and fertile arena for future research*" (Bristow, 2010, p.165). Pendall et al. (2010) conclude that, while caution should be exercised when using the term in order to avoid Markusen's (1999) fuzziness, the concept is a useful metaphor that facilitates alternative thinking on complex issues.

The term's multi-disciplinary trajectory, as well as the fact that resilience is a multi-faceted concept, make it susceptible to being fuzzy. To avoid fuzziness,

further research is needed across time, space and scale. This research should clarify the definition and methodology/measurement of the concept to address Markussen's (1999) concerns. Pendall et al. (2010) also argue that due to the multitude of different shocks, a resilient region should be the one that when faced with different types of adversity is able to respond in an effective way (Pendall, Foster & Cowell, 2010). Pike et al. (2010) argue that despite the concept's immaturity, it is a notion worth of further exploration.

Related to the definitional pluralism is the lack of a robust framework of operationalisation. As discussed and further examined below, different studies use different measures of operationalising resilience. Equilibrium approaches of resilience offer a more robust operationalisation which, however, does not account for the evolutionary processes that take place in localities, such as adaptation. On the other hand, evolutionary approaches have a more holistic conceptualisation of resilience but have yet to produce a robust framework of measurement.

Another gap in most resilience studies to date is the lack of information on its determining factors. It is by now well established that places react differently during economic downturns but very few studies have examined the determinants of this differential performance. Most of the potential factors of resilience stem from their relationship to economic or employment growth with very little investigation on how they affect the resilience performance of localities.

This study aims to contribute towards these gaps by providing an operational definition and examining two different transformations of the resilience

measures. It understands resilience as the ability to avoid or mitigate the crisis impact and is focused on the outcome of processes (i.e. labour market performance) rather than the mechanics of the notion's conceptualisation (return to single equilibrium, new equilibrium or adaptation). This in no case diminishes the importance of further developing the conceptualisation of resilience. It rather provides an operational definition in order to allow the empirical examination which follows. In this regard, the thesis will investigate the factors behind the performance of GB LADs during the crisis. Before that, a review of the existing literature of the determinants of resilience is warranted, in order to identify the research and conclusions that have emerged from studies in different fields.

Chapter 3 - Determining factors

3.1 Introduction

Given that it represents a concept at its early stages of development, it is not surprising that the determining factors of regional resilience are underexplored. Whilst a number of factors have been suggested as important, there are few studies that have empirically tested these hypotheses. Several of these factors arise from studies on regional growth and employment theories which signal the potential overlap between these research areas and economic resilience.

The range of factors examined reflects the definitional pluralism of the concept. However, as is the case with its definition, pluralism comes at a cost of clarity. Different empirical studies examine a diverse range of resilience determinants reflecting the theoretical underpinnings of each study. For example, New Economic Geography approaches might stress the increasing returns to the firm arising from the agglomeration of activities, increases in local labour supply and market size as well as their effect on productivity (Capello, 2014; Martin & Sunley, 2014); Evolutionary approaches would tend to focus more on industrial mix, innovation, institutional endowments and capabilities (Martin & Sunley, 2014) whilst Romer's (1986; 1989; 1990b; 1990a) and Lucas' (1988; 1990) endogenous growth theory might emphasize human capital and the process of knowledge creation (Capello, 2014).

This chapter provides a review of potential determinants of economic resilience. A range of factors are examined, mainly identified by their relationship to economic or employment growth rather than an explicit link to the theory of resilience. In turn, the chapter investigates the potential relationship of pre-

existing conditions; industrial structure and specialisation; entrepreneurship; human capital; demographics; urbanisation; geography and, finally, agency and institutions. Each of the sub-sections below starts with a short review of the theoretical background and continues by suggesting links to the crisis impact and reviewing any empirical studies testing these links. The final section concludes and summarises the key factors to be examined in the empirical analysis of this study.

3.2 Potential determining factors

3.2.1 Pre-existing conditions

Path dependency suggests that the conditions prior to a shock could have an important influence on the post-shock performance of countries and regions. At the onset of the financial crisis, GB regions were characterised by differing pre-crisis economic conditions, past investments and resource endowments. The outcomes of these differences were observed in varying growth levels and labour market characteristics. The uneven distribution of these factors may potentially constrain or enhance the ability of a region to adapt to a crisis (Lee, 2014; Martin & Sunley, 2014; Wolfe, 2010) and, hence, it is essential to examine the impact of these initial conditions.

As discussed in the empirical studies section of the review of regional resilience, most researchers examine the crisis in terms of the response of labour markets (Di Caro, 2017; Fingleton, Garretsen & Martin, 2012; Lee, 2014). This may reflect the fact that reducing labour costs is one of the main options of firms to reduce their operating costs and remain competitive at times

of reduced demand (Fingleton, Garretsen & Martin, 2012) as well as the social importance of employment.

The empirical literature has been inconclusive with regards to the effect of pre-existing labour market conditions on the crisis impact on local labour markets. Berthoud (2009) finds no clear relationship between pre and post-recession unemployment. However, Lee (2014) and Clayton (2011) suggest that the highest increases in unemployment were in places with already high unemployment rates when JSA claimant count data is considered. Using European data at the individual level, Doran & Fingleton (2016) construct post-2008 counterfactuals for the no-crisis scenario and compare them to the actual outcomes in the European Social Survey. They find that individuals living in high unemployment regions have a lower probability of employment during the recession. However, Lee (2014) finds the opposite relationship when examining unemployment rates (instead of JSA) at the local level in UK cities. These mixed results 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.

3.2.2 Industrial structure

Another important factor that might impact on resilience is the sectoral composition of employment in a region faced with a shock. Economic downturns may have differential impacts on various sectors and industries (Canova et al., 2012; Kilian, 2008; Kilian & Park, 2009; Lee & Ni, 2002; Navarro-Espigares, Martín-Segura & Hernández-Torres, 2012; Scholtens & Yurtsever, 2012). Different sectors exhibit varying levels of demand, supply, competition and location characteristics, uneven capital intensity or productivity

differentials which could translate into variable local impacts of the recession (Gregg & Wadsworth, 2010). The effect of these characteristics is also linked to the nature and origin of each crisis, the transmission and propagation mechanisms, institutional factors and sector characteristics including the size and age of firms.

The origin of the shock might indicate the most vulnerable sectors during a crisis. For example, the oil price shocks of the 1970s were expected to have a greater impact on manufacturing and, in particular, the supply and demand for consumer durables that use energy (Kilian, 2008; Lee & Ni, 2002). Following the same principles, the late 2000s downturn which emerged in the financial sector and the housing market might be expected to hit the financial services industry and construction (Clayton, 2011; Lee, 2014). However, the origin of the crisis provides only an indication of potentially vulnerable sectors and, depending on policy actions and the transmission mechanisms, the final impact may affect sectors unrelated to the origin of the crisis.

Most theoretical work on the transmission and propagation mechanisms of shocks, relates to the early 1970s oil price shocks (Lee & Ni, 2002). Theories often stress the supply side effects of the rise in oil prices on reduced productivity through the decrease in the use of this input. However, these theories have attracted little detailed empirical study and, more importantly, failed to explain the observed differential impact of oil price rises on different industries (Lee & Ni, 2002). On the other hand, demand side theories focus on income, uncertainty and operational cost effects as well as changing patterns of consumption, spending, saving and investment (Kilian, 2008). The income effect focuses on the reduction of household disposable income due to the rise

of energy prices which leads to a reduction of consumer demand. The uncertainty and operational cost effects (Hamilton, 1988; 2003) suggest that demand for consumer durables which use energy may be affected by a sudden oil price rise, impacting on specific sectors such as car manufacturing. At the same time, individuals may raise their rate of savings as a response to uncertainty and concerns over employment (Kilian, 2008).

Even though the literature is currently being developed, similar demand and supply side effects are likely to be significant in the case of the 2008 crisis. The analysis of supply side effects has tended to focus on the impact of limited credit availability and the associated reduction of investment (Bonaccorsi di Patti & Sette, 2012), whilst the demand side effects remain in essence the same as in studies of the 1970s shock. A number of researchers also examine how the recent crisis has been transmitted across countries via the linkages between banks in financial markets (Hesse, Frank & González-Hermosillo, 2008; Kalemli-Ozcan, Papaioannou & Perri, 2013), whilst others suggest that trade transmitted the crisis across borders (Claessens, Tong & Wei, 2012). Coupled with the varying income elasticity of demand, profitability and productivity rates for different goods and sectors (Canova et al., 2012; Fingleton, Garretsen & Martin, 2012; Martin, 2012; Martin & Sunley, 2014), the above effects can result in a disparate impact on different sectors of the economy.

Institutional factors may also affect the impact of economic downturns on different sectors. Market rigidities limit the flexibility of prices and wages leading to high entry costs, reduced competition and negative employment effects making adaptation to changing circumstances harder and lengthier (Blanchard & Giavazzi, 2003; Canova et al., 2012; Nicoletti & Scarpetta; Pissarides, 2003).

Different product market regulations across sectors may affect the entry and exit conditions in these sectors, impacting on competition and efficiency levels (Ahn, 2002). Increased levels of competition will lead to lower product prices, whilst low entry barriers will lead to the entry of more productive firms and the exit of those less productive. The incumbent businesses in more competitive environments will also have a greater motive to adopt more productive methods, improving overall production efficiency (Canova et al., 2012; Griffith, Harrison & Simpson, 2010; Melitz, 2003). As a result, flexibility and low entry barriers can assist a local economy to renew its business stock with more dynamic and productive firms which would be better able to adapt to the challenges of the economic crisis. Furthermore, different market regulations including protectionist policies such as those seen for the banking sector (Gordon, 2011; Haldane, 2010; 2011), for example, will lead to a differential impact of the 2008 crisis in various sectors.

At the firm level, a number of attributes may influence the ability of firms to mitigate the negative consequences of the economic crisis. Firstly, as Fromhold-Eisebith (2015) suggest, firms belonging to global value and supply chains do not respond to changing conditions in an isolated way but rather they are part of and are affected by industry or sector-wide responses. In this sense, the term sectoral resilience may be more appropriate than regional resilience since the location characteristics and impact of firms are secondary to the influence of the non-spatial sector-wide response.

In addition, firm size and age may be significant factors affecting the capacity to respond to the crisis. These characteristics may, for example, affect access to capital markets, with young and small firms depending on intermediary credit

and being constrained by their balance-sheet position, whilst large firms are able to use direct sources of credit (Fort et al., 2013; Gertler & Gilchrist, 1994; Gertler & Hubbard, 1988). Using firm level surveys, Popov & Udell (2012) find that the effects of banking constraints are greater for firms with limited tangible assets whilst Artola & Genre (2011) suggest that young and small firms had to face actual credit constraints (as opposed to the general perception of lending constraints for all firms) during the 2008 financial crisis. Ferrando & Griesshaber (2011) find similar results in relation to the age of a business but mixed results in terms of size. In turn, Campello et al. (2010), survey a number of Chief Financial Officers in firms across the US, Europe and Asia and find that borrowing constraints have led firms to postpone attractive investment opportunities.

As a result, firm level characteristics appear to be significant during the downturn, leading to different rates of labour hoarding and inventory accumulation and dissipation, resulting in differential impacts of the economic crisis (Fort et al., 2013; Gertler & Gilchrist, 1994; Gertler & Hubbard, 1988; Sharpe, 1994). To the extent that sectors and crises are differentiated in the characteristics mentioned above, it might be expected that the 2008 crisis would have a disparate effect across regions on the basis of the importance of different sectors in these areas.

Groot et al. (2011) study EU NUTS II regions and find a significant effect of the sectoral composition on sensitivity to business cycles (using the change in GDP and unemployment as the indicator), whilst Brakman et al. (2014) find a positive relationship of a local focus in export oriented industries and regional resilience (measured by change in unemployment and real GDP/capita. Martin (2012)

shows the UK-wide differential impact between production and services on employment and output in three different recessions in the UK. Whilst the 1980s downturn had a disproportionate impact on production industries of the Midlands and the North (Martin, 2012), the 1990s recession was more related to the housing markets and services which were more prevalent in the South (Lee, 2014). Davies (2011) on the other hand, finds that the initial response (in terms of unemployment) to the recent recession was better in places with low manufacturing employment rates whilst the rebound had mixed results in relation to local economic structure when examining the performance of a number of European regions during the recent economic crisis.

Due to the nature and origin of the 2008 financial crisis, it might be thought that the sectoral impact would be greater on services such as finance and banking, real estate and construction (Lee, 2014) and lower on the public sector, which acted as a buffer during the initial recession period (2008-2010) (Clayton, 2011). However, the literature is ambiguous as to whether the 2008 crisis hit manufacturing or services more severely. On the one hand, finance and business services showed the largest decrease in jobs during 2008-2009 with Q4 of 2008 seeing the largest decrease in jobs in the sector since Q2 of 1978 (ONS, 2009). On the other hand, Gregg and Wadsworth (2010) argue that the largest immediate fall of output was in manufacturing and that manufacturing and construction bore most of the losses in 2008-2009 with a drop of 8-10% in employment. However, manufacturing jobs have been declining since 1978, so it is difficult to attribute the employment decrease in manufacturing solely to the 2008 recession. At the same time, the loss of output in manufacturing for Q3 and Q4 of 2008 and Q1 2009 were the largest in the last 30 years (ONS, 2009).

The ESPON project on regional economic resilience in Europe identifies a mixed picture of the manufacturing sector's contribution to employment resilience and a positive relationship between employment in services and financial services at the industry level and regional economic resilience (Bristow et al., 2014).

One explanation for these mixed views is the finding of Martin et al. (2016b) who show that it was region specific effects other than differences in industrial structures that influenced the performance of regions during different recessions. The authors find that the importance of the mixture of industries in an area on resilience performance is different across crises and decreasing since the 1970s. If economic downturns increasingly affect a greater number of industrial sectors, through the increased interconnectedness of the latter (as measured by the growth of outsourcing (Bartel, Lach & Sicherman, 2005; McCarthy & Anagnostou, 2004) or the length of value chains (Elms & Low, 2013)), it is likely that this effect takes place at different points in time during a crisis period. As a result, a study which examines the 2008 crisis across a variety of sectors using data for 2008-2010 may find different results from a study considering the period 2008-2014 due to the time lag in the transition of the crisis across sectors. The contrasting studies on the sectoral impact of the crisis discussed above examine different measures and data for different time periods of the recent crisis and these factors could be important drivers of their opposing findings.

The literature on the initial effects of the 2008 downturn agrees on the limited immediate impact of the crisis on the public sector. Although not entirely public sector in nature, the education, health and public administration sectors

continued to grow during the first quarters of the 2008 crisis (Gregg & Wadsworth, 2010; Lee, 2014; ONS, 2009). However, this is not the case with developments after 2009 in the UK. Similarly, in the EU, the ESPON project suggests an initial positive relationship between employment in the public sector and resilience; however, at approximately 2011, this shows evidence of changing sign due to the austerity measures in a range of different countries across Europe (Bristow et al., 2014).

An explanation for the initial resistance of the public sector to the crisis could be that demand for a number of public services was either unaffected – such as the demand for education and health – or growing – such as the demand for job centres' services – during the recession (ONS, 2009). Traditionally, whether actively following counter-cyclical policies or exhibiting slow adjustment to implementing cutbacks, the public sector has been considered as a buffer, protecting employment at times of economic crisis. With the recent extensive reduction of public sector jobs (Clayton, 2011), it may be that the initial positive effect of public sector employment on resilience to the crisis will be less pronounced during the period examined in this study. To the extent that employment in public sector varies significantly across LADs, any reduction in its workforce will have a differential spatial impact. Data from the Annual Population Survey for 2007 show that this is potentially the case with the public sector accounting for a widely different proportion of employment across areas ranging from 36.9% of employment in Rochford, Essex to 9.8% in Corby, Northamptonshire.

3.2.3 Specialisation and diversity

The sectoral composition of employment is related to the locational decisions of firms and hence the degree of specialisation and diversification in an area. Firms co-locate in order to take advantage of dynamic externalities such as knowledge spillovers (Glaeser et al., 1992). The potential benefits of such externalities affect the industrial structure in different LADs and, as discussed above, may lead to a differential impact of the crisis across LADs.

Through knowledge spillovers, improvements and innovations that occur in one firm may be transferred and improve the productivity of other firms (Dasgupta & Stiglitz, 1980; Glaeser et al., 1992; Griliches, 1979; Loury, 1979). If these spillovers are not paid for by the recipient firms, then these firms receive external benefits from their counterparts in which the knowledge was originally produced. Moreover, if it is costly to transmit knowledge across space, spatial proximity may enhance the impact of such spatial spillovers. Whilst there is wide agreement on the presence of these kinds of externalities, there are different views as to whether these primarily occur within the same industry or across industries. This issue is critical as the nature of such spillovers might impact on the locational decisions of firms and thereby affect the sectoral composition of employment, create varying levels of diverse and/or specialised industrial structures and, consequently, lead to a differential impact of the crisis on localities.

Marshall-Arrow-Romer (MAR) or localisation externalities (Arrow, 1962; Marshall, 1890; Romer, 1986), refer to the flow of information through copying, informal exchange and mobility of labour between firms, and focus on exchanges between firms in the same sector (Bishop & Gripaios, 2010; Glaeser

et al., 1992). The rationale behind these spillovers is that similar firms are better able to utilise knowledge that has been produced by firms in the same sector since they are more likely to share technologies, processes and markets. Generated and contained within the industry, these externalities are beneficial to a limited number of firms and, in order to take advantage of them, specialisation is encouraged (Duranton & Puga, 2000; Glaeser et al., 1992). Hence, growth is generated by the increase of specialisation which leads to incremental innovations of existing products, services and processes (Bishop & Gripaios, 2010; Frenken, Van Oort & Verburg, 2007).

Contrary to MAR externalities are those suggested by Jacobs (1970). Jacobs' externalities also concern knowledge spillovers but it is suggested that these can arise across industries rather than between firms in the same sector. Combining knowledge from different areas may generate completely new products/innovations. If knowledge spillovers are generated by the interaction between firms in different industries, the implication is that growth is driven by a more diversified industrial structure that allows a multitude of industries to benefit from these externalities (Duranton & Puga, 2000; Glaeser et al., 1992). These radical innovations may be more useful than within-sector improvements during a crisis due to the disruptive environment in which they are born and have to operate within. Consequently, the two strands of theory come to different predictions as to whether specialisation or diversification is more beneficial to growth but it could also be the case that specialisation is more productive in times of economic stability whereas diversification benefits economies more during turbulent economic periods (Bishop & Gripaios, 2010; Frenken, Van Oort & Verburg, 2007).

At the empirical level, a number of studies examine localised externalities (Combes, 2000; Deidda, Paci & Usai, 2006; Forni & Paba, 2001; Glaeser et al., 1992; Shearmur & Polèse, 2005; Usai & Paci, 2003; Van Oort, 2007; Van Soest, Gerking & Van Oort, 2006). However the results concerning the relative merits of specialisation and diversity are mixed and complex (Bishop & Gripaios, 2010; De Groot, Poot & Smit, 2016). Examining the growth of major industries in US cities, an early study by Glaeser et al. (1992) argue that it is diversity rather than specialisation that promotes employment growth. Similar results are found by Usai & Paci (2003) and Deidda et al. (2006) studying Italian regions; Van Oort (2007) investigating urban areas in the Netherlands and; Combes (2000) examining local areas in France. At the same time, Shearmur & Polese (2005) find no clear link between diversification and local growth after examining 382 rural and urban areas in Canada for the period 1971-2001 whilst they find some evidence of coexisting specialisation and diversification externalities. Similarly, Forni & Paba (2001) and Van Soest et al. (2006) identify positive specialisation externalities in Italian and Dutch local areas.

In an attempt to clarify this contradiction in empirical studies, Frenken et al. (2007) have introduced the concept of relatedness where positive Jacobs' externalities are expected to be present when industries are diverse but somehow related. A number of studies suggest that related variety is of mixed benefits to local economic and employment growth. Bishop & Gripaios (2010) identify mixed results on the effect of related variety on employment growth at the subnational level whilst Boschma & Iammarino (2009) also find mixed results on employment and labour productivity growth and positive effects of

related variety on value added growth in Italian NUTS3 regions. Finally, Hartog et al. (2012) find similar results for employment growth in Finnish local areas.

In connecting diversity to economic resilience, portfolio theory, where variety in assets is expected to lower the risk associated with shocks, may be of relevance. A diversified economic base may be able to mitigate the negative impact of an asymmetric shock better than a specialised one since, in the latter, the size and interconnectedness of the specialised sectors may amplify the impact of a sector specific shock (Frenken, Van Oort & Verburg, 2007). This is particularly useful when considering diversification in markets and demand characteristics. Firms and economies may be diversified in products and/or sectors with similar demand characteristics or have a broad set of products and/or sectors based on different demand characteristics. Hence, specialisation may leave local economies prone to asymmetric shocks as different sectors face correlated demand whilst diversification may allow local economies to contain sector-specific shocks without their effects being widely spread (Di Caro, 2017; Frenken, Van Oort & Verburg, 2007; Lee, 2014; Turok, 2009).

Frenken et al. (2007) find that related variety has a positive effect on employment growth whilst it is unrelated variety that negatively affects unemployment growth. Other empirical evidence from the US and Europe support the idea that greater industrial diversity is linked to lower and more stable unemployment rates. Martin (2012) finds a link between reliance on production and the sensitivity of regions to disturbances. Fingleton and Palombi (2013) also suggest that increased specialisation and reduced diversification has left British towns prone to shocks by examining wage data at the end of the 19th and beginning of 20th century. Di Caro (2017) finds a positive relationship

between relative diversity (as expressed by Duranton and Puga's (2000) Relative Diversity Index) and resilience in Italian regions whilst Lee (2014), on the other hand, fails to identify a link between specialisation and the 2008 crisis' unemployment impact in British cities. In addition, diverse US metros have been found to exhibit lower unemployment and higher stability over time (Malizia & Ke, 1993) whilst specialised EU regions exhibit higher (Longhi, Nijkamp & Traistaru, 2005) and more volatile (Ezcurra, 2011) unemployment rates.

From the discussion above, it is unclear whether resilience benefits more from diversity or specialisation. Diversification appears to assist the mitigation of the crisis' impact in a local area, especially in the case of asymmetric shocks. Specialisation on the other hand, has been associated with employment growth and hence may be more significant at the rebound or recovery stage of the process. This study will further examine these relationships in order to add more evidence to this discussion.

3.2.4 Entrepreneurship

Several studies highlight the importance of entrepreneurship to economic growth through innovation and job creation (Audretsch & Keilbach, 2005; Audretsch, Belitski & Desai, 2015; Soininen et al., 2012; Williams, Vorley & Ketikidis, 2013). Audretsch and Keilbach (2005) proposed the notion of entrepreneurial capital to signal the capacity of an area to generate entrepreneurs. Measuring this by the number of firm births adjusted for population but also accounting for the financial risk involved depending on the industry of start-ups, the authors provide evidence for its positive link to increased labour productivity. However, when it comes to economic growth,

they only find a positive relationship when they use risk-oriented entrepreneurship capital (Audretsch & Keilbach, 2005).

In terms of the mechanics behind the relationship between entrepreneurship and growth, Acs et al. (2009) and Audretsch & Keilbach (2007) propose a knowledge spillover theory of entrepreneurship based on Romer's (1990b) endogenous growth model in which new, endogenously created knowledge increases the technological opportunities to be exploited by entrepreneurs. A number of new firms are created by employees leaving their jobs. In these firms, the entrepreneurs use knowledge acquired but not exploited in their previous post. Entrepreneurship then becomes a mechanism via which knowledge spillovers are transmitted. The number of entrepreneurial opportunities created is dependent on the knowledge intensity of the environment in which entrepreneurial individuals operate (Audretsch & Keilbach, 2007).

At times of economic distress, entrepreneurship may become even more important, as entrepreneurs could play a role in mitigating the effects of a downturn through the generation of employment and renewal of the existing stock of businesses with new and more dynamic firms (Bishop & Shilcof, 2016). In addition to this, there are a number of specific characteristics associated with entrepreneurs which may be particularly relevant at times of economic downturns, such as flexibility and adaptability (Bishop & Shilcof, 2016). Supporting the existence of specific characteristics affecting performance during the economic crisis, Soininen et al.'s (2012) study of Finnish firms found that high levels of entrepreneurial aspects such as innovation and pro-activeness

had a positive impact on the performance of firms during the downturn whilst increased risk taking negatively affected profitability.

Glaeser et al. (2014) provide a model of urban growth in which entrepreneurship is the vehicle through which skills can assist local areas in mitigating the negative impacts of industrial decline. The authors argue that, if the number of employers is not fixed, the model predicts that highly skilled individuals become entrepreneurs at times of economic distress. When there is an adverse shock which reduces the stock of employers, the high skills of individuals will lead to increased entrepreneurship which will increase the number of employers and wages (Glaeser, Ponzetto & Tobio, 2014). It follows then that, to the extent that different areas exhibit different concentrations of highly skilled individuals, they will exhibit different entrepreneurial and resilience levels.

Firm formation exhibits significant geographical differences (Acs et al., 2009; Acs & Mueller, 2008; Audretsch & Keilbach, 2007; Bishop, 2012; Reynolds et al., 2005) and these differences have been found to be time persistent in a number of countries such as the Netherlands (van Stel & Suddle, 2008), USA (Acs & Mueller, 2008), Germany (Fritsch & Wyrwich, 2012) and Sweden (Andersson & Koster, 2011). In the UK, Fotopoulos (2014) provides evidence on the time persistent spatial stickiness (slow propensity to change) of entrepreneurship for the period 1994-2007. In particular, he finds that previous entrepreneurship rates determine future ones in UK regions. This path dependency and persistent geographical pattern of entrepreneurship may be the result of a number of factors such as the institutional capacity (Martin & Sunley, 2006), sectoral specialisation and industry characteristics (Anyadike-

Danes & Hart, 2006; Stam, 2010), positive feedback (Andersson & Koster, 2011), available skills' pools (Bishop, 2012; Bishop & Brand, 2014) and localised returns (Krugman, 1991; Martin & Sunley, 2006) in an area.

Institutions, culture and norms affect the provision of a number of services among which are access to finance, advice and informal business networks. These factors are important in the exploitation of resources and opportunities and the generation and dissemination of knowledge that affects entrepreneurship and hence to the decision of an individual to become an entrepreneur (Sautet, 2005). Saxenian (1990) examines how local institutions, service firms, educational organisations and networks can influence the local entrepreneurial culture and promote technology and knowledge spillovers in Silicon Valley. The institutions - and especially the informal institutions - which affect entrepreneurial culture and activity, tend to be self-replicating and evolve slowly in time (Freytag & Thurik, 2007; Fritsch & Wyrwich, 2012; Martin & Sunley, 2006). These attributes can lead to path-dependency and spatial stickiness of entrepreneurship and, to the extent that entrepreneurship can assist the mitigation of the crisis impact, it can lead to geographically different levels of resilience.

UK firm birth rates are also associated with sector growth and industry specialisation and characteristics. Sectors with low entry barriers and opportunities for new services such as Business Services exhibit a high tendency to generate new firms (Anyadike-Danes & Hart, 2006; Stam, 2010). As a result, places which specialise in these types of industries and sectors will have greater firm formation rates and, more importantly, the geographical

differences in entrepreneurship (and hence, resilience) will be time persistent since the specialisation of an area is slow to change.

The greater concentration of entrepreneurs in an area further enhances local entrepreneurial activity through serial entrepreneurship (Stam, Audretsch & Meijaard, 2008), positive feedback (Andersson & Koster, 2011) and dynamic increasing returns (Martin & Sunley, 2006). Failing entrepreneurs have a high propensity to re-establish a firm usually close to the place themselves and their families live (Nielsen & Sarasvathy, 2011; Stam, Audretsch & Meijaard, 2008; Stokes & Blackburn, 2002). Through entrepreneurial activity, a feedback effect can develop through which entrepreneurs act as role models, hence increasing firm formation in an area (Fritsch & Wyrwich, 2012) through the expectation of success and significant returns. If these returns increase with the increase of scale of activities and are localised, then the spatial stickiness of entrepreneurship leads to circular and cumulative causation (Krugman, 1991; Martin & Sunley, 2006). All these contribute to the creation of a virtuous cycle of path dependence where places with high firm birth rates are better positioned to retain these rates in the future.

A high concentration of businesses can also create localised skill pools which, in turn, further enhance entrepreneurship (Brown, Lambert & Florax, 2013; Stam, 2010). This localised and diverse knowledge capital is important for entrepreneurship through spillovers from existing firms across different sectors and the creation and better exploitation of opportunities for nascent entrepreneurs (Bishop, 2012; Bishop & Brand, 2014). These spillovers may exhibit a degree of spatial stickiness since human capital accumulates slowly and is also connected to the industrial structure of an area. The proximity

reduces the cost of transmission for this knowledge which is technology and geography-specific (Essletzbichler & Rigby, 2005).

Thus, entrepreneurship is not only key to growth but may potentially mitigate the crisis impact and assist adaptation for recovery (Williams, Vorley & Ketikidis, 2013). The flexibility and innovation aspects of entrepreneurial activity are key to identifying and exploiting opportunities during a crisis (Soininen et al., 2012) whilst firm formation can replace the existing stock of firms with more dynamic ones. Higher rates of firm births imply more opportunities for employment growth and less impact from the economic downturn. The path dependency and spatial stickiness of entrepreneurship, as well as the differing sectoral specialisation in GB LADs, indicate that the positive effects of entrepreneurial activity will disproportionally affect local areas. For example, during the current economic crisis, three Services sectors with traditionally high proportions of birth rates have continued to generate the highest birth rates (Bishop & Shilcof, 2016). At the same time, severe economic shocks may disrupt existing institutions, culture and networks that contribute to spatial stickiness and circular causation and create new patterns of entrepreneurship and potential growth. Hence it is important to examine the relationship between the crisis impact and pre-crisis entrepreneurial activity in LADs.

3.2.5 Human Capital

Human capital has long been considered a significant contributor for economic growth. Adam Smith, in his “An Inquiry into the Nature and Causes of the Wealth of the Nations” (Labrianidis, 2011) stresses the importance of labour as a factor of production in which the skills, knowledge and training of an individual

play a significant role. Since then, numerous researchers have contributed to the identification of those attributes of human capital that promote growth.

The works of Arrow (1962), Becker (1962), Schultz (1959; 1960; 1961), Nelson and Phelps (1966), Lucas (1988; 1990) and Romer (1986; 1989; 1990b) have introduced human capital in the form of knowledge and expertise into macroeconomic growth models. At the empirical level, a number of studies have identified a positive relationship between human capital and economic growth (Barro, 2001; Bassanini & Scarpetta, 2002) whilst Moretti (2004) finds positive externalities of graduates on the wages of all groups in the labour market. At the same time, studies including those of Walsh (1935) and Mincer (1958; 1962; 1974) have provided evidence of a positive relationship between education and income at the individual level whilst Acs & Armington (2004), find a positive relationship between human capital and employment growth.

The move towards more skill intensive production methods in recent years (Lee, 2014) coupled with labour market polarisation (Brinkley, 2009; Salvatori, 2015; UKCES, 2014) creates conditions of high demand for skilled individuals in the labour market. In examining job polarisation, Salvatori (2015) argues that, in the UK, the jobs requiring the lowest educational level were the ones which lost the greater shares of employment in the last three decades (Salvatori, 2015). The high demand for skills means that LADs with greater shares of skilled individuals will have greater potential for growth.

At the same time, Schultz (1975) argues that educated individuals adapt more easily as economic circumstances change, using assets more efficiently, obtaining better credit arrangements, and exploiting new income opportunities.

More recent arguments on this revolve around financial inclusion (Finlayson, 2009; Rowlingson & McKay, 2016) and support that improving financial literacy would increase resilience in times of economic distress. Supporting Schultz's hypothesis, Glewwe & Hall (1998) using data from Peru, find that households with more educated individuals adapt better to shocks. These arguments suggest that more educated individuals may be better able to identify coping strategies in the event of a downturn.

Moreover, skilled employees are a highly valued asset due to embedded knowledge and experience (Lee, 2014). In the face of reduced demand, it is possible that firms may opt for hoarding this type of labour rather than losing this kind of capital (Brinkley, 2009; Clayton, 2011; UKCES, 2014). It is also possible that skilled employees are able to perform (or learn to perform) the tasks of lower skilled positions but not the opposite; this provides them with an advantage over individuals with low human capital when employers are considering restructuring (Gordon, 1999; Gordon, 1985; Gregg & Wadsworth, 2010; Lee, 2014). Overall, places with greater shares of highly skilled workers may be able to adapt more rapidly to changing circumstances and this may mitigate the local crisis impact.

Hill et al. (2010) find that regions having high rates of population with low levels of education are more prone to downturns and less likely to exhibit high resilience. In addition, Glaeser (2005) argues that human capital was a major driver behind the adaptability of the city of Boston when facing adversity. However, it has been suggested that just increasing the stock of qualifications is not necessarily an adequate condition for increased resilience; rather, it is the working experience and on the job skills which are positively related to

overcoming adversity (Bristow et al., 2014). This is the second channel via which human capital may affect the crisis impact in an area, namely through human and firm-specific capital created through on-the-job training (Becker, 1962; Hashimoto, 1981). A number of researchers find that increased rates of training are associated with reduced likelihoods of layoffs and staff turnover (Becker, 1962; Hashimoto, 1981; Molina & Ortega, 2003). However, evidence from North America suggests that firms with higher rates of training tend to be less technologically advanced, more unionised and with low rates of R&D (Molina & Ortega, 2003). These opposing characteristics suggest that the net impact of such training can only be identified by further empirical analysis.

3.2.6 Demographics

Linked to human capital and the ability to adapt, demographics may have a significant effect on the growth and capacity of a place to withstand the impact of an economic crisis. Even though the effect of demographic structure on empirical growth models is underexplored (Durlauf & Quah, 1999; Persson, 2004), there are a number of ways in which the age structure and trends can, at the theoretical level, affect an area. Canton et al. (2002) suggest that the increased difficulty of older aged individuals in adopting innovations could potentially create pressures against technological progress when older people are disproportionately represented in the population. If this is the case, an ageing society could see shifts in demand towards labour-intensive services where productivity growth is likely to be lower (Van Groezen, Meijdam & Verbon, 2005).

In growth models, population ageing, typically interpreted in terms of lower population growth, has a somewhat obscure effect on growth. In endogenous

growth theories, on the one hand it could increase technological innovation since the relative cost of labour is higher (Poot, 2008; Romer, 1990c), whilst on the other, it could decrease human capital accumulation and investment due to the lower level of savings in the economy (Poot, 2008; Steinmann, Prskawetz & Feichtinger, 1998). Persson (2004) incorporates demographic heterogeneity within the Mankiw, Romer, and Weil (MRW) (1992) model and finds that it improves the measurement of labour and human capital by incorporating a differential effect of various age cohorts on aggregate labour supply. This consideration of the age structure addresses the author's identified biases in the MRW model due to the correlation of age structure to explanatory variables such as income, educational attainment and population growth rates. As a result, by accounting for demographics it is possible to better explain growth differences among states in the U.S. (Persson, 2004).

Most of the impact of demographics on growth appears to stem from its relationship to human capital and productivity. If human capital stocks are subject to accumulation through education, training and work experience as well as to obsolescence and depreciation during an individual's lifetime (Brunow & Hirte, 2009b; Skirbekk, 2004), these stocks will be expected to rise up to a certain age and then decline. Due to the connection between human capital and productivity, a similarly shaped relationship with demographics may be expected for the latter. The rationale for this is that work experience can increase productivity up to a certain point, after which it is difficult to make productivity gains from increased tenure in a position (Skirbekk, 2004). As a result, if individual productivity depends on human capital and its stock changes with age, then differences in productivity and growth in models based on

aggregate production functions could be indirectly explained/affected by age structures (Brunow & Hirte, 2009b).

Several empirical studies identify an inverted U-shaped relationship between age structure and various human capital, productivity and growth measures (Brunow & Hirte, 2009a; Poot, 2008; Skirbekk, 2004). Brunow and Hirte (2006; 2009a) find an inverted U-shape relationship between age and growth in European regions, with the 45-54 age cohort making the greatest contribution to output growth. Persson (2004) finds that the initial age structure of the population affects future output in U.S. states in a similar way, whilst Lindh and Malmberg (1999) and Feyrer (2007) provide evidence of an inverted U-shaped relationship between productivity, its growth and output and workforce demographics with the 40-49 cohort having the strongest positive effect (Feyrer, 2007). The latter also suggests that a significant proportion of the productivity gap between rich and poor countries is explained by demographics (Feyrer, 2007). Finally, Tang and MacLeod (2006) find that older employees are less productive than younger ones and that the growing age of the working population will negatively impact on productivity growth in Canada.

At the individual level, the reasons behind the decline of productivity after a certain age are mainly related to the decrease in cognitive abilities over time, which is commonly observed across species (Bunk, 2000; Minois & Le Bourg, 1997; Prskawetz & der Wissenschaften, 2006; Skirbekk, 2004). Verhaegen and Salthouse's (1997) literature overview suggests that certain mental capacities such as reasoning and speed decline in time. Work experience may counteract some of these factors (Colonia-Willner, 1998) but as Rybash et al. (1988) argue, job-specific knowledge becomes locked-in and increasingly non-

transferable. Smith (1996) also find that older workers find it more difficult to switch between tasks and solve new problems compared to younger aged workers (Robertson & Tracy, 1998).

Of course, the relationship between age, cognitive ability and productivity is mediated by the task at hand and these findings refer to aggregates and averages. Accumulated work experience and tacit knowledge can benefit older employees in performing tasks they already know well. This could be the reason behind Colonia-Willner's (1998) findings that there are no performance differences between older and younger managers. However, as the complexity of tasks increases, the more important mental agility becomes and this has a negative impact on the relationship between age and productivity (Myerson et al., 1990).

With this in mind, the increased use of technology and frequent technological change enhance the importance of mental agility and adaptability over work experience in productivity and push the productivity peak to younger ages (Baltes & Lindenberger, 1997; Hoyer & Lincourt, 1998; Prskawetz & der Wissenschaften, 2006). This, coupled with lower job mobility as individuals grow older (Dixon, 2003), may create a dysfunctional system which is slow to change and adjust. Oswald (1996; 1997) has added the aspect of homeownership in this argument, suggesting a positive relationship between homeownership and unemployment within and across countries due to reduced mobility. Examining US data, Green and Hendershott (2001a; 2001b) confirm the result for middle age cohorts but not for younger groups. This suggests that, younger individuals have not accumulated significant amounts of assets in order to constrain their mobility as a response to unemployment.

The capacity to adjust and change directly impacts on an area's competitiveness and its response to the pressures arising from economic distress such as the 2008 downturn (Poot, 2008). The age structure of an area may hence emerge as a significant determinant of the resilience performance in a locality. In this process, younger aged workers are likely to have an advantage due to their characteristics of mobility and agility which may enable them to adapt faster during the crisis.

3.2.7 Cities and Urbanisation

*C*ities may have a particularly important role to play in both mitigating the recession impact and fuelling recovery. In 2014, almost 54% of the population in the UK lived in cities (according to the Centre for Cities classification) and these conurbations generated almost 60% of the national GVA. Urban agglomerations possess a number of geographical as well as demand and supply side characteristics that give them an advantage compared to rural areas. Several of these characteristics are captured by factors discussed above such as diversity, externalities, skills and demographics. However, it is also important to consider the effect of urbanisation on the crisis impact in more detail in order to account for any significant characteristics that are not captured by other variables.

Increased proximity in cities may enable knowledge to travel faster whilst their size means they have the critical mass to host institutions and functions that generate knowledge and assist growth. Such institutions could be universities or business organisations that provide functions of knowledge and information transfer as well as business support (Bishop, 2009; Bishop, 2012; Bishop & Gripaios, 2010; Dewhurst & McCann, 2006). The term *urbanisation externalities*, has been coined to refer to these types of benefits arising from the

existence of firms in urban areas (Bishop & Gripaios, 2010; Essletzbichler & Rigby, 2005).

Moreover, larger cities may be more attractive places to live for highly skilled employees (Becker, Glaeser & Murphy, 1999; Glaeser & Resseger, 2010). Florida (2002; 2010) and Florida et al. (2010; 2008) highlight the importance of talented people and the creative class in cities in shaping the geography of high growth firms and, consequently, regional growth. High levels of density and diversity in cities provides demand for a wide range of consumer services, amenities and an environment that may motivate talented individuals to move and seek employment in these areas (Florida, 2002; Florida, Mellander & Stolarick, 2008; Glaeser, Kolko & Saiz, 2001).

Consequently, firms, and especially those focusing on high added value, human capital and innovation intensive processes, are expected to locate in cities to take advantage of the large pool of highly skilled employees. This, in turn, may lead to higher levels of entrepreneurship in cities (Capello, Caragliu & Fratesi, 2015; Champion & Townsend, 2013; Lee, 2014; Lee, Morris & Jones, 2009). At the same time, firms located in urban areas benefit from urbanisation externalities (Bishop & Gripaios, 2010; Essletzbichler & Rigby, 2005; Frenken, Van Oort & Verburg, 2007) whilst the cities' broad consumer base allows for agglomeration of similar businesses and the generation of specialisation and/or diversification related externalities. In relation to this, Duranton & Puga (2000; 2001) suggest that firms will locate their production in specialised or diversified cities according to a product's life cycle stage. In particular, they argue that at the initial stages of a product's life cycle, firms will tend to locate in diversified cities where they can take advantage of knowledge created in other sectors,

whilst at the stage of maturity they will relocate to specialised cities to take advantage of economies of scale in mass production.

However, high density may involve negative externalities which could outweigh the positive ones. The close proximity of large numbers of individuals may give rise to increased congestion costs whether in terms of transport costs or in terms of increased competition for the same resources or customer base. Supporting this at the empirical level, a number of studies find negative effects of density (used as a proxy for urbanisation economies) in manufacturing and a statistically insignificant effect on services (Bishop & Gripaios, 2010; Combes, 2000; Deidda, Paci & Usai, 2006).

When recession hits, urban areas may be better equipped to mitigate the negative effects due to high concentrations of dynamic firms (Glaeser, 2005; Glaeser & Resseger, 2010; Glaeser & Saiz, 2003; Schultz, 1975; Shapiro, 2006) benefiting from high levels of human capital, and positive externalities. At the individual level, a more skilled and younger aged population offers greater potential for skilled labour hoarding and increased flexibility. At the same time, the diversity of the consumer base and suppliers reduces the risk of sectoral business cycle events impacting on the whole local economy (Lee, 2014) since firms do not overly depend on the same labour and product markets.

With regards to the 2008 recession in the UK, it was widely expected that the origin of the crisis in the financial sector would lead to a disproportionate impact on urban rather than rural areas. However, for a number of reasons, including the decision to support banking at the national and supranational level, evidence suggests that cities avoided the brunt of the crisis impact, at least in

the first years of the recession (Gordon, 2011; Lee, Morris & Jones, 2009). Empirical studies provide support for the argument that urban areas performed better during the 2008 economic crisis (Capello, Caragliu & Fratesi, 2015). The ESPON project finds a positive relationship between the existence of an urban area and economic resilience (Bristow et al., 2014) whilst Brakman et al. (2014) find a positive relationship between the degree of urbanisation and economic resilience in regions. However, Capello et al. (2015) suggest that agglomeration economies stemming from urban size alone are not enough to guarantee resilience. It is the quality of functions, infrastructure and production factors and networks that make a difference.

3.2.8 Geography

Another determinant of the crisis impact on GB LADs might be geography. The spatial imbalance of growth in the UK (Gardiner et al., 2013), as well as the geographically varying impact of past recessions in the 80s and 90s (Champion & Townsend, 2013; Martin, 2012) have created a landscape that exhibits significant divisions. This, coupled with spatially sticky and location specific factors, implies that the 2008 crisis is likely to have had a geographically diverse impact.

For example, various industrial sectors are affected differently by crises for the reasons discussed above. If these sectors have a certain spatial distribution and this pattern is slow to change, then the crisis impact on these sectors will disproportionately affect different areas (Bell & Blanchflower, 2009; Lee, 2014). Martin (2012), finds significant regional variations during several UK crises with broad differences between the peripheral, northern UK and the West Midlands on the one hand, and the South and East on the other. For the 2008 crisis, the

initial expectation was that there would be a severe impact on places with high shares of financial services activities such as the South of the UK. However, a stream of research suggests that the crisis rapidly spread to sectors linked to finance (Lee, 2014) such as markets with high speculative development (Florida, 2009) or finance dependent industries such as construction, other business services and retail (Lee, 2014; Oxford Economics, 2008; Parkinson et al., 2009). As a result, the 2008 recession is suggested to resemble the one in early 1980s in terms of having a more negative effect on labour markets in the North (Audas & MacKay, 1997; Green, Owen & Winnett, 1994; Lee, 2014; Martin, 2012).

3.2.9 Agency and institutions

Finally, a number of studies stress the importance of individuals, agency, institutions and policies in fostering resilience. The interest in institutions and the actions of stakeholders stems from two sources. The first involves approaches such as that of Acemoglu and Robinson (2012) which bring together the lack of effective institutions with the poor performance of macro economies. The second source is related to approaches concerning local leadership (Beer & Clower, 2014; Beer & Lester, 2015; Bristow & Healy, 2013; Sotarauta & Beer, 2016) where local economic development is very much dependent on the leadership capacities of specific actors.

Institutions, policy makers and local stakeholders are important factors that may affect development paths and the resilience performance of their locality (Glaeser, 2005; Simmie & Martin, 2010; Treado & Giarratani, 2008; Wolfe, 2010). A number of researchers posit that policy interventions can significantly influence local outcomes at times of adversity (Glaeser, 2005; Glaeser,

Ponzetto & Tobio, 2014; Wolfe, 2010). Wolfe (2010) uses a case study of Ottawa and Waterloo in Canada and suggests that path dependence and the city's economic and industrial structure are key enablers or constraints to the actions of individuals and institutions in the civic domain in forming policies to counterbalance the negative forces of external shocks. Stakeholders and institutions can work together and exploit regional assets and construct competitive advantages in order to reverse negative trends related to either external shocks or path dependency (Wolfe, 2010).

Glaeser (2005) examines the evolution of Boston over time and argues that an influential factor in shaping its development trajectory is local government, whilst Pike et al. (2010) and Bristow & Healy (2013) also stress the role of actors and institutions. Their nature and capabilities are considered instrumental in foreseeing and acting in time, in order to increase the resilience of places. Other expressions of institutions affecting the crisis impact in localities include civic capital and the institutional ability to innovate in order to overcome disturbances in a region's/system's development (Foster, 2007; Swanstrom, 2008; Wolfe, 2010).

Simmie & Martin (2010) examine "panarchy" using the divergent examples of Cambridge - a highly successful region in terms of adaptation - and Swansea - a relatively failing region - during recession periods. The authors show how Cambridge managed to adapt more quickly and more successfully while Swansea struggled when facing structural economic problems. They argue that it was the evolving institutional framework and the operations within it that were instrumental in Cambridge's success whilst Swansea's reliance on rootless FDI, based on externally generated and transferable knowledge proved to be more

prone to transferring operations to more efficient locations than embedding resilient elements in the area at times of economic distress (Simmie & Martin, 2010). Treado and Giarratani (2008), studying the case of intermediate steel-industry suppliers in Pittsburgh U.S., argue that the local cluster strength, based on the connections, contacts and inter-dependencies among intermediate steel suppliers was key to the mitigation of the negative effects from the local steel industry decline (Treado & Giarratani, 2008).

In a conceptual study, Martin & Sunley (2014) identify four subsystems which interact to shape the economic resilience of a place. They call these

> *"the structural and business subsystem; the labour market subsystem; the financial subsystem; and the governance subsystem"* (Martin & Sunley, 2014, p.26).

They argue that these subsystems are influenced by agency and the notions, norms, perceptions and general ideas of local decision makers. Within these subsystems, three types of factors come into play: *compositional* factors referring to those related to the sectoral and industry mix of an area; *collective* factors referring to the interactions between employers and employees in the labour market which influence the norms and economic climate in a locality and *contextual* factors which refer to the institutional environment that can potentially be exogenously determined (national policies etc.) (Martin & Sunley, 2014).

A common feature of the above studies is that they lack an empirical element to test their arguments and add robustness to stylised facts and mainly focus on case studies. This is not to detract from their value, since the growing qualitative literature on the effects of leadership on growth, for example, confirms the

importance of the former on the latter and provides useful insights into concepts that are hard to measure (Beer & Clower, 2014; Hambleton, 2014; Sotarauta & Beer, 2016).

There are a small number of empirical studies such as Cerra et al. (2012), Briguglio et al. (2009) and Duval et al. (2007) that stress the importance of policies and the institutional framework in the resilience and recovery of countries. Briguglio (2009) suggests that, despite the inherent vulnerabilities that an economy may be facing, it is possible to pursue policies that will absorb or quickly mitigate the adverse effects of external shocks. This emphasis on policies is shared with Cerra et al. (2012) who examine the recovery stage of national economies. The authors use the growth rate of broad money (M2) to measure monetary expansion or contraction and the fiscal deficit over trend GDP to measure fiscal policies. They also investigate the effects of real currency depreciation and the exchange rate regime and find that different policies have different effects on the speed of recovery or the persistence of the crisis. Finally, they argue that the effectiveness of these policies depends on the nature of the crisis by distinguishing between normal and banking crises (Cerra, Panizza & Saxena, 2012).

Similarly, Duval et al. (2007) suggest that the varying response of countries to the crises is due to different resilience capacities built upon differences in the policies, regulations and institutions in labour, product and financial markets. For example, countries with labour and product market rigidities are found to be subject to prolonged but reduced initial impact of a crisis' output gap whilst flexibility in financial markets reduces the persistence of these output gaps but increases their impact. However, it is not clear which of the effects (prolonged

and low impact or short and high impact) is more preferable for a region in recession. At the same time, the authors argue that the size of each downturn is another influential factor on the effects of policies and regulatory regimes during the crisis with large, systemic incidents of recession reducing the effectiveness of such policies and regulations (Duval, Elmeskov & Vogel, 2007). Thus, it is impossible to provide broad policy proposals which fit all cases.

3.3 Conclusions

This chapter has provided an overview of factors which could potentially affect economic resilience. Most of these stem from research on output or employment growth such as entrepreneurship and human capital whilst others emerge from local governance studies such as effective leadership. As a result, the connection between these factors and the size of the crisis impact on localities is largely hypothesised rather than being founded on wide-ranging empirical support. The reason for this lack of evidence is mainly the contemporary nature of the research field in economics and economic geography. The current study aims to contribute to filling this gap.

In theorising about the ability of an area to sustain and/or overcome a shock, pre-existing conditions are among the first factors to be controlled for. As path dependency suggests, the trajectory which an area has previously followed is a significant determinant of its future performance. However, with regards to economic resilience, and in particular the 2008 economic crisis impact, empirical research is inconclusive as to whether the crisis had the biggest impact on local economies that entered the crisis in relatively poor or buoyant conditions. This lack of clarity may be related to the different time span of

individual studies or specific features of the crisis such as origin and propagation.

These two mechanisms of a crisis could have significantly differential effects on various LADs. This is also relevant to the industrial structure of different places. For example, oil crises are more likely to severely hit manufacturing and hence areas that are dependent on manufacturing sectors may be more vulnerable. For the 2008 crisis, which originated in the financial sector, it might be expected that areas with higher shares of employment in finance would be mostly hit by the downturn. In addition to this, historically, the public sector was considered to act as a buffer at times of economic distress by maintaining employment and pursuing counter-cyclical policies and spending. Consequently, one would expect the 2008 crisis' impact to have a clear pattern related to the industrial structure of local areas. Once again, existing studies of the recent recession do not provide robust evidence of this; this may be related to the fact that policies followed throughout the downturn were targeted at protecting the financial sector and reducing public expenditure and the size of the state.

Another potential determinant of the crisis impact may be the level of diversification or specialisation in an area. Existing research has provided evidence on the importance of externalities to economic growth. However, there remains a dispute as to whether these externalities primarily arise from specialisation (Marshall externalities), diversification (Jacobs' externalities) or related diversity (or indeed a combination of all of these). Considering the crisis impact, it may be expected that elements of diversity in both supply and demand characteristics might assist LADs with mitigating the crisis impact since

a diverse local economy would not be dependent to a specific sector. Evidence of this on the crisis impact literature though is still scant and unclear.

The benefits of entrepreneurship for growth and employment are widely recorded and articulated. Promoting economic and/or employment growth through innovation and dynamism, entrepreneurship can help local economies grow. The same characteristics are expected to assist localities overcome the negative impact of a recession whilst the well-documented spatial stickiness of firm formation indicates potentially significant geographical variability in entrepreneurial responses to a crisis.

Skills and human capital may be amongst the most prominent determinants of resilience. Through its connection with growth at the macro level and adaptability and flexibility at the micro level, human capital may be a significant contributor to the resistance of places to the crisis impact. This is supported by a range of empirical research in the field. Related to human capital but largely under-examined, especially in connection to resilience, on the job training emerged from the literature review as a potentially important factor linked to resilience. However, whilst on the job training correlates with greater job security, there is evidence that it takes place in less competitive firms. This, in conjunction with the lack of empirical research, warrants further study of its crisis impact on localities.

Another potential determinant of resilience which has not attracted a great deal of attention is demographics. Age is related to both the depreciation of human capital and agility/flexibility which may prove significant characteristics at times of economic distress. Thus, areas with a greater concentration of younger age

workers may be better able to mitigate the crisis impact. However, this does not acknowledge the possible effects of experience that comes with age and hence empirical testing needs to address the issue in more detail.

The uneven spatial distribution of many of the above factors, coupled with spatial stickiness, create an environment where urbanisation and geography may become significant for the crisis impact on local areas. Cities have already been considered the engines of growth with agglomeration economies arising from the attraction and high concentration of talent and diversity. However, congestion and increased competition may mean that some firms operate at the margin of profitability and thus may be more sensitive to recessionary shocks. At the same time, the stickiness and path dependency of most of the aforementioned factors suggests that there may be a significant difference in the performance of LADs with regards to their geographical location.

Last but not least, it is likely that the crisis impact on localities is influenced by policies, actors and institutions at both the micro and the macro level. Numerous research strands have highlighted their importance for growth and there is a growing literature supporting their effect on how subnational entities have performed during the crisis. A common characteristic of studies on this field at the subnational level is that they tend to focus on qualitative methods which provide an insight into the mechanics of different relationships but are more difficult to infer generalisable results from.

Unfortunately, most of the factors discussed in this chapter either lack a comprehensive evidence base which is directly related to resilience, or provide inconclusive/limited results. The effects of entrepreneurship and demographics

on economic resilience have been largely underexplored, whilst the investigation of factors such as pre-existing conditions, sectoral composition and specialisation do not provide conclusive evidence with studies finding mixed results for a variety of measures. The conclusions of studies of pre-existing conditions and industrial structure are prone to be affected by the measures used (e.g. employment vs unemployment or JSA claimant count) and the time period of the study (e.g. 2008-2009 or 2010; annual vs quarterly figures). Amongst the most consistent results is human capital which is generally found to have a positive relationship to resilience, irrespective of its measure (resistance or recovery), but this excludes the element of employee training which has not been examined before in relation to resilience.

This study will contribute evidence to the identification of the determinants of economic resilience. It will examine the relationship of a number of the aforementioned factors to the performance of LADs in GB. However, before presenting these models, two further chapters are warranted. The first will outline the methodology and paradigm of inquiry for the study and the second will discuss issues around operationalisation. Two different methods of measurement will be used and the measures of the dependent variables will be examined.

Chapter 4 - Research Design and Paradigm of Inquiry

4.1 Introduction

This chapter examines the research design and paradigm of inquiry for the study of the determinants of economic resilience for GB LADs during the 2008 crisis. It starts with an overview of the relevant philosophical positions to research and their associated epistemological and methodological stances and then focuses on research methodology in the field of Economics. Subsequently, this thesis' paradigm of inquiry is provided in order to sketch the universe of the study and this is followed by a consideration of the methods and research strategy as well as the data sources used in this study. Due to economic resilience not having a universally acceptable measurement method, the operationalisation of the study is tackled in a separate chapter (chapter 5) which extensively discusses the construction of the dependent and independent variables as well as the data sources used. Hence, this chapter briefly touches on the topic of operationalisation and is complemented by chapter 5 which is more extensive and analytical on this issue.

4.2 Philosophies and Paradigms of Inquiry

As any entity, a research project is not an isolated island. People, ideas, items as well as pieces of research affect and are affected by the framework or the environment within which they exist and transact with. In actual life, this is the local environment as well as society, values and the surroundings within which a person exists. In the case of a research project these surroundings/environment/system of values are derived from the philosophical position and the paradigm of inquiry as well as the assumptions within which the

research rests. Consequently, clarifying the philosophy and paradigm of inquiry is equivalent to creating a world and laying the foundations for the research. It sets the values, norms, assumptions and outlines how the notions of truth, reality, process, knowledge etc. are treated (Howell, 2012). Below, a number of paradigms of inquiry are analysed and their link to the proposed research topic is examined in more detail. The chapter briefly discusses different research philosophies before focusing on the most relevant perspectives for the present study.

There are numerous differences amongst philosophies regarding the “universes of research” or paradigms of inquiry. Realism, for example, considers truth as objective and outside the observer, whilst Modernism challenges this notion and provides a philosophy which focuses more on the human factor. Post-modernist approaches criticise the modernist positions and increase the weight of the observer in influencing reality (Bradbury & McFarlane, 1978; Howell, 2012; Rosenau, 1991).

Thus, the numerous paradigms of inquiry arise from these philosophical positions and treat concepts such as reality, truth and knowledge in a different way and in line with their individual philosophical origins and the universe they describe. These paradigms of inquiry need to be considered before identifying the most appropriate to serve the research question at hand. The analysis examines mainly positivist and post-positivist positions and briefly touches on more phenomenological paradigms. These approaches differ in their views of ontology, epistemology, axiology and methodology as well as the nature of knowledge, reality and truth (Howell, 2012).

Reality can take different forms and conceptualisations based on the underlying value system of the research. Ontology is the term used to analyse how reality is treated under the different paradigms (Howell, 2012). Positivist approaches give to reality its own existence. Through what is often termed naïve realism, positivists argue that reality exists independently of whether one is there to observe it (Comte, 1880; Howell, 2012). This view is in line with Plato's view of knowledge which he believed was rooted within an individual's mind and who used his maieutic method to guide the individual to the discovery of this knowledge. Post-positivist approaches use critical realism and suggest that reality is subject to limitations and hence it is probable rather than absolute. This is partly because of the individual's inability to reach absolute truth (Bhaskar, 1978; Howell, 2012; Popper, 2005). More phenomenological positions tend to highlight the importance of the individual or collectives in shaping reality (table 4.1 below) (Denzin & Lincoln, 2005; Dryzek, 1995; Heron & Reason, 1997; Horkheimer, 1972; Howell, 2012).

Table 4.1 Basic Beliefs on which to Base Research Projects

Item	***Positivism***	***Post-positivism***	***Critical Theory* et al.**	***Constructivism and Participatory***
<u>Ontology</u> The form of reality. What can be known about reality?	Reality can be totally understood. Reality exits and it can be discovered. (*Naïve Realism*)	Reality may only be understood imperfectly and probabilistically. Reality exists but humanity unable to totally understand it. (Critical Realism)	Reality shaped by history. Formed by values that are crystallised over time. (Historical Realism) Breakdown of a clear distinction between ontology and epistemology	Reality is locally constructed. Based on experience although shared by many. Dependent on person/group changeable. (Relative Realism) Breakdown of a clear distinction between ontology and epistemology
<u>Epistemology</u> The relationship between the investigator and what can be discovered	The investigator and the investigation are totally separate. Values are overcome through scientific procedure. Truth is a possibility.	Abandonment of total separation of investigator and investigation. Objectivity still pursued.	The investigator and the investigated linked. Accepted that historical values influence the inquiry. Results subjective	As Critical Theory. However, the findings are created as the investigation proceeds. For the Participatory paradigm findings are developed between the researcher and cosmos

Methodology How does the investigator go about finding out what he/she believes can be discovered	Scientific experiments based on hypothesis, these are usually quantitative. Conditions that confound are manipulated.	Multiple modified scientific experiment. Pursues falsification of hypotheses; may include qualitative methods.	Needs dialogue between investigator and the subject of investigation. Structures may be changeable. Actions effect change.	Create a consensus through individual constructions including the construction of the investigator For the Participatory paradigm similar methodologies can be employed

Source: Howell (2012, p.29), adapted from Guba & Lincoln (2000) and Heron & Reason (2000).

In a similar way, truth and knowledge have different meanings in different research philosophies and paradigms of inquiry. Positivist approaches have more objective and absolute notions of what constitutes knowledge and truth. Moving across the spectrum to post-positivism, critical theory and the more phenomenological paradigms of inquiry, the treatment of these concepts becomes less objective and more subjective. The observer or researcher or even the researched can have an impact on these notions, the more one moves towards phenomenology (Denzin & Lincoln, 2005; Dryzek, 1995; Harre, 1981; Howell, 2012; Popper, 2005).

Consequently, positivist and phenomenological approaches also differ in the way they treat objectivity and subjectivity. More positivist paradigms suggest that the weight is given to the object because it exists anyway and it is a reality of its own (Bacon, 2000; Harre, 1981; Howell, 2012; Hume, 2000; Locke & Nidditch, 1970). The phenomenological paradigms on the other hand focus on the subjective representation of the object and claim that what matters is the effect of the object on the subject rather than the existence of the object itself (Heidegger, 1977; Husserl, 2012; Merleau-Ponty, 1996).

The link between the researcher and the researched is represented by epistemology and naturally differs across different paradigms of inquiry (Comte, 1880; Denzin & Lincoln, 2005; Howell, 2012; Popper, 2005). Positivism holds that research should be purely objective, the researcher completely detached from the researched and hence the findings should represent the one and only pre-existing truth (table 4.1). Post-positivists on the other hand, recognise the limitations and the assumptions which need to be made to idealise reality and hence the results can only be probable. More phenomenological approaches

enhance the subjectivity of the findings since the researcher and the researched interact.

The same range of different views amongst paradigms of inquiry and the philosophies behind them are observed in axiological terms, meaning the treatment of knowledge and its value (Comte, 1880; Denzin & Lincoln, 2005; Howell, 2012; Kuhn, 2012). Positivist and post-positivist approaches give to knowledge a meaning and value for itself irrespective of its impact to others. Phenomenological paradigms represent a more human-centric universe and focus on the value of knowledge in respect to its impact on changing the conditions in a society. In this way, knowledge is useful only if it has a positive effect.

The methodology of these paradigms also follows the differences in axiology and ontology (Comte, 1880; Denzin & Lincoln, 2005; Horkheimer, 1972; Howell, 2012; Kuhn, 2012; Russell, 1914). Positivism constructs theories and uses experimentation to confirm its postulates whilst post-positivism seeks the falsification of hypotheses more through abstraction and manipulation of environments and less through experimentation (table 4.1). The involvement and understanding of the researcher and her/his interaction with the researched is emphasised the more one moves towards more participatory paradigms.

The result of the methodological differences among different paradigms of inquiry is the difference in how these paradigms view the nature of knowledge and its accumulation as the end result of the research. Positivists for example seek for immutable laws whereas post-positivists assess the probabilities that events occur. Knowledge is accumulated with the aim of getting enough evidence to be able to formulate general theory and identify cause and effect

relationships. Critical theory attempts to gain a historical insight of the processes leading to events and hence contributes to knowledge accumulation and generalisation through the comparison and identification of similar cases. Constructivism, on the other hand, is in pursuit of practical change and attempts to generate knowledge in order to change social relationships which will, in turn, affect future economic and social development. Finally, participatory approaches aim to create and accumulate knowledge in the form of experience and practical understanding (Comte, 1880; Denzin & Lincoln, 2005; Horkheimer, 1972; Howell, 2012; Kuhn, 2012; Russell, 1914).

The different views on methodology and the treatment of knowledge also lead to differences in the understanding of good quality research (Howell, 2012). Positivists and post-positivists aim for rigour and objective analyses whilst critical theory's criterion is the motivation for change. Constructivists focus on the understanding and contextualisation of the results and participatory approaches for a fusion of knowledge through experience which will render them inseparable.

The analysis of the paradigms of inquiry in this section was based on their differences rather than their similarities. However, it is important to remember that borders and categories are not clear. The range of the different paradigms of inquiry represents a continuous spectrum rather than clear-cut groups. Nevertheless, it is important to understand the differences and the evolution of these paradigms of inquiry in order to map the research project accordingly.

4.3 Paradigms of Inquiry in Economics and this thesis

Excluding the Austrian School which adhered to a purely theoretical position of positivism, most of the paradigms of inquiry in economics include an empirical element (Caldwell, 1982). The methodological position of the Austrian school

suggests that economic laws are unquestionable truths which wait to be found (Von Mises, 1960). In this sense, the Austrian School adheres to a positivist paradigm of inquiry where the role for empirical investigation is to identify trends and assist the deductive reasoning which is the only way of pursuing the immutable laws.

The writings of Robbins (1932) confirm the above position and advocate that, through deduction, it is possible to construct the absolute laws of economics from objective truths. Whilst deductive reasoning maintains its position as the path to knowledge, Robbins finds a more significant role for empirical investigation. For him, empirics can be used to confirm postulates and the applicability of theory and suggest adjustments and extensions to theory (Caldwell, 1982).

Hutchison (1938), on the other hand, advocated a greater role for empirical testing in the construction of economic theory. He opposes Robbins' (1932) view on the significance of empirical investigation which he sees as instrumental in deriving economic theory. Hutchison is critical of purely theoretical positivist approaches and he suggests that if economics is to be a science, it must appeal to empirics. In his approach, it is the empirical regularities that form the laws of economics rather than deduction from objective truths (Caldwell, 1982; Hutchison, 1938). In this way, Hutchison introduces and argues for a greater role for empirical investigation to the pure theory position of Robbins' positivism.

In that sense, Hutchison's work represented the opposite end of the spectrum in the methodology of economics compared to Robbins' position. The former was instrumental in the shift of economics towards the greater use of empirical

investigation. This shift was later accompanied by advancements in methods and computational abilities which provided the tools for the robust examination of hypotheses. Such advances related to the collection of national statistics (following the introduction of double entry accounting by Richard Stone and others (Meade & Stone, 1957; Stone, 1961; Stone & Stone, 1959)) the emergence of linear programming and improvements in econometrics and statistics (following the work of the Cowles Commission for Research in Economics led by Jacob Marschak and others) (Caldwell, 1982). These developments increased the distance of pure theorists to applied economic research and expedited the use of empirical tools.

The significance of empiricism in the study of economics is further stressed by Friedman's 'instrumentalism' and Samuelson's 'operationalism'. Friedman argues that the purpose of economic laws is, above all, to offer predictability (Friedman, 1953). Theories, in his view, are instruments assisting forecasting. In this sense, the realism of assumptions is less important than their capacity to produce accurate predictions of behaviour (Caldwell, 1982). This applies Popper's post-positivist approach on economics with a focus on falsification (Popper, 2012; Popper, 1962; Popper, 1994). At the same time, Samuelson suggests that the purpose of the economic science is to provide 'operationally meaningful theorems' to provide hypotheses for testing the validity or falsifiability of theory (Caldwell, 1982, p.190).

The discussion above maps the introduction of empirical investigation in economic science with significant breakthroughs contributed by what is now the Cowles Foundation (Christ, 1994). Starting at the Austrian School's extreme territory of pure theory and Robbins' position that empirical testing is not part of

economic theory formulation, to Hutchison's view where empirics are the generators of assumptions and continuing towards the more post-positivist positions of Friedman and Samuelson where empirical investigation can provide a probability (rather than certainty) at which a hypothesis can be rejected.

The proposed project examines the resilience performance of GB LADs during the 2008 crisis and the determinants behind any differences. In that sense it combines lower to middle level concepts such as regional resilience, human capital, industrial structure and demographics. It will attempt to link the hypotheses derived from these concepts and associated theories using deduction and an empirical model based on past research in the field. Both resilience and the determining factors need to be defined and operationalised before the econometric examination. A model will be built in order to empirically test the hypotheses of the relationship between the determining factors and the crisis impact with the H_0 hypothesis being that there is no relationship between them. As a result, regression analysis will be used to test whether the hypothesis of no relationship can be falsified or not.

This research design fits within an empiricist and post-positivist paradigm of inquiry where a model is built based on assumptions and it attempts to predict relationships based on historical data (Friedman, 1953; Howell, 2012; Lakatos & Musgrave, 1970; Popper, 2005; Popper, 1994). Its ontology follows critical realism. Reality exists but it cannot be claimed that it is universally accepted or applicable since econometric results are statements of probability. Economics is founded around deduction which requires assumptions and conditions. In addition to this, econometric analysis is subject to a number of methodological choices which may affect the outcomes. As a result, it cannot be claimed that

the reality or the findings represents an absolute truth but rather the conditional representation of reality which is subject to assumptions and tested within a probabilistic framework. In this respect, such research could potentially encompass elements of critical theory and its historical realism as outlined in the writings of Dryzek and Horkheimer (Dryzek, 1995; Horkheimer, 1972; Howell, 2012).

Regional resilience, as well as a number of its determinants examined in this study such as human capital, entrepreneurship and the industrial structure of places can be considered as the results of historical processes. Hence, the research could open new paths for the examination of the evolution of places and the development and deployment of resources enhancing resilience. This analysis places the research closer to critical theory rather than Comte's and Harre's (Comte, 1880; Harre, 1981; Howell, 2012) pure positivism in terms of ontology and the treatment of the notion of reality.

A project which is based in both defining and quantifying concepts as well as undertaking an econometric analysis is very difficult to be considered as purely objective. As already discussed, the processes above are dependent on a series of assumptions regarding both the true world as well as the statistical properties of variables. Chapter 5 outlines these assumptions and the steps in operationalising both economic resilience and its determinants. The use of econometric analysis and the reporting of the results ensure a level of objectivity and substantially restrict the subjective intervention of the researcher to the results.

Consequently, modified objectivity is observed whilst the findings are probable, especially since the research is using econometric analysis which is based on

confidence intervals and probabilities. A clear outline and justification of the steps followed allows for greater clarity and objectivity. In addition, offering the results, together with the mechanisms deriving them, permits them to be peer-reviewed and scrutinised. Post-positivism represents the above, leaning more towards critical theory where results are value mediated rather than being entangled in the rigidities of positivism where findings are considered pure and objective representations of absolute truths.

The value of knowing the resilience performance of places as well as the mechanics behind it, serves a multitude of purposes. On the one hand, and in line with the positivist/post-positivist notions, knowledge is an end on itself and adds to the universal stock of knowledge and wisdom (Harre, 1981; Howell, 2012; Popper, 2005). In addition, the results can be used by other members of the academic community in examining different issues and generating further knowledge whilst they can also assist a better understanding of society and its mechanisms in line with notions closer to critical theory (Dryzek, 1995; Horkheimer, 1972; Howell, 2012). Knowledge is expected to be accumulated until the cause and effect relationship is revealed, whilst testing similar cases can help generalising the results. One important impact of the research will be to derive policy proposals for the improvement of regional resilience through the enhancement of the factors generating it. As a result, making a difference, having an impact on the ground and informing policy formulation lie at the core of the project and allow it to trespass through the borders of post-positivism and critical theory in axiological terms.

Although in economics and other fields, deduction, induction and abduction are interrelated, the proposed project will attempt to test a specific relationship for a certain time period and spatial level to draw conclusions which may be more generally applicable. Consequently, the process will be dominated by deduction, where several theories and empirical investigations are used to choose a number of potential determinants for this thesis' empirical investigation and followed by induction, where the empirical investigation is expected to falsify some of the hypotheses formulated. Data will be collected and manipulated to falsify the hypotheses of no relationship between economic resilience and its determining factors. As a result, the methodology is in line with post-positivist approaches rather than the hypothesis verification of positivism (Howell, 2012). The end result of the research will open up further topics closely related to critical theory, where a historical analysis could be used in order to analyse particular cases and investigate the historical processes leading to greater economic resilience.

In terms of the nature of knowledge, the econometric methods used are widely accepted and tested in the field. However, these methods provide tests based on confidence intervals and their results typically provide a maximum of a 99% probability threshold. Knowledge in this project will be produced in the form of probable laws. The methods used as well as the nature of the study make it impossible to be absolute with regards to the outcomes and are indicative rather than representations of pure truth. The way the nature of knowledge is treated falls within the post-positivist paradigm where probable laws are created whilst at the end of research the potential new routes can assess critical theory approaches and use historical insight to further examine the data (Howell, 2012).

With the use of the econometric methods outlined below, reliability and objectivity are achieved within limits and assumptions and it is very important to be clear about these limitations in order to reinforce the researcher's objectivity. This post-positivist approach moves away from the purity/rigidity of positivist views and fitting well to the research outline, whilst further study can examine historical variables entering the interpretation stage by employing more critical theory approaches.

4.4 Methods

Due to the topic's interdisciplinary nature, a range of paradigms of inquiry, methodologies and methods have already been used in resilience research studies. This range includes participatory as well as critical theory approaches examining case studies with elements of cultural ethnography and the use of interviews (Davies, 2011; Simmie & Martin, 2010) to post-positivist approaches investigating data with the use of quantitative methods which, however, acknowledge the lack of total objectivity (Fingleton, Garretsen & Martin, 2012; Fingleton & Palombi, 2013; Martin, 2012).

The proposed research falls within the second category. A number of steps will be taken in examining the relationship between economic resilience and its determining factors. Firstly, the concept of the crisis impact and its determinants are operationalised and expressed in quantifiable measures. A survey of secondary data from reliable sources will highlight the most appropriate measures and the exploratory analysis that follows will identify the relationships and correlations between the variables. Following this, an econometric analysis will be used in order to examine the relationship between economic resilience and its determining factors.

Before expanding on the empirical analysis, it is important to discuss the level of geography to be used. This is relevant due to the Modifiable Areal Unit Problem (MUAP) which represents the potential for statistical analysis to be affected by the spatial scale on which this analysis is undertaken (Flowerdew, 2011; Openshaw, 1984; Openshaw & Taylor, 1979). This is the potential effect of different statistics at various scales (Output Area, Ward etc.) or differences in zonal systems among areas in the same scale (Flowerdew, 2011). Despite the fact that empirical research using 2011 census data failed to identify major differences in most of the cases examined (Flowerdew, 2011), it is worth remembering the potential for such biases. To alleviate such concerns to a certain extent, the results of the econometric analysis are compared to similar studies but different geographies in the UK and abroad.

This study uses LADs as its geographical unit of analysis for a number of reasons. Firstly, LADs are the smallest geographical level at which local government decisions can be made. Moreover, statistics are collected at regular intervals for LADs and this assists the quantitative investigation for this thesis. Furthermore, this geography provides a population (380 for Great Britain) which is large enough for the econometric analysis used below whilst it is widely used in regional and spatial analyses (Bishop, 2012). However, it should be noted that LADs are often artificial boundaries and the constructs of political processes rather than the outcome of scientific research. In this sense, LADs may not fully represent functional economic areas.

Travel to Work Areas (TTWAs) could also be considered as an alternative to LADs. The TTWAs are constructed by considering commuting patterns from the Census of Population. In this sense, TTWAs more accurately represent labour

markets and define more meaningful economic areas. However, TTWAs disadvantages relate to the fact that they are drawn based on Census data. The latest TTWAs are drawn based on 2011 data which falls within the study period of this thesis (2004-2014). Even though it could be argued that boundaries based on 2011 commuting data are relevant to 2014, they are not necessarily accurate in representing local labour markets in the years before 2011. In addition, some TTWAs may not be as meaningful as LADs. An example of this is London which is considered one TTWA despite the fact that it is comprised by 32 Boroughs with different characteristics. Finally, most of the data used in this study are not available at the TTWA level even though as Lee (2014) shows, for few of these variables, they can be drawn from microdata.

Before the quantitative examination takes place, there is a need to operationalise both regional resilience and its determinants. As discussed in chapter 2, economic resilience does not have a universally accepted measure. Consequently, a number of decisions need to be made before proxying it. These decisions include whether to use a labour market indicator (i.e. employment rates) or a growth measure (i.e. GVA), as well as the transformations involved in constructing a measure of resilience. For the determinants of resilience, the decision making process is easier since they represent concepts with established measures (i.e. human capital, entrepreneurship, industrial structure etc.)

Economic resilience in this thesis is understood on the basis of a LAD's labour market performance before and after the onset of the crisis. This implies that its measurement should involve a comparison between the performance before and after 2008 and that 'economic resilience' is an interchangeable term for

‘crisis impact’. Due to the volatility of individual observations in specific variables, an averaging approach is adopted as this is expected to provide more meaningful indicators. The significant decisions involved in defining and measuring resilience and the rest of the determinants suggest that a chapter of this thesis should focus on the variables used in the analysis. Consequently, chapter 5 is devoted to describing the steps involved in creating the dependent and independent variables.

The outcome of this process is eight different labour market measures for local economic resilience based on employment and unemployment related indicators and two different transformations (absolute vs relative difference of the pre- and post-crisis period). The construction of these variables, which requires the comparison between the pre- and post-2008 conditions, dictates the use of a cross-sectional analysis instead of a panel data approach. A cross-sectional approach is in common to other studies in the field such as Lee (2014) and Brakman et al. (2014). Lee (2014) uses the change in unemployment (difference between unemployment just before the crisis and its trough) as a dependent variable to examine the crisis impact in UK cities whilst Brakman et al. (2014) use unemployment and real GDP differences for EU regions.

There are several reasons why the creation of a panel may not be appropriate for achieving the aims of this thesis. Firstly, a panel approach would require the use of annual data. As it will be seen, most of the dependent variables in this study come from sample surveys and, at the local level, these samples can be relatively small, leading to wide confidence intervals and high temporal variations from one year to the other. In order to address this issue, the study uses the average of four year periods (chapter 5). Secondly, the

conceptualisation and operationalisation of resilience in this thesis requires the comparison of the labour market conditions before and after 2008. This would not be feasible in a panel analysis since post-2008 years would have to individually be compared with the same pre-crisis year. An attempt was made to use the difference of each year from year 2008 but that proved to be a poor fit in measuring the crisis impact and shedding light on its determining factors.

What would be possible is to construct counterfactuals for the post-crisis period and use the difference between the counterfactuals and the actual performance as the dependent variable. The obstacle in this case however would be that most of the independent variables such as human capital and demographics are slow to change from one year to the other. This means that these attributes would mostly be captured by a fixed effects specification, making it difficult to identify any effect on the crisis impact.

Finally, a panel approach would suffer from significant endogeneity considerations where it would be difficult to distinguish the direction of any causal relationship between the dependent and independent variables. The requirement for annual observations for the independent variables would mean that observations would have to go into the post-2008 period. Hence it would be difficult to identify whether the independent variables are influenced by the crisis itself. Using a cross-sectional approach and taking the independent variables for the period up to 2007 alleviates these concerns to some extent since the independent variables' observations do not include the start of the crisis and the associated impact on LADs (see discussion below).

Once the dependent variables are constructed, the chapter examines their descriptive statistics and correlations and the decision is made to use all of

them in the econometric analysis in order to investigate similarities and differences in the results. A similar process is followed for the independent variables where, after their identification, their descriptive statistics are examined to reveal any significant differences in their characteristics. Once the dependent and independent variables are known, their correlations are studied in order to detect variables that are moving together.

The general model will be estimated using the OLS method and takes the form

$$Impact = a + \beta_i X_i + \varepsilon$$

where *Impact* stands for the dependent variables measuring economic resilience (outlined in chapter 5) and X_i is the vector of independent variables (also outlined in chapter 5) stemming from the literature review of the potential determining factors. ε is a vector of independently and identically distributed error terms whilst the coefficients to be estimated is a which is a constant and β_i which is the marginal effect for each independent variable *i*.

OLS provides an estimation of the coefficients and intercepts when examining the relationship between a dependent and independent variable within a linear regression model. In doing so, the method focuses on minimising the sum of the square residuals, meaning the difference between the estimated and real value on the dependent variable. The share of the explained sum of squares (sum of squared differences between estimate and average value of observations) to the total sum of squares (sum of squared differences between observed values and their average) is the value of R-squared which indicates the amount of the dependent variable's variation, explained by the model.

Initially, all the independent variables will be introduced together and the results will be tested for multicollinearity effects by examining their Variance Inflation Factors (VIFs). Independent variables with VIFs over four will be excluded and then used in alternative specifications. In order to establish a direction of causality in the results of the cross-section analysis, the independent variables used are either for year 2007 or for an average of 2004-2007 (depending on the need to avoid year to year volatility impacting on individual observations). This allows for the exclusion of the direction of the effects from the left side of the equation to the right in accordance with studies of a similar nature (Audretsch & Keilbach, 2005). Furthermore, in order to account for the potential of cluster correlation in the error terms (and their subsequent heteroscedasticity problems) between LADs in the same region, the analysis will use regionally clustered robust standard errors as is common in similar studies (Lee, 2014; Wooldridge, 2015).

Once the results of the initial analysis are drawn, they will be analysed cumulatively in order to identify firstly the marginal effects of the independent variables on the dependent ones and secondly, the similarities and differences in using alternative transformations and measures of the crisis impact. Following the analysis of the results, chapter 7 will offer further robustness checks which will investigate: the existence of outliers and their potential impact on the results if any; the potential effects of migration on the results; any counterintuitive results; and finally, the potential for a composite indicator representing a combination of the dependent variables. These robustness checks will assess the reliability of the initial results and provide further insights into the determinants of economic resilience in GB LADs.

4.5 Data Sources

Focusing on economic resilience measures related to local labour markets means there is a need for employment and unemployment statistics at regular intervals. In the UK this is offered by the Annual Population Survey which provides a sample of more than 120,000 households and 300,000 individual respondents annually. The survey combines data from the quarterly Labour Force Surveys and supplies statistics on socio-economic conditions with a focus on labour market indicators. As a result, the dependent variables are derived from transformations of data from the Annual Population Survey (APS). The only exceptions are the measures related to the JSA claimant rates which are drawn from administrative data counting all recipients.

The Survey also provides most of the data for the independent variables such as the industrial structure, human capital variables and others. Exceptions include the data on entrepreneurship which come from ONS' Business Demography as well as population density and demographics estimates. These official sources ensure the quality of data is the best available and collected for the same LADs every year using the same methodology. Chapter 5 discusses more extensively the variables used in the analysis and their data sources.

4.6 Conclusions

This chapter discusses this thesis' epistemological position and outlines the research strategy required to measure economic resilience in GB LADs and examine its determinants. It starts with a review of research philosophies and the evolution of their paradigms of inquiry before focusing on economics and this study in particular. The chapter examines the paradigm of inquiry together with its epistemological and methodological choices before discussing its methods and data sources. As mentioned before, the chapter should be

considered in conjunction with chapter 5 which clearly outlines the steps for constructing the dependent and independent variables.

The nature of the research question and the study's scientific field require the use of empirics as an integral part of the research philosophy. The constructed universe for the study is one mainly influenced by post-positivist and empiricist views of testing for the falsification of hypotheses. An averaging approach is followed in constructing the dependent variables which are then used together with the independent ones in a cross-sectional analysis employing the OLS method. The results are analysed and discussed as well as accompanied by a number of robustness checks.

The following operationalisation chapter provides detail on the steps in the construction of the dependent and independent variables. As discussed, research on economic resilience has so far utilised numerous measures depending on the interpretation of resilience as well as practical considerations such as data availability. Consequently, the construction of the variables for this study requires clear outlining and justification. Chapter 5 is dedicated on providing this information before continuing to the analysis and results section.

Chapter 5 - Operationalisation

5.1 Introduction

Following the literature overviews of resilience and its potential determinants, as well as the outline of this study's paradigm of inquiry, it is now essential to discuss the operationalisation of both the dependent and independent variables. This chapter focuses on the identification of relevant data which represent the concepts discussed so far together with an overview of their descriptive statistics. It first considers the dependent variables and their method of construction where eight different labour market indicators are examined in order to investigate the crisis impact on local labour markets in a holistic way.

Following the construction of the dependent variables, the chapter examines the independent variables. The factors discussed are derived from the literature review of potential determinants in chapter 3 in conjunction with existing empirical studies in the field. These factors are: the pre-existing conditions in LADs prior to the crisis; the industrial structure; specialisation and diversity; human capital; entrepreneurship; demographics; the extent of urbanisation; geography; agency and institutions. Several variables, subject to the availability of quantitative measures, have been identified to reflect these determinants, some of which are included in this type of study for the first time.

After identifying the dependent and independent variables, the chapter examines their descriptive statistics and correlations between them and discusses emerging patterns. This section is followed by concluding remarks and a discussion of the next steps which include the econometric examination and analysis of the results.

5.2 Dependent variables

Quantitative measures of resilience have typically focused on single proxies, mainly examining labour market aspects (Di Caro, 2017; Fingleton, Garretsen & Martin, 2012). As previously discussed, labour markets typically provide more accurate and up to date information than GVA measures at the LAD level, reflect wider social conditions and, in the UK where labour markets have relatively few rigidities, indicators such as unemployment rates are reasonably free to fluctuate in response to economic conditions. Thus, this study concurs with much of the existing literature in examining the crisis and its impact on the basis of labour market indicators.

5.2.1 Labour market variables

The employment rate is probably the most widely used indicator for examining labour markets. The data in this study comes from the APS. This source combines quarterly data from the Labour Force Survey and rolling annual data from the Local Labour Force Survey to provide the largest coverage of household surveys in the UK with more than 120,000 households and 300,000 individual respondents annually. The survey uses a random sample and appropriate weighting in order to provide statistically reliable estimates of labour market indicators and socioeconomic conditions at the local authority level (ONS, 2012). It provides data from January to December of year t and in 2004 replaced the Local Area Population Survey. The latter used a different methodology, collecting data for the period March of year t till February of year t+1. As a result, to ensure consistency, the time period examined refers to 2004-2014.

The data sources have a number of limitations. First, the survey refers only to individuals aged 16 and over, ignoring the employment of those below that age

and does not consider individuals in communal establishments apart from NHS housing and student residences. As a result, armed forces employees, for example, will only be included in the survey if they live in private accommodation. Furthermore, it is worth repeating that this is a sample based survey where data imputation and proxy respondents were used to alleviate non-response bias. The size of the sample assists in mitigating potential attrition-bias which refers to the different characteristics between respondents who stay for all the waves of the study and those who leave (ONS, 2012).

Despite these considerations, the APS is ONS' preferred survey for examining labour market indicators due to its sample size, coverage and consistency of the study. With regards to employment, the residence based analysis is used in this study. This refers to those aged 16+ who have done some paid work during the reference week divided by the 16+ population of an area. The relevant concepts are defined as follows:

"Employment

People aged 16 or over who did some paid work in the reference week (whether as an employee or self-employed); those who had a job that they were temporarily away from (e.g. on holiday); those on government supported training and employment programmes; and those doing unpaid family work (i.e. working in a family business).

Employment rate

The number of people in employment as a percentage of the population in that age group." (NOMIS, 2016).

The above measure offers a useful initial perspective on the local labour markets in different LADs. However, employment rates reflect binary answers to the question concerning whether an individual has performed any kind of paid work during the reference week. In more flexible labour markets, where labour hoarding and temporary employment are important features as alternatives to

redundancy, employment drops may be smaller in response to a crisis than in less flexible markets. This appears to be important within the context of recent labour market behaviour in the UK. ONS estimates of the current percentage of employees in contracts that do not guarantee a minimum number of hours stood at 2.3% (697,000 employees) for October to December 2014. This is almost four times higher than the figure of 0.6% (166,000 employees) for the same period in 2007 (ONS, 2015). A significant jump is present in the ONS data between 2012 and 2013 where the share of employment in contracts with no guaranteed hours more than doubled (from 0.8% to 1.9%).

Without a doubt, part of this increase in zero hour contracts is due to improved recognition of this term of employment by respondents (ONS, 2015). However, it may also imply that an ever-increasing number of people counted as employed by official statistics definitions are underemployed. This issue makes it harder for aggregate employment rates to record the real impact of the crisis in different areas. Hence, it is necessary to also analyse employment changes in terms of full-time equivalents (FTE). The APS provides information on hours worked, so it is possible to construct an estimate of full-time equivalent employment rates to better reflect the magnitude of employment and its change during the crisis.

Employment indicators are not the only labour market indices and an examination of alternative data adds robustness to the results. Information on another important indicator, unemployment, can be derived from two different sources, namely the APS and the JSA claimant data. The APS uses the definition of the International Labour Organisation (ILO) for unemployment which:

"… refers to people without a job who were able to start work in the two weeks following their APS interview and who had either looked for work in the four weeks prior to interview or were waiting to start a job they had already obtained." (NOMIS, 2016).

The JSA claimant data, on the other hand, records the total number of those out of work who are eligible for the allowance either based on past contributions or income (NOMIS, 2016). In that sense, the JSA is a more comprehensive measure than the unemployment rates because it is based on administrative data instead of sampling methods. However, JSA statistics do not account for those ineligible for the benefit. Hence, it could be argued that whilst the JSA rates are expected to be more accurate representations of reality, they do not offer a measure or an estimate of everyone looking for work and not being able to find a job; for this reason, they should be studied in conjunction with the unemployment rates from the APS.

5.2.2 Construction of the dependent variables

Numerous empirical studies examine the crisis impact on different localities using a "peak to trough" approach (Fingleton, Garretsen & Martin, 2012; Martin, 2012; Martin et al., 2016b). Typically, a post-recession trough (maximum impact point) is compared to a pre-recession peak (performance at the time period before the decline) in order to gauge the impact of the crisis. The rationale for this approach is that it is considered preferable to construct a measure which will judge the performance of each place based on its own past performance before the crisis. A similar approach is used in this study. The only difference is that, instead of using a single point in time to represent the peak (i.e. pre-crisis year) and the trough (i.e. year of lowest employment or highest unemployment rate), an average of several points in time is used. This deviation is discussed further below but the principle for operationalising the crisis impact remains the

same in comparing the pre- and post-crisis performance of a locality. The results of this exercise provide the dependent variables used in the econometric analysis that follows.

It is important to note that the variation, volatility and relevant confidence intervals of employment rates at the LAD level are significantly higher than the respective numbers at higher geographies and the national level. To illustrate this, table 5.1 provides the descriptive statistics of the labour market indicator changes in LADs and UK countries for the differences between 2006 and 2007. EMPL stands for the employment rates, FTE for the full-time equivalents, UNEMP for the unemployment rates and JSA for the claimant count rates respectively. The differences in the standard deviations as well as minimum and maximum between the LAD and UK countries figures are indicative of the significantly higher volatility at the former geographical level.

The table also provides the average of the confidence intervals (CI) for each indicator (employment rates, FTE employment and unemployment rates) for the period 2004-2014. It is worth mentioning that JSA rates do not come with confidence intervals because of the administrative nature of the data which count total population instead of using samples for estimation. As can be seen, the CIs for LADs are between six and eight times larger than the CIs for the UK and five countries. This is indicative of the increased uncertainty and noise in the data at lower geographical level. Together with the differences in the standard deviations between the national and local geographies, this evidence suggests that any measure of labour market impact should account for the sensitivity and increased volatility of these rates at the subnational level.

Table 5.1: Descriptive statistics of the annual differences in employment for LADs 2006-07.

Variable	Obs	Mean	Std. Dev.	Min	Max	Average CI of individual indicators over 2004-2014
EMPL_07_06_LAD	378	-0.12	2.80	-8.60	8.60	4.45
EMPL_07_06_UK	5	0.3	0.51	0	1.2	0.56
FTE_07_06_LAD	378	-0.18	3.12	-10.2	9.94	4.62
FTE_07_06_UK	5	0.12	0.51	-0.33	0.99	0.58
UNEMP_07_06_LAD	338	-0.16	1.81	-6.6	9.1	2.3
UNEMP_07_06_UK	5	-0.26	0.38	-0.7	0.3	0.35
JSA_07_06_LAD	380	-0.32	0.21	-1.2	0.1	-
JSA_07_06_UK	5	-0.32	0.11	-0.5	-0.2	-

Source: Author's treatment from APS and JSA Administrative data.

To add robustness to the measurement of the crisis impact and the results of the econometric analysis on its determining factors, an averaging approach is selected. The decision was taken to average the rates over four time-periods because this is the highest number of observations from the start of the dataset (2004) to the year before the onset of the crisis (2007). Averaging over four years ensures maximum consistency against the increased volatility seen above whilst for the post-crisis period (2008-2014), averaging assists in providing a more holistic view of the crisis impact. Consequently, for each labour market indicator the rates for 2004-2007 are combined to provide an initial stable point before the crisis whilst the average of the four lowest rates for the period 2008-2014 is used to reflect the trough for each LAD. In this way, it is possible to account for the year to year volatility of these rates and reduce the impact of any noise in the data. The outcome variable for each indicator is equal to the difference between the pre-crisis (2004-2007) and post-crisis (2008-2014) levels of that variable, adjusting for the conceptual differences between

employment and unemployment related variables (table 5.6). These points reflect the maximum impact in a LAD between the pre-crisis and post-crisis periods studied and, whilst they correlate to single year differences, they are expected to be more robust measures of the crisis impact.

To examine the effect of this approach on the measurement of the crisis impact, an illustrative example is given, using the employment rates below (table 5.2). The four year averaging approach measure (EMIMPACT) is highly correlated but more robust (since it accounts for the year to year volatility at lower geographies) to a *"2007 to trough"* approach (EMP2007MIN) which is the difference between the 2007 employment rate and the minimum for 2008-2014 for each LAD. EMIMPACT also highly correlates to different averaging approaches taking the averages of the two (EMIMPACTMIN2) or three (EMIMPACTMIN3) lowest years for the period 2008-2014 (table 5.2).

The significant jump in the correlations is observed between any averaging method (EMIMPACT, EMIMPACTMIN2 or EMIMPACTMIN3) and EMP2007MIN. The latter has correlation coefficients of 0.75, 0.82 and 0.88 with EMIMPACT, EMIMPACTMIN3, EMIMPACTMIN2 respectively when the three averaging measures have correlation coefficients from 0.9 upwards. This indicates that the number of years used in averaging is less significant than the difference in method between an averaging and a single year approach.

Table 5.2: Correlations between EMIMPACT and alternative transformations.

Variables	EMIMPACT	EMP2007MIN	EMIMPACTMIN2	EMIMPACTMIN3
EMIMPACT	1.00			
EMP2007MIN	0.75	1.00		
EMIMPACTMIN2	0.90	0.88	1.00	

EMIMPACTMIN3	0.97	0.82	0.96	1.00

Source: Author's treatment.

Similar results are obtained for the other two variables derived from the APS estimations, namely the FTE and unemployment related crisis impact indicators. The only significant difference is observed when the JSA based indicators are examined. In this case, as can be seen below (table 5.3), the correlation between the peak to trough method and the averaging methods is much larger with a coefficient of 0.93 between JSA2007MIN and JSAIMPACT.

This could be indicative of the difference between the APS estimates and the administrative nature of the JSA data, showing the potential impact of noise in single year estimates and reinforcing the need for averaging of more than one year when considering the performance of LADs during the crisis.

Table 5.3: Correlations between JSAIMPACT and alternative transformations.

Variables	JSAIMPACT	JSAIMPACTMIN3	JSAIMPACTMIN2	JSA2007MIN
JSAIMPACT	1.00			
JSAIMPACTMIN3	1.00	1.00		
JSAIMPACTMIN2	0.98	0.99	1.00	
JSA2007MIN	0.93	0.95	0.98	1.00

Source: Author's treatment.

The averaging method creates a measure of distance between the pre-crisis and post-crisis employment levels. It offers the advantage of having a direct quantitative measure of the crisis impact and a measure of the effect of the independent variables on the constructed dependent variable. However, a certain percentage change in employment can have varying importance for

different places depending on their initial conditions. For example (continuing with the employment rates indicative case), a drop of five percentage points in the employment rate of an area with an initial average (2004-2007) rate of 70% signifies a different impact than the same drop for an area with an initial average employment rate of 50%. As a result, it is important to consider the change in terms of its magnitude to account for the importance of that drop for an area. Hence, this study also examines the percentage difference ($EMPERIMPACT = \left(\frac{(X_i - X_j)}{X_j}\right) * 100$) (table 5.6) between the average for 2004-2007 and the average of the four minimum rates 2008-2014 for each LAD. In this way, it is possible to add the aspect of the magnitude of the employment impact relative to the pre-crisis conditions.

Producing the FTE employment rates involves multiplying the number of employees aged 16+ by a number of hours within the working hours' bands (mid points such as 22 hours for the 10-34 band, 39.5 hours for the 35-44 band and the starting point 45 hours for the 45+ band) excluding from the process those working for 0-10 hours due to missing data. This exclusion adversely impacts on the reliability of the data and, as will be seen below, it potentially leads to an underestimation of FTE employment rates post-2008. Dividing the sum of the above by 37 hours results in the numerator of the full time equivalent measure and further dividing this number by the population of 16+ provides the final employment rate in full time equivalents. This transformation provides variable FTEIMPACT which is the difference between the average FTE employment rate between 2004 and 2007 and the average of the four minimum FTE employment rates between 2008 and 2014, and, variable FTEPERIMPACT, which is the percentage difference between the average of

the four minimum FTE employment rates for 2008-2014 and the average FTE employment rate for 2004-2007 (table 5.6). This measure allows for the consideration of employment losses in terms of working hours instead of jobs, accounting for labour hoarding through flexible working conditions and enriching the information on the employment impact of the crisis.

However, this consideration is impeded by the lack of reliable data for the most crucial aspect of the phenomenon to be measured. For example, the assertion that a number of full time jobs at the pre-crisis stage have been transformed post-crisis into positions with no guaranteed hours of work is difficult to examine without the availability of data for the number of employees working between zero and ten hours. In addition, if the proposition above regarding the change in hours of work is true, then the post-crisis FTE employment rates will be underestimated as is discussed further in the potential issues section 5.2.4.

In terms of unemployment, the data used refer to the period 2004-2014 and the construction of the dependent variables follows the methodology used for the employment measures, after adjusting for conceptual differences such as the fact that it is the maximum of unemployment now that signals a more severe impact on a LAD. As a result, variable UNIMPACT is the difference between the average of the four maximum unemployment rates for 2008-2014 and the average unemployment rate 2004-2007 whilst variable UNPERIMPACT is the percentage difference between the above. To ensure consistency and avoid seasonality effects, the JSA rates are taken for November of each year. Constructed in the same way as the unemployment related variables, JSAIMPACT is the difference between the average of the four maximum JSA

residence-based rates for 2008-2014 and the average 2004-2007 while JSAPERIMPACT is the percentage change (table 5.6).

It is worth mentioning that the data for unemployment exhibit a number of missing values or too small numbers to report in the APS data. In order to balance the loss of observations with the consistency of data, a rule was devised and applied to determine whether a local authority would be excluded from the relevant regressions or not. A LAD was excluded if it had missing values on 50% or more of the observations used either for constructing the average 2004-2007 (2 years) or for constructing the post-crisis maximum for 2008-2014 (4 years). An illustrative example is given below (table 5.4) where Eden would be excluded from the analysis whereas Flyde would remain since the missing data is less than 50% of the data needed to construct the dependent variable.

Table 5.4: Unemployment rates for selected LADs.

LAD	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Eden	1.9	0.9	!	!	!	3.5	2.8	4.7	!	2.8	3.3
Fylde	3.3	4.0	!	5.3	!	!	5.8	4.0	5.5	5.5	!

Source: APS.

This rule excludes 14 LADs (table 5.5) from the analysis and needs to be considered when examining the results. However, the excluded areas tend to be small, representing only 3.68% of the 380 LADs and 1.29% of the total population.

Table 5.5: Areas excluded from unemployment analysis.

ualad09:Brentwood	ualad09:Mole Valley
ualad09:Castle Point	ualad09:North Dorset

ualad09:City of London	ualad09:Ribble Valley
ualad09:Daventry	ualad09:Ryedale
ualad09:Eden	ualad09:Uttlesford
ualad09:Isles of Scilly	ualad09:West Devon
ualad09:Melton	ualad09:West Somerset

5.2.3 Descriptive statistics

With the use of two different manipulations and data sources as well as four different labour market indicators, eight dependent variables are constructed (table 5.6). Their basic descriptive statistics and correlations are in the tables 5.7 and 5.8.

Table 5.6: 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
EMPERIMPACT	[(Xi-Xj)/Xj]*100			negative
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
FTEPERIMPACT	[(Xi-Xj)/Xj]*100			negative
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
UNPERIMPACT	[(Xi-Xj)/Xj]*100			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
JSAPERIMPACT	[(Xi-Xj)/Xj]*100			positive

Table 5.7: Descriptive statistics of the dependent variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
EMIMPACT	378	3.12	2.43	-7.33	11.38
EMPERIMPACT	378	-5.09	3.96	-18.40	14.01
FTEIMPACT	378	3.85	2.59	-5.48	10.87
FTEPERIMPACT	378	-6.87	4.56	-19.86	11.67
UNIMPACT	366	3.16	1.49	-1.45	8.51
UNPERIMPACT	366	73.45	39.10	-12.61	224.11
JSAIMPACT	380	1.42	0.63	0.05	3.55
JSAPERIMPACT	380	85.92	31.74	3.49	157.14

Table 5.8: Correlations between the dependent variables.

Variable	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
EMIMPACT	1.00							
EMPERIMPACT	-0.99	1.00						
FTEIMPACT	0.87	-0.86	1.00					
FTEPERIMPACT	-0.86	0.87	-0.99	1.00				
UNIMPACT	0.46	-0.51	0.44	-0.49	1.00			
UNPERIMPACT	0.53	-0.53	0.50	-0.49	0.71	1.00		
JSAIMPACT	0.16	-0.21	0.22	-0.27	0.63	0.16	1.00	
JSAPERIMPACT	0.32	-0.30	0.34	-0.31	0.13	0.34	0.28	1.00

The differences in the descriptive statistics and correlations among the dependent variables are indicative of the different concepts they measure. The relative measures of the labour market (EMPERIMPACT, FTEPERIMPACT, UNPERIMPACT, JSAPERIMPACT) exhibit greater means (as absolute values) and significantly higher volatility. This is particularly the case for the unemployment related measures which, in some cases, are more than double in relative terms compared to their pre-crisis levels. On the one hand, this is expected due to the smaller denominators for the unemployment and JSA rates. On the other hand, this evidence supports the argument that the crisis impact should be measured in terms of both level and percentage differences.

Examining the correlations, the employment rate variables correlate highly with the full-time equivalent as expected. They have a medium strength relationship with the unemployment measures and low or no relationship to the JSA measures. There is also a moderate (at best) correlation between the unemployment variables and the JSA variables. In explaining this, it is important to note that the JSA rates are calculated based on the 16-64 population of an area whilst unemployment rates refer to those 16+ and that JSA rates reflect administrative data whilst APS generated unemployment rates are derived from a survey based on samples. In addition, as is seen below, JSA rates could potentially suffer from biases based on uneven propensity to claim benefits.

Finally, it is important to note that even though the APS is an extensive study and provides significant information on subnational labour markets, it is not the only source of data. An alternative source is the Business Register and Employment Survey (BRES). BRES is a continuation of the Annual Business Inquiry (ABI) post 2008 and is a survey of 80,000 businesses which are asked

to declare the number of people on their payroll on a certain date of the year. This is the official source of the ONS estimates of employment by detailed geography and industry. However, it suffers from two disadvantages which make it impossible to use in this study. The first is that due to the change from ABI to BRES and calculations in agricultural employment, discontinuities in the time series exist in 2008. Hence, comparisons of employment rates between the pre- and post-2008 period would inevitably be inconsistent. In addition, BRES is a workplace based study which does not provide rates, hence the results do not account for population increases in LADs. For the above reasons, even though it could potentially offer a more accurate estimation of employment, the design of this study prohibits the use of this data.

5.2.4 Potential issues

There are a number of issues that may affect the reliability of the dependent variables that are important to recognise at the outset. The first relates to migration. Net-migration from a LAD will have a dual effect on the dependent variables. To the effect that migration is used as a response to the crisis, it would be expected to have a balancing effect with movements from places with an initial high crisis impact to places with an initial low crisis impact. This is the first effect and it is expected to reduce the range of the differences in the performance of LADs during the crisis. It is particularly relevant to the averaging methodology used in the calculation of impact in this study since the method takes into consideration four impact years and allows any migration movements to balance the magnitude of the initial impact.

The second effect is related to the calculation of the dependent variables themselves. Net-migration will affect the total population aged 16+ which is the denominator for the employment rates, FTE and JSA rates. For unemployment

rates however, the denominator only measures those able and willing to work and hence the impact could be different. As a result, an increase of net migration by 100 persons, for example, of which 50 are able and willing to work will decrease the employment, FTE and JSA measures by the same amount but the effect on unemployment will be half of that. This is without considering the employment characteristics of this in-migration which further complicates the effects of the latter on the dependent variables.

Despite the aforementioned concerns, this study is not expected to be significantly impacted by the effect of net-migration for two reasons. The first is that the study examines the net, aggregate effect on local labour markets which incorporates both the demand and the supply side responses to the crisis. To that effect, it is not relevant to this study whether a LAD has performed better because of out-migration or not, especially since the comparisons are within the same country with free movement across LADs. The second reason is that, as will be seen, in order to alleviate endogeneity and due to the cross-sectional nature of the study, independent variables were measured prior to the crisis. This means that any migration effects arising from the crisis are not considered within this approach. Chapter 7 examines further and discusses in detail the potential effects of migration on the study.

In terms of the FTE employment rates, a significant drawback is the lack of data for employees who work 0-10 hours. One of the important elements of the 2008 crisis is the significant increase in contracts not guaranteeing a minimum number of hours (ONS, 2015). Since a noteworthy share of previously full or part-time employment would be expected to be reduced to 0-10 hours, this information is missing from the relevant measure. The end result is a likely

underestimation of FTE employment rates, since those working for more than 20 hours before 2008 and switching to 0-10 hours as well as those who started work for 0-10 hours (if assumed to be more than the period before 2008) will not be counted as employed. Despite the high correlation with the employment measures, this could lead to inconsistencies in the results.

Furthermore, leaving the workforce through early retirement or education also has a differential impact on the dependent variables. Opting for early retirement whilst employed, for example, will increase the unemployment rate (since it will decrease its denominator) whilst it will not affect the JSA rates unless it leads to receiving an unemployment related benefit (Beatty, Fothergill & Macmillan, 2000; Lee, 2014). This could potentially lead to differential impacts arising from the crisis depending on the measure used.

In addition, spatial bias may be present in the JSA measure of the crisis impact. Research suggests that some kinds of benefits (i.e. incapacity benefits) are used in specific areas as a response to long-term changes in labour demand (Beatty & Fothergill, 2005; Beatty, Fothergill & Macmillan, 2000). This is due to employees with ill-health who find themselves out of a job and with limited opportunities for re-employment opting for sickness related benefits. There is evidence that this could particularly be the case in some Northern areas of declining traditional manufacturing. Lee (2014) argues that this could also be the case for JSA benefits. To the extent that claiming JSA is dependent on past experience and awareness, personal savings and circumstances which make individuals ineligible or unwilling to claim these benefits, then the JSA rates are more indicative of the distribution of claimants and the probability of claiming than unemployment itself (Lee, 2014).

The final significant difference amongst the dependent variables arises from the transformations used. Even though it is useful to consider both the nominal and the percentage change in the rates before and after the crisis, these two transformations provide results with significantly different distributions and magnitudes. As can be seen in table 5.7, this is particularly the case for the unemployment and JSA related variables which have the smallest rates. Table 5.9 below provides some illustrative examples by showing the dependent variables for four LADs in the sample.

Examining the table, it is evident that the figures for the employment related variables are commensurate and of similar magnitude, meaning that the differences between LADs for EMPERIMPACT are approximately as big (in terms of magnitude) as the ones for EMIMPACT. However, this is not the case for the unemployment related variables where, for example, Lewisham and Poole have the same JSAIMPACT but JSAPERIMPACT for Poole is more than four times the one for Lewisham. Similarly disproportionate are the results for UNIMPACT and UNPERIMPACT where, for example, West Oxfordshire had approximately twice the impact Camden had, in terms of unemployment but more than five times the impact in terms of UNPERIMPACT. At the same time, West Oxfordshire had less JSAIMPACT than Lewisham but more than five times its JSAPERIMPACT. The reason for these differences is the low initial values for unemployment and JSA. These values are the denominators when considering the magnitude of the crisis impact in a LAD. As a result, an increase in unemployment or JSA between pre- and post-crisis from one to two percent will provide a value of 1 for UNIMPACT and 100% for UNPERIMPACT whilst an increase from five to seven percent will provide values of 2 and 40% respectively. It follows then that despite the usefulness of accounting for the

magnitude of pre- and post-crisis changes these differences between the nominal and relative measures can in turn create inconsistencies in the results.

Table 5.9: Different crisis impact measures for selected areas.

LAD/	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
Lewisham	1.025	-1.666	1.07	-1.85	1.78	19.72	1.15	28.93
Poole	0.4	-0.671	1.1	-2.01	2.5	88.5	1.15	124.32
West Oxfordshire	4.8	-6.889	7.25	-11.37	2.93	102.63	0.83	157.14
Camden	2.475	-4.108	2.69	-4.75	1.38	19.16	0.28	8.53

Source: Author's treatment.

It is worth noting that the simultaneous comparison of employment and unemployment related variables in both nominal and relative terms could affect the interpretation of the crisis impact in different areas. For example, in the case of two binary labour market with employment and unemployment rates 60%-40% (place A) and 50%-50% (place B) respectively, EMIMPACT, EMPERIMPACT, UNIMPACT and UNPERIMPACT will have opposite sizes in terms of magnitude. This suggests that caution should be taken when comparing the results for employment and unemployment using the relative measures. However, in order to consider the magnitude, it is worth controlling for any differential effects by using the percentage change of the difference in the rates as a dependent variable.

5.3 Independent variables

This section focuses on outlining the independent variables used in this study. The factors discussed below are the outcome of the review of potential determinants in chapter 3 in conjunction with existing empirical studies in the field. Namely, the pre-existing conditions in LADs; the industrial structure; specialisation and diversity; human capital; entrepreneurship; demographics; the extent of urbanisation; geography; as well as agency and institutions. The

quantitative measures (where available) of these determinants are outlined below.

5.3.1 Pre-existing conditions

Related to path dependency and resource availability at the time of the crisis, the pre-existing conditions may significantly affect the crisis impact on LADs. To reflect these initial economic conditions, the rate of employment, FTE employment, unemployment or JSA claimant is used, in agreement with the dependent variables. The average 2004-2007 is used for the percentage differences (EMPERIMPACT, FTEPERIMPACT, UNPERIMPACT, JSAPERIMPACT) whilst the 2007 rate is used for the variables representing the nominal difference in the rates (EMIMPACT, FTEIMPACT, UNIMPACT, JSAIMPACT). This procedure has been adopted since using the average 2004-2007 for the latter dependent variables would lead to a high correlation between the independent and the dependent variable. Similar variables have been used by Lee (2014) in his examination of the movement of unemployment and claimant count rates. In particular, he uses the unemployment rate for Q4 2007 as an independent variable when examining the change in unemployment during the crisis and the claimant count when examining the change in the JSA claimants.

5.3.2 Industrial structure

The origin and propagation mechanisms of the crisis, as well as the spatial diversity or concentration of different sectors imply that the crisis may have hit different areas to varying degrees. Since its emergence in the financial sector, the initial expectation was that the downturn would mainly impact on LADs with high concentrations of employment in the financial sector. However, its propagation trajectory could mean that other sectors related or dependent on

financial services may well be affected. Thus, to broadly examine the effects of an area's industrial structure on the depth of the crisis impact, the 2007 employment shares of manufacturing (MANF), total services (TS), construction (CON) and banking, insurance and finance (BIF) sectors (SIC2007) are considered. In addition, a variable is also used to reflect the share of employment in the private sector (PRIVATE). The data is derived from the APS and similar variables are used in the studies of Lee (2014) and Hill et al. (2010).

5.3.3 Diversification

Linked to industrial structure is the examination of whether specialisation or diversity had an effect on the crisis impact on LADs. Both of these notions relate to the potential of positive externalities. Their difference lies in the source of these externalities with specialisation focusing on externalities arising from firms in the same industry and diversification on externalities coming from the diversity of economic activity. Diversification is measured by the variable INV_HHI. This is the inverse of a Herfindahl-Hirschman Index (HHI) showing the concentration of employment in fewer or more sectors of the economy by summing the squares of the sectoral employment shares (Rhoades, 1993). The index takes the form

$$HHI = \sum_{i=1}^{N} s_i^2 \qquad (1)$$

$$\text{INV\_HHI} = 1/HHI \qquad (2)$$

where *s* is the share of employment for sector *i* as an absolute value (i.e. 30 when the share is 30%). Hence, the upper limit of HHI is 10,000. The higher the value of INV_HHI, the higher is the diversification of employment and, consequently, the less the specialisation in an area. The HHI is widely used in a range of fields and is often used to measure market concentration in relation to

mergers and acquisitions (Peltzman, 2014) and for examining externalities in city and regional growth (Bishop, 2008; Dekle, 2002; Henderson, Kuncoro & Turner, 1995). It is worth mentioning that HHI is not the only available measure of industrial diversity. Similar variables have been used by Ormerod (2010) whilst Lee (2014) uses the Krugman index of specialisation and Di Caro (2017) the relative diversity measure by Duranton and Puga (2000). The HHI is chosen in this study due to its simplicity of calculation and widespread use in similar studies.

5.3.4 Entrepreneurship

Entrepreneurship is also a potential factor affecting the depth of the impact in an area. The ability to generate new firms is spatially differential and sticky in the UK whilst firm renewal may be key to mitigating the negative effects of the downturn due to its employment generating potential. In this study, entrepreneurship is represented by the 2004-2007 average ratio of new firm formation per 1000 inhabitants in each LAD (ENTR). To the author's knowledge it is the first time that this variable has been used as an explanatory variable in a quantitative analysis of the crisis impact. The decision to include the 2004-2007 average instead of the 2007 rate was taken in order to mitigate the volatility these rates may exhibit from one year to the other. Even though, as discussed earlier, entrepreneurship is geographically sticky, this volatility may negatively affect the consistency of the results. Thus, the 2004-2007 average might be thought of in terms of reflecting the current culture of entrepreneurship in a LAD, rather than the instance of entrepreneurship in a single year.

5.3.5 Human capital

Human capital is expected to have an effect on the ability of LADs to mitigate the recession. As has been noted, education is instrumental to economic growth

and the flexibility and adaptability it offers may assist individuals in coping with the crisis. These results will then translate to a lower crisis impact. However, besides educational levels, skills generated and sustained through on-the-job training may be important. Hence, in this study human capital is represented by three variables. The first is the rate of employees who received training in their workplace (TRAIN) and reflects human capital created on the job. Similar to entrepreneurship, on the job training is used in resilience analysis for the first time and as an average for the years 2004-2007 in order to reflect a culture of training rather than its instance in a specific year. The other two variables used are the 2007 shares of population with degree level qualifications (DEGREE) and no qualification holders (NO_QUAL) in LADs which have also been used in similar studies (Doran & Fingleton, 2016; Lee, 2014).

5.3.6 Demographics

In terms of demographics, different age groups have been suggested to provide different attributes related to productivity. Younger aged workers are more agile and can embrace change easier than older aged workers who with their work experience are more productive in performing existing tasks. These characteristics of the various age groups could then impact differently on the effects of the crisis on LADs. To represent demographics, the 2007 share of the age groups 20-34, 35-49 and 50-64 (AGE_20_34, AGE_35_49 and AGE_50_64) are considered. It is the first time demographics have been examined in a resilience framework.

5.3.7 Urbanisation

As already discussed, urbanisation is linked to several positive externalities related to geographical proximity of people and businesses (urbanisation, specialisation, diversification externalities) as well as to the size of local labour

and product markets. At the same time, negative externalities may arise in high density areas from congestion, giving rise to associated costs (traffic, pollution, transport costs). Since this study focuses on LADs of varying sizes and not otherwise defined cities, the level of urbanisation is approximated by the population density per square kilometre for 2007 (PopDen07).

The distribution of this variable exhibits a large right-hand tail, pointing at a left skewed distribution (figure 5.1).

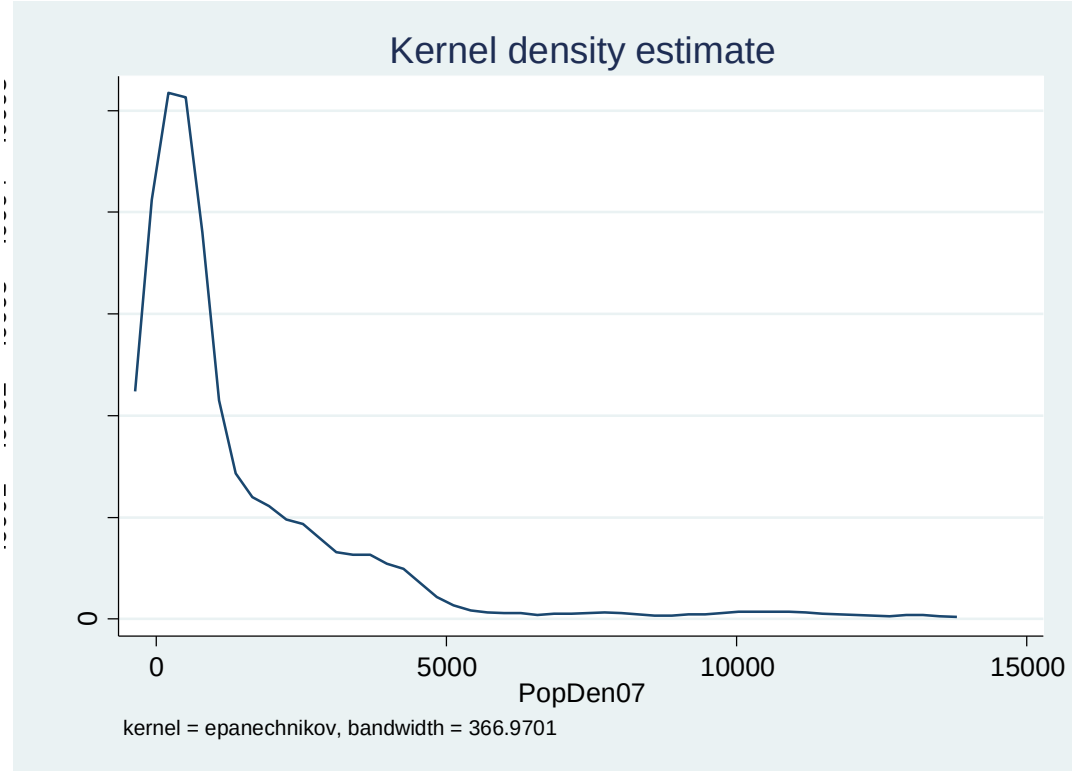

Figure 5.1: Kernel density of PopDen07

Examining the descriptive statistics in detail, the skewness of PopDen07 is 2.91 which is over the ±2 general rule of acceptable skew (George & Mallery, 2010; Gravetter & Wallnau, 2016). This could mean that the variable could have a disproportionate effect on the parameter estimates as they do not provide normally distributed errors. Indeed, the scatter plot (figure 5.2) of PopDen07 against EMIMPACT (the employment crisis impact measure) is indicative of the

potential issues for the parameter estimation. From the graph it appears that there is a cluster of observations at low population density levels together with a significant number of observations tailing to higher densities.

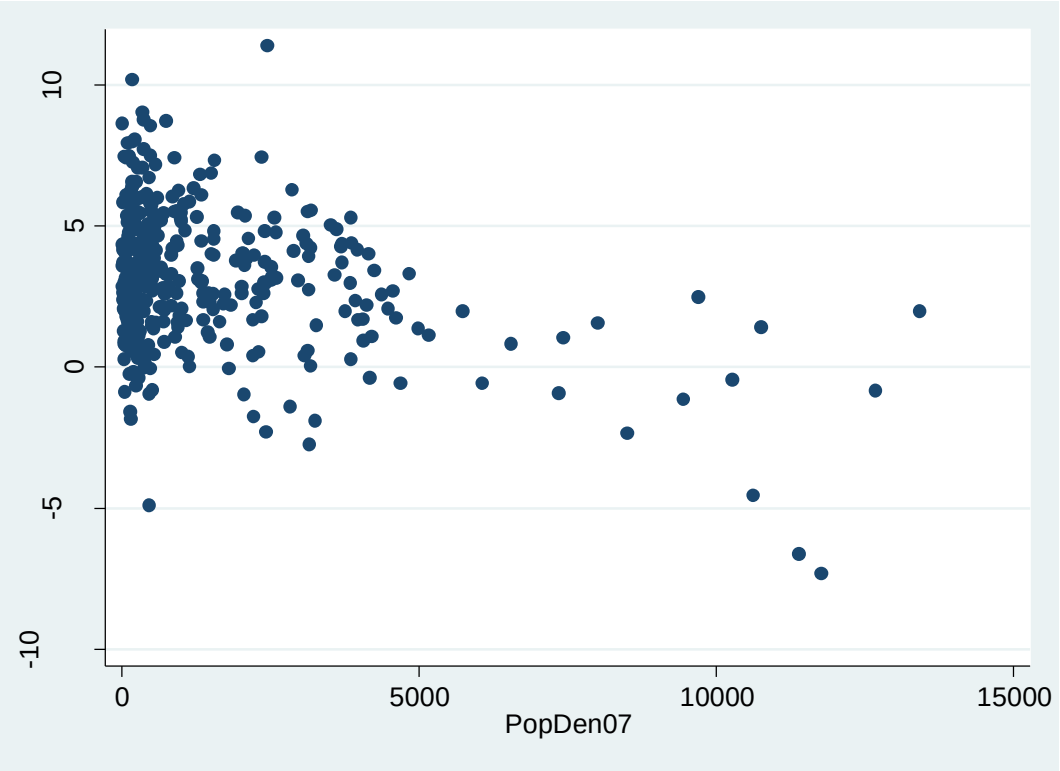

Figure 5.2: Scatterplot of PopDen07 against EMIMPACT.

In order to resolve this issue, the natural logarithm of the 2007 population density (LN_DENSITY) is used to represent urbanisation. As it can be seen from the density graph (figure 5.3) LN_DENSITY has a distribution which better approximates a normal distribution; it has a skewness of -0.11 and a more normalised plot against EMIMPACT (figure 5.4). Similar variables have been used by Bishop (2009), Capello et al. (2015) and Lee (2014) who uses the natural logarithm of employment to proxy the size of Travel-To-Work Areas in the UK.

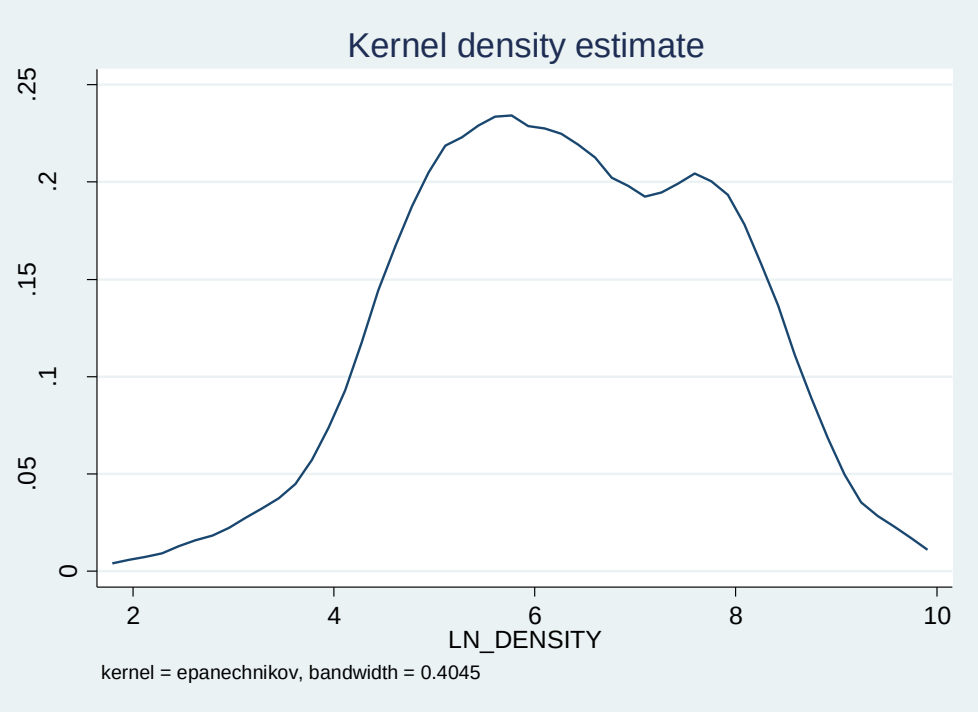

Figure 5.3: Kernel density estimate for LN_DENSITY.

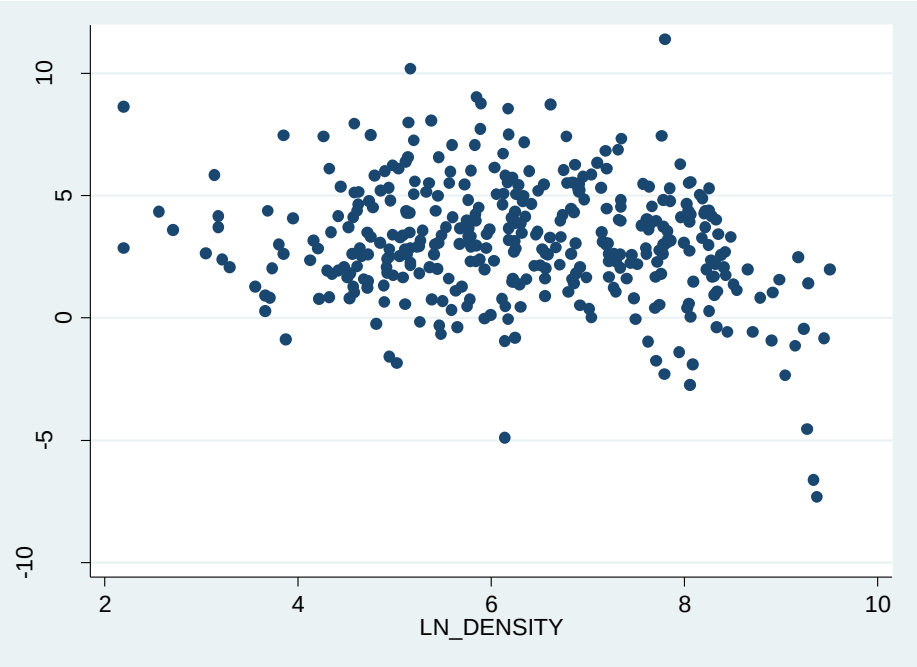

Figure 5.4: Scatterplot of LN_DENSITY against EMIMPACT.

5.3.8 Geography

Finally, it is expected that the crisis impact will be affected by explicitly geographical factors. As discussed in chapter 3, the reasons for this are the

existing and chronic geographical imbalances between regions in the UK, revolving mainly (but not exclusively) around a North-South division (Gardiner et al., 2013; Martin et al., 2016a). Part of this spatial heterogeneity is expected to be due to the differential impact of previous recessions in the 80s and 90s (Champion & Townsend, 2013; Martin, 2012), the particular industrial structure of places and the spatial stickiness of growth factors such as entrepreneurship (Bishop & Shilcof, 2016).

Significant variation is observed among regions for the eight dependent variables (table 5.11 and figure 5.5 below) and the independent variables such as DEGREE (table 5.10). The average loss of employment (EMIMPACT) in the West Midlands is approximately 10 times larger than that in London and almost twice as much as that for LADs in Wales (second lowest impact). At the same time, the unemployment increase (UNIMPACT) in the North East is more than double that for LADs in London whilst the latter has more than double the share of degree holders of the former.

On the basis of these variations, it is expected that geography could play a significant role in the resilience performance of LADs. As a result, a number of geographical area dummies are used to account for the regional differences among LADs. Variable NOE takes the value of 1 for LADs in the North of England (North East, North West and Yorkshire and the Humber regions) and 0 for the rest, variable MIDLANDS accounts for LADs in the West and East Midlands regions and SCOTLAND and WALES reflect the LADs in the respective regions. Similar variables have been used in Lee's (2014) study in the UK.

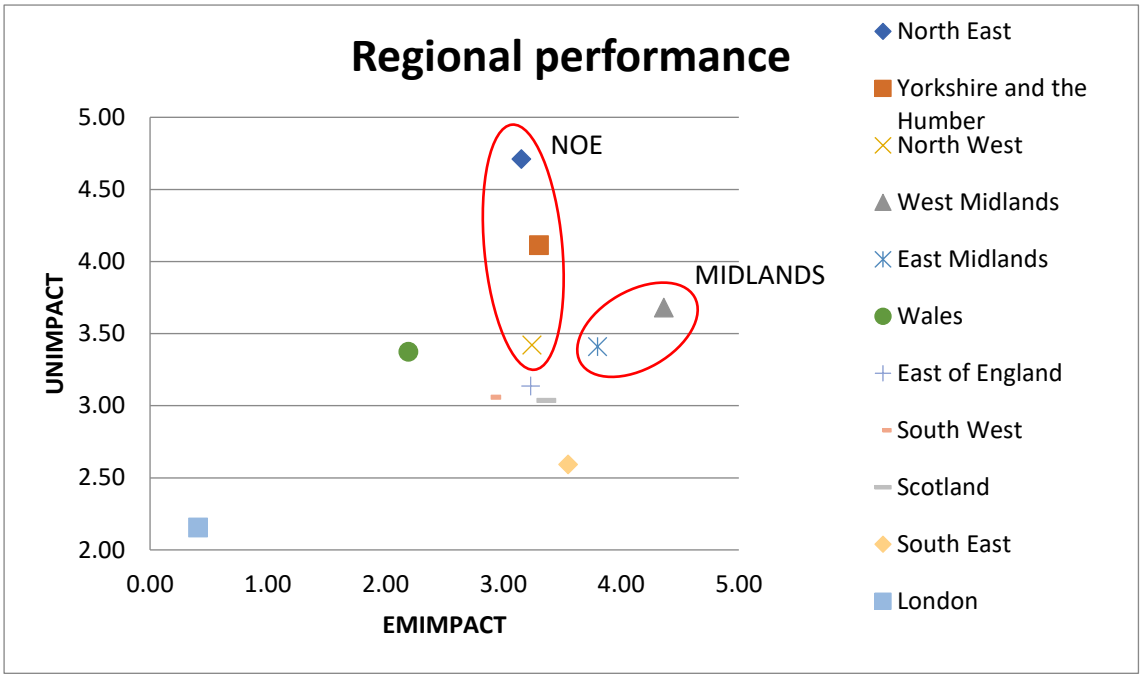

Figure 5.5: The performance of regions for EMIMPACT and UNIMPACT.

Table 5.10: Descriptive statistics of DEGREE by region.

DEGREE	Obs	Mean	Std Dev	Min	Max	CV
East Midlands	40	16.93	6.12	5.90	32.90	0.36
East of England	47	18.05	8.18	8.00	39.80	0.45
London	33	32.53	13.41	12.40	75.80	0.41
North East	12	15.26	3.79	9.70	23.50	0.25
North West	39	16.32	6.13	8.00	36.80	0.38
Scotland	32	18.05	6.35	11.30	35.00	0.35
South East	67	21.79	7.79	9.60	42.20	0.36
South West	36	18.75	6.06	7.60	34.10	0.32
Wales	22	15.93	5.09	7.90	28.30	0.32
West Midlands	30	16.77	5.61	6.10	33.00	0.33
Yorkshire and the Humber	21	16.01	5.71	7.60	29.60	0.36

Table 5.11: Regional differences of the crisis impact measures.

Region/Variable	EMPIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
North East	3.15	-5.69	3.82	-7.55	4.71	75.50	2.46	81.66
North West	3.24	-5.46	4.05	-7.45	3.42	71.53	1.74	91.66
Yorkshire and the Humber	3.30	-5.50	4.72	-8.59	4.11	92.59	1.94	98.06
West Midlands	4.36	-7.10	5.18	-9.13	3.68	88.99	1.61	86.06
East Midlands	3.80	-6.11	4.79	-8.27	3.41	81.69	1.47	94.94
Scotland	3.36	-5.59	4.15	-7.52	3.04	63.49	1.32	61.14
South East	3.55	-5.57	4.11	-7.06	2.59	68.44	1.16	99.41
South West	2.90	-4.77	3.53	-6.41	3.06	92.20	1.13	98.79
Wales	2.19	-3.92	2.97	-5.85	3.37	66.55	1.78	82.57
London	0.41	-0.52	0.92	-1.50	2.16	34.41	0.94	37.36
East of England	3.23	-5.17	3.75	-6.55	3.14	80.69	1.34	92.23

Table 5.12 provides a summary of the independent variables together with a brief explanation for ease of reference.

Table 5.12: List of variables and their definitions.

Theme	Variable	Definition
Initial economic conditions	EMAVG_2004_2007	Average employment rate 16+ 2004-2007
	EMP_2007	Employment rate 16+ 2007
	FTEAVG_2004_2007	Average full time equivalent employment rate 16+ 2004-2007
	FTE_2007	Full time equivalent employment rate 16+ 2007
	UNEMPAVG_2004_2007	Average unemployment rate 16+ 2004-2007
	UNEMP_2007	Unemployment rate 16+ 2007
	JSAAVG_2004_2007	Average JSA rate as proportion of resident population 16-64 2004-2007
	JSA_2007	JSA rate as proportion of resident population 16-64 2007
Sectoral composition of employment	MANF	Percentage of all in employment who work in - Manufacturing (C, SIC 2007) 2007
	TS	Percentage of all in employment who work in - Total Services (G-Q, SIC 2007) 2007
	BIF	Percentage of all in employment who work in - Banking, Finance and Insurance (K-N, SIC 2007) 2007

	CON	Percentage of all in employment who work in - Construction (F, SIC 2007) 2007
	PRIVATE	All persons employed in private sector as % of all persons in employment 2007
Industrial diversity	INV_HHI	Inverse of Herfindahl-Hirschman Index for employment on sections
Entrepreneurship	ENTR	Average firm birth per 1000 population 2004-2007
Employee training and human capital	TRAIN	Average % of employee training 2004-2007
	DEGREE	% of population with degree or equivalent and above 2007
	NO_QUAL	% of population with no qualifications 2007
Demographics	AGE_20_34	Population aged 20-34 as a % of total
	AGE_35_49	Population aged 35-49 as a % of total
	AGE_50_64	Population aged 50-64 as a % of total
Population density	LN_DENSITY	Natural logarithm of population density 2007
Geography	NOE	North of England dummy including former regions North East, North West and Yorkshire and the Humber
	MIDLANDS	Midlands dummy including East and West Midlands
	SCOTLAND	Scotland dummy
	WALES	Wales Dummy

5.3.9 Descriptive statistics

The descriptive statistics of the independent variables excluding the geography related dummies are presented in table 5.13. As can be seen, the variables have different characteristics with the coefficient of variation (CV) ranging from 0.063 (AGE_35_49) to 1.452 (ENTR). The table also confirms the lack of complete sets of observations across most of the variables with single year unemployment rates (UNEMP_2007) suffering the most.

Table 5.13: Independent variables' descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max	CV
EMAVG_2004_2007	378	60.44	4.53	46.40	72.15	0.075
EMP_2007	378	60.40	4.84	45.60	71.90	0.080
FTEAVG_2004_2007	378	55.59	4.83	39.04	67.77	0.087
FTE_2007	378	55.46	5.23	38.79	69.83	0.094
UNEMPAVG_2004_2007	378	4.71	1.76	1.25	12.93	0.374
UNEMP_2007	354	5.06	2.07	1.60	12.10	0.409
JSAAVG_2004_2007	380	1.86	0.95	0.53	5.28	0.511
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	0.00055	0.000056	0.00038	0.0007	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: Author's treatment from APS and ONS data.

The geography related dummy variables are also included in the table below (table 5.14) in order to assess their population. As expected, variable NOE has the most observations since it covers local authorities in the North East, North West and Yorkshire and the Humber. This is followed by variable MIDLANDS, which covers the West and East Midlands regions.

Table 5.14: Number of LADs in each geographical dummy.

Dummy variable	LADs
NOE	72
MIDLANDS	70
SCOTLAND	32
WALES	22
LONDON	33

Source: Author's treatment.

5.4 Correlation matrix

Tables 5.15-5.17 present the correlation matrices for both the dependent and independent variables. The underlined figures signal statistically insignificant correlations. Also, to assist the analysis, relatively medium to strong correlations (coefficients larger than 0.5 or smaller than -0.5) are highlighted with bold fonts.

From the tables, it is apparent that there are no strong correlations (correlation coefficients statistically significant and greater than 0.5) observed between the dependent and the independent variables. The only exceptions to this are JSAIMPACT and JSAPERIMPACT, and their medium strength relationship to other unemployment related variables such as UNEMPAVG2004_2007 or

JSA_2007 and to human capital variables such as DEGREE and NO_QUAL. This lack of significant pairwise correlations may be indicative of the nature of the study, suggesting that there is no single variable that the crisis impact depends on and that the depth of the crisis is the outcome of a number of factors at play.

Examining the relationships between the independent variables, as would be expected, there are strong correlations between variables reflecting similar or mirror concepts. For example EMAVG2004_2007 is highly and positively correlated to EMP_2007, FTEAVG2004_2007 and FTE_2007 and has a negative correlation to the unemployment related independent variables (UNEMPAVG_2004_2007 etc.). The same holds for the relationships between the industrial structure variables (correlation coefficient between MANF and TS equal to -0.8) and between DEGREE and NO_QUAL to a lesser extent.

Tables 5.15 – 5.17: Correlation matrices of dependent and independent variables.

Variable	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT	EMAVG_2004_2007	EMP_2007	FTEAVG_2004_2007
EMAVG_2004_2007	0.33	-0.24	0.26	-0.15	-0.25	0.17	-0.39	0.31	1.00		
EMP_2007	0.27	-0.18	0.21	-0.10	-0.24	0.15	-0.36	0.25	**0.92**	1.00	
FTEAVG_2004_2007	0.26	-0.17	0.28	-0.16	-0.23	0.10	-0.27	0.28	**0.94**	**0.87**	1.00
FTE_2007	0.21	-0.13	0.21	-0.10	-0.22	0.09	-0.25	0.23	**0.86**	**0.93**	**0.91**
UNEMPAVG_2004_2007	-0.35	0.32	-0.31	0.27	0.10	-0.50	0.38	-0.53	**-0.59**	**-0.51**	-0.43
UNEMP_2007	-0.27	0.24	-0.22	0.18	0.12	-0.39	0.39	-0.32	**-0.52**	**-0.52**	-0.39
JSAAVG_2004_2007	-0.21	0.17	-0.16	0.11	0.31	-0.24	0.49	**-0.58**	**-0.58**	-0.49	-0.44
JSA_2007	-0.17	0.12	-0.11	0.05	0.37	-0.18	**0.59**	-0.49	**-0.61**	**-0.52**	-0.47
MANF	0.22	-0.24	0.26	-0.26	0.32	0.22	0.39	0.25	-0.04	-0.05	0.02
TS	-0.23	0.25	-0.28	0.30	-0.31	-0.27	-0.28	-0.16	0.08	0.10	0.08
BIF	-0.23	0.26	-0.29	0.33	-0.30	-0.17	-0.32	-0.10	0.26	0.25	0.31
CON	0.10	-0.13	0.11	-0.14	0.22	0.19	0.12	0.10	-0.15	-0.17	-0.19

PRIVATE	0.06	-0.04	0.03	0.01	-0.05	0.06	-0.11	0.17	0.25	0.21	0.27
INV_HHI	0.19	-0.17	0.20	-0.17	0.07	0.19	0.03	0.19	0.29	0.26	0.29
ENTR	-0.11	0.14	-0.17	0.20	-0.40	-0.13	-0.21	-0.13	0.27	0.24	0.24
TRAIN	0.18	-0.17	0.14	-0.12	-0.08	0.07	-0.08	0.15	0.34	0.34	0.26
DEGREE	-0.24	0.28	-0.31	0.35	-0.47	-0.26	**-0.53**	-0.20	0.35	0.36	0.32
NO_QUAL	-0.05	0.01	0.01	-0.06	0.42	-0.03	**0.58**	-0.18	**-0.54**	**-0.53**	-0.40
AGE_20_34	-0.34	0.35	-0.33	0.35	-0.12	-0.37	0.04	-0.44	0.00	0.04	0.14
AGE_35_49	0.11	-0.05	0.08	0.00	-0.12	0.05	-0.13	0.17	**0.62**	**0.57**	**0.66**
AGE_50_64	0.32	-0.34	0.31	-0.34	0.07	0.36	-0.14	0.34	-0.02	-0.06	-0.16
LN_DENSITY	-0.19	0.19	-0.20	0.20	0.09	-0.21	0.31	-0.18	-0.09	-0.04	0.05

Source: Author’s treatment.

Variable	FTE_2007	UNEMPAVG_2004_2007	UNEMP_2007	JSAAVG_2004_2007	JSA_2007	MANF	TS	BIF	CON	PRIVATE	INV_HHI
FTE_2007	1.00										
UNEMPAVG_2004_2007	-0.38	1.00									
UNEMP_2007	-0.40	**0.83**	1.00								
JSAAVG_2004_2007	-0.37	**0.86**	**0.70**	1.00							
JSA_2007	-0.41	**0.84**	**0.70**	**0.98**	1.00						
MANF	0.01	-0.03	0.08	0.02	0.09	1.00					
TS	0.10	0.17	0.06	0.06	-0.01	-**0.80**	1.00				
BIF	0.30	0.07	-0.02	-0.05	-0.10	**-0.52**	**0.60**	1.00			
CON	-0.20	-0.13	-0.10	-0.06	-0.05	-0.03	-0.41	-0.30	1.00		
PRIVATE	0.25	-0.14	-0.08	-0.22	-0.21	0.13	-0.06	0.38	0.02	1.00	
INV_HHI	0.27	-0.24	-0.23	0.19	-0.17	0.19	-0.38	-0.06	0.27	0.49	1.00
ENTR	0.22	-0.16	-0.16	-0.05	-0.07	-0.30	0.06	**0.57**	-0.26	0.30	0.01
TRAIN	0.28	-0.29	-0.32	-0.25	-0.26	-0.08	0.07	0.01	-0.05	-0.18	-0.02
DEGREE	0.34	-0.06	-0.12	-0.16	-0.23	-0.46	**0.56**	**0.70**	-0.41	0.12	-0.18
NO_QUAL	-0.41	**0.54**	**0.54**	**0.61**	**0.66**	0.29	-0.26	-0.30	0.09	-0.13	-0.02

AGE_20_34	0.15	**0.61**	0.43	**0.51**	0.46	-0.25	0.44	0.42	-0.33	-0.02	-0.20
AGE_35_49	**0.61**	-0.21	-0.19	-0.20	-0.24	0.05	0.04	0.34	-0.16	0.23	0.28
AGE_50_64	-0.18	**-0.63**	-0.47	**-0.54**	-0.50	0.23	-0.46	-0.38	0.30	0.00	0.12
LN_DENSITY	0.07	**0.56**	0.44	0.50	0.49	-0.16	0.43	0.41	-0.24	0.09	-0.12

Variable	ENTR	TRAIN	DEGREE	NO_QUAL	AGE_20_34	AGE_35_49	AGE_50_64	LN_DENSITY
ENTR	1.00							
TRAIN	-0.07	1.00						
DEGREE	0.44	0.18	1.00					
NO_QUAL	-0.40	-0.42	**-0.51**	1.00				
AGE_20_34	0.15	-0.03	0.42	0.16	1.00			
AGE_35_49	0.21	0.11	0.29	-0.22	-0.05	1.00		
AGE_50_64	0.00	0.03	-0.33	-0.19	**-0.92**	-0.05	1.00	
LN_DENSITY	0.07	-0.02	0.23	0.19	**0.73**	0.05	**-0.80**	1.00

Other relationships of interest include the coefficient of 0.57 between ENTR and BIF, indicating a high concentration of new firms in this sector, as well as the positive relationship of AGE 35_49 and employment related independent variables suggesting a high propensity of this age group to be employed. The age groups 20-34 and 50-54 have opposite coefficients of similar magnitude to UNEMPAVG_2004_2007 (0.61 and -0.63 respectively) and JSAAVG_2004_2007 (0.51 and -0.54) signalling the higher probability for younger aged workers to be unemployed. NO_QUAL has an expected negative correlation to EMAVG_2004_2007 and EMP_2007 and a positive one with all the unemployment related independent variables, whilst DEGREE has a negative correlation to JSAIMPACT and positive correlation to BIF and TS indicating the relationship of human capital to employment related variables as well as a higher concentration of degree level qualification holders in the banking and general services sector. Finally, LN_DENSITY is positively correlated with UNEMPAVG_2004_2007 and the age 20-34 cohort and negatively correlated with the age 50-64 one suggesting a higher concentration of younger aged individuals in urban cores which also exhibit higher unemployment rates.

5.5 Conclusions

This chapter has outlined the construction of the eight dependent variables and the independent variables to be used in the empirical analysis. All of the dependent variables are based on labour market indicators and attempt to provide a holistic view of local labour markets and their crisis impact. The independent variables reflect the determining factors identified in the literature (chapter 3) and include a wide range of variables.

The derived dependent variables are loosely correlated with significant differences between the employment and unemployment related indicators as well as amongst the unemployment indicators themselves. This provides evidence on the complementarity of these variables and, in combination with a number of potential issues, raise interesting questions as to whether the differences between LADs, indicated by each dependent variable, will be affected by the same or different factors.

With regards to the independent variables, several of these factors such as industrial structure and specialisation have been investigated in studies of the crisis impact or economic resilience in general. However, most of these studies examine different geographical levels and, as was discussed in chapter 3, have varying results. For other potential determinants, such as demographics and entrepreneurship, it is the first time that a study examines their relationship to the crisis impact on a multitude of localities.

Unfortunately, the list of independent variables is not exhaustive. Potentially significant determinants such as agency and institutions are left out because of lack of quantitative data at the LAD level and across the LAD population. Thus far, these factors have only been examined by qualitative studies and, unless measures are created, they will continue to be better analysed in a case study context. Therefore, it is argued that in examining the crisis impact and economic resilience, quantitative and qualitative studies are complementary rather than substitutes. The next section focuses on the results and analysis of the econometric examination of the relationships between these variables.

Chapter 6 - Results

6.1 Introduction

This chapter presents the results of the econometric analysis. The models that are presented test the effect of the initial economic conditions, industrial structure, specialisation, entrepreneurship, education and training, population age structure, population density and geographical characteristics on the impact of the 2008 economic downturn. The general model takes the form:

$$Impact = a + \beta_i X_i + \varepsilon$$

where X_i is the vector of independent variables discussed in the previous chapter.

In devising the estimation strategy, all of the independent variables were initially considered simultaneously with EMIMPACT as the dependent variable. However, as can be seen from table 6.1, high VIFs for the age group 50-64 (AGE_50_64) and the total services' (TS) variables (13.58 and 12.02 respectively) confirmed multicollinearity concerns for these independents with other measures of age and industrial structure. This dictated the inclusion of different sets of variables in different specifications. Hence, across all tables of results in chapters 6 and 7, models 1 and 2 omit the total services' variable which is included in models 3-4 where the variables for manufacturing (MANF), business, insurance and finance (BIF) and construction are excluded. In addition, models 1 and 3 exclude the 50-64 age group which is included in models 2 and 4 which exclude the 20-34 group.

Table 6.1: Variance Inflation Factors tables.

Variable	VIF
AGE_50_64	13.58
TS	12.18
AGE_20_34	12.17
MANF	8.17
LN_DENSITY	4.36
BIF	3.72
DEGREE	3.63
ENTR	2.85
NO_QUAL	2.81
CON	2.74
EMP_2007	2.67
PRIVATE	2.54
AGE_35_49	2.41
SCOTLAND	2.18
INV_HHI	2.16
NOE	1.77
MIDLANDS	1.75
WALES	1.56
TRAIN	1.44
Mean VIF	4.46

Variable	VIF
TS	12.02
MANF	8.14
LN_DENSITY	4
BIF	3.72
AGE_20_34	3.63
DEGREE	3.62
NO_QUAL	2.76
ENTR	2.74
CON	2.73
EMP_2007	2.65
PRIVATE	2.54
AGE_35_49	2.15
INV_HHI	2.13
SCOTLAND	2.08
NOE	1.71
MIDLANDS	1.66
WALES	1.54
TRAIN	1.44
Mean VIF	3.4

Variable	VIF
DEGREE	3.59
AGE_20_34	3.54
LN_DENSITY	3.5
BIF	3.46
NO_QUAL	2.74
ENTR	2.69
EMP_2007	2.63
PRIVATE	2.52
MANF	2.42
AGE_35_49	2.15
SCOTLAND	2.01
INV_HHI	1.82
NOE	1.71
MIDLANDS	1.63
CON	1.57
WALES	1.54
TRAIN	1.44
Mean VIF	2.41

Following the analysis of Lee (2014), regionally clustered robust standard errors are taken. This procedure was used due to the fact that regions are the next geographical layer upwards from LADs to the country level and the process accounts for potential cluster correlation (and heteroscedasticity) arising from correlations between LADs in the same region (Wooldridge, 2015). OLS examinations assume that units of observation are independent. However, in the case of LADs, there may be a high level of spatial interdependence, especially since LADs represent administrative rather than functional economic area boundaries. For this reason, OLS estimators may be biased and thus, regionally clustered robust standard errors and regional dummies are employed to alleviate these concerns.

An alternative approach would involve spatial regressions which explicitly model spatial interactions across regional boundaries. This involves the use of spatial weight matrices and alternative estimation methods such as maximum likelihood. This approach was tested by running a set of spatial regressions using alternative spatial models. However, the spatial coefficients were invariably insignificant when using these techniques and information criteria suggested a preference for the OLS models. Hence the reported results use the OLS approach with regionally clustered robust standard errors and regional dummies to reflect regional effects.

There are eight different dependent variables representing two transformations of four labour market indicators (employment, FTE employment, unemployment and JSA rates). The first part of this chapter will focus on highlighting the relationships arising between the dependent and independent variables examining each indicator separately. For ease of presentation, and since the results are largely similar, the transformations of the same indicator (i.e. EMIMPACT and EMPERIMPACT) will be examined together. Following this, the results will be presented in a cumulative table; this is where the main part of the analysis takes place together with suggested explanations of the results.

6.2 EMIMPACT & EMPERIMPACT

In table 6.2, the dependent variable is EMIMPACT which is the nominal difference between the average employment rate 2004-2007 and the average of the four minimum employment rates between 2008 and 2014. This is the residence based rate and it refers to those aged 16+ who have done some paid work during the reference week divided by the 16+ population of an area. The higher the value of this variable, the deeper the employment impact of the crisis on a local authority. Hence, independent variables with positive coefficients will

deepen the employment impact of the crisis whilst the opposite is true for variables with negative coefficients.

Table 6.2: 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	-80.86	402.3	1512.3	2392.0
	(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

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

The second dependent variable examined (EMPERIMPACT) is conceptually similar to the first with the difference that it is the percentage difference between

the average employment rate of 2004-2007 and the average of the four lowest rates of the period 2008-2014. Acknowledging that a certain drop in employment rates may impact differently in LADs with varying levels of employment, this transformation introduces relativity to the impact of the 2008 crisis in local labour markets. In essence, it is recognised that, for example, a 5% drop in employment is less severe in a LAD with an average employment rate of 65% than in an authority with an average of 50%. In terms of the results, the transformation implies that a positive coefficient on the independent variables is contributing to the mitigation of the crisis impact whilst a negative coefficient deepens it. It also allows for the use of the average employment rate for the period 2004-2007 as an independent variable instead of the employment rate of 2007 to represent the initial conditions. With the change of this variable it is possible to account for the employment rates' volatility at the Local Authority level and provide more robust results.

Table 6.3: Results to alternative specifications for EMPERIMPACT.

	(1) EMPERIMPACT	(2) EMPERIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT
EMAVG_2004_2007	-0.596***	-0.538***	-0.583***	-0.524***
	(0.0830)	(0.0680)	(0.0820)	(0.0638)
MANF	-0.0362	-0.0283		
	(0.0516)	(0.0539)		
BIF	0.0220	0.0223		
	(0.0405)	(0.0461)		
CON	-0.0288	-0.0399		
	(0.0584)	(0.0722)		
TS			-0.0312	-0.0498
			(0.0548)	(0.0487)
PRIVATE	0.0122	0.00539	-0.00202	-0.00711
	(0.0541)	(0.0643)	(0.0391)	(0.0488)
INV_HHI	2592.3	1608.4	-532.0	-2366.5
	(6778.6)	(6942.9)	(6902.5)	(6581.7)
ENTR	-0.245**	-0.149	-0.174*	-0.0688
	(0.0963)	(0.0993)	(0.0949)	(0.0763)
TRAIN	-0.186	-0.216	-0.223	-0.257*
	(0.124)	(0.133)	(0.125)	(0.134)
DEGREE	0.0822	0.0996*	0.0889**	0.109**
	(0.0477)	(0.0477)	(0.0367)	(0.0351)
NO_QUAL	-0.195**	-0.193**	-0.179**	-0.181**
	(0.0731)	(0.0612)	(0.0723)	(0.0605)
AGE_20_34	0.440***		0.461***	
	(0.0574)		(0.0543)	
AGE_35_49	1.075***	0.718***	1.061***	0.694***
	(0.221)	(0.202)	(0.217)	(0.187)
AGE_50_64		-0.828***		-0.883***
		(0.164)		(0.156)
LN_DENSITY	-0.911***	-0.924***	-0.936***	-0.946***
	(0.191)	(0.252)	(0.204)	(0.252)
NOE	-1.704***	-1.232**	-2.016***	-1.544***
	(0.463)	(0.448)	(0.345)	(0.302)
MIDLANDS	-1.212***	-0.729	-1.723***	-1.247***
	(0.355)	(0.419)	(0.242)	(0.298)
SCOTLAND	-2.723***	-1.634**	-2.934***	-1.814***
	(0.522)	(0.525)	(0.554)	(0.546)
WALES	-0.882	-0.311	-1.425**	-0.866
	(0.634)	(0.653)	(0.574)	(0.598)
_cons	8.168	36.33***	12.07*	43.47***
	(7.195)	(10.09)	(5.508)	(7.926)
N	373	373	378	378
r2	0.366	0.351	0.360	0.346

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

The results in both tables highlight a number of interesting points. First, the initial economic conditions, whether measured by the employment rate in 2007 (table 6.2) or the average 2004-2007 (table 6.3), are consistently significant at the 1% level and have a positive sign when examining EMIMPACT and a

negative sign when using EMPERIMPACT as the dependent variable. Given the different meaning of the coefficients' sign in the two transformations, these results suggest that LADs with greater employment rates before the onset of the crisis, exhibited the greatest losses of employment in the period 2008-2014, irrespective of the measures used.

The employee training variable has statistically significant and positive coefficients at the 10% level for EMIMPACT, implying that LADs with greater shares of employee training have had deeper impact from the downturn. This effect is largely lost when examining EMPERIMPACT, with the exception of model 4 which confirms the findings for EMIMPACT. The other two human capital variables verify the initial hypothesis. The share of degree holders in an area is consistently statistically significant in all the models except model 1 for EMPERIMPACT. The coefficients have a negative sign for EMIMPACT and a positive sign for EMPERIMPACT implying that places with a higher share of degree holders have lost less of their employment during the 2008 downturn. Similarly, the coefficients for the share of population with no qualifications are statistically significant and have a positive sign for EMIMPACT and a negative sign for EMPERIMPACT, further enhancing the human capital hypothesis that high levels of human capital have mitigated the crisis impact in LADs.

The demographic structure of a LAD also emerges as a significant factor for the employment impact on different areas. Models 1 and 3 consider the differences between the age groups 20-34 and 35-49. Both the variables have consistently significant coefficients whilst the direction of the effect implies that the higher the population share of these age groups, the greater the mitigation of the employment impact will be. The F-test for the equality of the coefficients,

however, provides mixed results. In the case of EMIMPACT, the F-test does not clarify if one of the groups has a greater contribution than the other and thus, the effects should be assumed to be equal. On the other hand, when examining EMPERIMPACT, the F-test confirms a statistically significant difference between the coefficients and hence the 35-49 cohort contributes more in mitigating the crisis impact.

Models 2 and 4 consider the age groups 35-49 and 50-64. In these cases, the coefficient for the 35-49 age group maintains its sign but exhibits inconsistencies with regards to its statistical significance. For EMIMPACT, it is not statistically significant in model 2 and it is significant at the 10% level in model 4. For EMPERIMPACT, the coefficients are statistically significant but their size is reduced by approximately 30% compared to models 1 and 3. For the 50-64 group, the coefficients are more consistent. They are significant and positive for EMIMPACT and significant and negative for EMPERIMPACT, indicating a detrimental effect of high shares of population in this group on the employment impact of the 2008 downturn. These findings provide some evidence for an inverted U-shaped relationship between demographics and resilience, suggesting a mixture of flexibility and experience as factors mitigating the employment impact.

Population density also provides consistent results across all models. The coefficients for LN_DENSITY are positive for EMIMPACT and negative for EMPERIMPACT, exhibiting a deepening effect of urbanisation on the employment impact of the 2008 downturn. Also detrimental are the effects for LADs in North of England (except for model 2 for EMIMPACT), Midlands (except from model 2 in both tables) and Scotland (only in models 1 and 3 for

EMIMPACT). This implies that areas in these regions have generally performed worse than LADs in the rest of the country. The dummy variable for local authorities in Wales provides statistically significant results only in model 3 for EMPERIMPACT with a negative sign suggesting a deepened impact for LADs in Wales. However, the inconsistency in the significance of this latter result does not allow the extraction of conclusive findings.

The entrepreneurship variable provides some inconclusive and counterintuitive results. ENTR exhibits statistically significant (only in models 1 and 3 in both tables) positive coefficients for EMIMPACT and negative coefficients for EMPERIMPACT and statistically insignificant coefficients for models 2 and 4 in both tables. The signs of the coefficients suggest that greater firm formation before the start of the crisis is associated with deeper employment impact whilst the lack of consistency in the statistical significance of the results indicates sensitivity to the precise model specification. These results are further discussed at the end of the chapter when the cumulative results are considered.

Finally, in terms of sectoral employment, all the models point to the same conclusion. The sectoral employment variables are statistically insignificant across all models and the same holds for the share of employment in the private sector. In addition, INV_HHI does not provide any statistically significant results, failing to support the argument that the degree of diversification in a local economy plays a role in the impact of the 2008 crisis in GB LADs.

The independent variables explain approximately 30% of EMIMPACT's and 35% of EMPERIMPACT's variation. These figures on explanatory power are reasonable considering the cross-section nature of the model and heterogeneity of LADs and are not uncommon in studies of this type (Wooldridge, 2015).

6.3 FTEIMPACT & FTEPERIMPACT

The third and fourth dependent variables (FTEIMPACT & FTEPERIMPACT) refer to the full-time equivalent employment. The regressions examine the relationship between the nominal and percentage distance of the average 2004-2007 FTE employment rate and the average of the four lowest rates in 2008-2014 and the independent variables. The only difference from the prior regressions is that the control variable for the initial economic conditions is now the FTE employment rate in 2007 for FTEIMPACT and the average 2004-2007 for FTEPERIMPACT. Due to the dependent variable calculation, a positive coefficient is interpreted as a deepening factor of the 2008 crisis' employment impact on LADs whilst a negative sign on the coefficients signals a mitigating effect for FTEIMPACT. The opposite is true for FTEPERIMPACT.

Table 6.4: Results to alternative specifications for FTEIMPACT.

	(1) FTEIMPACT	(2) FTEIMPACT	(3) FTEIMPACT	(4) FTEIMPACT
FTE_2007	0.237***	0.218***	0.249***	0.229***
	(0.0271)	(0.0215)	(0.0292)	(0.0232)
MANF	-0.0124	-0.0152		
	(0.0321)	(0.0342)		
BIF	-0.0395	-0.0384		
	(0.0450)	(0.0476)		
CON	-0.0185	-0.0134		
	(0.0443)	(0.0512)		
TS			0.0251	0.0342
			(0.0248)	(0.0236)
PRIVATE	-0.0249	-0.0206	-0.0415	-0.0378
	(0.0326)	(0.0380)	(0.0299)	(0.0345)
INV_HHI	803.9	1302.7	3259.9	4145.2
	(5193.4)	(5400.5)	(4887.4)	(4846.6)
ENTR	0.114	0.0625	0.0914	0.0376
	(0.0707)	(0.0696)	(0.0652)	(0.0631)
TRAIN	0.143	0.152*	0.166*	0.176*
	(0.0805)	(0.0839)	(0.0867)	(0.0910)
DEGREE	-0.0675*	-0.0745**	-0.0780***	-0.0864***
	(0.0334)	(0.0326)	(0.0238)	(0.0231)
NO_QUAL	0.0710	0.0759**	0.0688*	0.0745**
	(0.0395)	(0.0324)	(0.0380)	(0.0310)
AGE_20_34	-0.229***		-0.232***	
	(0.0451)		(0.0405)	
AGE_35_49	-0.395***	-0.224**	-0.418***	-0.246**
	(0.104)	(0.100)	(0.0999)	(0.101)
AGE_50_64		0.451***		0.461***
		(0.102)		(0.0917)
LN_DENSITY	0.259***	0.304**	0.249**	0.290**
	(0.0804)	(0.125)	(0.103)	(0.120)
NOE	0.742	0.525	0.915**	0.704*
	(0.416)	(0.430)	(0.332)	(0.323)
MIDLANDS	0.862***	0.608*	1.124***	0.887***
	(0.253)	(0.297)	(0.159)	(0.167)
SCOTLAND	0.577**	0.0814	0.697**	0.201
	(0.243)	(0.296)	(0.255)	(0.289)
WALES	-0.367	-0.608	-0.0399	-0.265
	(0.326)	(0.379)	(0.279)	(0.314)
_cons	2.134	-13.68***	-0.694	-17.56***
	(2.863)	(3.574)	(2.555)	(2.685)
N	373	373	378	378
r2	0.324	0.319	0.328	0.324

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 6.5: Results to alternative specifications for FTEPERIMPACT.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT	(3) FTEPERIMPACT	(4) FTEPERIMPACT
FTEAVG_2004_2007	-0.607***	-0.520***	-0.600***	-0.513***
	(0.0564)	(0.0567)	(0.0571)	(0.0574)
MANF	0.0198	0.0240		
	(0.0505)	(0.0551)		
BIF	0.0716	0.0668		
	(0.0626)	(0.0692)		
CON	-0.00750	-0.0239		
	(0.0660)	(0.0794)		
TS			-0.0317	-0.0534
			(0.0445)	(0.0410)
PRIVATE	0.0562	0.0434	0.0832	0.0718
	(0.0519)	(0.0673)	(0.0493)	(0.0615)
INV_HHI	1596.1	376.4	-4571.5	-6752.6
	(8142.0)	(8709.4)	(8310.1)	(8304.5)
ENTR	-0.252**	-0.131	-0.194*	-0.0669
	(0.105)	(0.104)	(0.0994)	(0.0860)
TRAIN	-0.162	-0.200	-0.227	-0.269
	(0.138)	(0.148)	(0.149)	(0.161)
DEGREE	0.0961*	0.123**	0.108***	0.139***
	(0.0521)	(0.0549)	(0.0323)	(0.0346)
NO_QUAL	-0.189***	-0.182***	-0.168***	-0.165***
	(0.0564)	(0.0467)	(0.0528)	(0.0442)
AGE_20_34	0.563***		0.575***	
	(0.0517)		(0.0379)	
AGE_35_49	1.411***	0.916***	1.419***	0.915***
	(0.213)	(0.221)	(0.205)	(0.215)
AGE_50_64		-0.996***		-1.028***
		(0.153)		(0.130)
LN_DENSITY	-0.853***	-0.824**	-0.912***	-0.870***
	(0.196)	(0.264)	(0.219)	(0.262)
NOE	-1.976**	-1.413*	-2.235***	-1.682**
	(0.711)	(0.707)	(0.577)	(0.538)
MIDLANDS	-1.307***	-0.771*	-1.772***	-1.270***
	(0.331)	(0.411)	(0.253)	(0.276)
SCOTLAND	-2.271***	-0.951	-2.617***	-1.273*
	(0.493)	(0.584)	(0.625)	(0.641)
WALES	-0.153	0.516	-0.859	-0.216
	(0.621)	(0.737)	(0.671)	(0.737)
_cons	-10.96*	24.44***	-6.394	31.83***
	(5.307)	(7.173)	(5.674)	(7.123)
N	373	373	378	378
r2	0.394	0.371	0.380	0.357

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Consistent with the previous results, the initial economic conditions have a deepening effect on the crisis impact. For FTEIMPACT, the coefficients are consistently significant and positive implying that LADs which had larger initial FTE employment rates had a deeper impact from the 2008 downturn. The same is true for FTEPERIMPACT where the coefficients are statistically significant at the 1% level across all models.

The share of degree holders in LADs has a mitigating effect on the downturn's impact in terms of FTE employment. This effect is consistent across all models for both FTEIMPACT and FTEPERIMPACT and is in agreement with previous results. The share of population with no qualifications has a statistically significant and worsening effect in models 2, 3 and 4 for FTEIMPACT. This effect is more robust when considering FTEPERIMPACT where NO_QUAL exhibits consistently significant and negative coefficients across all models.

Employee training exhibits the sign and statistical significance of the coefficients seen before in models 2, 3 and 4 for FTEIMPACT, deepening the employment impact of the crisis. This effect proves sensitive to the dependent variable used, since the coefficients are not statistically significant when examining the effect of employee training on FTEPERIMPACT.

Demographics also add robustness to the results for EMIMPACT and EMPERIMPACT, providing further evidence for an inverted U-shaped relationship. Models 1 and 3 consider the differences between the age groups 20-34 and 35-49. Both the variables have consistently significant coefficients with signs which imply that the higher the population share of these age groups the greater the mitigation of the crisis impact. In the case of FTEPERIMPACT, the F-test confirms the larger contribution of the latter (35-49) compared to the

former (20-34) group. However, this does not hold for FTEIMPACT where the F-test for the equality of the coefficients fails to reject the null hypothesis at the 5% level.

Models 2 and 4 consider the age groups 35-49 and 50-64. The 35-49 age group maintains its significance and direction of effect whilst the coefficients for the 50-64 group are statistically significant and indicate a detrimental effect of high shares of population in the group on the FTE employment impact.

Population density has statistically significant coefficients across all models. The signs of the coefficients indicate a deepening effect on the crisis impact, which is in agreement to the results for EMIMPACT and EMPERIMPACT. The dummies for North of England, Midlands and Scotland (excluding model 2) signal a deeper impact on LADs in these areas. For FTEPERIMPACT the results are similar as to the nature of the effect (detrimental to resilience) but less robust. In particular, whilst the coefficients for Midlands are consistently significant, those for North of England are significant only in models 3 and 4 and for Scotland they are significant only in models 1 and 3.

In no specification do the industrial structure variables show statistically significant coefficients and the same holds for the index of specialisation (INV_HHI). Entrepreneurship exhibits statistically significant and negative coefficients in models 1 and 3 for FTEPERIMPACT but not statistically significant coefficients for any other model. This is consistent with the results seen for EMIMPACT and EMPERIMPACT and signals the sensitivity of any statistically significant results on entrepreneurship.

The explanatory power of the models ranges from approximately 32% for FTEIMPACT to 36% for FTEPERIMPACT. These figures are similar to those observed for EMIMPACT and EMPERIMPACT.

6.4 UNIMPACT & UNPERIMPACT

The fifth and sixth dependent variables are related to unemployment rates. Due to the different meaning of these variables compared to employment (where the higher the rate the better), the calculation for the unemployment (as well as JSA) related dependent variables follows a conceptually similar but operationally different methodology. Variable UNIMPACT is the difference between the average of the four maximum unemployment rates for each LAD in the period 2008-2014 and the average unemployment rate for 2004-2007 and variable UNPERIMPACT is the percentage change of this difference. Due to the calculation of UNIMPACT and UNPERIMPACT, positive coefficients on the independent variables signal a deepening effect on the crisis impact whilst variables with negative coefficients help mitigate the effects of the downturn. The average unemployment rate for 2004-2007 is used as an independent variable to reflect the initial economic conditions when considering UNPERIMPACT whilst the 2007 unemployment rate is used in the models with UNIMPACT as the dependent variable.

Table 6.6: Results to alternative specifications for UNIMPACT.

	(1) UNIMPACT	(2) UNIMPACT	(3) UNIMPACT	(4) UNIMPACT
UNEMP_2007	-0.106**	-0.0981*	-0.105*	-0.0943*
	(0.0454)	(0.0442)	(0.0471)	(0.0463)
MANF	0.0457**	0.0439**		
	(0.0202)	(0.0189)		
BIF	0.0376*	0.0379*		
	(0.0185)	(0.0191)		
CON	0.0771***	0.0794***		
	(0.0190)	(0.0191)		
TS			-0.0126	-0.00956
			(0.0205)	(0.0198)
PRIVATE	-0.00529	-0.00489	0.0152	0.0152
	(0.0206)	(0.0208)	(0.0229)	(0.0234)
INV_HHI	-937.0	-761.4	-355.4	-1.125
	(2001.7)	(2052.3)	(1995.4)	(1926.6)
ENTR	-0.0890	-0.0993	-0.0984	-0.112
	(0.0690)	(0.0640)	(0.0708)	(0.0653)
TRAIN	0.0454	0.0474	0.0539	0.0560
	(0.0378)	(0.0361)	(0.0399)	(0.0387)
DEGREE	-0.0384***	-0.0398***	-0.0338***	-0.0364***
	(0.00962)	(0.00925)	(0.00903)	(0.00878)
NO_QUAL	0.0990***	0.101***	0.0976***	0.100***
	(0.0138)	(0.0140)	(0.0144)	(0.0148)
AGE_20_34	-0.0486*		-0.0644**	
	(0.0241)		(0.0260)	
AGE_35_49	-0.0591	-0.0284	-0.0480	-0.00902
	(0.0503)	(0.0518)	(0.0529)	(0.0571)
AGE_50_64		0.106*		0.139**
		(0.0534)		(0.0566)
LN_DENSITY	0.276**	0.294**	0.349***	0.368***
	(0.0940)	(0.0973)	(0.0880)	(0.0922)
NOE	0.367	0.322	0.415	0.352
	(0.268)	(0.248)	(0.312)	(0.289)
MIDLANDS	0.180	0.124	0.220	0.145
	(0.156)	(0.169)	(0.136)	(0.147)
SCOTLAND	0.0347	-0.0700	0.104	-0.0296
	(0.244)	(0.219)	(0.236)	(0.212)
WALES	-0.0569	-0.101	0.0648	0.00909
	(0.198)	(0.202)	(0.237)	(0.239)
_cons	2.801	-0.948	3.088	-2.035
	(1.805)	(1.628)	(3.274)	(3.154)
N	351	351	352	352
r2	0.379	0.379	0.360	0.360

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 6.7: Results to alternative specifications for UNPERIMPACT.

	(1) UNPERIMPACT	(2) UNPERIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT
UNEMPAVG_2004_2007	-17.65***	-17.59***	-17.11***	-16.95***
	(2.231)	(2.255)	(2.103)	(2.101)
MANF	1.119**	1.119**		
	(0.449)	(0.427)		
BIF	1.356**	1.353**		
	(0.465)	(0.460)		
CON	1.574**	1.558**		
	(0.631)	(0.623)		
TS			-0.250	-0.231
			(0.499)	(0.491)
PRIVATE	-0.736	-0.737*	-0.118	-0.117
	(0.408)	(0.406)	(0.475)	(0.476)
INV_HHI	-16822.6	-16376.8	-4105.9	-1602.6
	(39128.8)	(39302.7)	(35845.7)	(34487.2)
ENTR	-1.076	-1.068	-1.127	-1.229
	(1.324)	(1.393)	(1.450)	(1.508)
TRAIN	-1.055	-1.050	-0.847	-0.826
	(0.813)	(0.813)	(0.856)	(0.853)
DEGREE	-0.885**	-0.863**	-0.622*	-0.613*
	(0.319)	(0.280)	(0.307)	(0.278)
NO_QUAL	2.007***	2.011***	1.877***	1.901***
	(0.388)	(0.400)	(0.399)	(0.408)
AGE_20_34	0.134		-0.348	
	(0.824)		(0.874)	
AGE_35_49	-0.868	-0.944	-0.304	-0.0907
	(1.090)	(1.000)	(1.097)	(1.156)
AGE_50_64		-0.110		0.965
		(1.765)		(1.903)
LN_DENSITY	4.578*	4.702*	6.812**	7.095**
	(2.077)	(2.170)	(2.177)	(2.428)
NOE	5.548	5.567	6.423	5.973
	(6.657)	(6.565)	(7.346)	(7.156)
MIDLANDS	4.294	4.344	5.485	4.961
	(3.695)	(4.285)	(3.738)	(4.123)
SCOTLAND	-4.641	-4.398	-2.563	-3.427
	(4.805)	(4.983)	(5.208)	(5.387)
WALES	-6.479	-6.430	-3.633	-4.077
	(4.088)	(4.528)	(5.320)	(5.564)
_cons	173.0***	177.5**	157.9*	123.6
	(41.95)	(62.52)	(84.34)	(96.60)
N	365	365	366	366
r2	0.424	0.424	0.399	0.399

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

In the case of the unemployment related dependent variables, the initial economic conditions maintain the same effect on the crisis impact measures as observed in previous equations. The level of unemployment has consistently

significant and negative coefficients suggesting that places with greater unemployment rates before the start of the crisis have had smaller increases (both in absolute and percentage terms) of unemployment post-2008.

From the industrial structure variables, employment in manufacturing, banking, insurance and finance and construction in 2007 have a deepening effect on the crisis impact for both UNIMPACT and UNPERIMPACT. The F-test for the difference between the coefficients did not confirm a statistically significant difference and hence the effect of these variables is assumed to be uniform. The identification of statistically significant results is a difference from the analysis of employment related variables and will be discussed in the cumulative results section at the end of the chapter. The share of employment in the private sector (PRIVATE) exhibits statistically significant and negative coefficients only in model 2 for UNPERIMPACT suggesting that employment in the public sector was detrimental to the performance of LADs during the crisis. The result shows sensitivity to alternative specifications so it is subject to further validation before considering it as robust evidence.

DEGREE and NO_QUAL are consistently significant and their coefficients have the expected signs confirming the results so far and the expectations from theory. LADs with higher rates of degree holders have seen smaller increases in unemployment whilst areas with high rates of no qualification holders have had a deeper impact measured in both absolute and percentage terms.

The results for population density are consistent with the results so far with more populous LADs having a greater increase in unemployment rates post 2008. On the other hand, demographics do not exhibit the same importance shown in the previous regressions. Only the groups 20-34 and 50-64 provide

statistically significant results and this occurs only for UNIMPACT. However, these results are still consistent with previous results. The group 20-34 has negative coefficients, mitigating the crisis impact whilst the group 50-64 has positive coefficients which signal a deepening effect on the impact of the downturn.

Contrary to the results in the sections above, the geographical dummies are insignificant across all models for both UNIMPACT and UNPERIMPACT. Less surprisingly, the same holds for employment in total services, diversification, entrepreneurship and employee training which do not exhibit statistically significant results. The explanatory power of the models ranges from 36% to approximately 42.5% of the variation of the dependent variables which is an improvement compared to the figures observed so far.

6.5 JSAIMPACT & JSAPERIMPACT

The final pair of dependent variables examined (JSAIMPACT and JSAPERIMPACT) relate to JSA claimant rates. These variables consider the difference between the average of the four maximum rates for 2008-2014 and the average for 2004-2007 in both nominal (JSAIMPACT) and percentage (JSAPERIMPACT) terms. The JSA 2007 rates are used with JSAIMPACT to reflect the initial economic conditions whilst the average 2004-2007 is used with JSAPERIMPACT. Due to the calculation of the dependent variables, coefficients with positive signs signal factors which deepen the crisis' impact whilst negative coefficients identify those which assist LADs in mitigating its effects.

Table 6.8: Results to alternative specifications for JSAIMPACT.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAIMPACT	(4) JSAIMPACT
JSA_2007	0.186**	0.193**	0.177*	0.183**
	(0.0821)	(0.0788)	(0.0823)	(0.0801)
MANF	0.0192*	0.0186*		
	(0.00990)	(0.00927)		
BIF	0.0103*	0.0105*		
	(0.00535)	(0.00553)		
CON	0.0103	0.0113		
	(0.00770)	(0.00808)		
TS			-0.00391	-0.00265
			(0.00803)	(0.00771)
PRIVATE	0.0131**	0.0135**	0.0171**	0.0174***
	(0.00488)	(0.00470)	(0.00559)	(0.00547)
INV_HHI	-253.6	-210.7	-319.4	-227.3
	(411.4)	(382.9)	(558.7)	(498.0)
ENTR	-0.0440	-0.0498	-0.0462	-0.0523*
	(0.0313)	(0.0275)	(0.0317)	(0.0280)
TRAIN	0.0463**	0.0469**	0.0471**	0.0478**
	(0.0178)	(0.0178)	(0.0188)	(0.0189)
DEGREE	-0.0173***	-0.0182***	-0.0172**	-0.0183**
	(0.00514)	(0.00498)	(0.00596)	(0.00597)
NO_QUAL	0.0207**	0.0215**	0.0236***	0.0245***
	(0.00741)	(0.00827)	(0.00671)	(0.00765)
AGE_20_34	-0.0281***		-0.0284***	
	(0.00696)		(0.00721)	
AGE_35_49	0.00859	0.0261	0.0226	0.0399
	(0.0210)	(0.0202)	(0.0234)	(0.0226)
AGE_50_64		0.0570**		0.0575**
		(0.0184)		(0.0215)
LN_DENSITY	0.166***	0.171***	0.176***	0.180***
	(0.0303)	(0.0337)	(0.0318)	(0.0345)
NOE	0.408***	0.383***	0.421**	0.397***
	(0.128)	(0.112)	(0.141)	(0.124)
MIDLANDS	0.0711	0.0385	0.113	0.0816
	(0.0669)	(0.0577)	(0.0829)	(0.0692)
SCOTLAND	0.151	0.0866	0.117	0.0535
	(0.185)	(0.155)	(0.192)	(0.161)
WALES	0.450***	0.423***	0.458***	0.433***
	(0.104)	(0.0876)	(0.123)	(0.104)
_cons	-1.196*	-3.208***	-1.089	-3.211**
	(0.586)	(0.792)	(1.049)	(1.259)
N	373	373	378	378
r2	0.691	0.689	0.680	0.678

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 6.9: Results to alternative specifications for JSAPERIMPACT.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT	(3) JSAPERIMPACT	(4) JSAPERIMPACT
JSAAVG_2004_2007	-26.08***	-26.75***	-26.79***	-27.36***
	(2.266)	(2.319)	(2.111)	(2.218)
MANF	0.786	0.788		
	(0.493)	(0.485)		
BIF	0.931**	0.959**		
	(0.315)	(0.335)		
CON	0.157	0.293		
	(0.589)	(0.593)		
TS			0.235	0.282
			(0.410)	(0.413)
PRIVATE	0.286	0.286	0.533	0.552
	(0.365)	(0.394)	(0.369)	(0.396)
INV_HHI	-31510.4	-34502.3	-29968.2	-29503.6
	(31139.0)	(32118.0)	(31679.8)	(30142.8)
ENTR	-1.961	-2.099	-1.896	-2.071
	(1.257)	(1.194)	(1.310)	(1.264)
TRAIN	1.036	1.005	1.125	1.108
	(0.951)	(0.964)	(0.868)	(0.882)
DEGREE	-0.758*	-0.927**	-0.663	-0.831*
	(0.374)	(0.376)	(0.398)	(0.406)
NO_QUAL	1.083**	1.063**	1.329***	1.295***
	(0.406)	(0.433)	(0.331)	(0.378)
AGE_20_34	-1.270**		-1.249**	
	(0.484)		(0.480)	
AGE_35_49	2.209**	2.970**	3.279***	4.005***
	(0.879)	(1.046)	(0.931)	(1.090)
AGE_50_64		1.398		1.429
		(1.005)		(1.124)
LN_DENSITY	6.296***	5.392**	6.739***	5.857**
	(1.847)	(2.028)	(1.864)	(1.961)
NOE	11.96***	11.61***	12.64**	12.36***
	(3.477)	(3.126)	(4.065)	(3.627)
MIDLANDS	-0.300	-0.981	2.210	1.604
	(3.453)	(3.383)	(3.738)	(3.534)
SCOTLAND	-8.796*	-11.23**	-10.19**	-12.47**
	(4.469)	(3.899)	(4.479)	(3.994)
WALES	7.534**	6.778**	7.779**	7.292**
	(2.809)	(2.931)	(2.853)	(2.664)
_cons	41.91	-12.23	-3.601	-62.62
	(40.51)	(72.63)	(53.12)	(90.03)
N	373	373	378	378
r2	0.598	0.589	0.585	0.576

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

The main human capital variables maintain the results identified so far. The shares of degree holders and no qualification holders are consistently significant (except for DEGREE in model 3 for JSAPERIMPACT) across all

models with the expected signs for the coefficients, enhancing the result that higher human capital levels have helped LADs mitigate the crisis impact. Employee training exhibits consistently significant and positive coefficients when examining JSAIMPACT, confirming its relationship to the crisis impact identified in previous regressions but there are no statistically significant coefficients for JSAPERIMPACT.

Population density and geography also provide consistently significant coefficients. This suggests that LADs with high population densities before the start of the crisis have had higher increases in the JSA rate. The North of England and Wales have consistently significant and positive coefficients when examining the two dependent variables and this is the case for Scotland for JSAPERIMPACT. These results suggest a higher increase in JSA rates for LADs in these regions than the rest of the UK.

The initial conditions provide statistically significant but opposing results. When examining JSAIMPACT, the coefficients for JSA_2007 are positive implying that LADs with high JSA claimant rates just before the start of the crisis have experienced greater impact than those with smaller rates. This is a reversal of the results seen so far and its potential causes will be discussed in the cumulative results section. On the other hand, when examining JSAPERIMPACT, the initial conditions appear consistently significant with negative coefficients. Thus, LADs with high JSA claimant rates just before the start of the crisis have had smaller percentage increases than those with smaller pre-crisis rates. These results are indicative of the difference in considering the absolute or the relative change in the dependent variables used.

In terms of demographics, the age group 20-34 shows consistently significant coefficients across all models with negative signs, assisting the mitigation of the crisis impact. The group 35-49 has consistently significant and positive coefficients in all models when JSAPERIMPACT is examined whilst the 50-64 group is statistically significant only with JSAIMPACT and it exhibits positive coefficients, deepening the impact of the crisis.

Finally, in terms of the sectoral composition, the shares of employment in manufacturing (only with JSAIMPACT) and banking, insurance and finance have statistically significant and positive coefficients, suggesting a deepening crisis impact on LADs. The F-test failed to confirm a statistically significant difference between the coefficients for the two variables. The share of employment in the private sector also provides statistically significant and positive coefficients only for JSAIMPACT, whilst entrepreneurship exhibits inconsistently significant and positive coefficients (model 4 for JSAIMPACT) and diversity does not provide significant results.

The results for the JSA related dependent variables are indicative of the differences between the nominal and percentage transformation with the majority of the statistically significant independent variables exhibiting inconsistencies between JSAIMPACT and JSAPERIMPACT. The explanatory power of the models is approximately 69% for JSAIMPACT and 58% for JSAPERIMPACT, a significant increase compared to the results so far.

6.6 Cumulative results

This section reviews the results cumulatively. Table 6.10 shows the results using “D” for a detrimental effect and “M” for a mitigating effect on the crisis impact. In brackets, the number of statistically significant coefficients is shown out of the total number of models that the independent variables were used in.

For example, the independent variable reflecting the initial conditions in a LAD (STARTING POINT) has statistically significant coefficients indicating a detrimental effect on EMIMPACT in four out of four model specifications used. In contrast, variable ENTR has provided statistically significant coefficients pointing to a detrimental effect in only two out of the four specifications for EMIMPACT.

Table 6.10: Cumulative results.

Variable	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (4/4)	D (4/4)	D (4/4)	D (4/4)	M (4/4)	M (4/4)	D (4/4)	M (4/4)
MANF					D (2/2)	D (2/2)	D (2/2)	
BIF					D (2/2)	D (2/2)	D (2/2)	D (2/2)
CON					D (2/2)	D (2/2)		
TS								
PRIVATE						M (1/4)	D (4/4)	
INV_HHI								
ENTR	D (2/4)	D (2/4)		D (2/4)			M (1/4)	
TRAIN	D (4/4)	D (1/4)	D (3/4)				D (4/4)	
DEGREE	M (4/4)	M (3/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (3/4)
NO_QUAL	D (4/4)	D (4/4)	D (3/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)
AGE_20_34	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)		M (2/2)	M (2/2)
AGE_35_49	M (3/4)	M (4/4)	M (4/4)	M (4/4)				D (4/4)
AGE_50_64	D (2/2)	D (2/2)	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)	D (4/4)	D (4/4)	D (4/4)	D (4/4)

NOE	D (3/4)	D (4/4)	D (2/4)	D (4/4)	D (4/4)	D (4/4)
MIDLANDS	D (3/4)	D (3/4)	D (4/4)	D (4/4)		
SCOTLAND	D (2/4)	D (4/4)	D (2/4)	D (3/4)		M (4/4)
WALES		D (1/4)			D (4/4)	D (4/4)

Considering the cumulative effects of the independent variables on the crisis, a number of interesting points arise. First, a better initial position has a consistently detrimental effect on the crisis impact when using the employment variables but this relationship changes to a mitigating effect for unemployment and JSA rates (only for JSAPERIMPACT). Despite the change from a detrimental to a mitigating effect, these results are consistent due to the conceptual differences between the employment and unemployment related dependent variables. For example, in the case of EMIMPACT, the results suggest that places with higher employment rates before the on-start of the crisis have performed worse during the crisis. Concurrently, the results for UNIMPACT show that places with higher unemployment rates before 2008 have had smaller crisis impact than LADs with low pre-crisis unemployment rates.

Hence, the first four columns of table 6.10 (cumulative table) show that places with better initial employment rates have had a deeper crisis impact whilst three out of the four last columns show that places with high initial unemployment rates have performed better during the crisis. The only inconsistency observed relates to variable JSAIMPACT where the initial JSA rates were found to have a negative effect, implying that places with higher JSA rates before the crisis have had a worse crisis impact. This evidence supports Lee's (2014) arguments for a potential spatial bias with regards to the JSA rates. As discussed in chapter 5, the suggestion is that experience and better knowledge of the benefits system in specific areas - with persistently high unemployment levels - may lead to LADs exhibiting higher claimant rates both before and after the crisis. Once the magnitude of the changes is accounted for (JSAPERIMPACT) the effect of the starting point on the crisis impact returns to a mitigating one where places with

high JSA rates before the on-start of the crisis exhibit a smaller impact than places with low pre-crisis rates.

The results on the nominal unemployment and JSA (UNIMPACT, JSAIMPACT) crisis impact measures agree with those available from Lee (2014). These outcomes, together with the coefficients of the starting point variables on the rest of the impact measures suggest that places which were better-off before the start of the crisis have borne the brunt of the crisis. This is further supported by the positive correlations between the measures of STARTING POINT and the crisis impact variables.

A possible explanation is that the booming conditions in those areas with high employment meant that many inefficient firms that had been able to survive in times of prosperity could not absorb the reduction of profitability when the crisis hit without adjusting their workforce. Another factor might be greater running costs (rents, labour, local taxes etc.) for businesses in booming areas as well as greater credit dependency and borrowing needs. If this is the case, the reduced credit availability that followed the initial shock may have stifled businesses in booming places. On the other hand, it could be the case that once the crisis started, workers have tried to move to places which prospered before 2008 and that the latter have not generated enough jobs to absorb this increase. The end result in all of these cases would be a deeper crisis impact for places that performed well before the start of the crisis.

The results on the main human capital variables are amongst the most consistent ones and concur with the hypothesised effects on the crisis impact. The share of degree holders has a mitigating effect across all dependent variables, suggesting that places with higher shares of degree holders have

suffered a smaller crisis impact. Conversely, the coefficients for the share of population with no qualifications exhibit a consistently negative effect, deepening the impact of the crisis for LADs. This is in agreement with the studies of Lee (2014), Di Caro (2017) and Doran & Fingleton (2016) and suggests that places with higher levels of human capital were better able to mitigate the recession effects due to the attributes associated with transferable knowledge and skills, greater flexibility and potential for labour hoarding.

Employee training provides inconsistently significant and counterintuitive results. The variable has a detrimental effect in the specifications where it is statistically significant. This outcome could be viewed in terms of a potential self-selection bias, since companies that engage in formal systems of employee training tend to be potentially less flexible at times of adversity. These results also suggest that employee training may be signalling firms with lagging productivity (Bartel, 1994), under restructuring, highly unionised and/or with inappropriate stocks of skills (Almeida-Santos & Mumford, 2005; Molina & Ortega, 2003). If this is the case, then these firms may be more vulnerable at times of economic stress.

The demographic structure of a LAD also emerges as a significant factor. Among the employment related variables, there is a consistent picture where the age groups 20-34 and 35-49 have a mitigating (or statistically insignificant) effect whilst the group 50-64 has a negative effect, deepening the crisis impact. It is possible that age exhibits an inverted-U shaped relationship to the crisis impact, in agreement with studies of the effects of demographics on various human capital, productivity and growth measures (Brunow & Hirte, 2009a; 2009b; Poot, 2008; Skirbekk, 2004). This also suggests that there are potential

lock-in effects associated with the 50-64 age group being detrimental to the crisis impact and that the combination of a more youthful population but with significant work experience is the most helpful demographic attribute.

When examining the crisis impact using the unemployment related variables, the results are less clear. The coefficient for the age group 20-34 loses its statistical significance for UNPERIMPACT but maintains the direction of its effect. The age group 35-49 loses its statistical significance for all the dependent variables but JSAPERIMPACT, where it switches from a mitigating to a detrimental effect on the crisis impact. Finally, the age group 50-64 is statistically significant and maintains the direction of its effect for two out of the four dependent variables' (UNIMPACT and JSAIMPACT).

The sensitivity of the aforementioned results could potentially be explained by the differences among the dependent variables discussed above. For example, the percentage transformation for the two unemployment related variables, leads to variables of a significantly different magnitude and alters the weighting of different areas in shaping the results. However, the change of direction in the effect of age group 35-49 (from mitigating to detrimental) for JSAPERIMPACT could also be explained by the likelihood of the eligibility and claiming effects discussed earlier. In addition, if different age groups have different propensities to drop out the labour market through early retirement etc., this could lead to different results between the employment and unemployment crisis impact measures. As a result, whilst most of those aged 35-49 would move from employment to unemployment when losing their job, it would be expected that a fraction of those 50+ could drop out of the labour market through early retirement, leading to a smaller increase of unemployment.

Population density is another variable which provides consistently significant results. Higher densities have a detrimental effect, suggesting a greater crisis impact in more densely populated areas. This result could be linked to the lower crisis impact found by other studies in “sheltered” economies (Fratesi & Rodríguez-Pose, 2016) but it is largely counterintuitive at this stage since higher densities were found to provide urbanisation economies which have positive or statistically insignificant effects on growth (Bishop, 2009; Bishop, 2012; Bishop & Gripaios, 2010). One possible explanation could be that it is the individual characteristics such as age and education that lie behind the expected positive relationship between urbanisation and the mitigation of the crisis impact; the same effects could be in play for entrepreneurship. This possibility will be further examined in the robustness checks chapter that follows.

In terms of the recession’s geographical footprint, there is evidence of the impact being more severe for LADs in the North of England, Midlands and Scotland, especially in the case of the employment related dependent variables. These results agree in part with Lee’s (2014) results for the North. Despite the initial expectations of a greater impact on London and the South where financial services are more prominent, these results suggest that places in the Midlands and the North were more adversely affected. This could be because of the support to the Financial Services sector (Gordon, 2011) or potentially a strategic decision at the firm level to reduce back-office activities but not headquarters which tend to be located in the South.

These types of effects are suggested by Kolko & Neumark (2010) who examine the relationship between local ownership, type of establishment and resilience to crises and find that hosting company headquarters is the most significant

contributor to local responses to downturns. However, the results of the current analysis are more blurred when the unemployment related variables are considered. This could potentially be explained by spatially differential drop-out rates through early retirement and/or better knowledge of available options whilst the results for Wales could be affected by the small size of the sample (22 LADs).

The sectoral employment variables reveal a mixed picture. On the one hand, when using the unemployment related dependent variables, higher shares of employment in manufacturing (for UNIMPACT, UNPERIMPACT and JSAIMPACT), banking insurance and finance (for all four measures) and construction sectors (for UNIMPACT and UNPERIMPACT) have a deepening effect on the crisis impact. The fact that the F-tests do not confirm a statistically significant difference among the aforementioned sectoral employment shares obscures the relative importance of each individual sector.

On the other hand, when the employment related dependent variables are considered, the shares of employment in manufacturing (MANF); banking insurance and finance (BIF); and construction (CON) do not provide statistically significant results. Moreover, employment in total services does not exhibit any statistically significant results across all measures whilst the employment share of the private sector has a mitigating effect for UNPERIMPACT and a detrimental effect for JSAIMPACT. Overall, the results are inconclusive when it comes to the importance of specific sectors on the crisis impact.

The same holds for specialisation and diversity as reflected by the inverse of the Herfindahl-Hirschman index (INV_HHI). This is in contrast to the findings of Di Caro (2017), Fingleton & Palombi (2013) and Brakman et al. (2014) who find

that diversity has a positive effect (or specialisation has a negative effect) on resilience. The differences between this paper and others could be attributed to a range of factors such as the different geographies examined, the different datasets used and temporal differences, since each study examines a different time period.

The results on specialisation and industrial structure (and their differences to other studies), provide evidence that in the 2008 crisis these factors were not crucial in shaping the impact on localities. This may imply that, whilst the crisis originated in specific sectors, it spread rapidly to the rest of the economy. This argument is also in line with Martin et al.'s (2016b) observation of the decreasing importance of industrial structure in shaping the regional responses to crises since the 1970s. The authors suggest that the decreasing reliance on manufacturing and the increasing regional specialisation on services has converged regional dynamics in terms of sectoral business cycles (Jackman & Savouri, 1999; Martin et al., 2016b). Thus, if most of the regions specialise in the same sectors, differences in the industrial structure are unlikely to explain regional disparities in resilience. Martin et al. (2016b) hence, argue that it is differences in the regional characteristics and their ability to attract specific firms and/or operations within the same sectors that could better explain regional variations in mitigating the crisis impact.

With the recession originating in the banking, insurance and finance sector, one would expect to find a significant correlation between the local prominence of the sector and the crisis impact. However, the crisis in the sector led to a reduction of liquidity for lending and reduced credit availability which affected firms in every sector of the economy and consumers throughout the country.

Simultaneously, government programmes were introduced to shield the banking system (Gordon, 2011). As a result, it is not surprising to find a more uniform effect of local sectoral composition on the crisis impact. Any significant results hold only for the unemployment related variables and agree with the analysis of Lee (2014) as well as the initial expectations due to the origin of the crisis but they do not hold for different measures of the crisis impact.

One possible explanation for the inconsistency is the differences discussed above amongst the dependent variables both conceptually and in terms of error margins. For example, if employees in these sectors (BIF, MANF, CON) have systematically opted less for early retirement or education than their counterparts in the rest of the economy, this would explain the results on the unemployment related variables. However, there is a lack of data available to test this hypothesis and hence at this stage it is purely speculative. In addition, it could be the case that studies on similar geographies and data will find different results, depending on the time-period they examine.

The discussion suggests that studies focusing only on one measure (or one concept such as unemployment) of the crisis impact run the risk of identifying resilience factors that do not hold when other aspects of the labour market are examined. In order to avoid providing misleading results, this study has opted to examine a broad range of available labour market indicators and this should be viewed as best practice for studies in the field.

Furthermore, the loss of statistical significance for MANF between JSAIMPACT and JSAPERIMPACT highlights another potential issue which stems from the effects of the transformation from the nominal to the relative measure. For example, as already seen (chapter 5), places with high rates of JSA (the

traditional manufacturing areas) have had greater increases of these rates; however, after the transformation, as a consequence of these pre-existing high rates, they appear to have had a smaller relative impact. As a result, employment in manufacturing could appear detrimental to JSAIMPACT and not statistically significant for JSAPERIMPACT. This is indicative of the data sensitivity across transformations and further supports the choice of examining a number of different measures.

The effect of entrepreneurship on the crisis impact exhibits inconsistencies and differs according to the measure used. Firm formation has a deepening effect when the crisis impact is measured by employment related variables and a mitigating effect when the impact is measured with JSAIMPACT. The expectation would be that an entrepreneurial climate would be conducive to the mitigation of the crisis impact, as suggested by other studies (Bishop & Shilcof, 2016; Williams & Vorley, 2014; Williams, Vorley & Ketikidis, 2013). The opposing effects of firm formation on employment generation - dynamism and flexibility on the one hand and the fact that most new firms tend to be small enterprises with relatively limited access to credit and high death rates (according to business demography data, firms established in 2008 show a survival rate below 50% past their third year), could potentially explain the sensitivity of the results to small changes in specification. In addition, it could be the case that entrepreneurship is important to the restructuring or recovery phase rather than the crisis impact (Bishop & Shilcof, 2016; Williams & Vorley, 2014; Williams, Vorley & Ketikidis, 2013). The results however, may also be affected by individual characteristics such as the inclusion of the human capital variables. This is examined in the next chapter as part of the robustness checks.

An alternative explanation for the mitigating effect when JSAIMPACT is considered, is the relationship between entrepreneurship and the spatial distribution of JSA. If entrepreneurship is greater in the South (average of ENTR for London and South East is 10.7 compared to 6.56 for the rest of the LADs) where JSA rates are lower and have had smaller nominal increases (average JSAIMPACT for LADs in London and South East is 1.09 compared to 1.54 for the rest), this would provide a mitigating effect for ENTR on JSAIMPACT in the econometric examination. The lack of consistency in the results when the relative measure (JSAPERIMPACT) is considered provides evidence supporting this claim. Indeed, average JSAPERIMPACT for LADs in London and the South East is almost 79% whilst for the rest it is 88.4% which is a much smaller proportional difference between these areas for JSAIMPACT. The inconsistency in the statistical significance of the variable is indicative of the sensitivity of the results to the particular specification and crisis impact measure used.

Overall, across all models, there were very few changes of sign for the statistically significant coefficients. Indeed, it is only in six out of 87 occurrences of statistically significant coefficients where this is the case and these all refer to the relationship between an independent variable and the JSA related dependent variables. For example, whilst the limited evidence on the relationship between entrepreneurship and the crisis impact point to a detrimental effect, when it comes to the link between ENTR and JSAIMPACT, the effect turns to a mitigating one. Given that these results can be attributed to the particularities of JSA related variables discussed in chapter 5 and/or the sensitivity of some variables such as ENTR and PRIVATE, overall the evidence suggests generally robust results for the analysis.

6.7 Conclusions

In conclusion, the results suggest that the brunt of the crisis have been borne by previously booming areas, where inefficient firms may have been able to prosper prior to the crisis. It is possible that the crisis exposed these inefficiencies and led these firms to either scale down via a reduction in employment levels or close down. Higher shares of degree level qualification holders and a younger aged, more dynamic, demographic structure have mitigated the crisis impact whilst high shares of no qualification holders and an ageing population have worsened it. In addition, the crisis exhibits a significant geographical footprint, with increased problems in the North and Midlands. On the contrary, variables related to the structure of local economies such as the shares of employment, entrepreneurship and specialisation do not show consistently significant coefficients.

These results point to a crisis impact which, independent of its origins, has spread throughout the economy irrespective of local specialisation in certain sectors. In these conditions, individual characteristics such as education and age (as a proxy for flexibility) have had an important role to play in mitigating the effects of the crisis through improved adaptation strategies. In addition, the results on entrepreneurship point to the need, of newly formed firms, for increased protection in times of economic downturns. These measures might take the form of increased liquidity and credit availability rather than interventions which distort competition in product markets.

There are, however, some considerations to be clarified via robustness checks. In particular, there is a need for further examination of the counterintuitive results for urbanisation and entrepreneurship, as well as testing for the existence of outliers and their potential effects as well as migration. The

existence of outliers can significantly impact on the results by producing non-normal residuals and affecting the size of coefficients. In addition, the increased mobility in recent years has also brought the effects of migration to the attention of researchers. These issues, together with the potential for using a composite indicator to reflect labour market impacts are examined in the next chapter.

Chapter 7 - Robustness checks

7.1 Introduction

Following the results of the econometric analysis, there are several issues which need to be addressed in order to further confirm the robustness of the outcomes. The puzzling results for urbanisation (LN_DENSITY) which was found to have a negative effect on the crisis impact and the sparsely significant and deepening effects for the entrepreneurship variable (ENTR) call for further investigation in order to identify potential causes. In addition, it is useful to examine whether the eight dependent variables reflecting the crisis impact can be combined in a composite indicator to test whether one index can represent the labour market effects of the 2008 crisis in British LADs.

There is also a need to consider the possible effects of potential outliers on the results. Due to the variation of performance at the subnational level it is important to identify any LADs that could impact on the results of the analysis. These influential observations could produce non-normal residuals and affect the size and significance of the coefficients. In addition, the chapter separately examines the effect of the London region, which is often considered (see Lee (2014) for example) as a potential outlier and a source of extreme values. Examining the “London effect” could answer whether it is the regions identified as lagging so far (NOE, Midlands, Scotland and Wales) that perform particularly badly or whether it is the strong performance of London during the crisis that has left these regions behind. Finally, as already noted, increased mobility in the recent years has also brought the possible effects of migration to the attention of researchers. As a result, there is a need to investigate whether migration plays a role in the results.

To understand the potential effects of these factors, four sets of robustness checks are undertaken. First, the chapter examines the urbanisation and entrepreneurship nexus by excluding the individual characteristics from the econometric analysis. An attempt to create a composite indicator of the crisis impact follows, together with an econometric analysis that uses the indicator as the dependent variable to assess both the robustness of the results and the suitability of the composite index. Thirdly, the chapter examines the potential effects of outlying observations and LADs in London as well as the impact of migration on the analysis by including the relevant variables in the econometric model. The chapter closes with a summary of the findings and comment on the robustness of the results in chapter 7.

For ease of reference, the table with the original cumulative results is first presented below (table 7.1).

Table 7.1: Cumulative results.

Variable	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (4/4)	D (4/4)	D (4/4)	D (4/4)	M (4/4)	M (4/4)	D (4/4)	M (4/4)
MANF					D (2/2)	D (2/2)	D (2/2)	
BIF					D (2/2)	D (2/2)	D (2/2)	D (2/2)
CON					D (2/2)	D (2/2)		
TS								
PRIVATE						M (1/4)	D (4/4)	
INV_HHI								
ENTR	D (2/4)	D (2/4)		D (2/4)			M (1/4)	
TRAIN	D (4/4)	D (1/4)	D (3/4)				D (4/4)	
DEGREE	M (4/4)	M (3/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (3/4)
NO_QUAL	D (4/4)	D (4/4)	D (3/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)
AGE_20_34	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)		M (2/2)	M (2/2)
AGE_35_49	M (3/4)	M (4/4)	M (4/4)	M (4/4)				D (4/4)
AGE_50_64	D (2/2)	D (2/2)	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)	D (4/4)	D (4/4)	D (4/4)	D (4/4)

NOE	D (3/4)	D (4/4)	D (2/4)	D (4/4)	D (4/4)	D (4/4)
MIDLANDS	D (3/4)	D (3/4)	D (4/4)	D (4/4)		
SCOTLAND	D (2/4)	D (4/4)	D (2/4)	D (3/4)		M (4/4)
WALES		D (1/4)			D (4/4)	D (4/4)

7.2 Urbanisation and Entrepreneurship

Tables 7.2 to 7.4 show the cumulative results when individual characteristics such as age and human capital are excluded from the analysis. The reason for excluding these variables is the suspicion of multicollinearity between the human capital and demographic characteristics on the one hand and the variables representing entrepreneurship and population density on the other. Multicollinearity signals the existence of a relationship between two variables that could impact on their coefficients in the econometric analysis in two ways.

The first is through inflated standard errors. Increased standard errors mean that coefficients need to be significantly larger in order to be statistically significant. In other words, multicollinearity could render statistically insignificant coefficients which otherwise would be statistically significant. Secondly, highly correlated independent variables will produce correlated coefficients with the relationship being the opposite of the one between the independent variables. For example, positively correlated variables will have negatively correlated coefficients which may lead to coefficients small enough to be insignificant (Williams, 2015).

The high correlations exhibited with ENTR and LN_DENSITY and the fact that the individual characteristics such as human capital and demographics exhibit among the highest VIFs suggest that the further investigation of the counterintuitive results for entrepreneurship and urbanisation is required. This needs to examine whether it is variables such as DEGREE and AGE_20_34 that mask the effects of ENTR and LN_DENSITY. In particular, DEGREE and NO_QUAL have statistically significant correlation coefficients of 0.44 and -0.40 to ENTR (which is also found in the entrepreneurship literature (Bishop & Brand, 2014; Bishop & Shilcof, 2016)) whilst AGE_20_34 and AGE_50_64

exhibit coefficients of 0.73 and -0.80 with LN_DENSITY respectively. These high correlation coefficients signal a relationship between the human capital and demographics variables and ENTR and LN_DENSITY. These relationships could potentially impact on the econometric results by attributing, for example, the positive effects of entrepreneurship to the levels of human capital and thus, providing misleading results for variable ENTR.

The analysis starts with the exclusion of the human capital variables (table 7.2). Four specifications for each dependent variable are still required since the variance inflation factors for TS and AGE_50_64 point to potential multicollinearity issues as before. For ease of interpretation, the results are provided in a cumulative format (the individual regressions are in appendix 1) and the analysis will focus on significant changes such as the loss of statistical significance across all specifications or reversal of the direction of effect from detrimental (D) to mitigating (M) or vice versa.

7.2.1 Excluding human capital

As was seen in the results chapter (chapter 6), variables DEGREE and NO_QUAL are amongst the most important and consistently significant determinants of the crisis impact in LADs. Despite that, their exclusion has a relatively small effect on the cumulative results (table 7.2 below and appendix 1). In particular, more than 80% of the results remain the same with significant changes being observed in only 25 of the 128 (8 dependent variables multiplied by 16 independent ones) relationships shown in table 7.2. This is indicative of the robustness of the results seen in chapter 6.

In the main, significant effects of the exclusion of human capital are only evident for the variables BIF and ENTR (table 7.2). Employment in the Banking, Insurance and Finance sector (BIF) now provides a statistically significant and

mitigating effect for variables EMIMPACT, EMPERIMPACT and FTEPERIMIPACT whilst it has lost its significant and detrimental effect on UNIMPACT, JSAIMPACT and JSAPERIMPACT. The only statistically significant and detrimental effect is observed for UNPERIMPACT.

Similarly, the exclusion of the training and education independent variables significantly affects the results for entrepreneurship (ENTR). The initial, counterintuitive results which showed higher shares of firm births in LADs being associated with higher crisis impacts have now turned around to mitigating effects for EMIMPACT, UNIMPACT, JSAPERIMPACT. The mitigating effect for JSAIMPACT has been maintained and it is now statistically significant for 4/4 specifications. Concurrently, the detrimental effects previously identified for EMPERIMPACT and FTEPERIMPACT have lost their statistical significance.

Table 7.2: Cumulative results excluding human capital variables.

Variable	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (4/4)	D (4/4)	D (4/4)	D (4/4)		M (4/4)	D (4/4)	M (4/4)
MANF					D (2/2)	D (2/2)	D (2/2)	
BIF	M (2/2)	M (2/2)		M (2/2)		D (2/2)		
CON					D (2/2)	D (2/2)	D (2/2)	
TS								
PRIVATE							D (4/4)	
INV_HHI								
ENTR	M (1/4)				M (1/4)		M (4/4)	M (4/4)
AGE_20_34	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)		M (2/2)	M (2/2)
AGE_35_49	M (3/4)	M (4/4)	M (4/4)	M (4/4)	M (1/4)	M (1/4)		D (1/4)
AGE_50_64	D (2/2)	D (2/2)	D (2/2)	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)	D (4/4)	D (4/4)	D (4/4)	D (4/4)
NOE	D (3/4)	D (4/4)	D (3/4)	D (4/4)	D (4/4)		D (4/4)	D (4/4)
MIDLANDS	D (3/4)	D (3/4)	D (4/4)	D (4/4)	D (3/4)	D (3/4)		
SCOTLAND	D (2/4)	D (4/4)	D (2/4)	D (4/4)				M (3/4)

WALES	D (1/4)	D (4/4)	D (4/4)

The explanation for these changes may lie in the fact that both BIF and ENTR are positively correlated with the share of degree level qualification holders in LADs (0.7 between BIF and DEGREE and 0.44 between ENTR and DEGREE). As discussed above, the argument for entrepreneurship is further supported by the literature which finds that entrepreneurial activity is linked to human capital levels (Bishop & Shilcof, 2016; Glaeser, Ponzetto & Tobio, 2014). Thus, these positive effects may be mainly attributed to the variable DEGREE in the initial formulations.

Less significant changes are observed in the results of a few other independent variables. For example, the initial economic conditions for UNIMPACT lose their statistically significant mitigating effect; The same holds for variable PRIVATE for UNPERIMPACT whilst NOE and MIDLANDS further confirm their detrimental effect on the crisis impact for variables UNIMPACT and UNPERIMPACT by exhibiting statistically significant coefficients.

7.2.2 Excluding demographics

The demographics variables are amongst the most consistent and significant determinants of the crisis impact in GB LADs. Adding back the human capital and excluding demographics (appendix 2) provides another set of interesting results (table 7.3 below), mostly for the employment related dependent variables (EMIMPACT, EMPERIMPACT, FTEIMPACT, FTEPERIMPACT). Once again, more than 80% of the results remain the same, with changes observed only in 23 of the potential 128 relationships between the dependent and independent variables. Again, this is indicative of the relative robustness of the results seen in chapter 6.

Table 7.3 provides the cumulative results which mainly show LN_DENSITY reversing its sign and SCOTLAND losing its previously detrimental effects for

the employment related variables. In addition, NO_QUAL loses its consistently significant and detrimental effects in the employment related dependent variables. The addition of the human capital variables also implies that ENTR returned to the results shown in chapter 6.

The most significant impact of excluding the demographics from the econometric analysis is on the LN_DENSITY variable measuring the effect of urbanisation on resilience. The main results from the analysis in chapter 6 have revealed a very consistent and statistically significant detrimental effect of urbanisation on the crisis impact. Eliminating the demographic variables in the regressions partly reverses these counterintuitive results. LN_DENSITY now shows a mitigating effect for EMIMPACT, FTEIMPACT and FTEPERIMPACT, a statistically insignificant result for EMPERIMPACT and maintains its detrimental effect on the unemployment related variables (UNIMPACT, UNPERIMPACT, JSAIMPACT, JSAPERIMPACT).

These results suggest that the negative relationship between urbanisation and the employment related measures of the crisis impact was mainly driven by the different demographic characteristics of more and less urbanised areas. Indeed LN_DENSITY is highly positively correlated to AGE_20_34 (0.73) and negatively correlated to AGE_50_64 (-0.8). Beyond the dynamism and adaptability of younger aged populations though, the demographic structure of a place could have a signalling effect, pointing to a more economically successful area, better able to mitigate the crisis impact.

However, these relationships do not explain why LN_DENSITY maintains its negative effect on the unemployment related measures. One possible explanation is the positive relationship between high density areas and

unemployment. The 2007 population density (LN_DENSITY) has correlation coefficients of 0.56, 0.44, 0.50 and 0.49 with the unemployment variables UNEMPAVG_2004_2007, UNEMP_2007, JSAAVG_2004_2007, JSA_2007 measuring the average unemployment 2004-2007; the 2007 unemployment rate; the average JSA rate 2004-2007; and the JSA 2007 rate respectively. This is evidence that more urban LADs in 2007 exhibited higher unemployment rates. This relationship was maintained between LN_DENSITY and the unemployment rates post-2008 suggesting that unemployment remained higher in more urban areas. If this trend was further enhanced by people moving to urban areas in search of a job, it could increase unemployment rates in urban areas more than in less dense ones during the crisis, maintaining the detrimental effect of density on the unemployment related dependent variables.

Table 7.3: Cumulative results excluding demographics variables.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (2/2)	D (2/2)	D (2/2)	D (2/2)	M (2/2)	M (2/2)		M (2/2)
MANF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
BIF						D (1/1)	D (1/1)	D (1/1)
CON					D (1/1)	D (1/1)	D (1/1)	
TS								
PRIVATE							D (2/2)	
INV_HHI								
ENTR	D (1/2)	D (1/2)					M (1/2)	M (1/2)
TRAIN	D (2/2)	D (1/2)	D (1/2)				D (2/2)	
DEGREE	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)
NO_QUAL					D (2/2)	D (2/2)	D (2/2)	D (2/2)
LN_DENSITY	M (2/2)		M (2/2)	M (2/2)	D (2/2)	D (2/2)	D (2/2)	D (2/2)
NOE	D (1/2)	D (2/2)	D (2/2)	D (2/2)			D (2/2)	D (2/2)
MIDLANDS	D (2/2)	D (2/2)	D (2/2)	D (2/2)				
SCOTLAND								

WALES	M (1/2)	D (2/2)	D (2/2)

Other significant differences from the main results include the loss of the detrimental effect of variables NO_QUAL and SCOTLAND on the employment related measures of the crisis. This suggests that demographics mediate these relationships and thus, when they are accounted for, it is possible to isolate the effect of different demographic structures on the crisis impact. In addition, the variable for entrepreneurship (ENTR) returns back to its initial detrimental effects on EMIMPACT and EMPERIMPACT whilst any mitigating effect is shown for JSAIMPACT and JSAPERIMPACT and only in half of the specifications examined. This is further evidence of its relationship to human capital since, once education and training is accounted for (TRAIN, DEGREE and NO_QUAL), firm formation (ENTR) exhibits mostly detrimental or statistically insignificant coefficients.

7.2.3 Excluding human capital and demographics and concluding remarks

Excluding both the human capital and demographics variables from the analysis consolidates the results seen so far (appendix 3 and table 7.4). Despite excluding five of the most consistent (in both significance and direction of relationship) variables, the results remain fairly robust with 64% of the available relationships remaining the same. The drop in the explanatory power of alternative specifications ranges between 10 and 20% of the variation of the dependent variable and it is more significant for the employment related dependent variables than the unemployment ones (where explanatory powers are generally larger).

The lack of the individual characteristics' variables (DEGREE, NO_QUAL, AGE_20_34, AGE_35_49 and AGE_50_64) and variable TRAIN is largely being reflected in the mitigating or statistically insignificant effect of BIF; the mitigating

effect of ENTR (albeit statistically significant in half the specifications run for each dependent variable); the switch of LN_DENSITY from a detrimental to a mitigating effect for the employment related variables; and the lack of statistical significance for the effect of variable SCOTLAND on the employment related dependent variables.

Table 7.4: Cumulative results excluding both human capital and demographics variables.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (2/2)	D (2/2)	D (2/2)	D (2/2)		M (2/2)	D (2/2)	M (2/2)
MANF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
BIF	M (1/1)	M (1/1)	M (1/1)	M (1/1)				
CON		D (1/1)		D (1/1)	D (1/1)	D (1/1)	D (1/1)	
TS								
PRIVATE							D (2/2)	
INV_HHI								
ENTR	M (1/2)	M (1/2)	M (1/2)	M (1/2)	M (1/2)	M (1/2)	M (2/2)	M (2/2)
LN_DENSITY	M (1/2)	M (1/2)	M (2/2)	M (2/2)	D (2/2)	D (2/2)	D (2/2)	D (2/2)
NOE	D (1/2)	D (2/2)	D (1/2)	D (2/2)	D (2/2)		D (2/2)	D (2/2)
MIDLANDS	D (1/2)	D (1/2)	D (2/2)	D (2/2)	D (2/2)	D (1/2)		
SCOTLAND						M (1/2)		M (2/2)
WALES			M (1/2)	M (1/2)			D (2/2)	D (2/2)

In conclusion, this section has examined the robustness of the initial results and investigated two of the counterintuitive ones identified in the main empirical study (chapter 6), namely the detrimental effects of ENTR and LN_DENSITY on the crisis impact in GB LADs. The examination involved the study of the relationship between the independent variables representing individual characteristics such as education levels and age and the variables reflecting the levels of entrepreneurship and urbanisation in an area. The results above show a high degree of robustness of the initial results with the overwhelming majority remaining unchanged.

In addition, the examination showed that the correlations between DEGREE and NO_QUAL on the one hand and ENTR on the other, as well as the correlation between demographic variables and urbanisation meant that some of the positive effects of entrepreneurship and higher densities were attributed to the human capital and demographic characteristics correlated with them. These outcomes provide a better explanation of the initially observed results and also revealed similar relationships between the human capital variables and BIF (switch from not significant or detrimental effect to mitigating or not statistically significant) and between demographics and LADs in Scotland with the effect for variable SCOTLAND switching from detrimental to a statistically insignificant one when excluding demographics from the analysis.

7.3 Composite indicator

As discussed in chapter 2, resilience is a multifaceted concept that may be better represented by multiple and/or composite indicators that recognise the complexity of the concept (Augustine et al., 2013; Foster, 2011; Psycharis, Kallioras & Pantazis, 2014) rather than the single proxies widely used in empirical studies. Numerous studies in disaster and socio-economic resilience

utilise composite indicators (Briguglio et al., 2009; Cardona et al., 2008; Östh, Reggiani & Galiazzo, 2015; Psycharis, Kallioras & Pantazis, 2014). Such indicators allow the representation of concepts with different dimensions as well as the monitoring of progress; they also allow for an increased amount of information to be considered, compared to the use of a single variable, and may provide a common understanding amongst stakeholders with different agendas (Giovannini et al., 2008). Finally, such an indicator is less affected by temporal fluctuations in single variables, something that is relevant to this study's low geographical level.

Unfortunately, composite indicators can be subject to significant shortcomings in relation to their robustness and construction. Whilst they provide integrated information in one variable, they may concurrently mask the movement of individual variables that could be significant to the concept considered. In addition, the aggregation and weighting methods include a degree of subjectivity and arbitrariness since there are no universally accepted rules for implementing these procedures (Giovannini et al., 2008). Finally, data availability could affect the decision regarding the variables to be included and hence lead to a biased indicator. Nevertheless, improvements in statistical tests and robustness checks have led to the increasing use of composite indices when considering multi-faceted concepts such as resilience.

This section examines the construction of a composite indicator and measures the performance of LADs during the downturn by combining the individual variables used so far. This approach defines performance in relation to that of other regions within a country. Using a composite indicator, it is possible to increase the informational value of resilience indicators by representing labour

market performance under one figure. The performance of LADs is examined and the indicator is used as a dependent variable in replicating the examination of chapter 6. In this way, it is possible to test both the validity of the composite index and the robustness of the determining factors to the crisis impact.

7.3.1 Constructing the composite indicator

The composite indicator combines the series of dependent variables (EMIMPACT, EMPERIMPACT, FTEIMPACT, FTEPERIMPACT, UNIMPACT, UNPERIMPACT, JSAIMPACT, JSAPERIMPACT) which reflect the crisis impact in terms of employment, full-time equivalent employment, unemployment and job-seekers allowance rates in both nominal and relative (percentage) terms. In constructing it, important decisions need to be made in terms of the normalisation, weighting and aggregation methods. First, the indexed values are normalised to ensure that the variables have the same meaning (i.e. higher values imply better performance) and scale. There are various methods of normalisation. The choice made here is the min-max normalisation which is common in many indices such as the Human Development Index (HDI), the Kearney/Foreign Policy Index of Globalisation, the resilience index of Psycharis et al., and the Centre for the Study of Globalisation and Regionalisation's (CSGR) globalisation index (Dreher et al., 2010; Giovannini et al., 2008; Lockwood, 2004; Lockwood & Redoano, 2005; Martens & Zywietz, 2006; Noorbakhsh, 1998; Psycharis et al., 2012).

By using the min-max method, it is possible to use the minimum and maximum as well as the range of values in the variables to transform the data to assist comparability and inclusion in the composite indicator.

For variables where the higher the value in a LAD, the worse its performance (EMIMPACT, FTEIMPACT, UNIMPACT, UNPERIMPACT, JSAIMPACT, JSAPERIMPACT), the normalisation formula is:

$$NX_{ir} = \left(\frac{\mathrm{X}_{imax} - \mathrm{X}_{ir}}{X_{imax} - X_{imin}}\right) * 100$$

The variables where a higher value is better (EMPERIMPACT, FTEPERIMPACT), are normalised using the formula:

$$NX_{ir} = \left(\frac{\mathrm{X}_{ir} - \mathrm{X}_{imin}}{X_{imax} - X_{imin}}\right) * 100$$

In both formulae, NX_{ir} is the normalised value for variable X_i and LAD r. X_{imax} and X_{imin} are the maximum and minimum values for each variable among all the LADs. The normalised values are then multiplied by 100 to give a scale of performance from 0-100, where the higher the score, the better.

In addition to normalisation, another crucial decision is the weighting and aggregation methods used. There is no unanimously accepted method; for this reason, the choice needs to be clear and explicit as well as fit for purpose (Giovannini et al., 2008; Lockwood, 2004; Martens & Zywietz, 2006; Noorbakhsh, 1998; Roodman, 2011). The choice made here is to use equal weights where all variables, sub-indices or dimensions assume the same weight and the sum of the weights amounts to unity due to its relatively simpler calculation and future comparability to other indicators. This signals no preference or added significance for one of the dependent variables and it is a similar strategy to the one used for indicators such as the Maastricht Globalisation Index (Dreher et al., 2010; Martens & Zywietz, 2006), and the

CSGR overall Globalisation Index (Lockwood & Redoano, 2005). As a result, the formula for the Composite Indicator of Crisis Impact (CICI) is:

$$CICI_r = \frac{1}{n}\sum_{i=1}^{n} NX_{ir}$$

where NX_{ir} is the normalised value of variable X_i for LAD r; and n is the total number of variables.

7.3.2 Descriptive statistics

Table 7.5 shows the basic descriptive statistics of the composite indicator whilst table 7.6 shows its correlations to the rest of the dependent and control variables examined in this study. CICI can only be created for 366 of the 380 LADs (table 7.5) due to lack of data, especially for UNIMPACT and UNPERIMPACT. Due to the normalisation process, the descriptive statistics have little insight to offer apart from the fact that the size of the minimum and the maximum which are close to 0 and 100 respectively signal that places consistently perform poorly or well across all measures.

Table 7.5: Descriptive statistics of the Composite Indicator of Crisis Impact (CICI).

Variable	Obs	Mean	Std. Dev.	Min	Max	CV
CICI	366	49.15	11.21	16.28	93.72	0.23

Source: Author's treatment.

In terms of CICI's relationship to the dependent variables from which it is constructed, the results are representative of the relationships between the eight dependent variables. Chapter 5 and, in particular table 5.8, identified strong correlations between the employment related variables (EMIMPACT, EMPERIMPACT, FTEIMPACT, FTEPERIMPACT) and weaker relationships both amongst the unemployment related variables (UNIMPACT, UNPERIMPACT, JSAIMPACT, JSAPERIMPACT) and between the employment

and unemployment related variables overall. Thus, it comes as no surprise that CICI is influenced more by the employment related variables which are more closely aligned to each other and hence, it is more correlated to EMIMPACT, EMPERIMPACT, FTEIMPACT and FTEPERIMPACT and less so with UNIMPACT, UNPERIMPACT, JSAIMPACT and JSAPERIMPACT. The lowest correlation coefficient is -0.53 for JSAIMPACT.

Table 7.6: Correlations of CICI to the rest of the dependent and independent variables.

Variable	CICI
CICI	1
EMIMPACT	-0.84
EMPERIMPACT	0.85
FTEIMPACT	-0.85
FTEPERIMPACT	0.86
UNIMPACT	-0.74
UNPERIMPACT	-0.72
JSAIMPACT	-0.53
JSAPERIMPACT	-0.56
EMAVG_2004_2007	-0.1127
EMP_2007	-0.0642
FTEAVG_2004_2007	-0.1022
FTE_2007	-0.0539
UNEMPAV_2004_2007	0.3136
UNEMP_2007	0.1789
JSAAVG_2004_2007	0.1354
JSA_2007	0.0449
MANF	-0.3772
TS	0.3633
BIF	0.3283
CON	-0.2195
PRIVATE	-0.0645
INV_HHI	-0.2024
ENTR	0.2915
TRAIN	-0.0934
DEGREE	0.4737
NO_QUAL	-0.1462
AGE_20_34	0.4024
AGE_35_49	-0.0265
AGE_50_64	-0.3504
LN_DENSITY	0.1361

Source: Author's treatment.

CICI also confirms the results seen before when it comes to its relationship to the independent variables (table 7.6). A number of these relationships are statistically insignificant (underlined) whilst the rest are all below 0.5 possibly pointing to a relatively weak link between some individual variables and the crisis impact. This might also be a sign of the multitude of factors at play when it comes to mitigating the negative effects of the crisis. Variable DEGREE exhibits the highest positive correlation of 0.47 whilst MANF has the highest negative one at almost -0.38. The correlations above provide an interesting insight into the bivariate relationships between the independent and the dependent variables. However, in a multivariate model, it is the simultaneous consideration of a range of variables that is mostly of interest. These relationships are examined below.

7.3.3 Empirical analysis

Table 7.7 shows the results of the analysis using CICI as the dependent variable. In order to reflect the initial conditions, the average employment rate for 2004-2007 (EMAVG_2004_2007) was chosen since it provides a more stable measure. However, using EMP_2007 or the other variables which represented the initial conditions had no significant impact on the results. Due to the dependent variable's calculation, positive coefficients on the control variables indicate a positive effect in mitigating the crisis impact whilst negative values signal a detrimental effect.

Table 7.7: Results when using CICI as the dependent variable.

	(1) CICI	(2) CICI	(3) CICI	(4) CICI
EMAVG_2004_2007	-1.521***	-1.337***	-1.480***	-1.290***
	(0.245)	(0.230)	(0.255)	(0.236)
MANF	-0.291*	-0.260*		
	(0.145)	(0.125)		
BIF	-0.234	-0.243		
	(0.150)	(0.165)		
CON	-0.375**	-0.409*		
	(0.161)	(0.188)		
TS			-0.0242	-0.0861
			(0.171)	(0.157)
PRIVATE	-0.00662	-0.0279	-0.130	-0.148
	(0.112)	(0.147)	(0.140)	(0.164)
INV_HHI	7877.0	3480.4	2919.7	-3854.3
	(16001.8)	(16593.8)	(16769.0)	(15343.3)
ENTR	0.0275	0.329	0.106	0.422
	(0.541)	(0.425)	(0.562)	(0.441)
TRAIN	-0.515**	-0.623**	-0.563**	-0.665***
	(0.221)	(0.217)	(0.197)	(0.191)
DEGREE	0.338***	0.400***	0.340***	0.414***
	(0.102)	(0.111)	(0.0778)	(0.0868)
NO_QUAL	-0.641***	-0.630***	-0.630***	-0.622***
	(0.140)	(0.136)	(0.153)	(0.156)
AGE_20_34	1.358***		1.407***	
	(0.150)		(0.149)	
AGE_35_49	2.451***	1.372**	2.244***	1.144
	(0.518)	(0.538)	(0.631)	(0.661)
AGE_50_64		-2.558***		-2.686***
		(0.459)		(0.473)
LN_DENSITY	-3.053***	-3.108***	-3.243***	-3.283***
	(0.383)	(0.543)	(0.429)	(0.551)
NOE	-6.952***	-5.507***	-7.416***	-5.922**
	(1.983)	(1.677)	(2.244)	(1.881)
MIDLANDS	-3.114***	-1.695*	-4.012***	-2.598***
	(0.841)	(0.869)	(0.831)	(0.687)
SCOTLAND	-3.700*	-0.396	-3.786*	-0.453
	(1.990)	(1.320)	(1.982)	(1.313)
WALES	-4.354***	-2.668*	-5.078***	-3.399**
	(1.353)	(1.349)	(1.389)	(1.223)
_cons	96.89***	183.8***	103.2***	198.7***
	(9.707)	(14.90)	(16.25)	(18.73)
N	365	365	366	366
r2	0.490	0.473	0.480	0.464

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

The results largely confirm what has been seen so far. It was expected that the construction of CICI would provide more statistically robust and consistent results across different models. This is due to the fact that any impact from extreme values, which could affect the examination of the individual dependent

variables, is now reduced both by the normalisation process and by the aggregation method which involves the averaging of the eight dependent variables (EMIMPACT, EMPERIMPACT, FTEIMPACT, FTEPERIMPACT, UNIMPACT, UNPERIMPACT, JSAIMPACT, JSAPERIMPACT).

The initial conditions (EMAVG_2004_2007) have statistically significant and negative coefficients, indicating that places which had higher employment rates (as an average of 2004-2007) have had a deeper crisis impact. In terms of human capital, employee training (TRAIN) and the share of the population without any qualifications (NO_QUAL) have a deepening effect on the crisis impact with consistently statistically significant coefficients across all models. The opposite effect is found when examining the share of the population with degree level qualifications (DEGREE) which provides positive coefficients at the 1% level of significance.

The demographic variables also maintain the results seen before. LADs with higher shares of the 20-34 and 35-49 age groups have statistically significant and positive coefficients in all the models. The only exception is the lack of statistical significance for the coefficient of the 35-49 age group in model 4. On the other hand, the age group 50-64 exhibits statistically significant and negative coefficients pointing at a deepening effect on the impact of the 2008 downturn.

The urbanisation and geographical variables also maintain their effects. LADs with higher population densities as well as those in the North of England, Midlands and Wales have had a greater crisis impact in their labour markets. The same holds for LADs in Scotland for models 1 and 3 but not in models 2 and 4 where the coefficients are not statistically significant. In addition, ENTR

does not provide any statistically significant result which is an indication that the (statistically insignificant) effects of entrepreneurship on the unemployment related variables (chapter 6) are dominating the respective negative effects on the employment related variables (chapter 6).

Finally, in terms of the industrial structure of LADs, areas with higher employment shares in manufacturing and/or construction are found to have experienced a deeper crisis impact whilst employment in total services (TS) or BIF does not affect the performance of different places during the downturn. This is evidence that the brunt of the 2008 recession was borne by the manufacturing and construction sectors rather than the financial services sector. In addition, the levels of employment in the private sector as well as specialisation and entrepreneurship do not provide statistically significant results, confirming the results seen so far.

Overall, CICI has the advantage of reflecting the eight dependent variables in one figure. This, together with the normalisation and aggregation method reduced the influence of independent observations and fluctuations and led to more consistent and statistically significant results. The results of the econometric analysis using CICI as the dependent variable confirm (and in some cases augment) the relationships identified in chapter 6. This both enhances the robustness of the initial results and suggests that a composite index of this nature could offer a more holistic view of the local labour markets under one indicator.

7.4 Outliers

The concept of outliers refers to observations that greatly differ from the mean. The inclusion of outliers could produce non-normal residuals which could affect the independent variables' coefficients. This is because OLS attempts to

minimise the sum of squared residuals and hence, large positive or negative residuals will be given more weight (Wooldridge, 2015). This section reviews the residuals produced in the econometric analysis (chapter 6) and examines the potential for influential outlying observations. Once outliers are identified (if any) the section will investigate their influence and decide on how best to address the issues.

The expectation is that the large sample in this study could include potential outliers but these would mostly impact on the size of the coefficients rather than the direction of the impacts. Nevertheless, the normality of the residuals for each individual regression of chapter 6 is examined based on the skewness and kurtosis test by D'Agostino, Belanger and D'Agostino Jr. (1990). The test provides a composite measure of the normality of the residual's skewness and kurtosis. Rejecting the null hypothesis of the test means that the residuals are not normally distributed and further examination is required.

The investigation highlighted potential concerns with outliers in 12 of the 32 regressions of the econometric analysis (chapter 6). Table 7.8 below summarises the variables and specifications with non-normally distributed residuals. Potential outliers are those producing residuals which are 2.5 standard deviations away from the mean.

Table 7.8: Dependent variables and specifications with non-normally distributed residuals.

Dependent Variable	Specifications
EMPERIMPACT	1, 3, 4
FTEPERIMPACT	3
UNPERIMPACT	1, 2, 3, 4
JSAIMPACT	1, 2, 3, 4

Once these observations were identified, they were excluded from the relevant regressions which were then re-run. The comparison of the results with and without these observations allows for a judgement on whether these outliers are influential enough to be specially considered with the inclusion of individual dummy variables. Tables 7.9 to 7.11 below show the differences in the results arising from the exclusion of potential outliers. As it can be seen by comparing the sample sizes (N), odd numbered specifications (i.e. 1, 3, 5, 7) are the original ones, added for ease of reference, whilst even numbered ones are the new regressions excluding the potential outlying observations.

There are very few changes in the statistical significance of the independent variables. Changes are observed in 36 of the 190 coefficients (underlined in tables 7.9 to 7.11) leaving more than 80% of the relationships the same. The majority of the impact from the exclusion of potential outliers involves the increase of statistical significance for the results. For example, when running the regressions on the reduced sample variables DEGREE and WALES provide statistically significant results now at the 10 and 5% level for EMPERIMPACT (table 7.9). Concurrently, there are a few cases where variables that were previously statistically significant lose their significance when running the regressions on the reduced sample. These are the cases of relatively unreliable variables such as ENTR and BIF and suggest that their sporadic statistically significant results in the regressions examined below were largely driven by influential outliers. It is worth mentioning that these variables were considered of inconsistent significance in the main analysis.

Table 7.9: Results of robustness checks for employment related variables.

	(1) EMPERIMPACT	(2) EMPERIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT	(5) EMPERIMPACT	(6) EMPERIMPACT	(7) FTEPERIMPACT	(8) FTEPERIMPACT
EMAVG_2004_2007	-0.596***	-0.568***	-0.583***	-0.546***	-0.524***	-0.495***		
	(0.0830)	(0.0984)	(0.0820)	(0.0923)	(0.0638)	(0.0756)		
FTEAVG_2004_2007							-0.600***	-0.622***
							(0.0571)	(0.0696)
MANF	-0.0362	-0.00805						
	(0.0516)	(0.0463)						
BIF	0.0220	-0.0177						
	(0.0405)	(0.0370)						
CON	-0.0288	0.00253						
	(0.0584)	(0.0545)						
PRIVATE	0.0122	0.0000243	-0.00202	-0.0272	-0.00711	-0.0168	0.0832	0.0538
	(0.0541)	(0.0588)	(0.0391)	(0.0563)	(0.0488)	(0.0587)	(0.0493)	(0.0510)
INV_HHI	2592.3	3296.0	-532.0	-816.9	-2366.5	-2220.4	-4571.5	-1398.3
	(6778.6)	(5765.8)	(6902.5)	(5423.4)	(6581.7)	(6338.4)	(8310.1)	(8099.0)
ENTR	-0.245**	-0.193*	-0.174*	-0.130	-0.0688	-0.0383	-0.194*	-0.189*
	(0.0963)	(0.0886)	(0.0949)	(0.105)	(0.0763)	(0.0816)	(0.0994)	(0.0951)
TRAIN	-0.186	-0.111	-0.223	-0.167	-0.257*	-0.175	-0.227	-0.180
	(0.124)	(0.111)	(0.125)	(0.122)	(0.134)	(0.125)	(0.149)	(0.135)
DEGREE	0.0822	0.0798*	0.0889**	0.0697*	0.109**	0.104**	0.108***	0.103**
	(0.0477)	(0.0383)	(0.0367)	(0.0316)	(0.0351)	(0.0330)	(0.0323)	(0.0439)
NO_QUAL	-0.195**	-0.209**	-0.179**	-0.199**	-0.181**	-0.176**	-0.168***	-0.185**
	(0.0731)	(0.0699)	(0.0723)	(0.0659)	(0.0605)	(0.0602)	(0.0528)	(0.0616)
AGE_20_34	0.440***	0.410***	0.461***	0.428***			0.575***	0.577***
	(0.0574)	(0.0428)	(0.0543)	(0.0469)			(0.0379)	(0.0429)
AGE_35_49	1.075***	0.910***	1.061***	0.895***	0.694***	0.591***	1.419***	1.464***
	(0.221)	(0.146)	(0.217)	(0.148)	(0.187)	(0.153)	(0.205)	(0.216)
AGE_50_64					-0.883***	-0.757***		
					(0.156)	(0.129)		
LN_DENSITY	-0.911***	-0.844***	-0.936***	-0.888***	-0.946***	-0.858***	-0.912***	-0.855***
	(0.191)	(0.167)	(0.204)	(0.169)	(0.252)	(0.191)	(0.219)	(0.212)
NOE	-1.704***	-1.901***	-2.016***	-2.023***	-1.544***	-1.706***	-2.235***	-2.555***

	(0.463)	(0.410)	(0.345)	(0.384)	(0.302)	(0.227)	(0.577)	(0.709)
MIDLANDS	-1.212***	-1.357***	-1.723***	-1.787***	-1.247***	-1.567***	-1.772***	-1.812***
	(0.355)	(0.271)	(0.242)	(0.269)	(0.298)	(0.225)	(0.253)	(0.248)
SCOTLAND	-2.723***	-2.436***	-2.934***	-2.696***	-1.814***	-1.624***	-2.617***	-2.813***
	(0.522)	(0.357)	(0.554)	(0.425)	(0.546)	(0.329)	(0.625)	(0.606)
WALES	-0.882	-1.149**	-1.425**	-1.635***	-0.866	-1.089**	-0.859	-0.972
	(0.634)	(0.417)	(0.574)	(0.419)	(0.598)	(0.394)	(0.671)	(0.635)
TS			-0.0312	-0.0591	-0.0498	-0.0893	-0.0317	-0.0308
			(0.0548)	(0.0564)	(0.0487)	(0.0558)	(0.0445)	(0.0473)
_cons	8.168	9.904	12.07*	17.76**	43.47***	43.78***	-6.394	-6.248
	(7.195)	(6.130)	(5.508)	(6.560)	(7.926)	(10.30)	(5.674)	(5.433)
N	373	365	378	369	378	370	378	374
r2	0.366	0.346	0.360	0.348	0.346	0.324	0.380	0.409

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 7.10: Results of robustness checks for unemployment related variables.

	(1) UNPERIMPACT	(2) UNPERIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT	(5) UNPERIMPACT	(6) UNPERIMPACT	(7) UNPERIMPACT	(8) UNPERIMPACT
UNEMPAVG_2004	-17.65***	-15.62***	-17.59***	-15.81***	-17.11***	-15.27***	-16.95***	-15.55***
_2007	(2.231)	(1.875)	(2.255)	(1.929)	(2.103)	(1.661)	(2.101)	(1.711)
MANF	1.119**	0.942**	1.119**	0.953**				
	(0.449)	(0.404)	(0.427)	(0.395)				
BIF	1.356**	1.161*	1.353**	1.162**				
	(0.465)	(0.521)	(0.460)	(0.517)				
CON	1.574**	1.404**	1.558**	1.424**				
	(0.631)	(0.485)	(0.623)	(0.500)				
TS					-0.250	-0.272	-0.231	-0.278
					(0.499)	(0.451)	(0.491)	(0.446)
PRIVATE	-0.736	-0.639	-0.737*	-0.641	-0.118	-0.260	-0.117	-0.260
	(0.408)	(0.463)	(0.406)	(0.465)	(0.475)	(0.399)	(0.476)	(0.406)
INV_HHI	-16822.6	-17386.0	-16376.8	-19378.9	-4105.9	-12752.1	-1602.6	-14968.2
	(39128.8)	(35009.0)	(39302.7)	(34678.3)	(35845.7)	(36019.5)	(34487.2)	(34787.4)
ENTR	-1.076	-0.758	-1.068	-0.691	-1.127	-0.478	-1.229	-0.432
	(1.324)	(1.195)	(1.393)	(1.225)	(1.450)	(1.096)	(1.508)	(1.147)
TRAIN	-1.055	-0.835	-1.050	-0.862	-0.847	-0.746	-0.826	-0.782
	(0.813)	(0.830)	(0.813)	(0.829)	(0.856)	(0.718)	(0.853)	(0.699)
DEGREE	-0.885**	-1.072***	-0.863**	-1.106***	-0.622*	-0.941***	-0.613*	-1.009***
	(0.319)	(0.295)	(0.280)	(0.275)	(0.307)	(0.258)	(0.278)	(0.264)
NO_QUAL	2.007***	1.712***	2.011***	1.691***	1.877***	1.617***	1.901***	1.592***
	(0.388)	(0.365)	(0.400)	(0.397)	(0.399)	(0.388)	(0.408)	(0.425)
AGE_20_34	0.134	0.0839			-0.348	-0.136		
	(0.824)	(0.782)			(0.874)	(0.847)		
AGE_35_49	-0.868	-0.509	-0.944	-0.568	-0.304	0.198	-0.0907	0.263
	(1.090)	(1.051)	(1.000)	(0.990)	(1.097)	(1.169)	(1.156)	(1.133)
AGE_50_64			-0.110	-0.557			0.965	-0.341
			(1.765)	(1.764)			(1.903)	(1.953)
LN_DENSITY	4.578*	4.730**	4.702*	4.355**	6.812**	6.274***	7.095**	5.733**
	(2.077)	(1.959)	(2.170)	(1.937)	(2.177)	(1.955)	(2.428)	(2.122)
NOE	5.548	4.578	5.567	4.877	6.423	4.647	5.973	4.861
	(6.657)	(4.742)	(6.565)	(4.676)	(7.346)	(5.278)	(7.156)	(5.137)

MIDLANDS	4.294	2.226	4.344	2.535	5.485	4.004	4.961	4.179
	(3.695)	(3.942)	(4.285)	(4.508)	(3.738)	(3.331)	(4.123)	(3.862)
SCOTLAND	-4.641	-2.805	-4.398	-2.485	-2.563	-2.037	-3.427	-2.152
	(4.805)	(3.851)	(4.983)	(4.238)	(5.208)	(3.737)	(5.387)	(4.207)
WALES	-6.479	-4.546	-6.430	-4.299	-3.633	-3.305	-4.077	-3.166
	(4.088)	(4.075)	(4.528)	(4.717)	(5.320)	(4.575)	(5.564)	(5.172)
_cons	173.0***	155.8***	177.5**	173.8**	157.9*	157.5*	123.6	167.9*
	(41.95)	(42.20)	(62.52)	(57.50)	(84.34)	(74.87)	(96.60)	(77.92)
N	365	356	365	356	366	356	366	356
r2	0.424	0.436	0.424	0.436	0.399	0.417	0.399	0.417

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 7.11: Results of robustness checks for JSA related variables.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAIMPACT	(4) JSAIMPACT	(5) JSAIMPACT	(6) JSAIMPACT	(7) JSAIMPACT	(8) JSAIMPACT
JSA_2007	0.186**	0.225***	0.193**	0.238***	0.177*	0.225***	0.183**	0.218***
	(0.0821)	(0.0565)	(0.0788)	(0.0554)	(0.0823)	(0.0607)	(0.0801)	(0.0613)
MANF	0.0192*	0.0205*	0.0186*	0.0199*				
	(0.00990)	(0.0100)	(0.00927)	(0.00990)				
BIF	0.0103*	0.0120**	0.0105*	0.0126**				
	(0.00535)	(0.00483)	(0.00553)	(0.00499)				
CON	0.0103	0.00409	0.0113	0.00469				
	(0.00770)	(0.00760)	(0.00808)	(0.00791)				
TS					-0.00391	-0.00229	-0.00265	-0.00156
					(0.00803)	(0.00702)	(0.00771)	(0.00766)
PRIVATE	0.0131**	0.0162**	0.0135**	0.0157**	0.0171**	0.0194**	0.0174***	0.0198***
	(0.00488)	(0.00581)	(0.00470)	(0.00552)	(0.00559)	(0.00682)	(0.00547)	(0.00586)
INV_HHI	-253.6	-178.4	-210.7	-195.1	-319.4	-283.4	-227.3	-204.3
	(411.4)	(508.3)	(382.9)	(508.5)	(558.7)	(558.4)	(498.0)	(526.5)
ENTR	-0.0440	-0.0955***	-0.0498	-0.0962***	-0.0462	-0.0966***	-0.0523*	-0.107***
	(0.0313)	(0.0130)	(0.0275)	(0.0155)	(0.0317)	(0.0171)	(0.0280)	(0.0181)
TRAIN	0.0463**	0.0509***	0.0469**	0.0516***	0.0471**	0.0475***	0.0478**	0.0502***
	(0.0178)	(0.0141)	(0.0178)	(0.0139)	(0.0188)	(0.0128)	(0.0189)	(0.0146)
DEGREE	-0.0173***	-0.0140***	-0.0182***	-0.0162***	-0.0172**	-0.0138**	-0.0183**	-0.0137**
	(0.00514)	(0.00352)	(0.00498)	(0.00375)	(0.00596)	(0.00515)	(0.00597)	(0.00481)
NO_QUAL	0.0207**	0.0168**	0.0215**	0.0182**	0.0236***	0.0212***	0.0245***	0.0224***
	(0.00741)	(0.00645)	(0.00827)	(0.00693)	(0.00671)	(0.00573)	(0.00765)	(0.00652)
AGE_20_34	-0.0281***	-0.0298***			-0.0284***	-0.0279***		
	(0.00696)	(0.00542)			(0.00721)	(0.00605)		
AGE_35_49	0.00859	0.0161	0.0261	0.0348	0.0226	0.0336	0.0399	0.0541**
	(0.0210)	(0.0243)	(0.0202)	(0.0235)	(0.0234)	(0.0260)	(0.0226)	(0.0230)
AGE_50_64			0.0570**	0.0574***			0.0575**	0.0648**
			(0.0184)	(0.0170)			(0.0215)	(0.0230)
LN_DENSITY	0.166***	0.141***	0.171***	0.144***	0.176***	0.147***	0.180***	0.161***
	(0.0303)	(0.0197)	(0.0337)	(0.0217)	(0.0318)	(0.0214)	(0.0345)	(0.0264)
NOE	0.408***	0.368***	0.383***	0.352***	0.421**	0.381***	0.397***	0.369***
	(0.128)	(0.103)	(0.112)	(0.0898)	(0.141)	(0.104)	(0.124)	(0.0923)
MIDLANDS	0.0711	0.0126	0.0385	-0.0219	0.113	0.0571	0.0816	0.0300

	(0.0669)	(0.0539)	(0.0577)	(0.0490)	(0.0829)	(0.0646)	(0.0692)	(0.0526)
SCOTLAND	0.151	0.0462	0.0866	-0.0180	0.117	-0.0134	0.0535	-0.105
	(0.185)	(0.113)	(0.155)	(0.0848)	(0.192)	(0.114)	(0.161)	(0.0795)
WALES	0.450***	0.360***	0.423***	0.370***	0.458***	0.343***	0.433***	0.332***
	(0.104)	(0.0746)	(0.0876)	(0.0615)	(0.123)	(0.0826)	(0.104)	(0.0695)
_cons	-1.196*	-1.159*	-3.208***	-3.157***	-1.089	-1.187	-3.211**	-3.540**
	(0.586)	(0.613)	(0.792)	(0.714)	(1.049)	(0.996)	(1.259)	(1.294)
N	373	366	373	364	378	369	378	372
r2	0.691	0.751	0.689	0.760	0.680	0.749	0.678	0.734

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

The analysis indicates that the potentially influential outliers (observations with significantly large residuals) have little impact on the results of the analysis. A relatively small percentage of independent variables saw changes in their statistical significance and the vast majority of these involved an increase in the significance levels of their coefficients. As expected, excluding observations with large residuals has also altered the size of the coefficients, leaving the direction of the effect (mitigating vs detrimental) unchanged. These results further support the robustness of the original analysis since the potential outliers do not exert significant influence.

London is often examined separately by researchers as it can behave differently to other regions and be the source of extreme values for several variables. For example, the City of London and other central areas are common outliers in studies of business demographics and entrepreneurship due to their high rates of firm formation and low resident population (Bishop, 2012; Gleave & Mitra, 2010). Given this, and following similar studies such as Lee's (2014), the effect of London has been examined separately with the replacement of the geographical dummies (NOE, MIDLANDS, SCOTLAND, WALES) with a London one (LONDON) assuming the value of 1 for each LAD in the London region and 0 for the rest (appendix 4).

Replacing the geographical dummies with the London one has relatively minor effects on the results (tables 9.17-9.25 in appendix 4). The LONDON dummy has a mitigating effect for EMIMPACT and FTEIMPACT, as well as JSAIMPACT and JSAPERIMPACT whilst it does not provide any statistically significant results for the rest of the dependent variables. This implies that, LADs in London have performed better than the rest of the GB when

performance is judged by some but not all of the dependent variables which highlights the differences between various measures of the crisis impact. The rest of the results see little change from the inclusion of the LONDON dummy. AGE_35_49 is the most affected variable, losing its mitigating effect on EMIMPACT and exhibiting a detrimental effect on JSAIMPACT which now agrees with the results for JSAPERIMPACT. Variable ENTR also sees limited changes such as the loss of its detrimental impact for EMPERIMPACT and FTEPERIMPACT and the provision of a sensitive, mitigating effect for UNIMPACT in one of four specifications. Finally, other minor changes are observed for variables CON (detrimental effect for JSAIMPACT) and PRIVATE (mitigating effect in one of four specifications for FTEPERIMPACT and loss of detrimental effect for JSAIMPACT) demonstrating the sensitivity of the original results.

7.5 Migration

A final issue to be explicitly addressed in the robustness checks is migration. Migration could be a strategy for individuals to mitigate the effects of the crisis by seeking employment in a different area. This section investigates the effects of migration rates on the results obtained in chapter 6.

Table 7.12 provides the descriptive statistics of variables *MIG07* which is the net migration (inflow minus outflow) per 1000 population in LADs for 2007 and its disaggregation into international (*INTMIG07*) and domestic (*DOMMIG07*) components. The data is derived from ONS' local area migration indicators which use General Practitioner (GP) and National Insurance Number (NINO) registrations in order to provide estimates of long-term international and domestic migration. From the table, it can be seen that the average LAD has a net inward migration of 5.65 per thousand population which is approximately

comprised of 2/3 international migration and 1/3 domestic. This, however, reflects the difference between inflows and outflows rather than the number of movements where domestic inflows outstrip international inward migration by a factor of five. It is also worth noting that the mean net migration figures of table 7.12 reflect the unweighted average of the 380 LADs and this is why the average DOMMIG07 is not zero.

Table 7.12: Descriptive statistics of migration variables.

Variable	Obs	Mean	Std. Dev.	Min	Max	total inflow	total outflow
INTMIG07	380	3.78	6.44	-13.51	74.93	652,803	376,490
DOMMIG07	380	1.87	7.31	-32.95	25.77	2,952,717	2,954,210
MIG07	380	5.65	7.78	-27.93	100.7	3,605,520	3,330,700

Source: Author's treatment from ONS data.

In terms of the econometric analysis, since the variables included refer to the year 2007, it is unlikely that extraordinary migration movements due to the economic crisis have affected the results of the demographic variables. Using migration statistics for the post-2008 years would create endogeneity concerns and make it difficult to distinguish between the cause and effect among the dependent and independent variables. This is not to diminish the real impact of migration on resilience and the performance of local labour markets. It rather means that, due to the methodology applied, the current empirical investigation is not able to comprehensively answer questions concerning the effects of migration on the crisis impact. In order to provide adequate evidence, an examination of these effects would need to consider migration movements in the period after 2008.

Hence, it is more likely that net migration in 2007 signals places that are more attractive and hence more buoyant and able to mitigate the negative effects of the crisis. Table 7.13 shows the correlations (statistically significant correlations

are underlined) of *MIG07, INTMIG07 and DOMMIG07* to the rest of the variables in the study.

There are several points of interest arising from this table. *MIG07* is positively correlated to *INTMIG07* and *DOMMIG07* with their relationship being of medium strength. With the exception of ENTR and DOMMIG07, net migration does not have a correlation greater than 0.5 with any other variable. This may indicate that, within net total migration (MIG07), there are different relationships for international and domestic migration.

There are several variables for which the relationships with INTMIG07 and DOMMIG07 have different signs. For example, the unemployment related independent variables (UNEMPAVG_2004_2007, UNEMP_2007, JSAAVG_2004_2007, JSA_2007) all have a positive relationship to net international migration and a negative one to DOMMIG07. Different correlation coefficients are also seen for AGE_20_34, AGE_50_64 and LN_DENSITY. These variations suggest different patterns and motives for migrating.

International migration is higher in places with high unemployment; entrepreneurship rates; a more youthful population and higher densities. These are characteristics of more urban areas towards which international migrants tend to move. On the contrary, domestic migration is negatively correlated to high unemployment rates and higher population densities, whilst it is positively associated to areas with high shares of population in the 50-64 age band. These are characteristics of less urban areas and indicate a rural exodus for domestic migrants. These two different patterns may give rise to different results on the migration variables. As a result, the analysis below will look both

at the net migration levels as a total and the disaggregation into its international and domestic components.

Table 7.13: Correlations between the migration variables and the rest of the dependent and independent variables.

Variable	MIG07	INTMIG07	DOMMIG07
MIG07	1.00		
INTMIG07	0.48	1.00	
DOMMIG07	0.64	-0.36	1.00
EMIMPACT	0.02	-0.27	0.21
EMPERIMPACT	-0.02	0.28	-0.22
FTEIMPACT	0.04	-0.24	0.21
FTEPERIMPACT	-0.04	0.26	-0.22
UNIMPACT	-0.13	-0.12	-0.02
UNPERIMPACT	0.10	-0.29	0.30
JSAIMPACT	-0.30	-0.15	-0.19
JSAPERIMPACT	0.06	-0.39	0.40
EMAVG_2004_2007	0.05	-0.07	0.10
EMP_2007	0.07	-0.02	0.07
FTEAVG_2004_2007	-0.02	0.02	-0.03
FTE_2007	0.03	0.08	-0.03
UNEMPAVG_2004_2007	-0.32	0.49	-0.63
UNEMP_2007	-0.30	0.33	-0.51
JSAAVG_2004_2007	-0.28	0.32	-0.58
JSA_2007	-0.30	0.27	-0.55
MANF	-0.07	-0.18	0.07
TS	-0.09	0.19	-0.26
BIF	0.27	0.44	-0.10
CON	0.17	-0.16	0.26
PRIVATE	0.29	0.23	0.11
INV_HHI	-0.19	-0.05	-0.12
ENTR	0.64	0.57	0.17
TRAIN	-0.01	-0.14	0.10
DEGREE	0.17	0.34	-0.12
NO_QUAL	-0.24	0.14	-0.30
AGE_20_34	-0.22	0.54	-0.72
AGE_35_49	0.06	0.05	0.01
AGE_50_64	0.31	-0.47	0.75
LN_DENSITY	-0.31	0.32	-0.62

Source: Author's treatment.

Tables 7.14 to 7.16 below show the cumulative results of the regressions using MIG07, INTMIG07 and DOMMIG07. Because of the high correlations and multicollinearity concerns arising from inflated VIFs between INTMIG07 and

DOMMIG07 on the one side and some of the demographics variables on the other (AGE_20_34 and AGE_50_64), it was decided to exclude the demographics variables from this analysis. To assist the comparison between MIG07, INTMIG07 and DOMMIG07, the demographics variables are excluded from the analysis using MIG07 as well.

Comparing the cumulative results (chapter 6 and table 7.1) to table 7.10 below, it can be seen that most of the results of the main analysis remain the same (for the individual regressions see appendix 5). Variable MIG07, representing the net migration rate per thousand population does not provide any statistically significant results. As discussed above, this could be due to the differing effects of international and domestic migration. Indeed, when MIG07 is replaced by INTMIG07 and DOMMIG07, it is the net international migration which has a mitigating effect on the crisis impact which is lost when combined with domestic migration which shows no statistically significant effect.

The few other changes observed mainly involve variables that were inconsistent throughout the analysis such as ENTR and PRIVATE or the industrial structure variables. In addition to this, NO_QUAL loses its detrimental effect on the crisis impact whilst a few changes also occur due to the exclusion of the demographics variables. As was seen in the relevant section above, the exclusion of the age related variables results in a change in the direction of the effect for LN_DENSITY for the employment related dependent variables (EMIMPACT, EMPERIMPACT, FTEIMPACT, FTEPERIMPACT) from a detrimental to a mitigating one.

Table 7.14: Cumulative results excluding demographics and including MIG07.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (2/2)	D (2/2)	D (2/2)	D (2/2)	M (2/2)	M (2/2)		M (2/2)
MANF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
BIF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
CON					D (1/1)	D (1/1)	D (1/1)	
TS								
PRIVATE							D (2/2)	
INV_HHI								
ENTR	D (1/2)	D (1/2)						M (1/2)
TRAIN	D (2/2)	D (1/2)	D (1/2)				D (2/2)	
DEGREE	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)
NO_QUAL					D (2/2)	D (2/2)	D (2/2)	D (2/2)
MIG07								
LN_DENSITY	M (2/2)	M (1/2)	M (2/2)	M (2/2)	D (2/2)	D (2/2)	D (2/2)	D (2/2)
NOE	D (1/2)	D (2/2)	D (1/2)	D (2/2)			D (2/2)	D (2/2)
MIDLANDS	D (2/2)	D (2/2)	D (2/2)	D (2/2)			D (1/2)	
SCOTLAND								
WALES			M (1/2)				D (2/2)	D (2/2)

Table 7.15: Cumulative results excluding demographics and including INTMIG07.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (2/2)	D (2/2)	D (2/2)	D (2/2)	M (2/2)	M (2/2)	D (2/2)	M (2/2)
MANF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
BIF						D (1/1)		D (1/1)
CON					D (1/1)	D (1/1)		
TS								
PRIVATE						M (1/2)	D (2/2)	
INV_HHI								
ENTR							M (1/2)	M (1/2)
TRAIN	D (2/2)	D (1/2)					D (2/2)	
DEGREE	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)
NO_QUAL					D (2/2)	D (2/2)	D (2/2)	D (2/2)
INTMIG07	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)		M (2/2)	M (1/2)
LN_DENSITY			M (2/2)	M (2/2)	D (2/2)	D (2/2)	D (2/2)	D (2/2)
NOE	D (1/2)	D (2/2)	D (1/2)	D (2/2)			D (2/2)	D (2/2)
MIDLANDS	D (2/2)	D (2/2)	D (2/2)	D (2/2)			D (1/2)	
SCOTLAND		D (1/2)						
WALES			M (1/2)	M (1/2)			D (2/2)	D (1/2)

Table 7.16: Cumulative results excluding demographics and including DOMMIG07.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (2/2)	D (2/2)	D (2/2)	D (2/2)	M (2/2)	M (2/2)	D (2/2)	M (2/2)
MANF					D (1/1)	D (1/1)	D (1/1)	D (1/1)
BIF						D (1/1)		D (1/1)
CON					D (1/1)	D (1/1)		
TS								
PRIVATE							D (2/2)	
INV_HHI								
ENTR	D (1/2)	D (1/2)					M (1/2)	M (1/2)
TRAIN	D (2/2)	D (1/2)	D (1/2)				D (2/2)	
DEGREE	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)
NO_QUAL					D (2/2)	D (2/2)	D (2/2)	D (2/2)
DOMMIG07							D (2/2)	D (2/2)
LN_DENSITY					D (2/2)	D (2/2)	D (2/2)	D (2/2)
NOE	D (2/2)	D (2/2)	D (2/2)	D (2/2)			D (2/2)	D (2/2)
MIDLANDS	D (2/2)	D (2/2)	D (2/2)	D (2/2)			D (1/2)	
SCOTLAND		D (1/2)						
WALES			M (1/2)				D (2/2)	D (2/2)

Overall, considering the effect of net migration in 2007 does not significantly impact on the results. The inclusion of MIG07 leads to a small number of changes for the independent variables, with the majority being changes in previously inconsistent variables rather than changes in the direction of the relationship between the dependent and independent variable (with mainly the exception of LN_DENSITY). The overwhelming majority of the results identified in chapter 6 are confirmed whilst a significant tension within total net migration is revealed.

The differentiation between international and domestic migration has revealed a mitigating role for international migration which is not identified when considering the total due to the size of domestic migration and its different characteristics (movement to more rural areas). In attempting to explain the link between international migration in 2007 and the post-2008 crisis impact, one could consider the location of immigrants and their effect on local labour markets. Table 7.13 shows that international migration is positively correlated with UNEMPAVG_2004_2007 (0.49) which indicates that places with higher unemployment rates have received more net international migration per 1000 population. This could be because places with high unemployment rates tend to have lower costs of living such as rents. At the same time, it was found in chapter 6 that places with higher unemployment rates before the crisis have seen lower unemployment increases post-2008. It is possible that the arrival of immigrants (who are predominantly working age individuals) in an area would increase labour supply and lower its cost, assisting the mitigation of the crisis impact. This would be in agreement with findings from Rodríguez-Pose & von Berlepsch (2014) who find that the pattern of migration correlates with the pattern of growth in the US one century on.

However, it is worth remembering that, due to the nature of examination, any explanation is speculative and that the migration variables identify areas where immigrants chose to settle rather than reflecting a response to the crisis (since the variable considers net migration in 2007). Hence, it is more likely that higher migration rates reflect LADs with more attractive attributes for migrants and that these attributes are different for international (high densities, younger aged populations) and domestic (lower densities, older aged populations) immigrants and thus, INTMIG07 and DOMMIG07 reflect different places.

7.6 Conclusions

This chapter addresses some robustness checks for the main analysis. It deals with issues that have been identified either from the econometric results or the operationalisation of the study. In turn, the chapter examines chapter 6's counterintuitive results on urbanisation (LN_DENSITY) and entrepreneurship (ENTR) by testing whether they are influenced by some individual characteristics that are controlled for (human capital and demographics). It also investigates the possibility of constructing a composite indicator to reflect the eight measures of crisis impact before testing for the possible effects of outliers, London as a region and migration.

The results of the robustness checks confirm that, once human capital and demographics are excluded from the study, firm formation and the degree of urbanisation exhibit more intuitive results. It has been found that ENTR reverses its effect from a detrimental to a mitigating one, once education and training variables are excluded. The same holds for variable BIF which is also related to human capital. Urbanisation on the other hand is heavily influenced by the demographic characteristics of LADs. Once the age structure of different areas is excluded from the analysis, LN_DENSITY shows more meaningful results,

switching from a detrimental to a mitigating effect for the employment related dependent variables.

Constructing a composite indicator to reflect the crisis impact in local labour markets holistically, produced variable CICI. As expected, the indicator is highly correlated to the underlying variables. Using CICI as the dependent variable provided results which were similar in direction but more robust statistically. This improvement could be attributed to both the indicator's construction method and to the fact that it smoothens any potential extreme values that could impact on the coefficients of individual variables.

The effects of potential outliers as well as of LADs in London have also been studied. A few of the original regressions have been identified as having non-normal residuals which indicated potentially significant outliers. Excluding these outliers and re-running the regressions have shown no significant change of the original results. Replacing the regional dummies with a London one also showed sporadically significant mitigating effects for LADs in the capital but despite the differences to the rest of GB, few other results change. In addition, any changes are related to previously identified inconsistent results.

Finally, the chapter has examined the impact of migration on the results. The potential impact of migration could affect the dependent variables but as discussed above, this study is concerned with the aggregate crisis impact in local labour markets and the study's research design means that independent variables are considered for the year(s) before the on-start of the crisis. Considering net migration rates for 2007 did not provide statistically significant results and it neither altered significantly the results on the pre-existing independent variables. The lack of a significant effect for MIG07 is mainly

attributable to the influence of domestic migration which dilutes the mitigating effects of international migration. However, even in this case, migration rates should be considered as a reflection of the attractiveness of places rather than a response to the economic crisis. The inclusion of MIG07 has also led to few changes in (mainly) previously inconsistent results.

In conclusion, this chapter has confirmed and clarified the results of the initial analysis. It clarified the counterintuitive results on ENTR and LN_DENSITY from chapter 6 and examined the advantages of constructing a composite indicator. At the same time, it has confirmed that the results are not heavily influenced by outliers and LADs in London or by pre-crisis mobility in the form of migration. Following, the closing remarks and overall conclusions provide a round-up view of the thesis and its contribution.

Chapter 8 - Conclusions

8.1 Introduction

This thesis has sought to investigate and contribute to the analysis of economic resilience. The concept of resilience is a contested field without a robust conceptualisation and operationalisation. Consequently, there is a considerable research gap in identifying the determinants of the differential resilience performance of places during an economic crisis such as the one of 2008. In this respect, this study aimed at examining these determinants at the LAD level in GB for the period 2008-2014.

It is the first time a study has investigated the resilience of local authorities in GB in detail. The thesis devises an operational definition of the crisis impact which revolves around the comparison of local labour market conditions before and after 2008. It then constructs and examines eight labour market measures of economic resilience and a composite indicator which combines the information of the eight measures. In this sense, it provides a holistic overview of the crisis impact in local labour markets and identifies differences between the various measures used in different studies. The construction of the dependent variables introduces the use of an averaging method to avoid temporal variations (due to small sample sizes) from which methods such as the “peak to trough” may suffer at low geographical levels.

In addition, the thesis identifies and examines a wide range of the crisis impact determinants in LADs. It is the first time that a resilience study has examined determinants such as demographics which were found to be consistently significant factors in deepening or mitigating the crisis impact. Besides this,

among the most important findings is the influence of skills, previously good labour market performance and the lack of statistically significant results with regards to the local industrial structure. Finally, a series of robustness checks confirmed the results against the potential influence of outliers; examined the feasibility of using a composite indicator of labour market performance; and clarified the counterintuitive initial results on entrepreneurship and population density.

The thesis started by outlining the emergence and development trajectory of the notion of resilience in economics, and then continued to critically assess the concept of engineering resilience and resilience as an evolutionary process of adaptation. This was followed by a review of potentially influential factors of the performance of different places following a downturn. This investigation ranged from path dependence considerations such as the pre-crisis conditions in the labour market to human capital and the role of the geographically uneven growth trajectories of different regions.

Following this initial review, the thesis' paradigm of inquiry was considered and clarified with the identification of a post-positivist empirical approach at the heart of the investigation. Accompanying the research methodology, the operationalisation of resilience provided a comprehensive set of eight labour market indicators to be used as dependent variables. In addition, the analysis identified the indicators representing the determining factors to be examined. An OLS cross-sectional examination was employed to investigate the relationships between the dependent and independent variables. Finally, the empirical examination is complemented by a comprehensive robustness analysis and further consideration of counterintuitive results on entrepreneurship and

population density measures. In addition, potentially influential outliers, as well as the impact of migration and the construction of a composite indicator representing all the dependent variables were examined. The purpose of this final chapter is to summarise the thesis, present its main conclusions and policy implications as well as discussing steps for further research.

8.2 Conclusions of the research and policy implications

The examination of the determining factors of economic resilience in GB's LADs has led to a number of interesting results. First, the study finds that places which performed better before the start of the crisis have had deeper negative crisis impacts. Whilst it is not possible to fully explain this, it is plausible that this could be the result of a large firm base operating with marginal profits in these areas during the boom period, many of which were unable to survive once demand fell or when the credit availability which underpinned their expansion was restricted. An alternative explanation would be a movement of workers from LADs with weaker, pre-crisis growth rates to stronger ones once the crisis started. If post-crisis job growth in these latter areas failed to match the growth of the workforce, these areas may show deeper crisis impacts.

In addition to initial conditions, human capital and demographics are amongst the most consistent determinants of the crisis impact. Places with higher shares of their population with degree level qualifications have performed better whilst places with higher shares of population without any qualifications have performed worse. This is most likely related to the transferability of knowledge and skills as well as the increased probability of highly skilled individuals being retained within companies. Highly skilled individuals are expected to possess skills that are easily adaptable and transferable to a range of different jobs and sectors. An economist for example can work as an economist for the Bank of

England but also as a data analyst for a firm, a journalist in a financial newspaper or a maths tutor.

Moreover, within firms, highly skilled individuals are more likely to be able to perform the tasks of jobs requiring fewer skills. For example a CEO can arrange their own agenda and set up their own meetings and the purchasing manager of a firm can check herself/himself the levels of stock in the warehouse without needing to contact the warehouse manager. As a result, in the case where a firm which needs to scale down its operations, it is more likely to maintain the highly skilled staff than staff with lower levels of skill. Both of these arguments suggest that individuals possessing a higher level of skills will be more likely either to keep their jobs in the event of cuts or to find another job in the event of being made redundant.

The demographic structure of local authorities also emerges as a significant factor of the crisis impact with younger aged populations exhibiting a mitigating effect and the age group 50-64 a detrimental one. These two results combined stress the importance of flexibility and the transferability of skills, especially in crisis periods involving sudden structural change. Younger aged populations are expected to possess skills that are easier to transfer whilst they are less likely to be locked in professions and places and more likely to accept jobs not guaranteeing a minimum number of working hours. This flexibility attribute greatly expands the number of labour markets younger aged workers can participate in, thus increasing their probability of employment.

Another significant determinant identified was population density. As mentioned in chapter 3, urbanisation can have numerous positive growth effects. Larger urban areas provide bigger markets, larger skill pools (and greater magnets of

talent) and enable knowledge to travel faster. These urbanisation externalities were expected to outweigh the negative effects of over-crowding reflected in increased costs for firms and individuals. Population density was used to represent the level of urbanisation in different LADs and, in line with the positive urbanisation externalities, was expected to provide a mitigating effect on the crisis impact, at least for the employment related dependent variables.

However, contrary to expectations, LN_DENSITY had a consistent detrimental effect across all measures of resilience, suggesting that more urban areas have had greater crisis impacts. Whilst higher densities could be linked to lower resilience for the unemployment related dependent variables (due to higher concentrations of unemployment in urban areas), these results required further examination to test their robustness. Due to multicollinearity considerations and the high correlations between the age groups 20-35 and 50-64, these checks tested the effect of excluding demographics from the analysis. As a result, it was found that the results on LN_DENSITY for the employment related dependent variables were mainly driven by controlling for demographics. Once the age group variables have been removed from the analysis (chapter 7 section 2), the effect of LN_DENSITY for the employment related measures of the crisis impact reversed to a mitigating one. Thus, the existence of a more youthful and flexible workforce in cities has been identified as a major attribute through which more urbanised areas managed to weather the crisis impact better.

The number of different dependent variables and their conceptual differences (employment vs unemployment related variables, nominal vs relative difference measures, estimates vs administrative data for JSA) implies that different

determinants may be significant for different measures. This proved to be the case with a number of inconsistently significant relationships identified. For example, the regional dummies proved significant mainly for the employment related variables where they show that LADs in the North of England, Midlands and Scotland have performed worse, compared to LADs in the rest of GB. The lack of statistically significant results for the unemployment related measures could be related to the traditionally high and persistent rates of unemployment in these areas irrespective of whether there is an economic crisis or not.

Similarly inconsistent are the results for employee training and entrepreneurship. In the few occurrences that employee training provided statistically significant results, these imply a deepening of the crisis impact which could be an indication of self-selection and rigidities within the firms that engage in employee training. On the other hand, the original detrimental effect of higher rates of firm births (ENTR) on the crisis impact, if not related to the fragility and limited access to finance for new firms, was a counterintuitive result. Further robustness testing suggested that this detrimental effect was related to controlling for human capital due to the positive correlation between ENTR and DEGREE. However, the results remained inconsistently significant which has implications for the support of new firms as will be seen below.

A final important result arises from the consideration of the variables representing the industrial structure of different LADs. Despite examining a range of variables including the employment shares in numerous sectors (MANF, BIF, CON, TS), as well as the share of employment in the private sector and the degree of sectoral concentration (INV_HHI), the study has not identified a particular pattern. In the minority of specifications that the

aforementioned variables provided statistically significant results, these were mainly detrimental but further testing has failed to identify statistically significant differences between the coefficients. This could be an indication that whilst the crisis may have started in the financial sector it rapidly spread throughout the economy, leaving no sector unaffected.

The results have been confirmed through a range of robustness checks which also confirmed that there is potential for creating a composite indicator to provide a more stable and holistic measure of the effects in local labour markets. The results have been further tested for the effect of outliers and migration and no significant influence has been identified on the original analysis. With regards to understanding the effect of migration on the results, it was found that international and domestic migration are directed to areas with different characteristics and that the former was directed (in 2007) towards areas which have performed better during the crisis.

The above results have significant policy implications despite the fact that there is no current government policy explicitly addressing economic resilience. For example, the importance of human capital and an age distribution with a focus on younger aged workers, highlights the importance of universities as anchor institutions (also recognised for their role delivering the industrial strategy (HM Government, 2017)). Universities have the capacity to generate human capital and attract talent from outside the local area which has a high probability of staying in the region after graduation, provided the relevant opportunities for employment exist. In addition, universities are instrumental in local smart specialisation strategies and driving innovation (European Commission, 2011)

whilst they generate significant revenues for their areas both through their spending and by attracting students from abroad (Universities UK, 2014).

Another strain of research suggests that amenities and characteristics such as tolerance and a multi-cultural environment are crucial in attracting talent at a global level (Florida, 2002; Florida & Mellander, 2010; Florida, Mellander & Stolarick, 2008; Glaeser, Kolko & Saiz, 2001). In that sense, LADs and local governments should be concerned with creating attractive built environments and offering housing and services that are suitable to these highly skilled individuals whose consumption preferences revolve around high quality goods and services. Without the right housing offer, it is highly unlikely that any place will be able to attract highly skilled individuals and this is often neglected in local growth strategies.

On the other hand, areas with high proportions of an aging population may need to devise strategies for attracting young professionals that will meet the needs of that ageing population, specialising for example in care provision and innovation in the health industry. Again, educational institutions have a role to play here by providing relevant courses and specialisms. However, a healthy local economy would more likely require a rebalancing of demographics.

The mixed results on ENTR suggest that newly formed firms may be particularly vulnerable during the crisis. This means that there is a need to identify the factors that could foster entrepreneurship, perhaps particularly in relation to credit constraints, if it is to provide positive outcomes and generate resilience during economic crises. Increasing credit availability and protection during the incubation period emerge as crucial characteristics of a policy that would enhance entrepreneurship, especially during a recession.

This thesis suggests that the crisis had a distinct geographical footprint which was affected by historical path dependence. LADs in the North and the Midlands have performed worse than the rest in the employment related measures. However, this is not the case for the unemployment related variables and the reason for this is potentially the historically high rates of unemployment which pre-existed the 2008 crisis and dilute any post-recession unemployment increases. These findings further support the need for addressing the chronic unemployment issues in some areas which should focus on sustainable and endogenous employment generation engaging each place's competitive advantages. Starting with infrastructure and a place-based industrial strategy, it is imperative that these areas are provided with the resources needed to understand and capitalise on their assets.

Finally, the lack of a sectoral footprint for the 2008 crisis suggests that sectoral policies may not be appropriate in downturns of this size and extent. The examination of the determinants of the crisis impact in the UK has not found a clear sectoral pattern as was initially expected with deeper impacts on finance and construction. It appears that the crisis has spread from the financial sector to the rest of the economy by reducing demand and credit availability in the economy as a whole. Even though the support for the financial sector may have averted a collapse in the banking industry, it did not appear very effective in avoiding its transmission to the rest of the economy. This could suggest that when facing recessions that are systemic in nature and affect the whole of the economy, it may be more appropriate to follow place-based policies rather than sector-specific ones, since the differences in overcoming the negative impact of the crisis is more related to factors other than an area's industrial structure.

In order to create places that can better mitigate an economic crisis, this thesis suggests a direct action plan for the future. This should start with a holistic place-based review, identifying local assets, strengths and weaknesses and continue with developing a strategic growth plan that accounts for resilience as a core element. This implies working together with local stakeholders to identify competitive advantages that may sustain a resilient economy and developing transferable skills and built-in flexibility and dynamism to mitigate potential downturns. Currently, any work on resilience at the national level relates to infrastructure resilience to disasters (Cabinet Office, 2016) without considering resilience to external economic shocks. This thesis argues that there is a need to change that, and consider resilience holistically as an integral part of growth policies such as the industrial strategy (HM Government, 2017).

8.3 Limitations and future research

The study is subject to a number of methodological limitations. Some of these are related to the resilience notion and its stage in its conceptual development whilst others are linked to the econometric analysis. This section considers these limitations in order to provide insights for future research in the field.

The generic limitations in studies of economic resilience concern the lack of a robust definition and a widely accepted operationalisation for the concept which imply that decisions in these areas are bound to be subjective. The empirical nature of this thesis suggested that it is imperative for any conceptualisation of the notion to be translatable into a clear econometric research design. Hence, the decision was made to proceed with an operational definition of resilience that could be measured quantitatively. Chapters 2 and 5 outlined the different quantitative indicators available which include labour market as well as income measures. The decision for this study was to focus on labour market indicators

and adopt a methodology that compares the conditions before and after the crisis without restricting the data periods (as does the ‘peak to trough’ method which takes the maximum and the minimum observations) too much. This has allowed the crisis impact to be reflected in different areas irrespective of its lag.

These decisions led to a cross sectional empirical analysis which is also subject to limitations. This type of analysis does not allow for the examination of the issue in time. It rather offers a snapshot which makes it difficult to provide conclusive results for long-term resilience. It also makes it difficult to provide inference with regards to causality. For example, is it a younger aged population that is the source of lower crisis impacts or do younger aged workers tend to move to places that are better at mitigating the negative effects of the downturn?

To an extent, these concerns are alleviated by the operationalisation of the independent variables. The fact that these variables are taken for the period before the on-start of the crisis whilst the dependent variables represent the differences between pre and post-2008 means that the scale of the former cannot be affected by post-crisis movements. This method for alleviating endogeneity in cross sectional studies have been used in other studies (Audretsch & Keilbach, 2005) and whilst it prevents the direction of the effect from the left hand side of the regression equation to the right, it does not fully address the issue of sorting suggesting a spatial concentration of high human capital individuals in urban areas (Ahlin, Andersson & Thulin, 2016; Berry & Glaeser, 2005). The solution to these concerns would involve the repetition of the study using different time periods and potentially, geographical units. In addition, once more data periods have been collated an operationalisation

suitable for panel analysis which would include instrumental variables may confirm the direction of causality in the results found in this thesis.

In common with other studies, data availability is another factor which limits this thesis. Multi-faceted concepts such as economic resilience could be affected by a number of factors which are not easily measurable. In this particular case, for example, the quality of local institutions and agency may be significant constraints in understanding resilience performance. However, with the exception of a few qualitative case studies, insights on the effects of leadership and institutions to resilience are limited. In addition, even for the measurable determinants, there is potentially significant qualitative information missing. For example, whilst firm formation is an established measure of entrepreneurship, there is no data on the quality of these new firms and the motivations behind the entrepreneurs.

In addressing these limitations, the expectation in the analysis is that the independent variables used can reflect these non-measurable characteristics as well. For example a previously successful area with high levels of human capital and a younger aged population may be expected to have good quality institutions and better quality entrepreneurs. However, these are assumptions that have not been explicitly analysed and require further examination.

In conclusion, this study could be used as the basis for future research which can overcome some of the above limitations and extend the understanding of the determinants of economic resilience. Repeating the study for alternative time periods and geographies will help to confirm the results. For example, testing the relationships found in this study using relevant areas in a different country or the EU as a whole would allow understanding whether these

determinants are case specific or more generic. However, it should be noted that comparing regions in different countries (across the EU for example) should take into consideration the national effect on regional performance. For example, comparing a region in Greece to a region in Germany without accounting for the country conditions is unlikely to provide any meaningful results.

In addition, another interesting avenue of research would involve repeating the examination at the Government Office Region (GOR) level and identifying similarities and differences in the findings. Using GORs would expand the available data since there is a greater number of statistics collected at this level (including weighted samples of longitudinal studies such as Understanding Society). At the same time, it would reduce the UK's sample size to 12 so a more long-term view will be needed to provide robust results.

Such an approach could utilise a panel data structure and research design which could provide more robust answers on the direction of causality. This approach could use the growth rates of the dependent variables as indicators of the crisis impact or measure the effect of the interaction of a crisis dummy and an independent variable. A further addition could include the use of instrumental variables to address the concerns of sorting and causality. For example an instrumental variable that is related to human capital but not related to the crisis impact could clarify the direction of effect in such an investigation.

Expanding the list of determinants to include factors such as innovation and housing will allow testing for the effects of innovative capacity and the 'Oswald' hypothesis (Oswald, 1996). The latter suggests a link between home-ownership and flexibility in labour markets. If this is the case, it would be expected that

areas with high rates of home-ownership may have seen deeper crisis impact than places where home ownership is low due to the increased mobility of the labour force. As discussed above, the expansion of determinants will likely need to be accompanied by a levelling-up at the geographical level in which both the accuracy and the breadth of data increase. For example, home-ownership rates at the sub-regional level are offered only by the census whilst the household component of the Labour Force Survey provides relevant statistics at the regional level, annually.

Finally, as it was seen, constructing a composite indicator (such as CICI) to represent the effect of crises on local labour markets could provide a more robust measure which is influenced less from year to year fluctuation and variability. In future research, this composite could be augmented with income related measures in order to better reflect the multi-faceted concept of economic resilience. In addition, its methodology could include factor analysis in grouping variables that reflect the same aspects and more statistically robust weighting methods.

8.4 Concluding remarks

This thesis has sought to examine the resilience performance of GB LADs during the 2008 crisis. The lack of a robust conceptualisation and operationalisation framework meant that resilience had to be defined and measured before any examination of its determinants takes place. A labour market based operational definition and measurement method was devised based on improvements compared to previous attempts. The potential factors of economic resilience were reviewed in order to identify the factors behind the differential performance of LADs in GB. This led to an empirical analysis which provided significant insights on the determinants of the crisis impact such as

human capital and demographics. The results of the analysis have been confirmed by a range of robustness checks which offered further insights in the relationships between the independent variables. The end result is a comprehensive analysis of the 2008 crisis impact on local labour markets and the determinants of the varying performance among local areas. As with any research project, a number of limitations have also been identified which further research (currently underway) is attempting to address.

Chapter 9 - Appendices

9.1 Appendix 1 – Results excluding human capital

Table 9.1: Results for EMIMPACT excluding human capital variables.

	(1) EMIMPACT	(2) EMIMPACT	(3) EMIMPACT	(4) EMIMPACT
EMP_2007	0.214***	0.189***	0.223***	0.196***
	(0.0296)	(0.0247)	(0.0300)	(0.0247)
MANF	0.0264	0.0248		
	(0.0338)	(0.0352)		
BIF	-0.0529*	-0.0568*		
	(0.0288)	(0.0307)		
CON	0.0180	0.0270		
	(0.0413)	(0.0483)		
TS			-0.00713	-0.00236
			(0.0330)	(0.0318)
PRIVATE	0.00439	0.00876	0.000705	0.00408
	(0.0269)	(0.0333)	(0.0194)	(0.0262)
INV_HHI	985.2	1547.3	2252.3	3264.5
	(4214.3)	(4360.4)	(3896.2)	(3817.0)
ENTR	0.0235	-0.0387	-0.0451	-0.121*
	(0.0786)	(0.0531)	(0.0937)	(0.0660)
AGE_20_34	-0.230***		-0.246***	
	(0.0321)		(0.0350)	
AGE_35_49	-0.327**	-0.156	-0.369***	-0.191*
	(0.109)	(0.109)	(0.0964)	(0.0935)
AGE_50_64		0.448***		0.483***
		(0.0939)		(0.0998)
LN_DENSITY	0.433***	0.466***	0.418***	0.445**
	(0.109)	(0.137)	(0.126)	(0.146)
NOE	0.655*	0.416	0.908***	0.666**
	(0.336)	(0.346)	(0.270)	(0.262)
MIDLANDS	0.813**	0.543	1.114***	0.842**
	(0.340)	(0.390)	(0.273)	(0.300)
SCOTLAND	0.995*	0.452	1.021*	0.435
	(0.454)	(0.398)	(0.462)	(0.398)
WALES	-0.00295	-0.286	0.292	0.00766
	(0.441)	(0.452)	(0.378)	(0.384)
_cons	-2.167	-17.37***	-1.182	-17.75***
	(3.314)	(3.868)	(3.610)	(3.178)
N	373	373	378	378
r2	0.271	0.261	0.271	0.260

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.2: Results for EMPERIMPACT excluding human capital variables.

	(1) EMPERIMPACT	(2) EMPERIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT
EMAVG_2004_2007	-0.489***	-0.429***	-0.496***	-0.431***
	(0.0656)	(0.0590)	(0.0741)	(0.0657)
MANF	-0.0734	-0.0693		
	(0.0574)	(0.0594)		
BIF	0.0775**	0.0855*		
	(0.0324)	(0.0384)		
CON	-0.0615	-0.0831		
	(0.0678)	(0.0812)		
TS			0.0329	0.0237
			(0.0570)	(0.0547)
PRIVATE	-0.0100	-0.0197	-0.00922	-0.0164
	(0.0420)	(0.0567)	(0.0303)	(0.0459)
INV_HHI	468.3	-595.5	-1766.5	-3757.1
	(6930.5)	(7199.4)	(6739.7)	(6554.6)
ENTR	-0.0553	0.0667	0.0574	0.205
	(0.150)	(0.106)	(0.180)	(0.131)
AGE_20_34	0.444***		0.476***	
	(0.0437)		(0.0502)	
AGE_35_49	1.013***	0.654***	1.059***	0.685***
	(0.183)	(0.179)	(0.189)	(0.176)
AGE_50_64		-0.829***		-0.901***
		(0.147)		(0.163)
LN_DENSITY	-1.059***	-1.056***	-1.085***	-1.070***
	(0.224)	(0.270)	(0.257)	(0.297)
NOE	-1.723**	-1.241**	-2.098***	-1.603***
	(0.547)	(0.548)	(0.430)	(0.401)
MIDLANDS	-1.369**	-0.867	-1.851***	-1.338***
	(0.456)	(0.552)	(0.339)	(0.419)
SCOTLAND	-2.911***	-1.761**	-2.956***	-1.714**
	(0.728)	(0.659)	(0.769)	(0.671)
WALES	-1.038	-0.413	-1.536**	-0.898
	(0.764)	(0.774)	(0.676)	(0.675)
_cons	2.627	30.79***	-0.613	30.18***
	(5.561)	(7.961)	(5.513)	(6.778)
N	373	373	378	378
r2	0.325	0.304	0.318	0.295

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.3: Results for FTEIMPACT excluding human capital variables.

	(1) FTEIMPACT	(2) FTEIMPACT	(3) FTEIMPACT	(4) FTEIMPACT
FTE_2007	0.213***	0.187***	0.228***	0.200***
	(0.0246)	(0.0217)	(0.0274)	(0.0240)
MANF	0.0107	0.0107		
	(0.0390)	(0.0415)		
BIF	-0.0734	-0.0761		
	(0.0414)	(0.0433)		
CON	0.00870	0.0198		
	(0.0435)	(0.0524)		
TS			-0.0193	-0.0149
			(0.0272)	(0.0273)
PRIVATE	-0.0108	-0.00390	-0.0350	-0.0287
	(0.0293)	(0.0373)	(0.0280)	(0.0350)
INV_HHI	1783.1	2385.2	3853.3	4902.1
	(5121.7)	(5399.2)	(4701.4)	(4729.4)
ENTR	-0.00607	-0.0759	-0.0689	-0.152
	(0.108)	(0.0847)	(0.115)	(0.0908)
AGE_20_34	-0.253***		-0.266***	
	(0.0323)		(0.0355)	
AGE_35_49	-0.420***	-0.229**	-0.478***	-0.280**
	(0.0939)	(0.0958)	(0.101)	(0.102)
AGE_50_64		0.487***		0.512***
		(0.0827)		(0.0862)
LN_DENSITY	0.383***	0.422***	0.381**	0.409**
	(0.0880)	(0.120)	(0.124)	(0.129)
NOE	0.813*	0.575	0.998**	0.759**
	(0.427)	(0.444)	(0.339)	(0.326)
MIDLANDS	0.919***	0.643*	1.152***	0.882***
	(0.266)	(0.326)	(0.213)	(0.241)
SCOTLAND	0.755*	0.197	0.756*	0.157
	(0.373)	(0.329)	(0.412)	(0.345)
WALES	-0.248	-0.522	0.0307	-0.241
	(0.350)	(0.400)	(0.318)	(0.338)
_cons	3.976	-13.14***	6.376*	-11.79***
	(2.912)	(3.464)	(3.209)	(2.794)
N	373	373	378	378
r2	0.294	0.283	0.291	0.277

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.4: Results for FTEPERIMPACT excluding human capital variables.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT	(3) FTEPERIMPACT	(4) FTEPERIMPACT
FTEAVG_2004_2007	-0.525***	-0.434***	-0.545***	-0.449***
	(0.0576)	(0.0608)	(0.0664)	(0.0692)
MANF	-0.0257	-0.0267		
	(0.0617)	(0.0665)		
BIF	0.128**	0.135*		
	(0.0551)	(0.0609)		
CON	-0.0519	-0.0833		
	(0.0657)	(0.0828)		
TS			0.0425	0.0343
			(0.0449)	(0.0452)
PRIVATE	0.0233	0.00546	0.0688	0.0531
	(0.0446)	(0.0659)	(0.0432)	(0.0615)
INV_HHI	-369.9	-1732.7	-5496.8	-7934.7
	(8454.0)	(9154.5)	(8227.2)	(8357.6)
ENTR	-0.0434	0.118	0.0637	0.256
	(0.185)	(0.141)	(0.203)	(0.156)
AGE_20_34	0.570***		0.604***	
	(0.0530)		(0.0536)	
AGE_35_49	1.390***	0.888***	1.481***	0.960***
	(0.195)	(0.202)	(0.199)	(0.204)
AGE_50_64		-1.011***		-1.078***
		(0.148)		(0.155)
LN_DENSITY	-1.060***	-1.017***	-1.128***	-1.063***
	(0.203)	(0.256)	(0.251)	(0.286)
NOE	-2.141**	-1.556*	-2.431***	-1.834***
	(0.722)	(0.750)	(0.546)	(0.534)
MIDLANDS	-1.539***	-0.965*	-1.928***	-1.358***
	(0.372)	(0.529)	(0.274)	(0.409)
SCOTLAND	-2.656***	-1.239*	-2.782***	-1.247*
	(0.589)	(0.562)	(0.706)	(0.628)
WALES	-0.527	0.231	-1.128	-0.358
	(0.681)	(0.794)	(0.666)	(0.741)
_cons	-13.78**	22.27**	-18.20***	20.28**
	(4.847)	(7.897)	(5.731)	(7.859)
N	373	373	378	378
r2	0.358	0.326	0.343	0.308

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.5: Results for UNIMPACT excluding human capital variables.

	(1) UNIMPACT	(2) UNIMPACT	(3) UNIMPACT	(4) UNIMPACT
UNEMP_2007	-0.00657	0.00344	-0.00815	0.00498
	(0.0521)	(0.0539)	(0.0564)	(0.0587)
MANF	0.0672**	0.0661**		
	(0.0248)	(0.0242)		
BIF	0.0172	0.0157		
	(0.0199)	(0.0215)		
CON	0.0975***	0.105***		
	(0.0259)	(0.0271)		
TS			-0.0419	-0.0409
			(0.0266)	(0.0267)
PRIVATE	-0.000248	0.00139	0.0150	0.0161
	(0.0203)	(0.0220)	(0.0219)	(0.0240)
INV_HHI	335.3	521.5	407.7	827.1
	(2140.2)	(2263.7)	(2061.2)	(2106.2)
ENTR	-0.162	-0.182	-0.180	-0.207**
	(0.110)	(0.103)	(0.0997)	(0.0917)
AGE_20_34	-0.0751***		-0.0888***	
	(0.0198)		(0.0231)	
AGE_35_49	-0.125**	-0.0788	-0.115	-0.0644
	(0.0499)	(0.0544)	(0.0635)	(0.0665)
AGE_50_64		0.143***		0.173***
		(0.0417)		(0.0499)
LN_DENSITY	0.378***	0.383***	0.444***	0.448***
	(0.112)	(0.106)	(0.109)	(0.103)
NOE	0.495*	0.439*	0.531*	0.461*
	(0.233)	(0.203)	(0.277)	(0.244)
MIDLANDS	0.298**	0.224	0.326**	0.231*
	(0.119)	(0.132)	(0.111)	(0.127)
SCOTLAND	0.291	0.123	0.259	0.0568
	(0.357)	(0.316)	(0.312)	(0.262)
WALES	0.218	0.155	0.291	0.217
	(0.157)	(0.150)	(0.170)	(0.165)
_cons	3.823**	-1.432	7.435*	1.207
	(1.218)	(1.595)	(3.531)	(3.307)
N	351	351	352	352
r2	0.305	0.300	0.291	0.284

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.6: Results for UNPERIMPACT excluding human capital variables.

	(1) UNPERIMPACT	(2) UNPERIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT
UNEMPAVG_2004_2007	-13.27***	-13.18***	-13.29***	-13.13***
	(2.180)	(2.159)	(2.336)	(2.354)
MANF	1.477***	1.470***		
	(0.460)	(0.446)		
BIF	0.814*	0.803*		
	(0.417)	(0.434)		
CON	1.994**	2.055**		
	(0.676)	(0.674)		
TS			-0.790	-0.773
			(0.584)	(0.583)
PRIVATE	-0.363	-0.343	0.0704	0.0902
	(0.405)	(0.423)	(0.440)	(0.456)
INV_HHI	5760.6	7394.4	5697.9	10010.8
	(44621.4)	(45529.1)	(41486.4)	(41281.5)
ENTR	-2.625	-2.837	-2.634	-2.954
	(1.950)	(1.917)	(1.773)	(1.726)
AGE_20_34	-0.760		-1.026	
	(0.552)		(0.649)	
AGE_35_49	-2.050**	-1.611	-1.446	-0.885
	(0.779)	(0.920)	(1.021)	(1.186)
AGE_50_64		1.452		2.057
		(1.319)		(1.538)
LN_DENSITY	5.603***	5.648**	7.466***	7.564***
	(1.752)	(1.837)	(1.824)	(2.010)
NOE	8.144	7.610	8.536	7.757
	(5.543)	(5.340)	(6.031)	(5.817)
MIDLANDS	6.764*	5.999	7.388**	6.302*
	(3.645)	(3.795)	(3.147)	(3.254)
SCOTLAND	-2.934	-4.676	-2.772	-5.162
	(5.031)	(4.803)	(4.453)	(4.420)
WALES	-1.710	-2.361	-0.0644	-0.946
	(3.449)	(3.664)	(3.514)	(3.834)
_cons	153.7***	101.4*	207.2**	133.7
	(27.66)	(47.64)	(76.34)	(83.63)
N	365	365	366	366
r2	0.368	0.367	0.356	0.355

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.7: Results for JSAIMPACT excluding human capital variables.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAIMPACT	(4) JSAIMPACT
JSA_2007	0.257***	0.271***	0.256***	0.270***
	(0.0661)	(0.0621)	(0.0675)	(0.0638)
MANF	0.0242*	0.0238*		
	(0.0124)	(0.0119)		
BIF	0.00243	0.00208		
	(0.00773)	(0.00804)		
CON	0.0173*	0.0198*		
	(0.00927)	(0.00981)		
TS			-0.0134	-0.0126
			(0.0108)	(0.0104)
PRIVATE	0.0155**	0.0164**	0.0177**	0.0185**
	(0.00571)	(0.00559)	(0.00650)	(0.00656)
INV_HHI	4.921	72.65	-151.3	-19.90
	(371.2)	(377.0)	(508.0)	(451.5)
ENTR	-0.0713*	-0.0816**	-0.0798**	-0.0917***
	(0.0365)	(0.0310)	(0.0338)	(0.0278)
AGE_20_34	-0.0399***		-0.0405***	
	(0.00980)		(0.0113)	
AGE_35_49	-0.00344	0.0209	0.00545	0.0289
	(0.0327)	(0.0286)	(0.0351)	(0.0316)
AGE_50_64		0.0801***		0.0804**
		(0.0227)		(0.0273)
LN_DENSITY	0.187***	0.192***	0.195***	0.197***
	(0.0376)	(0.0407)	(0.0422)	(0.0447)
NOE	0.403**	0.368***	0.418**	0.384**
	(0.134)	(0.115)	(0.152)	(0.130)
MIDLANDS	0.0711	0.0248	0.109	0.0634
	(0.0762)	(0.0694)	(0.0987)	(0.0853)
SCOTLAND	0.161	0.0667	0.101	0.00330
	(0.235)	(0.191)	(0.235)	(0.188)
WALES	0.467***	0.429***	0.470***	0.433***
	(0.125)	(0.105)	(0.145)	(0.123)
_cons	-0.685	-3.540***	0.554	-2.342
	(0.794)	(0.654)	(1.640)	(1.318)
N	373	373	378	378
r2	0.657	0.651	0.640	0.632

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.8: Results for JSAPERIMPACT excluding human capital variables.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT	(3) JSAPERIMPACT	(4) JSAPERIMPACT
JSAAVG_2004_2007	-22.22***	-22.45***	-22.59***	-22.83***
	(2.633)	(2.694)	(2.576)	(2.691)
MANF	1.044	1.074		
	(0.596)	(0.596)		
BIF	0.578	0.531		
	(0.360)	(0.393)		
CON	0.474	0.733		
	(0.595)	(0.606)		
TS			-0.200	-0.219
			(0.497)	(0.506)
PRIVATE	0.486	0.549	0.643	0.709
	(0.358)	(0.390)	(0.387)	(0.414)
INV_HHI	-19357.2	-20471.8	-23877.2	-21485.4
	(30441.1)	(32366.9)	(31391.1)	(29978.4)
ENTR	-3.153**	-3.663**	-3.289**	-3.901***
	(1.403)	(1.245)	(1.264)	(1.123)
AGE_20_34	-1.846***		-1.769***	
	(0.412)		(0.427)	
AGE_35_49	1.472	2.531	2.367	3.280*
	(1.457)	(1.504)	(1.520)	(1.612)
AGE_50_64		2.653***		2.508**
		(0.787)		(0.918)
LN_DENSITY	7.200***	6.359***	7.527***	6.564***
	(1.479)	(1.680)	(1.603)	(1.782)
NOE	12.44***	11.55***	13.38**	12.61***
	(3.215)	(2.743)	(4.242)	(3.684)
MIDLANDS	0.260	-1.268	2.839	1.380
	(3.457)	(3.429)	(4.220)	(3.982)
SCOTLAND	-8.821	-13.17**	-11.34*	-15.63***
	(5.396)	(4.391)	(5.665)	(4.620)
WALES	9.371**	7.788**	9.687**	8.319*
	(3.284)	(3.411)	(4.207)	(3.982)
_cons	51.43	-51.58	60.33	-32.59
	(41.72)	(59.86)	(73.13)	(90.28)
N	373	373	378	378
r2	0.569	0.552	0.550	0.533

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

9.2 Appendix 2 – Excluding demographics

Table 9.9: Results for EMIMPACT and EMPERIMPACT excluding demographics variables.

	(1) EMIMPACT	(2) EMIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT
EMP_2007	0.173***	0.173***		
	(0.0381)	(0.0367)		
EMAVG_2004_2007			-0.337***	-0.310***
			(0.0746)	(0.0729)
MANF	0.0118		-0.0238	
	(0.0322)		(0.0543)	
BIF	-0.0238		0.0526	
	(0.0305)		(0.0432)	
CON	0.0308		-0.0940	
	(0.0454)		(0.0746)	
TS		0.0358		-0.0435
		(0.0289)		(0.0513)
PRIVATE	-0.000350	0.00659	-0.00272	-0.0131
	(0.0391)	(0.0309)	(0.0678)	(0.0552)
INV_HHI	-1076.0	1219.9	5346.8	458.6
	(4463.5)	(4033.4)	(7326.6)	(6863.9)
ENTR	0.125*	0.0743	-0.194*	-0.0960
	(0.0628)	(0.0502)	(0.0968)	(0.0789)
TRAIN	0.220*	0.242*	-0.308	-0.360*
	(0.113)	(0.116)	(0.182)	(0.186)
DEGREE	-0.105***	-0.117***	0.181***	0.202***
	(0.0240)	(0.0215)	(0.0410)	(0.0359)
NO_QUAL	0.0250	0.0177	-0.0581	-0.0314
	(0.0496)	(0.0442)	(0.0681)	(0.0606)
LN_DENSITY	-0.155**	-0.208**	0.156	0.234
	(0.0672)	(0.0896)	(0.118)	(0.150)
NOE	0.410	0.671***	-0.954**	-1.324***
	(0.234)	(0.171)	(0.359)	(0.308)
MIDLANDS	0.698*	1.044***	-1.034*	-1.570***
	(0.346)	(0.285)	(0.471)	(0.433)
SCOTLAND	0.0820	0.192	-0.468	-0.663
	(0.282)	(0.280)	(0.383)	(0.414)
WALES	-0.410	-0.0250	0.157	-0.460
	(0.357)	(0.307)	(0.588)	(0.582)
_cons	-7.570*	-11.34***	14.27*	17.91***
	(4.092)	(3.570)	(6.667)	(4.879)
N	373	378	373	378
r2	0.249	0.249	0.264	0.251

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.10: Results for FTEIMPACT and FTEPERIMPACT excluding demographics variables.

	(1) FTEIMPACT	(2) FTEIMPACT	(3) FTEPERIMPACT	(4) FTEPERIMPACT
FTE_2007	0.155***	0.158***		
	(0.0276)	(0.0277)		
FTEAVG_2004_2007			-0.281***	-0.260***
			(0.0743)	(0.0725)
MANF	-0.00352		0.0192	
	(0.0343)		(0.0563)	
BIF	-0.0394		0.0904	
	(0.0447)		(0.0658)	
CON	0.0173		-0.0862	
	(0.0506)		(0.0865)	
TS		0.0292		-0.0435
		(0.0278)		(0.0499)
PRIVATE	-0.0165	-0.0288	0.0222	0.0530
	(0.0375)	(0.0340)	(0.0685)	(0.0642)
INV_HHI	-374.3	2800.6	4788.4	-3256.3
	(5358.7)	(4759.7)	(9030.2)	(8216.1)
ENTR	0.0973	0.0596	-0.174	-0.0924
	(0.0729)	(0.0646)	(0.110)	(0.100)
TRAIN	0.178	0.208*	-0.290	-0.367
	(0.107)	(0.113)	(0.206)	(0.216)
DEGREE	-0.119***	-0.134***	0.219***	0.245***
	(0.0292)	(0.0212)	(0.0521)	(0.0357)
NO_QUAL	0.0112	0.00430	-0.0378	-0.0104
	(0.0369)	(0.0346)	(0.0598)	(0.0528)
LN_DENSITY	-0.233***	-0.257**	0.383***	0.397**
	(0.0502)	(0.0851)	(0.0910)	(0.150)
NOE	0.542*	0.739***	-1.217**	-1.501***
	(0.298)	(0.228)	(0.470)	(0.408)
MIDLANDS	0.827***	1.129***	-1.279**	-1.783***
	(0.261)	(0.220)	(0.424)	(0.447)
SCOTLAND	-0.179	-0.0629	0.137	-0.168
	(0.215)	(0.227)	(0.291)	(0.443)
WALES	-0.645**	-0.248	0.823	0.0546
	(0.282)	(0.249)	(0.518)	(0.590)
_cons	-1.980	-5.314*	2.219	6.730
	(2.561)	(2.868)	(4.202)	(4.829)
N	373	378	373	378
r2	0.268	0.270	0.276	0.261

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.11: Results for UNIMPACT and UNPERIMPACT excluding demographics variables.

	(1) UNIMPACT	(2) UNIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT
UNEMP_2007	-0.121**	-0.126**		
	(0.0470)	(0.0491)		
UNEMPAVG_2004_2007			-17.39***	-17.38***
			(2.267)	(2.202)
MANF	0.0441*		1.043**	
	(0.0202)		(0.434)	
BIF	0.0358		1.262**	
	(0.0198)		(0.451)	
CON	0.0881***		1.579**	
	(0.0213)		(0.693)	
TS		-0.0109		-0.242
		(0.0225)		(0.504)
PRIVATE	-0.00386	0.0172	-0.718	-0.110
	(0.0214)	(0.0261)	(0.400)	(0.501)
INV_HHI	-1470.2	-573.7	-22521.0	-6160.3
	(2054.7)	(2047.0)	(39696.4)	(37480.0)
ENTR	-0.0881	-0.0987	-1.119	-1.133
	(0.0637)	(0.0614)	(1.368)	(1.394)
TRAIN	0.0442	0.0532	-1.036	-0.872
	(0.0390)	(0.0408)	(0.823)	(0.862)
DEGREE	-0.0508***	-0.0516***	-0.861***	-0.714**
	(0.00763)	(0.00851)	(0.205)	(0.239)
NO_QUAL	0.0938***	0.0879***	2.038***	1.846***
	(0.0123)	(0.0139)	(0.348)	(0.350)
LN_DENSITY	0.177*	0.218**	4.674**	6.203***
	(0.0850)	(0.0867)	(1.654)	(1.711)
NOE	0.377	0.439	5.275	6.543
	(0.255)	(0.304)	(6.838)	(7.539)
MIDLANDS	0.188	0.238	4.111	5.520
	(0.157)	(0.153)	(3.665)	(3.708)
SCOTLAND	-0.112	-0.0377	-5.840	-3.195
	(0.225)	(0.225)	(5.182)	(5.262)
WALES	-0.0629	0.0794	-6.456	-3.491
	(0.206)	(0.254)	(4.036)	(5.359)
_cons	1.746	2.076	157.7***	152.3*
	(1.223)	(3.139)	(25.73)	(73.14)
N	351	352	365	366
r2	0.371	0.346	0.423	0.399

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.12: Results for JSAIMPACT and JSAPERIMPACT excluding demographics variables.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAPERIMPACT	(4) JSAPERIMPACT
JSA_2007	0.139	0.124		
	(0.0910)	(0.0903)		
JSAAVG_2004_2007			-28.61***	-29.69***
			(2.236)	(2.246)
MANF	0.0219**		1.041*	
	(0.00971)		(0.532)	
BIF	0.0136*		1.229**	
	(0.00722)		(0.421)	
CON	0.0145*		0.281	
	(0.00735)		(0.619)	
TS		-0.00337		0.237
		(0.00824)		(0.427)
PRIVATE	0.0123**	0.0183**	0.208	0.600
	(0.00496)	(0.00635)	(0.361)	(0.418)
INV_HHI	-270.4	-161.3	-19335.3	-7770.5
	(432.5)	(512.4)	(31999.8)	(29409.9)
ENTR	-0.0428	-0.0451*	-1.809*	-1.673
	(0.0250)	(0.0243)	(0.956)	(0.991)
TRAIN	0.0445**	0.0462**	0.922	1.073
	(0.0187)	(0.0186)	(1.015)	(0.877)
DEGREE	-0.0243***	-0.0235***	-1.045***	-0.855**
	(0.00538)	(0.00642)	(0.263)	(0.290)
NO_QUAL	0.0180**	0.0204**	0.917*	1.154***
	(0.00781)	(0.00699)	(0.428)	(0.329)
LN_DENSITY	0.117***	0.133***	4.373**	5.399**
	(0.0270)	(0.0291)	(1.508)	(1.766)
NOE	0.433***	0.460***	13.37***	14.95***
	(0.117)	(0.130)	(3.367)	(3.443)
MIDLANDS	0.0853	0.143*	0.530	4.341
	(0.0648)	(0.0749)	(3.771)	(3.304)
SCOTLAND	0.139	0.134	-6.098	-5.279
	(0.145)	(0.148)	(4.879)	(4.296)
WALES	0.446***	0.466***	7.106*	7.887**
	(0.0970)	(0.113)	(3.411)	(2.849)
_cons	-1.010**	-0.815	82.48**	46.27
	(0.441)	(0.913)	(29.87)	(52.50)
N	373	378	373	378
r2	0.674	0.659	0.575	0.550

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

9.3 Appendix 3 – Excluding human capital and demographics

Table 9.13: Results for EMIMPACT and EMPERIMPACT excluding human capital and demographics variables.

	(1) EMIMPACT	(2) EMIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT
EMP_2007	0.153***	0.147***		
	(0.0276)	(0.0268)		
EMAVG_2004_2007			-0.285***	-0.256***
			(0.0647)	(0.0629)
MANF	0.0371		-0.0690	
	(0.0374)		(0.0652)	
BIF	-0.0723**		0.137**	
	(0.0319)		(0.0475)	
CON	0.0853		-0.188*	
	(0.0565)		(0.0961)	
TS		-0.0198		0.0530
		(0.0406)		(0.0732)
PRIVATE	0.0150	0.0133	-0.0359	-0.0288
	(0.0329)	(0.0271)	(0.0552)	(0.0471)
INV_HHI	-253.7	1803.1	3712.3	-550.9
	(4429.9)	(3906.0)	(7550.5)	(6856.3)
ENTR	-0.0417	-0.159**	0.0945	0.303**
	(0.0519)	(0.0534)	(0.111)	(0.107)
LN_DENSITY	-0.164	-0.257**	0.165	0.329*
	(0.0945)	(0.114)	(0.140)	(0.171)
NOE	0.374	0.605*	-0.906*	-1.210**
	(0.294)	(0.293)	(0.477)	(0.508)
MIDLANDS	0.622	0.890**	-0.945	-1.319**
	(0.384)	(0.351)	(0.572)	(0.563)
SCOTLAND	-0.111	-0.250	-0.157	0.128
	(0.328)	(0.304)	(0.530)	(0.450)
WALES	-0.619	-0.331	0.488	0.0881
	(0.367)	(0.340)	(0.621)	(0.605)
_cons	-6.086*	-3.753	11.98**	5.129
	(2.831)	(3.622)	(5.174)	(5.449)
N	373	378	373	378
r2	0.193	0.175	0.204	0.172

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.14: Results for FTEIMPACT and FTEPERIMPACT excluding human capital and demographics variables.

	(1) FTEIMPACT	(2) FTEIMPACT	(3) FTEPERIMPACT	(4) FTEPERIMPACT
FTE_2007	0.132***	0.129***		
	(0.0199)	(0.0205)		
FTEAVG_2004_2007			-0.228***	-0.201***
			(0.0538)	(0.0571)
MANF	0.0252		-0.0354	
	(0.0426)		(0.0735)	
BIF	-0.0919*		0.188**	
	(0.0435)		(0.0643)	
CON	0.0803		-0.202**	
	(0.0524)		(0.0876)	
TS		-0.0334		0.0721
		(0.0379)		(0.0701)
PRIVATE	0.00667	-0.0147	-0.0248	0.0267
	(0.0340)	(0.0326)	(0.0605)	(0.0602)
INV_HHI	440.3	3350.1	3098.9	-4274.7
	(5326.1)	(4565.2)	(9233.0)	(7988.7)
ENTR	-0.0833	-0.197**	0.163	0.378**
	(0.0844)	(0.0831)	(0.155)	(0.149)
LN_DENSITY	-0.249***	-0.312**	0.395***	0.502**
	(0.0695)	(0.111)	(0.115)	(0.191)
NOE	0.516	0.672**	-1.197**	-1.382**
	(0.307)	(0.296)	(0.531)	(0.580)
MIDLANDS	0.744**	0.958**	-1.181*	-1.490**
	(0.299)	(0.322)	(0.544)	(0.620)
SCOTLAND	-0.392	-0.545	0.486	0.744
	(0.275)	(0.311)	(0.412)	(0.529)
WALES	-0.872**	-0.586	1.180*	0.688
	(0.326)	(0.334)	(0.647)	(0.731)
_cons	-1.915	1.663	2.204	-6.229
	(2.348)	(3.764)	(4.167)	(6.944)
N	373	378	373	378
r2	0.211	0.194	0.213	0.179

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.15: Results for UNIMPACT and UNPERIMPACT excluding human capital and demographics variables.

	(1) UNIMPACT	(2) UNIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT
UNEMP_2007	-0.0264	-0.0334		
	(0.0492)	(0.0541)		
UNEMPAVG_2004_2007			-13.54***	-13.90***
			(2.055)	(2.167)
MANF	0.0655**		1.406**	
	(0.0265)		(0.498)	
BIF	0.00150		0.580	
	(0.0259)		(0.445)	
CON	0.127***		2.300**	
	(0.0311)		(0.790)	
TS		-0.0511		-0.904
		(0.0332)		(0.647)
PRIVATE	0.00801	0.0210	-0.265	0.141
	(0.0217)	(0.0271)	(0.427)	(0.499)
INV_HHI	-859.8	-428.8	-11681.7	-5703.9
	(2342.4)	(2357.2)	(47014.1)	(46231.6)
ENTR	-0.186	-0.226**	-2.927	-3.183*
	(0.105)	(0.0880)	(1.980)	(1.731)
LN_DENSITY	0.210*	0.228**	3.968**	5.230**
	(0.0979)	(0.0925)	(1.476)	(1.658)
NOE	0.503**	0.544**	8.059	8.688
	(0.190)	(0.236)	(5.220)	(5.600)
MIDLANDS	0.283*	0.281*	6.385	6.740*
	(0.150)	(0.152)	(4.205)	(3.555)
SCOTLAND	-0.0430	-0.142	-7.172	-7.013*
	(0.288)	(0.209)	(4.675)	(3.658)
WALES	0.164	0.233	-1.991	-0.371
	(0.169)	(0.200)	(3.545)	(3.839)
_cons	1.018	5.808	112.1***	187.0**
	(0.754)	(3.677)	(18.11)	(73.90)
N	351	352	365	366
r2	0.280	0.256	0.362	0.349

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.16: Results for JSAIMPACT and JSAPERIMPACT excluding human capital and demographics variables.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAPERIMPACT	(4) JSAPERIMPACT
JSA_2007	0.207**	0.201**		
	(0.0771)	(0.0767)		
JSAAVG_2004_2007			-25.16***	-25.89***
			(2.366)	(2.418)
MANF	0.0287**		1.357*	
	(0.0128)		(0.642)	
BIF	0.00145		0.678	
	(0.0113)		(0.521)	
CON	0.0301**		0.989	
	(0.0118)		(0.682)	
TS		-0.0166		-0.320
		(0.0126)		(0.511)
PRIVATE	0.0175**	0.0210**	0.533	0.782
	(0.00562)	(0.00726)	(0.388)	(0.458)
INV_HHI	-124.3	-133.7	-14226.6	-8980.3
	(474.5)	(519.8)	(31996.9)	(28476.2)
ENTR	-0.0828**	-0.0961***	-3.550***	-3.692***
	(0.0288)	(0.0223)	(1.098)	(0.968)
LN_DENSITY	0.107***	0.114***	3.811**	4.678**
	(0.0284)	(0.0254)	(1.624)	(1.893)
NOE	0.427***	0.450***	13.77***	15.38***
	(0.117)	(0.136)	(2.537)	(3.165)
MIDLANDS	0.0734	0.116	0.526	4.005
	(0.0743)	(0.0894)	(3.600)	(3.638)
SCOTLAND	0.0801	0.0255	-9.315**	-10.08**
	(0.168)	(0.146)	(4.079)	(3.768)
WALES	0.434***	0.447***	7.668**	8.666**
	(0.117)	(0.133)	(3.428)	(3.874)
_cons	-1.056*	0.630	63.53**	96.96
	(0.521)	(1.400)	(26.64)	(62.61)
N	373	378	373	378
r2	0.620	0.599	0.531	0.507

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

9.4 Appendix 4 – London

Table 9.17: Results for EMIMPACT using the LONDON dummy.

	(1) EMIMPACT	(2) EMIMPACT	(3) EMIMPACT	(4) EMIMPACT
EMP_2007	0.223***	0.214***	0.225***	0.216***
	(0.0432)	(0.0340)	(0.0437)	(0.0333)
MANF	0.0189	0.00990		
	(0.0254)	(0.0267)		
BIF	-0.0251	-0.0237		
	(0.0297)	(0.0312)		
CON	0.00277	0.00502		
	(0.0384)	(0.0442)		
TS			-0.000723	0.0141
			(0.0292)	(0.0243)
PRIVATE	-0.0114	-0.00309	-0.00949	-0.00274
	(0.0287)	(0.0337)	(0.0195)	(0.0241)
INV_HHI	22.02	540.2	818.0	1833.3
	(4144.0)	(4275.3)	(3792.4)	(3712.5)
ENTR	0.124*	0.0948	0.0870	0.0548
	(0.0585)	(0.0554)	(0.0517)	(0.0376)
TRAIN	0.176	0.178	0.191*	0.194*
	(0.100)	(0.101)	(0.100)	(0.100)
DEGREE	-0.0487	-0.0538*	-0.0500*	-0.0565**
	(0.0277)	(0.0242)	(0.0230)	(0.0192)
NO_QUAL	0.0956*	0.0963**	0.100*	0.103**
	(0.0473)	(0.0405)	(0.0478)	(0.0401)
AGE_20_34	-0.184***		-0.193***	
	(0.0391)		(0.0367)	
AGE_35_49	-0.197	-0.0917	-0.196	-0.0897
	(0.135)	(0.114)	(0.124)	(0.102)
AGE_50_64		0.401***		0.432***
		(0.0938)		(0.0857)
LN_DENSITY	0.284**	0.392**	0.292**	0.400**
	(0.0910)	(0.135)	(0.109)	(0.130)
LONDON	-0.872*	-0.871*	-1.029**	-0.988**
	(0.409)	(0.403)	(0.383)	(0.354)
_cons	-6.404	-20.31***	-6.977*	-23.02***
	(4.042)	(5.129)	(3.198)	(3.668)
N	373	373	378	378
r2	0.292	0.295	0.292	0.298

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.18: Results for EMPERIMPACT using the LONDON dummy.

	(1) EMPERIMPACT	(2) EMPERIMPACT	(3) EMPERIMPACT	(4) EMPERIMPACT
EMAVG_2004_2007	-0.524***	-0.497***	-0.497***	-0.472***
	(0.0904)	(0.0665)	(0.0889)	(0.0626)
MANF	-0.0601	-0.0412		
	(0.0397)	(0.0438)		
BIF	0.0385	0.0349		
	(0.0439)	(0.0467)		
CON	-0.0218	-0.0293		
	(0.0584)	(0.0689)		
TS			0.0236	-0.00705
			(0.0536)	(0.0447)
PRIVATE	0.0492	0.0306	0.0370	0.0219
	(0.0482)	(0.0603)	(0.0333)	(0.0445)
INV_HHI	2127.7	1079.6	372.3	-1694.2
	(6735.6)	(6764.5)	(6555.3)	(6193.6)
ENTR	-0.151	-0.0959	-0.0761	-0.0147
	(0.143)	(0.101)	(0.151)	(0.0928)
TRAIN	-0.233	-0.238	-0.274	-0.281*
	(0.148)	(0.149)	(0.153)	(0.151)
DEGREE	0.0758	0.0890*	0.0708*	0.0870**
	(0.0467)	(0.0446)	(0.0376)	(0.0327)
NO_QUAL	-0.212**	-0.209***	-0.207**	-0.210***
	(0.0706)	(0.0591)	(0.0729)	(0.0600)
AGE_20_34	0.388***		0.403***	
	(0.0654)		(0.0639)	
AGE_35_49	0.807**	0.568**	0.748**	0.514**
	(0.290)	(0.224)	(0.272)	(0.209)
AGE_50_64		-0.817***		-0.874***
		(0.166)		(0.156)
LN_DENSITY	-0.649***	-0.841***	-0.709***	-0.899***
	(0.172)	(0.232)	(0.194)	(0.224)
LONDON	0.164	0.253	0.614	0.601
	(1.078)	(0.762)	(1.027)	(0.720)
_cons	5.870	34.41***	5.273	37.96***
	(6.566)	(9.475)	(5.222)	(7.061)
N	373	373	378	378
r2	0.337	0.338	0.324	0.328

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.19: Results for FTEIMPACT using the LONDON dummy.

	(1) FTEIMPACT	(2) FTEIMPACT	(3) FTEIMPACT	(4) FTEIMPACT
FTE_2007	0.225***	0.212***	0.234***	0.221***
	(0.0320)	(0.0232)	(0.0315)	(0.0222)
MANF	0.0105	0.00133		
	(0.0258)	(0.0291)		
BIF	-0.0461	-0.0436		
	(0.0415)	(0.0443)		
CON	-0.0183	-0.0150		
	(0.0462)	(0.0522)		
TS			-0.0121	0.00365
			(0.0255)	(0.0215)
PRIVATE	-0.0310	-0.0208	-0.0472	-0.0387
	(0.0297)	(0.0351)	(0.0262)	(0.0313)
INV_HHI	1004.8	1588.6	2371.1	3459.6
	(5055.8)	(5327.3)	(4629.8)	(4662.7)
ENTR	0.115	0.0819	0.0892	0.0548
	(0.0701)	(0.0607)	(0.0638)	(0.0524)
TRAIN	0.133	0.135	0.155*	0.158*
	(0.0810)	(0.0846)	(0.0803)	(0.0851)
DEGREE	-0.0629*	-0.0694**	-0.0671**	-0.0752***
	(0.0318)	(0.0295)	(0.0234)	(0.0213)
NO_QUAL	0.0800**	0.0802**	0.0860**	0.0882**
	(0.0351)	(0.0270)	(0.0363)	(0.0281)
AGE_20_34	-0.211***		-0.213***	
	(0.0461)		(0.0424)	
AGE_35_49	-0.304**	-0.175	-0.308**	-0.182
	(0.119)	(0.0998)	(0.113)	(0.104)
AGE_50_64		0.449***		0.462***
		(0.102)		(0.0904)
LN_DENSITY	0.263***	0.377**	0.282**	0.388***
	(0.0816)	(0.130)	(0.107)	(0.120)
LONDON	-0.648	-0.667	-0.852*	-0.835*
	(0.524)	(0.521)	(0.430)	(0.419)
_cons	0.877	-14.97***	1.064	-16.39***
	(2.632)	(3.568)	(2.531)	(2.688)
N	373	373	378	378
r2	0.306	0.308	0.306	0.310

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.20: Results for FTEPERIMPACT using the LONDON dummy.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT	(3) FTEPERIMPACT	(4) FTEPERIMPACT
FTEAVG_2004_2007	-0.573***	-0.505***	-0.554***	-0.493***
	(0.0679)	(0.0534)	(0.0727)	(0.0577)
MANF	-0.0200	-0.000853		
	(0.0405)	(0.0487)		
BIF	0.0923	0.0831		
	(0.0597)	(0.0642)		
CON	0.00919	-0.00652		
	(0.0654)	(0.0771)		
TS			0.0318	-0.00495
			(0.0469)	(0.0386)
PRIVATE	0.0910	0.0614	0.119**	0.0941
	(0.0521)	(0.0673)	(0.0479)	(0.0604)
INV_HHI	1020.3	-370.8	-3223.0	-5841.5
	(8107.8)	(8582.8)	(8090.1)	(8015.4)
ENTR	-0.178	-0.110	-0.105	-0.0354
	(0.144)	(0.0898)	(0.159)	(0.0894)
TRAIN	-0.200	-0.209	-0.268	-0.279
	(0.145)	(0.154)	(0.148)	(0.159)
DEGREE	0.0958*	0.120**	0.0952***	0.123***
	(0.0493)	(0.0498)	(0.0294)	(0.0300)
NO_QUAL	-0.210***	-0.194***	-0.206***	-0.197***
	(0.0508)	(0.0376)	(0.0525)	(0.0394)
AGE_20_34	0.533***		0.536***	
	(0.0643)		(0.0539)	
AGE_35_49	1.223***	0.822***	1.173***	0.789***
	(0.262)	(0.213)	(0.259)	(0.224)
AGE_50_64		-1.016***		-1.049***
		(0.156)		(0.131)
LN_DENSITY	-0.689***	-0.856***	-0.768***	-0.922***
	(0.150)	(0.229)	(0.188)	(0.211)
LONDON	-0.293	0.0480	0.195	0.417
	(1.276)	(0.920)	(1.195)	(0.830)
_cons	-12.05**	24.87***	-12.44*	28.19***
	(5.274)	(6.699)	(5.768)	(6.120)
N	373	373	378	378
r2	0.367	0.356	0.348	0.340

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.21: Results for UNIMPACT using the LONDON dummy.

	(1) UNIMPACT	(2) UNIMPACT	(3) UNIMPACT	(4) UNIMPACT
UNEMP_2007	-0.0916*	-0.0839*	-0.0901*	-0.0802
	(0.0442)	(0.0437)	(0.0453)	(0.0454)
MANF	0.0509***	0.0481***		
	(0.0148)	(0.0136)		
BIF	0.0355*	0.0364*		
	(0.0188)	(0.0193)		
CON	0.0793***	0.0815***		
	(0.0157)	(0.0158)		
TS			-0.0212	-0.0159
			(0.0182)	(0.0167)
PRIVATE	-0.0107	-0.00913	0.00913	0.0106
	(0.0201)	(0.0200)	(0.0230)	(0.0235)
INV_HHI	-827.4	-607.9	-459.1	2.772
	(1950.6)	(1999.0)	(1893.7)	(1832.3)
ENTR	-0.0759	-0.0829	-0.0916	-0.101*
	(0.0539)	(0.0470)	(0.0625)	(0.0536)
TRAIN	0.0303	0.0314	0.0437	0.0448
	(0.0382)	(0.0365)	(0.0428)	(0.0409)
DEGREE	-0.0366***	-0.0380***	-0.0311***	-0.0343***
	(0.00985)	(0.00923)	(0.00914)	(0.00884)
NO_QUAL	0.101***	0.102***	0.102***	0.102***
	(0.0103)	(0.00961)	(0.0110)	(0.0103)
AGE_20_34	-0.0460*		-0.0637**	
	(0.0245)		(0.0272)	
AGE_35_49	-0.0403	-0.0163	-0.0308	0.000637
	(0.0585)	(0.0578)	(0.0578)	(0.0595)
AGE_50_64		0.106*		0.145**
		(0.0525)		(0.0570)
LN_DENSITY	0.309***	0.340***	0.380***	0.414***
	(0.0920)	(0.0989)	(0.0878)	(0.0946)
LONDON	-0.431	-0.425	-0.357	-0.334
	(0.308)	(0.298)	(0.356)	(0.329)
_cons	2.498	-1.282	3.707	-1.797
	(2.000)	(1.696)	(3.230)	(3.131)
N	351	351	352	352
r2	0.375	0.376	0.353	0.355

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.22: Results for UNPERIMPACT using the LONDON dummy.

	(1) UNPERIMPACT	(2) UNPERIMPACT	(3) UNPERIMPACT	(4) UNPERIMPACT
UNEMPAVG_2004_2007	-18.46***	-18.36***	-17.91***	-17.72***
	(2.739)	(2.740)	(2.621)	(2.592)
MANF	1.457***	1.447***		
	(0.397)	(0.363)		
BIF	1.201**	1.200**		
	(0.470)	(0.470)		
CON	1.325**	1.311**		
	(0.550)	(0.549)		
TS			-0.555	-0.504
			(0.470)	(0.453)
PRIVATE	-0.715*	-0.711*	-0.0850	-0.0679
	(0.385)	(0.382)	(0.463)	(0.466)
INV_HHI	-12445.5	-11275.6	-12123.9	-7753.5
	(41244.8)	(41714.1)	(38350.2)	(37123.0)
ENTR	-0.923	-0.957	-1.156	-1.262
	(1.244)	(1.280)	(1.501)	(1.497)
TRAIN	-0.860	-0.845	-0.571	-0.550
	(0.794)	(0.800)	(0.912)	(0.911)
DEGREE	-1.000**	-0.982***	-0.718**	-0.716**
	(0.322)	(0.270)	(0.295)	(0.245)
NO_QUAL	1.969***	1.977***	1.951***	1.969***
	(0.382)	(0.370)	(0.389)	(0.374)
AGE_20_34	-0.0375		-0.502	
	(0.870)		(0.952)	
AGE_35_49	-1.440	-1.421	-0.673	-0.434
	(1.299)	(1.218)	(1.276)	(1.276)
AGE_50_64		0.295		1.415
		(1.772)		(1.943)
LN_DENSITY	5.456**	5.673**	7.580***	8.094***
	(2.086)	(2.320)	(2.160)	(2.461)
LONDON	11.38	11.49	10.92	11.17
	(13.98)	(13.99)	(15.55)	(15.23)
_cons	182.8***	173.3**	191.8*	139.3
	(49.05)	(68.31)	(89.63)	(102.4)
N	365	365	366	366
r2	0.420	0.421	0.396	0.397

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.23: Results for JSAIMPACT using the LONDON dummy.

	(1) JSAIMPACT	(2) JSAIMPACT	(3) JSAIMPACT	(4) JSAIMPACT
JSA_2007	0.297***	0.299***	0.288***	0.289***
	(0.0860)	(0.0856)	(0.0833)	(0.0841)
MANF	0.0185*	0.0173*		
	(0.00962)	(0.00927)		
BIF	0.00900*	0.00926*		
	(0.00453)	(0.00454)		
CON	0.0203**	0.0208**		
	(0.00817)	(0.00837)		
TS			-0.00877	-0.00689
			(0.00791)	(0.00726)
PRIVATE	0.00371	0.00470	0.00770	0.00855
	(0.00550)	(0.00541)	(0.00533)	(0.00561)
INV_HHI	-297.3	-244.0	-359.1	-248.0
	(442.3)	(426.7)	(504.5)	(472.7)
ENTR	-0.0279	-0.0313*	-0.0283	-0.0319**
	(0.0187)	(0.0141)	(0.0182)	(0.0134)
TRAIN	0.0293*	0.0292*	0.0290*	0.0288
	(0.0159)	(0.0160)	(0.0159)	(0.0160)
DEGREE	-0.0109***	-0.0117***	-0.0104**	-0.0117**
	(0.00293)	(0.00265)	(0.00369)	(0.00379)
NO_QUAL	0.0240**	0.0244**	0.0264***	0.0268**
	(0.00829)	(0.00878)	(0.00792)	(0.00853)
AGE_20_34	-0.0232***		-0.0253***	
	(0.00615)		(0.00669)	
AGE_35_49	0.0360*	0.0477**	0.0436**	0.0560***
	(0.0188)	(0.0186)	(0.0171)	(0.0167)
AGE_50_64		0.0507**		0.0537**
		(0.0198)		(0.0215)
LN_DENSITY	0.166***	0.179***	0.186***	0.196***
	(0.0328)	(0.0384)	(0.0333)	(0.0390)
LONDON	-0.689***	-0.689***	-0.709***	-0.706***
	(0.126)	(0.138)	(0.110)	(0.123)
_cons	-1.307*	-3.095***	-0.654	-2.690**
	(0.669)	(0.851)	(1.101)	(1.111)
N	373	373	378	378
r2	0.683	0.683	0.676	0.675

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.24: Results for JSAPERIMPACT using the LONDON dummy.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT	(3) JSAPERIMPACT	(4) JSAPERIMPACT
JSAAVG_2004_2007	-23.00***	-23.92***	-23.79***	-24.61***
	(2.843)	(2.738)	(2.688)	(2.572)
MANF	0.746	0.753		
	(0.543)	(0.544)		
BIF	0.905**	0.937**		
	(0.321)	(0.349)		
CON	0.533	0.700		
	(0.508)	(0.510)		
TS			0.0654	0.110
			(0.396)	(0.381)
PRIVATE	0.127	0.138	0.382	0.415
	(0.380)	(0.403)	(0.379)	(0.415)
INV_HHI	-30328.2	-34433.1	-29740.7	-30093.0
	(33991.0)	(36024.4)	(33475.3)	(33527.7)
ENTR	-0.628	-0.594	-0.458	-0.485
	(0.727)	(0.590)	(0.704)	(0.552)
TRAIN	0.0270	-0.0868	0.0562	-0.0356
	(1.043)	(1.073)	(0.953)	(0.978)
DEGREE	-0.552**	-0.745***	-0.450*	-0.647**
	(0.210)	(0.202)	(0.225)	(0.244)
NO_QUAL	1.095**	1.041**	1.346***	1.282***
	(0.348)	(0.344)	(0.315)	(0.336)
AGE_20_34	-1.162**		-1.192**	
	(0.439)		(0.458)	
AGE_35_49	2.701***	3.336***	3.572***	4.189***
	(0.750)	(0.866)	(0.660)	(0.689)
AGE_50_64		0.915		1.059
		(0.924)		(1.057)
LN_DENSITY	8.327***	7.412***	9.118***	8.225***
	(1.970)	(2.159)	(1.926)	(2.142)
LONDON	-33.19***	-34.64***	-34.08***	-35.32***
	(6.805)	(6.745)	(6.532)	(6.364)
_cons	21.53	-18.62	-5.230	-53.29
	(26.10)	(55.16)	(46.07)	(66.83)
N	373	373	378	378
r2	0.608	0.600	0.597	0.588

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.25: Cumulative results using the LONDON dummy.

Total	EMIMPACT	EMPERIMPACT	FTEIMPACT	FTEPERIMPACT	UNIMPACT	UNPERIMPACT	JSAIMPACT	JSAPERIMPACT
STARTING POINT	D (4/4)	D (4/4)	D (4/4)	D (4/4)	M (3/4)	M (4/4)	D (4/4)	M (4/4)
MANF					D (2/2)	D (2/2)	D (2/2)	
BIF					D (2/2)	D (2/2)	D (2/2)	D (2/2)
CON					D (2/2)	D (2/2)	D (2/2)	
TS								
PRIVATE				M (1/4)		M (2/4)		
INV_HHI								
ENTR	D (1/4)				M (1/4)		M (2/4)	
TRAIN	D (2/4)	D (1/4)	D (2/4)				D (3/4)	
DEGREE	M (3/4)	M (3/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)	M (4/4)
NO_QUAL	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)	D (4/4)
AGE_20_34	M (2/2)	M (2/2)	M (2/2)	M (2/2)	M (2/2)		M (2/2)	M (2/2)
AGE_35_49		M (4/4)	M (2/4)	M (4/4)			D (4/4)	D (4/4)
AGE_50_64	D (2/2)	D (2/2)	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)	D (4/4)	D (4/4)	D (4/4)	D (4/4)

LONDON	M (4/4)	M (2/4)	M (4/4)	M (4/4)

9.5 Appendix 5 – Migration

Table 9.26: Results for EMIMPACT using MIG07.

	(1) EMIMPACT	(2) EMIMPACT
EMP_2007	0.168***	0.167***
	(0.0400)	(0.0382)
MANF	0.00652	
	(0.0313)	
BIF	-0.0221	
	(0.0306)	
CON	0.0307	
	(0.0454)	
TS		0.0416
		(0.0288)
PRIVATE	0.00341	0.0106
	(0.0354)	(0.0270)
INV_HHI	-685.4	1796.2
	(4437.3)	(4100.7)
ENTR	0.128*	0.0784
	(0.0641)	(0.0496)
TRAIN	0.219*	0.241*
	(0.113)	(0.115)
DEGREE	-0.108***	-0.121***
	(0.0244)	(0.0219)
NO_QUAL	0.0177	0.00919
	(0.0539)	(0.0482)
MIG07	-0.0362	-0.0384
	(0.0302)	(0.0314)
LN_DENSITY	-0.224***	-0.284***
	(0.0666)	(0.0815)
NOE	0.289	0.539***
	(0.167)	(0.115)
MIDLANDS	0.686*	1.026***
	(0.311)	(0.252)
SCOTLAND	0.00359	0.123
	(0.242)	(0.249)
WALES	-0.492	-0.110
	(0.305)	(0.268)
_cons	-6.894	-11.11**
	(4.244)	(3.755)
N	373	378
r2	0.254	0.255

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.27: Results for EMPERIMPACT using MIG07.

	(1) EMPERIMPACT	(2) EMPERIMPACT
EMAVG_2004_2007	-0.328***	-0.299***
	(0.0751)	(0.0718)
MANF	-0.0198	
	(0.0534)	
BIF	0.0508	
	(0.0440)	
CON	-0.0929	
	(0.0745)	
TS		-0.0488
		(0.0517)
PRIVATE	-0.00598	-0.0169
	(0.0632)	(0.0492)
INV_HHI	4914.9	-182.6
	(7415.5)	(7049.0)
ENTR	-0.197*	-0.1000
	(0.0972)	(0.0772)
TRAIN	-0.309	-0.362*
	(0.181)	(0.184)
DEGREE	0.183***	0.205***
	(0.0409)	(0.0365)
NO_QUAL	-0.0506	-0.0225
	(0.0791)	(0.0704)
MIG07	0.0302	0.0356
	(0.0591)	(0.0603)
LN_DENSITY	0.215	0.307*
	(0.123)	(0.149)
NOE	-0.844***	-1.192***
	(0.259)	(0.234)
MIDLANDS	-1.025**	-1.556***
	(0.440)	(0.404)
SCOTLAND	-0.399	-0.592
	(0.352)	(0.392)
WALES	0.244	-0.359
	(0.504)	(0.517)
_cons	13.48*	17.46***
	(7.064)	(5.295)
N	373	378
r2	0.266	0.253

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.28: Results for FTEIMPACT using MIG07.

	(1) FTEIMPACT	(2) FTEIMPACT
FTE_2007	0.154***	0.156***
	(0.0281)	(0.0282)
MANF	-0.00690	
	(0.0336)	
BIF	-0.0383	
	(0.0447)	
CON	0.0177	
	(0.0496)	
TS		0.0331
		(0.0280)
PRIVATE	-0.0142	-0.0261
	(0.0337)	(0.0305)
INV_HHI	-182.9	3137.0
	(5429.6)	(4900.5)
ENTR	0.0994	0.0625
	(0.0732)	(0.0640)
TRAIN	0.177	0.206*
	(0.107)	(0.113)
DEGREE	-0.121***	-0.136***
	(0.0290)	(0.0208)
NO_QUAL	0.00771	-0.000257
	(0.0396)	(0.0371)
MIG07	-0.0214	-0.0248
	(0.0340)	(0.0342)
LN_DENSITY	-0.273***	-0.305***
	(0.0664)	(0.0955)
NOE	0.476	0.659**
	(0.270)	(0.211)
MIDLANDS	0.822***	1.119***
	(0.240)	(0.202)
SCOTLAND	-0.224	-0.105
	(0.191)	(0.212)
WALES	-0.686**	-0.295
	(0.251)	(0.227)
_cons	-1.693	-5.303
	(2.760)	(2.929)
N	373	378
r2	0.269	0.272

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.29: Results for FTEPERIMPACT using MIG07.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT
FTEAVG_2004_2007	-0.281***	-0.257***
	(0.0718)	(0.0695)
MANF	0.0195	
	(0.0563)	
BIF	0.0902	
	(0.0665)	
CON	-0.0861	
	(0.0858)	
TS		-0.0449
		(0.0510)
PRIVATE	0.0220	0.0520
	(0.0625)	(0.0581)
INV_HHI	4759.6	-3409.8
	(9319.7)	(8581.6)
ENTR	-0.175	-0.0935
	(0.111)	(0.100)
TRAIN	-0.290	-0.367
	(0.206)	(0.216)
DEGREE	0.219***	0.246***
	(0.0508)	(0.0344)
NO_QUAL	-0.0374	-0.00851
	(0.0653)	(0.0575)
MIG07	0.00224	0.00916
	(0.0644)	(0.0655)
LN_DENSITY	0.388**	0.414*
	(0.132)	(0.190)
NOE	-1.210**	-1.469***
	(0.417)	(0.355)
MIDLANDS	-1.279**	-1.781***
	(0.420)	(0.439)
SCOTLAND	0.142	-0.154
	(0.319)	(0.458)
WALES	0.828	0.0760
	(0.487)	(0.565)
_cons	2.177	6.678
	(4.858)	(5.033)
N	373	378
r2	0.276	0.261

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.30: Results for UNIMPACT using MIG07.

	(1) UNIMPACT	(2) UNIMPACT
UNEMP_2007	-0.121**	-0.126**
	(0.0465)	(0.0487)
MANF	0.0427*	
	(0.0213)	
BIF	0.0363*	
	(0.0196)	
CON	0.0883***	
	(0.0215)	
TS		-0.00984
		(0.0240)
PRIVATE	-0.00306	0.0178
	(0.0210)	(0.0258)
INV_HHI	-1385.7	-476.4
	(2173.9)	(2271.5)
ENTR	-0.0876	-0.0980
	(0.0639)	(0.0612)
TRAIN	0.0438	0.0527
	(0.0394)	(0.0413)
DEGREE	-0.0517***	-0.0524***
	(0.00688)	(0.00792)
NO_QUAL	0.0928***	0.0870***
	(0.0128)	(0.0143)
MIG07	-0.00763	-0.00614
	(0.0203)	(0.0225)
LN_DENSITY	0.162**	0.206**
	(0.0650)	(0.0706)
NOE	0.355	0.420
	(0.254)	(0.302)
MIDLANDS	0.188	0.236
	(0.163)	(0.153)
SCOTLAND	-0.129	-0.0484
	(0.211)	(0.217)
WALES	-0.0749	0.0704
	(0.190)	(0.242)
_cons	1.818	2.042
	(1.192)	(3.252)
N	351	352
r2	0.372	0.346

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.31: Results for UNPERIMPACT using MIG07.

	(1) UNPERIMPACT	(2) UNPERIMPACT
UNEMPAVG_2004_2007	-17.43***	-17.45***
	(2.243)	(2.173)
MANF	1.067**	
	(0.450)	
BIF	1.251**	
	(0.461)	
CON	1.572**	
	(0.687)	
TS		-0.275
		(0.551)
PRIVATE	-0.732	-0.128
	(0.413)	(0.512)
INV_HHI	-23960.0	-9208.9
	(42122.7)	(43170.7)
ENTR	-1.131	-1.159
	(1.358)	(1.372)
TRAIN	-1.035	-0.865
	(0.816)	(0.842)
DEGREE	-0.843***	-0.687***
	(0.160)	(0.204)
NO_QUAL	2.064***	1.888***
	(0.361)	(0.376)
MIG07	0.131	0.187
	(0.434)	(0.475)
LN_DENSITY	4.945**	6.599***
	(1.641)	(1.874)
NOE	5.660	7.134
	(6.761)	(7.405)
MIDLANDS	4.099	5.554
	(3.578)	(3.565)
SCOTLAND	-5.530	-2.837
	(5.229)	(5.331)
WALES	-6.245	-3.211
	(3.741)	(5.042)
_cons	156.6***	153.6*
	(22.66)	(73.52)
N	365	366
r2	0.423	0.399

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.32: Results for JSAIMPACT using MIG07.

	(1) JSAIMPACT	(2) JSAIMPACT
JSA_2007	0.138	0.123
	(0.0916)	(0.0903)
MANF	0.0216**	
	(0.00966)	
BIF	0.0136*	
	(0.00705)	
CON	0.0145*	
	(0.00729)	
TS		-0.00286
		(0.00787)
PRIVATE	0.0125**	0.0186**
	(0.00475)	(0.00618)
INV_HHI	-255.5	-125.3
	(421.3)	(470.5)
ENTR	-0.0426	-0.0447
	(0.0256)	(0.0250)
TRAIN	0.0443**	0.0458**
	(0.0183)	(0.0181)
DEGREE	-0.0246***	-0.0239***
	(0.00587)	(0.00691)
NO_QUAL	0.0178**	0.0200**
	(0.00766)	(0.00691)
MIG07	-0.00206	-0.00319
	(0.00571)	(0.00557)
LN_DENSITY	0.114***	0.127***
	(0.0287)	(0.0308)
NOE	0.427***	0.451***
	(0.110)	(0.121)
MIDLANDS	0.0849	0.142*
	(0.0644)	(0.0734)
SCOTLAND	0.134	0.128
	(0.139)	(0.142)
WALES	0.442***	0.461***
	(0.0935)	(0.109)
_cons	-0.985*	-0.823
	(0.471)	(0.920)
N	373	378
r2	0.674	0.659

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.33: Results for JSAPERIMPACT using MIG07.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT
JSAAVG_2004_2007	-28.54***	-29.67***
	(2.159)	(2.193)
MANF	1.097*	
	(0.550)	
BIF	1.216**	
	(0.418)	
CON	0.271	
	(0.628)	
TS		0.199
		(0.432)
PRIVATE	0.175	0.576
	(0.339)	(0.408)
INV_HHI	-21701.4	-10513.2
	(34570.8)	(31699.6)
ENTR	-1.841*	-1.702
	(0.947)	(0.982)
TRAIN	0.955	1.100
	(1.035)	(0.895)
DEGREE	-1.007***	-0.825**
	(0.259)	(0.290)
NO_QUAL	0.957*	1.190***
	(0.434)	(0.332)
MIG07	0.321	0.239
	(0.203)	(0.167)
LN_DENSITY	4.960**	5.868**
	(1.628)	(1.892)
NOE	14.32***	15.68***
	(3.234)	(3.390)
MIDLANDS	0.602	4.457
	(3.635)	(3.238)
SCOTLAND	-5.430	-4.850
	(4.966)	(4.350)
WALES	7.672**	8.281**
	(3.308)	(2.833)
_cons	78.67**	46.86
	(27.92)	(52.20)
N	373	378
r2	0.577	0.552

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.34: Results for EMIMPACT using INTMIG07.

	(1) EMIMPACT	(2) EMIMPACT
EMP_2007	0.171***	0.170***
	(0.0374)	(0.0357)
MANF	-0.00451	
	(0.0285)	
BIF	-0.0336	
	(0.0325)	
CON	0.00768	
	(0.0489)	
TS		0.0442
		(0.0278)
PRIVATE	0.00879	0.0128
	(0.0369)	(0.0289)
INV_HHI	72.49	2276.7
	(4436.0)	(4006.0)
ENTR	0.111	0.0607
	(0.0634)	(0.0497)
TRAIN	0.195*	0.214*
	(0.102)	(0.105)
DEGREE	-0.0922***	-0.105***
	(0.0276)	(0.0233)
NO_QUAL	0.0421	0.0350
	(0.0435)	(0.0380)
INTMIG07	-0.0764***	-0.0789***
	(0.0230)	(0.0225)
LN_DENSITY	-0.0732	-0.138
	(0.0673)	(0.0837)
NOE	0.312	0.577***
	(0.186)	(0.134)
MIDLANDS	0.689**	1.032***
	(0.294)	(0.232)
SCOTLAND	0.158	0.287
	(0.248)	(0.255)
WALES	-0.446	-0.0627
	(0.315)	(0.285)
_cons	-8.541*	-13.06***
	(4.049)	(3.359)
N	373	378
r2	0.270	0.272

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.35: Results for EMPERIMPACT using INTMIG07.

	(1) EMPERIMPACT	(2) EMPERIMPACT
EMAVG_2004_2007	-0.322***	-0.294***
	(0.0684)	(0.0656)
MANF	-0.000542	
	(0.0490)	
BIF	0.0665	
	(0.0464)	
CON	-0.0566	
	(0.0766)	
TS		-0.0563
		(0.0488)
PRIVATE	-0.0167	-0.0229
	(0.0640)	(0.0507)
INV_HHI	3357.3	-1419.9
	(7148.9)	(6664.1)
ENTR	-0.173	-0.0748
	(0.102)	(0.0816)
TRAIN	-0.276	-0.325*
	(0.163)	(0.169)
DEGREE	0.161***	0.182***
	(0.0481)	(0.0395)
NO_QUAL	-0.0800	-0.0550
	(0.0592)	(0.0519)
INTMIG07	0.115**	0.122**
	(0.0444)	(0.0423)
LN_DENSITY	0.0362	0.129
	(0.126)	(0.147)
NOE	-0.780**	-1.156***
	(0.250)	(0.240)
MIDLANDS	-1.020**	-1.556***
	(0.393)	(0.364)
SCOTLAND	-0.579	-0.802*
	(0.341)	(0.386)
WALES	0.255	-0.356
	(0.488)	(0.519)
_cons	15.17**	20.02***
	(6.395)	(4.530)
N	373	378
r2	0.282	0.271

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.36: Results for FTEIMPACT using INTMIG07.

	(1) FTEIMPACT	(2) FTEIMPACT
FTE_2007	0.158***	0.160***
	(0.0264)	(0.0265)
MANF	-0.0190	
	(0.0327)	
BIF	-0.0484	
	(0.0451)	
CON	-0.00193	
	(0.0463)	
TS		0.0369
		(0.0262)
PRIVATE	-0.00855	-0.0235
	(0.0367)	(0.0332)
INV_HHI	524.4	3655.5
	(5431.4)	(4801.4)
ENTR	0.0863	0.0478
	(0.0728)	(0.0640)
TRAIN	0.154	0.182
	(0.0941)	(0.101)
DEGREE	-0.109***	-0.123***
	(0.0330)	(0.0242)
NO_QUAL	0.0282	0.0210
	(0.0320)	(0.0296)
INTMIG07	-0.0676**	-0.0701**
	(0.0248)	(0.0249)
LN_DENSITY	-0.161***	-0.196**
	(0.0474)	(0.0792)
NOE	0.465	0.663**
	(0.302)	(0.240)
MIDLANDS	0.821***	1.116***
	(0.214)	(0.180)
SCOTLAND	-0.119	0.0177
	(0.196)	(0.224)
WALES	-0.664**	-0.270
	(0.261)	(0.245)
_cons	-3.033	-7.024**
	(2.441)	(2.593)
N	373	378
r2	0.283	0.286

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.37: Results for FTEPERIMPACT using INTMIG07.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT
FTEAVG_2004_2007	-0.276***	-0.252***
	(0.0681)	(0.0650)
MANF	0.0422	
	(0.0532)	
BIF	0.104	
	(0.0673)	
CON	-0.0523	
	(0.0782)	
TS		-0.0560
		(0.0463)
PRIVATE	0.00875	0.0433
	(0.0664)	(0.0615)
INV_HHI	3071.6	-4920.8
	(9057.9)	(8193.4)
ENTR	-0.155	-0.0723
	(0.114)	(0.101)
TRAIN	-0.255	-0.328
	(0.183)	(0.195)
DEGREE	0.201***	0.226***
	(0.0602)	(0.0420)
NO_QUAL	-0.0622	-0.0361
	(0.0518)	(0.0453)
INTMIG07	0.110*	0.118**
	(0.0501)	(0.0482)
LN_DENSITY	0.265**	0.290*
	(0.0877)	(0.142)
NOE	-1.074**	-1.358***
	(0.470)	(0.424)
MIDLANDS	-1.271***	-1.773***
	(0.354)	(0.399)
SCOTLAND	0.0211	-0.318
	(0.286)	(0.456)
WALES	0.879*	0.120
	(0.478)	(0.573)
_cons	3.581	9.248*
	(3.992)	(4.309)
N	373	378
r2	0.288	0.275

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.38: Results for UNIMPACT using INTMIG07.

	(1) UNIMPACT	(2) UNIMPACT
UNEMP_2007	-0.102**	-0.104**
	(0.0406)	(0.0430)
MANF	0.0387*	
	(0.0198)	
BIF	0.0336	
	(0.0204)	
CON	0.0813***	
	(0.0232)	
TS		-0.00711
		(0.0227)
PRIVATE	-0.00143	0.0187
	(0.0209)	(0.0259)
INV_HHI	-956.7	41.53
	(2120.7)	(2125.3)
ENTR	-0.0915	-0.102
	(0.0672)	(0.0648)
TRAIN	0.0379	0.0455
	(0.0421)	(0.0455)
DEGREE	-0.0473***	-0.0475***
	(0.00847)	(0.00974)
NO_QUAL	0.0967***	0.0909***
	(0.0120)	(0.0132)
INTMIG07	-0.0259*	-0.0299*
	(0.0127)	(0.0153)
LN_DENSITY	0.195*	0.235**
	(0.0892)	(0.0881)
NOE	0.334	0.390
	(0.264)	(0.316)
MIDLANDS	0.182	0.231
	(0.161)	(0.158)
SCOTLAND	-0.0937	-0.00801
	(0.220)	(0.227)
WALES	-0.0797	0.0631
	(0.202)	(0.258)
_cons	1.319	1.227
	(1.286)	(3.365)
N	351	352
r2	0.377	0.354

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.39: Results for UNPERIMPACT using INTMIG07.

	(1) UNPERIMPACT	(2) UNPERIMPACT
UNEMPAVG_2004_2007	-18.04***	-17.83***
	(2.011)	(2.009)
MANF	1.115**	
	(0.417)	
BIF	1.292**	
	(0.449)	
CON	1.679**	
	(0.651)	
TS		-0.275
		(0.520)
PRIVATE	-0.761*	-0.129
	(0.410)	(0.507)
INV_HHI	-30628.1	-11696.3
	(40181.9)	(40442.6)
ENTR	-1.051	-1.090
	(1.385)	(1.435)
TRAIN	-0.992	-0.842
	(0.793)	(0.831)
DEGREE	-0.909***	-0.745**
	(0.238)	(0.257)
NO_QUAL	2.051***	1.855***
	(0.345)	(0.354)
INTMIG07	0.382	0.253
	(0.426)	(0.509)
LN_DENSITY	4.661**	6.235***
	(1.677)	(1.702)
NOE	5.960	6.985
	(6.486)	(7.242)
MIDLANDS	4.110	5.509
	(3.565)	(3.617)
SCOTLAND	-5.565	-3.059
	(5.090)	(5.200)
WALES	-6.001	-3.203
	(3.940)	(5.213)
_cons	164.7***	160.0*
	(27.29)	(75.41)
N	365	366
r2	0.425	0.399

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.40: Results for JSAIMPACT using INTMIG07.

	(1) JSAIMPACT	(2) JSAIMPACT
JSA_2007	0.200**	0.193**
	(0.0641)	(0.0617)
MANF	0.0171*	
	(0.00839)	
BIF	0.0110	
	(0.00791)	
CON	0.00762	
	(0.00825)	
TS		-0.000247
		(0.00736)
PRIVATE	0.0157***	0.0209***
	(0.00492)	(0.00607)
INV_HHI	167.4	268.6
	(324.8)	(327.9)
ENTR	-0.0458	-0.0480*
	(0.0272)	(0.0264)
TRAIN	0.0394**	0.0402**
	(0.0136)	(0.0137)
DEGREE	-0.0201***	-0.0190***
	(0.00477)	(0.00580)
NO_QUAL	0.0189**	0.0213***
	(0.00719)	(0.00621)
INTMIG07	-0.0254***	-0.0275***
	(0.00605)	(0.00591)
LN_DENSITY	0.127***	0.137***
	(0.0270)	(0.0273)
NOE	0.378***	0.401***
	(0.105)	(0.111)
MIDLANDS	0.0723	0.128*
	(0.0555)	(0.0594)
SCOTLAND	0.131	0.127
	(0.123)	(0.123)
WALES	0.418***	0.433***
	(0.0797)	(0.0879)
_cons	-1.429**	-1.533
	(0.458)	(0.884)
N	373	378
r2	0.707	0.698

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.41: Results for JSAPERIMPACT using INTMIG07.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT
JSAAVG_2004_2007	-27.35***	-27.99***
	(2.463)	(2.599)
MANF	0.950*	
	(0.523)	
BIF	1.182**	
	(0.413)	
CON	0.142	
	(0.604)	
TS		0.313
		(0.442)
PRIVATE	0.279	0.671
	(0.401)	(0.457)
INV_HHI	-10630.8	2625.9
	(30385.0)	(26781.8)
ENTR	-1.874*	-1.748
	(1.013)	(1.064)
TRAIN	0.845	0.961
	(0.893)	(0.735)
DEGREE	-0.967**	-0.756**
	(0.305)	(0.327)
NO_QUAL	0.925*	1.167***
	(0.422)	(0.321)
INTMIG07	-0.494	-0.651*
	(0.317)	(0.350)
LN_DENSITY	4.502**	5.420**
	(1.534)	(1.808)
NOE	12.41***	13.74***
	(3.642)	(3.420)
MIDLANDS	0.372	4.133
	(3.862)	(3.354)
SCOTLAND	-6.589	-5.902
	(5.137)	(4.493)
WALES	6.608	7.165**
	(3.835)	(3.019)
_cons	73.87*	28.45
	(34.96)	(59.58)
N	373	378
r2	0.580	0.559

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.42: Results for EMIMPACT using DOMMIG07.

	(1) EMIMPACT	(2) EMIMPACT
EMP_2007	0.177***	0.178***
	(0.0375)	(0.0360)
MANF	0.00981	
	(0.0310)	
BIF	-0.0291	
	(0.0352)	
CON	0.0218	
	(0.0477)	
TS		0.0344
		(0.0297)
PRIVATE	0.000130	0.00581
	(0.0401)	(0.0313)
INV_HHI	-947.7	1169.6
	(4554.0)	(4129.7)
ENTR	0.117*	0.0655
	(0.0614)	(0.0500)
TRAIN	0.211*	0.232*
	(0.104)	(0.106)
DEGREE	-0.0965***	-0.109***
	(0.0294)	(0.0252)
NO_QUAL	0.0379	0.0314
	(0.0527)	(0.0485)
DOMMIG07	0.0302	0.0312
	(0.0299)	(0.0282)
LN_DENSITY	-0.0657	-0.119
	(0.0698)	(0.0751)
NOE	0.472*	0.741***
	(0.224)	(0.147)
MIDLANDS	0.704*	1.053***
	(0.350)	(0.282)
SCOTLAND	0.178	0.286
	(0.290)	(0.270)
WALES	-0.355	0.0291
	(0.353)	(0.295)
_cons	-8.519	-12.21***
	(4.748)	(3.621)
N	373	378
r2	0.253	0.253

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.43: Results for EMPERIMPACT using DOMMIG07.

	(1) EMPERIMPACT	(2) EMPERIMPACT
EMAVG_2004_2007	-0.349***	-0.324***
	(0.0697)	(0.0668)
MANF	-0.0189	
	(0.0522)	
BIF	0.0653	
	(0.0496)	
CON	-0.0736	
	(0.0765)	
TS		-0.0402
		(0.0526)
PRIVATE	-0.00365	-0.0111
	(0.0693)	(0.0557)
INV_HHI	5136.0	650.1
	(7551.3)	(7066.3)
ENTR	-0.176*	-0.0753
	(0.0932)	(0.0796)
TRAIN	-0.284	-0.335*
	(0.163)	(0.166)
DEGREE	0.162***	0.184***
	(0.0497)	(0.0426)
NO_QUAL	-0.0889	-0.0636
	(0.0766)	(0.0711)
DOMMIG07	-0.0703	-0.0723
	(0.0491)	(0.0477)
LN_DENSITY	-0.0555	0.0245
	(0.130)	(0.145)
NOE	-1.105***	-1.492***
	(0.333)	(0.241)
MIDLANDS	-1.047*	-1.589***
	(0.477)	(0.427)
SCOTLAND	-0.697	-0.888*
	(0.464)	(0.449)
WALES	0.0146	-0.604
	(0.583)	(0.557)
_cons	16.66*	20.08***
	(7.926)	(5.059)
N	373	378
r2	0.272	0.259

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.44: Results for FTEIMPACT using DOMMIG07.

	(1) FTEIMPACT	(2) FTEIMPACT
FTE_2007	0.158***	0.162***
	(0.0273)	(0.0275)
MANF	-0.00616	
	(0.0341)	
BIF	-0.0461	
	(0.0484)	
CON	0.00608	
	(0.0550)	
TS		0.0276
		(0.0274)
PRIVATE	-0.0161	-0.0300
	(0.0386)	(0.0343)
INV_HHI	-212.6	2751.7
	(5468.0)	(4882.1)
ENTR	0.0877	0.0492
	(0.0780)	(0.0703)
TRAIN	0.168	0.197*
	(0.0938)	(0.101)
DEGREE	-0.109***	-0.124***
	(0.0344)	(0.0241)
NO_QUAL	0.0265	0.0197
	(0.0389)	(0.0364)
DOMMIG07	0.0371	0.0365
	(0.0332)	(0.0297)
LN_DENSITY	-0.124	-0.154
	(0.0747)	(0.0896)
NOE	0.615*	0.817***
	(0.320)	(0.246)
MIDLANDS	0.833**	1.138***
	(0.263)	(0.216)
SCOTLAND	-0.0670	0.0406
	(0.206)	(0.216)
WALES	-0.583*	-0.191
	(0.285)	(0.253)
_cons	-3.056	-6.222*
	(3.395)	(3.022)
N	373	378
r2	0.273	0.275

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.45: Results for FTEPERIMPACT using DOMMIG07.

	(1) FTEPERIMPACT	(2) FTEPERIMPACT
FTEAVG_2004_2007	-0.297***	-0.276***
	(0.0643)	(0.0632)
MANF	0.0266	
	(0.0552)	
BIF	0.109	
	(0.0720)	
CON	-0.0591	
	(0.0927)	
TS		-0.0394
		(0.0486)
PRIVATE	0.0217	0.0564
	(0.0702)	(0.0650)
INV_HHI	4532.4	-3009.3
	(9311.2)	(8461.9)
ENTR	-0.151	-0.0652
	(0.116)	(0.109)
TRAIN	-0.260	-0.337
	(0.178)	(0.190)
DEGREE	0.194***	0.221***
	(0.0597)	(0.0399)
NO_QUAL	-0.0780	-0.0509
	(0.0623)	(0.0563)
DOMMIG07	-0.0941	-0.0944
	(0.0573)	(0.0522)
LN_DENSITY	0.106	0.131
	(0.146)	(0.181)
NOE	-1.409**	-1.710***
	(0.501)	(0.400)
MIDLANDS	-1.286**	-1.797***
	(0.436)	(0.446)
SCOTLAND	-0.143	-0.438
	(0.369)	(0.481)
WALES	0.649	-0.115
	(0.521)	(0.589)
_cons	5.177	9.285*
	(5.804)	(4.951)
N	373	378
r2	0.286	0.271

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.46: Results for UNIMPACT using DOMMIG07.

	(1) UNIMPACT	(2) UNIMPACT
UNEMP_2007	-0.110*	-0.111*
	(0.0512)	(0.0536)
MANF	0.0438**	
	(0.0192)	
BIF	0.0335	
	(0.0202)	
CON	0.0837***	
	(0.0200)	
TS		-0.0118
		(0.0216)
PRIVATE	-0.00403	0.0164
	(0.0214)	(0.0259)
INV_HHI	-1337.6	-477.4
	(2033.1)	(2023.7)
ENTR	-0.0913	-0.104
	(0.0652)	(0.0633)
TRAIN	0.0414	0.0497
	(0.0402)	(0.0424)
DEGREE	-0.0468***	-0.0461***
	(0.00718)	(0.00870)
NO_QUAL	0.0975***	0.0931***
	(0.0127)	(0.0138)
DOMMIG07	0.0152	0.0204
	(0.0133)	(0.0147)
LN_DENSITY	0.216**	0.269***
	(0.0737)	(0.0772)
NOE	0.395	0.469
	(0.257)	(0.306)
MIDLANDS	0.184	0.239
	(0.149)	(0.145)
SCOTLAND	-0.0680	0.0182
	(0.220)	(0.224)
WALES	-0.0489	0.0980
	(0.197)	(0.247)
_cons	1.352	1.611
	(1.027)	(2.876)
N	351	352
r2	0.373	0.350

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.47: Results for UNPERIMPACT using DOMMIG07.

	(1) UNPERIMPACT	(2) UNPERIMPACT
UNEMPAVG_2004_2007	-17.61***	-17.38***
	(2.190)	(2.177)
MANF	1.044**	
	(0.440)	
BIF	1.288**	
	(0.446)	
CON	1.630**	
	(0.629)	
TS		-0.242
		(0.516)
PRIVATE	-0.719	-0.110
	(0.403)	(0.503)
INV_HHI	-24195.2	-6148.4
	(36858.6)	(35638.2)
ENTR	-1.076	-1.133
	(1.379)	(1.414)
TRAIN	-1.019	-0.872
	(0.832)	(0.874)
DEGREE	-0.905***	-0.713***
	(0.181)	(0.208)
NO_QUAL	2.011***	1.847***
	(0.379)	(0.382)
DOMMIG07	-0.163	0.00215
	(0.415)	(0.446)
LN_DENSITY	4.332**	6.207***
	(1.736)	(1.942)
NOE	5.089	6.546
	(6.865)	(7.618)
MIDLANDS	4.125	5.521
	(3.752)	(3.698)
SCOTLAND	-6.109	-3.192
	(5.115)	(5.259)
WALES	-6.524	-3.490
	(3.942)	(5.312)
_cons	162.1***	152.3**
	(19.79)	(67.00)
N	365	366
r2	0.423	0.399

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.48: Results for JSAIMPACT using DOMMIG07.

	(1) JSAIMPACT	(2) JSAIMPACT
JSA_2007	0.194**	0.179**
	(0.0701)	(0.0692)
MANF	0.0216**	
	(0.00881)	
BIF	0.0108	
	(0.00764)	
CON	0.00854	
	(0.00703)	
TS		-0.00431
		(0.00776)
PRIVATE	0.0129**	0.0182***
	(0.00452)	(0.00564)
INV_HHI	-70.82	-72.97
	(440.5)	(527.0)
ENTR	-0.0470	-0.0496*
	(0.0260)	(0.0252)
TRAIN	0.0427**	0.0442**
	(0.0162)	(0.0165)
DEGREE	-0.0186***	-0.0176**
	(0.00510)	(0.00598)
NO_QUAL	0.0210**	0.0239***
	(0.00813)	(0.00704)
DOMMIG07	0.0199***	0.0204***
	(0.00549)	(0.00603)
LN_DENSITY	0.161***	0.175***
	(0.0333)	(0.0346)
NOE	0.447***	0.478***
	(0.114)	(0.125)
MIDLANDS	0.0788	0.141*
	(0.0553)	(0.0653)
SCOTLAND	0.173	0.164
	(0.147)	(0.149)
WALES	0.458***	0.474***
	(0.0913)	(0.105)
_cons	-1.577**	-1.299
	(0.507)	(0.878)
N	373	378
r2	0.697	0.683

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Table 9.49: Results for JSAPERIMPACT using DOMMIG07.

	(1) JSAPERIMPACT	(2) JSAPERIMPACT
JSAAVG_2004_2007	-26.45***	-27.48***
	(2.504)	(2.609)
MANF	1.033*	
	(0.503)	
BIF	1.123**	
	(0.409)	
CON	0.0359	
	(0.595)	
TS		0.202
		(0.421)
PRIVATE	0.240	0.608
	(0.337)	(0.392)
INV_HHI	-11239.5	-4072.7
	(32554.1)	(32711.4)
ENTR	-1.990*	-1.867
	(1.004)	(1.053)
TRAIN	0.881	1.028
	(0.931)	(0.798)
DEGREE	-0.828**	-0.629*
	(0.300)	(0.318)
NO_QUAL	1.029**	1.293***
	(0.461)	(0.358)
DOMMIG07	0.789**	0.820**
	(0.288)	(0.306)
LN_DENSITY	6.020***	7.034***
	(1.695)	(1.910)
NOE	14.15***	15.94***
	(3.436)	(3.426)
MIDLANDS	0.455	4.480
	(3.510)	(3.043)
SCOTLAND	-5.241	-4.593
	(4.861)	(4.135)
WALES	7.701**	8.328**
	(3.422)	(2.629)
_cons	59.36*	25.84
	(30.95)	(55.32)
N	373	378
r2	0.589	0.566

* p<0.10, ** p<0.05, *** p<0.01. Standard Errors in brackets.

Chapter 10 - References

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SPECIAL ISSUE PAPER

Economic resilience in Great Britain: the crisis impact and its determining factors for local authority districts

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Abstract The 2008 recession has had a prolonged and varying effect both across and within countries. This paper studies the crisis impact on Great Britain's Local Authority Districts (LADs) using the concept of economic resilience. This country is an interesting case study as the impact varied significantly among LADs. The focus is on employment, and a new method is proposed for comparing pre- and post-recession conditions in order to assess the recession impact. The influence of a number of determining factors is examined, and the study finds a significant effect for initial economic conditions, human capital, age structure, urbanisation and geography. Policy makers need to take into account subnational differences in these factors in order to design and implement better targeted policies.

JEL Classification R11

1 Introduction

The 2008 economic crisis has had a global impact which is still being felt in a number of countries. In the UK, in addition to a decrease in output, the crisis led to a drop of 2.3 % in the rate of employment and an increase of 2.8 % in the rate of unemployment between 2007 and 2011. At the subnational level, there have been significant variations in the performance of different areas; for example, during the same period, Tamworth in Staffordshire lost 11.8 % of its employment, whilst Hackney in London gained 5.6 %. These wide variations lend credence to the arguments of a number of researchers

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that economic downturns impact on localities in significantly different ways and with varying levels of severity (Capello et al. 2016; Fingleton et al. 2012).

The magnitude of the downturn and its differential impact across various areas have sparked research on identifying the underlying factors behind these differences as well as whether it is possible to influence these factors. The concept of resilience, broadly defined as the ability of a system to withstand or overcome a shock—economic or otherwise—provides one useful framework to study these questions. Within the context of the recent crisis, it is useful to identify two stages in the process of examining resilience—the initial impact/downturn or recession phase and the rebound/adaptation or recovery phase (Fingleton et al. 2012; Lee 2014; Martin and Sunley 2014).

Recent empirical research on resilience focuses on examining quantifiable economic indicators such as GDP, employment and unemployment (Cellini et al. 2014; Fratesi and Rodríguez-Pose 2016; Lee 2014; Martin and Sunley 2014). A number of studies examine "peak" to "trough" differences at the national, regional or city level (Lee 2014) during the period 2008–2010. However, with 240 out of 380 GB Local Authority Districts (LADs) reaching their minimum employment rate after 2010, most of these studies fail to consider the full extent of the crisis. In addition, the use of the difference between two single points in time is subject to potentially significant errors arising from survey data based on small samples at the subnational level. As a consequence, single observations may suffer from high levels of volatility and weak reliability as evidenced by large confidence intervals for data such as unemployment at the subnational level in Great Britain.

This study focuses on the impact of the 2008 recession on local labour markets and the factors behind it using an econometric analysis of data at the GB LAD level. A new method of calculating the crisis impact is proposed which involves averaging the annual data on pre- and post-2008 employment performance and examining the change of these averages in order to ameliorate the issues associated with single-year observations. The paper begins by reviewing recent developments in the study of economic resilience and the factors behind resilience performance. Section 3 discusses the data and methodology, whilst Sect. 4 presents the results. Finally, Sect. 5 concludes and discusses further steps for research. To the authors' knowledge, this is the first study based on the methodology and variables discussed as well as its focus on the GB's 380 LADs.

2 Economic resilience

2.1 Concept and measurement

Definitions of economic resilience can be broadly categorised into equilibrium and evolutionary approaches even though recent developments reconcile the two by suggesting that the former could be part of the latter (Di Caro 2015a). Equilibrium approaches consider resilience either as a return to a pre-existing equilibrium (engineering resilience) or as a movement towards a new state (ecological resilience). Engineering resilience is typically measured in terms of speed of return to equilibrium (Fingleton et al. 2012; Hill et al. 2010; Holling 1996; Martin and Sunley 2014),

whilst ecological resilience is measured by the force required before the structural characteristics of a system change permanently (Holling 1996; Martin 2012). One specific example of this approach is offered by Hill et al. (2010) in which resilience is treated as the ability of a place to return to a previously defined growth path within a certain timeframe. In contrast, evolutionary perspectives treat resilience as a continuum of adaptation to constantly changing conditions (Bristow and Healy 2013; Martin and Sunley 2014; Walker et al. 2004). As a result, resilience includes the possibility for adaptive capacity building and creation of a new sustainable path with improved qualitative characteristics (Martin and Sunley 2014).

A wide range of methods have been used in the study of economic resilience. For example, Treado and Giarratani (2008) and Simmie and Martin (2010) use qualitative research methods, Martin (2012) and Di Caro (2015a) investigate the topic quantitatively, whilst Hill et al. (2010) use mixed methods.

Quantitative measures of resilience have typically focused on single proxies, mainly examining labour market aspects (Di Caro 2015b; Fingleton et al. 2012). Lee (2014), for example, studies the crisis impact on British cities using changes in unemployment rates and claimant counts, whilst Fingleton et al. (2012) examine the employment performance of GB regions. The rationale for focusing on labour markets is related to both practical and theoretical considerations. Labour market data tend to be more readily available and reliable at lower geographical levels than output measures such as GVA for which the method of calculation at the subnational level has been criticised (Gripaios and Bishop 2006). In addition, labour market adjustments are one of the main options available for firms to reduce costs during a recession, and hence, the impact of a crisis may manifest itself particularly strongly in such markets (Fingleton et al. 2012). As a result, investigating employment conditions becomes instrumental in understanding the impact of the recession on local areas, and this is the approach taken in this study. However, it should be noted that in countries with greater institutional rigidity, GDP measures may better reflect economic fluctuations (Cellini and Torrisi 2014).

Within labour markets, a number of potential indicators might be used including those covering employment, unemployment and claimant count data, all of which have their own merits and disadvantages. As Lee (2014) notes, for example, claimant count data may exclude unemployed foreign migrant workers who are ineligible to claim benefits and those who retire early due to a lack of employment prospects. These data may also be biased towards those on lower incomes who may claim benefits more rapidly than those who had higher incomes and use savings as a buffer against unemployment. Similarly, unemployment data exclude those who retire early in response to a shock and are based on survey data with large sampling errors at a local level. Indeed, data and confidence intervals for many LADs are not published due to very small sample sizes.

Given these considerations, in common with several recent studies, this paper focuses on employment (see e.g. Fingleton et al. 2012; Simmie and Martin 2010; Hill et al. 2010). This measure consists of people aged 16 and over who did paid work (as an employee or self-employed), those who had a job that they were temporarily away from, those on government-supported training and employment programmes and those doing unpaid family work. This measure has a relatively large sample ensuring that data are available for most LADs. The data also cover all those employed and avoid

the exclusion of migrant workers. As the sample areas differ considerably in size, the analysis focuses on employment rates rather than absolute numbers. Whilst employment rates are clearly an important indicator of economic activity, changes in rates may reflect a variety of factors including the impact of workers retiring earlier than anticipated due to the shock, migration flows in response to differential employment opportunities and changes in the number of individuals accessing training or educational programmes. Hence, they incorporate the net impact of demand side shocks and supply side responses in the local labour market.

2.2 Determinants of resilience

In examining the determining factors of the crisis impact, this paper draws on existing research on resilience and theoretical perspectives on growth and employment. A number of variables, such as indicators of good governance, social capital and public investment could not be included due to lack of data at the LAD level. Consequently, the analysis concentrates on factors for which quantitative data are available; these include measures of pre-crisis economic conditions, industrial structure, industrial diversification, entrepreneurship, human capital, demographics, population density and geography. The rationale for the inclusion of these factors is now discussed in turn.

At the onset of the financial crisis, GB regions were characterised by differing pre-crisis economic conditions, past investments and resource endowments. The theory of path dependency suggests that such factors may potentially constrain or enhance the ability of a region to adapt to a crisis (Lee 2014; Martin and Sunley 2014) and, hence, it is essential to explore the impact of these initial conditions. In terms of pre-crisis labour market conditions, the empirical literature has been inconclusive with Lee (2014), suggesting that the largest increases in unemployment were in places with already high unemployment rates but the opposite is true when claimant counts are examined. These mixed results suggest that there is a need for further research on the impact of initial labour market conditions.

Related to the effect of pre-existing economic conditions is the sectoral composition of employment. Different sectors exhibit varying demand, supply, competition and location characteristics which could translate into differences in the local impact of the recession. Due to the origin of the 2008 financial crisis, it might be thought that the sectoral impact was greater on services such as finance and banking, real estate and construction (Lee 2014) and lower in the public sector, which acted as a buffer during the initial recession period (2008–2010) (Clayton 2011). Hence, it is important to test whether the sectoral composition of pre-crisis employment had an effect on its impact.

The sectoral composition of employment could also be an indication of industrial diversity. Although a degree of specialisation is often considered beneficial to growth through increased competitiveness and externalities, it may leave local economies exposed to business cycles that impact on these specialised sectors (Di Caro 2015b). Following the same principles as portfolio diversification, it is possible that a drop in demand will have a greater impact in an area where a large number of firms depend on

customers with similar characteristics. Consequently, areas with greater diversification might exhibit a smaller crisis impact (Di Caro 2015b; Lee 2014).

Entrepreneurship could also play a role in mitigating the effects of the downturn (Bishop and Shilcof 2016). A number of studies highlight the importance of entrepreneurship to economic growth through innovation and job creation (Audretsch et al. 2015; Williams et al. 2013). However, firm formation exhibits significant geographical and time persistent differences (Acs and Mueller 2008; Bishop 2012). In the UK, Fotopoulos (2014) provides evidence on the time persistent spatial stickiness (slow propensity to change) of entrepreneurship for the period 1994–2007. The flexibility and innovation aspects of entrepreneurial activity are key to identifying and exploiting opportunities during a crisis (Soininen et al. 2012), whilst firm formation can replace the existing stock of firms with more dynamic ones. Higher rates of firm births may imply more opportunities for employment growth and less impact from the economic downturn.

Human capital could have an important effect on resilience through at least two channels. First, skilled employees are a highly valued asset due to embedded knowledge and experience (Lee 2014). In the face of reduced demand, it is possible that firms may opt for hoarding this type of labour (Clayton 2011). As a result, places with more workers with high level qualifications may exhibit a lower crisis impact. The second channel is via human and firm-specific capital created through on-the-job training (Becker 1962; Hashimoto 1981). A number of researchers find that increasing rates of training are associated with reduced likelihoods of lay-offs and staff turnover (Becker 1962; Hashimoto 1981; Molina and Ortega 2003). However, evidence from North America suggests that firms with higher rates of training tend to be less technologically advanced, more unionised and with low rates of R&D (Molina and Ortega 2003). These opposing characteristics suggest that the net impact of such training can only be identified by empirical analysis.

Human capital stocks are subject to accumulation as well as obsolescence and depreciation during an individual's lifetime (Brunow and Hirte 2009a, b; Skirbekk 2004). Age has also been negatively associated with labour mobility and flexibility which could translate to slower structural adjustment in local economies (Poot 2008; Robertson and Tracy 1998). Even though younger people may be more flexible and adaptable than older workers, productivity may rise with experience for a number of working years. As a result, demographics could significantly affect the recession impact, and it is interesting to examine whether it is the flexibility or experience effects that dominate.

The existing literature suggests that cities have a special role to play with regard to resilience (Capello et al. 2015). Larger cities may be more diverse and less susceptible to changes in demand. In addition, firms in large cities tend to focus more on human capital and innovation intensive activities rather than production and benefit from agglomeration economies (Capello et al. 2015; Lee 2014). Hence, urban areas may benefit from increased proportions of human capital and the potential for skilled labour hoarding. Empirical studies provide support for the argument that urban or denser areas performed better during the 2008 economic crisis (Capello et al. 2015). Even though the existing explanatory variables cover some characteristics of cities such as

human capital, it is important to include a measure of urbanity to account for other agglomeration factors.

Due to spatial stickiness and location specific factors, the crisis may have had a geographically diverse impact. Martin (2012), for example, finds significant regional variations during different UK crises with broad differences between the peripheral, northern UK and the West Midlands on the one hand and the South and East on the other hand. For the 2008 crisis, the initial expectation was that there would be a severe impact on places with high shares of financial services activities. However, a stream of research suggests that the crisis rapidly spreads to sectors linked to finance (Lee 2014) and, consequently, the 2008 recession resembles the early 1980s in terms of having a more negative effect on the labour markets in the North (Lee 2014; Martin 2012). These factors are examined by the incorporation of various regional dummies.

3 Data and variables

3.1 Dependent variables

This paper argues that, irrespective of one's view on the conceptualisation of resilience, quantitative measurement is an essential component of understanding the impact of the crisis. Consequently, in gauging the crisis impact on labour markets, the paper compares the conditions before and after the 2008 downturn using quantitative employment indicators.

The period of study covers the years from 2004 to 2014. The start year is chosen to ensure consistency since in 2004 the Annual Population Survey (APS), from which the employment data are extracted, replaced the Local Area Population Survey which used different periods for its estimation of employment rates. The APS combines quarterly data from the Labour Force Survey and rolling year data from the Local Labour Force Survey to provide the largest coverage in the UK.

LADs have been chosen as the geographical level for this study because they are the lowest administrative level in which policies can be pursued both for the mitigation of the crisis' effects and for preparing for the recovery stage. The average population of a LAD for 2007 was approximately 150,000 with the Isle of Scilly being the smallest, counting for only 2300 and Birmingham being the largest with 1,029,000 citizens. In addition, compared to travel-to-work areas (TTWAs), the LADs provide a significantly richer dataset covering the period since 2004 with, for example, employment rates for TTWAs from the APS being available only from 2013 onwards.

Given that the period 2004–2007 was one of relative labour market stability at the national level, with age 16+ employment rates of 59.7 % in 2004 and 59.9 % in 2007, it is possible to construct an average rate of employment during this period to act as an initial point against which subsequent performance can be measured. In this way, it is possible to overcome problems associated with the volatility of these rates at the LAD level. Table 1 shows that averaging over the four-year period is highly correlated with two- and three-year averages as well as the 2007 employment rate. However, the four-year average may better reflect the concept of an "equilibrium" point prior to the recession and help to ameliorate any volatility effects for individual areas at the subnational level.

Table 1 Correlation matrix of average employment rates for 2004–2007, 2005–2007, 2006–2007 and employment rates 2007

Variable	AVERAGE06–07	AVERAGE05–07	AVERAGE04–07	EMPLOYMENT07
AVERAGE06–07	1			
AVERAGE05–07	0.9862	1		
AVERAGE04–07	0.9703	0.9929	1	
EMPLOYMENT07	0.9578	0.9367	0.9198	1

Taking the difference between this initial employment average and the respective minimum for the period 2008–2014 would create a variable reflecting the recession's impact in LADs. However, to ensure consistency with the averaging approach used for the pre-recessionary period, the minimum employment point is calculated by averaging the lowest four rates during 2008–2014. This also accounts for any potential lag of the crisis impact on LADs. The difference between the initial and minimum averages provides a direct measure of the employment impact and the ability to measure the effect of the independent variables on the dependent in absolute terms.

This method differs from some approaches such as that of Martin (2012) in that it does not consider the change at the national level as mediating the results. The reason for this is that this study does not attempt a categorisation of LADs into resilient or non-resilient and nor does it compare areas across countries in which case controlling for national effects would be needed. Rather, the study is focused on comparing LADs within a country and, more importantly, in identifying the determining factors behind the magnitude of the crisis impact on these LADs. Dividing the crisis impact on LADs by the impact at the national level would simply scale the original results with no effect on the substance of the analysis.

A drop of a certain percentage in employment can have varying importance for different places depending on their initial conditions. Hence, the differences between the initial and minimum points in such studies could be measured in terms of both level (variable IMPACT) and percentage change. In this study, the level and percentage change exhibit a high correlation (0.99) which leads to similar results in the analysis and as such only the results for the level difference (IMPACT) are reported. Despite the high correlation, there are methodological grounds for examining both measures as these may potentially lead to more varied results when examining other labour market statistics. The formula for the dependent variable is IMPACT $= X_j - X_i$ (1) where X_j is the average employment for 2004–2007 in region j, X_i is the average of the four minimum employment rates during 2008–2014 and its descriptive statistics are shown in Table 2.

Table 2 Descriptive statistics of crisis impact variable

	Obs	Mean	SD	Min	Max
IMPACT	378	3.12	2.43	−7.33	11.38

3.2 Independent variables

Based on the discussion of the determinants of resilience, this section outlines the available variables included in the analysis (precise definitions are outlined in Table 3).First, the initial economic conditions are controlled for by using the 2007 employment rate, whilst the industrial structure is measured by the employment shares of different sectors associated with the crisis such as manufacturing (A, SIC 2007), total services (G-Q, SIC 2007), banking insurance and finance (K-N, SIC 2007) and construction (F, SIC 2007). Similar variables have been used in recent studies such as Lee (2014) (Table 3). Industrial diversity/specialisation is represented by using the natural logarithm of the Herfindahl–Hirschman Index (HHI) of sectoral employment (A-U, SIC 2007). The HHI is the sum of the squares for the employment shares of each economic sector in a LAD after standardisation to account for missing values mainly in agriculture (A, SIC 2007) and energy and water sections (B, D and E, SIC 2007). It shows the concentration of economic activity in different sectors where a higher value implies greater specialisation

Entrepreneurship is measured in terms of new firm births per 1000 population; this is averaged over the 2004–2007 period to avoid the year-to-year fluctuations that can occur at a local level. Three variables are used to represent human capital: the shares of degree and higher qualifications and those with no qualifications among the working age population in 2007 measure the initial stock of human capital, whilst the average employee training rate 2004–2007 reflects the culture of on-the-job training. The former two have been widely used (Di Caro 2015b; Hill et al. 2010; Lee 2014), whilst it is the first time that employee training has been used in resilience studies as a reflection of on-the-job created human capital. In terms of demographics, the population shares of three age groups (20–34, 35–49 and 50–64) are used. The natural logarithm of population density tests for the effects of urbanity, whilst a number of geographical dummies are included to examine locational effects. The models also initially included the size of the public sector as an independent variable. However, the coefficients were invariably insignificant and did not affect the significance of other variables; for simplicity, these are excluded from the reported results. One explanation for this lack of significance could be that its initial positive contribution to maintaining employment levels (ONS 2009) was counteracted by post-2009 austerity measures which saw a significant reduction of public sector jobs (Clayton 2011). Indeed, the share of the public sector in total employment at the national level reached a peak of 25 % in 2010 before dropping to 23.4 % in 2013, its lowest rate since data started in 2004.

Table 4 presents the descriptive statistics of the independent variables excluding the geography related dummies, whilst Table 5 depicts the relevant correlation matrix. As expected, high correlations are observed among the industrial sector variables and among the age groups.

It should be noted that a few observations are missing due to lack of data, typically due to unreliable sample sizes for some areas with extremely small populations. The City of London and Isles of Scilly are missing from all models, whilst West Somerset is missing from models 1 and 4 (these three areas have the smallest, second smallest and sixth smallest working population of all the areas covered by the initial sample).

Table 3 Range of independent variables and definitions

Theme	Variable	Definition	Papers with similar variable
Initial economic conditions	EMP_2007	Employment rate 16 + 2007	Lee (2014)
Sectoral composition of employment	MANF	Percentage of all in employment who work in—Manufacturing (C, SIC 2007) 2007	Lee (2014)
	TS	Percentage of all in employment who work in—total services (G-Q, SIC 2007) 2007	
	BIF	Percentage of all in employment who work in—banking, finance and insurance (K-N, SIC 2007) 2007	
	CON	Percentage of all in employment who work in—Construction (F, SIC 2007) 2007	
Industrial diversity	LN_HHI	Natural Logarithm of Herfindahl–Hirschman Index for employment on sections	Lee (2014), Fingleton and Palombi (2013) and Di Caro (2015b)
Entrepreneurship	ENTR	Average firm birth per 1000 population 2004–2007	Bishop and Shilcof (2016)
Employee training and human capital	TRAIN	Average % of employee training 2004–2007	
	DEGREE	% of population with degree or equivalent and above 2007	Hill et al. (2010), Lee (2014) and Di Caro (2015b)
	NO_QUAL	% of population with no qualifications 2007	
Demographics	AGE_20_34	Population aged 20–34 as a % of total	
	AGE_35_49	Population aged 35–49 as a % of total	
	AGE_50_64	Population aged 50–64 as a % of total	
Population density	LN_DENSITY	Natural logarithm of population density 2007	Capello et al. (2015), Brakman et al. (2014) and Lee (2014)
Geography	NOE	North of England dummy including former regions North East, North West and Yorkshire and the Humber	Lee (2014)
	MIDLANDS	Midlands dummy including East and West Midlands	
	SCOTLAND	Scotland dummy	
	WALES	Wales dummy	

Table 4 Descriptive statistics of the independent variables

Variable	Obs	Mean	SD	Min	Max
EMP_2007	378	60.40	4.84	45.60	71.90
MANF	377	12.48	5.02	1.90	29.60
TS	379	75.44	6.20	56.70	93.80
BIF	376	14.27	6.40	2.80	72.50
CON	376	8.87	2.52	1.50	18.30
LN_HHI	378	7.51	0.10	7.26	7.88
ENTR	380	7.65	11.10	3.00	218.82
TRAIN	378	10.72	1.56	5.90	14.60
DEGREE	379	19.32	8.65	5.90	75.80
NO_QUAL	378	12.74	4.51	2.00	29.90
AGE_20_34	380	18.40	4.98	10.70	38.20
AGE_35_49	380	22.21	1.39	18.00	26.80
AGE_50_64	380	18.75	2.55	9.00	23.70
LN_DENSITY	380	6.31	1.47	2.20	9.51

Ryedale, Melton, Mole Valley and Forest Heath are also missing from models 3 and 6. The decision to exclude these places on a model by model basis rather than across the different specifications was made on the basis of exploiting the maximum information available. Moreover, regressions run with the same sample of LADs (i.e. excluding all these LADs in every equation) show no significant differences from the analysis presented below. The independent variables explain approximately 30 % of the dependent's total variation which is reasonable considering the cross-sectional nature of the model and heterogeneity of LADs and is not uncommon in studies of this type (Wooldridge 2015).

Table 6 presents the results of the linear regression models. In devising the estimation strategy, all of the independent variables were initially considered simultaneously. However, high VIFs for the age group 50–64 and the total services' variables (13.62 and 11.93 respectively) confirmed multicollinearity concerns for these independents with other measures of age and industrial structure. This dictated the inclusion of different sets of variables in different specifications. Hence, models 1–3 omit the 50–64 age group, whilst models 4–6 include this age group but omit the 20–34 age group. Models 1 and 4 include manufacturing only, whilst models 2 and 5 include total services. In addition, to explore the potential impact of industrial structure, it was decided to include variables BIF and CON in a separate model (models 3 and 6) as these sectors might be expected to have been particularly vulnerable in the 2008 crisis given the origin of the crisis in the financial and housing markets. Models 3 and 6 also serve as a robustness check of the results in the other the specifications.

4 Results

Due to the calculation of the dependent variable, positive coefficients imply a deeper employment impact, whilst the opposite is true for negative coefficients. Following the

Table 5 Correlation matrix of dependent and independent variables

	IMPACT	AVG_2004_2007	EMP_2007	MANF	TS	BIF	CON
IMPACT	1.00						
AVG_2004_2007	0.32	1.00					
EMP_2007	0.25	0.92	1.00				
MANF	0.23	−0.05	−0.05	1.00			
TS	−0.23	0.10	0.11	−0.80	1.00		
BIF	−0.23	0.26	0.24	−0.52	0.70	1.00	
CON	0.11	−0.15	−0.17	−0.04	−0.41	−0.30	−1.00
LN_HHI	−0.16	−0.26	−0.22	−0.21	0.40	0.07	−0.31
ENTR	−0.10	0.28	0.25	−0.31	0.39	0.58	−0.26
TRAIN	0.16	0.33	0.33	−0.08	0.07	0.00	−0.04
DEGREE	−0.26	0.34	0.35	−0.46	0.61	0.65	−0.41
NO_QUAL	−0.04	−0.55	−0.54	0.29	−0.26	−0.30	0.09
AGE_20_34	−0.35	−0.01	0.04	−0.25	0.46	0.41	−0.32
AGE_35_49	0.09	0.61	0.56	0.05	0.05	0.29	−0.16
AGE_50_64	0.33	0.00	−0.04	0.24	−0.47	−0.44	0.28
LN_DENSITY	−0.21	−0.10	−0.06	−0.15	0.44	0.44	−0.22

Table 5 continued

	LN_HHI	ENTR	TRAIN	DEGREE	NO_QUAL	AGE_20_34	AGE_35_49	AGE_50_64	LN_DENSITY
LN_HHI	1.00								
ENTR	0.00	1.00							
TRAIN	0.05	−0.07	1.00						
DEGREE	0.21	0.60	0.17	1.00					
NO_QUAL	0.00	−0.40	−0.42	−0.50	1.00				
AGE_20_34	0.22	0.13	−0.03	0.42	0.15	1.00			
AGE_35_49	−0.26	0.21	0.09	0.24	−0.22	−0.08	1.00		
AGE_50_64	−0.14	−0.09	0.04	−0.37	−0.19	−0.93	−0.04	1.00	
LN_DENSITY	0.15	0.07	−0.04	0.22	0.20	0.73	0.02	−0.81	1.00

Table 6 Cross-sectional regression results for IMPACT

	Model 1 Coef./se	Model 2 Coef./se	Model 3 Coef./se	Model 4 Coef./se	Model 5 Coef./se	Model 6 Coef./se
EMP_2007	0.247***	0.253***	0.249***	0.226***	0.232***	0.229***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
MANF	0.009			0.005		
	(0.03)			(0.03)		
TS		0.031			0.04	
		(0.03)			(0.03)	
BIF			−0.024			−0.023
			(0.03)			(0.03)
CON			−0.006			−0.001
			(0.03)			(0.04)
LN_HHI	−0.098	−0.747	−0.035	−0.496	−1.304	−0.406
	(1.62)	(1.84)	(1.73)	(1.62)	(1.77)	(1.77)
ENTR	0.112**	0.102*	0.133**	0.063	0.051	0.088
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
TRAIN	0.192*	0.200*	0.196*	0.201*	0.211**	0.207**
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)
DEGREE	−0.056**	−0.064**	−0.055*	−0.062**	−0.071***	−0.061**
	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
NO_QUAL	0.079	0.086*	0.091*	0.081*	0.090**	0.094**
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
AGE_20_34	−0.222***	−0.222***	−0.214***			
	(0.03)	(0.03)	(0.04)			
AGE_35_49	−0.338***	−0.333***	−0.312**	−0.176*	−0.173*	−0.157
	(0.1)	(0.09)	(0.11)	(0.09)	(0.09)	(0.11)
AGE_50_64				0.443***	0.447***	0.423***
				(0.08)	(0.09)	(0.09)
LN_DENSITY	0.341***	0.302**	0.330***	0.386***	0.343**	0.370**
	(0.09)	(0.1)	(0.09)	(0.1)	(0.12)	(0.12)
NOE	0.704***	0.844***	0.658**	0.462*	0.622**	0.429
	(0.22)	(0.2)	(0.26)	(0.25)	(0.21)	(0.28)
MIDLANDS	0.863***	1.068***	0.793**	0.596*	0.826***	0.532
	(0.24)	(0.21)	(0.29)	(0.29)	(0.23)	(0.32)
SCOTLAND	0.956***	0.961**	0.858**	0.435	0.457	0.37
	(0.3)	(0.31)	(0.34)	(0.33)	(0.34)	(0.39)
WALES	0.074	0.219	−0.038	−0.197	−0.025	−0.291
	(0.35)	(0.33)	(0.4)	(0.38)	(0.36)	(0.42)

Table 6 continued

	Model 1 Coef./se	Model 2 Coef./se	Model 3 Coef./se	Model 4 Coef./se	Model 5 Coef./se	Model 6 Coef./se
Constant	−4.89	−2.509	−5.972	−16.333	−13.542	−17.149
	(13.63)	(14.16)	(15.29)	(13.3)	(13.66)	(15.51)
R-squared	0.305	0.311	0.307	0.3	0.307	0.302
N. of cases	377	378	374	377	378	374

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

analysis of Lee (2014), regionally clustered robust standard errors are used. A number of variables such as human capital and demographics could potentially be affected by reverse causality. However, the use of explanatory variables at the base year (2007) to examine their effect on the post-2008 crisis impact alleviate this concern in this cross-sectional analysis.

The results highlight a number of interesting points. First, initial economic conditions are consistently significant with a positive sign, suggesting that LADs with greater employment rates prior to the crisis exhibited the greatest losses of employment in the subsequent period. One possible explanation is that higher initial employment rates are an indicator of areas with tight labour markets where the profitability of the marginal worker was low and a drop in demand led to significant labour market adjustment. This result is in accordance with Lee's (2014) findings where places with higher unemployment rates had a smaller crisis impact than places with lower ones. Second, all of the sectoral variables, including the specialisation index failed to provide statistically significant results, providing no evidence that particular sectors were the source of greater vulnerability for the LADs. This is in contrast to Lee's (2014) study which finds statistically significant and negative effects for employment in manufacturing, financial services and construction sectors.

The results on specialisation confirm the lack of significance found in sectoral results. Di Caro (2015b), Fingleton and Palombi's (2013) and Brakman et al's (2014) studies on the other hand find that diversity has a positive effect (or specialisation has a negative one) on resilience. The differences between this paper and others could be attributed to a range of factors such as the different geographies examined, the different datasets used and temporal differences, since each study examines a different time period. If not attributed to data considerations, the lack of statistical significance on the sectoral and diversification variables could indicate that post-2010 crisis has spread across all sectors.

Entrepreneurship exhibits statistically significant and positive coefficients in models 1–3 and statistically insignificant coefficients in models 4–6. The loss of statistical significance across models indicates considerable sensitivity across specifications. This diminishes the robustness of the results and does not allow for the confirmation of a significant effect for entrepreneurship suggested by other studies (Bishop and Shilcof 2016; Williams and Vorley 2014; Williams et al. 2013). The opposing effects of firm formation on employment generation—dynamism and flexibility on the one hand and the fact that most new firms tend to be small enterprises with relatively

limited access to credit and high death rates, could potentially explain the sensitivity of the results to small changes in specification. In addition, it could be the case that entrepreneurship is important to the restructuring or recovery phase rather than the crisis impact (Bishop and Shilcof 2016; Williams and Vorley 2014; Williams et al. 2013).

As far as the human capital variables are concerned, the training variable is consistently significant and positive. This outcome could be viewed in terms of a potential self-selection bias, since companies that engage in employee training tend to be larger in size (Kotey and Folker 2007) and potentially less flexible at times of adversity. The result suggests that employee training may be signalling firms with lagging productivity (Bartel 1994), under restructuring, highly unionised and/or with low stocks of skills (Almeida-Santos and Mumford 2005; Molina and Ortega 2003). If this is the case, then these firms may be more vulnerable in times of economic stress. The share of degree holders is consistently negative and statistically significant across all models, suggesting that places with a higher share of degree holders have suffered a smaller crisis impact. Conversely, the coefficients for the share of population with no qualifications are statistically significant in models 2–6 and have a positive sign, deepening the impact of the crisis for LADs. This is in agreement to Lee's (2014) results and suggests that places with higher levels human capital were better able to mitigate the recession effects due to the attributes associated with transferable knowledge and skills.

The demographic structure of a LAD also emerges as a significant factor. Models 1–3 include the age groups 20–34 and 35–49. Both variables have consistently significant and negative coefficients implying that the higher the population share of these age groups, the greater the mitigation of the employment impact. An F-test for the equality of the coefficients fails to confirm that one of the groups has a greater contribution than the other. Models 3–6 consider the age groups 35–49 and 50–64. The coefficient for the 35–49 group is mostly significant and negative at the 10 % level, whilst the coefficients for the 50–64 group are significant and positive, indicating a detrimental effect of high shares of this group. It is possible that age exhibits an inverted U-shaped relationship to the crisis impact, in agreement with studies of the effects of demographics on various human capital, productivity and growth measures (Brunow and Hirte 2009a, b; Poot 2008; Skirbekk 2004). This also suggests that the combination of a more youthful population but with significant work experience is the most helpful demographic attribute.

Since the variables included refer to the year 2007, it is unlikely that extraordinary migration movements due to the economic crisis have affected the results of the demographic variables. However, migration figures for 2007 (as well as its components of international and domestic migration) are positively correlated with the 20–34 age group, have no relationship to the 35–49 group and exhibit a negative relationship to the 50–64 group. This could be a sign that age is proxying or is affected by previous migration, and hence, it is worth further investigation. Replacing the age groups with inward migration for 2007 provides statistically significant results for the latter but only at the 10 % level, leading to a poorer fit of the model than with the age variables. In addition, separating migration into domestic and international does not provide any statistically significant results. As a result, it can be argued that the use of demographic groups is a better proxy even if it partly reflects migration.

Population density has consistently significant and positive coefficients, suggesting a greater crisis impact in more densely populated areas. This result could be linked to the social characteristics of highly populated areas. Capello et al. (2015) argue that it is the qualitative characteristics—infrastructure, quality of production and factors etc.—of cities that matter to resilience rather than size and agglomeration as well as the lower impact found in "sheltered" economies (Fratesi and Rodríguez-Pose 2016). In terms of the recession's geographical footprint, there is evidence of the impact being more severe than the rest of GB for LADs in the North of England and Midlands agreeing in part with Lee's (2014) results for the North. The two dummies have statistically significant and positive coefficients in models 1–5, and the same holds for the Scotland dummy in models 1–3. Considering the magnitude of the impact, the statistical significance of the coefficients for *NOE, MIDLANDS* confirms that LADs in these regions had deeper crisis impact than the rest of GB, whilst for *SCOTLAND*, the results are inconclusive.

5 Conclusions

The concept of resilience provides a useful framework with which to examine the recent economic crisis as it facilitates a focus on the factors behind both the differential impact and success of the recovery stage across spatial areas. The theoretical and empirical investigation of resilience is still being developed, and this special issue is a significant step in the development of appropriate measures and understanding of the factors affecting resilience. This paper makes a contribution by taking an averaging approach to measuring pre- and post-recession employment conditions to avoid issues associated with year-to-year volatility at a local level. A number of factors affecting the crisis impact are identified and tested. These factors stem from existing research on resilience as well as economic theory on growth and employment and include the initial economic conditions, sectoral specialisation, industrial diversification, human capital, entrepreneurship, demographics, urbanisation and geographical variables.

The analysis supports the view that the recession had variable effects across GB due to a number of factors. The impact was deeper in places with higher employment rates in 2007 but also in LADs of the traditionally lagging North and Midlands. A mixture of dynamism, skills and experience at the individual level appears to have the most beneficial effect for LADs with the share of degree holders, and the age groups 20–34 and 35–49 mitigating the crisis impact whilst employee training, perhaps as an indicator of underlying problems, and the group 50–64 having the opposite effect. The lack of consistently significant results for industrial structure, diversity and entrepreneurship may suggests that, in the medium term, the systemic nature of the crisis had spread to all sectors of the economy and worsened the environment for new firms counterbalancing any potential benefits of firm formation.

The approach adopted in this study has a number of limitations. In particular, the low spatial scale of the study inevitably limits the range of variables that can be included in the analysis, and some potentially important variables may have been omitted. In addition, the cross-sectional method utilised limits the causal inferences that can be made from the study. Nevertheless, the approach has a number of advantages that might

usefully inform future studies in the area. In particular, whilst using local level data has major advantages in terms of increasing sample sizes and assessing the variability of impacts across space, the use of single-year observations based on sample data with wide confidence intervals may yield unreliable conclusions. The approach to averaging data at this spatial scale has the potential to avoid this issue and improve the reliability of results. In addition, the study opens numerous strands for further research. Employment rates are only one of a range of variables worth exploring, and it would be interesting to repeat the methodology of this study using other measures such as unemployment rates and household disposable income. Further research might also more closely examine the differences between urban and rural areas and augment the list of independent variables in order to identify resilience building factors.

Finally, in terms of policy implications, perhaps the most interesting aspect of the study is the importance of high level qualifications and a relatively youthful population in mitigating the crisis impact. Whilst it is difficult for policy makers to directly control demographics, investment in higher education institutions that both supply qualifications and attract young people who may stay and live in the area in which they study is a potential development strategy. Those areas that are weak in the provision of higher education might seek to persuade national decision-makers to assist in capacity building or develop strategies that seek to attract recently qualified graduates to jobs within the subregion. This might include both domestic migrants and overseas migrants who are seeking to develop a career in their country of study. Policy makers might also consider investment in those amenities and cultural aspects of a local environment that might prove attractive to young, educated individuals.

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