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Regional Economic Resilience, Hysteresis and Recessionary Shocks

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Abstract

The notion of 'resilience' has recently risen to prominence in several disciplines, and has also entered policy discourse. Yet the meaning and relevance of the concept are far from settled matters. This paper develops the idea of resilience and examines its usefulness as an aid to understanding the reaction of regional economies to major recessionary shocks. But in so doing, it is also argued that the notion of resilience can usefully be combined with that of hysteresis in order to more fully capture the possible reactions of regional economies to major recessions. These ideas are then used as the basis for a preliminary empirical analysis of the UK regions.

Introduction

Although the idea of 'resilience' has been used for some time in the physical, engineering and ecological sciences, and has found its way into such disciplines as psychology and organisation science, it is only very recently that it has attracted attention from regional analysts, spatial economists and economic geographers. In one of the first discussions, Reggiani, de Graff and Nijkamp (2002) argued that the notion of 'resilience' could be a key aspect of the dynamics of spatial economic systems, especially concerning how such systems respond to shocks, disturbances, and perturbations. Over the past five years other urban and regional analysts have begun to take up this call and to consider the applicability of the concept in their work (for example, see, for example, Rose and Liao, 2005; Vale and Campanella, 2005; Stehr, 2006a, 2006b Foster, 2007; Hill, Wial and Wolman, 2008, Pendall, Foster and Cowell, 2010; Pike, Dawley and Tomaney, 2010 Simmie and Martin, 2010).[1]   This growth of interest has been stimulated by several factors and developments. Without question, a major influence has been the succession of major environmental disasters that have afflicted local communities in different parts of the world; these have rightly concentrated attention on how quickly local and regional populations recover from such 'shocks' and emergencies.[2] Secondly, in thinking about such issues, regional and urban analysts have been influenced by the development of 'resilience' notions and models in other disciplines, and especially ecology and panarchy, in both of which a core interest is in how ecosystems and socio-ecological systems respond to major disturbances and disruptions. At the same time, the idea of resilience resonates with the growing importance of an evolutionary perspective within economic geography (see for example, Boschma and Martin, 2007, 2010a; Simmie and Martin, 2010), and the recognition that major shocks may exert a formative influence over how the economic landscape changes over time. And fourthly, in this context, the deep

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[1] See also the other contributions to the Special Issue of the *Cambridge Journal of Regions, Economy and Society* (2010) on 'The Resilience Region'. There have also been special economic geography sessions on 'resilience' at the 2010 annual conferences of both the Association of American Geographers and the Royal Geographical Society-Institute of British Geographers.

[2] Examples would include the catastrophic impact of the 2004 Indian Ocean Tsunami on the Ache territory in Indonesia, of Hurricane Katrina on New Orleans in 2005, of the 2010 earthquake in Haiti, of pollution from the 2010 BP Deepwater Horizon offshore oilrig explosion on US Gulf state coastal communities, and of the unprecedented scale of the floods in Pakistan following the exceptionally severe Monsoon rains in 2010. In addition, the prospect of growing pressures, stresses and instabilities caused by global climate change has brought the issue of 'resilience' to the fore.

financial and economic crisis that swept across much of the globe over 2008-2010, and the consequential austerity policies that many states have put in place to restore public finances in the wake of that crisis, have directed attention to the resilience of local and regional economies to these events.

However, although still gathering momentum, the exploration of the notion of resilience in economic geography has already proved somewhat contentious. For one thing, there is much ambiguity and difference of view as to the precise meaning of the notion of regional or local economic resilience, how it should be measured, whether resilience is a positive or negative attribute, and what it implies for policy intervention (see Christopherson, Michie and Tyler, 2010; Hudson, 2010; Pendall, Foster and Cowell, 2010). To a large degree this lack of consensus reflects the different uses and interpretations of the notion of resilience found across the social sciences, and indeed across the natural, physical and biological sciences: resilience is not a unitary concept with a precise and universally agreed definition. According to Pendall et al (op cit), the idea of resilience would seem to be an example of the 'fuzzy concepts' that Markusen (1999) complained of as being all too common in regional studies. For another thing, transferring a concept developed to analyse the dynamics of one type of system, especially ecosystems, to the analysis of another, quite different type of system, a regional or local economy, is itself problematic. An ecosystem is quite different from a regional economy, and while metaphors and analogies based on the former can certainly be highly illuminating in thinking about the latter, such abduction raises all sorts of ontological issues, not least about the 'resilience of what, to what' (Walker, 2002). And for yet another, to some writers, 'resilience talk' conjures up worries that the notion can all too easily be captured by neo-liberal apologists, to bolster arguments in favour of the need for 'flexibility', 'self-help' and 'competitive fitness'. For these and other reasons, some economic geographers remain hesitant about the notion of regional resilience (for example, Hassink, 2010; Hudson, 2010; Pike, Dawley and Tomaney, 2010).

The response to this hesitancy should not be to rush to dismiss the concept, however, but to devote some effort to try to give it more precision and clarity, and to see how far and in what sense it might help inform our understanding of regional economic development and change. This is the motivation behind this

paper. More specifically, my aim is to explore how the notion of 'resilience', for example as used in ecological work, can be combined with that of 'hysteresis', as used in economics, to examine how regional economies react to recessionary shocks. Major recessions can be viewed as 'system-wide' shocks that periodically interrupt and disrupt the process of economic growth and development. During the 1960s, 1970s and into the early-1980s, a significant literature developed around the study of regional business cycle dynamics – how regions react to recessions, and why different regions react differently. Research into such issues typically drew on Keynesian business cycle theory. Over the past twenty five years this type of work has been all but eclipsed by research on regional convergence and divergence, spatial economic agglomeration, clusters, regional innovation systems, global supply networks, and the like. Yet the past three decades have hardly been recession free. Three major recessionary shocks have occurred across most of the advanced economies during the past thirty years: in the early-1980s, the early-1990s, and, of course, most recently between 2008-2010.[3] Further, the evidence suggests that within countries like the US, the UK, and other European economies, these three major recessionary shocks have been far from geographically even in their incidence (see Martin, 1997; Baddeley, Martin and Tyler, 1998; Florida, 2009; Wilkerson, 2009; Martin, 2010b). Arguably, therefore, the issue of 'regional cyclical sensitivity' has never been more relevant: the 'geography of recession' is itself of critical importance. But further, how regions respond to major recessionary shocks may also be highly pertinent to the question of long-run regional growth patterns, and hence to the existence, persistence and evolution of long-run regional disparities in economic prosperity.   In this regard, some recent work on the impact of shocks on national growth paths suggests that countries that experience severe and/or frequent economic disruptions (recessions, financial crises, and political upheavals) tend to have lower growth rates over the long run (Cerra and Saxena, 2008; Cerra, Panizza, and Saxena, 2009). There is evidence that severe recessionary shocks tend to depress a country's long-run growth rate. Patterns of long-run national income convergence and divergence may thus be linked to how different countries have reacted to recessionary and other shocks. This raises the intriguing question of how recessions affect regional growth paths.

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[3] The collapse of the so-called 'dotcom' bubble in 2000-2001 is sometimes also identified as a recession (especially in the USA), but it was neither as pronounced nor as widespread as the three main recessions referred to here.

Do regions differ in the extent to which their economies recover and rebound from severe recessionary shocks? Do regions that are more severely affected by such shocks grow more slowly than other regions as a result? These are questions that seem to lend themselves to exploration using the notion of resilience, and this is the aim of this paper. But in so doing, I also argue that the notion of resilience might usefully be combined with that of hysteresis, as used in economics, in order to more fully capture the possible reactions of regional economies to major recessionary shocks. The paper is essentially in two main parts: the first sets out some of the components of a possible conceptual framework for thinking about regional economic resilience to recessions, while the second uses this framework as a basis for some preliminary empirics on the UK regions.

Thinking About Regional Economic Resilience to Recessions: Towards a Conceptual Framework

According to its strict Latin root, *resilire*, to leap back or to rebound, the idea of 'resilience' refers to the ability of an entity or system to 'recover form and position elastically' following a disturbance or disruption of some kind.**4** Most of the recent uses of the term in regional or urban applications refer to this idea of the ability of a local socio-economic system to recover from a shock or disruption. Thus Foster (2007, p.14) defines "regional resilience as the ability of a region to anticipate, prepare for, respond to, and recover from a disturbance". Or again, Hill et al (2008, p.4) see resilience as "the ability of a region … to recover successfully from shocks to its economy that either throw it off its growth path or have the potential to throw it off its growth path".

But to be analytically useful, a more detailed exposition is needed. In fact a perusal of the various literatures that refer to resilience ideas suggests at least three different (but not unrelated) interpretations or uses of the term (see Table 1). Probably the most frequently invoked meaning or definition of the notion is that of so-called 'engineering resilience'. This focuses on the *resistance* of a system to

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4 Chambers Dictionary definition.

disturbances (shocks) and the speed of return to its pre-shock state.**5**   In many discussions, the system is assumed to be in 'equilibrium' before the shock, so that resilience is defined in terms of the stability of a system near its 'equilibrium' (or 'steady') state (e.g. Holling, 1973; Pimm, 1984; Walker et al, 2006). A system that is more resistant (less vulnerable) to shocks and/or which returns quickly to its pre-shock 'equilibrium' state or configuration is deemed to be more 'resilient' than a system which, when subjected to the same shock, not only has a much more pronounced reaction to it, but also takes longer to move back to its 'equilibrium' or steady state.

Table 1: Different Interpretations of Resilience

Interpretation/Type of Resilience	Main Focus of Interest
'Engineering' Resilience (found in physical sciences)	Ability of a system to return to, or resume, its assumed stable equilibrium state or configuration following a shock or disturbance. Focus is on resistance to shocks and stability near equilibrium
'Ecological' Resilience (found in ecological sciences)	The scale of shock or disturbance a system can absorb before it is destabilised and moved to another stable state or configuration. Focus is on 'far from equilibrium' behaviour of system
'Adaptive' Resilience (found in complex adaptive systems theory)	The ability of a system to undergo anticipatory or reactionary reorganisation of form and/or function so as to minimise impact of a destabilising shock. Focus is on adaptive capability of system

Economists have not tended to use the notion of resilience, but this definition, with its focus on stability of a system near its equilibrium, clearly resonates with the idea (assumption) of self-correcting forces in mainstream economics. Under this perspective, the economy is assumed to be self-equilibrating: any shock that moves the economy from its equilibrium state automatically activates compensating adjustments that bring it back to that equilibrium. It may be that those

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5 This is close to the definition found in physics, where resilience is the property of a material to absorb energy when it is deformed elastically and then upon removal of the deforming force to resume its initial form.

compensating, self-correcting adjustments take a while to have effect, but the assumption nevertheless is that the economy will sooner or later return to its pre-shock equilibrium state.

A key issue arising from this view of resilience thus has to do with whether we believe the assumption of equilibrium is relevant to regional or local economies. Some writers seem prepared to make that assumption. Thus according to Pendall, Foster and Cowell (2010)

> Regional growth in output and population or rates of unemployment, poverty or labour force participation can be considered at least partly equilibrium phenomena. Since all these subjects offer significant interest for researchers and policy-makers alike, the single equilibrium version of resilience offers one important and legitimate metaphor for understanding regions (p. 73).

But unlike (some) physical or ecological systems, a regional economy need never be in equilibrium, yet can be characterised by an identifiable, and relatively stable, growth trend or path (Martin, 2010a).[6] In such circumstances, it seems that all that is required for this basic view of resilience as 'bounce back' to hold is simply that the regional economy returns to its pre-existing position or path, following a shock, or to where it would have been in the absence of that shock, regardless of whether or not that position or path is an 'equilibrium' state of affairs.

In fact, this interpretation of engineering resilience as 'bounce back' to an underlying growth path bears a close affinity to the so-called 'plucking model' of economic fluctuations (Friedman, 1993; Kim and Nelson, 1998). According to the 'plucking model', the path of an economy's output (or employment) can be likened to a string attached to the underside of an upward-sloping board which is 'plucked' downward at irregular intervals by recessionary (or other) shocks. The board represents a slowly-rising upper limit or ceiling on output set by an economy's resources, the way they are organised, and their productivity. Though the extent of decline caused by a recessionary shock will vary from downturn to downturn, output is assumed to rebound in each case to the (upward-sloping) ceiling level. In other words, the plucking model predicts that recessionary shocks should be

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[6] The relevance of the notion of equilibrium is in any case a much debated issue in economics itself (see for example Setterfield, 1997, 1998; Harris, 2005; Lawson, 2005; Lang and Setterfield, 2006).

transitory, and should have no permanent effect on the economy's long-run growth ceiling or growth trend. It is further argued that there is likely to be an asymmetry in this reaction, in that the size of the downturn due to the recessionary shock is predictive of the size of the recovery or boom that follows, but the scale of the latter does not predict the size of the next contraction.[7]

This scenario is illustrated in highly stylised fashion in Figure 1. Regional output, or employment, is shown on the vertical axis and time on the horizontal. The slope of the time path of output (or employment) reflects a steady rate of growth that, following the 'plucking model idea', will depend, among other things, on the region's human, capital and environmental resources, and how they are utilised. A region's growth trend, more than that for a national economy, is likely to be strongly influenced by its attractiveness, compared to other regions, to inflows of capital, labour and technology. Now assume a recessionary shock affects the region. Output and employment fall. With recovery, regional output and employment grow back to where they would have been in the absence of the shock, and thereafter the pre-shock growth rate is resumed. Of course, the precise pattern of decline and recovery may not be the same for output and employment, but for

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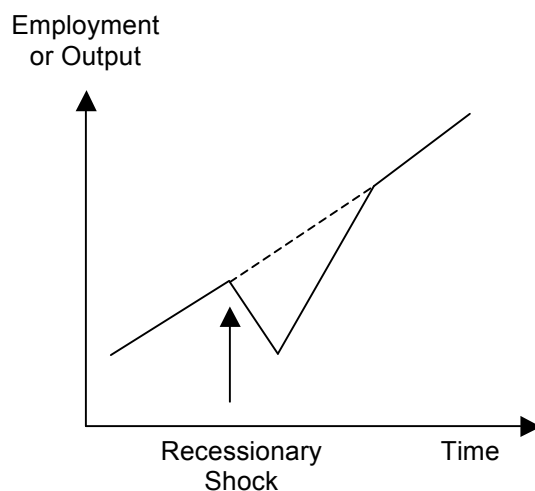
[7] Much of the recent economics research into the 'plucking model' has been concerned with devising econometric methods to identify the existence and extent of this asymmetry (see for example, Kim and Nelson, 1999; Kim and Piger, 2002; Sinclair, 2010).

**Figure 1: Impact of a Recessionary Shock on a Region's Growth Path:
Region Returns to Pre-Shock Growth Trend**

the notion of 'engineering' resilience, or its economic equivalent, the 'plucking model', to hold with respect to either regional output or employment, both would return to their pre-recession growth paths.

Note, however, that this 'plucking' model version of regional economic resilience to recessionary shocks makes no assumptions or statements about the impact of such a shock on the region's economic structure. In reality, of course, some changes in regional economic structure are almost certain to occur, as they do more or less continuously in the absence of shocks. And such structural change may feed back to influence a region's resilience to future recessions: a region's resilience, in other words, may itself evolve over time (see Simmie and Martin, 2010, for a discussion of this process). So a question arises as to whether the concept of regional economic resilience as defined by the 'plucking model' should also consider the extent to which a regional economy also retains its form (structure) following a recessionary disturbance. A regional economy could resume its pre-shock growth path even though it experienced some structural and institutional change as a result of the shock. Thus even in the 'engineering' or 'plucking model' case, how we define regional resilience would depend on what aspect of regional economic performance and stability we are focussing on: growth rate, economic structure, institutional arrangements, etc.

The second definition of resilience found in the literature is that of so-called 'ecological resilience'. This conception focuses on the role of shocks or disturbances in pushing a system beyond its 'elasticity threshold' to a new domain. In this case, resilience is measured by the magnitude of disturbance or shock that can be absorbed before the system changes form, function or position (Holling, 1973, 1996, 2001; McGlade, 2006; McGlade et al, 2006; Walker, et al, 2006). According to this definition, then, resilience is the capacity of a system that is maintained by one set of mutually reinforcing processes and structures to tolerate disturbance without reorganising (or collapsing) into a system maintained by a different set of processes and structures. It assumes that systems are characterised by *multiple* stability domains, and that if a shock pushes a system beyond its 'elasticity threshold', the system may move to a different domain or state. It is not absolutely

clear from this definition, however, as to what precisely constitutes resilience. In some uses of the notion, resilience is measured by the size of shock a system will tolerate (absorb) before it becomes unable to return to its former stability domain or path. The larger the shock that can be so absorbed, the more resilient is the system in question. In other accounts, the notion refers to the ability of the system, when pushed beyond its 'elasticity threshold', to move quickly to a new stable configuration or path. In this instance, much would surely depend on the nature of the new (stable) state or configuration the system moves to. If the new post-shock configuration or state is 'inferior' to its pre-shock predecessor in some way, then such a system would presumably be regarded as having low resilience as compared to a system which was able to move to a new, post-shock configuration or path that is in some sense or other 'superior' to that which obtained prior to the shock or disturbance. This issue assumes particular relevance in relation to idea of regional economic 'hysteresis'.

From its origin in the natural sciences, in studies of the magnetic and elastic properties of metals and materials, the concept of hysteresis has subsequently found its way into economics (Georgescu-Rogen, 1967; Elster, 1976; Cross and Allen, 1988; Cross, 1993; Göcke, 2002; Setterfield, 2010).[8] Even mainstream economics now admits of the possibility of multiple equilibria, or stability domains, and that an economy can be moved from one such equilibrium or domain to another as a result of a shock or disturbance. Economists often use the concept of 'hysteresis' to describe this phenomenon.[9] But again, the assumption of equilibrium is not essential to the notion. Romer (2001) for example, defines

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[8] The following analogy may help to illustrate the idea of hysteresis. Assume a spring is suspended vertically, and that initially a small weight is then attached. The spring will stretch. The weight is then removed, and the spring returns to its original shape and state. Then the spring is subjected to the same treatment using successfully heavier weights. At some point, the weight applied to the spring will be such that when it is removed, the spring will not return to its original shape and state, but will be left permanently stretched. The downward pressure on the spring will have exceeded the spring's 'elasticity threshold': hysteresis can be said to have occurred.

[9] Much of the discussion of hysteresis in economics has been associated with the impact of recessionary shocks on the (national) labour market, and especially how major recessions can lead to a permanent upward shift in an economy's so-called 'natural (or non-accelerating inflation) rate of unemployment (see Cross and Allan, 1988; Franz, 1990; Cross, 1993). A deep or prolonged downturn, so the argument runs, increases the likelihood of long term unemployment, which in turn erodes a worker's skills, dents his or her employability, and increases their dependency on welfare benefits, all thereby reducing an unemployed person's prospects of being re-employed even when the economy recovers. As a result an economy's unemployment rate may not return to its pre-recession rate, but become stabilised around a new, higher 'natural' (equilibrium) rate.

hysteresis as a situation "where one-time disturbances permanently affect the path of the economy" (p. 471), that is where the effect or 'memory' of the disturbance is left behind in the economy even after the disturbance or shock has passed, a process also known as 'remanence' (Cross, Grinfeld and Lamba, 2009; Cross, Mcnamara and Pokrovskii, 2010). Further, according to Setterfield (2010) hysteresis involves structural change in the economy. If the shock is severe enough, it may alter the behaviour of economic agents, change the composition of the economy, and set the economy on a new trajectory of path dependent development. He goes on to argue that this conceptualisation of hysteresis is a form of path dependence because it implies that even a 'temporary' event– here a recessionary shock – can have permanent effects. But rather than all of the past influencing the future, as in 'complete memory' path dependence, hysteresis or remanence is a process of 'selective memory' (recent 'extreme' event) path dependence. He also acknowledges that there is no need to invoke multiple equilibria in this interpretation of hysteretic path dependence (see also Martin, 2010). There is, then, a close relationship between the idea of 'ecological' resilience – specifically in the case where a shock is such that it displaces a system beyond its 'elasticity threshold' – and the notions of hysteresis and remanence.

Several different possible 'hysteretic' outcomes of a recessionary shock can be identified, and these could well differ as between employment and output responses. Figure 2 gives two cases, again depicted in stylised form, where a recession causes a hysteretic downward shift in a regional economy's growth path. In the first case (Figure 2 (a)), the recession permanently lowers the level of output or employment, but the region's growth rate recovers to its pre-shock rate. This could arise, for example, where the recession destroys a significant proportion of a region's productive capacity and jobs. Whether the region's unemployment rate is permanently raised as a result would depend on the extent to which those workers made redundant migrated out of the region or withdrew from the local labour force. Assuming that the closure of firms and shake-out of labour were not selective as between more and less productive sectors, firms and workers, then the region's economy may be able to resume it pre-recession growth rate, but on a permanently lowered trend path of output (and/or employment). Endogenous growth theory would also support a downward hysteretic effect of a deep recession.

If future benefits of learning by doing are not fully internalised by workers, then recessions are periods in which opportunities for acquiring experience are foregone. Even if output growth resumes after the recession, there would be a permanent loss in productivity compared to the pre-recession position.
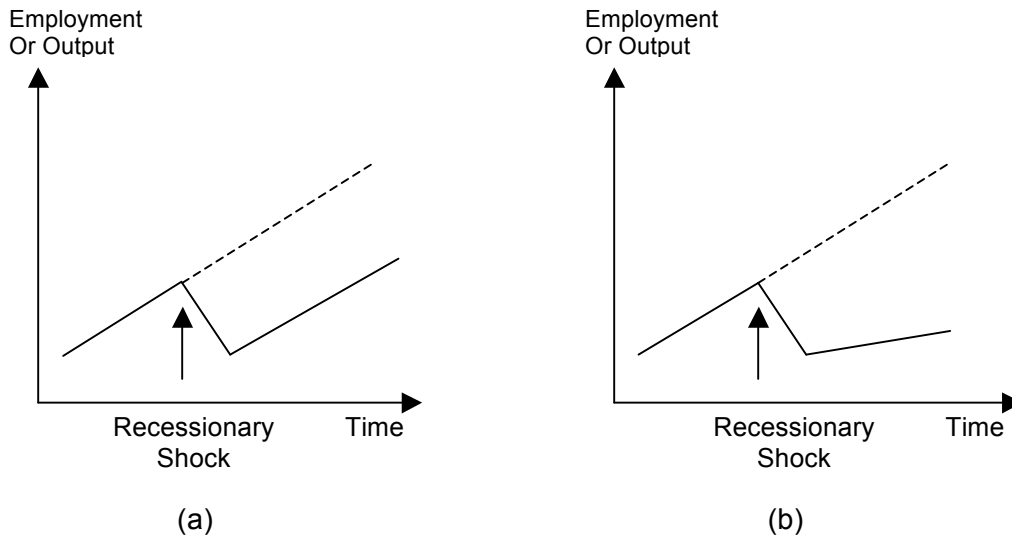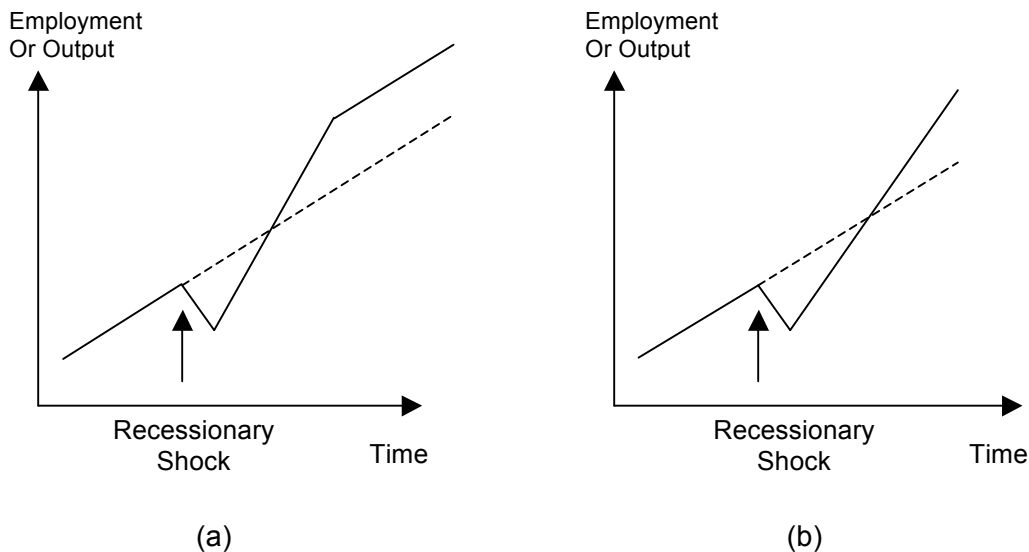

Figure 2: Negative Hysteretic Impacts of a Recessionary Shock on a Region's Growth Path:
(a) Permanent Decline in Level, Resumption of Pre-Recession Growth Rate
(b) Permanent Decline in Level, and Lowered Growth Rate

Figure 2 (b) shows the more pathological case where the impact of the recessionary shock is such that the destructive aspects of economic downturn more than outweigh, and may actively militate against, any compensating 'creative' growth of new firms and jobs in other sectors. The heavy deindustrialisation of a region by a deep recession may typify this pattern. In such a case, the destruction of large sections of the region's industrial base may have negative multiplier effects on other local sectors of activity, such as supporting suppliers and business services. It may so reduce the region's employment and associated incomes that local purchasing power is seriously reduced with additional knock-on effects on a whole range of consumer services. There may also be recession-induced effects on labour

supply (increased outmigration and lower participation), on capital flows (a fall or even reversal of inward investment), and a decline in local entrepreneurialism (because of a more risky local business climate). A depressed economy is unlikely to provide a conducive environment for the creation of new firms and jobs, or for productivity enhancing investments. As a result of these and other related effects, a permanent contraction of the region's whole economy may occur, and not just of its least efficient firms and workers. Thus both the region's level of output and employment, and its post-shock growth rate are lowered. In each of these two cases, the regional economy in question could be said to have a low resilience to shocks.

Most discussions of hysteresis in economics refer to the negative effects of shocks. But it is possible for positive effects to occur. Two such 'positive' hysteretic reactions in relation to the impact of a recessionary shock on a regional economy are shown in Figure 3. In both examples the regional economy more than 'rebounds' from the recessionary downturn, and initially experiences rapid growth out of the recession, at a rate above the pre-shock growth trend. This might be due to highly optimistic

Figure 3: Positive Hysteretic Impacts of a Recessionary Shock on a Region's Growth Path:
(a) Recovery to Higher Level, Resumption of Pre-Recession Growth Rate
**(b) Recovery to a Sustained Higher Growth Rate**

business expectations, the availability of spare capacity to expand output and jobs, perhaps some initial opportunities to increase productivity, an initial wave of new firm formation, and similar factors. The issue is whether this post-shock recovery rate of growth can be sustained. If the scope for continued rapid growth becomes exhausted, or if the regional economy approaches its 'growth ceiling', for example because it is unable to attract the additional resources (capital and labour) required, or the potential for continued productivity improvements declines, then the economy may then return to its pre-shock growth path, though at a permanently higher level of output (or employment) (Figure 3(a)). If, on the other hand, the region is able to attract in labour and capital from elsewhere, or witnesses the emergence of new sectors of activity, and/or a new wave of productivity- and growth-promoting innovation, then the rapid growth out of recovery may well be sustained (Figure 3(b)). Further, a deep economic crisis may facilitate beneficial economic and political reforms that lead to a permanent increase in regional output and output growth (Caballero, 1994; Gali and Hammour, 1993), and possibly also employment, though that will depend on the nature and sources of the growth in output. Regional economies that exhibit positive hysteretic effects of either type would presumably be regarded as highly resilient.

The possibility of positive hysteretic outcomes provides a link to a third use or interpretation of the notion of resilience, that of 'adaptive' resilience. This interpretation is one that derives from the theory of complex adaptive systems. Supposedly, what distinguishes complex adaptive systems is the way they exhibit self-organising behaviour, driven by co-evolutionary interactions among their constituent components and elements, and an adaptive capacity that enables them to rearrange their internal structure spontaneously, whether in response to some external shock, or in reaction to some from internal emergent mechanisms or 'self-organised criticality' (Martin and Sunley, 2007). Regional economic resilience in this framework could be viewed as having to do with the capacity of a regional economy to reconfigure, that is adapt, its structure (firms, industries, technologies and institutions) so as to maintain an acceptable growth path in output, employment and wealth over time. This view of resilience is then quintessentially an evolutionary one: resilience is a dynamic *process*, not just a characteristic or property, and it resonates closely with the Schumpeterian notion of 'gales of creative destruction'. A deep recession may sweep away outmoded and

unproductive activities, the removal of which opens up opportunities for the development of new sectors and a new phase of growth. Whether the creative aspects of this process outweigh the destructive is, of course, a vital issue. The adaptive capabilities of a region's economy may well depend on the nature of the region's pre-existing economy; that is, adaptation is likely to be a path dependent process (see Martin, 2010), shaped by the region's industrial legacy and the scope for re-orientating skills, resources and technologies inherited from that legacy. How regional economies adapt over time, and why some regions appear more successful in this respect than others, are largely un-researched issues. But such adaptation is arguably a key source of economic resilience.

These different interpretations of resilience suggest that at least four interrelated dimensions are needed to give full meaning to the notion as a description of how regional economies respond to recessionary or other such shocks (Figure 4). The first is that of *resistance*, that is the vulnerability or sensitivity of a regional economy to disturbances and disruptions, such as recessions. The second is that of the speed and extent of *recovery* from such a disruption. Of interest here is whether the speed and extent of recovery are determined by the degree of resistance to the shock in the first place. The third aspect concerns the extent to which the regional economy undergoes structural *re-orientation* and what implications such re-orientation has for the region's output, jobs and incomes. The fourth dimension concerns the degree of *renewal* or resumption of the growth path that characterised the regional economy prior to the shock. In addition, these different aspects or dimensions of regional economic resilience may interact in different ways, to produce different outcomes of the sort illustrated stylistically in Figures 1-3 above. They are moreover linked by virtue of the various factors and characteristics that shape a region's reaction to a major recessionary shock. Such factors will include the regional economy's prior growth performance. A regional economy that has a strong underlying growth dynamic is likely to be more resistant to a recessionary downturn, or if it is severely impacted, more likely to recover quickly and resume that dynamic. It might be expected, therefore to suffer less structural disruption, or alternatively be able to adapt successively into new growth sectors. The converse set of reactions might be hypothesised for a region that has a weak underlying growth dynamic.
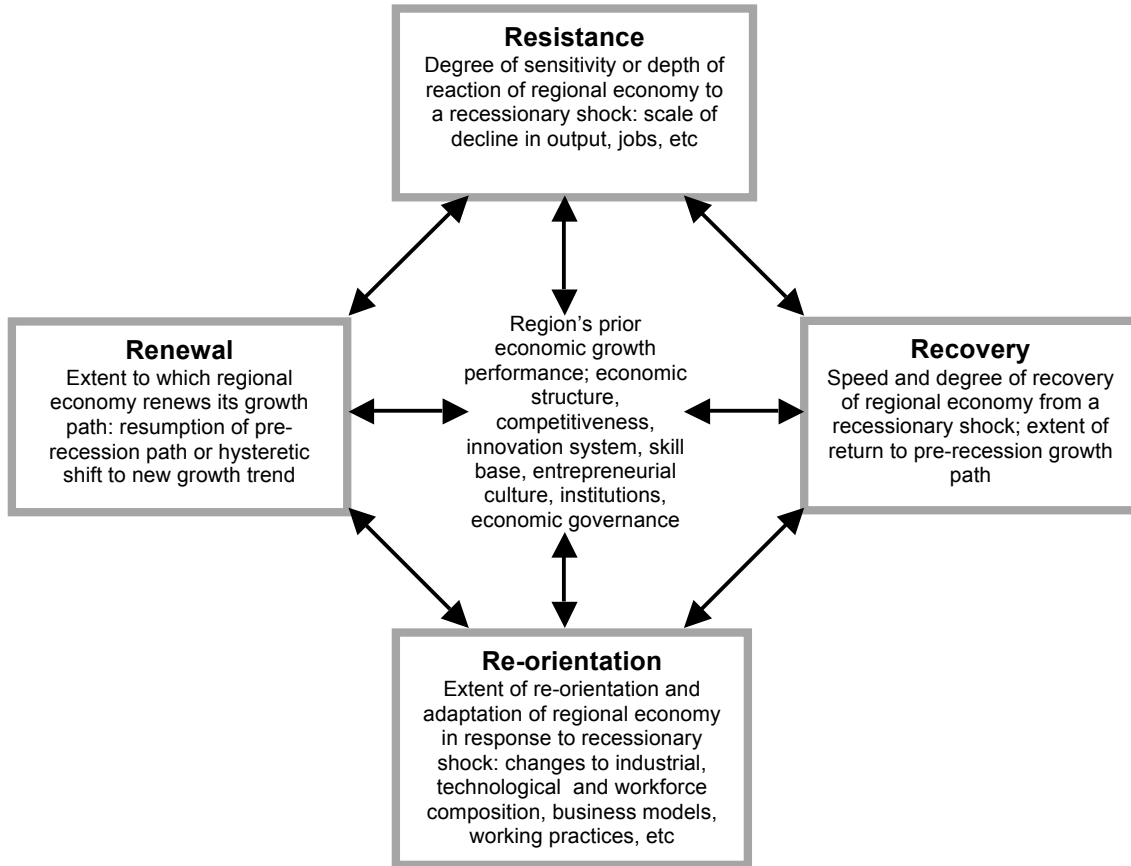
Figure 4: Four Dimensions of Regional Economic Resilience to Recessionary Shock

A region's economic structure, the competitiveness and innovative propensity of its firms, the skills of its workforce, its entrepreneurial culture, its institutional forms and its economic governance arrangements, will all shape the resistance and response of its economy to, and its recovery from, a shock. Economic structure is often thought to play a particularly key role in shaping a region's sensitivity or resistance to shocks. In an insightful, though curiously neglected, study, Conroy (1975) demonstrated in some detail how a region's industrial 'portfolio' - its particular mix of economic activities and the relationships and interdependencies between them - can influence the reaction of a region's economy to recessionary disturbances and fluctuations (see also Dissart, 2003). Other things being equal, a

diverse or varied economic structure ('portfolio') is often assumed to provide greater regional resistance to shocks, than does a more specialised structure, since different industries themselves have different sensitivities to business fluctuations, changes in export markets, major shifts in monetary conditions (exchange rates and interest rates), and so on (in effect a 'spreading of risk', to continue the investment portfolio analogy). However, precisely how a diversified regional economy reacts to recession will also depend on the degree of sectoral inter-relatedness (whether direct or indirect) that can exist even in a diversified structure, so that the latter does not necessarily guarantee a high resistance. As Conroy showed, where such interdependencies are significant – or, as he puts it, where there is a significant degree of co-variance between sectors - a downward shock to one or just some of a region's industries may well ripple through and have consequential depressive effects on much of the region's economy as a whole. And conversely, whether a highly specialised regional economy is more sensitive to cyclical downturns than a diversified regional economy will depend on the nature of that specialisation. Conventionally, however, manufacturing and construction industries have been viewed as being more cyclically sensitive than private service industries, and the latter more sensitive than public sector services. The spatial distribution of these activities across localities and regions might then be expected to be relevant in explaining geographical differences in resistance to recessionary shocks. But at the same time, much will depend on the precise nature (causes) of the recessionary downturn. Thus the resistance and recovery of individual local and regional economies to recession is a complex outcome of not only their economic structures, but also the specifics of a given downturn in the economy.

Some Exploratory Empirics: The Resilience of the British Regions to Major Recessions

To explore whether these notions on resilience and hysteresis might be of value in analysing regional growth paths in the presence of periodic recessionary shocks, this section presents some preliminary empirics for the major British regions. In terms of the different dimensions of resilience summarised in Figure 4, the main aim is to identify regional differences in reaction, recovery and renewal. The fourth dimension, of structural re-orientation and adaptation, is touched on only briefly

and in broad terms, since a detailed analysis of this complex aspect of resilience is a major task in its own right, and is not possible here.

As mentioned above, three major recessions have affected the UK economy over the past 40 years: 1979-82 1990-92 and 2008-2010 (see Table 1). The recession of 1979-1982 was the first deep economic downturn of the post-war years, and followed a decade of slow, almost stagnant growth, rising inflation and industrial disputes, so the national economy was already in a weak state before the contraction began. In addition, it is widely agreed that the severity of the recession was made worse by the refusal of the Thatcher government to attempt to attenuate its scale by means of counter-cyclical fiscal and monetary measures; rather the pursuit of strict monetary policies contributed to the depth of the downturn (see Martin, 1992). The major impact was on the UK's industrial base (Table 1). Deindustrialisation had been underway since the late-1960s (Martin and Rowthorn, 1986; Rowthorn, 2010), but it accelerated dramatically in the recession: employment in production fell by 18.2 percent, and output by 14.6 percent. At the time, the early-1980s recession was regarded as the worst of the post-war period.

The second recession, of 1990-1992, was also pronounced, but came after several years of strong growth and recovery following the previous recession. Unlike that earlier downturn, the impact of the early-1990s contraction fell much more on employment than on output: employment in production fell by 14.1 percent and output by 6.7 percent, with respective falls of 2.7 percent and 1.1 percent in services. The recession was followed, from early-1993 onwards, by what was one of the longest periods of sustained economic expansion on record, fuelled overwhelmingly by the growth of banking and finance, and related business services. That so-called 'long boom' was brought to an abrupt halt by the onset of recession in mid-2008, and from which, which at the time of writing, recovery remains fragile. Contrary to what was widely and loudly predicted, the brunt of economic contraction caused by the 'credit crunch' has not been borne by financial and related services: between 2008(2) and 2010(2) the contraction in financial employment (7.1 percent), although higher than in services as a whole, was actually less than that in production (9.8 percent). Somewhat differently from the previous two downturns, the impact of the latest recession was greater on output than on employment. But with the massive reductions in public spending planned for the

next four years or so, it has been predicted as many as 500,000 public sector jobs will be axed. And the cuts to public spending will inevitably in their turn impact on manufacturing, and reduce employment further there (some estimate the loss could amount to a further 500,000 or more jobs). So the eventual reduction in employment could well end up exceeding that in output.

Table 1: A Tale of Three Recessionary Shocks: Output and Employment Contractions in the UK Economy

|	1979-83 Recession		1990-93 Recession		2008-2010 Recession	
	Output	Employment	Output	Employment	Output	Employment
Production	-14.6	-18.2	-6.7	-14.1	-14.7	-9.8
Services	-2.4	-1.9	-1.1	-2.7	-4.6	-1.4
Total	-6.6	-7.3	-2.4	-6.9	-5.7	-2.8

Notes: (a) Contractions are measured in percentage terms from peak to trough in output and employment respectively (the length of the downturn is typically longer in employment than it is in output); (b) Output is GVA in 2006 prices; (c) quarterly data in each case. The troughs in output typically occur sooner than those in employment, and the latter also takes longer to recover.
(c) Production industries include: manufacturing, mining, energy, water and construction
Source of Data: Calculated from data available at http://www.statistics.gov.uk/statbase/

In what follows analysis is confined to the movements in employment since this tends to take longer than output to recover from recession, and in many ways is the more critical variable, given its consequences for unemployment and labour market adjustment.[10] The impact of these three recessionary shocks on the growth path of national employment is shown in Figure 5. The national experience seems to bear some resemblance to the idealised 'plucking model' pattern depicted in Figure 1, with each of the three recessions pushing total employment down from an upward sloping 'ceiling' linking the successive peaks in the long-run time path of employment (shown as the pecked line). The severity of the shocks of the early-1980s and early-1900s compared to the most recent downturn, as shown in Table 1, is again immediately evident.

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[10] This was the rationale behind Blanchard and Katz's (1992) focus on employment in their classic study of the long run evolution of US regional economies.
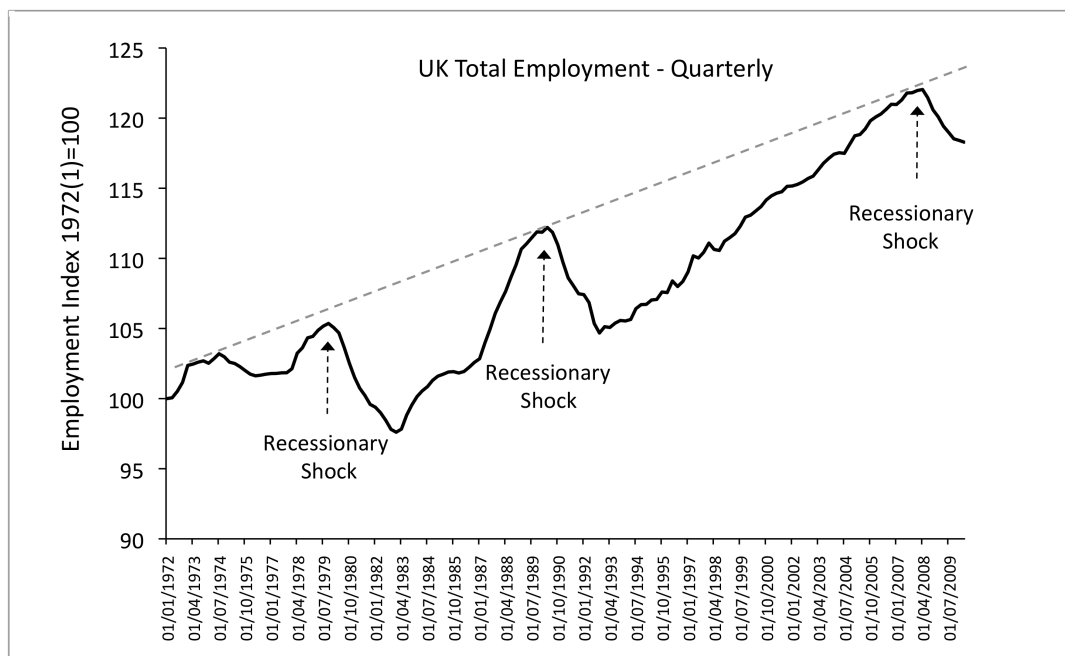
**Figure 5: Growth and Recessionary Shocks in UK
Employment, Quarterly, 1972(1)-2010(2)**
Notes: Employment is Total Employment; Output is Gross Value Added at 2005 prices
Source of Data: Calculated from data available at http://www.statistics.gov.uk/statbase/

However, as Figure 6 reveals, this national picture obscures quite disparate employment growth patterns among the major regions of the country. These different trends are no doubt the product of a host of different underlying forces and processes, the complexity of which is not the focus here. But what is also evident is that the different regions have reacted very differently to the main recessions over this period. One simple way of measuring the resistance aspect of resilience of the regions to recession is the ratio of decline in employment or output in a region to the respective decline in the country as a whole: that is, the reaction of the national economy is used as a benchmark against which to measure the relative resistance or resilience of regions. If the ratio for a given region is greater than unity, we may say that the region in question has a low (relative) resilience (high sensitivity) to a recessionary shock. And conversely, if a region has a ratio of less than unity it has a high (relative) resilience (low sensitivity).
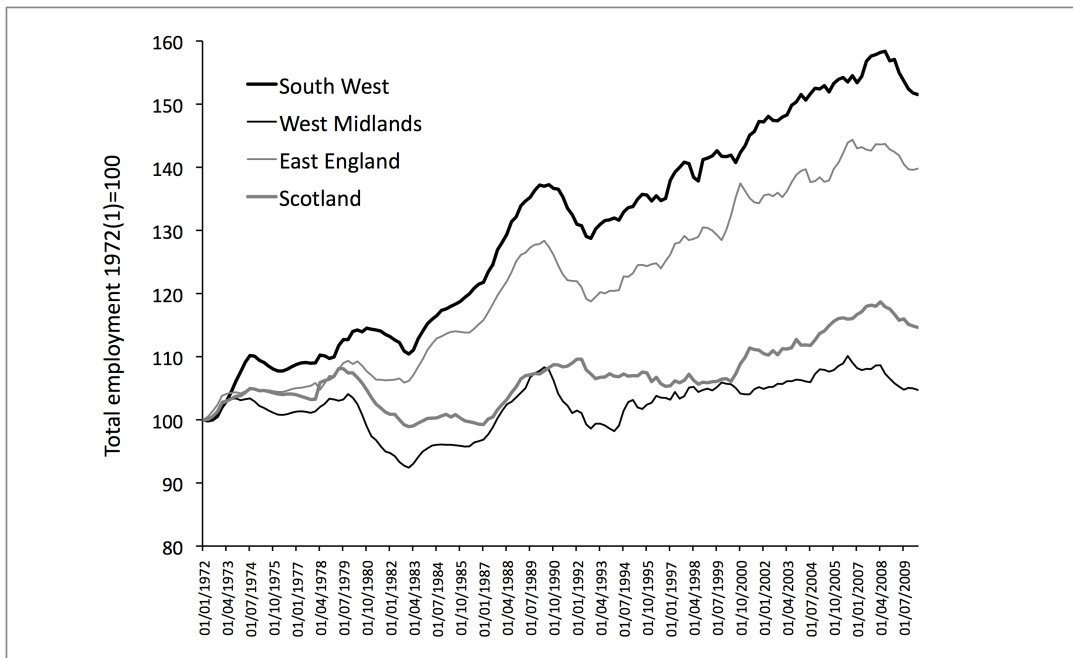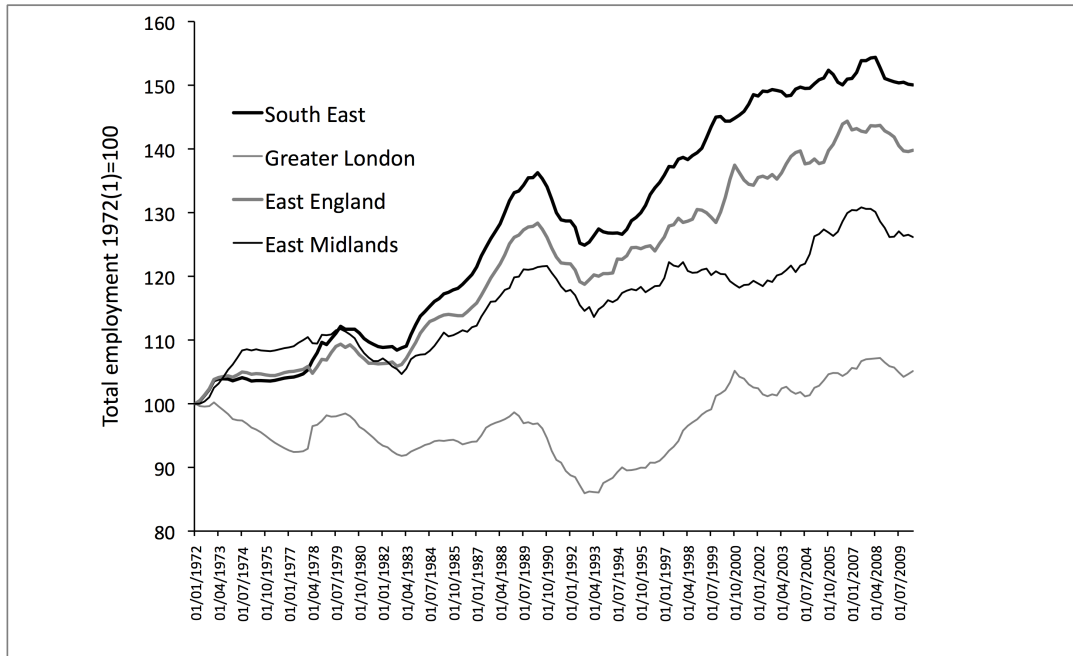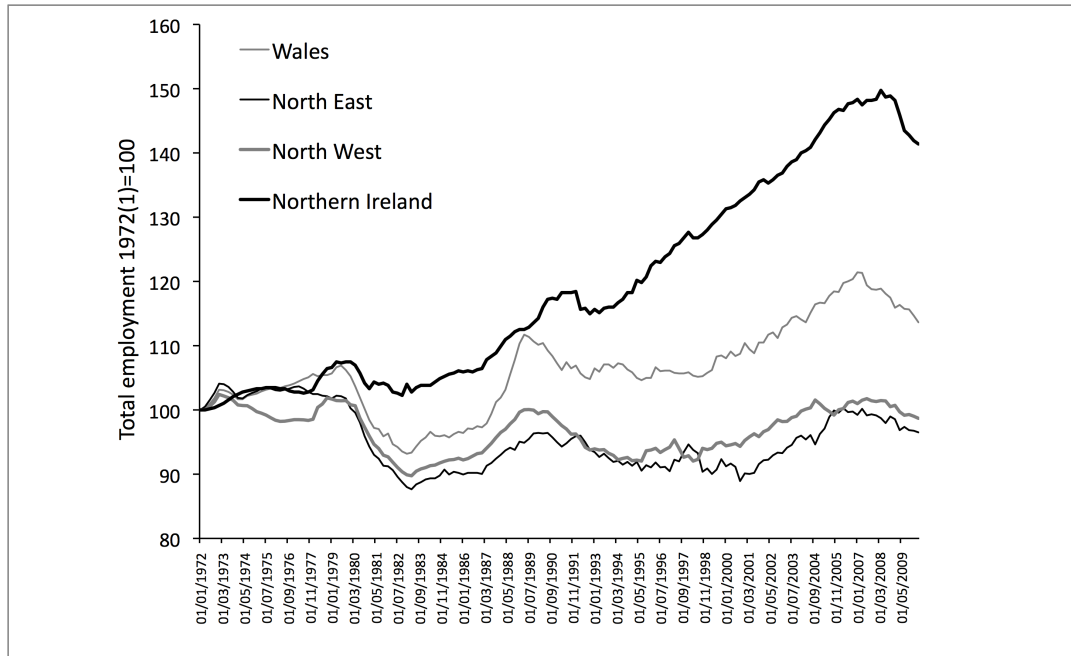
Figure 6: Employment Growth Paths in the UK Regions, Quarterly, 1972(1)-2010(2), Indexed to 1972(1)=100
Source of data: Calculated from data supplied by Experian, London.

These simple indexes are revealing. First, there is considerable variation in resistance (or sensitivity) to recession across the regions, especially in the downturns of the early-1980s and early-1990s. For example, all of the old industrial regions of peripheral and northern UK (North East, North West, Wales and Scotland) and the West Midlands reacted much more severely to the early-1980s recession than the regions of the south and east, apart from Greater London. Second, what also emerges is that the pattern of resilience (resistance) has varied between recessionary shocks. The geographical incidence of the recession of the early-1990s was markedly different from that of the early-1980s. Compared to the recession of the early-1980s, the impact of that of the early-990s downturn was far greater in Greater London, the South East, Eastern England, and the two Midlands regions than in the industrial north and periphery, almost the reverse in fact of the regional incidence of the previous downturn. With respect to the most recent recession, the pattern of regional sensitivity thus far has differed yet again from the earlier downturns. Despite the fact that the banking crisis of 2007-2008 was

predicted to result in massive job losses in London, this region has registered the lowest relative fall in employment.

Table 2: Resilience to Recession across UK Regions: 'Sensitivity' Indices of Relative Employment Contraction in Three Downturns

	1979(4)-1983(1)	1990(2)-1992(4)	2008(2)-2010(2)
South East	0.40	1.24	0.91
Greater London	0.89	1.69	0.60
Eastern	0.39	1.39	0.86
South West	0.28	0.90	1.37
East Midlands	0.86	0.85	0.98
West Midlands	1.52	1.33	1.20
Yorks-Humberside	1.21	0.88	1.15
North West	1.55	0.89	0.88
North East	1.84	0.40	0.73
Wales	1.67	0.75	1.43
Scotland	1.08	0.08	1.11
N. Ireland	0.44	0.13	1.81

Note: 'Sensitivity' Index measured as:
   (Percentage decline in employment in region/percentage decline in employment in UK)
Source of Data: Calculated from data supplied by Experian, London
Figures for 2008(2)-2010(2) are based on preliminary estimates of employment across the UK regions

What accounts for these spatial and temporal variations in regional resistance to recession? As mentioned above, economic structure, and especially the relative dependence on production industry, is generally regarded as having a major influence on the sensitivity of regional economies to recessionary shocks. The recession of the early-1980s was primarily based in manufacturing and other production industries, so it was inevitable that the industrial regions of the North East, North West, West Midlands, Wales and Scotland would experience the most pronounced shock (Table 3), particularly since these same regions had shown only weak employment growth in the preceding 1970s (see Figure 6). Further, in some of these worst effected regions, the dramatic fall in production employment was compounded by a fall, albeit much less severe, in service jobs, whereas in some of the regions in which the impact of the recession on the production sector was less

pronounced (South East, Eastern, South West), service employment actually increased. In the recession of the early-1990s, the major impact was once again on the production sectors, but this time around the sharpest falls took place in the southern and eastern regions, rather than in the older industrial regions of the north and periphery, the exception being the West Midlands, which once again was severely impacted.   And unlike the early-1980s recession, services proved vulnerable to this downturn, especially so in the South East and London, adding to the intense contraction in manufacturing and related activities in these areas.

Table 3: Regional Responses to Two Major Recessionary Shocks: Employment Change in Production and Services

	1979-1983 Recession		1990-1992 Recession	
	Production	Services	Production	Services
South East	-12.1	4.7	-24.6	-3.1
Greater London	-17.9	-3.5	-25.5	-8.2
Eastern	-11.9	7.8	-18.6	-3.0
South West	-9.6	4.8	-15.9	-0.5
East Midlands	-15.7	4.4	-16.5	0.7
West Midlands	-21.9	1.5	-21.0	-3.2
Yorks-Humber	-23.1	1.7	-16.3	1.1
North West	-25.0	-4.1	-19.2	0.1
North East	-26.3	-5.5	-19.1	1.0
Wales	-26.7	-2.2	-10.8	-1.3
Scotland	-22.3	-1.5	-12.9	2.5
N. Ireland	-22.7	2.4	-8.3	3.7
UK	-19.4	0.6	-18.8	-2.3

Note: Production industries include: manufacturing, mining, energy, water and construction
Source of Data: Calculated from data supplied by Cambridge Econometrics: these data are yearly rather than quarterly, so the recessions are defined in terms of peak and trough years.

The two recessionary shocks were thus somewhat different in nature and regional impact. The reasons for the different reactions of the UK regions to these two recessions have not received much analysis, but an interesting argument is that

part of the explanation resides in the effect that the early-1980s recession and subsequent structural change had on the regions. More specifically, it has been suggested that the dramatic decline in the manufacturing and production industries in the northern regions in the early-1980s recession and the continued deindustrialisation in those areas in the subsequent recovery permanently altered the sensitivity (resilience) of those regions to future recessionary shocks:

> the manufacturing and production sectors, the main source of regional imbalance in the past, [will] no longer dominate shifts in the employment structure to the same extent. Future shocks will have a more balanced regional incidence than has been the case in the past (Jackman and Savouri, 1999, p. 27).

The argument was that future recessionary shocks would be felt more equally across the country. It is certainly the case that the early-1980s recession accelerated the process of deindustrialisation (that had begun in the late-1960s) across all of the regions and that by the time of the onset of the recessionary shock of the early-1990s the northern and peripheral regions were much less dependent than they had been previously on production as a source of employment, though in terms of relative specialization (as measured, for example, by location quotients) the decline in dependence of the northern regions on this form of economic activity for their employment is less striking, and indeed was reversed somewhat between 1990 and 2008 (see Table 4). Of course, what matters is sectoral composition of a region's production activity, and whether in this context the main destructive impact of the early-1980s recession and its aftermath was concentrated in the dominant cyclically-prone and structurally and competitively weak industries in the northern regions.

The evidence tends to support this point. Thus in Yorkshire-Humberside, for example, the two main sources of employment in 1979 were coal mining (83,000), and textiles and clothing (124,000). By 1990, the numbers employed in these two had shrank by to 25,000 and 68,000 respectively. In the North East, the dominant employers, coal mining, and basic metal and metal products, declined from 42,000 to 13,000, and from 61,000 to 37,000 over the same period. These same two sectors had also been the primary sources of employment in Wales in 1979, accounting for 40,000 and 86,000 jobs respectively; but by 1990 the numbers employed in these industries in the region had shrunk to 8,000 and 47,000. Over

the same period, employment in textiles and clothing, the dominant sector in the economy of the North West had halved, from 190,000 to 95,000. Second, if this dramatic run-down of previously key industries was accompanied by a selective survival of the more competitive and productive firms across the slimmed down industrial base of these regions, then in combination these processes could possibly help explain the greater resistance of these regions to the early-1990s recession. What is clear is that the relative specialisation of regional economies in production activities was highly correlated with their relative vulnerability (or resilience) to recession in the early-1980s downturn (see Figure 7 (a)), but not in the two subsequent recessions (Figure 7 (b) and (c)).

Table 4: Regional Dependence on Production Industries, Selected Years (Percent of Total Numbers Employed and Location Quotient)

	1971		1979		1983		1990		1992		2008	
	%	**LQ**	**%**	**LQ**	**%**	**LQ**	**%**	**LQ**	**%**	**LQ**	**%**	**LQ**
South East	34.3	*0.86*	30.6	*0.84*	27.1	*0.83*	24.8	*0.75*	20.5	*0.77*	15.6	*0.66*
Greater London	30.1	*0.69*	24.3	*0.66*	21.5	*0.64*	17.7	*0.53*	14.9	*0.55*	10.3	*0.47*
Eastern	39.0	*1.05*	34.9	*1.01*	30.7	*1.00*	27.5	*0.91*	24.2	*0.98*	18.9	*1.00*
South West	33.5	*0.80*	29.6	*0.83*	26.5	*0.81*	25.3	*0.80*	22.3	*0.86*	17.4	*1.01*
East Midlands	48.9	*1.30*	43.3	*1.27*	38.2	*1.24*	34.3	*1.26*	30.2	*1.40*	23.0	*1.43*
West Midlands	50.4	*1.56*	44.6	*1.41*	38.1	*1.34*	33.9	*1.32*	29.6	*1.41*	20.9	*1.34*
Yorks-Humber	46.5	*1.21*	40.9	*1.16*	34.4	*1.05*	30.7	*1.08*	27.4	*1.16*	20.8	*1.15*
North West	44.1	*1.10*	38.1	*1.15*	31.9	*1.09*	29.5	*1.08*	25.6	*1.15*	18.7	*1.14*
North East	45.1	*1.16*	40.7	*1.09*	33.7	*1.06*	30.5	*1.04*	25.9	*1.12*	20.0	*1.17*
Wales	41.0	*1.17*	36.3	*1.15*	31.3	*0.86*	28.1	*0.97*	26.2	*1.13*	20.4	*1.20*
Scotland	39.6	*0.93*	34.5	*0.92*	29.4	*0.86*	26.6	*0.85*	23.5	*0.91*	17.6	*0.88*
N. Ireland	39.7	*0.89*	33.0	*0.91*	26.8	*0.82*	26.2	*0.86*	24.1	*0.99*	19.9	*1.09*
UK	39.9	*1.00*	34.9	*1.00*	30.9	*1.00*	27.0	*1.00*	23.6	*1.00*	17.6	*1.00*

Source of Data: Cambridge Econometrics. The data are mid-year estimates.
Note: Production industries include: manufacturing, mining, energy, water and construction

However, what Jackman and Savouri failed to consider was the hysteretic effects that a major reduction in the industrial base of the northern regions may have had on their future growth prospects. As was argued above, a deep downturn in a

(a)

(b)

(c)
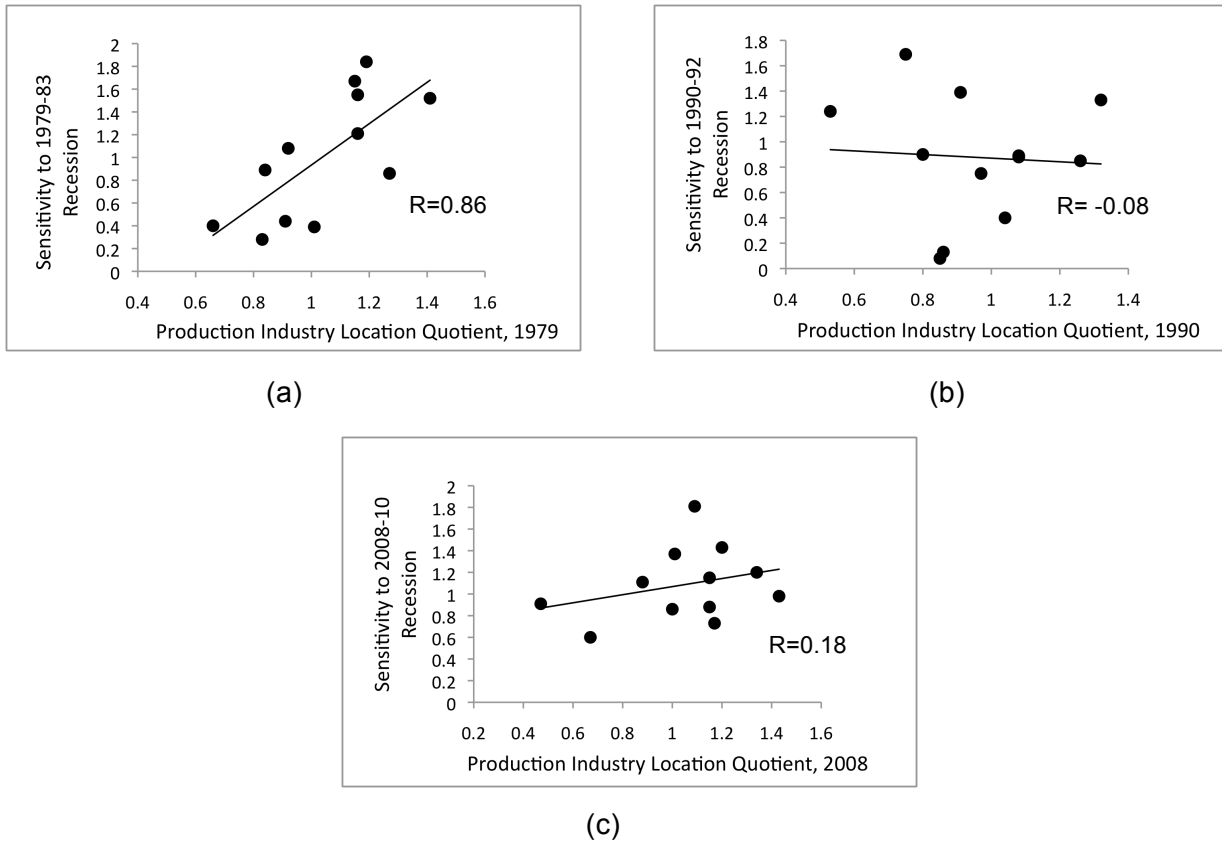
**Figure 7: Regional Specialisation in Production and Resistance to
Recessionary Shocks: The Three Recessions Compared**
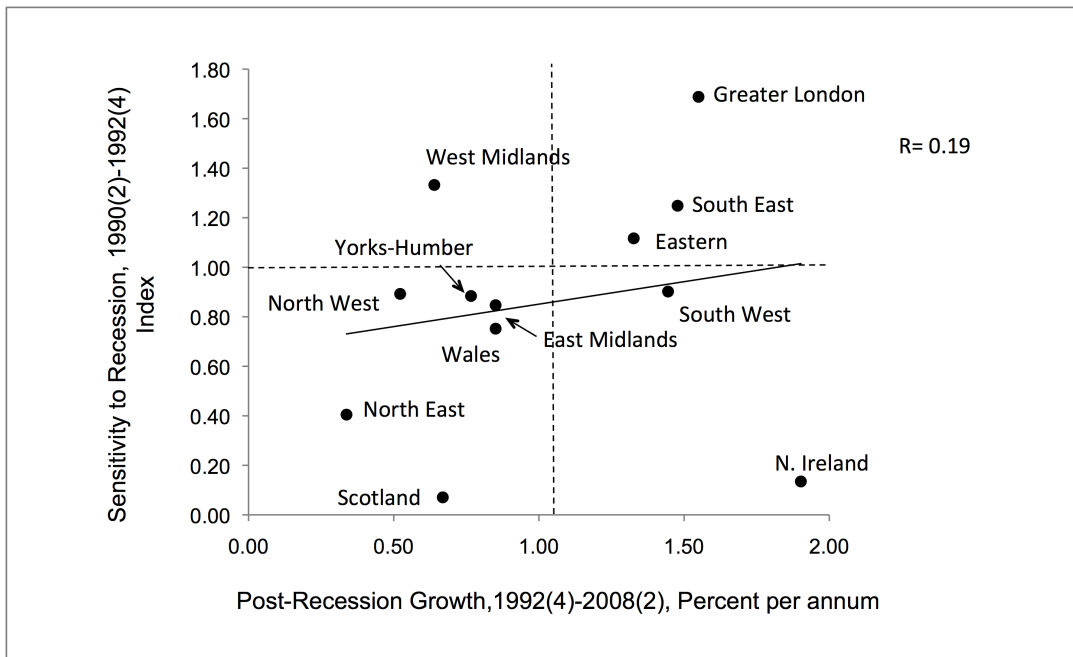*Source of Data:* Calculated from data supplied by Cambridge Econometrics

region's economy, particularly if it leads to the destruction of a significant proportion of its economic base, may result in a downward hysteretic shift in the region's growth path (Figure 2 (a)) and even a post-shock reduction in its growth rate (Figure 2(b)). This focuses attention on the speed and extent of recovery. To investigate this issue, Figure 8 plots the relationship across the UK regions between the impact on employment of the early-1980s recession and the respective subsequent post-recessionary employment growth rate.   The results for this downturn suggest that, whilst other factors were obviously at play, and the relationship is far from perfect, the greater was the severity of the recessionary contraction of employment in a region, that is the lower was its resistance, the

slower was that region's subsequent rate of employment recovery. Further, by partitioning the relationship into quadrants, defined by the national sensitivity index (1.00) and national post-recession employment growth rate, the four southern regions of the South East, South West, Eastern and East Midlands stand out as having been both the most resistant to the recession and as having experienced the fastest post-recession employment growth. The North East and North West stand out in strong contrast: they were badly hit by the recession, in terms of employment decline, and then experienced a very slow post-recessionary growth in employment. However, the results for the early-1990s recession and its aftermath, shown in Figure 9, are somewhat different. This time round, there was no negative relationship across regions between scale of recessionary contraction and subsequent rate of recovery. But the quadrant comparisons are telling. They show that despite the fact that Greater London and the South East were much more vulnerable to the recession than the North East, North West, Wales and Scotland, they proved more successful in recovering from it, achieving rates of employment growth well above the national average.

Translated into actual numbers employed, the impact of hysteretic effects in certain regions becomes clearer. Following the recessionary shock of the early-1980s, three regions - Greater London, the North West and the North East - failed to return to their 1979 employment levels before the onset of the next recession of the early-1990s (Table 5). In all three regions, the shortfall amounted to around 60,000 jobs. The other regions all managed to recover the jobs they lost in the early-1980s downturn. Following the recession of the early-1990s, employment in the North West region again failed to return to its 1990 pre-recession level before the recession of 2008-2010 began. And this time, the West Midlands also failed to fully recover the employment losses that it experienced in the early-1990s downturn. For certain regions, then, there is evidence that recessions have had hysteretic effects on employment levels.
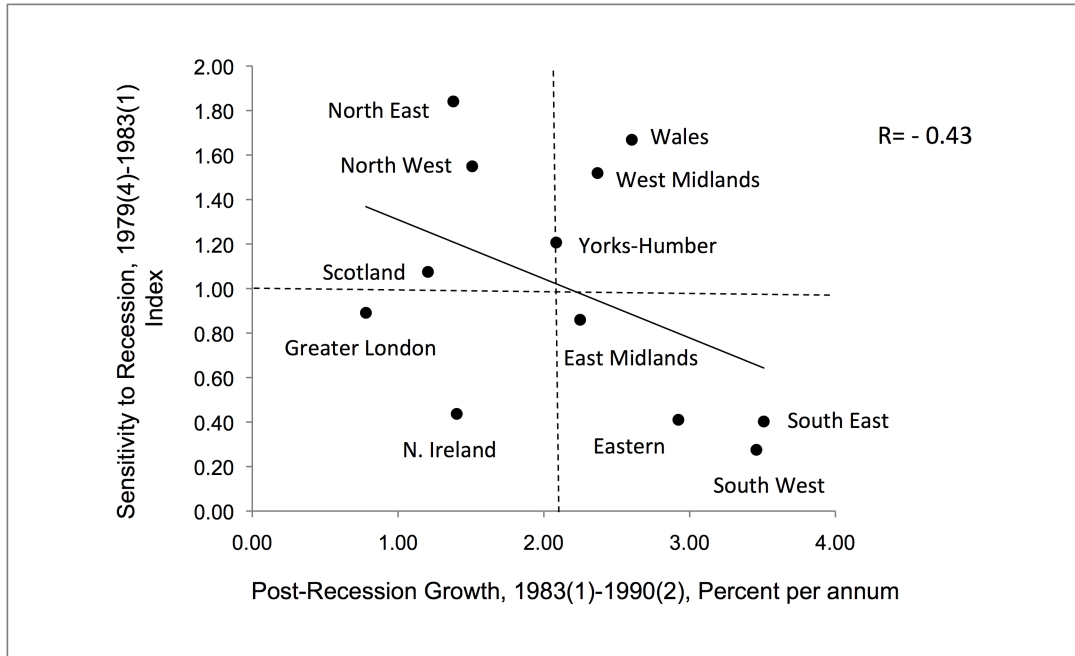
Figure 8: Regional Resistance to and Recovery from Early-1980s Recession: Total Employment

Figure 9: Regional Resistance to and Recovery from Early-1990s Recession: Total Employment
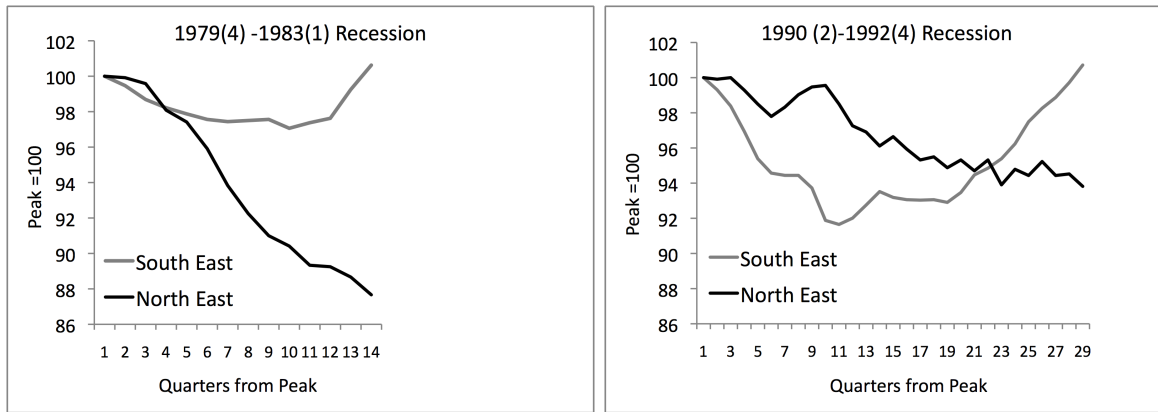*Source of Data*: Calculated from data supplied by Experian, London

Table 5: Regional Employment Change in Recession and Recovery
(Absolute Numbers Employed, in Millions)

	Recession 1979(4)-1983(1)	Recovery 1983(1)-1990(2)	Recession 1990(2)-1992(4)	Recovery 1992(4)-2008(2)
South East	-0.097	0.788	-0.326	0.787
Greater London	-0.285	0.226	-0.486	0.828
Eastern	-0.063	0.437	-0.189	0.413
South West	-0.039	0.454	-0.141	0.419
East Midlands	-0.118	0.281	-0.115	0.206
West Midlands	-0.286	0.390	-0.238	0.227
Yorks-Humber	-0.205	0.308	-0.142	0.257
North West	-0.389	0.331	-0.201	0.183
North East	-0.162	0.098	-0.003	0.072
Wales	-0.149	0.197	-0.064	0.156
Scotland	-0.196	0.203	-0.011	0.192
N. Ireland	-0.002	0.069	-0.006	0.180
UK	-2.009	3.782	-1.949	3.920

Source of Data: Calculated from data supplied by Experian, London

One of the most striking features to emerge from this analysis is the marked contrast in resilience between the North East and South East regions. This is particularly evident in Figure 10, which shows in detail how these two regions reacted to and recovered from the two recessions under discussion. Not only was the South East more resilient than the North East to the recession of the early-1980s, it also recovered quickly from it. Indeed, by the time employment in the South East had recovered to its pre-recession peak, that in the North East was still some 12 percent below it pre-recession peak, and was continuing to fall. And while the South East reacted more to the early-1990s downturn than did the North East, and took twice as long to recover than it did to the early-1980s shock, nevertheless by the time its employment has risen back to its 1990 peak, again employment in the North East had failed to recover, and was still declining. It would seem that even if the South East is severely impacted by recession, its economy recovers rapidly and strongly and that over time the region is able to sustain a rate of

Figure 10: Reaction to and Recovery from Recession:
The South East and North East Regions Compared - Total Employment
Source of Data: Calculated from data supplied by Experian, London

employment growth well above the national average. In this sense it would appear to be characterised by a high degree of resilience. At the other extreme, the economy of the North East region has still not recovered from the disproportionate destruction of a major part of its industrial base during the early-1980s recession. Given that destruction, the region's economy may no longer suffer dramatically when recession strikes, as Jackman and Savouri (op cit) argued would be the case, but neither has it barely managed to attract or indigenously generate new sources of employment on a scale sufficient to compensate for the jobs lost thirty years ago, let alone establish a new path of sustained employment recovery and growth. The negative hysteretic impact of the early-1980s recession on the labour market in this region has proved profound. Of course, whilst many other factors have been at work, there would seem good grounds for arguing that the marked divergence in long-run employment growth performance between these two regions of the UK has been shaped, in part at least, by their differential resilience to recession.

Given these findings, what then are likely to be the implications of the most recent recession on the employment paths of the UK regions? As we have seen (Table 2), with respect to employment, the of the impact of the 2008-2010 recession has been much less differentiated between northern and southern regions compared to the previous two downturns. Whilst employment the North East and North West has

proved less sensitive to the recession than that in London and the South East, the response of the other northern and peripheral regions (Wales, Northern Ireland, Scotland and Yorkshire-Humberside) has been similar to their reaction to the early-1980s recession, with sensitivity' indexes well above unity. The West Midlands has once again been severely impacted, and unusually the South West has also experienced an above average downturn in employment. How the regions will recover remains to be seen. But there has been much debate over the additional impact of the major cut-backs in Government public spending planned for the next four years, and the implications of this austerity programme for employment in the regions. The problem is that the economies of the northern and peripheral regions are more dependent on the public sector than are those of London and the South East (see Table 6). Thus, other things being equal, it is likely

Table 6: Regional Dependence on the Public Sector, 2007
(Regional Location Quotients of Public Sector Output and Employment)

	Location Quotient	
	Output	Employment
South East	0.88	0.85
Greater London	0.79	0.83
Eastern	0.91	0.90
South West	1.12	1.07
East Midlands	0.98	0.96
West Midlands	1.04	0.98
Yorks-Humberside	1.11	1.03
North West	1.04	1.04
North East	1.29	1.20
Wales	1.32	1.19
Scotland	1.17	1.13
N Ireland	1.43	1.27
UK	1.00	1.00

Source of Data: Calculated from data supplied by Cambridge Econometrics

that the jobs cuts expected in public services will be concentrated in regions like the North East, North West, Wales, Scotland and Northern Ireland. If this turn out to be the case, there will be additional negative knock-on effects on the labour

markets more generally within these regions. In the light of past experience, as presented here, and taking the prospects of the predicted large-scale public sector employment cuts falling unevenly across the country, it seems likely that the South East and London regions will rebound faster and further than other regions which may well witness hysteretic downward shifts in their future employment growth paths.

Discussion and Conclusions

There has been increasing interest in and invocation of the notion of resilience in the social and environmental sciences over the past three or four years, and the concept has even entered national, regional and local policy discourse. Yet the notion is not unproblematic. According to Hanley (1998), for example, the concept of resilience, though highly suggestive, suffers from imprecision of definition and conceptualisation, which in turn weakens its purchase as an analytical or explanatory tool. My aim here has been to try to move closer towards a more precise conceptualisation, with particular reference to how regional economies respond to recessionary shocks. I would not claim for an instant that the explication advanced here constitutes the only possible interpretation, nor that as developed here it is necessarily applicable in other analytical or empirical contexts. Indeed, different conceptions of resilience may well be needed for different circumstances. Similarly, even with respect to the specific issue of the impact of recessions on regional growth paths, the idea of resilience requires considerably more elaboration than offered here. The long-run trajectories of regional output and employment, for example, are obviously the complex outcomes of a range of structural and systemic, and external and internal factors, processes and arrangements, and resilience is but one aspect of a regional economy's growth dynamics. Indeed, how such factors, processes and arrangements shape the resilience of a regional economy to recessionary and other shocks is a key issue.

But a first stage in any such analysis is to determine whether and in what sense there are discernible and systematic patterns in how regional economies react to

and recover from such shocks, and whether the idea of resilience is helpful in this regard. This has been the focus of this paper. To this end, I have argued that (at least) four dimensions are needed to capture the idea of regional economic resilience in relation to recessionary shocks, namely: resistance, recovery, renewal and reorientation. Further, I have suggested that the concept of resilience might usefully be linked to that of hysteresis, which is the notion that economists tend to use to judge the impact of shocks on an economy's growth path. The idea of hysteresis is useful because it focuses not on the preservation of system functioning and performance in the presence of exogenous change and disturbances, but on how such changes and disturbances can shift system functioning and performance. As Hanley argues, we would not expect an economy's industrial structure, in terms of the distribution of output or employment, to be preserved over time, since structural change occurs more or less continuously. But recessionary shocks can and do cause sudden and intense structural change and re-orientation, and this can result in hysteretic change to a region's growth path. The idea of hysteresis would thus seem to complement that of resilience.

The arguments and analysis contained in this paper have been exploratory in nature, but suggest that further research would be worthwhile. Three avenues for possible additional investigation are immediately obvious. The first would be to undertake a more rigorous statistical analysis of the reaction and recovery dynamics of regional economies to recessionary shocks, for example using advanced time series techniques. Given that we are interested in identifying regional responses to a series of recessions, that such responses may vary from one recession to another, and that we wish to test for any hysteretic impacts of those recessions on regional growth paths, the time series models needed for this task are far from straightforward. In addition, allowance should be made for cross-regional interactions, since shocks can be transmitted from one region to another, and this further complicates this type of analysis. However, some preliminary work along these lines for the UK regions (Fingleton, Garretsen and Martin, 2010), does suggest that the use of formal statistical time series methods can provide a more precise indication of the scale and significance of regional differences in resilience

to recessions than the relatively simple procedures used in this paper.**¹¹**

Secondly, of course, if regional economies are found to have different degrees of resilience to recession, then those differences call for an explanation. Why are some local and regional economies more resilient than others? I have not pursued this issue in this paper, beyond some partial discussion of the role of regional economic structures in shaping the sensitivity of regions to recessionary shocks. A full explanation would need to analyse the reactions and adjustments of both firms and workers at the local level, as well as the reactions of local institutions and policy actors. Regional and local economies are composite entities, made up of numerous heterogeneous firms and workers. Individual firms and workers differ with respect to the ease with which they can adjust to and weather recessionary shocks, their ability to switch into other activities, the range of constraints they face, the resources available to them, and their economic preferences. Aggregate regional reactions to recession are the outcome of the discrete adjustments and responses of these heterogeneous economic agents   Further, when we disaggregate a regional economy, we may well discover that the degree of resilience differs as between firms and workers. Firms may act to survive a major recessionary downturn by cutting their workforce, but then operate with a smaller workforce even when recovery comes. Unless the workers made redundant find other jobs in the locality, the brunt of the recessionary shock will be borne by the local labour market. A region's firms may well prove to be resilient, but whether its labour market recovers may be a different issue. A regional economy may be resilient in certain respects but not others. Interestingly, current economic research into hysteresis has begun to direct explicit attention to such heterogeneity of response and adjustment, and to the micro-foundations of hysteretic dynamics (for example, see Cross, Grinfield and Lamba, 2009).

Thirdly, the empirical findings presented here indicate that regional resilience to recession can vary and change over time, not only because of differences in the causes and nature of individual recessionary shocks, but because the factors and mechanisms that shape economic resilience may themselves evolve and change.

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¹¹ The starting point for such an approach would be seemingly unrelated (vector) autoregressive models with suitable dummy variables to capture any changes in growth rates and levels of growth paths.

Resilience is not a static feature of an economy, but a dynamic process, influenced both by the impact of major shocks and by the ongoing restlessness of structural economic change and adaptation. An evolutionary approach to regional economic resilience is thus called for, which would permit such notions as variety, selection, fitness and path dependence to play an explanatory role. Indeed, the notion of resilience should itself be central to any conceptual framework for studying the evolution of the economic landscape. In this paper I have focused on the idea of resilience in relation to the impact of recessionary shocks, but regional and local economies are also prone to various other shocks and disturbances, sometimes of a general nature, sometimes of a regionally specific and idiosyncratic nature. Technological disruptions, major shifts in competition, local plant closures, major changes in government policy or regulatory arrangement may all test a region's economic resilience and its capacity to recover and adapt. Regional economic evolution is not simply a steady incremental process, but is also shaped by periodic, often unexpected shocks. Potentially, the notions of resilience and hysteresis can aid our understanding of how regional economies respond to such disruptions.

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