

Towards the Resilient Region?

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Abstract:

Discussions of local and regional development have recently broadened from a preoccupation with growth to one which captures the notion of resilience. This paper makes two main contributions to these debates. First, the paper critiques static equilibrium-based notions of resilience and instead advances a more dynamic evolutionary approach to explain local and regional resilience. Second, we seek to address the widening gap between resilience thinking and its transfer to practical policy prescription. To do this, we explore the notions of adaptability, adaptive capacity and new path creation in developing local and regional resilience. We then focus upon what this might mean for local and regional strategies and draw on the case study of the Renewable Energy sector in North East England to demonstrate the enduring role of policy intervention in stimulating change and building resilience in peripheral regions.



Stuart Dawley, Andy Pike and John Tomaney

Centre for Urban and Regional Development Studies (CURDS),
School of Geography, Politics and Sociology,
Claremont Bridge,
Newcastle University,
Newcastle Upon Tyne,
England,
NE1 7RU.

Tel: +44 0191 222 7735

<http://www.ncl.ac.uk/curds/>

E- mail: Dr Stuart Dawley: s.j.dawley@ncl.ac.uk

1. INTRODUCTION: WHY HAS RESILIENCE BECOME IMPORTANT FOR LOCAL AND REGIONAL ECONOMIES?

Triggered in part at least by the recent economic crisis, discussions of local and regional development have recently broadened from a preoccupation with growth to one which captures the notion of resilience. Inspiration has been drawn from recent analyses, mostly in the USA, of how regions, localities and public policies have responded, adapted and demonstrated resilience in the face of extraordinary events and shocks, ranging from 9/11 to Hurricane Katrina and even military base closures (see, for example, Foster 2007a; Hill *et al.* 2008). Commentators have subsequently looked to transfer resilience thinking to the domain of local and regional economic development, itself a "...far from a smooth and incremental process but is subject to all sorts of interruptions and disruptions: periodic economic recession, the unpredictable rise of major competitors elsewhere, unexpected plant closures, the challenges arising from technological change and the like" (Simmie and Martin 2010 p. 1). Indeed for many, the vulnerability of localities and regions to episodic crises is heightened in the current era of intensified global economic integration, openness and interdependence (Hudson 2010). As an emergent rubric in this changing context, resilience is attracting burgeoning academic and policy attention in both the USA (Foster, 2007a; Pendall *et al.*, 2007) and Europe (CLES, 2008; Colbourne, 2008; Edwards, 2009; Folke *et al.*, 2002). In short, "resilience analysis...(is)..trendy" (Pendall *et al* 2010 p.2).

However, what does resilience mean? What might a resilient locality or region look like? And why are some places apparently more resilient than others? In addressing these and related questions, it is important to recognise that the application of resilience to local and regional development contexts remains embryonic (Christopherson *et al* 2010). To date, its use within policy fields has outpaced its development as a rigorous analytical concept. Its use within policy documents has been that of a loosely defined metaphor or buzzword, whilst in academia it remains a promising, albeit relatively 'fuzzy', concept still under development (Markusen 1999). As such, resilience has become a generic term used at the overall level of a local or regional economy, however much academic analyses appears to simply up scale the resilience of a key case study sector or cluster to demonstrate the resilience of a territory more broadly. Resilience will necessarily vary between, and even within, sectors within any given local or regional economy. Consequently, industrial policy, even 'industrial activism' (BERR 2009), may serve as a key dimension in any emergent local and regional resilience policy.

For industrial policy in particular, the sectoral composition of a locality appears central for two popular and interrelated strands of resilience thinking. First, the notion of *resistance* – the differential ability of places to resist disruptive changes – has focused upon the extent to which the rates of onset, breadth and depth of recent recession conditions and unemployment were regionally varied. For example, in the UK, despite the recent recession emerging from the financial services sector, the largest reductions in regional output and employment have been witnessed in the Midlands and the North East, with London appearing more resistant, or certainly impacted less, than predicted. Expectations that the traditionally vulnerable regions would now be more resistant due to structural changes in the 1980s and 1990s together with high proportions of public sector employment, have not been borne out. Instead, the recession appears to have largely unaltered, rather than fundamentally recalibrated, regional unemployment disparities. Attempts to understand the regionally uneven nature of regional resistance, as an element of resilience, have mostly focused upon the inter- and intra-sectoral composition of regional economies (Industrial Communities Alliance 2009; CRESC 2009; Martin 2009). The second, and interrelated, strand of popular resilience thinking relates to the ability of regions to be able to *'bounce-back'* or *'comeback'* from economic shocks and disruptions (Pendall *et al* 2010; OECD 2009). Attention has focused on the differential ability of regions to recover from a shock, especially around quantitative measures such as employment and output. In this sense, there is a clear relation to resistance, as regions which demonstrate higher levels of resistance to economic shocks would appear to possess better prospects for a full and rapid recovery relative to those more vulnerable regions experiencing greater disruption.

Whilst resistance and bounce-back are clearly promising ideas for policy analysis and prescription (OECD 2009), the position taken within this paper follows recent debates within economic geography and related disciplines which look towards an *evolutionary approach* as an alternative and fuller conceptualisation of local and regional resilience. As such, Section 2 critiques the ecological origins of the conventional wisdom understanding of resilience which apply overly reductionist notions of elasticity and equilibrium to the complexity and open ended nature of regional economic change. Instead, this paper draws attention to an evolutionary notion of resilience as a process, not pegged against movements to and from single or multiple equilibria, but towards a more dynamic understanding of constant change rather than stability. Therefore, in Section 3, we raise the prospect of understanding resilience characterised by processes of adaptation, adaptability and the presence of adaptive capacity. We introduce the

concepts of path dependence and variety as lines of analyses through which adaptation and adaptability are shaped, and consider the notion of adaptive cycles as a possible descriptive tool to help illustrate the dynamic nature of these processes. Section 4 then explores a number of emerging policy prescriptions which appear distinctive to resilience thinking. Indeed, a key question for the development of both territorial and industrial strategies is the extent to which resilience thinking offers something novel and different from existing approaches. To date, examples of potentially resilient regions have, understandably, drawn most conceptual and empirical analysis from high performing regions possessing high levels of adaptive capacity. An important and unresolved issue remains as to how peripheral regions, faced with a variety of structural challenges, stimulate adaptability and develop resilience. In response, we use the case study of the emerging renewables sector in the North East of England to provide insights into how old industrial regions can build adaptive capacity. The North East of England is a classic example of an industrial region which experienced large scale social and economic change in the final decades of the twentieth century (Hudson 2005). After experiencing the decimation of its traditional industry base – shipbuilding, coal, iron and steel – in the 1970s and 1980s the North East looked towards foreign direct investment to modernise and diversify the economy. However, the fragility of this exogenous model of development was exposed in the 1990s with a swathe of weakly embedded and regionally integrated FDI projects disinvesting from the region and seeking lower cost locations in Central and Eastern Europe, China and other parts of Asia (Phelps 2009; Dawley 2007). Consequently the North East region began the 21st century with a constrained indigenous industrial base, weak levels of private sector R&D and one of the poorest performing labour markets in the UK (Tomaney 2009; Dawley and Jones 2009).

2. WHAT DOES RESILIENCE MEAN AND HOW IS IT DEFINED AND MEASURED?

The application of resilience to a local and regional economic context is a fertile but still developing field of inquiry. Much debate has emanated from the challenge of transferring resilience principles from a diverse disciplinary background, from psychology to ecology, with little or no geographical or territorial sensibilities. Our aim here is not to provide a systematic review and critique of existing approaches because this work is being undertaken elsewhere (Foster 2007; Swanstrom 2008; Pendall *et al.* 2010). Instead, our focus is to highlight the apparent weaknesses of the equilibrium-based frameworks of resilience and provide an alternative evolutionary perspective to better capture the complexity of economic development.

At risk of generalisation, a conventional wisdom understanding of local and regional resilience has emerged within existing academic and policy literatures, varying based on the ability of a socio-economic system to recover from a shock or disruption: "...the most natural meaning of regional economic resilience" as "...the ability of a regional economy to maintain a pre-existing state (typically assumed to be an equilibrium state) in the presence of some type of exogenous shock" and the "...extent to which a regional or national economy that has experienced an external shock is able to return to its previous level and/or growth rate of output, employment or population" (Hill *et al.* 2008: 3).

Resilience here is understood as the degree and timing within which a spatial unit can return to its pre-shock position and level of output or employment. As such, little if any consideration is given to the roles of resistance or sensitivity against shocks as a dimension of resilience, nor whether the economy returns to a pre-shock level by retaining or successfully changing existing structures and functions. For Simmie and Martin (2010) the ambiguities present in this conventional wisdom emerge from the differing definitions of resilience within the ecological literature, arguably the historical home of conventional resilience thinking.

Two ecological notions of resilience – *engineering* and *ecological* - have shaped the tendency towards equilibrated approaches with early applications within regional and urban studies. In its simplest form, 'engineering resilience' defines resilience on the basis of elasticity - a system's ability to resist disturbance and /or the speed of its return to a pre-existing equilibrium or steady state (*ibid*). This approach - closely aligned with standard econometric notions of equilibrium approaches – would measure variations in local and regional resilience through the differing abilities of regions to resist shocks (i.e. maintain equilibrium) or the speed at which they would recover the equilibrium (Simmie and Martin 2010). In so doing, these accounts are undermined by their limiting assumption of adjustment through the free and flexible operation of factor markets and return to a single equilibrium state.

A key difference offered by 'ecological resilience' is that whilst a resilient region may indeed retain or return to its pre-shock single equilibrium state, it may also adapt by moving to one of multiple equilibriums, perhaps performing better or worse than the pre-shock. Put another way, non-resilient localities may be disrupted by economic shocks and subsequently become locked into long-run trajectories and under-performing equilibriums of decline. A failing of both notions of resilience is their relatively static notion of local and regional development. Engineering approaches imply that a resilient economy would not necessarily change over time, thus contrasting to the perceived dynamism of successful regional economies (Pike *et al* 2006). Despite ecological resilience offering a more dynamic approach, it nevertheless views regional

economic evolution as a process of 'punctuated equilibrium' - where movement is triggered by periodic shocks rather than the constant change and evolution of regional economies (Simmie and Martin 2010:4).

The basis of this overall critique draws on an evolutionary approach to economic change which rejects neo-classical inspired notions of adjustment mechanisms towards any form of equilibria within a spatial unit's development (Boschma and Martin 2007, Grabher 2009). Given the recognition that "regional economies evolve and move along open-ended developmental trajectories with an unknown endpoint" (Hudson 2010:3), proponents of an evolutionary approach understand the economic landscape as a "complex adaptive system" (Martin and Sunley 2006: 573) which can never be in equilibrium. How then might this more open-ended evolutionary approach seek to explain local and regional resilience?

3. WHAT MAKES LOCAL AND REGIONAL ECONOMIES RESILIENT? ADAPTATION, ADAPTABILITY AND ADAPTIVE CAPACITY

Evolutionary approaches focus upon the causal concepts of local and regional adaptation, adaptability and adaptive capacity in explaining the geographically uneven resilience of places. Whilst on the face of it notions of adaptation and adaptability would appear elements of the same process, Pike *et al.* (2010) have distinguished how the two notions can be seen as in tension with each other as explanations of different kinds of resilience. On the one hand, *adaptation* can be understood as the ability to respond to an economic shock with a movement back towards, at least in the short run, a pre-conceived model of regional or sectoral development which may have been successful prior to the shock. Here, adaptation reflects an inherent tendency of systems (regions, cities) to improve their adaptation to a given niche or environment by improving along the path that has been successful in the past (i.e. become ever better steel-producers, ship-builders etc). On the other hand, adaptability can explain a different kind of resilience and one which maybe necessary to cope with unforeseen futures. Resilience through *adaptability* emerges through opportunities or decisions to leave a path that may have proven successful in the past in favour of a new, related or alternative trajectory or niche. This different kind of resilience carries a series of substantive challenges in developing capacities and tolerances to deal with the cognitive uncertainties, economic inefficiencies and political unpopularity of moving from an established to alternative regional niche. Therefore, on one level, adaptation and adaptability may offer contrasting explanations for the differentiated resilience of places. Whilst on another level, if we understand resilience as a systemic feature that points to generic qualities of a regional economic system, then adaptation and adaptability

offer possible complementarities. Put another way, the different characteristics of adaptation and adaptability may help explain how different components of a regional economy (sectors; labour markets; political interests etc.) integrate to provide complex, often fragmented and varying forms of resilience in any particular place.

For old industrial regions, cases of adaptability where new paths are affected are evident - but relatively rare. Commonly cited examples include: the transition in Massachusetts, USA, from declining textiles 'rustbelt' to emergent high-technology complex around Route 128 (Harrison 1984); the reconfiguration of the coal and steel complex in the Ruhr, Germany, toward clean coal and environmental technologies (Grabher 1993); the ways in which Toledo adapted to industrial decline by branching out to capture new market opportunities in solar technologies (Fitzgerald 2009) and the restructuring of traditional industries in the Basque Country and consumption-oriented urban regeneration in Bilbao (Gonzalez 2006). More typical for old industrial regions are experiences of weaker adaptation shaped by entrenched path dependency and protracted decline, including the continued economic weaknesses and long-run marginalisation of North East England (Hudson 2005) and the post-transition rationalisation of steel and attempts to construct new economic growth paths in Małopolskie, Poland (Dawley et al 2008). Feyrer et al. (2007) demonstrate how in the late 1970s and early 1980s auto and steel-dominated localities in the US regained 'pre-shock' employment levels within five years but ended up being displaced onto low growth development paths.

How then might an evolutionary approach understand the local and regional variations in adaptation and adaptability? Or as Simmie and Martin (2010 p. 28) see it:

“...the idea of resilience as the ‘adaptive ability’ since it is the differential ability of a region’s or locality’s firms to adapt to changes and shocks in the competitive, market, technological, policy and related conditions that the evolutionary dynamics and trajectories of that regional or local economy over time”

Path Dependency

Notions of *path dependency*, how the past shapes the future, are seen to either enable or constrain local and regional economic adaptation in response to a shock and the development of adaptability over time. Whilst ideas of path dependency continue to receive much debate (Martin 2010; Hassink 2010), three dimensions appear applicable to resilience thinking.

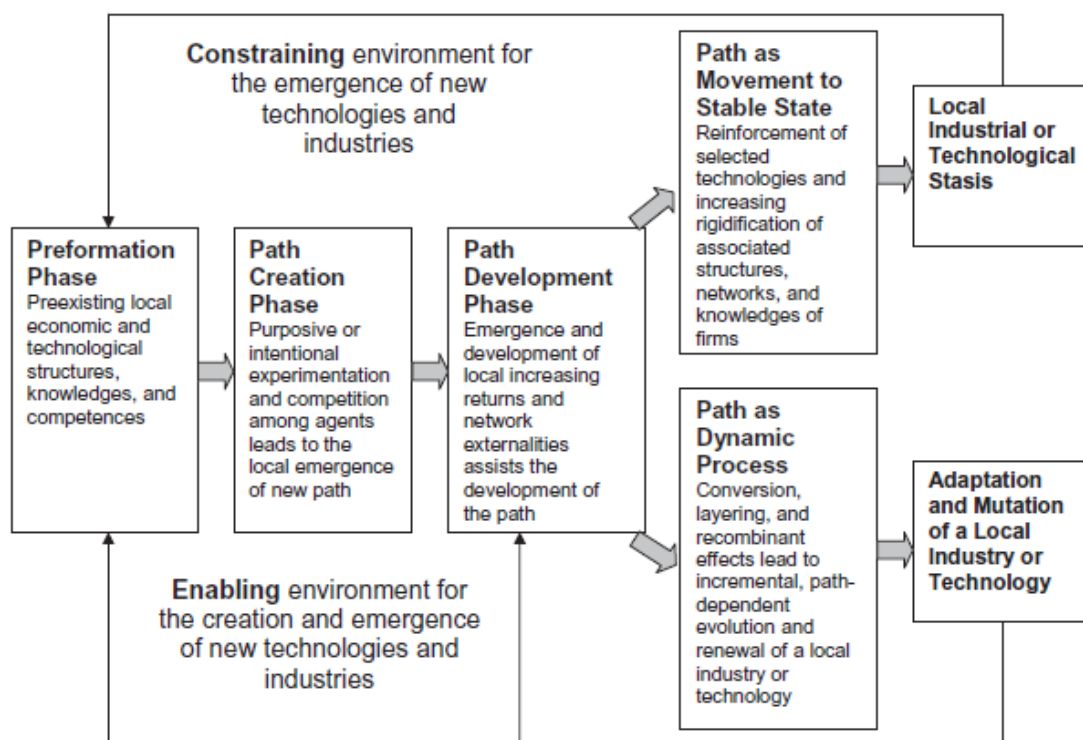
First, the historical and evolving dimension of path dependency brings with it a recognition that 'shocks' are often closely intertwined with the unfolding of broader, longer run and 'slow burn' processes of change (Pendall *et al* 2008). In old industrial regions the demise of particular economic activities may produce the 'shock' events of rationalisation and job loss due to factory, mine or office closures but such moments need to be contextualised as embedded within deep seated processes of de-industrialisation and attendant economic, social, political, ecological and cultural changes (Hudson 2005; Pike 2005).

Second, much work around path dependency has focused upon ideas of 'regional lock-in'. Grabher (1993) identifies various kinds of lock-in, comprising functional, cognitive and political, whereby economic, social and institutional outlooks, relationships and configurations in place ossify over time, undermining previous growth paths and inhibiting adaptive behaviours. Such lock-ins can overlap and become inter-dependent, even self-reinforcing, in particular places over time. How places interpret and address lock-ins is central to the geographically differentiated adaptation and adaptability explaining resilience. In West Münsterland, for example, a degree of adaptability explained the re-direction of its development paths by successfully connecting textiles producers to new markets for industrial and medical applications (Hassink 2007). In contrast, Mecklenburg-Vorpommern, experienced less success in the adaptation of its shipbuilding and engineering specialisations in the context of fierce international competition and the lock-ins of entrenched vested interests in the local, regional and federal state, capital and labour (Eich-Born and Hassink 2005). In an evolutionary framework, lock-ins are not inevitable end-points, however. Martin and Sunley (2006) usefully identify several 'de-locking' mechanisms capable of providing the basis of adaptability: marshalling technological developments; drawing upon innovation and novelty generated by heterogeneous economic agents; importing and embedding external resources; diversification; and, wholesale upgrading of the economic structure. Such ideas suggest that places can enhance their adaptive capacities if they can develop collective understanding and strategies to recognise and overcome the lock-ins that may be constraining their adaptability to disruptive changes.

Third, to prioritise the role of constant 'change' rather than 'continuity' implied by conventional lock-in approaches, Martin (2010) has developed a framework to better understand how and why paths of regional economic development emerge. According to this approach, see Figure 1, the emergence of a new industry or sectoral niche is stimulated or enabled "...by the pre-existing resources, competences, skills and experiences inherited from previous local paths and patterns of economic development" (Simmie and Martin 2010:6). These historical and place based characteristics help shape, enable or constrain, the attractiveness of an environment to

foster the purposive, competitive or innovative dynamic between local firms, agencies or indeed inward investing firms. Using Figure 1, adaptation (or indeed adaptability) develops as a part of a dynamic process through which institutions (firms, regional agencies etc) gradually change overtime (layering), convert strategies and competences (reorientation) and benefit from the knowledge exchanged through diversity and ongoing recombination of relations, networks and collaborations. It also illustrates, how a region’s adaptability evolves overtime and how that form of adaptability feeds back and influences the evolution of the region (Simmie and Martin 2010).

Figure 1: Towards an alternative path dependence model of industrial evolution (Source: Martin 2010 p. 21)



Variety

Variety provides a second line of analysis within the evolutionary perspective and complements path dependency in understanding the mechanisms of adaptation and adaptability. The variety of sectors (structural) and firm behaviours within a local or regional economy help support the argument that diversified economies are more adaptable because they act as a ‘shock absorber’, dissipating negative effects across an array of economic activities and places rather than concentrating and reinforcing them and help to speed up any recovery therein. Variety also connects to the ideas of selection and the competitive survival or failures of firms which contribute to the overall adaptability of a region’s industrial profile. At the same time, the degree to which the variety of firms and sectors are related – related variety – allows for regional spill-over’s of knowledge and capability of

economic actors in framing possibilities for the generation of novelty in response to rapid and/or slow changing environments (Frenken and Boschma 2007; Boschma 2008). Notions of related variety therefore align with the dynamism of the enabling environment present in Figure 1 and also play a key role in Simmie and Martin's (2010) adaptive cycle model elaborated below (Figures 2 & 3). Within old industrial regions, related variety presents a potential, albeit challenging, mechanism for the adaptation or adaptability of existing specialisations in traditional economic activities toward emergent and growing markets.

Adaptive cycles and resilience

Finally, in an attempt to bring the elements of path dependency and notions of variety together, Simmie and Martin (2010) have looked towards the notion of 'adaptive cycles' as a heuristic framework within which to explore the change over time of the resilience of regions, or perhaps more appropriately key sectors therein. Four phases of adaptation and hence resilience are proposed, with each phase shaped by variations in the following characteristics:

- *Potential of accumulated resources available: inter alia* competences of individual firms, skills, hard and soft (business cultures etc) infrastructures
- *Connectedness*: patterns of relations, networks and collaborations between firms and agencies. Traded interdependencies (e.g. supply agreements) and untraded interdependencies (e.g. informal knowledge spill overs), informal and formal business associations, labour mobility between firms and agencies etc.
- *Creative and flexible responses*: innovative capacity of firms, new firm formation, entrepreneurialism, venture capital, institutional innovation etc.

As demonstrated in Figure 2, the cycle plays out through two potential loops:

- The emergence, exploitation and development and stabilisation of a growth path (*Reorganisation-Exploitation-Conservation*)
- Rigidification, decline and the opening up of new growth opportunities (*Conservation-Release-Reorganisation*)

Figure 2: A four-phase adaptive cycle model of regional economic resilience (Source: Simmie and Martin 2010: Fig 2. p.7)

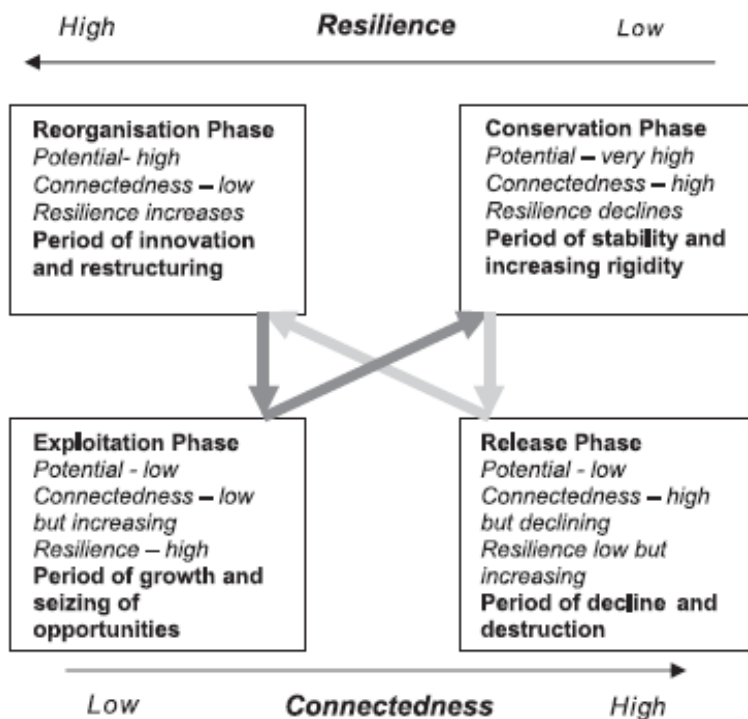
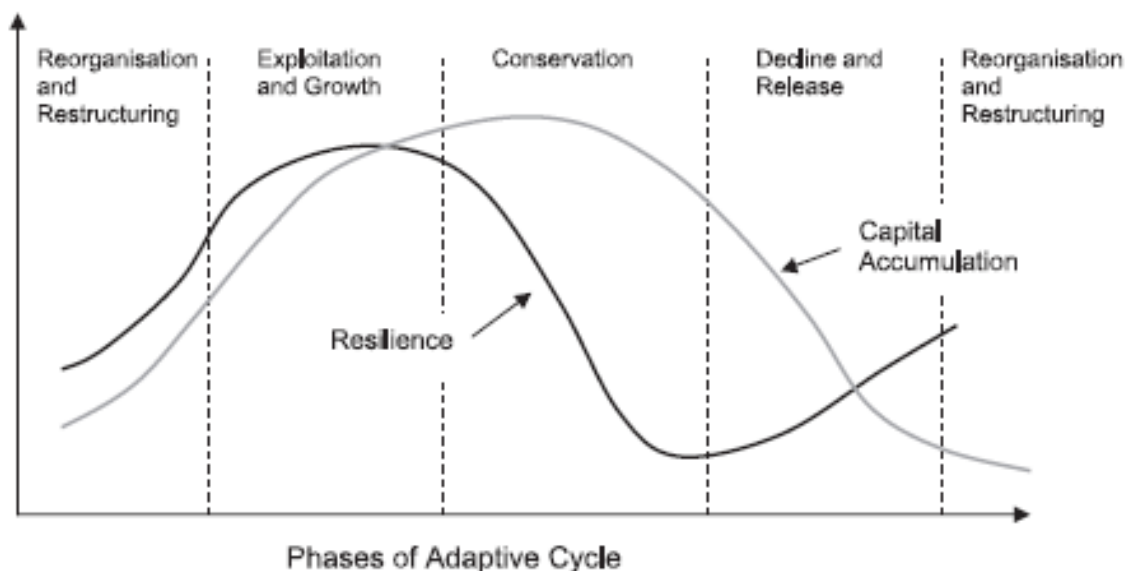


Figure 3: Resilience as a process: variations in resilience across the adaptive cycle (Source: Simmie and Martin 2010, Fig3 p.34)



The causal explanation behind the cycle is essentially one of growth and specialisation leading to increased connectedness and dependency between firms, agencies and other actors which eventually leads to a more rigid and less adaptive system and hence reducing resilience to a shock or longer terms structural decline (Figure 3). However, as decline takes place then relations once again

become looser, more diverse as part of a second release reorganisation loop which fosters innovation, experimentation, technological change and new growth trajectories – in part based on the reuse of previous skills, experiences and competences. As with previous attempts to develop cyclical notions of regional growth and decline, this approach is open to criticism by inferring an essentialist inner logic of the trajectories of regional development. Nevertheless, it remains worthy of consideration as a descriptive framework to explore and study local and regional dynamics, especially if it is applied at the sectoral or cluster level.

4. WHAT IS THE ROLE OF LOCAL AND REGIONAL STRATEGY?

If we are to develop an understanding of local and regional resilience based on evolutionary principles, then the foregoing discussion suggests that resilience is a dynamic process rather than an unchanging characteristic or a short-term outcome. This clearly has important implications for both industrial policy and local and regional strategies. Although the notions of local and regional resilience have created much debate within the academic literature, their applications into practical policy proposals have lagged. Indeed, given the embryonic stage of local and regional resilience thinking, nor should we expect to find any ‘off the shelf’ policy approaches at this stage.

On the one hand, in the face of the economic crisis, much attention has focused upon the ‘here and now’ of how local and regional policies have fared in helping places to either resist, mitigate or ‘snap back’ (Foster 2007 p.27). At the time of disruption of shocks, the role of institutional co-ordination and *political leadership* in mitigating and responding to the challenges has received considerable attention. Clearly, much scrutiny will be applied to the quantitative aspects of immediate challenges of fire-fighting job losses and other negative impacts. However, literally making sense of the moment with credibility and authority should not be underestimated in what can be confusing, uncertain and fearsome circumstances for people and places. Indeed, the OECD’s (2009) review of local and regional responses to the economic crisis identified how new forms of leadership and strategic thinking emerged, serving to reinvent and reposition notions of local development policies and practice. Whilst this notion of ‘leadership’ is clearly appealing, the OECD’s report failed to offer any convincing indication of the ‘how’ and/or ‘what works’ in these trends, over and above a series of standard principles. Even so, *political leadership* is clearly of paramount importance at the time of disruption or crisis. During such times, the cross-cutting challenges of adaptation and adaptability implies institutional co-ordination of multiple actors vertically across and horizontally between multiple spatial levels, from the supra-national to the local. On the other hand, with particular regard to industrial policy, evolutionary insights have suggested that the resilience of a locality at a time of crisis reflects a long term process of developing adaptive capacity and/or the fact that

adaptation in regional economies, especially in response to 'slow burn' challenges, may take years if not decades to play out (Simmie and Martin 2010; Pike *et al.* 2010). Therefore, there needs to be recognition that the adaptive capacity and adaptability of a locality or region is an ongoing process and one which may require on-going and longer-term policy objectives and strategies, including industrial development. This will also better engage the qualitative concerns of resilience by stepping back and reflecting on different ways out of predicaments, creating new pathways better able to stand a reoccurrence. However, if we are to accept the twin track approach of short and long-term policy perspectives, then it is probably not surprising that the emerging longer-term prescriptions connect, and often mirror, some well rehearsed approaches to local and regional development (Pike *et al.* 2006). A key task remains to capture the novel and the value-added in resilience thinking and to explore the extent it reflects more than simply the repackaging of existing strategies, approaches and measures in new language.

Whilst much attention has focused on the role of political leadership at the time of crisis, resilience thinking also looks to the role of *intelligent institutional leadership* in framing and articulating the nature of the event, crisis or slow-burn process and constructing a discursive narrative of strategic adaptation or adaptability able to enrol local and regional actors. Here then, both political and intelligent institutional leadership are required to integrate the 'here and now' as part of a longer-term perspective on the local and regional economy. Indeed, the OECD's recent international review of local economic leadership in response to the crisis suggests reports that:

'Initially concerns began with unemployment and home repossessions, but they then evolve into a concern for a more resilient local economy, and the longer term position of their local economy in future patterns of trade and innovation that are not yet visible.....many have also seen the crisis as an opportunity to embrace new strategic thinking about the future and to better align their long-term economic strategy with principles and values that research beyond the current or next business cycle, and focus instead on sustainable, adaptable, and more distinctive local economies in the future' (OECD 2009: 9, 14).

Using the contrasting case studies of the West Midlands Automotive cluster and Tuscany's machine manufacturing sector, Bailey *et al.* (2010) have tried to capture elements of this approach with the notion of 'place-renewing leadership' as a form of "public-private strategic leadership that empowers institutional or social forms of decision making to absorb and adjust (pro-actively and re-actively) to path breaking economic change". Bailey *et al.*'s (2010) analysis points to the importance of moving sectors or clusters to high-value added market segments and pro-actively fostering cross-sector fertilisation of activities. Similar analyses have emerged from studies which have looked to the renewal and redirection of clusters in old industrial areas, such as Styria and the Saarland (Trippel

and Otto 2009). All of which aligns to the perspectives developed in Figures 1 and 2 in terms of identifying appropriate moments in processes of change and finding ways of making 'key interventions' to support and guide an enabling environment for the development of new pathways of growth. Therefore, a central challenge for policy prescription is to continually foster adaptive capacity to support the renewal and 'branching out' of local and regional activities, even during periods of sustained growth. Notions of economic and industrial variety and the longstanding binary of specialisation versus diversification remain influential in discussions of what kinds of regional and local economies might be prone to adaptation or demonstrate adaptability. As already discussed, evolutionary Economic Geography has emphasised related and unrelated variety (Frenken and Boschma 2007), promoting its importance for 'constructing regional advantage' amongst EU policymakers (Cooke *et al.* 2006). This discussion also seems aligned with Simmie and Martin's notions of varying levels of connectedness and reorganisation in the adaptive cycle and the evolution of either stasis or adaptation in local industrial evolution. As such, Simmie and Martin (2010:13) ascribe Cambridge's resilience, in part, to its ability to "continually branch out of existing specialised industrial sectors."

However, insights into the processes of path branching and creation have, understandably, drawn most conceptual and empirical analysis from high performing regions possessing high levels of adaptive capacity. An important and unresolved issue remains as to how peripheral regions, faced with a variety of structural challenges, stimulate resilience through the development of path creation and branching (Christopherson 2009). Put another way, given the relatively weak levels of market-led R&D and adaptive capacity in peripheral regions, we argue that industrial policy activism remains a central, if overlooked, dimension of a resilience policy for peripheral regions.

The North East of England's recent Strategy for Success Programme, one of the largest innovation support programmes in the English Regions, was based on an explicit attempt to plug a long run market-failure in:

'...developing, based on existing strengths, leading expertise in the North East in emerging technologies for growing markets, and in the exploitation of those technologies' (Technopolis 2008 p.4)

In 2001, following a combination of foresight planning and international benchmarking of the region's existing research and industrial strengths, One NorthEast (Regional Development Agency) identified Renewable Energy as one five emerging technology areas to be prioritised for R&D and innovation support. This led to the creation of a dedicated not for profit centre of excellence – New and Renewable Energy Centre (NaREC) based around the development of internationally recognised

R&D, testing and commercialisation infrastructures. Drawing of the region's long history of offshore and sub-sea engineering skills and its proximity to natural and vast under-utilised former industrial sites (e.g. riverside yards with deep water access), the Strategy for Success programme aimed to provide an enabling environment to connect emergent technologies with potential regional strengths (Christopherson 2009). To date, the NaREC's project has attracted a range of flagship FDI R&D projects, including US-firm Clipper who have subsequently chosen the North East for the large-scale manufacture of the world's largest offshore wind turbine, Britannia, creating the prospect of 3000 jobs in the region's supply chain (Johnson 2010). Whilst clearly complimented, indeed vindicated, by its geographical proximity to the emerging market of the UK Government's vast North Sea wind farm designations, the Strategy for Success's technology-led approach is now also connecting to the the development of allied activities across the offshore wind value-chain, from knowledge intensive business services to infrastructure services.

A number of lessons can be drawn from One NorthEast's Strategy for Success programme, in particular its focus on renewable energy. First, the Strategy for Success adopted a long term, even evolutionary, perspective. At its heart was the integration of sophisticated foresight and horizon-scanning work with the mapping of existing, latent, even hidden regional assets - often jettisoned by previous waves of industrial development. During the 'reorganisation phase' (Fig 1.) of the adaptive cycle, both political and intellectual leadership was demonstrated by One NorthEast in both mobilising the 'enabling environments' for new path creation and attaining public-private support for hitherto novel technology fields, often a decade or more away from a market presence. In some ways, therefore, it could be argued that the North East was implementing elements of the recent *New Industry, New Jobs* policy programme a decade before the UK central government (BERR 2009). Second, and arguably necessary in a region with some of the lowest private sector R&D indicators, the Strategy for Success programme required large-scale and long-term funding, estimated at £131.7million by July 2008 (Technopolis 2008). The approach adopted with NaREC was highly capital intensive, driven by the acquisition and development of large scale – and ultimately world leading – laboratories and testing infrastructures. Third, it is questionable as to whether all five technology areas initially identified by the programme have yielded equivalent outcomes (Technopolis 2009). For example, during the course of the programme the focus shifted down to concentrate on three principle areas: Health; Energy; and Process Industries. Consequently, the extent to which it is practically possible to 'pick winners' is fraught with low-probability and high-risk, but nurturing the generic platforms and foundations for enabling environments appears central to resilience thinking. Fourth, NaREC was developed out of an explicitly regional industrial and R&D strategy. The Strategy of Success was built upon a degree of stability in regional institutional arrangements that allowed

the construction of knowledgeable staff and a reflective set of strategies and practices. Over time, this kind of 'institutional memory' and 'permanence' (Bailey *et al.* 2008) appears central to constructing and nurturing adaptive capacity in place (Pike 2002). Affording a degree of reflexive continuity in the ability of institutions in places to interpret and make sense of disruptive challenges is preferable to any simple reactive and/or 'off-the-shelf' response. It also demonstrates the importance of agency at the regional scale, adopting innovative special purpose vehicles – such a NaREC – to address the regional specific challenges and market failures. The case studies indicate leadership is not solely the domain of local and regional agencies and institutions, but can reflect a coordination of other public-private actors. Simmie and Martin's (2010) analyses of the resilience of the Cambridge economy highlights the important role played by the University in fostering commercial exploitation and science park development. Examples of cluster renewal in regions such as Styria reveal the central roles played by key firms and sectoral bodies, whilst Safford's (2009) study of Allentown (former US steeltown) points to the pivotal role of civic engagement and social capital within open and outward facing networks in developing joined-up city-wide resilience in responses to crises. Even so, for the North East - lacking many elements of adaptive capacity - the Strategy for Success demonstrates the enduring role for policy activism and agency in stimulating change and building resilience.

From the perspective of the English regions, the recent and proposed changes to the public sector raise worrying questions concerning about the ability of regions like the North East and West Midlands to cope with recession and forge more resilient economies. In part, the fate of these regions will be determined by decisions of central government, including plans to reduce the size of the public sector on an unprecedented scale, which will impact most heavily on those regions with larger than average shares on public employment. The ability of regions to respond to the consequences of these cuts – by growing high quality private sector jobs – will depend on judicious government interventions to identify and nurture sectors such as renewable energy using instruments such as those developed by One North East described above and manage large scale job losses such followed the closure of Rover in Birmingham (Bailey and Kobayashi 2008). If, as we noted above, vertical and horizontal coordination of multiple actors and focused leadership is the key to success, it is unclear how the Coalition government's plans to abolish RDAs and replace them with a multiplicity of Local Economic Partnerships will assist this goal. In short, the institutional capacity of the regions is being denuded at the very moment they need it most.

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