Cambridge Journal of Regions, Economy and Society Advance Access published March 18, 2015

Cambridge Journal of Regions, Economy and Society
doi:10.1093/cjres/rsv002

Crisis response, choice and resilience: insights from complexity thinking

Gillian Bristow and Adrian Healy

Cardiff University - Cardiff School of Planning & Geography, Glamorgan Building King Edward VII Ave, Cardiff CF10 3WA, UK, Bristowg1@cardiff.ac.uk, HealyA2@cardiff.ac.uk

Received on March 3, 2014; accepted on January 19, 2015

The recent global economic crisis has illuminated the need to open up the 'black box' which surrounds our understanding of the adaptive capacities of regional actors in the face of recessionary crises and how these relate to economic resilience. This paper contributes to this endeavour by developing a complex adaptive systems (CAS) framework for understanding who has agency within regional economies, how agency functions, and specifically what shapes how agents adapt, respond and react to crises. Using the case study of Wales, we draw on insights from CAS thinking to highlight the importance of conceptualising this agency in relation to the opportunities and capacity for action, and the co-evolutionary behaviour of agents within their regional contexts.

Keywords: resilience, agency
JEL Classifications: R10, R12, R58

Introduction

The post-2007 economic downturn has highlighted the vulnerability of many regional economies to international shocks, and drawn attention to differences between regions in their capacity to adapt accordingly (Davies, 2011; Fingleton et al., 2012; Gardiner et al., 2013). Indeed, one of the most striking features of the recent economic crisis in Europe is that in spite of its contagious nature and widespread impact, the diffusion of its effects has been highly geographically uneven (Martin, 2011). The crisis is recognised to have taken various forms in different national and regional contexts, with a number of studies highlighting the importance of contingent structural conditions in shaping the nature of its effects in different places. Thus, nations and regions with greater economic and political integration into global financial markets were hardest hit, as were those that had experienced greater reliance on foreign investments and exports (Davies, 2011; Hadjimichalis and Hudson, 2014).

This emphasis upon structural factors has also featured in the developing theorising around economic resilience, an increasingly prominent analytical concept and heuristic device for examining the capacities of local and regional economies to withstand and recover from economic shocks, and adapt their development paths accordingly (Martin, 2012). Thus, analyses of the determinants of resilience have tended to focus upon the structures of regional economic systems whether through understanding how inherited production structures shape the sensitivity of regions to recessionary shocks (Hill et al., 2011; Martin, 2012), or how these structures exhibit distinct phases of change in a manner akin to complex ecological systems such as panarchy (Simmie and Martin, 2010). While valuable in illuminating the path-dependent and evolutionary nature of regional economies, this system and structure emphasis has resulted in much less attention being paid to understanding the role of human agency in the adaptation at the heart of this conceptualisation of resilience (Bristow and Healy, 2014). This is problematic however. An overt emphasis on structures will inevitably lead to a focus on identifying generic features of resilient economic 'systems' and will ultimately tell us little about the means by which resilience can be achieved and, specifically, what actions and interventions might be critical (Pain and Levine, 2012). In short, resilience will have less traction analytically unless we can move to better understand *who* has capacity to adapt within regions and *how*.

The recent global economic crisis has thrown into sharp relief the need to open up the 'black box' of agency or 'the processes through which regional actors protected their regions from or responded to downturns caused by economic shocks' (Hill et al., 2011, 61). It has highlighted that when confronted with a broadly similar economic crisis or shock, policy makers in different regions and nations often respond in very different ways and at different speeds. In particular, as well as significant variations in the nature and timing of fiscal stimulus and austerity measures deployed across European nations, there is also evidence of considerable variation in the extent to which government responses have exhibited a regional dimension (Davies, 2011). This raises numerous questions about what shapes and constrains different crisis responses by policy makers, whether these responses are adaptive or transformative, and how these responses work to either 'nurture' or 'undermine' resilience (Cowell, 2013; Swanstrom, 2008).

Furthermore, the recent economic crisis has revealed that it is not just the agency of policy makers that is significant. The crisis has also highlighted the significant, often instrumental, role played by the strategic decisions and behaviours of businesses (Hill et al., 2011). When faced with a shock and falling demand, firms commonly respond in the short term by cutting back on employment in order to realise savings through reduced costs of personnel. However, there is increasing evidence that labour hoarding is a preferred strategy for certain firms depending upon their age, size, sector and geographical context (Holm and Ostergaard, 2014; Moeller, 2010). Moreover, other research suggests that the solidarity and altruistic behaviour characterised by firms within clusters provides an important social factor mediating coping strategies and ultimately providing greater resilience through crisis (Wrobel, 2013). This implies that agency does not simply reside with sovereign authorities or equate to narrow rationalities or entirely autonomous actions and behaviours. Human agency is both broad and distinct in the manner in which it can act to postpone or delay the effects of crisis, anticipate and recognise risks, and take positive, transformative steps to overcome (Davidson, 2010).

All of this suggests that if we are to understand what makes some regions more resilient to economic disruptions than others, then we need to understand how and why some regions and their constituent actors or agents respond more quickly and effectively in the face of economic shocks and take positive purposive action (Cowell, 2013; Martin, 2012), whereas other regions fail to adapt or act quickly in response to change (Hill et al., 2011). It also suggests the need to confront issues of choice and behaviour or, as Turner puts it, "to understand how different people actually make decisions in different circumstances" (Turner, 2012, 93). More specifically, it implies the need to better understand how and why the decisions and adaptive behaviours of different types of agents might vary spatially according to their particular economic, social and institutional contexts.

This is clearly a challenging task. The purpose of this paper is to contribute to this agenda in two main ways: firstly, to emphasise the need for and importance of understanding what agency is and what shapes how agents respond to crises and demonstrate adaptive agency; and secondly, to argue that in theories around complex adaptive systems (CAS), we have a promising conceptual framework and new way of thinking to help progress this agenda. The paper is thus intended to build on the conceptual work of those who have argued for an agency perspective on resilience (for example, Bristow and Healy, 2014; also Davidson, 2010; Skerratt, 2013). More specifically, it focuses on understanding how the choices and responses of agents are shaped within the messy complexity of real world spatial economies, and to reflect upon how this adaptive agency relates to economic resilience. It is thus exploratory in nature, but is intended to help enhance thinking about resilience and approaches to studying it, and to act as a stimulus to further debate.

The paper is now organised as follows. The next section explores the relevance of CAS thinking to regional economies and its implications for the conceptualisation of resilience. This is followed by a section that seeks to develop this thinking by considering critical questions around the meaning and role of agency in social systems such as regional economies. The paper then explores empirical evidence on responses to the recent economic crisis in the devolved region of Wales, to illustrate emergent patterns of adaptive behaviour in crisis responses and to explore how they have been shaped. The paper concludes by exploring what this means for our understanding of resilience, and establishes critical questions for further research.

Regional economies, CAS and resilience

CAS thinking is a broad body of work which recognises that the world is comprised of multiple, inter-related systems, whether physical, biological, chemical or social. These systems are characterised by complex non-linear dynamics and an adaptive capacity that enables them to re-arrange their internal structure spontaneously whether in response to an external shock or to some internal, self-organised criticality (Berkes and Folke, 1998; Beinhocker, 2007; Ramalingam and Jones, 2008).

CAS thinking has increasingly been applied to understanding regional economies and innovation systems, notably with an evolutionary biology inflection (Cooke, 2012). This has found qualified support for the relevance of key tenets of CAS thinking to the functioning and development of regional economies. Thus, for example, regional economies are increasingly understood to be characterised by non-linear and non-equilibrium dynamics where firms, institutions and their spatial contexts co-evolve (Boschma and Martin, 2010; Martin and Sunley, 2006, 2007). This non-linearity creates path dependence or local rules of interaction which means outcomes evolve as a consequence of the region's own history, but in an adaptive rather than deterministic form (Martin and Sunley, 2012). Regional economies also appear to exhibit elements of emergence whereby macro-level structures or patterns of behaviour such as cities and business clusters, arise endogenously and spontaneously out of the micro-level interactions of economic agents and their environment (Krugman, 1996; Martin and Sunley, 2012). Thus, "just as a living creature is more than the sum of the individual cells which make up its body, so the economy and society are more than the sum of the individuals who inhabit it" (Ormerod, 1998, x).

CAS thinking has also been utilised to develop understanding of regional economic resilience, or whether and how regional economic ‘systems’ respond to shocks and stresses. In contrast to the engineering conception of resilience which focuses on the resistance of a system to shocks and the speed of its return or ‘bounce-back’ to a pre-shock state or equilibrium, a CAS perspective leads to an adaptive, dynamic notion of resilience, defined as the capacity of a regional economy to adapt to the changing technological, market and competitive pressures and opportunities facing it (Cooke, 2012). Regional economic resilience from this perspective is conceived as a multidimensional property embracing not only *recovery* from the shock and *resistance* (the ability of regions to resist disruptive shocks in the first place), but also *re-orientation* (the extent to which the region adapts its economic structure), and *renewal* (the degree to which the region resumes its pre-shock growth path) (Martin, 2012).

This developing conception of resilience, and its theoretical and political implications, has become the subject of increasing critique however. In particular, CAS theorising has been criticised for its tendency to naturalise shocks and change with MacKinnon and Driscoll Derickson (2013, 258) arguing that “both the ontological nature of ‘the system’ and its normative desirability escape critical scrutiny.” Welsh (2014) articulates similar concerns over the tendency for an adaptive conception of resilience to reify the adaptability and flexibility of agents *to* the system and ignore the wider political and economic relations impacting upon regional outcomes and positioning. This, he argues, carries the attendant risk of creating resilience discourses which are situated in and help reproduce broader neoliberal practices of self-organisation in response to uncertainty and change. It is also increasingly apparent that there is no clear consensus as to how resilience should be defined and assessed, such that it is regarded by some as “self-evidently common sense and yet conceptually and programmatically elusive” (Pain and Levine, 2012, 3). Fundamentally, this reflects a tendency to conflate and confuse resilience as a performance outcome, an adaptive capacity or process, and an agenda (Bristow and Healy, 2014).

As a counter to this critique however, others argue that CAS theorising does not in and of itself give a justification for neoliberalism or particular political ends. In particular, several authors have argued that resilience cannot be treated as a necessarily desirable concept especially where resilience capacities are associated with outcomes which are not progressive or transformative (Bristow and Healy, 2014; Pain and Levine, 2012). Similarly, in a detailed exposition of the potential utility of complexity science to international development policy and humanitarian aid, Ramalingam and Jones (2008) argue that complex social systems are likely to be characterised by a whole range of emergent structures and patterns, some of which may not necessarily be ‘good’ for all individuals who are part of them. Critically they assert that understanding the different goals, strategies, interests and political trajectories of human agents in different settings is key to understanding their emergent properties in complex social systems. In terms of understanding regional responses to economic shocks, this implies the need to blend what CAS theories tell us about agent behaviour in complex systems, with what we know or are beginning to understand about the economic decision making of human agents. It is to this that this paper now turns.

Conceptualising agency

The who and what of agency

Recent debates have begun to enhance our understanding of both what agency is and who has agency within regions. Contributions within the field of labour geography, specifically in relation to the terms of engagement of place-based workers with global capitalist relations, have taken significant steps towards conceptualising agency as a dynamic and yet highly contingent process. Coe and Jordhus-Lier (2011), for example, define agency as intentional, purposeful and meaningful actions or strategies that work to shift the capitalist status quo in favour of workers. They argue that labour agency has a number of spatial and temporal aspects and as such, always needs to be understood in relation to its context-specific relationships with the state, community and labour market intermediaries. Similarly, in a study of workers in Glasgow, Cumbers et al. (2010) identify agency as contingent upon particular circumstances and processes in time and space, but argue that workers are neither necessarily victims or pawns in relation to capital. In focusing on the daily struggles of workers and their families to ensure their own social reproduction, they instead distinguish between the prosaic, everyday mechanisms through which people simply 'get by', and activities which allow people to create independent spaces free of subordination to capitalist social relations. Importantly, they establish that this agency need not necessarily always be defined in response to capital's strategies. Furthermore, they point to the decline of social agency around the workplace and a greater emphasis upon the household, identifying the increasing variety of creative strategies to sustain and enhance overall household incomes.

There are clear parallels to be drawn between these studies and the CAS perspective on agency, although CAS thinking yields valuable additional insights. In particular, in complex systems, agency is conceived as a recursive process of adaptive behaviour with agents reacting to both internal and external stimuli including each other and the wider system. Thus, adaptive agency is not simply confined to purposeful action to transform the system or change the status quo or an autonomous response to an external shock or crisis, but is essentially the dynamic capacity that actors have to adapt to changes in their environment and the behaviour of others. They may of course choose not to adapt and to resist change. The critical point is that the adaptive nature of their agency and its potential for transformative outcomes will depend, in part at least, upon the assessment they make of the threat to their survival posed by the changing environment and the responses of others (Senge, 1990).

As such, the scope for adaptive agency is highly contingent upon a complex mix of context, environment and local norms (Berkes and Folke, 1998). In social systems such as regional economies, the inherited socio-spatial structures of the social and economic environment provide the overarching constraints upon action. Thus, as suggested by Giddens (1984) in his structuration theory, structures shape agent behaviour and are in turn moulded by their decisions. Furthermore, these are shaped by context with different regions having different 'opportunity spaces' (Swanstrom, 2008, 4), that is, different economic, legal and institutional conditions which expand or constrict the opportunities for actors to respond. This leads us to recognise that even if the ways by which agents respond to crisis are similar, their means and effects are likely to be mediated by the unique contingencies of context and the path dependencies of previous decisions. As Ormerod (1998, 182) puts it, "even if individual rules of behaviour are known exactly, the resulting behaviour of the system still cannot be predicted and controlled in a precise manner".

CAS thinking also suggests that while all individuals in the system exhibit this adaptive agency, groups or teams will tend to act as the fundamental learning unit and driver for behavioural responses (Senge, 1990). Thus, while CAS are made up of hundreds of autonomous agents with the freedom to make any number of choices for action in response to any particular event, they tend to appear collectively highly organised and behave in an almost 'herd-like' manner (such as crowds in a football stadium). Ormerod (1998) illustrates the relevance of this to economies using the example of consumer behaviour at Christmas. When a new product is released on to the market, consumers do not know in advance whether they will like it.

People have to learn what their own preferences are, and the choice of any individual is influenced powerfully by the opinions and actions of others. Thus "popular toys or films become even more popular precisely because they are popular" (Ormerod, 1998, x). Powerful group forces also emerge through group-centred goals and behaviours, not simply imitation (Akerlof and Shiller, 2009).

Adaptive agents' behaviour within a system has been characterised in a number of ways (Ramalingam and Jones, 2008). Some adaptive agents will be 'weak' and simply react to environmental conditions, while others will be 'strong' and be both reactive and goal-oriented. This will reflect their information processing and decision-making capabilities as well as their sense of time, available opportunities, choice and risk (Davidson, 2010; Pain and Levine, 2012). Other strong agents may also seek to plan or exert control over the environment. Strong agents will tend to have beliefs, desires and intentions that influence their plans for future behaviour. As such, they are more capable than weak agents of attempting to carry out purposeful, goal-oriented behaviour (Ramalingam and Jones, 2008). In turn, strong agents may constrain the choices and actions of weak agents through their control of knowledge and resources, and their resulting capacity to exert influence through unequal and contested power relations (Haas, 1992; Pain and Levine, 2012).

The co-evolution of agency

Perhaps the most significant value of the CAS perspective is indeed in its insight that it is the *interaction* between agents (and groups of agents) which is critical. It is agent interactions which create the self-organised criticality or highly adaptable state of a complex system (Bak, 1996). It is acknowledging and understanding these interactions which, perhaps constitutes the biggest step forward in our understanding of regional economies and their adaption processes, and, ultimately, the biggest challenge for empirical research. The agents are co-evolving, constantly adapting to each other and to their environment such that their optimal outcomes are interdependent and dynamic—their choices influence each other and they depend on each other's success (Eidelson, 1997). In this co-evolutionary process, "the adaptive landscape of one actor heaves and deforms as the other actors make their own adaptive moves" (Kauffman, 1993, 238).

Analysing and understanding these dynamics is clearly challenging not least because complex systems function through the interaction of complex agent behaviours operating at different scales and time frames and not through one-way causal relationships. These behaviours have powerful feedback effects, such that understanding how they work to reinforce or counterbalance one another to affect patterns of agency becomes critical to understanding the capacity to respond effectively to challenges (Senge, 1990). Crucially, however, these interactions and patterns of agency are often most clearly discernible after a substantive instability. System wide shocks provide a critical disjuncture around which changes in patterns of behaviour are most readily distinguished (Eidelson, 1997). Moreover, disturbance "has the potential to create opportunity for doing new things, for innovation and development" (Folke, 2006, 253). This suggests that enquiries into agent responses to crisis should look to identify the sites at which opportunities for new or 'mutant' agent behaviours and system dynamics are generated (Davidson, 2010). Global economic shocks thus appear to provide an opportune moment to discern patterns of agency and their interdependencies within regions in comparative context.

In terms of regions, it is thus the interactions, ostensibly the social relationships between economic agents, which become crucial in understanding how shocks play out and whether and how adaptation occurs. Human behaviour is intrinsically influenced by contagion effects or the behaviour of those that we are in contact with, typically our family, friends and colleagues (Ormerod, 2012) and as such, it is increasingly recognised that when it comes to economic matters "our decisions depend on the responses of others and on what we anticipate these responses will be" (Kay, 2010, 139). This collective context is one reason underpinning the non-linearity observed in social systems. It also explains the importance of our expectations of the future and how these can be informed, shaped and reinforced by those around us. How economic agents narrated the global economic crisis, for example, played a critical role in mediating its effects (Akerlof and Shiller, 2009). The behaviour and decisions of key forums of collective agency, whether firms, workers or the state, thus has to be understood in relational terms and with respect to their networks in all their manifold complexity, connectedness and spatial variety (as Dicken et al., 2001).

In terms of what shapes these co-evolutionary interactions between groups of economic agents, it is the cultural and communicative resources governing patterns of agency that are important. Critically, these interactions are guided by human rules and norms which, owing to the constraints of limited information and following insights from behavioural economics, effect bounded rationality in decision making. In addition, bounded willpower acknowledges that agents at times find it difficult to make decisions that will benefit them in the long-term. As such, heuristics, framing and loss aversion shape the choices and decision-making methods of economic agents and influence the choices of those around them (Thaler and Sunstein, 2008).

These heuristics tend to be shared and shaped collectively within local contexts. The network view of the world articulated through a CAS perspective inherently gives rise to the concept of collective action and behavioural influences. If a set of rules spread across a network, the behaviour of the individual component parts is influenced by these emergent, collective rationalities for action. The spread of culture and attitudes in places can therefore be just as, and possibly even more important, than standard economic considerations in accounting for particular problems such as entrenched patterns of worklessness and inactivity (Ormerod, 2012). Human behaviour is, in part at least, shaped by social influence (where our behaviour conforms to group norms), and social learning (the level of evidence available to us, how we learn from each other and from our mistakes). Yet all too often in regional research and policy action, the importance of the dominant 'mind set' and its critical role in stifling or fostering the formation of a reflexive culture capable of promoting strategic goal-oriented behaviour has been overlooked (Amin, 1999).

CAS thinking asserts that in the case of weak (reactive) agents, their adaptive behaviour will be driven entirely by the interactions with other actors. For strong (cognitive) agents, interactions may still be important but their internal cognitive structures, beliefs and perceptions of opportunities and risks will also be significant in influencing their adaptive behaviour and that of others (Ramalingam and Jones, 2008). This suggests that the presence of strong actors plays a critical role in shaping the social norms and rationalities for action influencing agents' behaviour in regions. It also reinforces the importance of the narrative and communicative tools used by policy makers and others to frame events and changes in the environment, influence expectations about future opportunities and risks, and cultivate collective actions (Kay, 2010). Furthermore, these framings become all the more important in times of crisis and in the development of collective responses. Crises are likely triggers for new or alternative behaviours although, critically, these will be shaped by the dominant ideas circulating between agents at the time. As Friedman (1962, 2) states "only a crisis – actual or perceived – produces real change. When that crisis occurs, the actions that are taken depend on the ideas that are lying around".

Crisis responses and adaptive agency: evidence from Wales

This paper now explores empirical evidence from Wales on the nature of adaptive agency in an economic crisis and its shaping by powerful social norms, socio-spatial context and co-evolutionary behaviour by firms, households and policy makers. This evidence is derived from a study examining territorial resilience, with data drawn from a series of interviews with policy makers, business representatives and other stakeholders, and from a detailed synthesis of secondary data, policy and other documentary evidence. We focus on understanding adaptation in terms of employment responses to the recent economic crisis since this provides a clear point of connection with debates around place-based agency (see the previous section) and labour market adaptations. It also provides a clear focus for interrogating the role of co-evolutionary behaviours of economic agents in constituting each other's activities and choices. This inevitably provides only a partial picture of adaptive responses to the crisis in Wales, but nonetheless provides an important contribution to both opening up adaptive agency in crisis responses, and developing the more localised and qualitative approach to resilience that researchers have called for (Evans, 2011). We begin by briefly summarising the evolution of the region's economy to establish its critical path dependencies, inherited economic legacies and socio-spatial structures.

Context

Wales is a devolved region in the UK with a population of just over 3 million people (5% of the UK total). It is often referred to as one of the constituent nations of the UK (alongside England, Scotland and Northern Ireland) because of its distinctive culture and language. The Welsh economy has always been significantly embedded in and shaped by the UK national economy, not least because of the strength of the economic and trade relationships across its border with England. Indeed, arguably 'Wales is not an economy' inasmuch as the economies of north and south Wales are not integrated with each other but rather are each functionally connected in east–west links to neighbouring English regions.[1] Wales is nevertheless characterised by a distinctive set of economic characteristics and challenges.

From the mid-1970s, Wales has faced massive de-industrialisation with a continuous decline in heavy industry, culminating in the virtual disappearance of coal mining in the 1980s. Owing to its high dependence upon manufacturing, the early 1980s recession had a bigger impact in Wales than in other parts of the UK: between 1979 and 1982, Wales lost 130,000 jobs and the employment rate fell to 62%. Recovery also started later in Wales, and structural changes left a legacy of high unemployment and economic inactivity among older men, especially in the South Wales Valleys (Beatty and Fothergill, 2011). However, Wales has considerable capacities for self-determination having had its own devolved government with limited (but progressively expanding) powers over economic development since 1999. Devolution was intended to capture the economic dividend widely perceived to ensue from the decentralisation of power and the capacity to develop more regionally attuned economic development policies through a distinctively 'Made in Wales' approach (CBI Wales, 2002). As such, one of the most distinctive strategic developments of the early period of the Welsh Government was its decision to execute a 'bonfire of the quangos' and democratise the Welsh Development Agency (WDA) by bringing it under Welsh Government control. This has been widely critiqued as promoting a period of debilitating institutional churn within the region and signalling the onset of a more statist, precautionary and risk-averse approach to economic development policy (see Bristow, 2013).

One of the most defining characteristics of the Welsh economy when looked at in an evolutionary perspective is its enduring dependence on external and often cost-sensitive investment. This continued throughout the post-war period and the decline of coal and steel, with Wales securing significant UK public and private investment to update and modernise its industrial equipment (Matthias, 1969). It also continued in the period of de-industrialisation in the 1970s and 1980s when Wales secured more Foreign Direct Investment (FDI) than any part of the UK as a result of its relatively low wages and attractive packages of business support provided by the Welsh Development Agency (WDA). Between 1979 and 1991, Wales attracted 14% of all FDI flowing into the UK, and by 1992 30% of all Welsh manufacturing employees were working in foreign-owned plants. As a consequence, the Welsh economy grew faster than any other part of the UK between 1986 and 1990 (Welsh Affairs Select Committee, 2013). The foreign-owned plants were, however, typically highly footloose, capital-light operations which were highly mobile and indeed, during the 1990s this investment progressively left Wales as falling transport costs and the opening up of new markets in the expanding European Union, made the region a less attractive investment opportunity. Whole manufacturing plants moved away as manufacturers searched for cheaper locations such that by 2009, Wales had fallen from the best to the worst-performing region for attracting inward investment (Welsh Affairs Select Committee, 2013).

A further defining feature of the Welsh economy's evolution is the extent to which it is becoming less rather than more diversified over time. This is evident particularly in terms of traded exports where a steady decline in exports among relatively light manufactured goods has been compensated for by rising exports of heavy engineering and manufactured goods, particularly power-generating equipment and iron and steel (NEF (New Economics Foundation), 2013). Wales still suffers from an earlier prior dependence upon a limited set of heavy and extractive industries—the so-called 'fatal nexus' of coal, steel and iron—albeit that this dependence is now much weaker. Moreover, these exporters are typically owned by companies outside of Wales. As such, Wales' relative success in exporting has not translated directly into increased domestic capacity to invest. Furthermore, the economy has increased its dependence upon the public sector (through attraction of European structural funding and major public sector employers), which now accounts for over one-third of all jobs. With low activity rates and a high-dependent population, the Welsh economy is now heavily dependent upon fiscal transfers from the UK national government with a higher dependence on the welfare state than any other part of the UK (NEF (New Economics Foundation), 2013).

This is reflected in overall prosperity levels. Wales has witnessed the long-term decline of its per capita Gross Domestic Product from around 85% of the UK average in the late 1980s to around 80% by 2000. Using Gross Value Added (GVA),[2] Wales entered the recent economic crisis as the poorest region within the UK. Indeed, by 2011 Wales's GVA was 24.8% below the UK average. In 2011, Welsh output was 44% lower than that of London with GVA per head in Wales standing at £15,696 compared to a figure of £35,638 in London.

Arguably, the relatively low level of GVA per capita in Wales is not surprising given its lack of large cities or substantial economic agglomerations, a demographic profile characterised by a high (particularly elderly) dependent population and the relatively low skills base of the workforce.[3] Indeed, various reports and studies during the period leading up the crisis highlighted the persistent problem of low economic activity rates, and lower skills and productivity levels in Wales (for example, Hudson, 2008; Welsh Assembly Government Economic Research Advisory Panel, 2006). Thus, the crisis hit an economy already facing the considerable challenges associated with the legacy of industrial decay and decline and the need to re-skill and revitalise many of its communities.

Crisis responses

The recent history of economic decline in Wales is such that the post-2007 crisis arguably had a less devastating impact on the psyche of many of those living and working in Wales than might have been the case for other European regions. This is indeed supported by evidence on the impact of the recession on the former coalfield community of Gellideg in Merthyr Tydfil. One resident, when asked about the impact of the current recession replied "Recession, what recession? Economic and social depression is a constant state of life here" (Day, 2009, 10), reflecting the community's ongoing struggle with generational unemployment. This sense that communities and households entered the current crisis somewhat inured to recessionary shocks is such that a representative from the Welsh Government observed "this hasn't felt like a big crisis. There hasn't really been a big external shock that has led to a seismic change in people's attitudes or behaviour. The change is incremental. There has been gradual adaptation and adjustment with no big correction in house prices or change in expectations. People here are a bit desensitised to recession".[4] As such, economic crisis and dependency upon external support or public subsidy have become something of a normalcy, creating a context within which the adaptive agency of households and communities is distinctively weak and ostensibly reactive.

Furthermore, there is evidence that household agency has been shaped by co-evolutionary interactions with firms and policy makers. The most distinctive feature of the recent economic crisis compared to previous crises in the UK has been the differential performance of employment and output. While UK output fell by 6% between 2008 and 2010 (which represented a performance markedly worse than in past recessions), the loss of employment was much smaller at some 3% of the initial level. Furthermore, the period over which employment fell was much shorter than in the past (Gregg and Wadsworth, 2010).

There is evidence that this pattern of labour market adjustment has been significantly more pronounced in Wales than any other part of the UK. Sensier and Artis (2014) demonstrate that the employment cycle in Wales entered recession 1 year earlier than other nations in the UK in 2007, and emerged from the recession in 2009 before Scotland in 2010. While employment fell by 2.3% over this period, there is clear evidence that this fall in employment was significantly tempered by the strategies deployed by businesses, households and policy makers during this period. Instead of redundancy, there was an increase in part-time working and acceptance of reduced, or zero hours contracts as well as lower rates of pay. Total annual pay fell by 8.1% in Wales between 2007 and 2012, compared with a 7.5% fall across the UK as a whole (TUC, 2013). Moreover, underemployment rose to an unprecedented scale—a measure of the number of people who want more work than is available to them—indicative of both a fall in real wages and reduction in hours available. Underemployment as a percentage of the workforce is higher in Wales where in 2012 an estimated 134,000 people desired longer working hours (Bell and Blanchflower, 2013).

The Welsh Government played a key role in establishing a strategy and norm of employment retention as a response to the crisis and spreading this across all economic agents through its consensual politics and institutional leadership. A policy of labour subsidies was one of the outcomes of a series of eight Welsh Economic Summits facilitated by the Welsh Government in the wake of the economic crisis. These were intended to involve a breadth of stakeholders from local authorities, businesses, social partners and community representatives, in the development of crisis responses. The Welsh Government's ReACT II initiative was launched in the immediate aftermath of the crash. The original ReACT scheme, developed in utilised part-funding from the EU to assist newly employed individuals looking to retrain. However, in 2008 the emergency Economic

Summits led to the creation of ReACT II. The enhanced scheme provided grant support to employers taking on recently unemployed individuals, with funding provided to support the new employees' wages for 4 months (up to £2080), and pay for training over a 6-month period. Nearly 16,000 people subsequently entered the scheme, with 11,000 leaving at a cost of £24 million (CRG, 2008).

More innovative was the ProAct initiative, also launched in October 2008. This provided part-funding for businesses that had introduced short-term working for employees, the expectation being that once economic conditions improved, they would benefit from the retention of skilled workers and their specific on-the-job knowledge. It offered support for training costs of up to £2000 per individual, along with a wage subsidy for up to 12 months of up to £2000 (£50 per day) per individual during training. This focus on training meant that workers remained engaged with the workplace. Some 10,675 employees were supported under the programme at a cost of £27 million and are widely regarded as having worked well in Wales (Cambridge Policy Consultants, 2011).

There is strong evidence to suggest that, firms across a range of business types, sectors and parts of Wales took on board this approach to employment retention in that they have exhibited a much stronger inclination to hold onto workers through this crisis rather than lay them off or make them redundant. A survey of all local authorities across Wales in the midst of the crisis found evidence of labour hoarding across many businesses and authority areas (WLGA (Welsh Local Government Association), 2009). There were a number of reasons identified for this behaviour. For many firms, the shake-out had already happened prior to the crisis (WLGA (Welsh Local Government Association), 2009)—further evidence of the important influence of previous crises and their legacy effects. Local authorities however also reported that initially, greater dependence on public sector employment in Wales shielded the economy from the recession and provided a degree of stability and confidence through it. Furthermore, in the midst of the crisis, very few local authorities cut back their own employment to any significant extent and many stressed that proposed reductions in headcount could be achieved through natural wastage rather than redundancy. Many posts were also protected by virtue of their being in service areas such as regeneration and economic development which were on fixed-term, funding-related contracts. It is likely of course that this picture will have changed subsequently as austerity measures have required more substantive public sector contraction.

There is also some evidence of labour hoarding particularly in small and micro-businesses which are becoming more of the mainstay of many local economies across Wales (WLGA (Welsh Local Government Association), 2009). Membership organisations reported that small and medium-sized enterprises (SMEs) tended to hold on to labour through this crisis although this needs to be corroborated by firmer survey and quantitative evidence.[5] Indigenous firms and independents, particularly important to the economies of many small market towns and rural parts of Wales, also demonstrated a strong tendency to pursue business strategies defined more clearly by the objectives of stability and mid- to long-term survival than expansion or growth. For many of these firms, their strategies for sustaining employment through a crisis are premised upon the close-knit working relationships they have developed with their local populations. Here, strong social ties exist between communities and local traders who are seen as playing vital role in providing a service and contributing to local economic vitality. Their dominant values are thus defined in terms of an appreciation of their autonomy, a high degree of attachment to place and an emotional investment in both workers and the local community (Heley et al., 2012).

Perhaps not surprisingly in this context, workers in Wales appear to have been much more inclined to take pay cuts and accept reduced working hours during the crisis than become unemployed. With an already challenging labour market and crisis-induced austerity measures leading to significant changes in welfare provision, they appear to have had little choice in this regard. Survey data collected as part of the 2012 Skills and Employment Survey further supports the evidence that workforce reductions have been much less prominent in Wales than the rest of the UK and that employers in Wales have responded differently to the crisis. There is also evidence that Wales has exhibited the highest rate of increase of any UK region in the perceived costs associated with job loss, leading many workers to report that it would be difficult to find alternative employment. As a consequence, staying in 'any' job is preferable to no job at all. Notably however, workers in Wales reported significantly higher levels of confidence about their prospects of job security with only one in five expressing a belief that there was some chance of them losing their jobs in the foreseeable future, compared with one in three workers in London and the South East (Felstead et al., 2013).

What is clear however is that employment responses to the crisis in Wales can be characterised as a short-term, reactive form of coping—trying to maintain or quickly recover existing levels of employment and job security (if not household income)—rather than develop more progressive or transformative strategies for change. All economic agents have demonstrated weak agency in this regard. This argument is lent credence by the Welsh Government's strategic shift from 'green' and low carbon economic development agenda to one more pragmatically accommodating all energy development (including nuclear power, new gas power stations or other fossil fuel facilities). Spending cuts and the crisis have conspired with prevailing precautionary imperatives to propel greater emphasis upon the immediacy of a job dividend than progress towards its longer-term sustainable development obligations and aspirations. The trade-offs between economy and environment undoubtedly 'bite a bit more in the crisis'.[6] Clearly, of course, small, transformative change could be in place but is difficult to see as yet, making longer-term evaluation of crisis responses an important imperative.

Discussion and conclusions

This paper has sought to develop a CAS perspective to understand how agents respond to economic crisis within regions. It has argued that a CAS perspective provides a useful framework for understanding change processes in regional economies and, in particular, understanding the nature of collective agency in the messy complexity of regional economies and the significance of understanding agency as a recursive, adaptive notion relating to the opportunities and capacity for purposeful action, as well as understandings of available choices and risks of agents in their co-evolutionary and path-dependent context.

This plea for a greater appreciation of the importance of agency in processes of regional economic adaptation and change is manifestly not new, and scholars developing the institutionalist paradigm in regional development in particular have long asserted the importance of understanding the social foundations of economic behaviour, particularly in its collective forms. Thus, for example, in 1995 Storper (Storper, 1995, 49) emphasised the importance of understanding how "reflexive collective action unfolds" in regional economies. Furthermore in 1999 when emphasising the critical need for policy communities to develop "the ability to evolve in order to adapt" (1999; 372), Amin highlighted the central importance of "the ability of actor-networks to develop an external gaze and sustain a culture of strategic management and co-ordination in order to foresee opportunities and secure rapid response".

However, CAS thinking is particularly valuable in illuminating the importance of co-evolutionary behaviour and choices in shaping adaptive agency within regions in response to crises. It helps illuminate how crises and change processes are mediated collectively by agents and their interactions both with each other and their context, and how these are shaped by past choices and prevailing norms and expectations. As such, it provides a framework which is less static and linear to explore the interactive effects and drivers of change within regional economies. We utilise the case of Wales—a devolved region which is continuing to display the legacy of de-industrialisation—to highlight how CAS can be deployed to understand crisis responses of agents and their contingent, co-evolutionary development. We focus on employment responses to the recent economic crisis by households, firms and policy makers and argue that these responses have co-evolved in a distinctive way. The historically weak positioning of the region in economic and political hierarchies, its legacy of industrial decline, its dependency culture and its fledging and increasingly less diverse yet consensual institutional capacities, appear to have worked together to create a dominant short-term, reactive form of agency—one characterised as 'getting by'—rather than a more reflexive interrogation of the desirability of the status quo and the need for and means of pursuing longer term, more transformative change.

This in turn provides for important critical reflections upon the concept of resilience. The case of Wales usefully highlights the adaptive capacities of the region's actors in the short term when confronted with an economic crisis inasmuch as it reveals their ability to find ways of coping with ongoing economic change and maintaining job security. However, this does not necessarily provide evidence of resilience inasmuch as these skills in adapting or coping in the short term do not necessarily provide future resistance to crises and/or success in improving economic and social outcomes over the longer term. In this regard, it implies the need to distinguish more carefully between the short-term adaptive capacities of populations in a region and the longer-term resilience of their production and livelihood systems. Neither does it remove the importance of understanding the political economic realities and institutional landscape out-with the region which frame agents' scope for action. As such, it implies the need to better understand the interactive effects and drivers of adaptive capacities and resilience at multiple levels.

All of this indicates that further detailed empirical work is required in a number of key areas. Firstly, there is a need for more analysis to relate the evidence garnered on the agendas and adaptations to the crisis reported here, with detailed analysis of the resilience of the economy in performance (for example, output) terms (Bristow and Healy, 2014). The Welsh case also raises questions about what is needed to ensure that co-evolutionary adaptive responses become biased towards proactive rather than simply reactive responses. While the labour subsidies supported by the Welsh Government appear to have been valuable in encouraging employment retention through the crisis, questions surround the extent to which they have encouraged businesses to engage in long-term adaptation to the changing contours of the global economy. Similar labour subsidy schemes have been deployed in other European nations and regions, such as in Germany. Cross-comparative work on the effects of these schemes and how these have played out in different socio-spatial contexts and with different policy framings, mind sets and crisis narratives (for example, whether as more long-termist approaches rather than short-term stop-gaps), would be interesting, as would more critical reflection on the terms on which localism is being mobilised in contemporary political discourses around austerity.

Notwithstanding this, CAS thinking usefully highlights how adaptive agency functions in complex systems and its significance in mediating crisis effects. It also opens up new possibilities in thinking about both the challenge of, and the potential for, effecting more transformative change, highlighting the need for analysts and practitioners alike to better understand the complex and contingent web of interrelationships and interdependencies in regions through which adaptive agency plays out.

Indeed, the evidence here does suggest there is value in exploring co-evolutionary patterns of agency in crisis responses in regions. There does appear to be strong evidence from this case study that firms, workers and policy makers develop co-evolutionary responses as they learn about the crisis and its effects, undertake formal and informal dialogue with each other, and learn from the experience of past crises and policy experiments. Clearly there is more work to be done in unpacking the nature of these relationships, establishing exactly how they unfold, the critical networks at play and, more especially, the factors which enable the development of positive collective mindsets, and purposive, goal-oriented adaptations which build transformative resilience as well as perhaps greater understanding of when, where and why agents are non-adaptive and resistant to change. This represents an exciting research agenda and it is hoped that this paper has, in part at least, contributed to opening up this task.

Endnotes

[1] Interview with Welsh Government (BETS), 24 January 2013.

[2] GVA is the value generated by any unit engaged in a production activity. It is measured at current basic prices, excluding taxes (less subsidies) on production. GVA plus taxes (less subsidies) on production is equivalent to Gross Domestic Product.

[3] Interview with Welsh Government (BETS), 24 January 2013.

[4] Interview with Welsh Government (BETS), 3 April 2013.

[5] Interview with the Federation of Small Businesses in Wales, 13 May 2013.

[6] Interview with Welsh Government (BETS), 24 January 2013.

Acknowledgements

This research was supported by the ESRC under its Open Research Area programme (ES/I014667/1). The authors are also grateful to the editors and referees for their insightful and helpful comments.

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