Challenging Peripheralising Discourses: Using Evolutionary Economic Geography and, Complex Systems Theory to Connect New Regional Knowledges within the Periphery

Introduction

The persistence of large spatial inequalities between wealthy and poor regions has developed its own particular forms of research enquiry. Peripheralisation is emerging as one means of looking at regional inequalities. This paper contributes to studies of Peripheralisation by asking whether examining peripheral regions as Complex Adaptive Systems (CAS) can help to challenge peripheralising discourses by operationalising the agency of people in individual peripheries. I argue that CAS thinking from Evolutionary Economic Geography, can help to do this by conceptualising the ways that knowledges flow within peripheral regions. This makes it more visible how peripheralising narratives can become reproduced or challenged. Within this paper, 'knowledge' has a double meaning and is laden with power. On the one hand, it relates to the types of knowledges 'known', the representations of 'truths' created about a place and who knows and shapes these truths (see Foucault 1998; Massey 2005). On the other and as discussed below, knowledge relates to 'know-how' within economies (Bristow and Healey 2018). As Shearmur (2012) explains, this rests on a version of 'innovation' which privileges city economies and ignores more traditional forms of know-how (Bruckmeier and Tovey, 2008).

Intrinsically Peripheralisation emphasises the ways in which spatial knowledges are produced by the people who live and work within them (Soja 1996; Massey 2005; Cresswell 1996; Hetherington 2008; Sibley 1995), and the discourses and narratives through which such places are imagined by both residents and non-residents. Frequently Peripheralisation studies rely on a form of Foucauldian discourse analysis (Eriksson 2008; Jansson 2003; Plüschke-Altof 2017;

Meyer et al. 2016). Going beyond the particular speech acts that are used to discuss the region, these studies extend to the institutions, organisations and practices which congregate around particular statements about the peripheral space. This paper will build on the work of Willett (2016; Willett and Lang 2018; Willett 2019), analysing Peripheralisation through complex systems and affective theories derived from Deleuze and Guattari's (2004) use of Spinoza. Willett explores how the emotional responses and resonances evoked in peripheral productions of place can challenge peripheralising narratives. What these differing approaches share is a commitment to understanding how peripheries are perceived by persons living within the area and are represented by both themselves and others. They consider the effects of these kinds of perceptions and representations on peripheral development and how 'knowledges' and 'truths' about a region are constructed and reproduced.

Frequently (although not exclusively), Peripheralisation is founded in a postcolonial movement (Fannon 2008; Said 2003; Plüschke-Altoff 2018; Erikson 2008) which examines the role of power in constructing peripheral or marginalised spaces and regions. Kühn (2015) offers three main theoretical approaches to the inquiry; economic polarisation, social inequality, and political power. Other analyses approach Peripheralisation by considering the ways in which power shapes the knowledges held by persons and groups within and outside of the region (Pfoser 2017; Kühn et al 2017). These emphasise the ways in which peripheries are often discursively constructed through knowledges which present them in unfavourable ways (Erikson 2008; Jansson 2003). For example, Bürk et al (2012) and Meyer et al (2016) discuss this in terms of 'stigmatisation; Eriksson (2008) talks about how the rural parts of Northern Sweden are constructed as backward; and Willett (2016) considers how this form of production of place impacts on the kinds of futures that peripheries are able to develop. Peripheralisation studies often borrow the internal colonialism developed by Hechter (1975), emphasising how the space does not exist on its own and in isolation, but that it is imagined and constructed in

relation to stronger, more powerful, 'core' regions, that are 'winning' in the contemporary economy. It also frequently uses concepts around 'othering', pointing out that collectively core regions *need* to oppose the qualities that they value and attribute to themselves, against an 'other' that does not have these characteristics and therefore is imagined as 'bad'. Such a movement reinforces that the dominant identity is 'good', or 'right', which is illustrated by imagining peripheries (in particular rural peripheries) as backward, slow or 'traditional'. In turn this emphasises the modernity and progress of the metropolitan core (Willett 2016; Eriksson 2008; Jansson 2003; Willett and Lang 2018; Murdoch and Lowe 2003; Vepsäläinen and Pitkänen 2010 2010; Bosworth and Willett 2011).

This relationality breaks down into a number of key dichotomies that can be harmful to how peripheries are perceived: weak vs strong; powerful vs powerless; rich vs poor; core vs periphery, and often rural vs urban. The latter dichotomy is by no means universal, and indeed much of peripheralisation studies explore the urban (and shrinking) cities of Eastern Europe (Bürk et al 2012; Kühn et al 2017). The task for studies of Peripheralisation is to ensure that peripheries are discursively constructed as having the agency to be able to challenge or change the Peripheralising narratives through which they are represented by dominant core regions (Willett and Lang 2018; Willett 2019; Pfoser 2017; Kühn et al 2017; Kay et al 2012; Meyer and Miggelbrink 2013). This is important because to imagine peripheries as unable to actualise their own agency discursively locks them into a subaltern position, and threatens the fluidity and movement intended within peripheralisation as a concept. Peripheralisation was designed as a way of highlighting that regional fortunes are dynamic, shift over time, and that whether a region is peripheral or core does not mean that it is going to remain that way for always (Kühn et al 2017; Kühn 2015; Willett and Lang 2018). Instead, it is meant to be able to show and describe the processes through which regions (including previously core regions) become Peripheralised, and indeed that peripheries might move towards becoming stronger and more

core. At the same time, scholars also need to be mindful of the constraints which impact on how peripheral regions are able to actualise this agency (Plüschke-Altof and Grootens 2019) including structural definitions such as economic 'know-how' (Shearmur 2012). This means that regions cannot be 'blamed' for lack of activity, but instead we must understand the reasons why this might happen and find sites of possibility that peripheral decision-makers might utilise.

The paper now turns to the task of making visible these sites of possibility. First, I introduce evolutionary economic geography (EEG), examine its ideas and concepts, and consider the ways that they might be used within studies of peripheralisation. I show that much EEG imagines the region as a complex adaptive evolutionary organism, emphasising how regions can best adapt from the inside out, and offering a particular set of conceptual tools with which to analyse the periphery as an evolutionary organism. One of these tools is that of connectivity, and the ways that information and knowledge flows around the region in order to facilitate adaptation. The remainder of the paper will look at two peripheral case studies (one in the Mount Rogers area of Virginia, USA, and one in Cornwall in the UK) to consider mechanisms and information flows through which peripheralising narratives and discourses can be challenged. To do this, I look at how information about the changing economic landscape is shared with the wider population, enabling young people and adults to train/retrain in skills and sectors which will be both marketable for the individual, and which will help to meet peripheral skills gaps, better facilitate peripheral adaptation, and additionally, challenge peripheralising narratives.

Complex Adaptive Systems and the Evolution of Regional Economies.

The language of the core and periphery implies that there is something 'wrong' with the periphery that it needs to fix, and that it might be able to fix better if it starts to emulate the

core (See de Souza, 2017). Shearmur's (2012) discussion about the relationship between power, know-how and innovation epitomises this, whereby dominant conceptualisations of 'innovation' privilege attributes that tend to be a feature of cities rather than rural locations. This is an important point as it risks the assumption that there is some form of ideal type model which the core has, the periphery doesn't, and the periphery needs to learn. It relies on a linear conceptualisation of time which presupposes that there are particular building blocks which are required in order to make an ideal type of regional economy. However these arguments are challenged by evolutionary economic type of ideas, which emphasise how regional economies are complex adaptive systems which grow and adapt with regards to their particular physical, institutional, economic and human environments. From an evolutionary economic perspective, peripheral development and challenging peripheralising processes needs to come from within the periphery, building on peripheral strengths in order to develop a stronger niche, and better adapt its economy to be able to flourish (Martin and Sunley 2007; Boulding 1982; Bristow and Healey 2018; Boschma 2015; Bristow and Healey 2014; Dawley et al 2010; Meekes 2017). An evolutionary perspective has an important potential within studies of peripheralisation, because it creates a space whereby peripheries can develop on their own terms, without reference to an external core, emphasising regional agency. Further, evolutionary perspectives develop a different conceptualisation of knowledge free from the 'power over representation' baggage of peripheralisation studies. Here, knowledge is more akin to 'know how', which can be utilised, amplified, and maximised within the regional economy (Frenken and Boschma 2007; Bristow and Healey 2018; Markey-Towler 2018; Corradini 2018; Meekes et al., 2017).

In his (2008) review of Evolutionary Economics, Witt argues that there were two main approaches. Firstly, neo-Schumpeterian ideas, often using Darwinian biological metaphors, particularly with regards to natural selection. This recalls the work of Kenneth Boulding (1982) who likened businesses to biological organisms, adapting to and creating their specific

environmental niche, '(multi)parenting' new products. The second approach is based on evolutionary game theory. Evolutionary Economic Geography uses formal models built on utility maximisation and representative agents, and arrives at conclusions or predictions through equilibrium analysis (Boschma and Frenken 2006). The key factor that differentiates evolutionary geography from EEG is that it considers the historical processes that have led to how a regional economy has developed – or its spatial evolution (Frenken and Boschma 2007). The means that Boschma and Frenken (2006) seek to differentiate themselves from an econometrics focussed EEG, by using the place based and human centred specificity of Institutional Geography. For studies of Peripheralisation, EEG can provide us with a conceptual language that can explain how ideas develop and move within a region. This paper will explore this more fully below. However, in order to make this synthesis work, we need an additional piece of the puzzle, and for this we turn to Complex Adaptive Systems (CAS).

CAS grew out of physics, maths, and far from equilibrium economics, and perhaps its most famous early cross-over into the human sciences developed from the collaboration between Nobel Prize winning Physical Chemist Illya Prigogine, and the philosopher Isabel Stengers. Their 1985 book *Order Out of Chaos* remains a seminal encounter between the philosophy of Gilles Delueze, the evolutionary philosophy of Henri Bergson, and biological evolutionary systems. This work has become embedded into the social sciences through the scholarship of Kaufman (1995), Latour (2005), DeLanda (2011), and Connolly (2011) (see also Bedau and Humphries 2008; Smith and Jenks 2006). The above CAS thinkers share with EEG scholars a conceptual language of open and closed systems; self-organisation; emergence; path dependencies and adaptation; and an interest in, and an examination of, temporalities. However whilst these seminal CAS works open up the space to think of regions as Complex Adaptive Systems (indeed, DeLanda (2011) does this explicitly) and share much with Boulding's (1981) evolutionary economics, EEG is very cautious around using CAS. Martin

and Sunley (2007) explain that this is because there is no single, unified theory of EEG, and because of a fear that the scientific basis of complexity modelling may not translate to the economic landscape.

Outside of economics, the social sciences are much more comfortable with debates about theoretical approaches, and scholars that approach regional economics through the lens of Resilience have been more successful in combining CAS with regional economic development. CAS enables the region to be imagined as an organism that is bounded, but also connected to the socio-economic and political environment outside of the particular space or territory that is being examined (Meekes 2017). Scholars such as Bristow and Healey (2018), Boschma (2015) Bristow and Healey (2014), Dawley et al (2010) use conceptual tools which intersect with those of CAS, Resilience, and Schumpetarian biological evolutionary economics.

For Peripheralisation, drawing on EEG and CAS means that words such as 'knowledge' do more than connote perceptions and representations, but also, frequently paired with 'innovation', denotes skills and productivity within the regional economy (Moreno et al 2005; Ozturk 2018; Corradini 2017; Malerba and McKelvy 2018; Antonietti and Gambarotto 2018; Bristow and Healey 2018, Markey and Taylor 2018). An economy based on a high level of knowledge will be more productive and hopefully more innovative than it's opposite, based on primary labour, and will require a more skilled workforce in order to be able to service the industries developed and facilitate innovation. Innovation better enables the adaptation which is essential if the economy is to be resilient and flourish (Bristow and Healey 2018; Boschma 2015; Bristow and Healey 2014; Dawley et al 2010; Pike et al. 2010), and to this end, regions seek to develop innovation systems (Corradini 2017) and knowledge networks (Boschma 2015), facilitating and maintaining innovation. This use of the word 'knowledge' has an interesting set of implications for how it is imagined within the study of Peripheralisation. Having a high level of innovation, skills and know how, that the wider population in the region

know about, means that these knowledges can be more easily incorporated into positive spatial representations. In turn, these new representations or stories about the region can begin to challenge peripheralising narratives and discourses.

An important facilitator – or on the converse – inhibitor of peripheral knowledge development and innovation, is the role of regional and industrial histories. Innovative regions need to have a more open rather than a closed system (Meekes 2017; Boschma and Frenken 2011; Dawley et al. 2010), and be able to develop new growth paths. This creates the spaces for new ideas and innovation to be able to emerge (Boschma and Frenken 2011; Martin and Sunley 2006; Boschma 2015; Dawley et al 2010). Path dependency on the other hand, inhibits new ideas from taking shape and being implemented, which in turn has a deleterious effect on the production of economic knowledge systems. Taken in isolation, this could be interpreted that history is harmful. But this is not actually the case. Instead, regional and peripheral context is vitally important as a way of explaining differential spatial development (Boschma and Frenken 2011; Meekes 2017). It is the path dependencies derived from histories which threatens to lock regions in to harmful practices (Boschma and Frenken 2011). In short, regional specificities help to shape the distinctive knowledges (and therefore economies) that peripheries are able to use in order to challenge processes of peripheralisation. From an EEG perspective peripheral development and challenging peripheralising processes needs to come from within the periphery, building on peripheral strengths in order to develop a stronger niche and better adapt its economy in order to be able to flourish.

For peripheries, both types of knowledges embedded within historical path-dependencies can have a deleterious effect on ongoing development. To illustrate, being locked in to specific narratives of place (and by implication, the capacity of the kinds of industry that happens in that place) means that it becomes even more difficult for people to find out how economies and activities have started to change. This also means that it is difficult to take advantage of the

amplificatory effects (see Connolly 2011) that happens whereby utilising particular (new) knowledges and ideas makes these changes or adaptations much more visible, and therefore easier for other people to find and utilise.

Consequently, if peripheries are going to be able to adapt effectively, there needs to be a strong degree of connectivity in order to be able share knowledges (in all of its meanings) around the region. To take this back to the organistic metaphors of Kenneth Boulding (1981), in order to be able to know and adapt to changing environmental conditions and develop new niches, regions need to have an adequate system for knowledges about what those changes are, if these knowledges are to be able to flow around the region. This means that connectivity within the region organism is vitally important. Whilst current studies of EEG make clear the need to connect knowledge systems within sectors (Malerba and McKelvey 2018; Antonietti and Gambarotto 2018) or between policy and other actors (Bristow and Healey 2014; Dawley et al. 2010), this misses any attention towards sharing information with the general public. Indeed, public engagement does not factor in the region-organism of EEG. For the task of combatting peripheralising narratives, this is an important omission because the feedback loops created by the way that individuals discuss peripheral attributes is an important and amplificatory contributor to overall representations and perceptions of place (Willett and Lang 2018; Willett 2019; Meyer and Miggelbrink 2013). If stigmatising (Bürk et al 2012) and peripheralising narratives are to be challenged, the general public also need to know about current developments in the local economy. This is especially important for peripheral economies which have undergone significant change in recent years. For example, it is much easier to believe and repeat narratives of decline when visible past industries disappear. It is less easy to see where newer sectors are emerging – particularly if individuals are not part of these knowledge networks. For studies of Peripheralisation therefore, viewing the region as a complex adaptive organism can be a valuable tool for understanding better how knowledge

flows within the region-organism, producing and reproducing particular narratives. It is also useful to understand the double meaning of knowledge – as an object, but also as a set of skills.

In the next part of the paper I take two case studies of peripheral regions which have experienced large changes to their local economies to consider feedback loop mechanisms through which the general public is incorporated into knowledge systems around new industries. In particular I look at the ways that skills gaps and labour market needs are communicated to the broader population, which can show us how skills knowledges are being shared and amplified.

Research Methods

The case studies selected act as tools to explore and illustrate how peripheries can be imagined as evolutionary complex adaptive systems, and what this approach makes visible. I adopted a grounded theory approach (Charmaz 2006; Strauss et al. 2008) to my inquiry, wanting to allow sites of comparison to emerge as my understanding about the case studies deepened. For example, initially I had anticipated that this study would focus on discourse and narratives of place. Over the duration of the primary research (between January and June 2018), how changes in regional economies was communicated emerged as an important space to explore which then led to my inquiry into the combination of the peripheralisation literature and an EEG analysis. Consequently, I then began considering the processes of peripheralisation from the perspective of a complex adaptive organism, and this forms the insights of this paper.

To gather data I identified and arranged meetings with key economic development personnel in these localities and asked them explain the challenges and opportunities that they felt that the regions faced, and to recommend other persons that I ought to speak to. These meetings had two purposes. Firstly, to gather a better contextual understanding about each region, the environment in which decision-makers operate, and how they describe that situation.

Secondly, to identify key publicly available strategic documents and statistical sources on which to base my analysis. Basing the analysis on strategic documents was an important part of the methodology. Interviews are a strong means of gathering data. However, I wanted to develop an assessment of how a *region* rather than key development personnel represented the area in order to not become tangled in the particular performances, interpretations and impression management (see Goffman 1959; Blumer 1969) offered by interviewees. Whilst the nuances involved in multiple, competing decision-maker discourses would be an interesting study, it is not helpful to this particular inquiry. Moreover, although key overarching regional strategy documents present a (presumably) agreed unified single narrative, this is only a single narrative amongst many competing perceptions, and interpretations (Foucault 1998; Connolly 2002). Nevertheless, as the overarching strategy these documents are taken to present a dominant development narrative.

Once the key regional strategy document in each case study region was identified, I made an initial reading in order to find points of overlap, which 'spoke' to each other. At this stage I had started to realise that a key point of comparability between each region related to the fact that they were both managing a changing rural economy. This offered an opportunity to explore how planners in both regions communicated these changes to the general public. At this point it was also evident that whilst the Cornish strategy was trying to tell a definite story, the MRPDC was more utilitarian in this regard which is why the analysis below is supplemented with the story told by one of its component counties – which chimed with the story that I was frequently told in meetings. An emphasis on knowledge flows and a changing economy spoke to the interest that I was developing from the EEG literature, whereby despite being an important part of the labour force, the public seemed to be missing from EEG analyses. The next step from here was to request from my contacts which programmes were being used to connect the public with skills gaps. In the final stage, of the research, I analysed each

strategy document and programme through the lens of the complex adaptive system, and a Foucauldian-based (1998) discourse analysis which examines the discursive field that enables or disables certain discursive formations. These consider the knowledges portrayed; the meanings on which these knowledges rest; and the histories which have supported these meanings and knowledges. This includes the path dependencies; information flows; connectivities and feedback-loops that occur within the region-organism and how these knowledges interact with processes of peripheralisation.

Cornwall UK and the Mount Rogers District, Virginia, USA.

Insert Fig. 1 and 2 here.

The case study regions had a broad set of comparators. Both are rural regions about 5 hour's drive to the south west from their national capital. Both were regions with a strong economic history in agriculture and the extractive industries, which has latterly declined or died. Mount Rogers District (MRPDC), Virginia mined coal and natural gas, whilst Cornwall mined metals – in particular tin, copper – and china clay. Employment in MRPDC's coal and gas sector currently stands at 0.6% (Mount Rogers Planning District Commission – MRPDC 2018), halving since 2001; and in Cornwall the last metals mine closed in 1998. Employment in china clay extraction has reduced from 6000 in 1974, to fewer than 1000 today (Cornwall Council 2012). Additionally, MRPDC has seen a decline in its manufacturing base of 40.8% between 1990 and 2010, leaving 14,215 jobs (MRPDC 2013). The ongoing problems within Cornwall's mining industry throughout the 20th century led to the development of tourism as a way to generate income. MRPDC has come to tourism rather later, but it is a growing part of the regional economy. Both have been investing in their creative industries sectors, which has contributed to an artistic vibrancy and increased attractiveness as locations to move to and visit,

although in Cornwall this has been done with little real appreciation about the kinds of narratives that this creates about the region (Willett 2016).

The perceptions and representations used to construct these two regions are also interesting. In the Cornish example, narratives of place have been developed which collude with metropolitan/core stereotypes about 'backwards', 'traditional' and 'slow' peripheral rural regions (Willett 2016). But there are other ways of looking at these kinds of discursive symbolisms. For example, Satterwhite (2015) describes the broader Appalachian region as representing a static, uncommercialised 'rootedness' which she interprets as a form of 'authentic' America. Satterwhite borrows words that carry emotional resonances that recall the negative, 'outside of modernity' stereotyping characteristic of peripheralising narratives (Willett and Lang 2018; Eriksson 2008), and yet makes a very different interpretation from them. For both Cornwall and MRPDC, this represents a deeply complex narrative landscape whereby the region is both 'othered', whilst also representing some form of meaning. For Cornwall this meaning is found in a belief about the particular characteristics of the Cornish 'lifestyle', which derives value from more 'rooted' and 'meaningful' things than the accumulation of wealth, position, and possessions (Willett 2016; Dickson 2008). For the Appalachian region of which MRPDC is a part, the notion of the 'hillbilly' can represent a desire for rebellion against the injustices of the global economy, and the social norms and values that associate with it (Roberts 2010; Satterwhite 2015).

Both regions have received considerable external investment over recent years – Cornwall has received £1 billion between 1999-2018 from European Union Structural Funding (see also Willett 2013), and MRPDC has benefitted from a $1.1 billion fund from the Virginia Tobacco Commission, supporting South and South West Virginia (Virginia Tobacco Region Revitalization Commission, 2018). Part of these monies have funded high speed rural broadband (called 'fibre' in MRPDC), which enables Cornwall's digital economy (CIOSLEP

2018), and telenetworking in South West VA (Bristol City Council 2014). High environmental amenity value is translated into a strategic emphasis on tourism (Bristol City council 2014; CIOSLEP 2018). However, both have a different strategic emphasis on business size. Cornwall relies on small to medium sized enterprises, (CIOSLEP 2018), and whilst MRPDC does have a significant number of these sized businesses, their strategic focus is on large scale operations which can provide hundreds or thousands of jobs (MRPDC 2013). Finally, both regions took the oppositional, non-elite, or populist route in 2016 elections, associated with ideas about 'the left behind' (Dorling 2016). Cornwall voted strongly to leave the European Union (despite the support from EU structural Funding), and the MRPDC region voted in support of President Trump.

These similarities between the case studies are joined by some interesting differences. MRPDC is rather larger than Cornwall, covering 2800 square miles to Cornwall's 1,369 and has a lower population density – 188,993 to Cornwall's 553,700. Additionally, MRPDC's population has declined by 2.4% since 2010, which is symbolic of a long-term trend. Cornwall's population is expected to rise by 25% by 2036 (Cornwall Council 2011). Mount Rogers is made up of the counties of Washington, Grayson, Smythe, Bland, Wythe, and Carroll, and the cities of Bristol and Galax. Cornwall is a unitary authority, and smaller units of governance (parish councils) are at a community level.

Income differentials are another interesting aspect to explore. On the one hand, with a Mean average annual earned income of £24,913, Cornish wages are 87% of the UK average. A significant improvement on the 80% differential of 2008 (Nomis 2018). Annual median incomes in MRPDC are at $38,519, 59% of annual average national income. (As in Cornwall) there is significant variation within the district. This probably says alot about inequality in the US overall. At an exchange rate of 1.3 dollars to sterling, the MRPDC average income would be £29,630 per annum – higher than the UK average earned income. However, no overall US

State has a lower average income than this, although several counties in Virginia and other States do (Census 2018). Similarly, Cornwall's average incomes are at the bottom of those in the UK (Telegraph 2017).

In the remainder of the paper I look at how information about the changing economic landscape is shared with the wider population, enabling young people and adults to train/retrain in skills and sectors which will be both marketable for the individual, and which will help to meet peripheral skills gaps, better facilitating peripheral adaptation, and additionally, challenge peripheralising narratives.

Case Studies: Skills and a Changing Economy

Mount Rogers Planning District, Virginia

 One of the first things to acknowledge in this region is the contested nature of the word 'peripheral'. As an example, the Economic Development website of Washington County (Washington County Economic Development 2018) showcases that 40% of the US population live within 500 miles – or one days' drive of the county. It rejects potentially peripheralising narratives (Burke et al. 2012; Eriksson 2008; Kühn 2015; Kühn et al. 2017; Willett and Lang 2018) about the remoteness and isolation of a community with a very low population density, and places weight on the fact that an excellent network of interstate transport links means that the rest of the US is extremely accessible from this location. Furthermore, a low population density (Washington County has 54,729 persons living within its borders) masks the fact that 347,017 persons live within a 50 mile radius (Washington County Virginia Regional Profile 2018). In stating these claims, development leaders are making the argument that the region-organism is highly connected to the rest of the US and cannot be defined by the values that people assign to its rural demographic and geographic statistics. Perhaps one would expect nothing less from a document designed to entice investment into the locality. The question is

the extent to which these strategic narratives flow between planners and the rest of the general population. This is especially significant given the degree to which the economy has been changing over recent years, risking becoming locked in outdated narratives that don't reflect the adaptations of the contemporary economy.

In its most recent strategy document (the Mount Rogers Comprehensive Economic Development Strategy 2018-2022), compiled in partnership between public and private sector representatives, MRPD notes that the largest employment sector lies in manufacturing which currently provides 18.4% of all jobs in the region. However, this is an unstable sector which has shed 40.68% of jobs between 2000 and 2010. In fact several previously well-established subsectors of the manufacturing economy shrank by up to 98%. In the meantime other manufacturing sectors saw significant growth. Regional planners take from this that there has been a rupture in time between the industrial history and the present, and that the existing workforce needs to be guided towards this new reality as the region shifts towards more high-technology, highly skilled jobs. This is also perceived as an opportunity to develop more well-paid jobs, commensurate with an increased importance on having a highly skilled workforce.

For the region-organism as a complex adaptive system, the loss of such a large part of the manufacturing base represents both an adaptation of these industries to the current global economic system (as manufacturing seeks a cheaper workforce overseas), and a failure to adapt (as industries have not been able to meet the changing needs of the current economic environment). In such circumstances it would be easy for the region to develop a sense of 'stigmatisation' (Bürk et al 2012; Meyer et al. 2017; Pfoser 2017; Plüschke-Altof 2018), developing and maintaining narratives of decline, perhaps facilitated by the population loss that is being experienced. This is a particular risk when path dependencies (here, with regards to the public attitudes towards education and skills development) become entrenched (Boschma and Frenken 2011; Martin and Sunley 2006; Boschma 2015; Dawley et al 2010). Historical

knowledges 'know' the employment types within the local economy, and the routes and skills required in order to gain employment in historic sectors. These patterns and flows within the CAS, based on historical knowledge, have clearly served people well up until now. However they have become path dependencies indicative of a closed system which inhibits individual adaptation as the wider economy, beyond the region, evolves. In order to deal with this situation, the region has put in place feedback-loop systems connecting (Malerba and McKelvey 2018; Antonietti and Gambarotto 2018) the general public to knowledges about how the region-organism is dealing with these kinds of shifts. These feedback loops contain information about how people can take adaptive advantage of the opportunities that it offers.

There are two main programmes of note in this example; the United Way Ignite Programme, and the New River/Mount Rogers Workforce Development Board. The United Way is a volunteer directed organisation, led by businesses and civic leaders. The Ignite Programme works with Middle School students to help to develop a 'talent pipeline' for the regional economy (United Way 2018). They build soft workplace skills, arranging internships, and facilitating career discussion. They also provide connectors and conduits to ensure that education and training provision meets business demand; produces 'career clusters'; and raise awareness of the skills and job types that can be found in the local economy. The intention is to educate about local career trajectories, ensure that the economy has the skills that it needs in order to adapt and develop well, and help to stem the flow of people moving out of the region. In so doing, it enables knowledge flows and facilitates connections beyond innovation systems (Malerba and McKelvey 2018; Antonietti and Gambarotto 2018), between businesses, policy, and the general population. This helps to join up the interested and relevant parts of the complex adaptive system of the region-organism.

The NR/MR Workforce Development Board (2018) does this too, using different tools. It is a central government programme, which locally follows a mission statement to meet the needs

of businesses and job seekers, in order to be able to adapt to a changing economic ecosystem. It has the facility for businesses to directly engage with the organisation, to explore what the talent pool is like in the region, and to share the skills gaps that they are experiencing in order to facilitate investment in that area. Similarly, for jobseekers, the programme helps to navigate jobs, skills and training opportunities, and provides detailed information about which sectors/job families have been hiring in the region in the past year, and how many jobs have been available in each job family. Again, this makes available knowledges about how the complex adaptive system of the region is changing, to a wider population than just planners and businesses. This improves the resilience of the region-organism. Taken together, these programmes are helping to challenge peripheralising narratives (Bürk et al 2012; Meyer et al. 2017; Pfoser 2017; Plüschke-Altof 2018) by creating feedback loops to disseminate amplify information about developments in the regional economy. Peripheralising processes are challenged in practical ways by creating knowledge and information flows which connects businesses, policy, and the general public. Consequently, this helps to activate the agency of the public in order to be able to challenge both the fact of peripheralisation, and the processes which uphold it (Willett and Lang 2018; Willett forthcoming, Kühn et al. 2017; Pfoser 2017).

Cornwall, UK

The Cornwall and Isles of Scilly Vision 2030 is the strategic economic plan of the Cornwall and Isles of Scilly Local Enterprise Partnership, and is a central government initiative led by Cornwall Council, which includes business leaders on its partnership board (Cornwall and Isles of Scilly Local Enterprise Partnership – CIOS LEP, 2017). The Cornish economy is also navigating a temporal rupture from its industrial history. In recent years it has evolved new sectors around digital technologies, the creative industries, and food production; and is emphasising knowledge economy type of jobs in order to boost productivity and induce a higher rate of individual and business return. Connectivity between businesses, people and

place lies at the heart of its mission statement, and it has ambitious plans. The role of the LEP is to build partnerships – aiming to build knowledge sharing conduits within the region-organism, and growing regional innovation systems (Corradini 2018; Boschma 2015; Meekes et al. 2017; Martin and Sunley 2007). In common with what might be expected of a strategy document, the Vision emphasises regional strengths and attributes. But despite the successes that it lists, it can often read as though the authors feel that the audience requires some additional convincing. For example, we read on page 5 that '*A UK leading digital infrastructure is now in place, attracting new high tech businesses to the area and allowing current businesses to tackle the challenge of distance. Investment in roads and our airport mean that Cornwall has never been more accessible physically or virtually*'. In this statement, by trying to close the space for people to imagine the region as peripheral physically and economically, the authors acknowledge that this peripheralising perception and representation exists, and thereby give it the space to be reproduced (see Said 2003; Fanon 2008; Willett and Lang, 2018). This means that the Vision is positioning itself with reference to an acknowledged and stigmatising (Bürk et al 2012; Meyer et al. 2017) core representation of place, and is in effect locking itself into a historically path dependent discourse, despite having the evidence to construct a new narrative (See Willett and Lang 2018). It also indicates that new knowledges which it attempts to share have little purchase within the region-organism. Consequently the Vision writers struggle to construct effective information conduits between planners and the public. Worse, this suggests being trapped in an informational closed system.

Nevertheless, the range of positive stories with regards to how the region has developed recently clearly show that the Cornish economy is improving. One indicator is how the gap between Cornish and national average incomes has closed from 80% to 89% over the course of the past decade (NOMIS 2018). In one interpretation this could be viewed as what Bürk et al (2012) might describe as a 'reversal' strategy, replacing a hegemonic discourse with a

different set of meanings and trying to 'prove' that the hegemonic discourse is now inaccurate. However this risks what Foucault (1998) calls a 'dispersal' of the discourse, disseminating weaknesses in Cornwall's complex adaptive system to yet wider and potentially new audiences. This is especially important because by not being as deeply culturally embedded (Kay et al 2012) the new part of the story is more easily lost than the part that confirms old stereotypes (see also Willett 2016).

Skills investment for a changing economy is an area that the Vision identifies as an immediate priority for reasons around helping businesses to flourish and ensuring inclusive growth. With a growing population due to inward migration from other parts of the UK, there is less urgency than in the MRPD to support working people to stay in the region. Nevertheless, the Vision relates that whilst 15-20 year olds are less likely to leave now than previously, it is still hard to retain persons in their 20's. Possibly, this reflects difficulties in connecting knowledge flows about the new economy to younger people. To ameliorate this, the strategy seeks to raise aspirations and get businesses, universities and colleges to work together to help to meet regional needs. Rather than find better informational feedback-loops, planners assume that the problem is that local people do not aspire to better careers (which they may not know exist). Moreover, there is a serious misunderstanding amongst the general public about how the Cornish economy is and has changed. In a recent study, Willett et al. (2019) find that many people rely on a narrative which mourns the loss of the historic industries of mining, farming and fishing, and fails to spot other major sectors outside of tourism. This indicates that within the region-organism, whilst there are strong knowledge flows between businesses and policy, there are still systemic blockages between these new knowledges and the general public, who remain stuck in path dependent narrative patters about historic industries.

Two programmes which try to address this are the Cornwall Apprenticeships, and Unlocking Potential. Cornwall Apprenticeships (2018) is designed to be an apprentice gateway that is

used by young people, employers, and parents. It provides practical information about what apprenticeships are designed to do and why they are a good career route in general. It also provides a directory of apprenticeship opportunities that young people might like to apply for in the locality. What it does not do however, is to provide information or advice about the kinds of sectors where the skills learned will be marketable beyond the duration of the training. Consequently, knowledge conduits remain blocked as young people and their parents are not able to learn anything about how the current Cornish economy is adapting, and where skills gaps are. This omission means that businesses do not have full support to be able to fill the skills gaps which problematize their own adaptation. Taken together, this compromises the ability of persons in the region to develop narratives which challenge peripheralising core representations of place (Eriksson 2008; Kühn 2015; Willett and Lang 2018; Jansson 2003; Plüschke-Altof 2017).

Unlocking Potential (2018) has been a major part of the Cornish skills landscape for 10 years. It was designed as a way of keeping graduates in Cornwall, by connecting them to employment opportunities with graduate employers in the region and has been very successful in its task. It continues to provide a connecting gateway between employers and graduates, also offering extensive job hunting and recruitment advice. Additionally, there is a large section about the Cornish economy, informing job seekers about the benefits of living and working in Cornwall, the Cornish lifestyle, and about how to present oneself in the search for jobs. This section explicitly states that graduates do not want to miss out on working in such a lovely area because it is 'remote', inadvertently reproducing peripheralising narratives (Eriksson 2008; Pfoser, 2017; Jansson 2003; Plüschke-Altof 2017). Nevertheless, we also learn that the Cornish economy is growing, as are graduate jobs. However, we still do not know what skills these graduate jobs require, and where the skills gaps are. In an economy that has started to found itself on new knowledges and skills, Cornwall Apprenticeships and Unlocking Potential

provides a very useful service which helps to keep people working within an apparently vibrant Cornish economy. Consequently, it falls short of becoming a conduit of knowledges about changes in that economy. This is an important omission in terms of peripheralising narratives because it means that people to do not get to learn about new and emerging sectors which they might participate in – or which can just challenge stigmatising perceptions of place. Therefore, the region-organism is unable to flourish or adapt as efficiently as it might because the specific skills gaps remain.

Peripheralisation, Skills Gaps, and the Adaptive Economy

Both economies have interesting stories to tell, and it would be a mistake to conflate correlation with causality. The Cornish economy has grown, attracting people to stay and move to the area, narrowing income gaps between regional and national economies, and improving knowledge and skills in the area through programmes to encourage graduates to join the local labour force. However, in connecting a broad cross-section of the general public (from school children to adults seeking work/training) with developments that are happening at a strategic business and policy level, MRPD is helping to provide the space for the public to better adapt to an increased need for knowledge economy jobs, and businesses are better enabled to flourish as skills gaps are met. For peripheral development, using a complex adaptive systems approach makes visible that sometimes there are blockages in knowledge and information flows between regional planners and the public. This realisation opens up a space of possibility for better informational conduits to be put in place, connecting planners with members of the public, enabling people to know about, engage in, and talk about economic changes. Done well, more people can then become involved in finding ways of talking about the region that are *not* stigmatising, challenging historical path-dependencies (Dawley et al. 2010; Boschma and Frenken 2011) and creating new knowledges based on a more accurate and up-to-date interpretation of the regional economy. In the Cornish example, these knowledge conduits still

remain to be built and we also find planners remaining stuck in peripheralising narratives, despite having the contrary evidence from the improvements that have been made. Not enough feedback loops exist that pass new, non-peripheralising representations of place around all the constituents of the region-organism to create a culturally embedded new narrative (Kay et al 2012).

It is also interesting to note the role of national policy in creating the space for broader discussions about regional economies – and the role that this might play in the development and maintenance of peripheralising discourses. The NR/MR Workforce Development Board, with its heavy focus on regional jobs, is a Federal initiative that is delivered locally. Equally, Cornwall's support for apprenticeships is in line with national priorities to encourage this training route. The delivery of these projects, and their different emphases on communicating important local economic sectors might be a reflection on the ways that regions are constructed at a national level. Without idealising local government or putting more pressure on them than their resources allow (Plüschke-Altof and Grootens 2019), adequately resourced and efficient local government that can implement place-specific policy is essential for successful regional development (Rodrigues-Pose and Ketterer 2019). Put into CAS language, local actors are well placed to understand the region as an organism, be able to observe how knowledge and ideas flow around it, and to be able to consider the gaps in this. A cautionary note is that they might also be locked into path-dependencies which problematize this. Nevertheless, the structures of local governance might also help to reinforce or challenge relational constructions of place which imagine the periphery as in some form 'inferior' to the core (Willett, 2019), or to develop peripheral narratives independently of any stigmatising characterisation which the region might be subject to (Bürk et al 2012; Meyer et al. 2017; Willett and Lang 2018;). This has important implications for our understanding of agency with regards to how individual peripheries are represented and are able to represent themselves. In both of these instances,

improved knowledge flows were required in order to disseminate new knowledges between decision-makers and the general public. This is something that was not dependent on any level of external governance, but was something that each region could choose to do for themselves. The agency that CAS system helps to unlock therefore, is the agency to create information flows that might lead to a challenge to peripheralising representations of place. Place-representation is not the preserve of decision-makers, but is a set of complex feedback loops that all people in the periphery are a part of.

One of the interesting contributions of EEG and CAS to Peripheralisation scholars is the idea that regions are both bounded, and also connected to regions, nations, and economies outside of the locality. These case studies raise the question about the role of local identities and relationships with more prosperous regions; and the security and confidence that decision-makers have in a place with regards to the ability to exercise regional agency over how places are produced (Plüschke-Altof 2017; Willett and Lang 2018). In these case study examples, it is an interesting correlation that the region that was less inclined to engage with peripheralising narratives in its key strategic document, was also better equipped to develop a CAS which connected the public to what is happening in the regional economy. Future research might seek to understand how individual decision-makers imagine and interact with the path-dependent feedback loops of peripheralising discourses.

Conclusion

This paper set out to do three things. The first two are theoretical contributions. Firstly, it sought to explore what the study of Peripheralisation can gain from Complex Adaptive Systems and Evolutionary Economic Geography. Secondly, it sought to understand what peripheralisation brings to evolutionary economic geography. The third contribution is a practical argument, about tools to challenge peripheralising tendencies. The overarching

theoretical claim from this paper is that analysing individual regions as a Complex Adaptive System enables a fresh perspective to help us to see what is required in order for the region to function better as an adaptive organism. In this particular example, we see that if peripheralising discourses are to be challenged, then new knowledges and 'truths' about the region have to be created. Regional development successes provide a solid foundation for these 'truths' to emerge from. However, if this is to happen, the wider labour-force need to get to know about them. The CAS approach helped to spot a need to ensure that the general public not only know about economic changes, but also know how they themselves can get involved with new economic opportunities. In this particular study, communication of skills gaps emerged as an important site of possibility that could bring these changes about. Whilst regions do not need to be peripheral in order to be able to benefit from this type of approach (indeed it might enable cities to self-actualise and adapt more effectively) this paper has been particularly focussed on peripheral regions. This is not to say that all peripheries will have a need to improve systems of communication about labour market changes, or that this will automatically help to ameliorate peripheralising process. However the paper contends that it is a useful tool.

With regards to peripheralisation, we see from this study that by imagining the region as a complex adaptive system (Bristow and Healey 2014), we make visible some of the processes through which peripheralising narratives become (re)produced, and are able to think about what can be done to change this situation, and reinsert regional agency. In our case studies, we see the importance of mechanisms which enable new knowledges about changing peripheral economies to be shared amongst the broader population or the region. This helps to provide a counter-narrative to stigmatising perceptions and representations (Bürk et al 2012). It also helps to ensure that peripheries are better able to meet skills gaps, growing local industry and enabling it to develop, flourish and amplify discourses which challenge peripheralisation processes (Willett and Lang 2018). For the study of CAS within Evolutionary Economic

Geography, consideration of peripheralising narratives raises questions about the extent to which we imagine knowledge and innovation flows, and how we define innovation systems. Currently, knowledge conduits, flows, and connectivity are imagined as being primarily about how particular clusters or sectors are able to share information and develop innovative milieu and dynamic clusters (Bristow and Healey 2018). This study extends these flows of information to incorporate the general public into knowledge systems within the region-organism, better enabling the skills required to fuel the dynamic and emerging industries growing within the adaptive peripheral economy.

Finally, this study uses these theoretical insights to make some practical policy suggestions. Whilst this is in no way generalizable across peripheral regions it does provide a useful query with regards to how region-organisms manage changing economies. Through our two case studies, we see that whilst it is useful to support jobseekers (at whatever level) within the periphery, it is important to ensure that they are aware about how the economy is changing in order for them to be able to know what skills they should invest in. This goes beyond merely advertising vacancies and making the region appear more attractive to people looking for work. Instead, people need to know what kinds of sectors are starting to emerge and will be necessary in the future, what kinds of skills businesses are currently hiring, and what kinds of skills gaps there are in the contemporary economy. This kind of information enables people to consider how they can best adapt themselves to changing local economies. In turn, this can initiate the amplificatory feedback mechanisms which can contribute towards challenging Peripheralising narratives, through making the successes of strategic development more visible and people feel better about the region. Agency is not the preserve of decision-makers. Everyone has the potential to play a part in how peripheral discourses are constructed.

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