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Economic development and skills policy: what can we learn from Territorial Innovation Models and Territorial Knowledge Dynamics?

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Abstract

In LLAKES research paper 29, James et al. (2011) discussed ideas about learning that have developed in the 'cluster' literature in economic geography. Drawing on the UK as a case study, this paper builds on that analysis by comparing the conceptualisations of learning that underpin conventional education and skills policy for the knowledge-based economy (KBE) with those which underpin territorial innovation models (TIMs) and the territorial knowledge dynamics (TKDs) approach. TIMs, which include 'cluster' models, have had a profound impact on regional development policy, and deploy the language of learning, knowledge creation and innovation. However, they have had little impact on skills and education policy making in the UK. Here, learning for the knowledge economy has been understood in terms of individuals acquiring measurable (credentialised) knowledge or skills through formal education and training, preferably in Science, Technology, Engineering or Maths (STEM) subjects, which are then transferred into the labour market. This paper argues that territorial innovation models provide a quite different perspective on learning for the KBE, which is based on the relationship between firms, regions and institutions, and which has been largely concerned with the identification of different knowledge types and the relative importance of regionalised socio-economic relations. The concept of TKDs has been advanced as an extension to the TIM literature, and the paper argues that this new approach has important implications for the development of appropriate education and skills policies for the knowledge based economy in the UK and the European Union.

Introduction

This paper explores territorial innovation models (TIMs) and territorial knowledge dynamics (TKDs) as ideal-typical ways of thinking about economic development, innovation and learning. Using the UK as a case study, it explores their implications for the future direction of national (and European) education and skills policies in the context of the so-called knowledge-based economy (KBE) [1].

Over the last 20 years, the KBE narrative has become dominant in economic policy-making from the European to regional scale, with processes of innovation and learning increasingly considered to be central to successful economic development. In this context, territorial innovation models (TIMs), defined by Moulaert and Sekia (2003) as 'models of regional innovation in which local institutional dynamics play a significant role', have had a profound impact on regional economic development policy-making in the UK, and across the EU (Asheim et al., 2006). The TIM literature represents an extensive and diverse body of work but scholars writing in this area hold in common the view that to understand economic competitiveness, we need to examine the ways in which learning by individuals, firms and institutions is linked together and supported in regionalised economic systems. TIMs such as regional clusters (Porter, 1998a), regional innovation systems (Cooke, 1992), learning regions (Morgan, 1997) and localised learning (Maskell and Malmberg, 1999) – to name but a few – have consequently inspired a plethora of regional economic development initiatives in the UK and across Europe.

Despite the importance of the concept of learning in the TIM literature – and its influence on innovation and regional development policy – it has had curiously little impact on broader post-compulsory education and skills policy-making in the UK[2]. Policy makers have focussed on raising the educational attainment of the general population, concluding that the British economy requires a better qualified workforce with higher levels of

[1] Education is a devolved policy area in the UK. In this paper, policy documents published by the British Government have been analysed, but it must be acknowledged that the education and skills policy frameworks are not the same in England, Wales, Scotland and Northern Ireland.

[2] In the UK regional skills development was part of the remit of the RDAs, but economic development, business investment and regeneration were the main focus of their work.

education to ensure economic competitiveness in a globalised KBE (see, for example, DTI, 1998; DTI, 2001; DTI, 2003). Consequently, the policies adopted by the Labour Government from 1997 consisted of 'supply side' measures. These included targets to increase the number of students entering higher education, initiatives to improve rates of literacy and numeracy among adults, and, following the Leitch Review of Skills (Leitch, 2006), attempts to increase the number of people with intermediate level qualifications. Learning for the KBE, according to these policies, involves a process of credentialisation, whereby individuals are encouraged to acquire formal qualifications that represent measurable knowledge and skills. This, according to policy-makers, will increase productivity and national economic competitiveness (BIS, 2009).

In this paper I argue that there are distinct differences between the kind of learning prioritised by education and skills policy-makers and the conceptualisations of learning that underpin the TIM literature. Both are framed within a narrative of competitiveness in a globalised KBE (and are explicitly linked together), yet offer quite different interpretations of what learning in, and for, the knowledge economy consists.

The TIM literature suggests that although skilled labour is important, it is the way in which production processes are organised and institutionally supported within localised networks that is crucial. Although there are important differences between TIMs, I argue that they share some underlying conceptualisations of the learning processes that support competitiveness in the KBE. The first general insight that can be drawn from this literature is that learning is interactive and context dependent. Thus successful learning is the outcome of interactions and relationships between firms and/or other institutions within favoured regions. The second insight is that learning should be seen as a collective process that can be conceptualised at different scales. The TIM literature has little to say about individuals but focuses on learning by firms, institutions and regions, where innovative processes, products and services, rather than credentials are the outcome of learning. The third insight, which follows from the first two, is that cumulative trajectories of learning develop within regions, such that they become specialised in certain sectors, technologies and institutional structures. Thus firms (and individuals) within these regions learn what Pinch et al. (2003) describe as 'architectural' knowledge; i.e. the rules of the game, established routines and ways of working and learning, as they participate in the regional economic system.

However, the TIM literature has been challenged by the acknowledgement that extra-regional relations and sources of knowledge are as important as intra-regional interactions and institutions. Research has shown that most firms are unable to generate or source all of the economically useful knowledge they require from within their 'home' region, and also learn through relations that stretch beyond it (Bunnell and Coe, 2001; Moodysson, 2008; Simmie, 2004; Wolfe and Gertler, 2004). In this context, new models of knowledge dynamics have been developed, such as the idea of local buzz and global pipelines (Bathelt et al., 2004; Bathelt, 2007), and knowledge anchoring (Mahroum et al., 2008). This shift is captured by the concept of territorial knowledge dynamics (TKDs), proposed by Crevoisier and Jeannerat (2009).

The TKD approach explicitly attempts to further develop and broaden the 'traditional' TIM paradigm and offers new insights into the kind of learning that supports the KBE. Although it should be emphasised that this is not yet a fully developed conceptual framework, the TKD 'paradigm' stresses the mobilisation of knowledge from a variety of sources, and the combination of different types of knowledge across sectors. Thus learning is seen as a process of identifying, aligning and anchoring different kinds of knowledge from different sources.

The aim of this paper is to draw out the (mostly implicit) assumptions about learning that underlie the two 'paradigms' and consider their implications for the different – but closely related – policy area of education and skills. The paper is divided into three sections which analyse the conceptualisations of learning for the KBE that underpin conventional skills policy analysis, TIMs and TKDs. Two contrasting 'metaphors' of learning – learning as acquisition and learning as participation (Sfard 1998) – are used to situate the different approaches. The concluding section suggests ways in which insights from both the TIM and TKD approaches might form the basis for a broader conception of learning in the KBE, and a different emphasis in post-compulsory education and skills policy.

Learning for the Knowledge-Based Economy 1: conventional policy analyses

In recent years, the British Government has published a series of major policy documents which argue that the UK requires a better skilled workforce with higher levels of education to compete in a globalised knowledge-based economy (KBE) (e.g. DTI 1998; 2003; BIS 2009). The aim in this section is not to conduct a detailed exploration of individual initiatives or provide a comprehensive survey of provision, but to set out the main principles and general priorities of post-compulsory education and skills policy since the mid-1990s, taking the election of the Labour Government in 1997 as a starting point (see also James et al., 2011).

Interestingly, UK policy since 1997 has not focused solely on higher-level skills, but, initially at least, took an inclusive approach. In the 1998 White Paper, *Our competitive future: building the knowledge driven economy,* the KBE was described as 'a general phenomenon, encompassing the exploitation and use of knowledge in all production and service activities, not just those sometimes classified as high-tech or knowledge intensive' (DTI 1998: 2). Some commentators criticised the White Paper for conflating what Keep and Mayhew (1999:10) described as 'different types and orders of knowledge'. Thus, they suggested, 'skill' no longer referred only to 'hard' technical skills and knowledge or manual dexterity but also problem solving, team-working or even personal characteristics and psychological traits.

This expansion of the concept of skill, and a broader perspective on the nature of the KBE, is reflected in the (on-going) attempts by policy-makers to develop and/or reform vocational qualifications of various kinds. This includes, for example, the reform and expansion of the Apprenticeship programmes beyond traditional engineering and trades to include occupations in which they were previously unavailable at lower levels (or at all in some cases), such as retail and the creative sector. It is also apparent in efforts to encourage individuals to 'credentialise' a wider range of skills (e.g. caring, cleaning) through competence-based assessment to achieve a National Vocational Qualification (NVQ). Thus there have been efforts to codify and accredit different kinds of knowledge and non-technical skills in the workplace, as well as setting targets to increase the number of people

obtaining other formal qualifications at colleges or universities. The 2003 publication, *21st Century Skills* (DfES, 2003) exemplifies the emphasis placed on formal courses and credentials: of 11 key national policy objectives, nine involved increasing the number of people who receive 'training' and/or obtain 'qualifications'.

However, there is a tension between broader definitions of skill and knowledge, and a focus on scientific and theoretical knowledge, which implies a narrower definition of the KBE and a different kind of learning. The idea that science and technology form the foundation of the KBE can be traced back to the ideas of Bell (1973) who first put forward the notion of a 'post-industrial society' in which scientific knowledge would be the axial principle of society (see also Stehr (1994) and Castells (1996)). Government policy reflects the on-going tension between broad and narrow conceptualisations of the KBE, as the initiatives to increase intermediate level vocational training, described above, were developed alongside the expansion of universities and targets for 50% of 18-30 year olds to enter higher education. Initially, the drive to increase the number of graduates did not prioritise particular subject areas. In recent years, however, Science, Technology, Engineering and Maths (STEM subjects) have been championed as drivers of the KBE. The latest manifestation of this trend is the Coalition Government's plans to remove the teaching grant for social science and humanities degree courses, whilst retaining some funding for STEM subjects due to their strategic importance.

The increasing importance attached to science-based innovation (and a narrower definition of the KBE) is also illustrated by the restructuring of government departments over time. In 1995, the then Conservative government merged the Education and Employment departments, which in 2001 became the Department for Education and Skills. Although education/skills and innovation/economic development were linked in policy rhetoric (DTI, 2001; DTI, 2003), the separation of responsibilities between the Department of Trade and Industry (DTI) and Department for Education and Skills (DfES) meant that the two remained distinct in terms of policy programmes. They did overlap through the remit of the RDAs, but it was not until Labour's third term that the connections between them were underlined when the DfES was divided again, this time into the Department for Children, Schools and Families (DCSF) and the Department for Innovation, Universities and Skills (DIUS) in 2007. DIUS was itself was later merged into the Department for Business, Innovation and Skills (BIS) in 2009. From this time, the KBE was increasingly referred to

in terms of high technology and science-driven innovation. However, learning for the KBE continued to be conceptualised in terms of increasing the skill levels of the workforce through the acquisition of qualifications, although a narrower field of scientific and technical disciplines was prioritised (see BIS, 2009). The conceptualisation of learning that underpins this policy framework has four key characteristics.

Firstly, learning is conceptualised as an individualised process. Whether learners are young adults undertaking further or higher education courses prior to entering the labour market, or people who are already in employment, learning is understood as an activity that involves one person assimilating existing knowledge or skills. Secondly, whether the learning is vocational or theoretical, knowledge is seen in terms of measurable content with clearly defined occupational or disciplinary boundaries. Thirdly, learning is seen as discontinuous: associated with the acquisition of specific bodies of knowledge or skills during relatively short periods of formal education and training, rather than a process that is on-going as people produce goods and services in their everyday working lives. Finally, what is learned in educational contexts is understood to be easily transferrable and equivalent to that used in the workplace, enabling credentials to be used as a measure of knowledge in the economy. Thus, learning and skills policies to support the knowledge economy are understood in terms of improving *inputs* of knowledge in the form of qualified workers, rather than supporting *processes* of learning or innovation. The locus of agency lies primarily with the Government agencies that set the curriculum and accredit individual courses, whilst individuals are required to learn. These characteristics reflect what Sfard (1998:5) described as the 'acquisition metaphor' of learning, which 'makes us think about the human mind as a container to be filled with certain materials and about the learner as becoming an owner of these materials'.

Guile (2003:85) takes up this metaphor when he argues that UK policies are:

> based upon a one-sided and rather impoverished conceptualisation of the concept of learning…as the acquisition of pre-existing knowledge and assume that the main aim is to support individuals to constantly update their knowledge, rather than to support individuals to develop the 'capacity to understand and anticipate change' (David & Foray, 2002), and to produce new knowledge.

Other scholars have also criticized the argument that 'knowledge-based' economic growth can be achieved by increasing the level and number of formal qualifications held by the workforce. Wolf (2002; 2004) shows that increasing skill levels does not necessarily result in increased productivity, competitive advantage or growth, whilst Keep and Mayhew (2010) argue that the focus on the supply of skilled workers ignores the lack of demand from employers which means that blanket up-skilling may result in an over-supply of skilled workers (UKCES, 2009).

Learning for the Knowledge-Based Economy 2: Territorial Innovation Models

Moulaert and Sekia (2003) introduced the term 'territorial innovation model' in their review of literature in economic geography, regional development and business studies. TIMs are defined as a 'generic name for models of regional innovation in which local institutional dynamics play a significant role'. Moulaert and Nussbaumer (2005) suggest that there are three basic types of TIM: firstly, the innovative milieu model, associated with the work of the GREMI group (Aydalot, 1986), and the industrial district model (Becattini, 1990), which both stress the importance of endogenous institutions, cooperation and partnership; secondly, the systems of innovation approach which translates ideas about institutional co-ordination in the national innovation system literature (Edquist and Johnson, 1997) to the regional scale (Cooke, 1992); and, thirdly, the Californian School, which stresses transaction costs (Scott, 1988). Regional clusters (e.g. Porter, 1998b) are included in a 'residual category'.

It is not my intention to review the vast literature on different TIMs, a task that has been tackled by others (see Simmie, 2005 and Lagendijk, 2006). Rather, the aim is to selectively draw out the ways in which different strands of the TIM literature (often implicitly) conceptualise learning in their explorations of innovation, knowledge transfer and regional development. In this exercise there is, of course, the danger that the differences between perspectives are glossed over and it must be stressed that there is no single coherent conceptualisation of learning that can be extracted from the TIM literature. Indeed, very few of those writing in the TIM tradition have made any serious attempt to engage with mainstream theories of learning (Oinas, 1999), and the concept is often mixed with other terms such as knowledge spillovers, interactions, transfers, or creation (see, for example,

Malmberg and Power, 2005, who use all of these terms in their review of cluster literature without making any analytical distinction between them). Nevertheless there are some commonalities across the models.

The territorial innovation model literature has its roots in the longstanding academic interest in successful regional economies and agglomerations of economic activity, which can be traced back to the work of Alfred Marshall (1890). The renewal of interest in what he termed 'industrial districts' can be dated to the early 1980s. This was sparked by the apparent resurgence of regional economies in the face of globalisation and the crisis of Fordism (Storper, 1995), along with the continued propensity of economic activity to cluster in space. The TIM literature grew from a desire to explain the advantages that accrue to firms located in regional scale agglomerations, and why some of these 'territories' are more successful than others. Analysis of the 'new' industrial districts of Emilia Romagna and Baden Württemberg (Piore and Sabel, 1984; Amin and Robins, 1990) identified a number of important factors. Firstly, firms benefitted from localised external economies (pools of labour skilled in their particular industry, or the existence of specialised competent suppliers in the vicinity, for example). Secondly, in a situation where vertical disintegration (and therefore outsourcing) was common, proximity between firms in the same industry reduced transaction costs (Amin and Thrift, 1992). Thirdly, it was argued that the division of labour between a large number of small, specialised firms, located close together, facilitated innovation, collaborative technological development and collective learning. These firms were also said to benefit from informal institutions and conventions that created high levels of trust and social capital.

Thus, the industrial districts literature emphasised the importance of conventional transactions costs and positive economic externalities but, crucially, in the re-application of Marshall's ideas, learning, innovation and institutional assets were also emphasised. Their importance came to be considered axiomatic in the TIM literature (particularly following the 'insitutional turn' (Lagendijk, 2006)), albeit with different emphases and interpretations according to the interests of the writers concerned.

Learning, across the TIM literature, is primarily associated with the process of innovation, which is understood as an interactive activity that involves a variety of actors (Lundvall, 1992). As Malmberg and Power (2005) argue in their review of the cluster literature, the

assumption is that location in clusters helps firms to acquire, exchange and generate new knowledge faster and more easily, thus forming the basis for economic competitiveness. Similar arguments pertain in other TIMs, such as innovative milieu and industrial districts. Asheim and Isaksen (2002:83) summarise the argument (specifically in relation to clusters) thus:

> Agglomerations, and in particular regional clusters, are…regarded as places where close inter-firm communication, socio-cultural structures and institutional environment may stimulate socially and territorially embedded collective learning and continuous innovation. The crux of the argument is that the proximity between different actors makes it possible for them to create, acquire, accumulate and utilise knowledge a little faster than firms outside…Much of the regional capability found in dynamic regional clusters is rooted in inter-firm networking, inter-personal connections, local learning processes and 'sticky' knowledge embedded in social interaction.

Clearly there is a lot to unpack in this summary, but it includes several important points about the links between learning and competitiveness that resonate across the TIM literature.

Firstly, learning is seen as interactive and context dependent, and idea that stems from changes in the conceptualisation of innovation. In particular, the idea that innovation is a linear process has given way to evolutionary perspectives (Nelson and Winter, 1982; Rosenberg, 1982). Thus, as Maskell and Malmberg (1999) argue, learning processes are believed to be 'inherently interactive in nature and generally characterised by uncertainty. Most new knowledge emerges from problem-solving, often on a trial-and-error basis, and as such it is normally arrived at incrementally'. Maskell and Malmberg argue that firms develop routines to manage innovation processes, and these can be understood as path dependent 'learning trajectories' that evolve over time. They identify three 'localised learning' processes, all of which are based on interaction between firms: learning by monitoring rivals, learning by interacting with clients and suppliers and learning through 'buzz', a kind of spontaneous learning that takes place through regular face-to-face interactions within social and professional networks. Malmberg and Power (2005) identify a similar set of processes in their review of the cluster literature: that knowledge in clusters is created through various forms of local inter-organizational collaborative interaction;

through increased competition and intensified rivalry; and through spillover following from the local mobility and sociability of individuals.

The role of physical proximity in facilitating these processes is twofold. Firstly, the (contentious) distinction between tacit and codified knowledge (Gertler, 2003; Duguid, 2005) is used to explain the importance of regional-scale learning. Asheim and Isaksen (2002) describe tacit knowledge as 'sticky' and therefore difficult to transfer. This, they suggest, confers localised advantages, since firms need intensive face-to-face interactions in order to acquire it. Both the distinction between the two knowledge types, and the association of tacit knowledge transfer with localised interactions have been questioned in recent years (Maskell et al., 2004), but remain a central part of the TIM literature. Proximity is also believed to encourage the development of common institutions, economic cultures and routines, which facilitate learning. Whilst there is competition and rivalry between firms, there is also a degree of cohesion at a regional scale, constituted through shared institutions, physical and human resources (localised capabilities). Maskell and Malmberg (1999) argue, therefore, that regions as well as firms develop along path dependent trajectories, often tied to a particular sector in which a regional territory has specialised over time. Thus, innovation – and therefore learning – is seen as 'path dependent, locationally specific and institutionally shaped' (Mytelka and Smith, 2002:1472).

In various ways the TIM literature highlights the importance of 'institutional thickness' (Amin and Thrift, 1995), or 'untraded interdependencies' in supporting learning within regional territories. Amin (1999:369) suggests that such 'relational assets' (Storper, 1995) include 'tacit knowledge based on face-to-face exchange, embedded routines, habits and norms, local conventions of communication and interaction, reciprocity and trust based on familiarity'. Within the TIM literature, the regional innovation system approach (Cooke, 1992; Asheim and Coenen, 2005) focuses most clearly on the importance of formal institutions such as research institutes, chambers of commerce and development agencies in supporting innovation.

Both the emphasis on interaction between firms and the importance attributed to territorially-specific institutions within the TIM literature indicate an underlying conceptualisation of learning as collective. Certainly, in contrast to the conventional policy analysis described in the previous section, it is clear that learning is not seen as an

individualised activity: the primary goal is not to produce better qualified individual workers but innovative products or services at a firm level, and in stronger versions of the regionalist literature, 'learning regions' (Morgan, 1997), which are considered to be economic actors in their own right (Lagendijk, 2002). However, the different forms that collective learning might take are often unspecified in the literature, and the differences (and connections) between learning by individuals and firms are glossed over.

The underlying tension in the literature is illustrated in the model of localised learning presented by Tallman et al. (2004) and Pinch et al. (2003) who distinguish between component and architectural knowledge. The former is knowledge that relates to an identifiable part of an organisational system (e.g. scientific, technical or marketing knowledge), and is relatively transparent and mobile, for example when workers move between firms, whilst the latter refers to knowledge of the structure of a whole system, which develops through the routinisation of networks of interactions, interdependencies and common interests among members of a firm, and potentially, regional cluster.

In developing an argument around these two knowledge types, the tension between ideas of learning as acquisition, introduced above, and learning as participation (Sfard 1998) becomes clear. In common with most of the TIM literature, Tallman et al. and Pinch et al. draw on the language of 'stocks', 'flows' and 'transfers' of knowledge. However, firms' ability to learn component knowledge through interaction (mainly working with suppliers, monitoring rivals and the circulation of workers), is dependent upon them learning architectural knowledge which 'has much of the character of "knowing" as opposed to "knowledge"…' (Tallman et al. 2004: 266). In other words, firms must participate in the customs, habits and ways of working within a region in order to learn architectural knowledge. The idea of learning as participation derives from the work of Lave and Wenger (1991) who developed the concept of 'communities of practice' within which people develop knowledge and occupational identities as they engage with the customs, routines, and ways of thinking associated with specific occupational or interest groups. Participation is the means by which individuals learn to think, communicate and act, as they internalise insights from more experienced members of the community through a process of legitimate peripheral participation. It also enables groups with common interests and identities to share knowledge amongst themselves by telling 'stories' about the practice-based problems they have faced in the past and the strategies they used to solve them (Brown and Duguid, 1991).

Although the TIM literature tends to gloss over the differences between individual and collective learning, and uses the language of acquisition, it implicitly draws on the idea of learning as participation through its emphasis on territorially embedded networks, routines and norms, which support cumulative processes of collective learning at the regional scale.

In presenting a conceptualisation of learning that is interactive, territorially embedded, and collective, the TIM literature has the potential to widen conventional perspectives on learning and skills from a focus on qualifications towards the recognition that learning is an inherent part of producing new goods and services. TIMs open up a series of questions about how to support and link different kinds of learning between individuals, firms and 'territories', whether they are understood as innovation systems, clusters, or milieu. In this sense, the importance of the TIM contribution may lie less in presenting ideal-typical models for policy-makers to recreate, and more in opening up a debate on how to link together policy issues which are currently separated into business/innovation support (for collective learning as innovation) and education/skills (for individualised learning as credentialisation).

The TIM literature implies that learning trajectories are path-dependent and cumulative at the regional scale. Thus, particular regions become specialised in certain sectors and, according to this view, education and training should be aligned with them. This would imply some regional autonomy in the development of skills policy, with the emphasis on disciplines or vocational training that 'fit' with the region's history and presumed future trajectory. Thus the locus of agency lays with firms and regional institutions that direct learning according to their innovation needs. Two important issues must be highlighted here; namely, the problem of potential regional lock-in, where regional autonomy leads to a progressive narrowing of education and training around economic activities that become obsolete, and, secondly, the primacy of firms' requirements in shaping education and training, which may lead to a utilitarian approach which does not recognise the value of broader based education (see also Moulaert and Nussbaumer's (2005) critique).

The TIM literature also suggests that skills policy should recognise that whilst some knowledge and skills are acquired through formal education or training, individual workers also need to be immersed in the socio-economic relations of a regional cluster or innovation system in order to learn the 'rules of the game' in which they will apply their theoretical

knowledge or vocational skills. Such relationships, informal institutions and conventions are only recognised in current policy via demands for young workers to be made more aware of business practices and informal institutions of working life (e.g. punctuality, dress codes, how to address colleagues and clients, or work in teams) as part of their education and training. The TIM literature, however, suggests that participation in working practices in regionalised economic systems is the primary means through which individuals learn the tacit knowledge and routines that give favoured regions a competitive edge.

Thus, the TIM literature draws on a metaphor of learning as participation, where 'the permanence of *having* gives way to the constant flux of *doing*…the ongoing learning activities are never considered separately from the context within which they take place … the participation metaphor shifts the attention to the evolving bonds between the individual and others' (Sfard 1998: 6). Sfard recognised that a convincing model of learning must also acknowledge the idea of 'an acquired, situationally invariant property of the learner, which goes together with him or her from one situation to another' (ibid:10). Clearly, however, individuals 'acquire' knowledge through 'participation' in certain practices (e.g. attending a course). In other words, the acquisition and participation metaphors both capture important aspects of learning. The TIM literature tends to take for granted the existence of knowledgeable workers who can easily transfer their learning between educational and workplace contexts. Thus knowledge gained in formal settings is believed to be transferred among different firm-level communities as individuals 'job hop' or engage in other forms of mobility. One implication, however, is that education and skills policy should recognise that individuals need preparation to become effective participants in a regionalised economic system, potentially by providing opportunities for legitimate peripheral participation.

The importance of participation in regional institutions and routines is one of the TIM literature's most important insights, but also its greatest weakness, since most regions are not as successful as Silicon Valley, Baden Württemberg, and the other 'star' regions upon which it has focused. (Hudson, 1999) highlights the problems that beset old industrial areas where previously successful institutions and assets are now out-dated. In such regions there may be few benefits to learning tacit knowledge and routines that are now economically obsolete. The TIM literature is therefore limited by its focus on regionalised interactions. This is now widely recognised and scholars have begun to develop more nuanced arguments about the role of proximity in facilitating learning. In particular, new models of

knowledge dynamics have been developed to explain learning that takes place during interactions between actors who are not permanently co-located, for example the idea of local buzz and global pipelines, or temporary clusters (Maskell et al., 2004; Bathelt and Schuldt, 2008; Bathelt et al., 2004). These concerns are reflected in the concept of territorial knowledge dynamics (TKD), developed as a extension to 'traditional' TIMs, which is introduced in the next section.

Learning for the Knowledge-Based Economy 3: Territorial Knowledge Dynamics

The TKD concept, introduced by Crevoisier and Jeannerat (2009), is an embryonic but potentially important extension to the TIM literature. It is important to emphasise that this approach represents a development rather than 'break' with the concerns of the TIM literature, which, according to Creviosier and Jeannerat, is characterised by a concern with the rich regionalised learning processes that drive industrial or technological innovation in innovative milieu or industrial districts. This results in specialised, cumulative trajectories, in which new knowledge is only intermittently mobilised and there is a clear separation between production and consumption, as well as a dualism between the local and global scale. In the context of a knowledge based-economy, 'defined by the systematic and permanent mobilization of knowledge', Crevoisier and Jeannerat propose the concept of territorial knowledge dynamics as a means to broaden and update the TIM paradigm in response to three profound social and economic changes in society. The first is the introduction of new technologies, particularly digital technologies which have fundamentally changed the conditions for innovation, and which can be understood as 'fungible'. Secondly, they argue that innovation is increasingly influenced by socio-cultural 'dynamics'. This they link to the growth of cultural industries and the importance of aesthetic experiences and branding in all kinds of previously 'functional' products and services. Thus, the interlinking of production and consumption must be considered more carefully. Thirdly, they highlight the unprecedented increase in the mobility of goods, services, capital and, above all, information and people, which means that 'the central question is that of the modalities by which this knowledge can be mobilized…today it is no longer simply a question of accumulating knowledge along a trajectory but to an increasing extent of articulating it with knowledge from the exterior'. (Crevoisier and Jeannerat, 2009:1231).

Unfortunately, Crevoisier and Jeannerat do not provide a succinct definition of TKDs in their 2009 paper, rendering their extremely stimulating concept somewhat 'fuzzy' (Markusen, 2003). Nevertheless, it is possible to distinguish two separate uses of the term. Firstly, the plural 'territorial knowledge dynamics' is used to refer to the shape and nature (or modalities) of the patterns of interactions and learning that take place within what Crevoisier and Jeannerat describe as 'multi-location networks of mobility and anchoring'. Secondly, the singular 'territorial knowledge dynamic' is used as a noun which refers to a specific set of knowledge interactions and evolution or restructuring of a multi-local network. Crevoisier (2010) describes a TKD in this sense as 'a significant change in the knowledge base of an economic activity'.

Clearly some further clarification is required, but this should not distract from the fact that the TKD approach makes several potentially important contributions to the regional development literature, and has significant implications for the kind of learning that supports the KBE. Firstly, the TKD approach focuses on extra-regional relationships and linkages, in response to the evidence that the TIM literature has over-emphasised the importance of regionalised knowledge interactions (Simmie, 2004; Wolfe and Gertler, 2004). At the same time, Crevoisier and Jeannerat try to overcome the regional-global dualism that has been widely criticised (Amin and Cohendet, 2004; Bunnell and Coe, 2001; Lagendijk, 2002), through the idea of a TKD as a multi-local network of relations which constitutes its own spatial scale. Secondly, the TKD approach does not make any assumptions about the kind of knowledge that is being accessed and used, which makes it applicable to all kinds of sectors and regions. This contrasts to the TIM literature, which has focussed on analytical and synthetic knowledge, although there seem to be no a priori reasons for the exclusion of symbolic knowledge from them. Thirdly, the TKD approach stresses the importance of combinatorial and composite knowledge, rather than specialisation in path dependent learning trajectories within regions.

As in the traditional TIM paradigm, Crevoisier and Jeannerat combine the concepts of learning and innovation, which are defined together as 'the design and implementation of new technical solutions and/or new products/services' (2009: 1223). Drawing on the work of Planque (1991) and Maskell et al. (2006) they distinguish between two kinds, or degrees, of learning. Mono-functional or strong focused learning has objectives that are clearly

identified from the beginning and involve a clear division of labour among the different participants. This is targeted learning where the external effects are anticipated and there is little uncertainty, which means that it can be successfully accomplished over long distances or where there is an absence of previous relations. Multi-functional or diffused focused learning, by contrast, is complex and uncertain, requiring trust, a common language and rules regarding co-operation. This typically necessitates a lengthy socialisation process and is therefore associated with spatial proximity between actors. Crevoisier and Jeannerat (2009:1229) suggest that the relationship between multi-functional learning and spatial proximity has been disrupted by the increase in the mobility of people and information. This means that researchers must now explore the 'possibilities for interaction and of developing rich learning that take place at a distance'.

Crevoiser and Jeannerat use the terms 'mobility' and 'anchoring' to describe the processes through which such learning might take place. Although the term knowledge anchoring has no generally agreed definition, it is related to the ability of an organisation or territory to access external knowledge and make use of it in some way – through its application, economic exploitation, recirculation, or recombination, for example. The idea of anchoring is sometimes described as an element of absorptive capacity, a concept originally introduced by Cohen and Levinthal (1990:128) as the ability of a firm to 'recognize the value of new, external information, assimilate it, and apply it to commercial ends'. Giuliani (2005:269) draws on Cohen and Levinthal's classic paper to apply the concept of absorptive capacity to economic clusters where it is conceived as: 'the capacity of clusters to absorb, diffuse and creatively exploit knowledge that is acquired from extra-cluster sources'.

Crevoisier and Jeannerat (2009:1235-1237), also develop an explicitly spatial conceptualisation of knowledge anchoring, arguing that it is the 'other inseparable face of mobility'. Anchoring refers to the ways in which 'one or several mobile elements interact, or are articulated with, less mobile elements that are linked to a particular location or context'. According to Crevoisier and Jeannerat, anchoring can be distinguished from embeddedness because of the movement of knowledge from an 'old' context towards a 'new' one: 'anchoring is the way that this new knowledge interacts – or does not interact - with its new context'. Crevoisier and Jeannerat define the 'modalities of anchoring' as the wealth, diversity, intensity, duration, etc. of the relations that take place. They suggest that different modalities might be organised into four ideal types, according to the relationship

between what the authors call the 'mobile knowledge dynamic' and the 'regional knowledge dynamic'.

Crevoisier and Jeannerat envisage a 'receptor node' in each of the ideal types they identify. Here I assume that the node is a firm or another kind of organisation located in a region. Thus the *contextualisation of mobile knowledge* occurs when external knowledge is diffused within the receiving region, moving outwards from the firm or organisation that first accesses the knowledge. By contrast, *knowledge allocation* occurs when external knowledge is accessed by a receptor firm or organisation but is not diffused further within the region. The *assimilation of local knowledge* takes place when the receptor firm or organisation is able to access local knowledge and combine it with external knowledge that secures within its own boundaries. Finally, *knowledge reciprocal learning* occurs when external knowledge is diffused more widely in the region but local knowledge also flows back to the original receptor firm/organisation and is re-combined with the external knowledge. Crevoisier and Jeannerat's characterisation of anchoring, then, refers to a whole range of possible interactions between a regional 'context' or existing regional knowledge base and one or more elements of external knowledge. Importantly, this includes cases where there is no significant interaction between the external knowledge and regional context at all. This is a significant point because it signals the fact that anchoring does not equate to learning. It also means that the locus of agency is variable, depending on the kind of anchoring dynamics that are present; nevertheless it is clear that the receptor firm plays a central role in initiating interactions and developing relationships with 'mobile actors'.

What, then, is the underlying conceptualisation of learning presented by Crevoisier and Jeannerat in the model of knowledge mobility and anchoring? Firstly, learning appears to be defined in two ways: as a mutual change in the mobile actor and regional context, and/or as the 'enrichment of knowledge'. Widespread or multi-faceted interactions, described as rich interactions, are required for learning to take place. Perhaps because it is intended to be a quite general abstract depiction of knowledge interactions, the TKD model appears to draw heavily on cognitive assumptions about learning, in which 'pieces' or 'elements' of knowledge are de-contextualised and re-contextualised as they 'move' between actors. Crevoisier and Jeannerat suggest that the actors involved in the mobilisation of knowledge may be enterprises, individuals or socio-professional groups. One task that faces researchers who want to flesh out the concept of anchoring, is to explore the nature of learning at the

scale of the individual, firm and epistemic communities or communities of practice (i.e. socio-professional groups), and consider how they are related to one another. At present, the TKD approach does not differentiate between them, and the 'rich interactions' that result in learning are not explored.

Crevoisier and Jeannerat (2009:1232) also argue that nowadays, '…actors have easier access to extremely numerous areas of knowledge that are spatially dispersed. Their problem is one of identifying and mobilizing these resources within a coherent business model'. If we accept this proposition then we must also acknowledge the work that goes into crossing not just spatial distance but also practice-based and epistemological boundaries, and which should not be underestimated. Cognitive-influenced concepts such as absorptive capacity and knowledge transfer or mobilisation are less helpful in understanding the way in which this happens, than those based on participation and communities of practice (Brown and Duguid, 1991; 2001; Lave and Wenger, 1991; Wenger, 1998). As I have already argued, some of these ideas are implicit in much of the TIM literature, particularly in discussions about the importance of tacit knowledge and regionalised institutions, conventions and routines.

The communities of practice literature originated in empirical studies of relatively small groups where individuals worked in close proximity and the key type of learning was a form of apprenticeship (formal or informal) through which new members engaged in legitimate peripheral participation. However, Brown and Duguid (2001) argue that communities of practice establish cross-firm, cross-occupational and – crucially for the TKD approach – national and international scale specialist networks. The concept has subsequently been taken up by economic geographers, who have adapted it to explain how the kind of 'rich learning' identified by Crevoisier and Jeannerat can take place between actors who are spatially distant (see the collection of papers in Amin and Roberts, 2008). Writers such as Boschma (2005), who have developed an expanded concept of proximity, e.g. relational, social and organisational proximity, make similar arguments. Although the theoretical tradition is different, both approaches focus on the kind of relationships between actors that facilitate learning even when they are located at a distance from one another.

These writers highlight the difficulties in learning across the boundaries created by different forms of 'proximity' or 'communities'. If, as Crevoisier and Jeannerat (2009:1231) claim,

'knowledge dynamics are at present articulated in a cross-sectoral manner, around composite entities such as health, communication or tourism', then the key learning challenge for the KBE is enabling individuals, communities of practice and firms to develop cultures and create procedures that enable them to 'bridge occupational epistemologies' (Cook and Brown, 1999). The TKD approach therefore implies vocational education and skills policies that encourage individuals and firms to think about the links that might be made outside their own specialism. Rather than rigid disciplinary, occupational or sectoral boundaries, combinatory studies around the intersections of previously distinct disciplines, or new composite subjects are called for. In contrast to the privileging of STEM subjects in contemporary British skills policy discourse, the TKD approach emphasises the importance of creative knowledge, and suggests that narrow specialisation in scientific subjects is unhelpful. This is important because TIM-inspired regional policies have pursued a rather narrow definition of innovation and focussed on 'knowledge intensive' sectors such as biotechnology and digital industries based on a small number of 'successful' regional case studies. The EURODITE project (see Halkier et al, 2010), through which the TKD concept was developed, by contrast, took a much broader perspective. It included case studies not only of peripheral and less successful regions but also analysed examples of non-technological innovation, such as the tourism industries in Skåne (Sweden) and North Jutland (Denmark), and food and drink sector in Bornholm (Denmark).

Whereas the traditional TIM paradigm suggests that individual learners need to participate in and develop their skills and knowledge in line with a slowly evolving set of regional institutions and routines, the TKD approach implies that learners are likely to be mobile and interact in networks that stretch beyond the region and potentially across the world. They will require different skills to identify sources of knowledge, interact with people from very different 'communities' and align different networks in order to learn. Whilst there has been recognition in the traditional TIM literature that these behaviours have always formed an important part of the 'localised capabilities' of successful regions (Malmberg and Maskell, 2006), the TKD approach suggests that they are the preeminent mode of learning in the KBE.

Conclusions

This paper has explored the implications of TIMs and the TKD approach for education and skills policies in the context of the KBE, using the UK as a case study of conventional policy analysis against which to compare them. Using the contrasting metaphors of learning as participation and learning as acquisition, the paper has sought to draw out the ways in which TIMs and the TKD approach conceptualise the kind of learning that supports the knowledge economy. The key features of each approach are set out in Table , and whilst the distinctions between them are emphasised here, it should be noted that these are relative rather than absolute differences.

Table 1. Learning for the KBE: key features of conventional policy analysis, TIMs and TKDs

	Conventional UK Skills Policy	**TIMs**	**TKDs**
Who learns	Individuals	Firms and regions	Mobile actor, receptor node and/or regional context
Locus of agency	Government	Firms and regions	Receptor firm and/or mobile actor
Where learning takes place	Educational institutions/workplaces	Industrial districts, clusters, regions	Multi-locational networks
Outcome of learning	Qualifications	Innovation	Innovation and restructuring of TKDs
Learning trajectory	Individual and discontinuous	Collective and cumulative	Combinatory and composite
What kind of knowledge	'Stand-alone' disciplinary /mono-sectoral knowledge in a national curriculum Generic skills & employability	Mono-sectoral & disciplinary knowledge that is contextualised in a regional economy	Cross-sectoral and hybrid knowledge that is re-contextualised through anchoring
Scale	National	Regional	Multi-locational
Primary learning metaphor	Acquisition	Participation	Alignment
Policy aims	To increase qualification levels	To create synergy between education	To engender the capacity to participate

	To improve generic 'employability' Numeracy and literacy	and training and mono-sectoral production systems for new entrants. To enable individuals to be effective participants in regional economic routines and institutions	in multi-location, cross-sectoral networks and align multiple sources of knowledge. To nurture the ability to bridge gaps between communities of practice/epistemic communities

Conventional policy analysis in the UK has identified increasing qualification levels through formal education and training as the most important kind of learning to support a KBE where economic competitiveness is primarily conceived at a national scale. Learning is an activity undertaken by individuals in discrete blocks of time, which is separate from the everyday production of goods and services, and involves the acquisition of existing bodies of knowledge or skills. Learning is categorised according to academic discipline or an occupational/sectoral area, as reflected in the titles of courses or qualifications. In addition, generic skills, such as numeracy, literacy, team working or computing skills have been identified as important. Overall, the aim of education and skills policy is to support and encourage individuals to gain qualifications, thus creating a 'supply' of knowledge to the economy.

The TIM literature suggests a quite different understanding of learning for the KBE. Learning is conceptualised as collective at the scale of firms and territories, such as regions, clusters or industrial districts, and based on interactions between actors. It is understood as an activity that is inextricably bound up in the process of innovation and is therefore a central part of everyday economic activity, not a separate sphere. Due to the path-dependent nature of innovation and the economic development of regions, learning is understood to be cumulative over time as regions become specialised in particular activities. This perspective clashes with current skills policies in the UK in a number of ways. Firstly, it suggests that regions should be given more autonomy to shape skills policy, which would be more differentiated according to the history and presumed future trajectory of a region. There were some tentative moves towards decentralisation of skills policy under the Labour Government. Regional Development Agencies and (a few) Statutory City Regions (e.g.

Manchester) were given powers to determine strategies for skills development. These have been lost, however, under the Coalition Government, which has also moved to institute local rather than regional skills partnerships (without statutory powers). Moreover, the overall policy framework remains fixated on qualifications. Thus, for example, debates about skills gaps and at which scale they should be addressed (e.g. regional or local), are framed in terms of the alignment of funding streams and priorities for the provision of training courses. The TIM literature, by contrast, indicates that participation in regional routines, conventions and institutions is crucial for firms and individuals to learn. This would involve not only the inclusion of employers in partnerships with local/regional government agencies and training providers but specific policies to create opportunities for individuals to engage in legitimate peripheral participation within a regional economic system. There are problems, however, with this approach, which is based on the experiences of small number of regional case studies. I would certainly not advocate a narrowly focussed education and training framework that was regionally autonomous but inward looking (with potential for damaging lock-in), and reduced the wider goals of education to the economic imperatives of particular sectors. Rather, I would suggest, the key insights from the TIM literature are its identification of the importance of the links between individual and collective learning through participation and its emphasis on a broader conceptualisation of learning that goes beyond qualifications.

The TKD approach, is an important extension to the TIM literature, and suggests further changes to current skills policy. Like the traditional TIM paradigm, innovative processes, products and services are seen as the primary outcome of learning, rather than qualified individuals, and firms and other key regional organisations, rather than central government, are understood to play a central role in developing learning processes. In addition, however, the TKD approach focuses attention on the ability of regional territories (through receptor firms) to access and anchor mobile knowledge. Learning is understood to take place within multi-locational TKDs, which may involve relations that stretch across regional or national boundaries, and where the TIM approach appears to privilege cumulative learning through incremental innovation, the TKD perspective is more radical, emphasising learning trajectories which are combinatory and composite in terms of the knowledge that is involved. Thus, learning is likely to be cross-sectoral rather than disciplinary or mono-sectoral and results in new ‘hybrids’. To date the rather abstract characterisation of the modalities of anchoring has not been translated into concrete policy proposals but the TKD

approach suggests that the alignment of resources and wide-ranging networks is crucial to successful learning. The challenge for policy is to engender the capabilities of individuals and firms to participate in multi-local TKDs. The TIM literature implies participation in place-bounded communities of practice as individuals circulate in a regional economy. The TKD approach extends this to include much wider networks of practice. Thus, in distinction to current policy-making at a regional scale, which focuses on the provision of local training to eliminate perceived skills gaps, the TKD approach indicates that policy-makers should also encourage the initiation and development of interactions and relationships through which firms learn from actors located elsewhere (and in different sectors). This might involve the identification of receptor or gatekeeper firms who play a central role in initiating such relationships, or support for national and international networking. The TKD approach also suggests that strict disciplinary or sectoral boundaries in the provision of vocational and academic education should be challenged, supporting individuals to develop multi-disciplinary (or composite) knowledge. This requires openness, and explicit design of curricula and resources to develop learners' ability to communicate with those from other epistemological communities, as well as the skills to manage projects that span geographical, sectoral and institutional boundaries. Particularly important here is the insistence on a broad definition of innovation that includes a wide variety of activities that are not necessarily hi-tech. Although this paper used the UK as a case study, these issues are equally important for other European countries. The EU's Education and Training 2020 framework for policy cooperation between European countries aims to take forward the Lisbon agenda and develop policies for sustainable and socially inclusive growth. However, like the UK's national policy framework, it focuses almost exclusively on formal learning leading to qualifications. Thus the level of educational attainment of the adult population is used as a proxy for the availability of knowledge and skills, and the benchmarks for adult learning are an increase of at least 15% in the number of tertiary graduates in Mathematics, Science and Technology and for 12.5% of the adult population to participate in lifelong learning (measured in terms of engagement in education and training). A critical appreciation of the insights offered by the traditional TIM approach and the more recent arguments of the TKD approach would help broaden this rather narrow policy framework.

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