JRC TECHNICAL REPORTS

Regional Branching and Smart Specialisation Policy

Ron Boschma and Carlo Gianelle

2014

Regional Branching and Smart Specialisation Policy

Ron Boschma* and Carlo Gianelle**,[a]

*Centre of Innovation, Research and Competence in the Learning Economy (CIRCLE), Lund University, Lund (Sweden); and Urban and Regional Research Centre Utrecht (URU), Utrecht University, Utrecht (the Netherlands)

**European Commission, JRC-IPTS, Seville (Spain)

Abstract

This note studies the mechanisms through which regional economies diversify over time and formulates suggestions on how policy can influence such process. In particular, two closely related concepts will be defined, that is, technological relatedness and related variety.

Regional diversification is a crucial process in order to develop new growth paths. It is understood as an emerging process through which new activities develop out of existing ones, but the scope and outcome of this process are fundamentally affected by technological and cognitive constraints.

We discuss how technological relatedness may provide an input for effective policy making. In this respect, public policy should avoid picking winners that do not fit into the regional actual and potential industrial space and should prevent supporting declining industries that occupy a peripheral position in the industry space of a region. More in particular, we direct attention to various mechanisms through which new industries may be stimulated to connect to technologically related industries at the regional level.

We also introduce the process of entrepreneurial discovery, in which entrepreneurs generate the key information guiding the selection of the domains of future regional specialization, and discuss its relationship with policy schemes based on related diversification.

Keywords: Regional Branching, Technological Relatedness, Related Variety, Related Diversification, Entrepreneurial Discovery Process.

---

[a] The views expressed are purely those of the author and may not in any circumstances be regarded as stating an official position of the European Commission.

1. Introduction

Regional diversification is high on the political agenda in Europe. As many regions are badly hit by the economic crisis, there is a strong need to develop new economic activities to compensate for losses in their regional economies. For this reason, knowledge-based economic transformation that opens up new growth paths through investments in innovation, research and development (R&D) and higher value-added activities has been put at the core of the revised European cohesion policy, as a fundamental driver of a successful Europe 2020 strategy (European Commission, 2010). To achieve this goal, the disbursement of structural funds under the thematic objectives most directly related to R&D, innovation, information and communication technology (ICT) development, and support to SMEs will be conditional on the existence of national or regional Research and Innovation Strategies for Smart Specialisation (RIS3).

RIS3 are defined as integrated, place-based economic transformation agendas that focus policy support and investments on key challenges and needs for knowledge-based development, building on national/regional strengths, competitive advantages and potential for excellence (European Commission, 2012). Regional diversification is one of the key processes such strategies should build upon, with the aim of developing distinctive new areas of specialisation for the future.

Studies have learned that the ability to develop new growth paths is not equally divided across all regions. Perhaps one of the most daring example is the American motor city of Detroit that has completely failed to do so, and which has lost more than one million inhabitants as a result (Hill et al., 2012). In the USA, the recent revival of Pittsburgh shows that old industrial regions can recover though (Treado, 2010). While Pittsburgh lost most of its steelmaking capacity, it has not lost its steelmaking expertise which laid the foundations of a strong economic recovery. Other regions like Boston show a capacity to reinvent themselves by reconfiguring their skill-related assets over a long period of time (Glaeser, 2005). In Europe, there are regions that have succeeded in stepping out of stagnation, economic downturn or decline of traditional manufacturing and found their way to new economic development and urban regeneration. Well-known examples are Bilbao (Etxebarria and Franco, 2003), Turin (Vanolo, 2008) and Manchester (Quilley, 2000), based on differentiation of the existing skill and knowledge base into new activities, supported by increased accessibility through infrastructure building, creation of attractive events, and urban and regional branding.

In policy circles across the European Union, there is increasingly strong awareness that regions should create new growth paths to offset inevitable processes of stagnation and decline in other parts of their economic structure. Regional diversification is recognised as a key mechanism in achieving this goal; however, we still have little understanding of what drives the process of regional diversification, and how policy can have an impact on that. The aim of this policy note is to shed some light on this issue and frame it in fundamental terms.

This note focuses attention on two closely related concepts that might impact on regional diversification, that is, technological relatedness and related variety. Diversification is understood as an emerging process through which new activities develop out of existing ones, but the scope and outcome of this process are fundamentally affected by technological and cognitive constraints. Section 2 briefly presents some of the latest empirical insights concerning the importance of technological relatedness and related variety for regional development and regional branching (Boschma and Frenken, 2011). Section 3 takes up some implications for regional innovation policy and explains how technological relatedness may provide an input for effective policy making. In this respect, public policy should avoid picking winners that do not fit into the regional actual and potential industrial space and should prevent supporting declining industries that occupy a peripheral position in the industry space of a region. Section 4 discusses another policy concept, which is about the entrepreneurial discovery process, in which entrepreneurs generate the key information guiding the selection of the domains of future regional specialization (Foray et al., 2009, 2011; Foray and Goenaga, 2013), and its relationship with policy schemes based on related diversification. In Section 5, we sketch some policy options that use the concepts of technological relatedness and related variety as basic inputs to move regional economies into new directions. More in particular, we direct attention to various mechanisms through which new industries may be stimulated to connect to technologically related industries at the regional level. Section 6 draws some conclusions.

2. Technological relatedness, related variety and regional development

Central to our interest is the question of how growth and innovation depend on knowledge creation and its utilisation by firms. To examine how the process actually works, we start by considering firms that are ultimately responsible of economic growth and innovation. Firms are far from equal. They develop and accumulate firm-specific routines and knowledge over time, which are hard to copy or replicate by other firms. Scholars often refer to the tacit dimension of routines which are difficult to articulate and codify, and therefore, far from easy to imitate (Nelson and Winter, 1982). Therefore, performances of firms vary greatly, and they do so persistently. This variety of organizations embedding variety of knowledge in an economy is regarded as a crucial driving force of economic growth (Saviotti, 1996).

We may think of the process of production of new knowledge in an economy as a recombinant process in which organizations or individual agents continuously search for existing items of knowledge and make an effort to recombine them into new forms which in turn becomes new items of knowledge at the disposal of actors for a new process. This 'recombinant' view of knowledge creation, and ultimately of economic growth, was clearly set out by Weitzman (1998) building on

Schumpeter's work and has subsequently become the basis for a fruitful strand of research on the linkages between innovation, knowledge creation and growth. It is intuitively clear that the number and variety of existing knowledge items are fundamental ingredients of new knowledge creation. In order to understand how the process works, it is most important to identify the conditions for a successful recombination process. Two elements need to be defined in this respect: what are the actual channels for knowledge recombination, and what types of knowledge can be successfully recombined.

Knowledge spillovers or transfer of knowledge between firms have long been recognised in the literature as a key channel for recombination. However, space might be a constraining factor. As a matter of fact, knowledge spillover effects are often geographically localized, and these tend to become weaker the higher the distance from the knowledge source (Audretsch and Feldman, 1996). This suggests that geographical proximity is a precondition for knowledge transfers. However, Boschma (2005) argued that geographical proximity is neither a necessary nor a sufficient condition for interactive learning. The same applies to the process by which knowledge is transferred between organizations, incorporated and transformed into something new. Other barriers of effective knowledge transfer need to be overcome, such as social or cognitive distance (see e.g. Torre and Rallet, 2005; Balland, 2012). Some, if not all, of these forms of proximity between actors need to be secured to make them connected, and to facilitate knowledge transfers (Lagendijk and Oinas, 2005).

When firms have access to external knowledge, they might lack the capacity to understand and absorb it (Cohen and Levinthal, 1990; Broekel and Boschma, 2012). Besides absorptive capacity, knowledge transfer requires cognitive proximity, that is actors need to share similar knowledge and expertise to enable effective communication (Nooteboom, 2000). However, too much cognitive proximity between actors may also harm real learning. That is, when two actors know exactly the same, they cannot mean much to each other in terms of learning, as they have not much to add to each other's knowledge bases. And when these two actors would connect, they run the risk of being closed off to new knowledge. So, two actors need to have some cognitive proximity to ensure communication and mutual understanding, but not too much cognitive proximity, to avoid cognitive lock-in (Nooteboom, 2000). When two actors are related, from a technological point of view, for instance, they share different though related competences that facilitate and enhance effective knowledge transfer.

Therefore, variety within a region might matter for knowledge spillovers conductive to useful recombinations (Jacobs, 1969), but only if all these different industries in a region are technologically related to each other. Frenken et al. (2007) have claimed that the higher the number of industries that are technologically related in a region (i.e. the higher the amount of related variety), the more learning opportunities there are for local firms, and the more it will contribute to

regional growth. Accordingly, a high number of technologically related industries in a region should be more beneficial for knowledge spillovers than a set of unrelated industries, in which cognitive distance prevents inter-industry spillovers to occur.

Empirical studies have assessed whether related variety has enhanced urban and regional growth. Frenken et al. (2007) could indeed show that related variety had a positive impact on regional employment growth in the Netherlands. Other studies have followed on Italy (Boschma and Iammarino 2009; Mameli et al., 2012), Great Britain (Bishop and Gripaios, 2010), Finland (Hartog et al., 2012), Spain (Boschma et al., 2012), Germany (Brachert et al., 2013), Portugal (Rebelo and Gomes da Silva, 2013) and Europe (Van Oort et al., 2013). Although these studies do vary widely in their approach (e.g. in terms of the use of spatial scales, measures of relatedness, periods covered, and control variables), it is fair to conclude that related variety tends to have a positive effect on urban and regional growth. This effect of technological relatedness may also cross regional boundaries, although this has not yet been investigated systematically. A study by Boschma and Iammarino (2009) suggests that a region can benefit from extra-regional knowledge when it originates from sectors that are not identical, but related or close to the industries present in the region. In those circumstances, cognitive proximity between extra-regional knowledge and the regional knowledge base is not too small nor too large, which might favour real learning and recombination processes between related industries across regions to occur.

There is increasing evidence that related technological variety also is a key ingredient for regions to diversify and develop new growth paths, as new industries branch out of existing industries to which they are technologically related. There is case-study evidence that new industries grow out of related industries in the same region (Klepper and Simons, 2000), and that this branching process also increases the survival probability of new industries (Boschma and Wenting, 2007; Klepper, 2007; Buenstorf and Klepper, 2009). Studies have also demonstrated how technological competences accumulated at the regional scale shape future patterns of technological diversification, like fuel cells in European regions 1992-2007 (Tanner, 2011), nanotechnology in European regions for the period 1986-2006 (Colombelli et al., 2012), and biotechnology in 276 world cities from 1989 to 2008 (Boschma et al., 2013b).

There is also case-study evidence that the long-term resilience of particular regions is depending on the reconfiguration and reorientation of existing regional assets (Bathelt and Boggs, 2003; Belussi and Sedita, 2009; Moriset, 2009). Glaeser (2005) has described extensively how Boston was able to reinvent itself by building and reconfiguring its skill-related assets over a long period of time. Treado (2010) owed the recent revival of Pittsburgh to its steelmaking expertise that laid the foundations of a strong economic recovery. So, to the extent that new industries emerge from related industries, the industrial structure of a regional economy affects the diversification opportunities of regions in the long run (Neffke, 2009). More systematic empirical evidence on this

process of regional branching (Boschma and Frenken, 2011) is piling up in a rapidly growing number of studies (Neffke et al., 2011a; Rigby, 2012; Van der Wouden, 2012; Boschma et al., 2013a; Essletzbichler, 2013).

Importantly, all these studies show that regional renewal depends to a considerable degree on the industrial history of regions, as territories are more likely to expand and diversify into industries that are closely related to their existing activities. New development paths depend on the assets and industries already present in the region. Analysing the rise and fall of industries in 70 Swedish regions in the period 1969-2002, Neffke et al. (2011) found strong and robust evidence that a new industry has a higher probability to enter a region when that new industry is technologically related to other industries in that region. And an existing industry was more likely to exit a region when that industry was not technologically related to other industries in the region. And the higher related variety in a region, the more opportunities to make new recombinations and to diversify into new related industries.

Entrepreneurship might be one of the driving forces behind this process of regional branching. There is empirical evidence that old sectors give birth to new sectors, and that start-ups in new industries have a higher survival rate when the entrepreneur had a working background in related industries (Klepper, 2007). For instance, Boschma and Wenting (2007) found that firms in the emerging British car industry had a higher survival rate when their entrepreneurs had previously acquired experience in related industries (like bicycle making), especially in regions with a strong presence of related industries. So, when diversifying from related industries into the new car sector, these start-ups could fully exploit their related competences, which significantly improved their economic performance and life chances.

3. Possibilities to intervene publicly in the process of regional diversification

This increasing amount of evidence suggests that policy makers should be interested in related diversification because of its role in regional growth. The one-million-dollar question is: can public policy make an impact on this process of (related) diversification, and if so how? Scholars like Rodrik (2004) and Mazzucato (2013) claim that public policy plays a crucial role in the process of industrial restructuring and renewal, as Silicon Valley would not have existed without massive public expenditures on US military defence, and the Asian tigers could only catch up economically due to strong national policy interventions. However, the systematic studies on related diversification discussed earlier have not assessed the (intentional and unintentional) effects of public policy on industrial diversification.

When discussing the necessity for an industrial policy, crucial questions are whether governments should pursue a 'picking-the-winner' policy, and whether – and if so, how – policy makers can identify regional potentials and select possible fields for policy intervention. Below, we discuss how relatedness and related variety can be used as useful inputs for policy design to enhance regional diversification. In the next Section, we discuss how the entrepreneurial discovery process (Hausmann and Rodrik 2003; Rodrik 2004) identifies opportunities for public intervention, which has been later employed to develop the smart specialisation concept (Foray et al., 2009, 2011; Foray and Goenaga, 2013).

The concept of relatedness provides a tool to identify regional (unused) potentials and a framework to target and select promising activities. The objective of such a policy approach is not to aim for more specialisation, as this would increase the problem of overspecialisation and regional lock-in. The objective is not to aim for diversification per se either, as this runs the risk of developing new economic activities that are not embedded in the region, or, even worse, of building 'cathedrals in the desert'. Instead, the objective is to aim for specialised diversification into related technologies which generates new economic activities that are rooted in the region and that can draw on local related resources (Boschma, 2009; Neffke et al., 2011; McCann and Ortega-Argilés, 2013). This is also the view that the smart specialisation wants to convey. Every region can be made part of such a smart specialisation policy, but some regions will have more potential to recombine local resources and diversify into new directions, because of their accessibility, urban density, specialisation, related variety, and institutional and governance structures (McCann and Ortega-Argilés, 2013).

Such a smart specialisation policy aims to broaden and renew the industrial structure of regions by making it branch into new related activities. This is achieved by encouraging and enabling crossovers and recombinations between related industries that can provide complementary assets. This requires collection of data to identify the degree of relatedness between industries in a region, and to assess whether these related industries are actually connected or not. If not, bottlenecks need to be identified that prevent related industries to connect and interact. This would also contribute to a further refinement of the concept of connectivity proposed by McCann and Ortega-Argilés (2013) in their description of the smart specialisation framework. In our policy framework, bottlenecks need to be targeted and removed that prevent knowledge to flow from one related activity to another. Making connections between related activities both within regions and across regions makes that regional potentials are more fully exploited, as they bring in new knowledge and resources that are related to existing activities in the region (Boschma and Iammarino, 2009).

This policy approach would defy 'picking-the-winner-policies', as it is not about targeting activities that have been identified as promising for future growth more in general (like gaming or nanotech), and it is not about making strong local sectors stronger. Having said that, policy prioritisation is still

required, in the sense that related industries are targeted in regions where they have a strong presence and where potentials of new recombinations are high. This policy approach might work in any type of regions, though it is evident that some regions, because of their size and diversified industrial structure, have greater potential to successfully diversify in new directions, as more local recombinations can be made.

Let's us look at how this process of identification of industries and activities with higher potential for recombination might work in more detail. In Figure 1, we have depicted the industrial structure of a region as a network. Each node stands for one industry: in total, there are 24 industries in the whole economy in this example. Each black node stands for a particular industry present in the region, while a white node represents an industry that is not present in this region. Links between industries are based on a mapping of technological relatedness: if two industries have a link, it means that they are technologically related above a certain 'intensity' threshold (for some links, an actual value of relatedness is given in Figure 1); if there is no such link, it means that two industries are not technologically related. Technological relatedness between industries can be measured in a number of ways (see e.g. Boschma et al., 2012). Examples are measures of inter-industry relatedness based on SIC-codes (Frenken et al., 2007), co-occurrence of products (within plants, firms, or even countries) (Neffke et al., 2011; Boschma et al., 2013a), input-output linkages, and the intensity of labour reallocation between industries (Neffke and Henning, 2012).

Figure 1. The network of related industries in a region
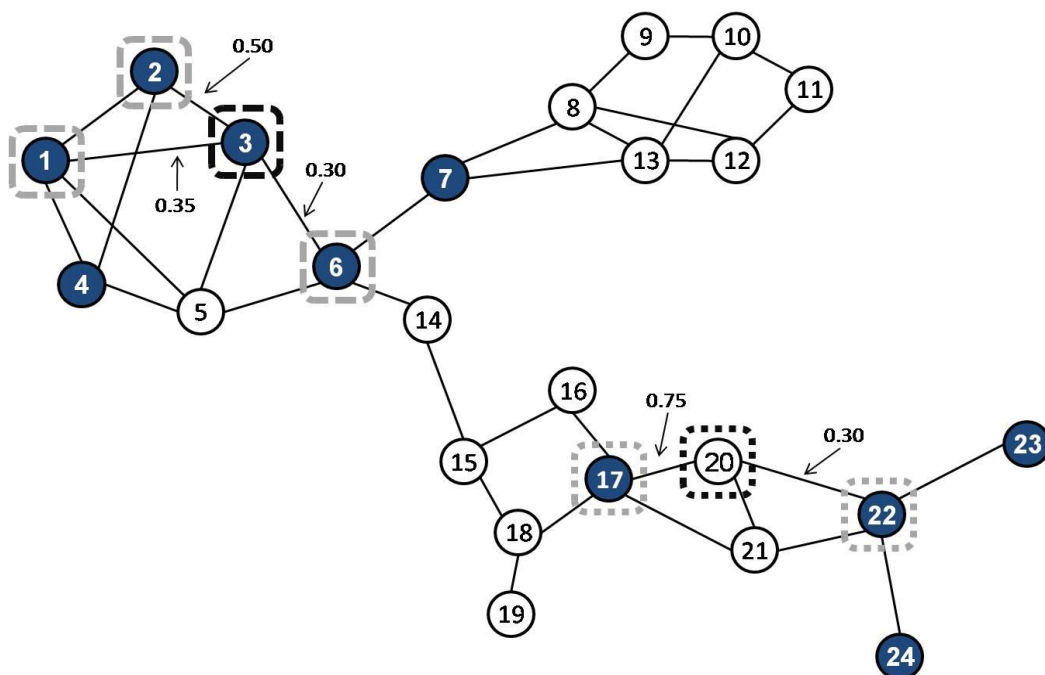
Source: Neffke et al. (2011), p. 249.

Such a network structure based on technological relatedness between industries can help to identify opportunities for regions to diversify into new related activities. First of all, one should be cautious to target new industries that are considered promising worldwide in terms of technological potential or job growth opportunities, but which occupy a rather peripheral position in the industry space of the region. For instance, this applies to sector 11 which is part of a group of technologically related industries, all of which are not present in the region. Because public policy is about spending scarce public money, it may be wise not to support this industry, as it will most likely fail to develop, and will disappear soon after its entrance, as it cannot draw on local resources from related industries in the region. This provides an explanation for why many regional initiatives that aimed to be the new Silicon Valley failed to materialize and have led to a waste of public money.

Instead, smart specialisation policy should better go for new industries that can more easily connect to and be embedded in the industrial structure of a region, because this increases its probability of survival and, thus, the probability of policy success to a considerable degree. In Figure 1, an obvious example is sector 5, which is still not present in the region, but once it enters, it can draw on related industries 1, 3, 4 and 6 which are present locally. One could also argue that industry 5 will emerge and develop sooner or later even without public support, because of the local presence of related industries, and that is why policy intervention might not be needed in the first place. Moreover, it would also be important to check whether industries 1, 3, 4 and 6 that are technologically related are actually connected and linked with each other in the region in practice. It might be the case that ignorance or bottlenecks prevent them to connect and exchange knowledge, or that they are even not aware of the existence and potential of each other. Policy could then focus on taking away these bottlenecks, make related industries interact and exchange resources in a region, as this might lead to new recombinations and new industries that branch out of that.

Backing declining industries in a region has been quite popular among many local policy makers but has been strongly rejected by many economists. In our framework, we can argue that such a policy is not necessarily bad, but that it depends on the degree of relatedness with existing industries. From such a relatedness perspective, it is not wise to support declining industries that already take a peripheral position in the industrial portfolio of the region (like sector 7 in Figure 1), because they have a high probability to exit the region anyhow (Neffke et al., 2011). This is different from local industries that have strong technological ties with other industries in the region. When such industries are confronted with a temporary demand fall, their decline and loss would damage the existence and dynamics of other local industries to which they are technologically related. In Figure 1, this might apply to industry 6, which is quite a strategic sector, as it potentially functions as a bridge between three different technological clusters (that is, three different groups of interlinked industries).

This policy approach can clearly be applied to every region and to all types of sector and economic activity. The selection criterion is to target industries based on their degree of technological relatedness with other industries in the region. The objective is not to stimulate particular sectors, but to enhance interaction and exchange between different but complementary activities, in order to support new recombinations and new variety in the region. This is in line with the smart specialisation approach described in the guidelines developed by the European Commission (European Commission, 2012). This is also in line with literature highlighting the dangers and limits of following a 'one-size-fits-all' policy (see e.g. Todtling and Trippl, 2005; Raspe and Van Oort, 2006; Asheim et al., 2011). Instead, the related diversification approach favours tailor-made policy strategies that capitalise on region-specific assets that are linked to technologically related industries (Lambooy and Boschma, 2001). This implies that the industrial history of regions provides opportunities but also sets limits to what can be achieved by regional smart specialisation policy. Policy focused on the creation of new growth paths in regions is, and will always remain, risky, as it is impossible to predict the most successful new recombinations of the near future. Nevertheless, we argue that inter-industry relatedness provides a powerful framework to identify regional potentials and to target and select activities as sources for diversification.

4. Related diversification policy and the entrepreneurial process of discovery

The works at the foundation of smart specialisation give prominence to another criterion to be used in the selection of priorities for public intervention and funding: the entrepreneurial discovery process (see Boschma, 2014). In the present Section, we explain how the related diversification approach can be combined with the entrepreneurial discovery process into an integrated, place-based framework for regional policy.

Compared to policy schemes based on related diversification, early elaborations of the smart specialisation concept (Foray et al., 2011) proposed a more open policy approach: no potentials and priorities are identified and set beforehand, but these are supposed to emerge out of the entrepreneurial discovery process. Entrepreneurs should take the lead and identify and select the domains of future specialisation of regions, as "entrepreneurs …. are in the best position to discover the domains of R&D and innovation in which a region is likely to excel given its existing capabilities and productive assets" (Foray et al. 2011, p. 7). Like the relatedness concept, this entrepreneurial discovery process defies a top-down strategy of 'picking winners' that imposes new specialisations on regions (Boschma, 2014). By contrast, it is bottom-up policy that aims to promote search activities by entrepreneurs that identify the potential advantages of general purpose technologies in their own economic domain.

In the policy model originally outlined by Foray et al. (2011), it is left to entrepreneurs to scan technological and market opportunities, to identify possible bottlenecks and to articulate obstacles to grow, as they are considered to possess the 'right' knowledge. This 'right' knowledge does not only concern technical and scientific knowledge, but above all, knowledge of market growth potentials, as entrepreneurs are in the best position to identify future market needs. In this respect, it is important to underline that entrepreneurs can be individuals but also organisations, and not only market-based organisations but also public organisations like health and higher education organisations.

Although market forces play a leading role in the entrepreneurial discovery process, governments fulfil a crucial role as well. As Rodrik (2004) put it, "... diversification is unlikely to take place without directed government action" (Rodrik 2004, p. 8). Hausmann and Rodrik (2003) have referred to two types of externalities to explain of why the public sector is crucial in a knowledge-based economy. Information externalities follow a conventional market failure argument in which the search and innovation process is hampered because it is accompanied with high private costs. This is likely to bring the entrepreneurial discovery almost to a halt, as private returns to entrepreneurship and experimentation cannot be fully appropriated and are likely to be undermined by imitation. The second type of externalities concerns coordination externalities. New activities that arise out of the discovery process need to be nurtured and may require large-scale investments in their surrounding environment (like, for instance, new rules and regulations, new research and teaching facilities) which are not likely to be provided by the private sector itself.

In the self-discovery process outlined by Foray et al. (2011), the private sector and the government have to collaborate strategically as they both have imperfect information. They have to make huge efforts to collect all decentralized information on experiments and discoveries, learn about their future potentials, assess all possible costs, select the most promising ones, decide how to support these projects, and monitor those carefully. Building on these bases, the smart specialisation concept puts emphasis on the nature of the policy process, how public and private agents can contribute to that, and how to improve that.

The policy guidelines for designing and implementing RIS3 strategies published by the European Commission (European Commission, 2012) embrace a slightly different view than earlier smart specialisation papers. In the European Commission guidelines, it is indeed clear that the entrepreneurial discovery process has to be supported and in some way subordinated to sound analyses of the regional economic system, including entrepreneurial potential, aimed at identifying areas with greater potential for knowledge-based transformation and value-added generation where innovation is more likely to be successful.

Taken in the abstract, this view on the open-ended process of entrepreneurial discovery to identify future specialisations seems to go against the relatedness approach that aims to identify beforehand which regional potentials and inter-industry crossovers could be stimulated, as this might deny the essence of the entrepreneurial discovery process (Boschma, 2014). As Foray et al. (2011) have put it, entrepreneurial discovery "... is not about telling people what to do, what are the right specialisations, but accompanying emerging trends and improving coordination by providing the necessary public goods (education, training) and creating additional incentives at certain critical bottlenecks to help the new activity to grow" (Foray et al., 2011, p. 6).

A way to reconcile the relatedness approach and the entrepreneurial discovery process and profit from both is to adopt a sequential approach to priority setting in which first economic activities with greater potential are identified with relatedness methods, after which an entrepreneurial discovery process is activated and harvested within the boundaries of these pre-defined areas. Analyses carried out using relatedness techniques will restrict the scope of entrepreneurial discovery only to the areas where there is strong emergent evidence of innovation and growth potential, substantially reducing the monitoring effort of policy makers. Entrepreneurial discovery will allow identification of actual bottlenecks to growth and opportunities for knowledge-oriented development through a bottom-up process based on the mobilization and use of entrepreneurial knowledge. This might be a promising way to undertake a policy intervention scheme aimed at producing smart specialisation.

There is still a policy dilemma that is neither taken up by the policy scheme based on relatedness nor on entrepreneurial discovery, and that is the question whether the long-term economic development of regions requires related or unrelated diversification (Boschma, 2014). The relatedness story learns that public support of discoveries that are defined as promising but that take an isolated, peripheral position in the industry space of the region is most likely to fail, as these discoveries cannot build on local resources available in related industries. In the entrepreneurial discovery process, public support is most likely to remain within the scope of particular paths or domains, and therefore may be blind to potentials of unrelated diversification. This implies that connections between unrelated industries are unlikely to be taken up in both policy frameworks, and that unrelated diversification is not part of the policy agenda.

Although related diversification is a more likely event to occur, and also more likely to be successful (see Neffke et al., 2011), it might still be argued that regions need to make a jump in the evolution of their industrial structure now and then, and to shift into more unrelated activities, to secure long-term regional development. As systematic empirical evidence is yet lacking, it is still too early to say to what extent long-term economic development can be secured by a long sequence of rounds of related diversification in regions, and to what extent unrelated diversification in completely new techno-economic fields is needed. There are examples in which technologically unrelated activities made new combinations and led to new growth impulses. The current tourist industry is such an

example, as it is making new connections between unrelated activities, like ICT, design, art and gastronomical activities.

So, it might still be argued that any discovery that is perceived as promising should warrant public support, no matter whether it concerns making connections between related or unrelated activities at the regional scale (Boschma, 2014). Such a policy approach leaves behind a strict use of relatedness or domains, as unrelated activities or domains may also be brought together and form new combinations for future regional growth. Making these new connections across any set of industries is what so-called platform policies might indeed try to accomplish (Harmaakorpi, 2006; Cooke, 2010; Harmaakorpi et al., 2011).

5. Potential policy targets for regional diversification

So far, we have discussed the rationale behind a smart specialisation policy that is based on the relatedness approach (Boschma and Frenken, 2011; Asheim et al., 2011) and the entrepreneurial discovery process (Foray et al., 2011). This allows the identification of recombination potentials and actual bottlenecks in regions that prevent related activities to connect and inter-industry cross-fertilization to occur. Moreover, we have underlined the need for a careful design of the policy process and how to implement smart specialisation policy strategies. In the remaining, we will very briefly direct our attention to three knowledge transfer mechanisms through which related industries may be connected at the regional level, and which could be potential targets for such smart specialisation strategies. These mechanisms are: (1) entrepreneurship, with a focus on experienced entrepreneurs; (2) labour mobility, with an emphasis on mobility between related industries; and (3) collaborative networks, with a focus on research collaborations between related partners. Due to space constraints, we will present not an exhaustive list of all possible policy actions here.

(1) in the entrepreneurship literature, a lot of attention has been devoted to spinoffs, as these firms make knowledge circulate and diffuse between firms and related industries in a regional economy. As spinoffs are new ventures founded by entrepreneurs who acquired experience in the same or a related industry (so-called experienced entrepreneurs), they often perform better than other new firms (Helfat and Lieberman, 2002). More importantly, spinoffs that come from related industries are a crucial driving force behind the emergence of new industries in regions (Klepper and Simons, 2000; Klepper, 2007; Boschma and Wenting, 2007). Experienced entrepreneurs are crucial for new industries to survive in their emergent phase, as they can draw on and exploit relevant knowledge and skills from related industries. As a consequence, experienced entrepreneurship is a key mechanism through which regional economies diversify into new industries while building on knowledge from local related sectors (Boschma and Wenting, 2007). As experienced entrepreneurs

are a key source of related diversification in regions, entrepreneurship policy should be made part of smart specialisation policy. It could target and support experienced entrepreneurs in the discovery process, because they bring into existence new industries, their ventures have higher survival rates, and they bridge related industries and connect different domains that lead to new combinations. Targeted policies should be complemented by capital market regulation measures to favour the flowing of capital, especially venture capital, into new firms, but also the stock market launch of successful startups and spinoffs or other forms of placing new firms in the capital market to possibly monetize the investments of early investors. These framework conditions represent prerequisites for developing serial entrepreneurship and entrepreneurial mentoring by experienced entrepreneurs.

(2) there is increasing evidence that labour mobility is a crucial mechanism through which related skills and experience are transferred between firms (Boschma et al., 2009), between industries (Neffke and Svensson Henning, 2008) and within regions (Neffke and Henning, 2013; Boschma et al., 2013c). Analyzing more than 100,000 job moves in Sweden, Boschma et al (2009) demonstrated that new employees recruited from related industries increased significantly the economic performance of plants, while new recruitments from the same industry actually lowered their performance (see also Timmermans and Boschma, 2013). Labour mobility between related industries may also bring economic benefits to regions, as recruitments of employees from related industries will truly renew the skill base of local industries which might lead to new and unexpected combinations, because it concerns inflows of new skills that can be integrated in their existing skill base because they are related. Since most labour mobility takes place within so-called labour market areas, policies promoting labour mobility between related industries may therefore enhance the recombination potential of regions and increase regional growth (Heuermann, 2009; Boschma et al., 2013c). It might also be crucial to stimulate the inflow of skilled labour from other regions and countries, especially from related industries, because it brings new ideas and knowledge to the region (Saxenian, 2006). This implies that smart specialisation policy should also concentrate on and incorporate labour market policy issues, and labour mobility between related industries in particular.

In the last two decades in most developed economies, labour market intermediaries have become central actors in the process of labour reallocation and job search (Autor, 2009). These organizations can be either private or public, organized through a physical or virtual infrastructure or both, and are often very well positioned in order to monitor and gather information about occupational needs and emerging trends in the labour market at the local level (Gianelle, 2011). For these reasons, it is important that policy makers consult labour market intermediaries and involve them in the preparation, design and implementation of policy measures aimed at facilitating labour mobility between related industries. Targeted policies for labour reallocation should be

complemented by effective regulation to guarantee and maintain an efficient and competitive labour intermediation market at the regional and national level (Gianelle, 2011 and 2012).

(3) in the foregoing, we have emphasized the importance of making connections between related industries at the regional scale. Through the above-mentioned processes of spinoff and labour mobility, but also through research collaborations, among others, firms and industries get connected and form networks through which knowledge flows and diffuses in economies (Agrawal et al., 2006; Breschi and Lissoni, 2003). So, firms and regions are positioned in knowledge networks, but they do so unevenly, because knowledge networks are selective, that is, they tend to favour the ones that are already highly connected and have a high absorptive capacity (see e.g. Giuliani, 2007; Ter Wal, 2009). Network studies show that being centrally positioned in knowledge networks matters for economic performance, but especially when research collaborations consist of partners with related competences, as these tend to favour exploration and the development of novelties (see e.g. Gilsing et al., 2007). This implies that smart specialisation policy should develop policy focused on research and knowledge networks, and make this part of the discovery process. Based on the previous findings, it might be beneficial to cross boundaries of related technology fields and industries, as this may help regional economies to diversify into new but complementary fields of activity. Doing so, policy should avoid that vested interests of established local players take over and dominate these knowledge networks, and should ensure that these networks cross boundaries of regions, to avoid regional lock-in (Camagni, 1991; Bathelt et al., 2004; Moodysson, 2008; Dahl Fitjar and Rodríguez-Pose, 2011), especially between related industries in different regions (Boschma and Iammarino, 2009). Universities may play a role in facilitating the formation of networks of learning and recombinations (Lester and Piore, 2004; D'Este et al., 2013), because they are well connected to international networks.

6. Conclusions

In this note, we have argued that knowledge is transferred, incorporated and recombined easier and more intensively when regions are endowed with a variety of related industries that have similar competences in common. This enables regions to start up new growth paths and to diversify into new but complementary fields of activity, which is crucial for their long-term economic development. We explored how this process of related diversification may serve as an underpinning for an effective smart specialisation policy. We have argued that the objective of such policy is to stimulate specialised diversification into related technologies, that is, to develop new economic activities that can draw on local related resources. Instead of copying best practices taken from elsewhere, smart specialisation policy should take the history of the region as a point of departure, and identify regional potentials and bottlenecks that prevent connections and recombinations

between related activities to occur. Doing so, we integrated insights from the relatedness approach and the entrepreneurial discovery process, in which economic activities with greater potentials in regions are identified with relatedness methods, after which the entrepreneurial discovery process will identify actual bottlenecks to growth and opportunities for knowledge-oriented development through a bottom-up process based on the mobilization and use of entrepreneurial knowledge.

In the last part, we discussed a number of potential targets such smart specialisation policy could concentrate on. We argued that focusing on spinoff activity, labour mobility and knowledge networks may enhance the effect of connecting related industries on regional development, because these mechanisms make knowledge diffuse between related activities primarily at the regional scale, and because they have the potential to make regions shift into new growth paths while building on existing assets. Firstly, we argued that the enhancement of so-called experienced entrepreneurs might be a good policy option. These entrepreneurs often perform better because they build on relevant experience acquired in related industries. Recent studies have shown that experienced entrepreneurs play a key role in the emergent phase of new industries in regions, and therefore, may provide a basis for successful smart specialisation policy that aims to diversify regional economies. As developing new growth paths in regions is extremely risky, targeting these experienced entrepreneurs could increase the probability of successful policy. Secondly, we have claimed that labour mobility needs to be encouraged between related industries, because it leads to the formation of knowledge networks and the transfer of skills between industries that provide complementary resources. And thirdly, we argued that knowledge networks provide settings through which knowledge circulates and learning between firms and industries takes place, but that it depends on the structure of these networks whether they can contribute to industrial renewal in regions. We claimed that policy could consider supporting research collaboration networks in which partners with related competences and located in different regions become connected. This underlines the importance of establishing linkages with partners outside the region, to get access to external knowledge, in particular related knowledge.

References

Agrawal, A., Cockburn, I. and McHale, J. (2006) "Gone but not forgotten: knowledge flows, labor mobility, and enduring social relationships", *Journal of Economic Geography*, 6: 571-591.

Arrow, K.J. (1962), "The economic implications of learning by doing", *Review of Economic Studies*, 29(3): 155-173.

Asheim, B. (ed.) (2006), *Constructing regional advantage. Principles, perspectives, policies*, final report, DG Research, European Commission, Brussels.

Asheim, B., R. Boschma and P. Cooke (2011), "Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases", *Regional Studies*, 45(7): 893-904.

Audretsch, D.B. and M. Feldman (1996), "Spillovers and the geography of innovation and production", *American Economic Review*, 86(3): 630-40.

Autor, D.H. (ed.) (2009), *Studies of Labor Market Intermediation*, Chicago IL: University of Chicago Press.

Balland, P.A. (2012), "Proximity and the evolution of collaboration networks: Evidence from research and development projects within the Global Navigation Satellite System (GNSS) Industry", *Regional Studies*, 46 (6): 741-756.

Bathelt, H. and J.S. Boggs (2003), "Towards a Reconceptualization of Regional Development Paths: Is Leipzig's Media Cluster a Continuation of or a Rupture with the Past?", *Economic Geography*, 79(3): 265-293.

Bathelt, H., A. Malmberg and P. Maskell (2004), "Clusters and knowledge. Local buzz, global pipelines and the process of knowledge creation", *Progress in Human Geography*, 28(1): 31-56.

Belussi, F. and S.R. Sedita (2009), "Life cycle versus multiple path dependency in industrial districts", *European Planning Studies*, 17 (4), 505-528.

Bishop, P. and P. Gripaios (2010), "Spatial externalities, relatedness and sector employment growth in Great Britain", *Regional Studies*, 44(4), 443-454.

Boschma, R. (2005), "Proximity and innovation. A critical assessment", *Regional Studies*, 39(1): 61-74.

Boschma, R. (2014), "Constructing regional advantage and smart specialization: Comparisons of two European policy concepts", *Italian Journal of Regional Science*, forthcoming.

Boschma, R., R.H. Eriksson and U. Lindgren (2009), "How does labour mobility affect the performance of plants? The importance of relatedness and geographical proximity", *Journal of Economic Geography*, 9(2): 169-190.

Boschma, R., R.H. Eriksson and U. Lindgren (2013c), "Labour market externalities and regional growth in Sweden. The importance of labour mobility between skill-related industries", *Regional Studies*, forthcoming.

Boschma, R. and K. Frenken (2011), "Technological relatedness and regional branching", in H. Bathelt, M.P. Feldman and D.F. Kogler (eds.), *Beyond Territory. Dynamic Geographies of Knowledge Creation, Diffusion and Innovation*, London and New York: Routledge.

Boschma, R., G. Heimeriks and P.A. Balland (2013b), "Scientific knowledge dynamics and relatedness in biotech cities", *Research Policy*, DOI:10.1016/j.respol.2013.07.009.

Boschma, R. and S. Iammarino (2009), "Related variety, trade linkages and regional growth", *Economic Geography*, 85(3): 289-311.

Boschma, R., A. Minondo and M. Navarro (2012), "Related variety and regional growth in Spain", *Papers in Regional Science*, 91(2): 241-256.

Boschma, R., A. Minondo and M. Navarro (2013a), "The emergence of new industries at the regional level in Spain. A proximity approach based on product-relatedness", *Economic Geography*, 89(1): 29-51.

Boschma, R. and R. Wenting (2007), "The spatial evolution of the British automobile industry", *Industrial and Corporate Change*, 16(2): 213-238.

Brachert, M., A. Kubis and M. Titze (2013), "Related variety, unrelated variety and regional functions. A spatial panel approach", Papers in Evolutionary Economic Geography, no. 13.01, Utrecht University, Department of Economic Geography.

Breschi, S., Lissoni, F. (2003) "Knowledge spillovers and local innovation systems: a critical survey", *Industrial and Corporate Change*, 10: 975–1005.

Broekel, T. and R. Boschma (2012), "Knowledge Networks in the Dutch Aviation Industry: The Proximity Paradox", *Journal of Economic Geography*, 12(2): 409-433.

Buenstorf, G. and S. Klepper (2009), "Heritage and agglomeration. The Akron tyre cluster revisited", *The Economic Journal*, 119(537): 705-733.

Camagni, R. (ed.) (1991), *Innovation networks. Spatial perspectives*, London/New York: Bellhaven Press.

Carlsson, B. and R. Stankiewicz (1991), "On the nature, function and composition of technological systems", *Journal of Evolutionary Economics*, 1: 93-118.

Cohen, W.M. and D.A. Levinthal (1990), "Absorptive capacity: a new perspective on learning and innovation", *Administrative Science Quarterly*, 35(1): 128-153.

Colombelli, A., J. Krafft and F. Quatraro (2012), "The emergence of new technology-based sectors at the regional level: a proximity-based analysis of nanotechnology", Papers in Evolutionary Economic Geography, no. 12.11, Utrecht University, Department of Economic Geography.

Cooke, P. (2010), "Transversality and transition. Branching to new regional path dependence", paper prepared for Trinity College workshop, Oxford, September.

Dahl Fitjar, R. and A. Rodríguez-Pose (2011), "When local interaction does not suffice; sources of firm innovation in urban Norway", *Environment and Planning A*, 43, 6: 1248–67.

D'Este P., Guy F., and Iammarino S. (2013), "Shaping the formation of university-industry research collaborations: what type of proximity does really matter?", *Journal of Economic Geography*, 13(4): 537-558.

Essleztbichler, J. (2013), "Relatedness, industrial branching and technological cohesion in US metropolitan areas", *Regional Studies*, DOI:10.1080/00343404.2013.806793.

Etxebarria, G. and H. Franco (2003), "Reflections on urban revitalisation strategies in old industrial regions. The case of Bilbao", paper presented at the European Association for Evolutionary Political Economy 2003 Annual Conference, Maastricht, 7-10 November.

European Commission (2010), "Europe 2020. A strategy for smart, sustainable and inclusive growth", Communication COM (2010) 2020, European Commission, Brussels, March.

European Commission (2012), *Guide to regional/national Research and Innovation Strategies for Smart Specialisation (RIS3)*, Brussels: European Commission.

Feldman, M.P., J. Francis and J. Bercovitz (2005), "Creating a cluster while building a firm. Entrepreneurs and the formation of industrial clusters", *Regional Studies*, 39: 129-141.

Foray, D., P.A. David and B.H. Hall (2009), "Smart specialization. The concept", Knowledge Economists Policy Brief No. 9, European Commission, Brussels, June.

Foray, D., P.A. David and B.H. Hall (2011), "Smart specialization. From academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation", MTEI-working paper, Lausanne, November.

Foray, D. and Goenaga, X. (2013), "The goals of smart specialisation", S3 Policy Brief 01/2013, JRC-IPTS, Seville, May.

Fornahl, D., S. Henn and M. Menzel (eds.) (2010), *Emerging clusters*, Cheltenham: Edward Elgar.

Frenken, K., F.G. Van Oort and T. Verburg (2007), "Related variety, unrelated variety and regional economic growth", *Regional Studies*, 41(5): 685-697.

Gianelle, C. (2011), "Temporary employment agencies make the world smaller: Evidence from labour mobility networks", working paper no. 618, Quaderni del Dipartimento di Economia Politica e Statistica, University of Siena, Siena, October.

Gianelle, C. (2012), "Discovering the Regional Small World of Labour Mobility. Evidence from Linked Employer–Employee Data", *Regional Studies*, DOI:10.1080/00343404.2012.697993.

Gilsing, V., B. Nooteboom, W. Vanhaverbeke, G. Duysters and A. van den Oord (2007), "Network embeddedness and the exploration of novel technologies. Technological distance, betweenness centrality and density", *Research Policy*, 37: 1717-1731.

Giuliani, E. (2007) "The selective nature of knowledge networks in clusters: evidence from the wine industry", *Journal of Economic Geography*, 7: 139–168.

Glaeser, E.L. (2005), "Reinventing Boston: 1630-2003", *Journal of Economic Geography*, 5: 119-153.

Harmaakorpi, V. (2006), "Regional Development Platform Method (RDPM) as a Tool for Regional Innovation Policy", *European Planning Studies*, 14: 1085-1114.

Harmaakorpi, V., T. Tura and H. Melkas (2011), "Regional innovation platforms", in P. Cooke, B. Asheim, R. Boschma, R. Martin, D. Schwartz and F. Todtling (eds.), *Handbook of Regional Innovation and Growth*, Cheltenham: Edward Elgar, pp. 556-572.

Hartog, M., R. Boschma and M. Sotarauta (2012), "The impact of related variety on regional employment growth in Finland 1993-2006. High-tech versus medium/low-tech", *Industry and Innovation*, 19(6): 459-476.

Hassink, R. (2005), "How to unlock regional economies from path dependency? From learning region to learning cluster", *European Planning Studies*, 13(4): 521-535.

Hassink, R. (2010), "Locked in decline? On the role of regional lock-ins in old industrial areas", in: R. Boschma and R. Martin (eds.), *The Handbook of Evolutionary Economic Geography*, Cheltenham: Edward Elgar, pp. 450-467.

Hausmann, R. and B. Klinger (2007), "The structure of the product space and the evolution of comparative advantage", CID working paper no. 146, Center for International Development, Harvard University, Cambridge, April.

Hausmann, R. and D. Rodrik (2003), "Economic development as self-discovery", *Journal of Development Economics*, 72(2): 603-633.

Helfat, C.E. and M.B. Lieberman (2002), "The birth of capabilities. Market entry and the importance of pre-history", *Industrial and Corporate Change*, 11(4): 725-760.

Heuermann, D.F. (2009), "Reinventing the skilled region. Human capital externalities and industrial change", working paper, Institute for Labour Law and Industrial Relations, University of Regensburg, February.

Hidalgo, C.A., B. Klinger, A.-L. Barabási, and R. Hausmann (2007), "The Product Space Conditions the Development of Nations", *Science*, 317: 482–487.

Hill, E., T.S. Clair, H. Wial, H. Wolman, P. Atkins, P. Blumenthal, S. Ficenec and A. Friedhoff (2012), "Economic Shocks and Regional Economic Resilience", in N. Pindus, M. Weir, H. Wial, and H. Wolman (eds.), *Building Resilient Regions: Urban and Regional Policy and Its Effects, vol. 4*, Washington: Brookings Institution Press, pp. 193-274.

Klepper, S. (2007), "Disagreements, spinoffs, and the evolution of Detroit as the capital of the U.S. automobile industry", *Management Science*, 53: 616-631.

Klepper, S. and K.L. Simons (2000), "Dominance by birthright. Entry of prior radio producers and competitive ramifications in the US television receiver industry", *Strategic Management Journal*, 21: 997-1016.

Lagendijk, A. and P. Oinas (eds.) (2005), *Proximity, distance and diversity. Issues on economic interaction and local development*, Aldershot: Ashgate.

Lambooy, J.G. and R. Boschma (2001), "Evolutionary economics and regional policy", *Annals of Regional Science*, 35(1): 113-133.

Lester, R. and M.J. Piore (2004), *Innovation – The Missing Dimension*, Cambridge and London: Harvard University Press.

Martin, R. and P. Sunley (2006), "Path dependence and regional economic evolution", *Journal of Economic Geography*, 6(4): 395-437.

McCann, P. and Ortega-Argilés, R. (2013), "Smart Specialisation, Regional Growth, and Applications to EU Cohesion Policy", *Regional Studies*, DOI:10.1080/00343404.2013.799769.

Moodysson, J. (2008), "Principles and practices of knowledge creation: On the organization of 'buzz' and 'pipelines' in life science communities", *Economic Geography*, 84(4): 449-69.

Moriset, B. (2009), "A high-tech cluster revisited: An evolutionary perspective on Grenoble, France", paper presented at the conference Economie et geographie de l'innovation et de la creativite, University of Lille, 11 December.

Neffke, F. (2009), *Productive Places. The Influence of Technological Change and Relatedness on Agglomeration Externalities*, PhD thesis, Utrecht University, Utrecht.

Neffke, F. and Henning, M (2013) "Skill-relatedness and firm diversification", *Strategic Management Journal* 34(3): 297-316.

Neffke, F., Henning, M., Boschma, R. (2011a), "How do regions diversify over time? Industry relatedness and the development of new growth paths in regions", *Economic Geography*, 87: 237–265.

Neffke, F. and M. Svensson Henning (2008), "Revealed relatedness: Mapping industry space", Papers in Evolutionary Economic Geography, no. 8.19, Utrecht University, Department of Economic Geography.

Nooteboom, B. (2000), *Learning and innovation in organizations and economies*, Oxford: Oxford University Press.

Quilley, S. (2000), "Manchester First: From Municipal Socialism to the Entrepreneurial City", *International Journal of Urban and Regional Research*, 24: 601–615.

Raspe, O. and F.G. van Oort (2006), "The knowledge economy and urban economic growth", *European Planning Studies*, 14, 1209–1234.

Rebelo, F., E. Gomes da Silva (2013), "Export variety, technological content and economic performance. The case of Portugal", Papers in Evolutionary Economic Geography, no. 13.10, Utrecht, Department of Economic Geography.

Rigby, D. (2012), "The geography of knowledge relatedness and technological diversification in U.S. cities", Papers in Evolutionary Economic Geography, no. 12.18, Utrecht University, Department of Economic Geography.

Rodrik, D. (2004), "Industrial Policy for the Twenty-First Century", working paper, Kennedy School of Management, Harvard University, Cambridge MA, September.

Saviotti, P.P. (1996), *Technological evolution, variety and the economy*, Cheltenham: Edwrad Elgar.

Saxenian, A.L. (2006), *The new argonauts. Regional advantage in a global economy*, Cambridge MA: Harvard University Press.

Scott, A.J. (1988), *New industrial spaces. Flexible production, organization and regional development in North America and Western Europe*, London: Pion.

Simmie, J. and J. Carpenter (eds.) (2007), "Path dependence and the evolution of city regional development", Working Paper Series No. 197, Oxford Brookes University, Oxford.

Storper, M., and Walker, R. (1989), *The capitalist imperative. Territory, technology and industrial growth*, New York: Basil Blackwell.

Tanner, A.N. (2011), "The place of new industries: the case of fuel cell technology and its technological relatedness to regional knowledge bases", Papers in Evolutionary Economic Geography, no. 11.13, Utrecht University, Department of Economic Geography.

Ter Wal, A., (2009), *The structure and dynamics of knowledge networks: a proximity approach*, PhD thesis, Utrecht University, Utrecht.

Timmermans, B. and R. Boschma (2013), "The effect of intra- and inter-regional labour mobility on plant performance in Denmark: the significance of related labour inflows", *Journal of Economic Geography*, DOI:10.1093/jeg/lbs059

Todtling, F. and M. Trippl (2005), "One size fits all? Towards a differentiated regional innovation policy approach", *Research Policy*, 34, 1203-1219.

Torre, A. and Rallet, A. (2005), "Proximity and localization", *Regional Studies*, 39(1): 47-60.

Treado, C.D. (2010), "Pittsburgh's evolving steel legacy and the steel technology cluster", *Cambridge Journal of Regions, Economy and Society*, 3: 105–120.

Van Oort, F. van, S. de Geus and T. Dogaru (2013), "Related variety and regional economic growth in a cross-section of European urban regions", Papers in Evolutionary Economic Geography, no. 13.12, Utrecht, Department of Economic Geography.

Vanolo, A. (2008), "The image of the creative city: Some reflections on urban branding in Turin", *Cities*, 25(6): 370-382.

Weitzman, M.L. (1998), "Recombinant Growth", *The Quarterly Journal of Economics*, 113(2): 331-360.

Wouden, F. van der (2012), *The role of relatedness in economic variety on knowledge production of U.S. cities between 1975 and 2005*, MA thesis, Department of Economic Geography, Utrecht University.

Abstract

This note studies the mechanisms through which regional economies diversify over time and formulates suggestions on how policy can influence such process. In particular, two closely related concepts will be defined, that is, technological relatedness and related variety.

Regional diversification is a crucial process in order to develop new growth paths. It is understood as an emerging process through which new activities develop out of existing ones, but the scope and outcome of this process are fundamentally affected by technological and cognitive constraints.

We discuss how technological relatedness may provide an input for effective policy making. In this respect, public policy should avoid picking winners that do not fit into the regional actual and potential industrial space and should prevent supporting declining industries that occupy a peripheral position in the industry space of a region. More in particular, we direct attention to various mechanisms through which new industries may be stimulated to connect to technologically related industries at the regional level.

We also introduce the process of entrepreneurial discovery, in which entrepreneurs generate the key information guiding the selection of the domains of future regional specialization, and discuss its relationship with policy schemes based on related diversification.

JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Serving society
Stimulating innovation
Supporting legislation

Publications Office