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**Unity in Variety?**

**Agglomeration Economics Beyond the Specialisation-Diversity Controversy**

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### **Agglomeration Economics Beyond the Specialisation-Diversity Controversy**

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#### **1. Introduction**

An ever-burgeoning literature is focused on studying the causes, magnitude and (policy) consequences of agglomeration economies in relation to urban and regional growth. However, this rise of agglomeration economies in economic and geographical studies has met substantial criticism (McCann and Van Oort 2009). Some observers have argued that the modern treatment of agglomeration economies and regional growth represents a rediscovery by economists of well-rehearsed concepts and ideas with a long tradition in economic geography. Several criticisms of the monopolistic modelling logic underpinning New Economic Geography have come from an economic geography school of thought as well as both orthodox and heterodox schools of economic thought. By contrast, advocates of relatively new economic approaches, such as institutional economics and evolutionary economic geography, argue that their analyses provide insights into spatial economic phenomena that were previously unobservable with the existing analytical frameworks and toolkits.

A prime example of the potential benefits of different theories and conceptual frameworks is the specialisation-diversity debate in the urban economics and economic geography literature. Should regions and cities specialise in certain products or technologies to benefit locally from economies of scale (in so-called clusters), shared labour markets and input-output relations, or should regions diversify over various products and industries and hence have both growth opportunities from inter-industry spillovers and portfolio advantages to hedge a regional economy in times of economic

turmoil? This question has kept been the focus of many researchers for the last two decades (Van der Panne and Beers 2006, Beaudry and Schiffauerova 2009), following the papers by Glaeser et al. (1992) and Henderson et al. (1995), advocating for sectoral diversity and specialisation, respectively, as the main economic-geographic circumstance propagating growth<sup>1</sup>. Ever since, the dichotomy between specialisation and diversity has been treated as a rather strict division in the literature, as many studies attempt to definitively answer the question, “Who is right: Marshall or Jacobs?” Although practically every study within this line of research attempts to determine whether either specialisation or diversity drives growth and innovation, studies by Van Oort (2004), Paci and Usai (1999), Neffke et al. (2011) Shefer and Frenkel (1998), Duranton and Puga (2000) and O’Hualloachain and Lee (2011) demonstrate that this is in fact not an “either-or” question, as both specialisation and diversity are important for regional economic performance - on different levels, for different time periods, over different periods in the industry life cycle and in different institutional settings.

Moreover, two meta-studies and an extensive overview of most published empirical analyses on this matter conclude that the specialisation-diversity issue is not an ‘either-or’ question (De Groot et al. 2009, Melo et al. 2009, Beaudry and Schiffauerova 2009). From these three overviews, it becomes clear that the specialisation-diversity debate is an unproductive line of argument in addressing the nature, magnitude and determinants of agglomeration externalities. The answer to the “either-or” diversity-specialisation question is at best inconclusive, as outcomes are dependent on the measurement of many factors (scale, composition, context, period, type of performance indicator). In addition to these methodological issues, the many tests provided in these studies do not actually measure knowledge transfer or knowledge spillovers (Van Oort and Lambooy 2013) – one of the main mechanisms that is considered to drive agglomeration economies. Finally, theoretically, the debate focuses on the old theory of agglomeration, as introduced by Marshall (1890), and does not use insights from newly developed theoretical models and conceptualisations. As such, New Economic

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<sup>1</sup> The question was asked long before these publications (e.g., Moomaw 1988), but the debate was fuelled by the Glaeser et al. (1992) and Henderson et al. (1995) publications. Although these papers are probably not exclusively relevant for endogenous growth modelling, their research results are considered to clearly indicate the relevance of urban environments for endogenous economic growth processes.

Geography and many urban economic frameworks, as opposed to evolutionary and institutional geographical approaches, are until now limited in adapting transfer mechanisms of knowledge in their analyses.

In this study, I aim to address the diversity-specialisation controversy by arguing that the debate needs both conceptual and empirical renewal before becoming conclusive. Empirically, the dichotomous perception of diversification versus specialisation is harmful, as it does not acknowledge the spatial, sectoral and firm-level heterogeneity that mould agglomeration economies in certain places while not in others (Van Oort et al. 2012). Empirical modelling that acknowledges and controls for this heterogeneity is argued to become fruitful for research and policy initiatives. However, it is also argued that the divergence observed in the literature concerning diversification and specialisation may be related to, apart from the observed differences in the measurement of classifications and methodological issues, most likely the weak conceptualisation and limited theoretical underpinning of the concepts. New theoretical developments in institutional and evolutionary economic geography have recently emerged, offering heterodox economic explanations for regional economic development and the role of relatedness and diversification. The needs for new empirical and theoretical development are discussed in sections 3 and 4, respectively. First, however, section 2 presents a concise overview of agglomeration theory and the role of the specialisation-diversity debate therein as well as a short overview of the inconclusiveness of the current empirical tests. Section 5 reviews and summarises the arguments for the conceptual and empirical renewal of the diversity-specialisation controversy.

## **2. Agglomeration economies: specialisation versus diversity**

The origin of the agglomeration economies concept can be traced to the end of the nineteenth century. At the *fin de siècle*, the neoclassical economist Alfred Marshall aimed to overturn Malthus' and Ricardo's pessimistic (but influential) predictions on the co-evolution of economic and population development. He introduced a form of localised aggregate increasing returns to scale for firms. In his seminal work, *Principles of Economics* (Book IV, Chapter X), Marshall (1890) mentioned a number of cost-saving benefits or productivity gains external to a firm. He argued that a firm could benefit from

co-location with other firms engaged in the same type of business. Marshall considered these *agglomeration economies* to be uncontrollable and difficult to regulate as well as immobile and spatially constrained. Marshall focused on a local specialist labour pool, the role of local knowledge spillover, and the existence of non-traded local inputs. By contrast, Hoover (1948) identified the sources of agglomeration advantages as internal economies of scale and external economies of scale in the form of localisation and urbanisation economies. The production cost efficiencies realised by serving large markets may lead to increasing returns to scale in a single firm. There is nothing inherently spatial in this concept, except that the existence of a single large firm in space implies a large local concentration of employment. External economies are qualitatively very different.

Owing to firm size or a large number of local firms, a high level of local employment may allow for the development of external economies within a group of local firms in a sector. These are known as *localisation economies*. The strength of these local externalities is assumed to vary, implying that they are stronger in some sectors and weaker in others (Duranton and Puga 2000). The associated economies of scale compose factors that reduce the average cost of producing outputs in that locality. Following Marshall (1890), a spatially concentrated sector can exert a pull on (and support) a large labour pool that includes workers with specialised training in the given industry. Obviously, this situation reduces search costs and increases flexibility in appointing and firing employees. Moreover, a concentration of economic activity in a given sector attracts specialised suppliers to that area, which, in turn, reduces transaction costs. Lastly, agglomerated firms engaged in the same sector can profit from knowledge spillover because geographic proximity to other actors facilitates the diffusion of new ideas or improvements related to products, technology and organisation.

By contrast, *urbanisation economies* reflect external economies passed to enterprises as a result of savings from the large-scale operation of the agglomeration or city as a whole. Thus, they are independent of the industry structure. Localities that are relatively more populous or places that are more easily accessible to metropolitan areas are also more likely to house universities, industry research laboratories, trade associations and other knowledge-generating institutions. The dense presence of these

institutions, which are not solely economic in character but are also social, political and cultural, supports the production and absorption of knowledge, stimulating innovative behaviour and differential rates of interregional growth (Harrison et al. 1997). However, areas that are too densely populated may experience a dispersion of economic activities owing to pollution, crime or high land prices. In this respect, one can speak of urbanisation diseconomies.

Agglomeration economies are now thought to be more complex than Marshall originally suggested. Quigley (1998), for instance, describes additional features that are embedded in agglomeration economies but that are not recognised for their individual value. These include scale economies or indivisibilities within a firm, the historical rationale for the existence of productivity growth in agglomerated industries. In terms of consumption, the existence of public goods leads to urban amenities. Cities function as ideal institutions for the development of social contacts, which correspond to various kinds of social and cultural externalities. Moreover, agglomeration economies may provide greater economic efficiency growth as a result of potential reductions in transaction costs. The growing importance, particularly recently, of transaction-based explanations of local economic productivity growth is a logical outcome of the interaction between urban economies and knowledge-based service industries. Knowledge-based theories of endogenous growth have recently been formulated at the city level. The density of economic activity in cities facilitates face-to-face contact as well as other forms of communication. The empirical evidence of agglomeration economies is strong, and overview papers by Rosenthal and Strange (2004) and Koster et al. (2013) show that doubling the size of an agglomeration leads to an increase in productivity of between 3 and 11 per cent. Several stylised and simplified hypotheses concerning the agglomeration conditions under which knowledge externalities affect such growth have been proposed (Van Oort 2007). Glaeser et al. (1992) and Henderson et al. (1995) use these hypotheses to empirically test dynamic externalities. One hypothesis, originally developed by Marshall (1890), contends that knowledge is predominantly sector specific and hence that regional specialisation fosters growth. Furthermore, (local) market power is also thought to stimulate growth, as it allows the innovating firm to internalise a substantial part of the rents. The second hypothesis, proposed by Porter

(1990), also states that knowledge is predominantly sector specific but argues that the effect of knowledge on growth is enhanced by local competition rather than market power, as firms need to be innovative in order to survive. The third hypothesis, proposed by Jacobs (1969), agrees with Porter that competition fosters growth but contends that regional diversity in economic activity results in higher growth rates, as many ideas developed by one sector can also be fruitfully applied in other sectors. Although this framework is usually interpreted to indicate positive effects of externalities (i.e., externalities lead to growth), in cases of crowding, congestion or pollution, externalities can impose negative effects on firm and industry growth (Broersma and Oosterhaven 2009, Koster et al 2013). While relatively simple, this framework has been copied numerous times and has been tested using different settings and measurements. De Groot et al. (2009) summarise 31 articles using Jacobs' framework. They find support for competition and diversity externalities but more ambiguous evidence regarding specialisation. The significance of various study characteristics in their ordered probit meta-analysis highlights the large heterogeneity of the empirical research in this field, even when the analysis is reduced to economy-wide analyses only. The level of regional aggregation and density are important determinants of outcomes. Melo et al. (2010), summarising 729 elasticities in 34 studies, and Beadry and Schiffauerova (2009), overviewing 83 models, come to very similar conclusions. The reviewed empirical works in these overviews present a diverse picture of possible conditions and circumstances under which each of the externalities could be at work. Beadry and Schiffauerova (2009) conclude that the wide breadth of findings is generally not explained by differences in the strength of agglomeration forces across industries, countries and time periods but by measurement and methodological issues. The levels of industrial and geographical aggregation together with the choice of the performance measures (innovation, employment growth, productivity) and specialisation and diversity indicators (e.g., entropy measures, Gini coefficients, location quotients) are the main causes for the lack of a resolution in the debate. They also conclude that the 3-digit industrial classifications (used by Glaeser et al. 1992 and Henderson et al. 1995) are insufficient for distinguishing between specialisation and diversity effects, and this is often exacerbated by a high level of geographical aggregation. Reading the overview by Beadry and

Schiffauerova (2009) carefully, one gets the impression that policy makers can find research to support any regional growth initiative, depending on the level of geographical aggregation (a fine grid level seems to provide greater support for diversity externalities), type of industrial classification (specialisation effects are more observable at a broad industrial level), type of sectors analysed (low-tech sectors co-evolve with specialisation to a greater extent, while services seem to flourish to a greater extent in diverse environments), and type of performance indicators used (innovation and productivity are better indicators of specialisation, while employment growth is a better indicator of regional and urban diversity; see also section 4).

### **3. Addressing heterogeneity: modelling the firm level**

The features of agglomeration economies described above may explain why regions characterised by an agglomeration of economic activities tend to exhibit higher economic growth (McCann and Van Oort 2009). Despite the focus in the empirical literature on the relationship between agglomeration economies and regional growth as a macro-level phenomenon, the underlying theory of agglomeration provides both macro- and micro-level propositions (see Rosenthal and Strange 2004). Although these propositions begin and end at the urban or regional level, they recede at the level of the individual firm. Firms are agents whose production function is partly determined by the region or city in which they are embedded. This phenomenon is influenced by the opportunities (agglomeration economies) and constraints (agglomeration diseconomies) present in this external environment. In turn, differences in opportunities and constraints across regions generate differences in firm performance and, hence, in regional performance. Firms optimise their own performance but do not strive for regional growth. Empirically addressing firm-level heterogeneity in agglomeration studies, especially concerning the specialisation-diversity issue, therefore appears paramount for future research in this field (Van Oort et al. 2012). Although the relative lack of firm-level evidence in the agglomeration economics literature can mainly be ascribed to data limitations and confidentiality restrictions, its absence is nevertheless remarkable. The theories that underlie agglomeration economies are microeconomic in nature (Martin et al. 2011). That



is, agglomeration economies do not directly foster regional economic growth; they do so only indirectly, through their effect on firm performance.

Many empirical studies on agglomeration instead use aggregated data, with cities or city-industries as the basic reference unit. These studies provide only limited insights and weak support for the effects of agglomeration economies on firm performance. Regional-level relationships are not necessarily reproduced at the firm level because information on the variance between firms is lost when aggregated regional-level data are used. Hence, even if regions endowed with a greater number of agglomeration economies grow faster, this conclusion cannot be generalised to firms. In the social sciences, this micro-macro problem is referred to as the “ecological fallacy” or the “cross-level fallacy”. In addition, agglomeration effects found in area-based studies may be purely compositional. For example, the strategic management literature often argues that large firms are more likely to grow compared with small firms owing to internal economies of scale. Hence, a location may grow rapidly because of the concentration of large firms rather than the localisation of externalities or external economies of scale. A similar issue is addressed in the works of Combes et al. (2008), Mion and Naticchioni (2009) and Andersson et al. (2013) on spatial sorting and spatial wage disparities. Similarly, Baldwin and Okubu (2006) show that the agglomeration of productive firms may simply result from a spatial selection process in which more productive firms are drawn to dense economic areas. For this reason, whether geographical differences are an artefact of location characteristics (e.g., agglomeration economies) or simply caused by differences in business and economic composition remains unclear. This endogeneity problem makes drawing inferences about firms even more difficult when cities or regions are used as the lowest unit of analysis (Ottaviano 2011). Continuous space modelling offers a promising approach for solving these issues (Duranton and Overman 2005), but some of these issues can be also, and perhaps better, addressed using multilevel modelling, with cross-level interaction effects that are more commonly used in firm strategy research (Van Oort et al. 2012).

During the last two decades, in addition to the proliferation of research on geographical agglomerations, firm strategy researchers have paid increasing attention to the performance implications for firms of locating in agglomerations. Early research has

concentrated on positive performance effects as incentives for firms to co-locate in an effort to explain the emergence of agglomerations. The ambiguity in research results concerning the relation among firm density, clustering and firm performance due to externalities is similar to the ambiguity in the current debates in urban economics and regional science. The performance-agglomeration relationship requires research with better tools and better data to reflect the transfer mechanisms between firms and their absorptive capacities (Cohen and Levinthal 1990). Agglomerations are not homogenous, and they vary along several dimensions. However, research on the effect of agglomeration-level heterogeneity on the performance-agglomeration relationship has been far from conclusive. Furthermore, firm-level heterogeneity has been insufficiently studied in the context of the performance-agglomeration relationship (McCann and Folta 2008). Overall, the possibility that different firms may be influenced differently by different dimensions of agglomeration remains unexplored in this body of literature.

A potential theoretical solution to address firm-level heterogeneity is to examine the interactions within (agglomerated) contexts. The strategic management approach to agglomeration economies is distinguished by its focus on explaining firm-level heterogeneity in performance. According to this approach, agglomerated firms can realise the potential benefits of being located within an agglomeration only to the extent that they are capable of using knowledge from co-located firms in combination with their own knowledge assets to create value (McCann and Folta 2011). Kogut and Zander (1992) argue that firms vary significantly in such “combinative capabilities”. It is suggested that these variations are related to three functions of firms and that they are affected differently by specialised and diversified agglomerative contexts. The first component of a firm’s combinative capabilities is its “organizing principles”, defined as the firm’s ability to coordinate different parts of the organisation and transfer knowledge among them. Firm size is commonly thought to be the most important proxy for this concept. The second component of a firm’s combinative capabilities is its existing knowledge base. The larger a firm’s existing knowledge base is, the better it can assess, access, and internalise externally available knowledge. Thus, it is more likely that the net performance effect of agglomeration will be positive for the firm. The third component of a firm’s combinative capabilities relates to the number of its localised connections. Firms

actively and purposefully collaborate with other firms to obtain, exchange, and mutually develop resources. The benefit of collaborating with other (specialised or diversified) firms in the same region emerges from the fact that geographical proximity facilitates both planned and serendipitous face-to-face interactions, which foster the exchange of tacit knowledge. These ideas have rarely been tested empirically, which leads to the ambiguity in organisational studies regarding the agglomeration-firm performance relationship.

In Van Oort et al. (2012), it is shown that multilevel analysis provides an analytical tool to assess the extent to which a link exists between the macro level and the micro level. As Corrado and Fingleton (2011, p.29), adopting a spatial econometric perspective, note, “Hierarchical models are almost completely absent from the spatial econometrics literature (and vice-versa are spatial econometric models mostly absent from the multilevel literature), but hierarchical models represent one major alternative way of capturing spatial effects, focusing on the multilevel aspects of causation that are a reality of many spatial processes. Recognition of the different form of interactions between variables which affect each individual unit (firm) of the system and the groups they belong to has important empirical implications”. Multilevel models offer a natural way to assess contextuality. Applying multilevel analysis to empirical work on agglomeration begins with the simple observation that firms that share the same external environment are more similar in their performance than firms that do not share the same external environment. Multilevel analysis allows one to incorporate unobserved heterogeneity into the model by including random intercepts and allowing relationships to vary across contexts through the inclusion of random coefficients. Whereas “standard” regression models are designed to model the mean, multilevel analysis focuses on modelling variances explicitly. For example, the effect of urbanisation and localisation externalities may vary across small and large firms or across sectors simultaneously with the spatial levels at which they occur. Koster et al. (2013) and Van Soest et al. (2006) argue that agglomeration externalities occur on relative small scales: within cities rather than on city, city-region or even larger scales. Duranton and Puga (2000, 2001) and Neffke et al (2011) argue that over the life cycle of firms and industries, local variety may be more important for early stage development, while more regionalised

specialisation may be important in later phases of development. This kind of complexity can be captured in a multilevel framework by including random coefficients for the various spatial scales and economic categories (industries, firm size) that are hypothesised to be important.

#### **4. Conceptual renewal: diversification, variety and relatedness**

The divergence observed in the literature concerning diversification and specialisation may be related to, apart from the observed differences in the measurement of classifications and methodological issues, most likely, the weak conceptualisation and limited theoretical underpinning of the concepts (Rigby 2012, Rigby and Van der Wouden 2012). New theoretical developments in institutional and evolutionary economic geography have recently emerged, offering heterodox economic explanations for the regional economic development and the role of relatedness and diversification (Boschma and Martin 2010). The critiques expressed in this new literature focus on the immeasurability of some of the notions of increasing returns, the static nature of many of the assumptions in New Economic Geography modelling, the lack of recognition of the heterogeneity of firms, the supposed sole presence of pecuniary economies and the absence of either human capital or technological spillovers as externalities (Lambooy and Van Oort 2005). Other evolutionary economic geography critiques (Martin and Sunley 2003) also question the originality and validity of Porter's (1990) concept of clusters. However, many of these criticisms actually relate to specific models and specific papers rather than to the whole field. By contrast, the most fundamental critique from this evolutionary economic geography perspective relates to the question of institutions and the relationship between knowledge and institutions (McCann and Van Oort 2009). For economic geographers and heterodox economists working within the evolutionary and institutional economics arenas, the role played by institutions in economic development is considered paramount. In this institutional-evolutionary schema, regions and countries that have more efficient institutions are therefore superior in both the generation and diffusion of knowledge and thus have better prospects for economic growth. For economic geographers, as well as institutional and evolutionary economists working in this research arena, cultural and cognitive proximity are deemed to be just as important as

geographical proximity in the transmission of ideas and knowledge (Boschma 2005, Rigby and Essletzbichler 2006). Boschma and Lambooy (1999) further argue that the generation of local externalities is also crucially linked to the importance of variety and selection in terms of the ‘fitness’ of a local milieu. According to this perspective, it is these specific historically contingent and geographically contingent features, rather than simply space as a dimension, that are crucial in determining the geography of entrepreneurship and growth.

The now burgeoning evolutionary economic geography tradition has called into question whether the concepts of diversification and specialisation can fully capture the complex role of variety within an economy. Interest in the role of specific forms of variety, notably related and unrelated variety (Frenken et al. 2007, Boschma and Iammarino 2009), has thus been revived, following earlier attempts to construct measures of relatedness and variety (Scherer 1982, Teece et al. 1994, Breschi et al. 2003). Jacobs (1969) proposed the idea that the variety of a city’s or region’s industry or technological base can affect economic growth. Frenken et al. (2007) argue that variety and diversification consist of related and unrelated variety, specifying that the mere presence of different technological or industrial sectors is insufficient to trigger positive results - sectors further need complementarity that exists in terms of shared competences. Nooteboom (2000) indicates that for this complementarity to hold, the cognitive distance between economic entities should be neither too large (this counteracts effective communication) nor too small (this hampers the transfer of truly novel ideas). Cognitive distance is thus the basis of the distinction between related and unrelated variety, as knowledge spillovers will not transfer to all industries evenly owing to the varying cognitive distances between each pair of industries. It is argued that industries are more related when they are closer to each other in the Standard Industrial Classification system (following Caves 1981 and Teece et al. 1994). Frenken et al. (2007) find that for Dutch urban regions, the positive results of knowledge spillovers are higher in regions with related variety, while regions characterised by unrelated variety are better hedged for economic shocks (portfolio effect, compare Dissart 2003)<sup>2</sup>. They also find marked

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<sup>2</sup> Studies using the same methodology report similar results in Great Britain (Bishop and Gripiaios 2010, Essletzbichler 2013), Italy (Boschma and Iammarino 2009, Quatraro 2010, Antonietti and Cainelli 2011,

differences between employment growth and productivity growth. An interesting theoretical contribution to the specialisation-diversity debate that focuses on these explained variables has been provided by life-cycle theory, which holds that industry evolution is characterised by product innovation in the first stage and process innovation in the second stage. It is generally assumed that process innovation hardly leads to structural change but that product innovation does. Following this two-stage logic, Pasinetti (1993) explains growth as a combination of structural change caused by process innovation within existing sectors and product innovation leading to new sectors. Two consequences arise from this explanation of growth: growth in variety is a necessary requirement for long-term economic development, and productivity growth and new sectors induced by growth in variety are endogenous aspects of economic development. This distinction does not imply that product innovation occurs exclusively when a new industry is established and that process innovation only occurs thereafter. Rather, product life-cycle theory assumes that product innovation peaks before process innovation peaks. In a geographical framework, this translates into new life cycles that start in urban environments and that move to more rural environments over time. The knowledge of the urban labour force, capital services, and product markets in urban environments fosters the incubator function for starting firms (Duranton and Puga 2001). In accord with the economics of agglomeration, evolutionary economists also stress the important role of variety in creating new varieties. That is, Jacobs' externalities are assumed to play an important role in urban areas in creating new varieties, new sectors and employment growth. When firms survive and become mature, they tend to standardise production and become more capital-intensive and productive. The initial advantages of the urban agglomeration core can now become disadvantages: growth is difficult to realise *in situ*, and physical movement becomes opportune when limited accessibility and high wages become disadvantageous. Growing firms are expected to 'filter down' towards more peripheral locations and regions where land, labour and transport costs are lower. Thus, in this 'urban product lifecycle', new products are developed in large diverse

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Cainelli and Iacobucci 2012, Mameli et al 2012), Germany (Brachert et al 2011), Finland (Hartog et al 2011), Spain (Boschma et al. 2012, 2013), the US (Castaldi et al 2013) and Europe (Van Oort et al 2013).

metropolitan areas with a diversified skill base, and mature firms eventually move to more peripheral regions.

In addition to the literature on complementarities between industries, two other streams of literature based on the evolutionary economic geography perspective have emerged (Rigby and Van der Wouden 2012). A group of publications that addresses the relation between technological relatedness and economic development focuses on the notion of co-occurrence. The relatedness between two technologies is shown by their co-occurrence in the same economic unit of analysis. If so, it is assumed that both technologies require similar capabilities, being either intangible in nature, such as skills, institutions or networks, or tangible, such as physical infrastructure (Hausmann and Hidalgo 2010). At the firm level, Teece et al (1994) and, recently, Neffke and Henning (2013) measure relatedness across product portfolios by recording how often these portfolios are combined within one company. At a regional level, Porter (2003) measure how often different industries co-occur at the US state level. Industries that often co-occur are argued to be related and to belong to the same cluster.

A third strand of literature considers technological relatedness through knowledge flows, across industries (e.g., Neffke et al. 2011), industries within cities (Rigby 2012, Rigby and Van der Wouden 2012) or inventors and firms (Breschi and Lissoni 2009). In these studies, it is argued that technologies are related when knowledge from one technology (user) is able to flow to another technology (user). Different measures have been constructed to capture these knowledge flows, such as labour mobility, spin-off dynamics (in which spin-off companies keep using a parent company's technology, networks and resources), input-output relations and creative relations in urban meeting points. There obviously is a great need for empirical studies analysing actual knowledge flows and the learning opportunities related to these knowledge flows (Van Oort and Lambooy 2012). As New Economic Geography and many urban economic frameworks are until now limited in adapting these transfer mechanisms of knowledge in their analyses, the conceptual renewal proposed by the approaches introduced in this section forms an important building block for interpreting diversity and specialisation (policy) strategies in relation to urban and regional economic growth processes.

## 5. Conclusions

Although numerous empirical studies have attempted to determine whether either specialisation or diversity drives growth and innovation in agglomeration economies, in this chapter, we argue that the specialisation-diversity debate has not provided definitive conclusions that may be applicable for understanding urban economic growth and evaluating policy initiatives alike. Although there is some common understanding concerning the conceptualisation of regional diversity and specialisation, the burgeoning number of studies since Glaeser's et al. (1992) seminal paper appear to use too divergent methodologies and operationalisations to provide sound conclusions. We do not need another twenty years of continuing studies on this debate, which will likely ultimately be as indecisive as the current stock of studies. We put forth two arguments in this chapter regarding why the focus in this research should shift. Conceptually, studies should focus more on the transfer mechanisms of knowledge and knowledge spillovers. Although these mechanisms are implicitly suggested in econometric agglomeration models that aim to capture specialisation and diversity, none of the models actually captures these flows and networks of relatedness. Such a focus is necessary to capture the spatial, sectoral and firm-, entrepreneurial- and skilled worker-level heterogeneity that actually causes differences in urban growth. If we accept that, in reality, the actual spatial and firm-level heterogeneity is much greater than that captured by the present models, the phenomena of related variety and heterogeneous sectoral development trajectories emphasised by evolutionary economic arguments do not necessarily contradict the analytical outcomes of the present growth models – instead, they will likely further our understanding of agglomeration economies. Related to this conceptual shift, new methodologies that capture this heterogeneity are needed. Multilevel modelling, continuous space modelling and survival and selection models are good examples of new methodologies that complement the present analysis of agglomeration economies.

The focus on the firm, entrepreneurial and skilled worker levels, networks and spatial and sectoral heterogeneity also has implications for policy. If growth opportunities continue to be recognised to occur through transfer mechanisms, networks, skill and transaction relatedness and individual firm and employee capacities, policy needs to target specific places and groups. There needs to be increased attention on facilitating



specific local needs, promoting positions in networks rather than branding places per se, and determining “smart specializations” in relation to the positions of other regions and cities in networks. The specialisation (cluster) or diversity (urbanisation) strategies lose value on their own – it is their mutual interaction and the (cross-level) interaction with firms that determines future urban economic development. With our current knowledge, asking whether either specialisation or diversity is better for economic growth is the wrong question.

## References

- Andersson, M., J. P. Larsson and J. Klaesson (2013). ‘The sources of the urban wage premium by worker skills - Spatial sorting or agglomeration economies?’ *Papers in Regional Science* (forthcoming).
- Antonietti, R. and G. Cainelli (2011) ‘The role of spatial agglomeration in a structural model of innovation, productivity and export’. *Annals of Regional Science* 46: 577–600.
- Baldwin, R. and T. Okubu, T. (2006), ‘Heterogeneous firms, agglomeration economies and economic geography’. *Journal of Economic Geography* 6: 323-346.
- Beaudry, C. and A. Schiffauerova (2009), ‘Who’s right, Marshall or Jacobs? The localization versus urbanization debate’. *Research Policy* 38: 318-337.
- Bishop, P. and P. Gripiaios (2010), ‘Spatial externalities, relatedness and sector employment growth in Great Britain. *Regional Studies* 44: 443-454.
- Boschma, R.A. (2005), ‘Proximity and innovation: a critical assessment’. *Regional Studies* 39: 61-74.
- Boschma, R.A. and J.G. Lambooy (1999), ‘Evolutionary economics and economic geography’, *Journal of Evolutionary Economics* 9: 411-429.
- Boschma, R.A. and S. Iammarino (2009), ‘Related variety, trade linkages, and regional growth in Italy’. *Economic Geography* 85: 289-311.
- Boschma, R.A. and R. Martin (2010), *The handbook of evolutionary economic geography*. Cheltenham: Edward Elgar.
- Boschma, R., A. Minondo and M. Navarro (2012), ‘Related variety and economic growth in Spain’. *Papers in Regional Science* 91: 241-256.

- Boschma, R., A. Minondo and M. Navarro (2013), 'The emergence of new industries at the regional level in Spain. A proximity approach based on product-relatedness'. *Economic Geography* 89: 29-51.
- Brachert, M., A. Kubis and M. Titze (2011) 'Related variety, unrelated variety and regional functions: Identifying sources of regional employment growth in Germany from 2003 to 2008'. IWH-Diskussionspapiere, No. 2011,15
- Breschi, S. and F. Lissoni (2009), 'Mobility of inventors and networks of collaboration: An anatomy of localised knowledge flows'. *Journal of Economic Geography* 9: 439-468.
- Breschi, S., F. Lissoni and F. Malerba (2003), 'Knowledge-relatedness in firm technological diversification'. *Research Policy* 32: 69-87.
- Broersma, L. & J. Oosterhaven (2009), 'Regional labor productivity in the Netherlands: evidence of agglomeration and congestion effects'. *Journal of Regional Science* 49: 483-511.
- Cainelli, G. and D. Iacobucci (2012), 'Agglomeration, related variety, and vertical integration'. *Economic Geography* 88: 255-277.
- Castaldi, C., K. Frenken and B. Los (2013), 'Related variety, unrelated variety and technological breakthroughs: an analysis of U.S. state-level patenting'. Papers in Evolutionary Economic Geography 13.02, Utrecht University.
- Caves, R.E. (1981), 'Intra-industry trade and market structure in the industrial countries'. *Oxford Economic Papers* 33: 203-223.
- Cohen, W. M. and D. A. Levinthal (1990). 'Absorptive capacity: a new perspective on learning and innovation'. *Administrative Science Quarterly* 35: 128-152.
- Combes, P.P., G. Duranton and L. Gobillon (2008). 'Spatial wage disparities: sorting matters!' *Journal of Urban Economics* 63: 723-742.
- Corrado, L. and B. Fingleton (2011), 'Where is the economics in spatial econometrics?' SERC Discussion Paper 71, London: LSE.
- De Groot, H.F.L., J. Poot and M.J. Smit (2009), 'Agglomeration externalities, innovation and regional growth: theoretical reflections and meta-analysis'. In: Capello, R. and Nijkamp, P. (eds) *Handbook of Regional Growth and Development Theories*. Edward Elgar, Cheltenham: 256-281.

- Dissart, J.C. (2003) Regional economic diversity and regional economic stability: research results and agenda. *International Regional Science Review* 26: 423-446.
- Duranton, G. and H.G. Overman (2005), Testing for localization using micro-geographic data. *Review of Economic Studies* 72: 1077-1106.
- Duranton, G. and D. Puga (2000), ‘Diversity and specialisation in cities: why, where and when does it matter?’, *Urban Studies*, 37, pp. 533-55.
- Duranton, G. and D. Puga (2001). ‘Nursery cities: urban diversity, process innovation, and the life cycle of products’. *American Economic Review* 91: 1454–1477.
- Essletzbichler, J. (2013), ‘Relatedness, industrial branching and technological cohesiveness in US metropolitan areas’. *Regional Studies* (forthcoming).
- Frenken, K., F.G. van Oort and T. Verburg (2007), ‘Related variety, unrelated variety and regional economic growth’. *Regional Studies* 41: 685-697.
- Glaeser, E.L., H. Kallal, J. Scheinkman and A. Shleifer (1992), “Growth in cities”. *Journal of Political Economy* 100: 1126-1152.
- Harrison, B., Kelley, M.R. and Gant, J. (1997) Innovative firm behavior and local milieu: exploring the intersection of agglomeration, firm effects, and technological change. *Economic Geography* 72: 233-258.
- 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: 459-476.
- Hausmann, R. and C.A. Hidalgo (2010), ‘Country diversification, product ubiquity, and economic divergence’. CID Working Paper 201.
- Henderson, V, A. Kuncoro and M. Turner (1995), ‘industrial development in cities’. *Journal of Political Economy* 103: 1067-1085.
- Hoover, E.M. (1948) *The Location of Economic Activity*. McGraw Hill, New York.
- Jacobs, J. (1969), *The economy of cities*. New York: Random House.
- Koster, H.R.A., J.N. van Ommeren & P. Rietveld (2013), ‘Agglomeration economies and productivity: a structural estimation approach using commercial rents’. *Economica* (forthcoming).
- Lambooy, J. and F.G. van Oort (2005), ‘Agglomerations in equilibrium?’. In: S. Brakman and H. Garretsen (eds.), *Location and competition*. London: Routledge: 60-80.

- Mameli, F., S. Iammarino and R. Boschma (2012) 'Regional variety and employment growth in Italian labour market areas: services versus manufacturing industries'. *Papers in Evolutionary Economic Geography* 12.03, Utrecht University
- Marshall, A. (1890) *Principles of economics*. MacMillian, London.
- Martin, R. and P. Sunley (2003), 'Deconstructing clusters: chaotic concept or policy panacea?', *Journal of Economic Geography* 3: 5-35.
- Martin, P., Mayer, T. and Mayneris, F. (2011), 'Spatial concentration and firm-level productivity in France'. *Journal of Urban Economics* 69: 182-195.
- McCann, B.T. and T.B. Folta (2008). 'Location matters: where we have been and where we might go in agglomeration research'. *Journal of Management* 34: 532-565.
- McCann, B.T. and T.B. Folta (2011) 'Performance differentials within geographic clusters'. *Journal of Business Venturing* 26: 104-123.
- McCann, P. and F.G. van Oort (2009), 'Theories of agglomeration and regional growth: a historical review'. In: R. Capello and P. Nijkamp (eds.), *Handbook of regional growth and development theories*. Cheltenham: Edward Elgar:19-32.
- Melo, P.C., D.J. Graham and R.B. Noland (2008), 'A meta-analysis of estimates of agglomeration economies'. *Regional Science and Urban Economics* 39: 332-342.
- Mion, G. and Naticchioni, P. (2009), 'The spatial sorting and matching of skills and firms'. *Canadian Journal of Economics* 42: 28-55.
- Moomaw, R.L. (1988), 'Agglomeration economies: localization or urbanization?', *Urban Studies* 25: 150-161.
- Neffke, F. and M. Henning (2013). 'Skill-relatedness and firm diversification'. *Strategic Management Journal* 34: 297-316
- Neffke, F., M. Henning and R. Boschma (2011), 'How do regions diversify over time? Industry relatedness and the development of new growth paths in regions,' *Economic Geography* 87: 237-265.
- Nooteboom, B. (2000), *Learning and innovation in organizations and economies*. Oxford: Oxford University Press.
- O'Huallachain, B. and D.S. Lee (2011), 'Technological specialization and variety in urban invention'. *Regional Studies* 45: 67-88.

- Ottaviano, G.P. (2011) 'New' New Economic Geography: firm heterogeneity and agglomeration economies. *Journal of Economic Geography* 11: 231-240.
- Paci, R. and S. Usai (2000), 'Externalities, knowledge spillovers and the spatial distribution of innovation'. *Geojournal* 49: 381-390.
- Pasinetti, L.L. (1993), *Structural Economic Dynamics*. Cambridge: Cambridge University Press.
- Porter, M. (1990), *The competitive advantage of nations*. New York: Free Press.
- Porter, M. (2003), 'The economic performance of regions'. *Regional Studies* 37: 549-578.
- Quatraro, F. (2010), 'Knowledge coherence, variety and economic growth: manufacturing evidence from Italian regions'. *Research Policy* 39: 1289-1302.
- Quigley, J.M. (1998) Urban diversity and economic growth. *Journal of Economic Perspectives* 12: 127-138.
- Rigby, D. (2012), 'The geography of knowledge relatedness and technological diversification in US cities'. *Papers in Evolutionary Economic Geography* 12.18, Utrecht University.
- Rigby, D. and J. Essletzbichler (2006) 'Technological variety, technological change and a geography of production techniques'. *Journal of Economic Geography* 6: 45-70.
- Rigby D. and F. van der Wouden (2012) 'Knowledge relatedness and the rate of invention in U.S. Cities'. Los Angeles: UCLA.
- Rosenthal, S.S. and Strange, W.C. 2004. 'Evidence on the nature and sources of agglomeration economies'. In: *Handbook of Regional and Urban Economics*, edited by J.V. Henderson and J.F. Thisse. Amsterdam: Elsevier: 2119–2171.
- Scherer, F.M. (1982), 'Inter-industry technology flows in the United States'. *Research Policy* 11: 227-245.
- Shefer, D. and A. Frenkel (1998), 'Local milieu and innovativeness: some empirical results'. *The Annals of Regional Science* 32: 185-200.
- Teece, D.J., R. Rumelt, G. Dosi and S. Winter (1994), 'Understanding corporate coherence. Theory and evidence'. *Journal of Economic Behavior and Organization* 23: 1:30.
- Van der Panne, G. and C. Beers (2006), 'On the Marshall-Jacobs controversy: it takes two to tango'. *Industrial and Corporate Change* 15: 877-890.

- Van Oort, F.G. (2004), *Urban growth and innovation. Localized externalities in the Netherlands*. Aldershot: Ashgate.
- Van Oort, F.G. (2007), 'Spatial and sectoral composition effects of agglomeration economies in the Netherlands'. *Papers in Regional Science* 86: 5-30.
- Van Oort, F.G., M. Burger, J. Knobens and O. Raspe (2012), 'Multilevel approaches and the firm-agglomeration ambiguity in economic growth studies'. *Journal of Economic Surveys* 26: 468-491.
- Van Oort, F.G., S. de Geus and T. Dogaru (2013), 'Related variety and regional economic growth in a cross-section of European regions'. *Papers in Evolutionary Economic Geography*, Utrecht University.
- Van Oort, F.G. and J.G. Lambooy (2013), 'Cities, knowledge and innovation'. In: M. Fischer and P. Nijkamp (eds.), *Handbook of Regional Science*. Berlin, Springer (forthcoming).
- Van Soest, D., S. Gerking and F.G. van Oort (2006), 'Spatial impacts of agglomeration externalities'. *Journal of Regional Science* 46: 881-899