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From Marshall's Triad to Porter's Diamond: added value?

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Abstract

Purpose – The purpose of this paper is to offer clarity on a central concept introduced in Porter's *The Competitive Advantage of Nations*, i.e. the cluster. The authors situate the concept introduced by Porter (1990) relative to two of its antecedents, the industrial district and industrial complex. Placing the cluster in a historical context permits consideration of the extent to which it, as a concept for analysis, may be differentiated from other geography-based approaches to economic phenomena. In this way, this paper examines the added value of the cluster concept derived from economic factors.

Design/methodology/approach – The paper provides a detailed literature review tracing the evolution of theories of location and agglomeration into which Porter's cluster fits. The evolution of Porter's own conceptualisation of the cluster and how this relates to theoretical clarity surrounding the concept is explored. Comparative analysis of theories of location, agglomeration and clustering is provided to identify similarities and differences across the approaches and identify the added value of the cluster concept in relation to other approaches.

Findings – Clustering represents a process associated with spatial organisational form which may offer advantages in efficiency, effectiveness and flexibility. Cluster benefits can be appreciated through the lens of Young's (1928) identified sources of increasing returns. A key aspect in clustering is revealed in terms of its role in enabling four sources of increasing returns. The authors outline how these sources of increasing returns are related to "soft" processes of networking, interaction and individual and collective learning. Porter's Diamond is a self-reinforcing system which can permit increasing returns and reinforce such tendencies of economic activity within agglomerations.

Originality/value – Added value from Porter's cluster concept is identified in the context of both its locational anchoring and in terms of its potential for understanding the role of exploitation of increasing returns for development. This points to the importance of focusing on clustering as a process rather than on cluster within typologies of organisational form. This implies that the nature of relationships (and how they change) within and across markets, institutions and actors lies at the heart of clustering because of their roles in knowledge-generation, including innovation, knowledge sharing and upgrading.

Keywords Cluster, Diamond, Increasing returns, Industrial complex, Industrial district, Location theory

Paper type Conceptual paper

1. Introduction

Few concepts have gained as much popularity amongst academics and policymakers over recent decades as Porter's *cluster* concept. Porter originally (1990) identified the potential of clusters as mechanisms for improving national, regional and local innovation and productivity, i.e. the cluster offering a definition of locational competitive advantage. Porter (1998a, 1998b) noted the "globalisation paradox" that

enduring competitive advantage in a global economy lies increasingly in local things – knowledge, relationships, motivation – that distant rivals cannot match. This was in direct contrast to the view that location was declining in importance due to global forces (Cairncross, 1997).

Notwithstanding the popularity of the concept, a lack of consensus exists surrounding the precise definition of a cluster, the most appropriate measurement method or effective policy recommendations applicable to a large variety of clusters. Some researchers consider this ambiguity and vagueness as reasons for its popularity (Martin and Sunley, 2003; Asheim *et al.*, 2006). Martin and Sunley (2003, p. 11) describe the cluster as a "chaotic concept" in the sense of conflating and equating quite different types, processes and spatial scales of economic localisation under a single, all-embracing universalistic notion.

Within this context, this paper explores cluster antecedents, focusing on the *industrial district* and *industrial complex* in particular, to offer conceptual clarity. Section 2 outlines the evolution of the concept from its roots in classical location and agglomeration theory to the influence and relevance of the industrial district and industrial complex. The relationship of these origins to Porter's more recent formulation is identified throughout. Furthermore, Schumpeter's (1934, 1942, 1947) work on innovation is highlighted with reference to its influence on Porter's concept and the extension offered by the cluster. Section 3 highlights the evolution of Porter's conceptualisation of a cluster from its introduction in Porter's (1990) work on national competitiveness to his more recent contributions (1998, 2003 and 2008). The section outlines how the evolution of Porter's own writing has contributed, arguably, to an alleged lack of theoretical clarity surrounding the concept. However, by providing a comparative analysis of theories of location, agglomeration and clustering, we identify similarities and differences across the approaches within a range of related conceptual contexts in which the cluster is situated. Section 4 concludes the paper with our considerations of how the cluster is differentiable from other related concepts and the extent to which it adds value to previous theories and approaches.

2. Some cluster origins: Marshall to Porter

Concepts concerned with the spatial concentration, including co-location, of business and industrial activity have been widespread. Terms such as "agglomeration" (Marshall, 1890; Weber, 1909; Lösch, 1954), "industrial districts" (Becattini 1979, 1989, 1990; Piore and Sabel, 1984) and "industrial complexes" (Isard, 1956, 1960) have been used almost interchangeably to describe the distribution of business and industrial activity across space, with often limited concern for differences in theoretical underpinnings and operationalisation of the concepts. Such oversight has contributed to criticism of the cluster concept, with some researchers insisting the concept is simply a "rebranding" of previous theories (Martin and Sunley, 2003) and questioning if it a case of "old wine in new bottles" (Harrison, 1992).

In considering the cluster explicitly in the context of its interrelation the industrial district and the industrial complex, we highlight the roots, added value and underlying challenges of the cluster concept. Porter (1998b, p. 207) acknowledges:

[…] a variety of bodies of literature have in some respect recognized and shed light on the phenomena of clusters, including those on growth poles and backward and forward linkages,

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agglomeration economies, economic geography, urban and regional economics, national innovation systems, regional science, industrial districts, and social networks.

Our overview of the theoretical foundations explains co-location of firms with the purposes of identifying their mutual influences and intellectual roots.

2.1 Historical and intellectual antecedents of cluster theory
Geographers and economists have long sought to explain the distribution of economic activity across space. Early pioneering theories of Von Thunen (1826), Launhardt (1882), Marshall (1890) and Weber (1909) demonstrate historical interest in spatial questions within economics. Von Thunen's (1826) conceptual model of the relationship between production, markets and transportation is considered one of the earliest works in spatial economics: assuming a central city in a self-sufficient isolated state, the model explains how agricultural production specialises and agglomerates in concentric circles around the city, with profits maximised based on market prices net of transportation and production costs.

Launhardt (1882) identified the focal point as the *plant*, and suggested it is the market which spreads across space. Weber (1909) conceptualised a separate type of classical location theory concerned with industry: assuming a set of market points and perfect competition, Weber identified three fundamental location forces for businesses as transport cost differentials, labour cost differentials and agglomeration economies and diseconomies.

Notwithstanding earlier considerations, Marshall (1890) is credited as laying the foundations for much of the theorising on economic agglomeration and industrial localisation, with his reference to "industrial districts". Marshall's analysis concerned small locally owned firms making investment and production decisions locally. Marshall (1890) highlighted three drivers of industrial agglomeration[1]:

- input – output linkages driving specialisation;
- labour market pooling; and
- knowledge spillovers.

Marshall (1890, IV, X, p. 271) highlights that benefits of agglomeration are generated in the external economies available to firms from proximity to other firms and suppliers. Marshall describes efficiencies, or economies, which are industry-specific and largely positive, that contribute to the flow of information, visibility and mutually reinforcing systemic industry supports within a given locale.

It is noteworthy that Marshall's consideration of agglomeration and its productivity advantages was in response to his "question" of how small firms could compete with larger firms. His later chapter (1890, IV, XI) addressed large-scale production. Hence, the production structure Marshall considers is very much in the spirit of how he saw the role of economics, i.e. in terms of explaining economic reality, and is soundly based on characteristics of the economy that he observed (Jacobsen, 2015). And so too with the work of Porter that dwells on and delves into observations of economic reality across locations (Porter, 1990), industries (Porter, 1980) and firms (Porter, 1985).

Porter (1990, p. 790) highlights the long tradition evident in location theory and economic geography, which provide useful contextual elements for the cluster.

Early location theories of Hotelling (1929), Christaller (1933) and Lösch (1954) treat the physical market as a homogenous area rather than separate market points. According to Hotelling (1929), space serves as a field within which firms engage in price competition for customers. Christaller (1933) used economies of scale in retailing and distribution to provide the theory of central places which generates a hierarchy of city sizes. Lösch (1954) expands Christaller's approach to show increasing returns and transport costs could give rise to a concentration of firms. Lösch's (1954) system of central places permitted specialised places and illustrated how some central places develop into richer areas than others. Such approaches set out to explain the concentration of economic activity. Consideration in these early theories of agglomeration, characterised by input cost minimisation, input specialisation and advantages of locating near local markets, has echoes in Porter's work on clusters. A distinctive feature is Porter's consideration of the factors which categorise the elements of differentiation in economic activity to provide explanation of "place" as a source of competitive advantage(s) for specific activities, i.e. arising from activities within the value chain.

Schumpeter's (1934, 1942) work on disruptive economic change, as well as the impacts of innovation and technological change on growth, generated substantial influence, evident in, for example, Perroux (1950), Dahmén (1950) and Myrdal (1957). Schumpeter (1942) treated capitalism as an evolutionary process under which industry develops through a series of innovations and imitations with implications for products, processes and management. The entrepreneur is highlighted as the central agent of change contributing to creative destruction by "[…] the doing of new things or the doing of things that are already being done in a new way" (Schumpeter, 1947, p. 151). Porter (1990, p. 778) acknowledges the influence of Schumpeter, explaining "My fundamental perspective is more Schumpeterian […] than neoclassical. Entrepreneurship and innovation prove central to national advantage". However, Porter (1990, p. 20) insists that Schumpeter "stopped short of answering the central question which concerns us here. Why do some firms, based in some nations, innovate more than others?". Hence, an industrial district in which innovation occurs that confers market advantage to firms was Porter's focus.

Extending the focus on innovation, Dahmén (1950) introduced the concept of development blocks, highly influential in Porter's cluster concept. At the core of a development block, a central innovation stimulates entrepreneurial activity in blocks of complementary activities. Porter (1990, p. 790 emphasis added) recognises Dahmén's contribution as:

> […] stressing the necessary link between the ability of one sector to develop and progress in another […] This interesting work is suggestive that connections *among* industries can be important to achieving advantage.

In a similar vein, Perroux (1950) expanded on Marshall's (1890, IV, X) "subsidiary industries" in developing a theory of growth poles. Also influenced by Schumpeter's creative destruction, Perroux focused on the driving forces of industrial development, i.e. innovation and investment. Growth poles were constituted by large, vital firms spreading economic benefits to smaller firms in geographic proximity. Perroux emphasises that growth potential and innovativeness can be intensified in "concrete geographical spaces", resonating with Porter's *Diamond*, in which innovation and

upgrading are key in development; "a nation's competitive advantage depends on the ability of its industry to innovate and upgrade", and this process "is created and sustained through a highly localized process" (Porter, 1990, p. 73).

Myrdal's (1957) core-periphery model addresses spatial concentration of economic activities and elements of sustained economic growth also by focusing on geographic dualism in economic activities. Circular and cumulative causation explain why more developed regions with competitive advantages in specific factors and modern sectors are able to strengthen their positions, whereas disadvantaged regions with traditional sectors fall further behind. The self-reinforcing properties of Myrdal's concept of circular causation are linked with path dependency and lock-in effects, which feature prominently in later cluster analysis.

2.2 Industrial complex analysis

Isard (1960, p. 377) contributed to conceptual and empirical understanding of agglomeration economies by integrating inter-industry economic linkages with geographic proximity and introduced the industrial complex as:

> […] a set of activities occurring in a given location and belonging to a group (subsystem) of activities which are subjected to important production [technological], marketing, or other interrelations.

These complexes may be characterised by sets of identifiable long-term stable relations between firms requiring frequent interaction and, in part, manifested in their spatial behaviour.

The industrial complex is most commonly observed in industries such as steel and chemicals, where the characteristics of products being consumed by each firm are known and thus the only requirements for analytical purposes concern the relationship between spatial transaction costs and geographic distance, as well as the nature of the production function characteristics of the firms in question, defined in terms of input-output requirements (Gordon and McCann, 2000, pp. 518-519). Within industrial complexes, co-location occurs as a result of individual firms' attempting to reduce transaction costs, which determines the extent of co-locating within the particular input-output production hierarchy of which they are part. Such cost-based sources of advantage, while relevant to generic strategies (Porter, 1980), appear far removed from Porter's (1998a, 1998b, pp. 199-200) cluster that relates to the "more extensive complement of supporting industries" and includes more interconnections than entailed in the industrial complex.

2.3 Modern analysis of location and economic agglomeration

Resurgent interest in "industrial districts" occurred throughout the 1970s and 1980s, particularly from Italian scholars (Becattini 1979, 1989, 1990; Piore and Sabel, 1984; Bellandi, 1982, 1989), and align with Porter's interest in location and economic growth, in their consideration of how certain regions prospered despite more general decline. The examples of Capri (Italy), where high-quality knitwear originates; Montebelluna (Italy), where 500 firms produce 80 per cent of the world's motorcycle boots, 75 per cent of ski boots and 50 per cent of track shoes; and Belluno (Italy), where 66 per cent of eye glasses are produced, became policy role models (Asheim *et al.*, 2006). Studies were adapted and reworked to some American cases, such as Hollywood (Scott, 2002), Silicon Valley (Saxenian, 1994) and Orange County (Scott, 1986).

Revival of the "industrial district" coincided with the decline of the prominence of the Fordist production model based on vertically integrated production systems organised for mass production. New, more flexible organisational structures reflected flexible specialisation and changing consumer preferences requiring vertically integrated production between small and medium-sized firms.

The Marshallian differs from the Italianate industrial district, as notions of trust and cooperation between actors within the system are emphasised in the latter. For Marshall, while frequent interaction between buyers and sellers was evident, *conscious* cooperation between actors was not essential for firms to benefit from external economies. Italian scholars argued that concerted efforts to co-operate among district members and to build governance structures improved the stickiness of the district (Markusen, 1996). For Marshall, linkages and co-operation with firms outside the district seem minimal (Alberti *et al.*, 2008), while under the Italian conception, one of the most important features is the link between the local system of small and medium-sized firms and the markets for goods and inputs. The phenomenon of globalisation required firms within the district to create strong networks with intermediate and final markets for their goods, usually outside the district.

Two main drivers of novelty in research into location are evident with models of Dixit and Stiglitz (1977) and Krugman (1979, 1991a, 1991b) that have both permitted substantial empirical research. The former developed a model which assumes a monopolistically competitive market structure to avoid problems associated with price-taking behaviour when there are increasing returns to scale with a focus on optimum levels of product diversity although no direct consideration of location is made. In formalised general equilibrium models, Krugman (1979) focussed on internally sourced increasing returns, and Krugman (1991a) considered agglomeration economies which rely on increasing returns and transportation costs, also in a monopolistic market structure. Krugman (1991b) noted the influence of earlier theories of location, such as Myrdal's (1957) notion of cumulative causation and backward and forward linkages outlined by Hirschman (1958) in his formulation of a positive feedback mechanism – separate firm-external origins of increasing returns. The focus was on the concentration of aggregate, i.e. sectoral (manufacturing), production. Centripetal and centrifugal forces inherent in Krugman's model are also evident in the earlier work of Christaller (1933), which highlighted the trade-off between scale economies as a source of agglomeration and high rents, and in Myrdal's (1957) "backwash effects" and "spread effects" that mitigate inequalities. Such research links to the cluster in terms of its increased focus on the role of consumer demand, differentiation, product diversity and imperfect competition.

3. Porter's cluster: evolution and differentiation
Focusing on international competitiveness, Porter's central concern was identifying the various conditions under which successful firms in different clustered economic activities became and remained sufficiently productive to compete on international markets. Porter (1990, p. 6) insisted that the only meaningful concept of national competitiveness is *productivity*. Central to this view is that increasing productivity allows a nation to support higher wages, a strong currency and attractive returns to capital – and with them a rising standard of living (Porter and Ketels, 2003). Porter's "Diamond" is the graphical representation of the determinants of spatial

competitiveness, innovation and growth. Porter's (1998, 2003) research, (including Delgado *et al.*, 2014), has conceptually and empirically demonstrated that "Diamond" conditions are intensive where clusters are strong. Moreover, Diamond conditions termed as "microeconomic foundations of competitiveness" are statistically significant in explaining cross-country productivity when macroeconomic policy and social, political and institutional factors are included (and controlling for endowments) (Delgado *et al.*, 2014). The Diamond is constituted in four elements:

(1) *Factor conditions*: Including a highly skilled workforce specific to industry needs, sufficient funding available to business, e.g. through venture capital, and access to specialised inputs including knowledge and information.

(2) *Demand conditions*: Referring to the size and sophistication of a firm's customers especially in the home market. Porter (1990, p. 82) insists a firm's home market provides the means for creating competitive advantage by identifying the needs of customers faster, increasing pressure to innovate and providing "early warning indicators".

(3) *Related and supporting industries*: Groups of related firms and industries operating within proximity to specialised inputs can incentivise companies to innovate to compete. Highly competitive supporting industries provide innovations and motivation for upgrading of components, inputs and processes.

(4) *Firm strategy, structure and rivalry*: Local conditions and context influence how firms organise and contribute to the nature of domestic rivalry. Intense local rivalry, Porter (1990) argues, is essential for increasing regional competitiveness.

The same system of four organising headings is used to consider drivers of regional competitiveness, and so, separate national or more local conditions under the same heading may govern the competitiveness of a cluster.

The "Diamond" was a seminal contribution of Porter's original work on national competitiveness. Porter (1990) acknowledged the role of related and supporting industries to enhance competition and introduced the concept of clustering to extend this notion further. Porter (1990, pp. 148-149, emphasis added) argues:

> The systematic nature of the "diamond" promotes the *clustering* of a nation's competitive industries. A nation's competitive industries are usually linked through vertical (buyer/supplier) or horizontal (common customers, technology, channels, etc.) relationships.

In Porter's (1990) original formulation of the cluster concept, geographic proximity tends to be an important, though not essential, aspect of clustering, with a cluster defined in terms of the system of evolved linkages, relationships and processes rather than location-inherent factors. Porter's (1990, p. 131) initial definition of clusters identified "industries related by various links of various kinds". Porter maintained a distinction between his concept of a cluster, based on linkages, relationships and processes from a geographically concentrated group of firms and institutions. Palacios (2005, p. 194) questions the geographic connotations associated with a cluster, identifying a cluster as "an amorphous entity, a bunch of things growing, standing or being held together. Therefore the concept has a functional, non-geographic connotation". However, Porter (1990, p. 157, emphasis added) notes that the "process of clustering, and the interchange among industries in the cluster, also works *best* when the

industries involved are geographically concentrated". In later research Porter (1998a, 2000) further integrated geographic proximity into the cluster definition, e.g. as "geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition" (Porter, 1998, p. 78). Some authors believe that this "gradual slide in the definition of the cluster concept" (Malmberg and Power, 2006, pp. 54-55) from definitions based on functionality to definitions based on geographic proximity has contributed to the cluster becoming a "chaotic concept". A valid harmonising view is that *both* perspectives are important when considering sources of firm performance on a comprehensive basis. The "functional" element may be less clear, however, than the geographic.

For many years, concepts concerned with the spatial concentration of business and industrial activity have been applied (Maskell and Kebir, 2005). Porter (1998b) acknowledges previous work on agglomeration, location and industrial districts but argues the cluster concept offers *more* than synthesis of previous theories. While earlier theories of agglomeration and location focused on the distribution of economic activity across space, Porter's (1990) approach differentiates itself in its focus on relating internationally successful concentrations of economic activity to proximate sources of productivity growth. This approach highlighted the positive reinforcing (increasing-returns-to-scale – IRS) effects of agglomeration economies – grounded in the interacting and interrelated factors outside firms included in the above Diamond. It also permits inclusion of *internal* sources of IRS in monopolistically competitive markets and rooted in the strategic management tradition, the link between firm strategy, performance, external opportunities and internal capabilities. Hence for Porter, proximity is more than a geographical consideration, as it features in firm strategy and performance – i.e. it is idiosyncratic, path-dependent and context-driven.

Some comparison can be drawn to also between Porter's Diamond of business clustering and Young's (1928) identification of sources of increasing returns (in distinction from IRS) in terms of "roundabout methods" of production, i.e. the replacement of capital for labour, and the division of labour among entire industries. Both features would offer sources of explanation for increasing returns generated through clustering that can relate to specific locations and changes in a location's productive structure and capacity over time. Such roundabout methods are evident in previous periods through different mechanisms, e.g. mass production supported through efficiency of vertical integration of production of the "Fordist system" – a feature of the industrial complex or the later flexible specialisation and de-verticalisation of production in the transition to the post-Fordist system as characterised by the new-form industrial district. The "new economy" is characterised by companies making the transition from capital- and physical-labour-intensive processes (characterising industrial districts and complexes) to high-skilled knowledge-intensive transformation processes. Not only does physical labour replace physical capital for some products and processes but also intellectual capital and knowledge become increasingly prevalent as resources determining competitive advantage.

In the case of knowledge-intensive activities, network effects and learning effects would be important sources of increasing returns. These represent two of four sources of increasing returns identified by Arthur (1988): the other two are scale and interaction

effects. The meaning of scale effects has an additional connotation here, as the cost-structure of knowledge-intensive products, e.g. software and pharmaceuticals, can require substantial up-front investment. To cover such investment substantial positive feedback effects and high price elasticity of demand are needed, so that consumers purchase output in sufficiently high quantity, allowing the products/services to more than cover such costs. Reaping increasing returns in such cases depends on consumers having faith in the capacity of the product to deliver on its promise, e.g. pharmaceuticals, or from increasing the value of the product in the mind of the consumer through longer-term interactions, such as through software upgrades to which the consumer is committed. Direct and indirect effects may reinforce each other.

For industrial complexes, the most important sources of increasing returns are scale and learning effects, which are primarily company-driven (internal economies), while for industrial districts, the most important features of increasing returns tend to be interaction and networking effects, which are primarily market-driven (external economies).

For clusters, however, all four sources of increasing returns are important with the potential for realising scale effects and learning effects magnified by the potential of interaction and networking effects. The impact of increasing returns, if reaped, is to be found and applied in specific localities, and in that sense only, we agree with Duranton *et al.* (2010, p. 14) that "local increasing returns are the core justification of the existence of clusters". As the ultimate source of such returns may well lie with people and products or processes innovated and developed in other jurisdictions, we argue that Porter's cluster conception targets also, and as potential equally important, additional non-local sources of increasing returns[2].

Table I consolidates the main features of different types of localised economic agglomerations across a set of selected comparative dimensions.

Table I permits comparison and contrast of industrial districts, industrial complexes and clusters, in terms of Porter's conceptualisation specifically. It offers a competing perspective to Palacios (2005, p. 194), who insisted that "an industrial district is a cluster and vice versa and both ultimately constitute industrial complexes, which […] in turn can be part of a cluster".

Geographic proximity is a distinctive feature of all three types of localised economic agglomeration. While "districts" and "complexes" have an inherently spatial dimension, "clusters" provide additional functional focus on enabled and emergent interactions for information and knowledge sharing. While geographic proximity has gained increasing significance in Porter's definition of a cluster, it is arguably not necessary for the *functioning* of all clusters. Indeed, Boschma (2005) highlights alternative types of proximity such as social, cognitive or organisational proximity, which could contribute to actors within a cluster benefiting from external-to-cluster economies.

We identify a link between Ullman's (1956) three bases of spatial interaction – complementarity, transferability and intervening opportunity – and the role of space in alternative meanings of "proximity". *Complementarity* generates mutual benefit from spatial proximity across the three categories of district, complex and cluster and would be visible through input-output links, for example. *Transferability* relates to ease of movement of, e.g., people, goods, information or money, which can crudely be measured as distance (and consequential cost implications), although when information is the essence of the transfer, cognitive- and technological- rather than physical-proximity are

Feature	Industrial districts	Industrial complex	Cluster
Proximity	Geographic	Geographic	Geographic, organisational, cognitive, social
Type of industry	Main industry and subsidiary industries	Large plants and related production units	System of units, productivity enhancing associations within and across manufacturing and services businesses
Focus	Output-product	Output-product	Output-product Productivity and productivity growth
Size of firms	Small and medium firms	Some large firms	Various – successful large and niche exporters
Membership	Partially open	High barriers to entry due to large start-up costs	Open; includes supporting institutions – research, education, quality-enhancing
Consumer role	Standardised product, mass-produced	Customisation of products to specific type(s) of customer	Sophisticated consumers impacting quality of offering – differentiated products
Relationship between actors	Frequent trade between actors within district	Frequent trading between actors inside and outside of complex	Actors not main focus instead nature of competition and/or collaboration
Measurement	Qualitative	Quantitative	Qualitative and quantitative
Competitive basis	Economies of scale: cost advantages and external agglomeration economies	Economies of scope; technological similarities, cost advantages	Differentiation; innovation increasing returns, external economies and innovation driving upgrading of inputs and economic system

Source: Compiled by authors

Table I.
Characteristics of industrial districts, industrial complexes and clusters

more relevant. Hence, its applicability to the industrial district and complex is more limited than for the cluster. The final base, *intervening opportunity*, opens a new set of factors in the competitive space where, for example, product attributes unavailable from one location and introduced elsewhere can affect initial complementarity and negatively impact initial grounds for spatial interactions or explain emergence of products in some locations relative to others. Porter's cluster with its systemic character permits consideration of characteristics of other products *and* other locations which require a broad definition of proximity, including product-attribute terms (Lancaster, 1966)[3].

Each economic agglomeration can be distinguished by the types of economic units it contains. Marshall (1890) was concerned with small and medium-sized firms in the UK, and proposed agglomeration as a means for groups of small firms managing to compete with larger-scale production. Becattini (1979) and Piore and Sabel (1984) were concerned with "flexible specialisation", which organises vertically integrated production between small and medium-sized firms. Marshall (1890) notes the formation of a "main industry" and "subsidiary industry", while Alberti *et al.* (2008, p.7) highlight that "firms of the district belong mainly to the same industrial branch, but the term industrial branch must be defined in an especially broad sense". While Porter (1990, 1998a, 1998b, 2003) does not directly address firm size, case studies ranging from small firms (Italy) to large companies (Silicon Valley) indicate that a cluster can accommodate firms of any and all sizes, depending on the type of activity and industry context the firms engage with.

Membership of an industrial district outlined by Marshall (1890), revived by Becattini (1979), is partially open in the sense that entry and exit into the district is open; however, the importance of history, long-term relationships and social networks, particularly in the Italian variant of the district, can be a barrier to entry to new firms from outside the district. For the industrial complex, barriers to entry are high due to high costs of production associated with structure, e.g. steel and chemicals. Under Porter's cluster concept, free entry and exit into the cluster exists and enables it to reach critical mass: it is via differentiation that a unique competitive position is achieved by a firm. New business formation, company spin-offs and entry of entrepreneurs are all features of successful clusters (Porter, 1998).

Marshall's seminal work on industrial districts was qualitative in nature, and he developed his concept of external economies based on observations of industries in the UK. In contrast, Isard's (1960) concept of industrial complexes is grounded in quantitative analysis and builds on Weber (1909) and Moses' (1958) location-production models. Both quantitative and qualitative methods have been used to identify and measure clusters with a qualitative approach used to interrogate the outcomes from data-driven identifications of clusters applied across Cluster Mapping Projects[4]. The most comprehensive considerations include combination of both approaches. Porter (2003) and Delgado *et al.* (2014) incorporate reference to location quotients, algorithms and expert opinion in identifying and measuring clusters.

4. Discussion and conclusions
Grounding consideration of Porter's contribution in Marshall's work on localisation and agglomeration allows us to identify the added value of the cluster concept within and beyond those domains. While Duranton *et al.* (2010, p. 1) consider "clusters are indeed nothing new", our review of two antecedent concepts in the broader theoretical context indicates the breadth of this research area that addresses a range of related, if not

similar, questions including the locational dimension. Spatial interests have focused variously on the role of the plant, the city, the district and the complex to investigate markets and their operations within their spatial contexts. Yet even to the extent that "cluster" relates to spatial concerns, its spatial and regional aspect focuses attention on the *system* of features that relate place to both competitive performance *and* potential and bridge Porter's related work on sources of value creation (including innovation) for the firm within its industry context (Porter, 1980, 1985).

We consider, however, there is added value relative to theories of location and agglomeration provided by Porter's conception of the "cluster", not least in terms of his focus on explaining firms' market success in the face of international competition, i.e. going beyond the nature of location as an explanation for business agglomeration more generally. Porter's (1990) key interest was in examining to what extent location, by reference to ten specific separate countries, was a source of competitive advantage for internationally competitive firms. The introduction and development of the cluster broadened it beyond a functional to a relational concept. Such a "relational turn" has been latterly identified in economic geography (Boggs and Rantisi, 2003).

The role of location becomes increasingly evident in applications of the "Diamond" to different spatial scales from national, to regional, to more local, including the city, for example (Porter, 1990, p. 29). Porter's (1998, 2003) setting of the Diamond within different geographical boundaries permits identification of separate but important determinants of a cluster's success – while simultaneously contributing to the theoretical vagueness and ambiguity some associated with the concept (Martin and Sunley, 2003; Asheim *et al.*, 2006). In Porter's (1985) approach to competitive advantage, the separate spatial scales are identified as accounting for distinctively separate contributory factors in firms' international competitiveness arising from their national, regional or city location, for example. Porter (1998, p. 243) notes the process through which a cluster emerges and develops may take a century or more in an actual location. In this way, the cluster is defined relationally by different spatial impacts on business competitiveness. Hence, for Porter, location is, therefore, both spatial, covering various scales, *and* historical, in an evolutionary sense.

Neither can location, as it relates to clustering, be cleanly separated from Porter's concept of competitive advantage (Porter, 1985). As it is through companies that international competition takes place, national competitive advantage describes the *interaction* between features of a location and its firms that govern superior performance. It is in bridging location and competitive advantage where Porter's contribution is clearest. Based on productivity, Porter's definition of competitive advantage represented a major departure from Ricardo's presentation of comparative advantage, which was supply-focused, related to factor abundance and on which earlier location and agglomeration theories were built, e.g. the industrial complex. Although various research has addressed location, Porter's was the first to offer a general consideration of innovation-based economic development where location, in both historical and spatial terms, is a central and key conceptual anchor (Doyle *et al.*, 2013).

Prompted by Young (1928), we consider that increasing returns (local *and* distant) strengthen the potential benefits exploitable through agglomeration and co-location via clustering. Similar to other theories of economic agglomeration, firms within clusters benefit from sources of external economies. However, unlike industrial districts and industrial complexes which benefited from external economies, following Marshall (1890), productive

clustering allows various sources of increasing returns to be exploited, with potential for realising scale effects and learning effects magnified by the potential of interaction and networking effects. These sources of increasing returns are related to "soft" processes, such as networking, interaction and collective learning, which are considered as important drivers of growth in contemporary economies. Linking to the spatial dimension, when research questions relate to internal and external sources of economies and increasing returns for groups of firms, it is difficult to envisage explanations that exclude potentially important linkages and complementarities whether across industries and institutions or without taking cognisance of relevant locational aspects also. Judicious explanation and analysis by researchers would appear to be key.

Aligning increasing returns with Porter's emphasis on unique positioning means that neither price signals nor the "form" of spatial organisation provides the foundations for the linkages and interconnections that characterise clustering. Accordingly, it may be more useful to focus on the term *clustering* rather than cluster to delineate a focus beyond the form or function of spatial organisation covered by the definition. While Feldman *et al.* (2005) point to the entrepreneur as a missing element in most cluster studies, when thinking about the cluster in its broader context of economic development, the process of clustering appears to be as central for Porter as the economic agent of the entrepreneur is for Schumpeter. A reorientation of attention towards process points to the nature of relationships (and how they change) within and across markets, institutions and actors at the heart of clustering. Both the process and the outcome of the process feature in Porter's explanation of economic development that focuses on uniqueness of offerings over time, achieved through upgrading.

In this paper, we offer conceptual and contextual clarity for the cluster concept. Notwithstanding the difficulties in obtaining data on essential elements of learning such as R&D, strong institutions, knowledge spillovers, culture and trust that can also play roles in understanding locational sources of international success (Malecki, 2011; Gilbert *et al.*, 2008) at this stage, much empirical work has solidified the cluster concept within economic literature as one that can improve understanding of economic structure and its evolution *and* has explanatory power as a statistically significant source of competitiveness in modern economies (Porter, 2003; Delgado *et al.*, 2010, 2014; Chatterji *et al.*, 2013). One substantial gap, at least, that remains to be addressed relates to cluster-related funding and support programmes that disperse substantial public funds to grow and develop clusters. There is a dearth of available methodologies for moving effectively from the general patterns of clustering evident in data to analysing impact of specific programmes and policies. We would see this as a fruitful focus for future research.

Notes

1. Marshall's argument is typically presented in the literature as a "triad of externalities"; however, it should be noted that the "triad of externalities" is a later construct and Marshall himself suggests *four* sources of external economies: transfer of skills and inventions between colleagues, competitors and generations; the growth of subsidiary industries supplying the core industry with specialised inputs and services; scale advantages in the shared use of specialised machinery; and a local labour market for specialised skills. In other words, Marshall suggests two different types of input-output linkages from two separate specialisation processes, and these are commonly combined into one category. Our thanks to a referee for this observation.

2. As authors from a small open economy, Ireland, with high levels of multinational activity, the role of non-local and international impacts for local markets and actors has a particular resonance and importance for productivity and economic growth.

3. Porter (1976, p. 20) emphasised his approach to product attributes the following terms: "I differ from Lancaster in putting emphasis on the product characteristics perceived by the consumer rather than any intrinsic product attributes and stressing imperfect information as a major determinant of the choice problem".

4. US cluster mapping: www.clustermapping.us/; European Cluster Observatory: www.clusterobservatory.eu/index.html

References

Alberti, F.G., Sciascia, S., Tripodi, C. and Visconti, F. (2008), *Entrepreneurial Growth in Industrial Districts: Four Italian Cases*, Edward Elgar, Cheltenham.

Arthur, W.B. (1988), "Self-Reinforcing mechanisms in economics", in Anderson, P.W., Arrow, K.J. and Pines, D. (Eds), *The Economy as an Evolving Complex System*, Addison-Wesley Publishing Company, Redwood City, CA, pp. 9-31.

Asheim, B., Cooke, P. and Martin, R. (2006), *Clusters and Regional Development: Critical Reflections and Explorations*, Routledge, New York, NY, pp. 30-49.

Becattini, G. (1979), "Dal 'settore' industrialle al 'distretto' industriale. Alcune considerazioni sull'unita d'indagine dell'economia industriale", *Rivista di Economia e Politica Industriale*, Vol. 1 No. 1, pp. 7-21.

Becattini, G. (1989), "Sectors and/or districts: some remarks on the conceptual foundations of industrial economics", in Goodman, E. and Bamford, J. (Eds), *Small Firms and Industrial Districts in Italy*, Routledge, London, pp. 123-135.

Becattini, G. (1990), "The Marshallian industrial district as a socio-economic notion", in Pyke, F., Beccatini, G. and Sengenberger, W. (Eds), *Industrial Districts and Inter-Firm Co-operation in Italy*, International Institute for Labour Studies, Geneva, pp. 37-51.

Bellandi, M. (1982), "Il distretto industriale in A. Marshall", *L'Industria*, Vol. 3 (July-September), pp. 355-375.

Bellandi, M. (1989), "The industrial district in Marshall", in Goodman, E. and Bamford, J. (Eds), *Small Firms and Industrial Districts in Italy*, Routledge, London, pp. 136-152.

Boggs, J. and Rantisi, N. (2003), "The 'relational turn' in economic geography", *Journal of Economic Geography*, Vol. 3 No. 2, pp. 109-116.

Boschma, R. (2005), "Proximity and innovation: a critical assessment", *Regional Studies*, Vol. 39 No. 1, pp. 61-74.

Cairncross, F. (1997), *The Death of Distance*, Harvard Business School Press, Cambridge, MA.

Chatterji, A., Glaeser, E. and Kerr, W. (2013), "Clusters of Entrepreneurship and Innovation", NBER Working Paper No 19013, May 2013.

Christaller, W. (1933), *Die zentralen Orte in Süddeutschland*, Gustav Fischer, Jena.

Dahmén, E. (1950), *Entrepreneurial Activity and the Development of Swedish Industry 1919-1939*, American Economic Association Translation Series, Homewood.

Delgado, M., Porter, M.E. and Stern, S. (2010), "Clusters and Entrepreneurship", *Journal of Economic Geography*, Vol. 10 No. 4, pp. 495-518.

Delgado, M., Porter, M.E. and Stern, S. (2014), "Clusters, convergence, and economic performance", *Research Policy*, Vol. 43 No. 10, pp. 1785-1799.

Dixit, A.K. and Stiglitz, J.E. (1977), "Monopolistic competition and optimum product diversity", *American Economic Review*, Vol. 67 No. 3, pp. 297-308.

Doyle, E., Fanning, C. and Miovic, P. (2013), "Towards a contemporary theory of economic development: a schumpeterian perspective on Porter's competitiveness framework", *Mimeo*, School of Economics, University College Cork.

Duranton, G., Martin, P., Mayer, T. and Mayneris, F. (2010), *The Economics of Clusters: Lessons from the French Experience,*, Oxford University Press, Oxford, UK.

Feldman, M.P., Francis, J. and Bercovitz, J. (2005), "Creating a cluster while building a firm: entrepreneurs and the formation of industrial clusters", *Regional Studies*, Vol. 39 No. 1, pp. 129-141.

Gilbert, B.A., McDougall, P.P. and Audretsch, D.A. (2008), "Clusters, knowledge spillovers and new venture performance: an empirical examination", *Journal of Business Venturing*, Vol. 23 No. 4, pp. 405-422.

Gordon, I. and McCann, P. (2000), "Industrial clusters: complexes, agglomeration and/or social networks?", *Urban Studies*, Vol. 37 No. 3, pp. 513-532.

Harrison, B. (1992), "Industrial districts: old wine in new bottles?", *Regional Studies*, Vol. 26 No. 5, pp. 469-483.

Hirschman, A. (1958), *The Strategy of Economic Development*, Yale University, New Haven, CT.

Hotelling, H. (1929), "Stability in competition", *Economic Journal*, Vol. 39 No. 153, pp. 41-57.

Isard, W. (1956), *Location and Space-Economy*, MIT Press, Cambridge, MA.

Isard, W. (1960), *Methods of Regional Science*, MIT Press, Cambridge, MA.

Jacobsen, L.R. (2015), "On Robinson, Robertson, and the industrial organization view", *History of Political Economy*, Vol. 47 No. 1, pp. 41-89.

Krugman, P. (1979), "Increasing returns, monopolistic competition, and international trade", *Journal of International Economics*, Vol. 9 No. 4, pp. 469-479.

Krugman, P. (1991a), *Geography and Trade*, MIT Press, London.

Krugman, P. (1991b), "Increasing returns and economic geography", *Journal of Political Economy*, Vol. 99 No. 3, pp. 483-499.

Launhardt, W. (1882), *Die Bestimmung des Zweckmässigsten Standortes einer Gewerblichen Anlage*, Zeitschrift des Vereines Deutscher Ingenieure, Berlin.

Lösch, A. (1954), *The Economics of Location*, in Woglom, W.H. and Stolper, W.F. (Eds), Yale University Press, New Haven, CT.

Malecki, E.J. (2011), "On diamonds, clusters, and regional development", in Huggins, R. and Izushi, H. (Eds), *Competition, Competitive Advantage, and Clusters: The Ideas of Michael Porter*, Oxford University Press, Oxford, pp. 193-210.

Malmberg, A. and Power, D. (2006), "True clusters. A severe case of conceptual headache", in Asheim, B.T., Cooke, P. and Martin, R. (Eds), *Clusters and Regional Development. Critical Reflections and Explorations*, Routledge, London and New York, pp. 50-68.

Markusen, A. (1996), "Sticky places in slippery space: a typology of industrial districts", *Economic Geography*, Vol. 72 No. 3, pp. 293-313.

Marshall, A. (1890), *Principles of Economics*, Macmillan, London.

Martin, R. and Sunley, P. (2003), "Deconstructing clusters: chaotic concept or policy panacea?", *Journal of Economic Geography*, Vol. 3 No. 1, pp. 5-35.

Maskell, P. and Kebir, L. (2005), "What qualifies a cluster theory?", DRUID Working Papers, 05-09, Aalborg University.

Moses, L. (1958), "Location and the theory of production", *Quarterly Journal of Economics*, Vol. 72 No. 2, pp. 259-272.

Myrdal, G. (1957), *Economic Theory and Under-Developed Regions*, Duckworth, London.

Palacios, J. (2005), "Economic agglomeration and industrial clustering in developing countries: the case of the Mexican Silicon Valley", in Kuchiki, S.J., Juan, S. and Palacios, J. (Eds), *Joint Research Program Series*, Vol. 137, pp. 161-271, available at: www.ide.go.jp/English/Publish/Download/Jrp/pdf/137_3.pdf (accessed 13 May 2015).

Perroux, F. (1950), "Economic space: theory and applications", *Quarterly Journal of Economics*, Vol. 64 No. 1, pp. 89-104.

Piore, M.J. and Sabel, C.F. (1984), *The Second Industrial Divide: Possibilities for Prosperity*, Basic Books, New York.

Porter, M.E. (1976), *Interbrand Choice, Strategy and Bilateral Market Power*, Harvard University Press, Cambridge, MA.

Porter, M.E. (1980), *Competitive Strategy: Techniques for Analyzing Industry and Competitors*, The Free Press, New York, NY.

Porter, M.E. (1985), *Competitive Strategy: Creating and Sustaining Superior Performance*, The Free Press, New York, NY.

Porter, M.E. (1990), *The Competitive Advantage of Nations*, The Free Press, New York, NY.

Porter, M.E. (1998a), "Clusters and new economics of competition", *Harvard Business Review*, Vol. 76 No. 6, pp. 77-90.

Porter, M.E. (1998b), *On Competition*, Harvard Business School Press, Cambridge, MA.

Porter, M.E. (2000), "Location, competition, and economic development: local clusters in a global economy", *Economic Development Journal*, Vol. 14 No. 1, pp. 15-34.

Porter, M.E. (2003), "The economic performance of regions", *Regional Studies*, Vol. 37 Nos 6/7, pp. 549-578.

Porter, M.E. and Ketels, C. (2003), "UK competitiveness: moving to the next stage", *DTI Economics Paper*, No. 3, pp. 1-60.

Saxenian, A. (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard University Press, Cambridge, MA.

Schumpeter, J. (1934), *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, Harvard University Press, Cambridge, MA.

Schumpeter, J. (1942), *Capitalism, Socialism and Democracy*, Harper, New York, NY.

Schumpeter, J. (1947), "The creative responses in economic history.", *The Journal of Economic History*, Vol. 7 No. 2, pp. 149-159.

Scott, A.J. (1986), "High technology and territorial development: the rise of the Orange County complex", *Urban Geography*, Vol. 7 No. 1, pp. 3-45.

Scott, A.J. (2002), "A new map of Hollywood: the production and distribution of American motion pictures", *Regional Studies*, Vol. 36 No. 9, pp. 957-975.

Ullman, E. (1956), "The role of transportation and the bases for interaction", in Thomas, W.L. (Ed.), *Man's Role in Changing the Face of the Earth*, University of Chicago Press, Chicago, IL, pp. 862-880.

Von Thunen, J. (1826), "Der Isolierte Staat in Beziehung auf Landwirtschaft und Nationalokonomie", Teil 1. Friedrich Perthes, Hamburg; Trans. Wartenburg, C. (1966) "Von Thunen"*s Isolated State*", Pergamon, Oxford.

Weber, A. (1909), *Uber den Standort der Industrien [On the Location of Industries]*, Mohr, Tubingen.

Young, A. (1928), "Increasing returns and economic progress", *Economic Journal*, Vol. 38 No. 152, pp. 527-542.

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