DE GRUYTER
OPEN

Administration, vol. 66, no. 1 (2018), pp. 107–128
doi: 10.2478/admin-2018-0011

Rethinking Irish cluster policy

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Introduction

For almost thirty years the cluster concept and cluster policy have retained strong traction across both academic and policymaking circles. In this paper we select issues of current relevance, particularly for policymaking, from contexts of the evolution of understanding of the concept, the experience of implementing policy and ongoing research.

The next section sets out key features of the cluster concept from its roots in Porter's work (1990, 1998) and in well-worn considerations relating to agglomeration and innovation. Cluster policy experience is examined in the following section, in relation both to the Irish case and to international, mainly European, approaches and experience. For Ireland, a lack of an agreed, consistent or clear definition of cluster is revealed across policy documents and practice. The importance of amplifying connectivity between cluster members is considered fundamental to future cluster performance across regional and sectoral boundaries. This is increasingly important for innovation imperatives.

The next section argues that to close the gap between government commitment to revising Irish cluster policy on the one hand and its

implementation on the other, a number of issues must be addressed in terms of cluster policies, strategies and actions. Key to delivering impactful cluster policy are coordination and integration of approaches across relevant government departments and related agencies. In addition, we highlight a number of issues relevant for growing the evidence base on underlying structures and scales of relevance for an appropriately developed and targeted cluster policy for Ireland. These issues cover methods for identifying clusters, their relevant geographical scale and the applicability of cluster policy for different areas in Ireland. The final section sets out our concluding comments.

The cluster concept

Since the publication of Michael Porter's *The Competitive Advantage of Nations* (1990), the cluster concept has become very influential in both academic and industrial policy circles. The Porter model is now well established. The thesis is that to understand why nations gain competitive advantage, the focus should be on particular competitive industries within the nation. For national competitive advantage to occur, it is not sufficient to have a number of unconnected successful companies. Rather it is necessary to develop clusters, initially defined as geographical concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries and associated institutions in particular fields that compete but also cooperate.

According to Porter, the competitive advantage of an industry derives from the 'national diamond', i.e. the four determinants of competitive advantage which are created within the nation state: factor conditions; demand conditions; related and supporting industries; firm strategy, structure and rivalry. He also identifies two additional influences: government and chance events.

The operational concept in Porter's model is not *cluster* but *clustering* – the process that leads to the development of clusters. The conditions that bring about industry clustering grow directly out of the determinants of competitive advantage and are a manifestation of their systemic character. The important role of interaction among the determinants means that advantage in an industry depends in part on how effectively the interactions work in a nation. Underlying the operation of the national diamond and the phenomenon of clustering are the exchange and flow of information about needs, techniques and

technology. Geographical concentration can greatly facilitate the flows of this information, so central to the capability to innovate and to upgrade competitive advantage.

The principal contribution of *The Competitive Advantage of Nations* was 'the diamond model'. The regional aspects of the cluster concept were given little thought. It is in *On Competition* (1998) that Porter elaborates the concept of clusters beyond what appeared as an appendage to the national context (Brosnan et al., 2016; van Egeraat, 2012).

Porter's interest in regional clustering should be related to renewed interest in territorial production concepts since the mid 1980s, involving a diverse range of theoretical perspectives. During the 1980s economists and geographers analysed the continued competitiveness of spatial conglomerations of small- and medium-scale enterprises (SMEs) in the 'Third Italy'. Linking their observations to the industrial districts described by Marshall (1898) gave rise to the 'Neo-Marshallian Industrial Districts' model for understanding the advantages of territorial production. During the end of the 1980s and into the 1990s, the proponents of the national and regional systems of innovation approach provided a holistic and evolutionary understanding of successful innovative countries and locations. Porter's (1998) full account of clusters bears similarity to the regional systems of innovation model. The main difference is that Porter insufficiently elaborates on important processes, such as collective learning and the role of important institutional actors (Malecki, 2011). Later again, the evolutionary analogy also informed the development of the Regional Sectoral Ecosystem concept.

More recently, the cluster concept became enveloped in the Smart Specialisation concept and policy tool promoted by the EU (Regional Innovation Strategies for Smart Specialisation, RIS3). However, the cluster concept and cluster policy have retained strong traction in both academia and policymaking circles.

Cluster policy: Ireland in context

Interest in the cluster concept and cluster-based policies has been evident for Ireland dating back to the Culliton report (1992), which highlighted the importance of a competitive business environment for the development of enterprise. The report recommended the promotion of clusters following Porter's (1990) approach that emphasised not specific industries but clusters of industries connected

through vertical and horizontal relationships. The report highlighted the need to build clusters based on existing local strengths. In addition, the report proposed the creation of a separate industrial development agency for the promotion of indigenous industry and – to support the development of local or regional clusters – it was proposed that this agency would have a regional structure (Breathnach, 2001).

The Culliton report prompted the National Economic and Social Council to commission a number of cluster studies (Clancy et al., 2001; Cooke, 1996). The studies were generally supportive of a cluster policy for Ireland, although Clancy et al. (2001) suggested that the approach would differ from Porter's concept of the cluster in a number of respects, notably an acknowledgement of a potentially positive role for foreign-owned companies.

The report and studies had some, though limited, effect on the strategies and actions of the state enterprise agencies. Recognising a degree of geographical concentration of some types of economic activity, such as medical devices in Galway or pharmaceuticals in Cork, IDA Ireland started to use terminology of regional 'magnets of attraction' (IDA Ireland, 2003, p. 8).

The agency also reported that '[d]eveloping clusters of excellence where companies, business service providers, and those in education and research network together to create a climate of innovation and entrepreneurship is a key area of IDA activity' (IDA Ireland, 2003, p. 20). This statement is interesting for several reasons. The inclusion of a range of institutions impacting business echoes the 'diamond model', and the networking reference with the inclusion of both business and non-business network members has a cluster ring to it. Nevertheless, targeting the creation of a 'climate', while a necessary condition for economic development, did not speak to sufficient conditions, nor was any indication provided as to if or how networking was to be facilitated, established or supported financially, or otherwise, over time. As IDA Ireland's focus was on large multinational companies (MNCs), the demarcation of 'companies' in the extract did not relate to indigenous companies, which since 1994 had fallen under the remit of Forbairt.

Forbairt was established in 1994 to promote indigenous industry, in direct government response to the Culliton report. However, in conflict with Culliton's recommendations, it was given a centralised, sector-oriented structure (Breathnach, 2001). Initiatives targeting network development were implemented through Forbairt involving indigenous firms. After Forbairt's incorporation in Enterprise Ireland

in 1998, the policy orientation of the new agency appeared to support the cluster concept but at the same time identified the Irish industrial base as insufficiently developed to have allowed clusters to emerge (Doyle & Fanning, 2007).

In policy terms, since Culliton, clusters have earned some mention, but only sporadically, in policy documentation. Their general absence is notable in a Forfás report, *Shaping Our Future: A Strategy for Enterprise in Ireland in the 21st Century* (Forfás, 1996), which again referenced networks, albeit in a limited way in the context of serving the development of technological capability. One further mention included a discussion of cities' role in development policy for regions, but without specifics or detail – so the cluster was effectively a catchphrase concept without follow-through or implications for policy or its practice.

Without detailing various Irish policy documents, their general message is essentially the same – periodic mentions of 'cluster' but little, if any, evidence in implementation. Where implementation is in evidence, it is limited to networking activities and without integrating indigenous and MNC activities (e.g. O'Driscoll, 2004). This is far from an 'academic' observation or conclusion. A report on the future of Irish enterprise by the Department of Jobs, Enterprise and Innovation (DJEI) acknowledges:

> Clustering activity in Ireland can be described as nascent relative to other developed economies which have used clustering initiatives as an effective policy tool for enterprise and economic development for many years. This initiative may provide a vehicle through which the grand challenges approach can be progressed. (Department of Jobs, Enterprise and Innovation, 2015b, p. xxx)

This statement is notable, not least in that the role for clustering is identified *not* in terms of the development of enterprise but is tagged to addressing substantial challenges, i.e. in relation to sustainable energy, healthy ageing and smart cities. The role of clustering is perceived as a potential mechanism for delivering on complex grand goals rather than a goal worth delivering in itself.

Over the same period, in Europe and the US (and wider afield) cluster-based policy became ubiquitous in both economic development policy and practice. This sets Ireland in stark contrast to the popular experience across many industrialised countries (Borras &

Tsagdis, 2008; Njøs & Jakobsen, 2016; OECD, 2007). Across Europe, for example, analysis of existing cluster portfolios is considered a natural tool for regional economic analysis to inform evidence-based policy (Ketels, 2015). Policy is also supported by cluster-based data that have become increasingly available across the US and EU, which can be used to offer diagnostics for investigating locations and fields of economic activity, and the potential to generate returns from policy actions.[1]

Algorithms have been computed from analysing interconnections and relatedness across businesses in different locations to identify optimal sets of mutually exclusive cluster definitions (Delgado et al., 2016; Ketels & Protsiv, 2014). Applying these definitions to Ireland indicates that, contrary to the DJEI consideration, clustering is a defining feature of the Irish economy: the co-location of *some* types of economic activities is evident in various NUTS 3 regions (O'Connor et al., forthcoming). Many clusters within the fourteen identified exhibited relative success (i.e. internationally competitive performance) across a number of NUTS 3 regions, pointing to the cross-regional applicability and the potential of coordinated cluster policies.

The role for policy acknowledges that, even where features of commonality and concentration are evident in, for example, clustering measures, clusters still face limits in delivering on their potential. In addition, research focused on the evolution of clusters (cluster life cycles) and the role for different policies across phases of the cycle has recently emerged (Fornahl & Hassink, 2017).

To convert cluster potential into business-level performance requires amplifying connectivity and removing barriers to connectivity through a range of different business-based links and relationships. Increased understanding of the nature of business linkages across the main players in the cluster helps in identifying means for improving the structures and processes necessary for further cooperation and

[1] For available data that can be examined at granular geographical levels see, for the US, the US Cluster Mapping project: www.clustermapping.us; a range of reference materials are also available. For the EU, some less granular but comparable data are available. In 2006 a cluster mapping project was established by DG Enterprise and Industry. The project was renamed 'The European Cluster Observatory' and its website was launched in July 2007. Resource materials and data on European clusters and cluster research are available from the European Cluster Observatory at www.clusterobservatory.eu/index.html. The observatory is now in its second phase (Phase 1: 2006–13), focusing more strongly on cross-sectoral linkages and the competitiveness and entrepreneurship opportunities in emerging industries.

collaboration: these are key to delivering on innovation imperatives for business. This is the policy space into which cluster initiatives (CI) have emerged, which often take cluster identification based on measurement as a first step to implementing appropriate policies.

CIs across different scales of regional demarcation are evident – from states such as North Rhine-Westphalia in Germany.[2] Policymakers have welcomed cluster-based policies as offering means to target focused regional improvement through managed multi-stakeholder networks. Much has been gleaned internationally from rolling out cluster-based policies in 'place-based' approaches to regional development (Ebbekink & Lagendijk, 2013; Laemmer-Gamp et al., 2012).

Surveys of European CIs have been carried out for 2008, 2012 and 2015, offering at this stage a substantial amount of data relevant for performance analysis and policy evaluation (European Commission, 2008; Meier zu Koecker & Mueller, 2015).[3] The 2012 survey revealed that most cluster programmes supported *both* the establishment of new cluster management organisations as well as the further development of already existing mature cluster management organisations. Relative to previous surveys, the 2015 survey indicated that the majority of CI programmes were more complex, revealing the changing requirements of cluster members. Most programme designs targeted challenges caused by industrial transformation processes and global trends. Clearly, with a consideration of cluster activity as 'nascent' in Ireland, Ireland stands well behind the international curve on CI development.

European cluster policy has evolved considerably over time: from 1990 to 2000 the focus was on understanding clusters; over the next ten years cluster identification and data development were the focus; whereas between 2010 and 2015 professionalising the management of clusters was the target. Since then the orientation has been towards the integration of clusters into broader policy development and targets, e.g. innovation and SME development. Considerations of economic transformation processes have long identified the need to avoid lock-in in economic structure and economic policy to facilitate necessary changes (Fromhold-Eisebith, 2017; Pouder & St John, 1996).

[2] For examples see www.clusterplattform.de/CLUSTER/Navigation/EN/Cluster-Policy/cluster-policy.html [13 December 2017].
[3] In 2008 the first structured survey of regional and national cluster programmes in Europe was conducted under the European INNOVA scheme.

In terms of national cluster policies and programmes, three groups of countries can be identified (Meier zu Koecker & Mueller, 2015). The first group includes Finland, the UK, the Netherlands and Italy, which, by 2015, did not have cluster programmes in place at national level. The second group includes countries, such as Ireland, that are reported as revising national cluster policies and programmes, and putting new programmes in place. The third group includes countries with dedicated policies and programmes already in place. From this group, sixteen national cluster programmes from fifteen countries – Austria, Bulgaria, Czech Republic, Denmark, France, Germany, Greece, Latvia, Montenegro, Norway, Portugal, Romania, Slovakia, Sweden and Turkey – participated in cluster programme benchmarking in 2015 (Meier zu Koecker & Mueller, 2015).

As Ireland is identified as a national cluster policy *reviser*, it is worth considering to what extent any evidence of cluster policy, strategy and action *currently* exists across policy documentation and implementation. Some indication can be gleaned from the latest development strategy of IDA Ireland, *Winning: Foreign Direct Investment 2015–2019*, which identifies not only regional development at its core but also includes a focus on five 'industrial sectors'. Some tangible cluster-related initiatives include IDA Ireland's building programme. This involves the provision of specific advanced technology buildings to support a regional sector or cluster. One example is the Sligo Advance Technology building supporting a potential life-science cluster around Abbott. Buildings alone, of course, cannot deliver clusters. Other elements of the strategy include linking industry with regional universities to stimulate the development of sector-specific skills.

Further indications are provided in the *Action Plan for Jobs,* introduced by the government in 2012 to support job creation. The enterprise agencies were tasked with the implementation of the actions. In 2015 national action plans were translated into regional action plans for jobs, with specific initiatives to support cluster development, including the development of high-spec buildings linked to existing or emerging regional clusters. The most recent *Action Plan* (Department of Jobs, Enterprise and Innovation, 2017) highlights specific areas of focus for different regions. It also includes a specific chapter (Chapter 9) targeting particular clusters to be strengthened.

A particularly relevant element of the *Action Plan for Jobs* is the call for projects for the Regional Enterprise Development Fund, administered by Enterprise Ireland. The aim of the competitive fund is to provide financial support for organisations set up specifically to

bring together stakeholders on projects that will benefit the local community or region. Successful projects develop strong entrepreneurial or innovation ecosystems, encourage clusters of similar businesses or develop specific sectors where there is the potential for competitive advantage. Selected projects for funding include IT@Cork, a cluster development initiative for the ICT sector in Cork. A cluster manager will steward the member companies to foster collaboration between companies and organisations. Many of the selected projects involve and benefit the entire enterprise ecosystems, i.e. including both indigenous *and* MNCs (Department of Business, Enterprise and Innovation, 2017).

Interestingly, the cluster strategies and actions of IDA Ireland are not restricted to substantial geographical sectoral concentrations. The agency is also trying to develop clusters around more modest concentrations or even individual successful companies. Thus, multiple geographical clusters within an industry are identified across Ireland. For example, apart from the Dublin financial services cluster, the agency targets financial services clusters in Limerick, Cork, Carlow and Kilkenny. Another example is the attempt to develop an animation cluster around a successful animation company in Kilkenny.

Insiders consider the recent initiatives an indication that cluster policy and implementation are stepping up a gear: 'This is a much more tailored approach to cluster development than I have seen in the last ten years. Cluster development in Ireland by MNCs is critical for the longer term strategic development of our regions' (Interview, Anne-Marie Tierney-Le Roux, Head of Regions, IDA Ireland, December 2017).

Policy approaches emanating most recently from Europe include Constructing Regional Advantage and Smart Specialisation (Boschma, 2013). These represent the current incarnation of transformation-focused policy, particularly evident in the development of regional innovation strategies for smart specialisation, known as RIS3. Ireland has embraced RIS3 in its revealed policy orientation (Department of Jobs, Enterprise and Innovation, 2014), choosing a predominantly top-down approach in developing, designing and implementing a national-level strategy. Although neither designed nor planned with an RIS3 agenda in sight, the National Research Prioritisation Exercise (NRPE) was used for the Irish RIS3.

Some links between RIS3 (based on NRPE) and clusters have been revealed in recent policy documents addressing enterprise, with

clustering defined in a limited context relating to increasing collaboration in the public research system, developing regional clusters of higher education and their commercialisation imperatives (Department of Jobs, Enterprise and Innovation, 2015b). A similarly limited definition for cluster is used for Ireland's innovation strategy, where all mentions of cluster are in terms of strategic research clusters (Department of Jobs, Enterprise and Innovation, 2015a).

To characterise historical policy development from a cluster perspective, a number of features can be identified. The concept gained some acceptance in policy, but lacks an agreed, consistent or clear definition. Coherence across policy documents is lacking. Networking appears as a preferred operationalisation but implementation has been episodic, at best. Clustering to date has not been applied with its cross-cutting potential, in regional, sectoral or ownership (MNC/indigenous) terms, although recent initiatives are encouraging.

Considerations for future cluster policy

Successful industrial cluster policy clearly requires a coordinated and integrated approach involving all relevant government departments and related agencies. This section explores a number of additional issues that should be considered in the development of future cluster policies, strategies and actions in Ireland. These are related to (a) the methodology for identifying spatial concentrations of firms that may be a target for cluster strategy and actions, (b) the appropriate geographical scale of cluster strategies and actions, and (c) the question of whether cluster policy is relevant or suitable for all areas in Ireland.

Methodology for identifying spatial concentrations

The types and size of external economies operating in clusters at least partly depend on the size (in terms of number of firms and/or workers) of geographical concentrations. The external economies, notably technological spillovers, are likely to be limited in small concentrations. For industrial policy this means that policymaking should focus on *substantial* concentrations, incorporating sizeable numbers of firms and workers, taking cognisance of network effects.

In relation to the methodology for identifying concentrations, the extant literature presents a range of measures of dissimilarity and

specialisation. Dissimilarity and similarity indices measure how similar/dissimilar a region's industrial structure is relative to that of a reference area. Such indices allow for some inference in relation to specialisation, in that areas with high dissimilarity values are likely to have industrial specialisations. However, they do not inform us about the *actual* level of specialisation. The actual level of specialisation of a specific industry in a given region tends to be measured with the location quotient (LQ), which indicates whether the share of employment in an industry in a particular area is disproportionate relative to its share in total national employment.

However, the LQ and related measures for industrial specialisation have a number of significant drawbacks when used to inform regional industrial policymaking and planning. Firstly, these measures of industrial specialisation do not provide a direct insight into the relative size or importance of individual concentrations. For example, even if a specific region has a relative specialisation in a specific industry, this industry can, nationally, be characterised by a low geographical concentration index, and vice versa. Extreme caution is therefore necessary when interpreting the results of the LQ for policymaking purposes. This is because a high LQ does not *necessarily* point to a substantial number of employees in an industry. In fact, a small absolute number of industry employees in a region with a small number of total employees relative to total national employees can generate a high LQ. Arguably, regional industrial policymaking informed by cluster thinking should focus on *substantial* concentrations. These are the concentrations which have the best potential for further development.

A second shortcoming common to these measures is that they use only employment and do not account for the number of firms, which is at least equally important where regional industrial policymaking is partly based on an appreciation of the beneficial effects of interaction amongst multiple firms. Finally, the extent of the spatial units is usually pre-specified to concord with administrative boundaries. As industry concentrations may incorporate parts of different administrative units, restricting the analysis to predefined administrative units is not appropriate.

These shortcomings were recently addressed by van Egeraat et al. (2016). Their Concentration Index (CI index) can be used to identify *substantial* industrial concentrations. *Substantial* here means concentrations that are large in size (in terms of firms and workers). The absolute measure proposed is not based on specialisation but on

disproportionately large shares of the national sector in specific areas. The problem arising from working with pre-specified administrative boundaries is addressed by employing overlapping labour fields of individual plants in an industry. The size of the labour field is determined by the travel to work area of the electoral district in which the firm is located.

Using plant level data of agency-assisted firms, Figures 1–3 illustrate the application of the CI index and method on the medical devices industry in Ireland. Figure 1 presents the concentrations based on LQ analysis, Figure 2 presents the substantial concentrations based on the CI index applied at the county level, and Figure 3 presents the substantial concentrations based on the CI index at the level of overlapping labour fields.

The different measures clearly yield diverging sets of industry concentrations. The LQ analysis suggests quite extensive areas of concentration, covering nearly half the country, though not including County Cork, the county with the second-highest number of employees in the industry. Applying the CI index at the county level reduces the number of counties with substantial concentrations to two, now including County Cork, which was not picked up as a concentration by the LQ analysis. The concentrations are rather coarsely defined, covering the entire area of two counties. The overlapping labour field methodology not only refines the geographical extent of the identified concentrations but also detects other concentrations around Limerick, Athlone and Dublin. This map closely expresses the empirical reality described in extant literature (Curran & van Egeraat, 2014).

Clearly, even the existence of a *substantial* geographical industrial concentration does not guarantee that clustering advantages and processes are in operation. Whether individual concentrations should be a target for cluster policy or whether such processes could be stimulated always requires more detailed investigation (Perry, 2005).

The appropriate geographical scale of cluster strategies and actions

The tendency of industrial activity to concentrate in particular localities or regions has long attracted the attention of social scientists. The debate regarding the determinants of such spatial concentration and the processes involved is evolving (see van Egeraat & Curran, 2013) but, for the purposes of this article, Marshall's original contributions are still useful for grouping the advantages identified in

Figure 1: LQ methodology applied to medical devices industry

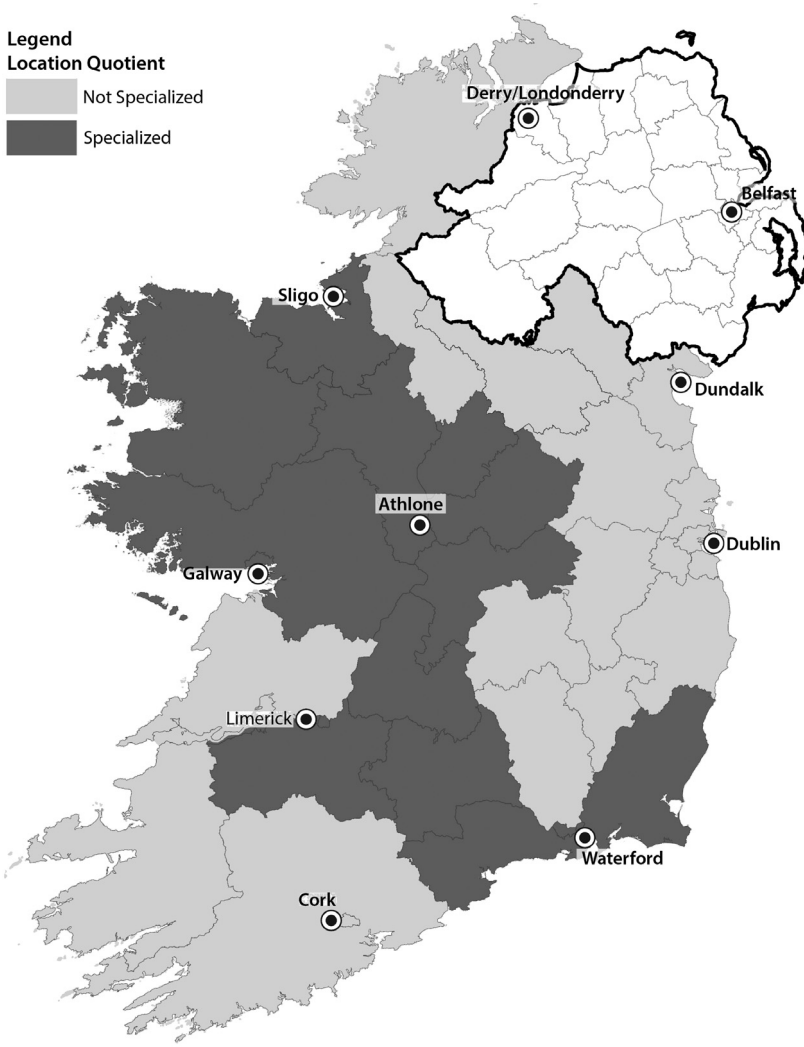


Figure 2: CI index using county boundaries applied to medical devices industry

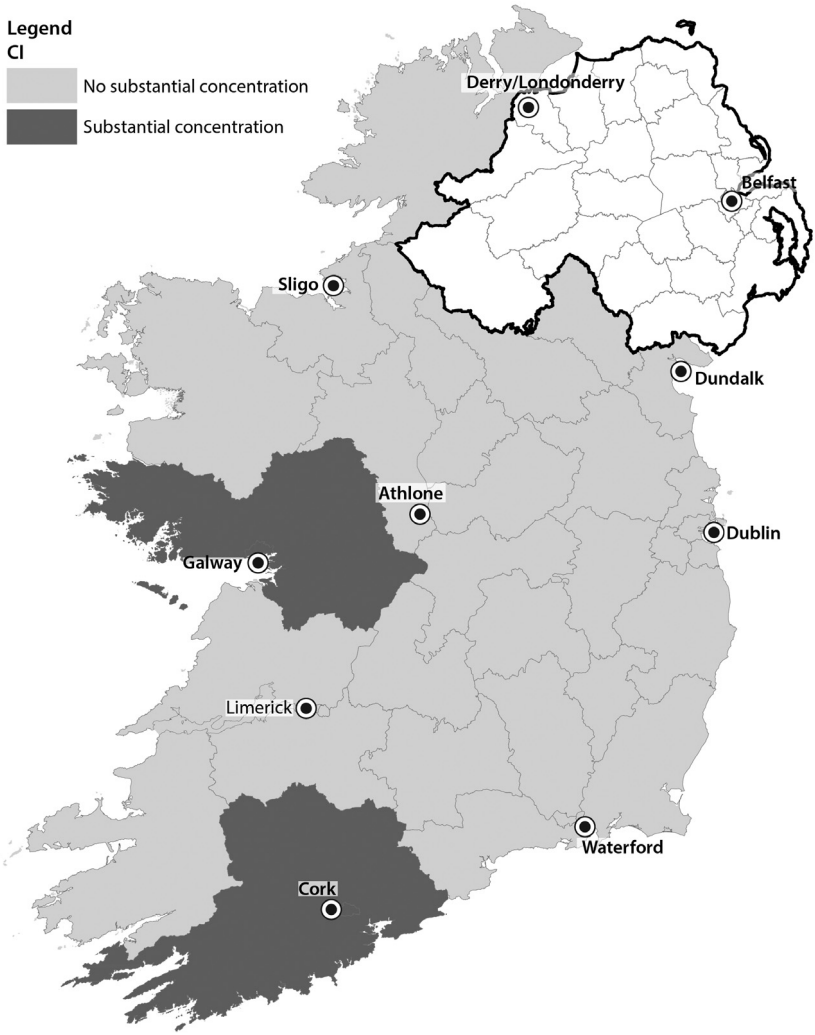
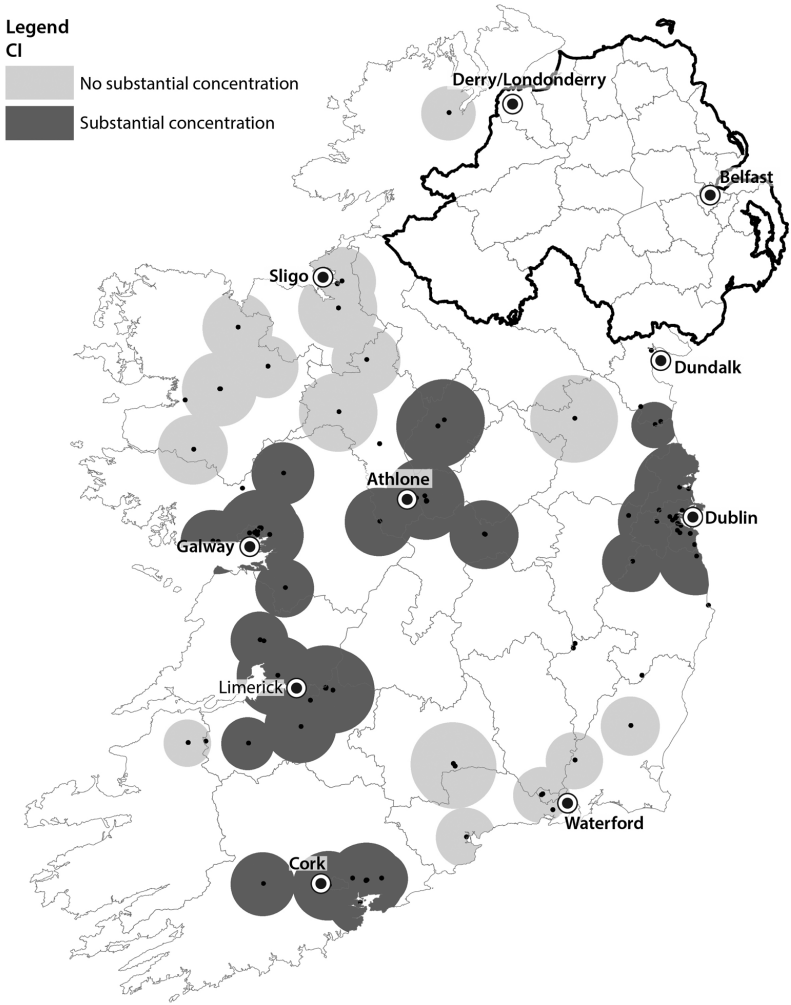


Figure 3: CI index using overlapping labour fields applied to medical devices industry



the recent literature. His observations on the advantages of industrial geographical concentration (Marshall, 1898, 1919, 1930) tend to be summarised into a triad of external economies – a pooled market for workers with specialised skills, a growing number of increasingly specialised input suppliers, and technological spillovers (Brosnan et al., 2016). The latter have become the focus of attention, believed to underpin present-day processes of learning and innovation (Malmberg & Maskell, 1997, 2002).

In relation to the scale of geographical concentration, Phelps & Ozawa (2003) point to the expanding geographical scale at which agglomeration has manifested itself over time. This is partly driven by changes in the relative importance of different types of external economies and changes in the geographical scale at which these different external economies operate. There is an increasing appreciation of the fact that the different external economies can manifest themselves at different geographical scales. The relations that make up industry agglomerations stretch across multiple geographical scales: local, regional, national and international (Phelps et al., 2015). Some externalities appear to be more locally bounded than others.

Such insights allow for a reinterpretation of the existence of multiple industrial clusters (of the same sector) within a single country. Individual regional clusters, or concentrations (in the same sector), may benefit from shared agglomeration economies, available at the national level, in addition to more locally or regionally bounded externalities.

The industrial concentrations observed in Ireland undoubtedly include a range of forms of industrial agglomeration involving different combinations of external economies available at different geographical scales. The pharmaceutical industry in Ireland can serve to illustrate some of these ideas. The spatial configuration of the industry is characterised by a high level of concentration, involving three substantial concentrations (in Cork, Dublin and Waterford), although pharmaceutical plants are operating in several other locations in the country (van Egeraat et al., 2016). Detailed qualitative research on the Cork pharmaceutical concentration (van Egeraat & Curran, 2013) showed that companies within that concentration utilised very few raw material input suppliers, even at the national level. The Cork-based pharmaceutical firms did benefit from proximity to a grouping of engineering companies. However, pharmaceutical firms in other parts of the country enjoyed nearly the

same level of benefit from the same engineering companies, suggesting that this agglomeration advantage is available at the national level, rather than the local or regional level. The study found very little evidence of genuine technological spillovers operating via untraded interdependencies. Cork-based pharmaceutical firms benefited from labour market economies, some elements of which were locally bounded while other elements were available at the national scale. This example illustrates the multi-scalar nature of external economies, relating individual concentrations, and plants outside these concentrations.

To take another example, the spatial configuration of the financial services sector is characterised by a single *substantial* concentration in Dublin (van Egeraat et al., 2016). The initial cause for this level of concentration was related to government policy, making fiscal incentives to financial companies conditional on their location in the demarcated International Financial Services Centre (IFSC). Since its inception in 1989, the particular concentration has grown and evolved. Although we have, as yet, limited insight into the level of technological externalities, substantial labour market economies are currently available, mainly operating at a local scale. The regime that made incentives conditional to a location in the IFSC was abandoned more than fifteen years ago. However, although some companies have since relocated (selected) activities (Reddan, 2008), the IFSC continues to grow and remains the single substantial concentration in the country. Compared to the pharmaceutical sector, processes are far more locally bounded.

The level of spatial boundedness of external economies clearly depends on the industry involved. But it even more strongly depends on the activity involved. Research activities tend to benefit more from external economies than production activities, and the external economies at play, notably technological spillovers, tend to be more locally bounded.

Taking the example of the medical devices industry in Ireland, we contend that the research-based cluster in Galway involves locally bounded externalities and it is here where a locally bounded cluster policy may be most appropriate. On the other hand, the medical devices companies located on the M4 corridor are more production focused and, for these firms, external economies may operate at the national scale. The level of benefits that these firms derive from being co-located may be more limited, and similar benefits may be available to firms that are more isolated from other medical devices firms. For

such operations, in a relatively small country, the relevant scale of the cluster may well be the national scale and companies can operate just as successfully outside existing concentrations (provided the necessary general facilities are available and a level of general *urbanisation* economies exist). For these operations a national-scale cluster policy may be more appropriate. Similar observations apply to the high-skills and research-based financial services cluster in Dublin and some of the smaller financial services 'clusters' now promoted by IDA Ireland in Limerick, Carlow and Kilkenny.

Is cluster policy suitable for all areas?

Considering the above, we assert that, in a small country like Ireland, national-level cluster policies will support industrial development and, depending on the industry and activities involved, can benefit many areas, including areas outside the main city-regions. Locally or regionally focused cluster policies and actions are probably suitable for a more limited set of locations – locations that house substantial concentrations of firms, particularly firms involved in research and advanced production activities.

Most of these locations involve one of the main city-regions of the country. Applying the CI index to the space-economy of Ireland, van Egeraat et al. (2016) identified thirty-one *substantial* concentrations. Of these concentrations, twenty-nine encompass at least one of the main city-regions in the country. Due to the fact that substantial concentrations are crossing county boundaries, quite a number of counties are, at least partially, incorporated in these substantial concentrations. The fact remains, however, that many areas and counties are not linked to any substantial industry concentrations. These tend to be peripheral locations with no substantial employment centres, such as Counties Donegal, Mayo, Kerry and Leitrim, as well as the peripheral areas of Counties Cork and Galway, predominantly in the west of Ireland. In these areas, locally or regionally focused cluster policies and actions will be of limited benefit.

This does not mean that there are no opportunities for development in these more peripheral areas. Some of the ubiquitously distributed industries provide opportunities for development. In addition, policies and actions may 'simply' focus on creating key framework conditions that support business activity in general.

Conclusion

This article assessed the history of Irish cluster policy in an international context. In contrast to international experience, in Ireland the new cluster concepts initially gained little traction in policymaking and the actions of the agencies. Over time, the concept gained limited acceptance in policy, but continues to lack an agreed, consistent or clear definition: coherence across policy documents is lacking. Networking appears as a preferred operationalisation but even here implementation has been episodic, at best. Clustering to date has not been applied with its cross-cutting potential in regional, sectoral or ownership (MNC/indigenous) terms. While the most recent initiatives may be more encouraging, the potential for exploiting cluster policy as a mechanism to support innovation has only been addressed in a limited way.

This article identifies a set of key issues that need to be considered in the development of future cluster policies in Ireland. In relation to methodology of identifying targets for cluster policy, evidenced-based policy should move away from specialisation-based measures to measures that identify *substantial* concentrations.

In relation to the geographical scale of clusters, policymakers should appreciate the fact that different external economies can manifest themselves across different geographical scales, all at the same time. Some externalities are more locally bounded than others, and the level of spatial boundedness depends on the industry and activity involved. This calls for a reinterpretation of the existence of multiple industrial clusters (of the same sector) within a single country. Individual regional clusters, or concentrations (in the same sector), may benefit from shared agglomeration economies, available at the national level, in addition to more locally or regionally bounded externalities. Finally, in a small country like Ireland, national-level cluster policies will support industrial development and, depending on the industry and activities involved, can benefit many areas, including areas outside the main city-regions. Locally or regionally focused cluster policies and actions are suitable for a more limited set of locations, sectors and activities.

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