Urban specialisation, complementarity and spatial development strategies on the island of Ireland

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Abstract

Complementarity is one of the key concepts underlying the spatial development strategies introduced on the island of Ireland a decade ago. While neither Northern Ireland's Regional Development Strategy nor Ireland's National Spatial Strategy defines the concept explicitly, both documents suggest that it relates to differences in functional roles between places, thereby linking complementarity to the concept of sectoral specialisation. Using data on employment by industrial group from the respective censuses of population, this paper examines the extent to which urban centres in Ireland displayed complementary patterns of specialisation at the regional level at the time the spatial strategies were introduced. The analysis finds little evidence of this, revealing instead a strong tendency towards similar specialisations of neighbouring centres, including those in cross-border settings. The findings point to the need for a more nuanced specification of the policy precept of inter-urban complementarity that is sensitive to both sectoral and geographical scale.

Keywords: Urban specialisation, spatial planning concepts, employment by industrial group, Ireland

Introduction

Both Ireland's *National Spatial Strategy* (NSS) (Government of Ireland, 2002) and Northern Ireland's *Regional Development Strategy* (RDS) (Department for Regional Development, 2001) draw heavily on concepts of territorial development as promulgated in the *European Spatial Development Perspective* (Commission of the European Communities, 1999).[1] Among the key concepts is that of complementarity between urban centres. Both documents encourage the development of complementary roles for urban centres, at both the intra-regional and inter-regional, or national, scale. Although the documents do not define complementarity, in most cases the term appears to signify functional distinctiveness or specialisation of urban centres. The idea seems to be that if different centres engage (specialise) in different activities, then they will complement each other to their mutual advantage, and that of the region in which they are located.

This paper attempts to measure the level of specialisation and potential complementarity of urban centres on an all-Ireland basis at the time when the two spatial strategies were launched. Specialisation and complementarity are investigated using data on employment by industrial group from the Republic of Ireland's 2002 Census of Population and the Northern Ireland 2001 Census. The paper examines both the degree and types of specialisation of urban centres, and explores the extent to which the prevailing spatial patterns of specialisation in the early years of the last decade supported the existence of groupings of complementary urban centres at regional level. The analysis allows a baseline profile of inter-urban complementarity to be established, against which subsequent changes (whether policy-induced or otherwise) can be measured when the relevant data from the most recent censuses become available.

The next section starts with an analysis of the complementarity concept and the way it is employed in the two spatial strategies. This is followed by an outline of the methodology used to assess complementarity in the present paper, which describes the data sets used and the methods of analysis. The results of these analyses are presented in the fourth section, where it is suggested that patterns of specialisation at the time that the two strategies were introduced were

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[1] In order to avoid any confusion Ireland is henceforth referred to as the Republic of Ireland.

not indicative of high levels of industry/sectoral complementarity between centres located in the same region. The final section draws out some of the main implications for spatial policy and planning on the island of Ireland.

Complementarity in the Irish spatial strategies

The concept of complementarity has a long history in economic geography, going back at least to the work of Ullman (1956), who identified complementarity between places as one of the three fundamental 'bases for [spatial] interaction'. In Ullman's treatment, complementarity is closely linked to the specialisation of different places in different economic activities, so that the excess production (supply) of a particular product in one place is matched by a production deficit (demand) in another. In turn specialisation – or what Ullman (p. 56) refers to as 'areal differentiation' – is seen as arising out of economies of scale in production. A more detailed account of specialisation, and one explicitly focused on inter-urban relationships, is provided in the urban systems literature (Henderson, 1974) and the so-called new economic geography (Krugman, 1991), where it is viewed as the outcome of external, rather than internal, economies of scale, more specifically localisation economies. These are benefits to individual firms from locating close to other producers in the same industry, and they result in the emergence of distinctively specialised types of cities.[2] For urban systems theorists, complementarity based on specialisation and the spatial interactions that result from it are the glue that transforms a territorially based collection of urban centres into a unified urban system or urban network.

While the advantages for individual firms of agglomerating within a specialised urban area have been well documented, the net benefit of specialisation to the urban area as a whole is still debated. Authors such as Markusen & Schrock (2006) argue that, in an era of intensifying competition for mobile investment, when cities may struggle even to retain the service demand arising in their own hinterlands, specialisation, in so far as it promotes distinctiveness, can act as an important source of competitive advantage. On the other hand,

[2] The localisation benefits for firms that are commonly identified in the literature include access to skilled labour pools, specialist services and suppliers, and knowledge spillovers.

Chinitz (1961), Jacobs (1969) and Quigley (1998) have emphasised the desirability (in terms of economic performance) of urban areas that have diversified as opposed to specialised economic profiles. Likewise, the precise benefits of complementarity, which is an attribute of groups of urban centres rather than individual towns or cities, have not always been clearly articulated. This is due to the fact that, as Meijers (2006) argues, the concept itself has remained vague and inadequately specified, in both the academic and policy literature. He finds specialisation/differentiation alone to be insufficient for complementarity and suggests that, for urban centres to be considered complementary, they also need to have geographical markets (or catchment areas) for their respective functions that overlap, at least partly. For example, two urban areas could be said to be complementary if one specialises in health care and the other in education, with both providing their specialist service to residents of the other city. With complementarity defined in this way, the benefits of it are essentially that a region containing only smaller settlements can provide a wider range of specialist services and facilities than would otherwise be the case. In later work Meijers (2007) suggested that urban networks based on complementarity have replaced the hierarchical relationships between centres envisaged by classical central place theory.

The concept of complementarity is central to the prescriptions for balanced regional development advanced in both the NSS (Government of Ireland, 2002) and the RDS (Department for Regional Development, 2001), with repeated use of phrases such as 'complementary roles of regions', 'complementary roles of urban centres', 'complementary functions', 'complementing positions' and 'complementary development'. In both strategies complementarity is mostly used in its meaning of difference between urban centres or regions operating as a system, and the concept is applied at spatial scales ranging from the national (between regions or between cities) to the regional (within regions) and the local or intra-urban (e.g. within the Belfast Metropolitan Area). At the regional scale it is used both in the context of the relations between towns at different levels in the urban hierarchy (complementarity between the 'gateway', 'hub' and 'other towns' in the same region) and in the context of relations between towns at the same level in the urban hierarchy (for example, the complementary functions of the linked gateways, such as Athlone–Mullingar–Tullamore, and linked hubs, such as Tralee–Killarney).

However, the NSS and the RDS provide few clear suggestions as to the different roles or functions that are accorded to the various territorial components (regions, cities, gateways, hubs, small towns, etc.). The suggestions are often expressed in general terms, and different categories of place are sometimes accorded similar functions or roles.

In the NSS all components of the urban system have service, retail, employment and residential functions. The main point of differentiation lies in the intended scale and spatial reach of the functions, but even on this point there is substantial overlap. With regard to services, the thinking appears to be based on ideas from classical central place theory, with centres providing greater or narrower ranges of services for spatially more or less extensive hinterlands. The gateways have a national and regional role with 'national or regional third-level centres of learning', 'regional hospitals and specialised care' and 'city-level range of theatres, arts and sports centres and public spaces'. The hubs are strong services centres 'for an extensive rural hinterland' with 'local and/or regional hospitals' and 'a wide range of amenity, sporting and cultural facilities including public spaces and parks'. County towns perform 'regionally strategic administrative and other service functions'. Other towns have 'service functions', while smaller towns and villages provide 'local services'. The clearest differentiation of service functions (but using a slightly incompatible categorisation of urban centres) is provided by reference to a model developed by the South Tipperary County Development Board (Government of Ireland, 2002, p. 113). Even here great overlap remains, particularly between cities and county towns and in the areas of professional services, education and health.

As regards employment in manufacturing or internationally traded services, there is substantial overlap between the prescribed functions of the gateways and the hubs. Gateways are envisaged as developing 'large clusters of national/international scale enterprises, including those involved in advanced sectors'. Hubs contain 'a mix of local, medium-sized and larger businesses servicing local, regional and national/international markets'. Further differentiation is contained in the distinct infrastructure planned for the gateways and hubs – strategic development zones in the gateways versus industrial and local business parks in the hubs. The strategic development zones contain the sites that are specifically developed to support large- and medium-scale manufacturing activities with large utility requirements, such as pharmaceutical and semiconductor plants.

The NSS is less specific regarding the employment functions envisaged for (non-hub) county towns, other than that these should sustain a 'good employment base' and involve 'regionally strategic employment functions'. The category 'other towns' is envisaged to provide 'a range of … opportunities of employment' and 'employment in a variety of enterprises', while smaller towns and villages are proposed as 'the foci for … economic activity' in rural areas. It is suggested that other towns and smaller towns and villages create employment in tourism and natural resources. Likewise, rural areas in general are envisaged to focus on agriculture, forestry and fishing, together with tourism, enterprise and other sources of off-farm employment. This could lead to sectoral complementarity, although tourism is promoted in all types of urban centres, including the largest. The NSS mentions that the mix and concentration in any one of these sectors 'will vary according to the potential of different places' (p. 51).

The NSS acknowledges the emergence in the Republic of Ireland of clusters of innovative, technology-intensive, high-value-added activities and start-ups, and the fact that these are particularly focused around the city-regions and other strategic locations. It 'seeks to strengthen these areas and increase their number by supporting the formation of self-sustaining clusters of economic activity in line with the national spatial structure that the NSS has established' (p. 97). While the statements on clustering contained in the NSS paint a picture of sectoral complementarity at the national scale (between regions or between cities), it is unclear what the spatial expression of clusters will be at the regional scale, i.e. what kinds of employment/enterprise are destined for the various urban components that make up a city-region. Are all elements of the regional cluster to be concentrated in the gateways, or are certain firms/activities to be located in hubs, county towns, other towns, and small towns and villages? The first scenario would involve sectoral distinctiveness between urban centres at the intra-regional scale. The latter would involve sectoral similarity.

The picture painted in the RDS is very similar. Again, all components of the settlement system have service, retail, employment and residential functions. In relation to employment, 'the aim is to ensure that every town, main and small, continues to generate employment and investment opportunities' (Department for Regional Development, 2001, p. 44). Overall though, compared to the NSS, there is a somewhat greater emphasis on the concentration of

employment in the larger centres (cities and hubs). The 'strategic employment locations' (industrial sites to accommodate major inward investment projects and local enterprise) are envisaged as being strategically located throughout Northern Ireland, but priority should be given to the two regional cities and the main hubs (p. 139).

It is difficult to determine what is envisaged for the different categories at the lower end of the urban hierarchy, because the category of small towns is sometimes defined to include all towns with less than 10,000 inhabitants (see, for example, p. 87), which would include the local hubs. However, in the RDS too, the main point of differentiation lies in the intended scale and spatial remit of the functions. For example, small towns and villages are envisaged to attract 'small scale' inward investment, indigenous projects and 'micro businesses'. The RDS is less specific regarding sectoral complementarity. The plan for the smaller towns is that they create employment in a range of sectors, including food processing, niche markets, rural services, 'diverse indigenous investment', 'wood-based employment', sea fisheries, aquaculture, rural tourism, attractions based on water resources and heritage.

In summary, in both spatial strategies the prescribed allocation of activities across the various strategic elements of the urban system is subject to a certain degree of overlap, especially in relation to services. However, both documents would appear to envisage the strengthening of complementarity, at least at a relatively high level of functional/sectoral aggregation, with the gateways/cities and hubs providing employment in manufacturing and advanced services, while the smaller towns and villages in the hinterlands have a local service and recreational function. The remainder of this paper examines the patterns of sectoral specialisation among urban centres on the island of Ireland at the time when the two spatial strategies were developed. The results inform the development of a more nuanced specification of the concept of complementarity in the conclusion.

Methodology

The data: Industries and urban areas

The functions performed by towns, their levels of specialisation and the resulting patterns of complementarity are all assessed in this article on the basis of employment data. These data are for what the Republic of Ireland Census of Population refers to as 'intermediate industrial groups', which represent a mixture of NACE categories, but

which mostly correspond to two-digit 'divisions'.[3] In total, there are twenty-three intermediate industrial groups (henceforth referred to simply as 'industries'), as illustrated in Table 1 below, including nine different groups of manufacturing industries as well as a range of service activities. For comparability between the Republic and Northern Ireland, a specially commissioned census data set was obtained from the Northern Ireland Statistics and Research Agency (NISRA) in which employment was re-coded to the same industrial categories. The level of aggregation is important. At a very high level of disaggregation (e.g. NACE four-digit 'classes') each town becomes more unique, less like any other town; at a higher level of aggregation they all become more similar. The level of aggregation in the present analysis is almost identical to that in Markusen & Schrock's 2006 study of specialisation in the US urban system (twenty-two categories) and O'Donoghue & Townshend's 2005 analysis of the British urban system (twenty categories).

While the level of statistical aggregation is similar, Markusen & Schrock's analysis differs from the present research (and that of O'Donoghue & Townshend) in the fact that the data used relate to employment classified by occupation rather than by industrial sector. This is an important difference, and relates to the issue of how urban specialisation is expressed and what aspect of specialisation is important for urban economic performance. There is some evidence that, while urban areas are becoming more specialised in terms of their occupational profiles, specialisation measured with respect to industry is decreasing (see, for example, Duranton & Puga, 2005). However, it is not yet clear whether occupational specialisation is more important to the economic performance of towns, and most of the literature on topics such as localisation economies as sources of urban growth still concentrates on the importance of industrial structure. For this reason, the more conventional approach of focusing on industrial specialisation is followed here. This is also the approach followed by Meijers (2005) in his assessment of complementarity in the Randstad region of the Netherlands, and by Cowell (2010) in her analyses of complementarity in the Randstad, Emilia–Romagna (Italy) and the San Francisco Bay Area (US).

It is important to note that the census data for each town are for workers *resident* in the town, as opposed to *employed* in the town. This

[3] NACE (Nomenclature Statistique des Activités Économiques) is the EU's system of classification for industrial activity.

Table 1: Industrial groups

	Intermediate industrial group	Functional category (see Tables 2–3)
1	Agriculture, forestry and fishing	Other
2	Mining, quarrying and turf production	Other
3	Food industries	Food, beverages and tobacco
4	Beverages and tobacco	Food, beverages and tobacco
5	Textiles, clothing, footwear and leather	Textiles and clothing
6	Wood and wood products	Other
7	Paper and paper products, printing, publishing	Other
8	Chemicals, rubber and plastic products	Chemicals
9	Glass, pottery and cement	Other
10	Metals, metal products, machinery and engineering	Metals and engineering
11	Other manufacturing	Other
12	Electricity, gas and water supply	Construction and utilities
13	Construction	Construction and utilities
14	Wholesale and retail trade	Trade
15	Hotels and restaurants	Tourism
16	Transport, storage and communications	Transportation
17	Banking and financial services	Banking and business
18	Real estate, renting and business activities	Banking and business
19	Public administration and defence	Public administration and defence
20	Education	Health and education
21	Health and social work	Health and education
22	Other community, social and personal service activities	Other
23	Industry not stated	Other

means that towns are being characterised by the employment sector of their residents (regardless of where they work), rather than of their factories, offices and other places of work. As commuting increased throughout the years of economic boom, both in volume and distances travelled (Horner, 1999), there emerged a growing disjuncture between the geography of employment supply and the geography of employment demand. Although data that would support an analysis of

specialisation based on employed workers have recently become available for the Republic of Ireland – the POWCAR (Place of Work Census of Anonymised Records)/POWSCAR (Place of Work School or College Census of Anonymised Records) data sets – the equivalent data for Northern Ireland are not available.

The question of how to define the urban system – i.e. which centres of population to include – is central to the analysis. On the one hand, it could be argued that very small centres (towns under 5,000 inhabitants) should be excluded, because they are unlikely to have any significant level of employment or basic activity. Given the small scale of employment, the concept of specialisation is problematic for such towns, in the sense that, despite potentially high levels of specialisation, their role in the urban system and contribution to the national economy are relatively insignificant. There are methodological problems too. Basic employment in a small town is typically contributed by relatively few enterprises, often indeed a single medium-to-large-scale plant or firm, with the result that the specialisation of the town can change dramatically following a plant closure or downsizing. Small towns in the commuting hinterland of large centres, which function mainly as dormitory towns, present particular problems for the analysis. Because their resident workers travel elsewhere to work, their functional classification depends on the employment opportunities available in the destination(s) to which their residents commute. But this is a problem for all centres – not just smaller ones – because of the fact that the data are based on place of residence, not place of work (see above).

Despite these conceptual and methodological problems, the authors believed it desirable to include smaller settlements in the analysis because of their locally important role (especially in more peripheral regions) and their consequent importance in the two spatial strategies. Considerable attention has been devoted to the key role of such centres in the Republic of Ireland in the various regional planning guidelines prepared for each region. Our analysis therefore is for all places with 1,500 or more inhabitants (N = 144 in Republic of Ireland; N = 75 in Northern Ireland). The spatial distribution of these centres is illustrated in Figure 1, and the size distribution in Table 2.

As well as the urban system, the urban areas themselves need to be defined. This is done as much as possible on the basis of the built-up area, or what is sometimes termed the morphological urban area. This definition defines urban areas that are more extensive than
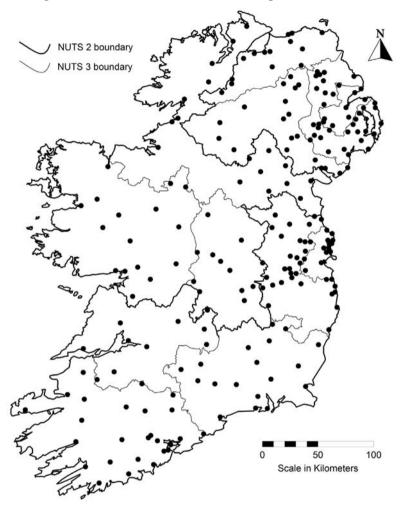
Figure 1: Urban Areas with over 1,500 Population, 2001/02

administrative areas, but less extensive than functional areas or daily urban systems. However, it should be noted that slightly different definitions are used in Northern Ireland and the Republic of Ireland. In the Republic the data are for legally defined towns and cities plus their contiguous suburbs, or for so-called 'census towns' in the case of urban areas without a legal boundary. For Northern Ireland, the data are based on the unit of the 'settlement', defined mainly on the basis

Table 2: Frequency distribution of urban centres by size category, 2001/02

Population size	Number of centres		
	NI	*RoI*	*All-island*
1,500–2,999	31	53	84
3,000–4,999	11	25	36
5,000–9,999	13	33	46
10,000–49,999	16	29	45
50,000–199,999	3	3	6
Over 200,000	1	1	2
Total	75	144	219

of statutory development limits around towns, but also taking account of factors such as identity or 'community sentiment' (see NISRA, 2005, for details). This unit provides a reasonable fit with the 'built-up' areas of the Republic of Ireland.

Measuring specialisation and complementarity

The two key concepts underpinning the analysis are specialisation and complementarity. This section sets out the methods used to measure each of these.

There are two dimensions of specialisation that are relevant to the analysis: first, the degree or level of specialisation in the town and, second, the nature or type of that specialisation. Conventionally, the *degree* of urban functional specialisation is measured by the extent to which the industrial profile of workers resident in a town corresponds to, or diverges from, the average employment profile of a wider reference area, or group of centres, to which the town belongs. The greater the degree of divergence from this average, the more specialised the town in question is said to be. Conversely, the closer the town's employment profile is to the average, the lower the degree of specialisation and the higher the level of diversification. Specialisation and diversification are thus considered to be opposite sides of the same coin.[4] The *type* of specialisation is examined by identifying each centre's dominant sector of employment and assigning it to a functional category accordingly. As with the measurement of specialisation, the identification of the dominant function is based on

[4] This need not always be the case: Duranton & Puga (2000), for example, set out measures of diversification and specialisation that are not the inverse of each other.

a comparison of the town's employment profile to that of the reference area or group of centres.

The reference or 'normal' employment profile in studies of urban specialisation is usually the aggregate employment profile of either all the towns in the urban system or the national (or regional) economy as a whole. In countries such as the US or Canada, where there is a high level of urbanisation of employment, the difference between these two norms is relatively small, and studies have tended to use the urban system as a whole as the benchmark. The situation in the island of Ireland is different. Despite ongoing urbanisation, a significant component of total employment (both in Northern Ireland and the Republic) remains outside the urban centres, and therefore the use of an urban system norm to determine levels and types of specialisation gives significantly different results from those obtained using the employment profile for the economy as a whole. In the present study the latter approach is preferred. Thus, the employment patterns of towns in each jurisdiction (Northern Ireland or the Republic) are compared to the aggregate pattern across the relevant jurisdiction as a whole.[5] The main reason for this approach is that it is the urban centre's role in relation to the rest of the economy in which it is situated that is of interest, not merely its role in relation to other urban areas. A second advantage of this approach is that it avoids the problem whereby the results of the analysis depend on which towns are included in the definition of the urban system.

Following Markusen & Schrock (2006), the degree of specialisation is measured using the Coefficient of Specialisation (CS), which ranges in value from 0 to 1, with larger values indicating higher levels of specialisation. Preliminary exploratory analyses on data for the Republic of Ireland found that this was the most satisfactory of a range of measures, including the Gini Coefficient and the Hirschman–Herfindahl Index. Assessment of the type of specialisation involves classification of centres according to their dominant industry. First, the Index of Surplus Workers (Mattila & Thompson, 1955) is

[5] A third norm is of course possible: that derived from the aggregate all-island employment pattern. This is not applied here because the focus of the analysis is mainly on specialisation and complementarity *within* rather than *across* the two jurisdictions. Interestingly, however, the results for each jurisdiction do not vary greatly if an all-island norm is used. Thus, for example, only 18 per cent of all centres (13 per cent in the Republic, 28 per cent in Northern Ireland) are classified differently when an all-island norm is used; and the average difference across urban centres in the measure of specialisation is less than 17 per cent.

used to disaggregate each industry's employment in a given town into imputed 'basic' and 'non-basic' components. Basic employment is that which is sustained by exogenous demand, i.e. demand that arises outside of the town and its immediate hinterland; non-basic employment is that which arises from endogenous demand. Next, centres are classified into industrial categories based on a simple rule: each centre is assigned to the category in which it has the greatest level of basic employment. Like all single attribute classifications, this approach undoubtedly oversimplifies matters, and can result in the assignment of centres possessing quite similar employment profiles to different categories. However, classification represents conceptually the simplest method for assessing complementarity between centres in a 'first pass' analysis.

Following Meijers' conceptualisation (2006; see above), assessment of complementarity is based on both the spatial proximity of urban centres and the similarity of their industrial employment profiles: neighbouring towns are considered to be complementary in so far as their employment profiles are different. In the first instance, therefore, this element of the analysis requires the specification of a regional framework for the assessment of proximity. In the absence of any obvious and more satisfactory alternative, the regions used initially for this purpose will be the NUTS 3 regions.[6] However, it is acknowledged that the NUTS 3 framework is not ideal for this purpose: the geography of regions such as the north of Northern Ireland and the border region in the Republic of Ireland is such that their component urban areas can hardly be said to form clusters. Using this spatial framework, assessment of complementarities is based on the extent to which the centres within a region differ in terms of their dominant function. Thus, the regional location of centres is cross-tabulated by their industrial/functional type, and an appropriate measure of the association between the two attributes is derived.[7] If there are significant intra-regional complementarities (i.e. differences in function), then this will result in low values for the association measure. Conversely, higher values will indicate that industrial type co-varies with regional location, thereby indicating an absence or weakness of sectoral complementarities.

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[6] In total there are eight NUTS 3 regions in the Republic of Ireland and five in Northern Ireland. However, because Belfast NUTS 3 region contains only part of the Belfast urban area, as defined here, it is merged with outer Belfast – see Figure 1.

[7] The measure used is Cramer's *V*.

The NUTS 3 analysis outlined above is conducted separately for the two jurisdictions, as indicated earlier. However, in order to introduce a cross-border element to the analysis, the existence (or absence) of complementarities among groups of centres located in the border area is also assessed. For this, the final part of the analysis, differences in employment profiles between pairs of centres (e.g. Newry–Dundalk) are measured using the Dissimilarity Index (DI). DI is a widely used and robust measure of the difference between areas in their employment profiles.[8] Higher values of DI indicate greater differences and hence higher levels of sectoral complementarity. While this pair-wise analysis of complementarity, unlike the NUTS 3 analysis, is confined to a subset of the urban centres, it has the advantage of being based on a direct comparison between centres' employment profiles, rather than an indirect comparison with a specified norm. In addition, all of each town's employment profile is taken into account, not just the dominant sector.

Results

Preliminary analysis of specialisation
Prior to the spatial analysis of patterns of specialisation and complementarity, the relationships between the level of specialisation of centres, their overall size and their dominant function are examined. Throughout this section and the next, specialisation is measured for urban centres in each jurisdiction with reference to the aggregate employment pattern for that jurisdiction.

The relationship between the overall level of specialisation and population size of centres has long been a focus of urban systems analyses. Findings on the relationship are mixed, though most evidence suggests that specialisation decreases with population (Marshall, 1981; O'Donoghue & Townshend, 2005; Ullman & Dacey, 1960); in other words, larger centres tend to be more diversified. Duranton & Puga (2000) present this as one of their 'stylised facts' about diversity and specialisation in cities. However, there is also some evidence that the relationship may be U-shaped, such that specialisation decreases with size up to a given level or range of sizes, before increasing again thereafter (Bahl et al., 1971). In this case it is the medium-sized centres that show the highest levels of diversity, with smaller and larger centres alike more specialised.

[8] When one of the areas in the comparison is the nation as a whole, then DI is exactly equivalent to the CS.

For the two Irish urban systems the relationship between size and level of specialisation is measured by means of Spearman's correlation coefficient.[9] For both the Republic of Ireland and Northern Ireland the data suggest that the relationship is closer to the first of the scenarios outlined above – i.e. larger centres are less specialised. This is indicated by negative values of the rank correlation coefficient in both instances, with r_s = –0.36 for the Republic, and r_s = –0.40 for Northern Ireland. It is notable that the order of magnitude of the association is similar across the two jurisdictions. However, while r_s indicates that the relationships are both monotonic, they do not appear to be linear. Rather, in both jurisdictions there is a tendency towards an L-shaped relationship, whereby the decrease in levels of specialisation attenuates as size increases.

As with the relationship between specialisation level (CS) and size, there is conflicting evidence in the urban systems literature on the relationship between the degree of specialisation and the dominant function of the urban area. However, a common finding is that centres specialising in manufacturing tend to be more specialised, while those oriented primarily towards service functions are more diversified. In order to test the relationship for the two Irish economies, the dominant function of each centre was identified on the basis of the industry in which it had the greatest number of basic workers, as outlined earlier. To simplify the analysis, centres were then assigned to one of twelve broader functional categories, according to the classification set out in Table 1, and the mean value of CS for each functional category was calculated. For the Republic of Ireland there is a relatively strong relationship between functional category and specialisation, with the highest levels of specialisation found in centres where either the textiles industry or tourism-related activities form the mainstay of the economic base (Table 3). Centres of wholesale and retail trade tend to be the most diversified. The differences in mean CS values across functional groups are statistically significant.

For Northern Ireland, the strength of the relationship between the degree and type of specialisation is somewhat weaker, but the pattern of the relationship is broadly similar. Leaving aside the single chemicals centre (Broughshane, Ballymena local government district), the most diversified centres, as in the Republic of Ireland, are centres of transportation and trade (Table 4). Apart from a single metals and

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[9] Because the distribution of population size is highly skewed in both jurisdictions, Spearman's correlation coefficient is used instead of Pearson's correlation coefficient.

Table 3: Mean CS by functional category, ordered by specialisation level, Republic of Ireland

Functional category	Number of centres	Mean CS
Textiles and clothing	2	0.217
Tourism	15	0.207
Public administration and defence	12	0.188
Food, beverages and tobacco	14	0.186
Health and education	11	0.186
Other	15	0.177
Construction and utilities	15	0.170
Metals and engineering	16	0.169
Banking and business	8	0.167
Chemicals	7	0.161
Transportation	11	0.156
Trade	18	0.150
All centres	144	0.175

F-ratio $= 2.11$; $p = 0.023$.

Table 4: Mean CS by functional category, ordered by specialisation level, Northern Ireland

Functional category	Number of centres	Mean CS
Metals and engineering	1	0.175
Other	3	0.170
Textiles and clothing	5	0.168
Construction and utilities	18	0.166
Tourism	3	0.160
Food, beverages and tobacco	8	0.144
Health and education	9	0.141
Banking and business	3	0.124
Public administration and defence	16	0.122
Trade	4	0.120
Transportation	4	0.119
Chemicals	1	0.096
All Centres	75	0.144

F-ratio $= 1.77$, $p = 0.08$.

engineering centre (Larne), the most specialised are textiles and clothing centres, with tourism centres also showing a relatively high degree of specialisation. One noticeable point of contrast between the two economies is urban centres where 'public administration and defence' is the dominant basic function. In the Republic of Ireland

these centres display a relatively high degree of specialisation (both relative to their counterparts in Northern Ireland and relative to centres specialising in other functions in the Republic of Ireland). This is due in part to the much higher levels of employment in this sector in towns in Northern Ireland as a whole, itself largely a legacy of the Troubles.[10]

Spatial patterns of specialisation: Intra-jurisdictional comparisons

Whereas hypothesised relationships between specialisation levels and both population size and function can be derived theoretically, this is not the case with specialisation and location (in the abstract), and hence studies of urban systems have focused less on this relationship. However, there is some evidence of spatial variation in specialisation in the island of Ireland. Despite the limitations of the NUTS 3 regionalisation (as noted earlier), for both the Republic of Ireland and Northern Ireland CS shows a stronger relationship with regional location than with functional type. In the Republic of Ireland the region with most diversified centres on average is the mid-east, with specialisation highest in the mid-west and in the border region (Table 5). The association between specialisation/diversification and regional location is statistically significant and cannot be attributed to inter-regional differences in the sizes of centres: there is in fact only a weak relationship between regional location and population size.[11] In Northern Ireland the association between regional location and specialisation, while not as strong, is still statistically significant. The most diversified region is Belfast (including outer Belfast); the most specialised is the north of Northern Ireland, followed by the west and south (Table 6). As in the Republic of Ireland, differences in specialisation between regions cannot be attributed to differences in size.

Not alone is the relationship between specialisation and regional location strong for both jurisdictions, but there is also a clear and consistent spatial pattern evident, in that the general tendency is for more peripheral and disadvantaged regions to contain the most specialised centres. Thus, two of the three regions in the more disadvantaged Border, Midlands and West (BMW) region in the

[10] Public administration and defence employed over 9 per cent of the total at work in Northern Ireland in 2001, as opposed to less than 6 per cent in the Republic of Ireland in 2002.

[11] The Kruskal–Wallis statistic for differences in urban size by region, $H = 4.97$, $p = 0.663$.

Table 5: Mean CS by region, ordered by specialisation level, Republic of Ireland

Region	Number	Mean CS
Mid-west	11	0.208
Border	19	0.197
West	15	0.186
South-east	17	0.182
Dublin	12	0.179
South-west	26	0.178
Midlands	12	0.169
Mid-east	32	0.142
All centres	144	0.175

$F = 5.22, p < .001.$

Table 6: Mean CS by region, ordered by specialisation level, Northern Ireland

Region	Number	Mean CS
North	20	0.171
West and south	14	0.152
East	32	0.133
Belfast (incl. outer Belfast)	9	0.124
All centres	75	0.144

$F = 3.89, p = .012.$

Republic of Ireland are also two of the three most specialised regions, and the rank order of Northern Ireland's regions in terms of specialisation is inversely related to their order in terms of GVA (gross value added) per capita. This finding, which is consistent with previous research on the urban system of the west of Ireland (McCafferty, 2002), is somewhat surprising, given that centres in more-peripheral and less-developed regions might be expected to be oriented mainly towards central place functions, and thereby to display higher levels of diversity. From a spatial policy point of view, the results might be considered encouraging in relation to the potential for exploitation of inter-urban complementarity in peripheral disadvantaged regions. However, while high levels of specialisation might be a necessary condition for complementarity, they are not a sufficient condition. In particular, the strength of inter-urban complementarity will depend on the nature of the specialisations involved, and therefore this is considered next.

In terms of assessing the degree of functional complementarity at regional level the crucial relationship is that between the dominant function (i.e. type of specialisation) of a centre and its regional location. If location and function are closely related – i.e. like functional types of centres are located together – then the degree of complementarity between urban centres within the same region is necessarily restricted. Cross-tabulation of functional type by region indicates, for both jurisdictions, that there is a moderately strong relationship. This is indicated by Cramer's V statistic, with $V = 0.39$ for the Republic of Ireland and $V = 0.50$ for Northern Ireland.[12] These findings reflect the operation of a number of factors in shaping the contemporary economic geography of the island, ranging from the historical association of regions with particular industries to contemporary processes of regional clustering of enterprise.

Table 7 illustrates the geography of functional/industrial specialisation in more detail, focusing in particular on the functional types that exhibit the highest levels of spatial clustering.[13] Particularly strong regional clustering is evident in both jurisdictions for centres of transportation, and business and banking services, which are concentrated around the two capital cities, Belfast and Dublin. A different pattern of concentration is evident in relation to tourism centres in the Republic, where seven out of fifteen centres that are so designated are located in the south-west region. Centres of public administration and defence cluster in the Midlands and mid-east regions of the Republic, as well as in Belfast and the east region in Northern Ireland. Centres specialising in two of the more traditional sectors also show evidence of clustering. Thus, five out of the fourteen food and beverages centres in the Republic are located in the south-west region (four of them in north Cork), while five out of eight such centres in Northern Ireland are located in the east region. Reflecting the effects of industrial divestment and restructuring in recent years, there are only seven centres specialising in textiles and clothing across the island as a whole. Four of these are located on both sides of the border in the north-west: three, including Derry, in the north region of

[12] V ranges from 0 to 1, with higher values indicative of stronger association. The respective p values associated with these values of Cramer's V are < 0.001 (Republic of Ireland) and 0.007 (Northern Ireland), but because the conditions for drawing inferences from the data are not met, these must be treated with a degree of caution.
[13] For a thematic mapping of urban centres by functional type, see McCafferty et al. (2010).

Northern Ireland; and one (Buncrana) in the border region of the Republic.

In summary, the analysis indicates that there is a strong tendency for centres that are specialised in a particular function to be located close to each other. The consequences of these spatial patterns in relation to the conceptualisation of complementarity will be discussed in the conclusion. First, the final part of the analysis examines the extent of sectoral complementarity for a number of selected cross-border regions.

Table 7: Regional (NUTS 3) distribution of centres in selected functional categories

	Business and banking	Food, beverages and tobacco	Public admin. and defence	Textiles and clothing	Tourism	Trans-port	Total
RoI	8	14	12	2	15	11	62
Border	1	3	2	1	3	1	11
Dublin	3	0	0	0	0	7	10
Midlands	0	1	3	0	1	0	5
Mid-east	3	1	4	0	0	3	11
Mid-west	0	2	1	0	0	0	3
South-east	0	1	0	0	2	0	3
South-west	1	5	1	1	7	0	15
West	0	1	1	0	2	0	4
NI	3	8	16	5	3	4	39
Belfast	3	0	3	0	0	2	8
East	0	5	8	2	1	2	18
North	0	1	3	3	1	0	8
West and south	0	2	2	0	1	0	5

Complementarities in cross-border regions

In order to assess the degree of complementarity between and among centres in cross-border areas, a different approach to the above is used. Instead of comparing the functional category of centres, the DI is used to measure differences between pairs of centres. This is both a more direct and a more comprehensive approach than that based on comparison of dominant industry only, in that the actual relative distribution of employment across all industrial categories is taken into account.

For illustrative purposes, four cross-border groups of centres are examined, as detailed in Table 8. These are referred to as the north, west, central, and east border groups. While only the first of these (though excluding Strabane) has formally designated status (as a gateway in the NSS), all four are of key importance in the development of spatial planning on an all-island basis. In addition to the four cross-border regions, the Athlone–Mullingar–Tullamore urban cluster is included in the analysis for reference purposes as a cluster that has been formally designated as a polycentric gateway in the NSS.

Table 8: Dissimilarity matrix for selected urban clusters

Cluster/ town	Town				Average DI for centre	Group average
North border	*Derry*	*Letter-kenny*	*Strabane*			*16.18*
Derry	–	11.92	15.33		13.63	
Letterkenny	11.92	–	21.29		16.61	
Strabane	15.33	21.29	–		18.31	
West border	*Enniskillen*	*Sligo*	*Bun-doran*	*Bally-shannon*		*22.28*
Enniskillen	–	19.35	27.54	18.70	21.86	
Sligo	19.35	–	26.37	22.39	22.70	
Bundoran	27.54	26.37	–	19.34	24.42	
Ballyshannon	18.70	22.39	19.34	–	20.14	
Central border	*Monaghan*	*Armagh*	*Castle-blaney*	*Keady*		*20.93*
Monaghan	–	17.54	14.15	24.05	18.58	
Armagh	17.54	–	22.11	21.06	20.24	
Castleblaney	14.15	22.11	–	26.64	20.97	
Keady	24.05	21.06	26.64	–	23.92	
East border	*Dundalk*	*Newry*				*17.87*
Dundalk	–	17.87			17.87	
Newry	17.87	–			17.87	
Midlands gateway	*Athlone*	*Mullingar*	*Tullamore*			*16.25*
Athlone	–	19.09	17.15		18.12	
Mullingar	19.09	–	12.52		15.81	
Tullamore	17.15	12.52	–		14.84	

While it is difficult to interpret the absolute level of the DI, the levels recorded in the table appear to be relatively low.[14] In relative terms, the table indicates that the north border group contains the most similar urban centres, followed by the Midlands gateway. All three of the other cross-border regions have higher levels of dissimilarity on average. Within all of the clusters consisting of three or four centres it is noticeable that the average dissimilarity level is pushed up by the smaller towns (Strabane, Bundoran and Keady), with the larger centres (Derry, Letterkenny, Enniskillen, Sligo, Monaghan and Armagh) generally exhibiting higher levels of similarity. This result is consistent with the earlier finding that larger centres are likely to be more diversified (and hence similar to each other). However, it takes that finding further, by showing that large-centre similarity applies on a cross-border basis also.

Within the north border cluster, the degree of dissimilarity is lower for the two main urban centres of Derry and Letterkenny than it is for any other pair of centres within the selected clusters. With regard to dominant function, both centres are classified (on the basis of an all-island norm) as centres of health and education, but both also have important basic employment in the textiles and clothing sector.[15] In terms of the approach adopted in this paper, these two key centres in the north-western gateway show little evidence of inter-sectoral complementarity.

Closer consideration of this example raises more fundamental questions relating to the complementarity concept as applied in the NSS and RDS. The north-west's textiles and clothing sector is characterised by the location of a number of large producers in several urban centres throughout the region. Some of these companies have facilities in, or close to, both Derry and Letterkenny. This geographical location pattern is consistent with the large body of international research on regional industrial clustering, which demonstrates that some sectors portray strong tendencies to cluster in specific regions, leading to similarity rather than complementarity at the sectoral or broad functional level. The concluding section of the

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[14] Theoretically the upper limit of DI is 100, but this value can only occur in the highly unlikely circumstance where the two centres in question have all of their employment in different industries, i.e. there is no industry in town A that also has employees in town B.

[15] As noted earlier, Derry is classified as a centre of textiles and clothing when compared to the aggregate Northern Ireland employment profile.

paper will briefly discuss the consequences for specification of the complementarity concept in future spatial planning and policy in the island of Ireland.

Conclusions

The analysis set out in this paper has revealed strong geographical patterns in urban industrial specialisation on the island of Ireland. Both in Northern Ireland and the Republic of Ireland, towns and cities in the same region tend to have broadly similar employment profiles when the distribution of employment across the full range of manufacturing and service activities is examined. This finding also holds for a number of cross-border groupings of urban centres that are of strategic importance in current spatial policy. The presence of the border in these groupings is not associated with markedly different industrial employment profiles of the towns on either side of it.

In both the NSS and the RDS, complementarity is in many places defined in terms of *differences* in the sectoral employment profiles of neighbouring centres. Our results suggest that there was little evidence, at the time that the two strategies were introduced, of strong intra-regional differentiation in industrial profiles, and therefore of sectoral-level complementarity within regions. One response to these findings might be to focus industrial and regional policy on promoting divergent patterns of specialisation amongst neighbouring centres in order to enhance sectoral complementarity. However, such an approach runs the risk of conflicting with established industrial policy, which, in Ireland as in many countries, has been focused for some time on the development of industrial clusters. These are regional concentrations of firms in the same or closely related sectors, together with specialist suppliers and supporting institutions in both the public and private sectors (Porter, 1998). The industrial policy focus on cluster development reflects an increasing volume of international research evidence pointing to their importance as a source of regional and indeed national competitive advantage. Crudely designed policies to promote intra-regional sectoral complementarity may actually undermine regional competitiveness.

The authors therefore believe that the research reported here points primarily to the need for a clearer, more nuanced specification of the concept of inter-urban complementarity as a policy precept that is sensitive to sectoral and geographical scale. Our analysis suggests that complementarity should be defined in terms of *similarities* in

employment patterns at the sectoral or broad functional level, with differences – i.e. specialisation – at the sub-sectoral level. This conceptual development in turn calls for further research involving ideally the collection of information about the extent to which industrial firms and service institutions (such as hospitals or third-level educational establishments) in one urban centre have linkages to similar establishments in neighbouring urban centres. The development of the critical concept of complementarity so as to facilitate its translation into effective regional policy, and the detailed empirical work that is required to that end, should be central to future revisions of both the NSS and the RDS.

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