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International Lessons for the Future Spatial Direction for Ireland: Aspects of Agglomeration and Their Influences on the Economic Role of Cities

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International Lessons for the Future Spatial Direction for Ireland: aspects of agglomeration and their influences on the economic role of cities

Dr Brian Hughes

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Abstract

Ireland's demography in the world context is unique. Its population count remains the same as it was some 200 years ago and yet it has experienced profound movements. This paper contrasts Ireland's changing demography with that of Japan since the 1840's, for these the two offshore nations, located off either end of the Eurasian land mass. Historic urban literature identifies that governmental policies towards cities and city-based industry and services appears to explain many of these contrasts. In Ireland's case such policy both prior to and since the formation of the State has been an ambivalent one that has not favoured the growth of its provincial cities. Ireland's forthcoming National Planning Framework provides a policy opportunity to change policy direction and opt for intensive city growth. Urban economic and new economic geography advances show that Ireland is no different from similar nations and the principal question for the future is: will the focus of development be in favour of its secondary cities or will Dublin by default become Ireland's city state of the 21st century?

The choice is to remain with the failed policies of the last spatial plan, premised on balanced regional development, which has created many additional villages, small towns and one-off housing while Ireland's provincial cities get left further behind compared with 'primate' Dublin. The paper provides interesting insights into the preliminary 2016 census figures to portray the contrasting populations and regional growth differences. Celebrated world urban experts, including Japan's Masahisa Fujita and Nobel Prize winner Paul Krugman and also Jacques-Francois Thisse, all emphasise the wealth creation benefits of cities, driven by the move from physical to cerebral types of work and to the concentration of economic activity.

The paper reviews some of the major players on the world stage of Urban Economics and the New Economic Geography. It points to future demographic possibilities and concludes that the adoption of urban-agglomeration policies of densification, centripetal rather than centrifugal growth and a positive land-use/ transportation interface with the objective of reducing commuting times, all will enhance competitiveness and which should inform Ireland's spatial policy direction.

1. Introduction:

The commencement point is that of the classic literature of Jane Jacobs in *The Economy of Cities* (1969), wherein, she contrasts the 19th century industrialisation of an independent, emerging Japan with the political and economic subjugation that had retarded a colonised Ireland. These contrasts between Japan and Ireland are stark. Jacobs vividly describes the desperate subjugation of the Irish people (and to quote from P. 11) *...were held in an iron economic and social subjection. But that the very core of that subjection – and the reason that it was so effective and had rendered Ireland so helpless – was the systematic suppression of city industry, the same suppression in principle that the English had unsuccessfully tried to enforce upon industry of the little cities of the American colonies.*

Jacobs also noted the 19th Century similarities: geographical offshore Islands located at the opposite edges of the massive Eurasian land-mass. During the 1840s Japan’s population was a static one and at 26.9 million it was a little over three times that of Ireland’s ‘high point’, of 8.4 million in 1841. So the question arising in the first Table is: why did Japan’s population grow from three times that of Ireland’s to nearly twenty-two times its size over a 120 year period 1841 to 1961?

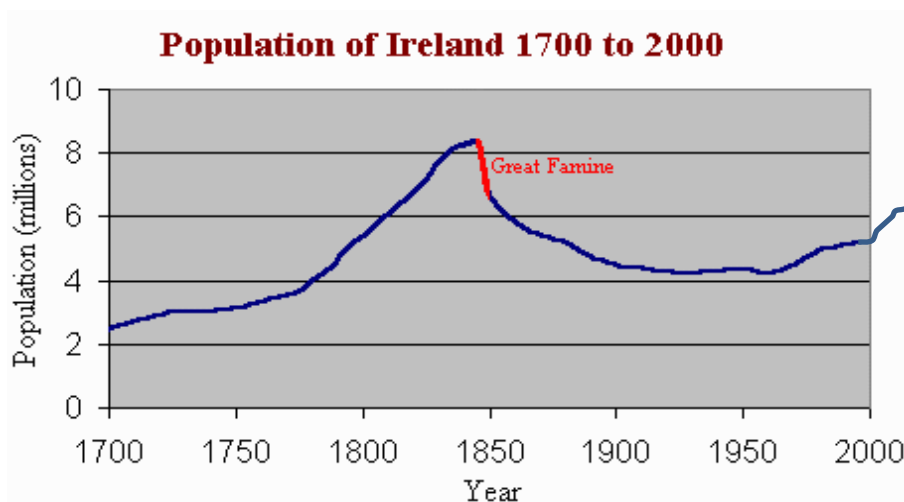
Table 1: Japan and Ireland Population Comparisons
(Millions)

	Japan	Ireland	Multiple
1841	26.95	8.44	3.19
1961	92.93	4.25	21.87
2016 (p)	126.39	6.62	19.09
2041 (f)	121.84	8.62	13.85

Source: Brian Hughes, based on Populstat.info.HTML

2. Demography:

In the global context Ireland presents a unique demographic case in its dramatic population decline between 1841 and 1961. Even though it has recovered and has grown by nearly 60% in population since 1961, today it is still some 1.7 million below 1841 census of 8.4 million - some 175 years further on. The following graph shows the overall performance of the island’s population for the last 300 years, thus:



Unlike the rest of this site, this chart is declared to be in the public domain.

Source: Wesleyjohnston.com - up to about 1990; since then the graph continues upward to 6.61 m.

[This author has extended the indicative Wesley Johnston graph line beyond 2000 to take account of further population growth into this century – pending release of the final 2016 CSO census results in mid-2017, whilst noting that the results for Northern Ireland are next due, for the 2021 UK census, in 2022/3]

Because of its weak urban base, the Republic of Ireland (RoI) reached its lowest population of just 2.818m together with Northern Ireland’s (NI) 1.4 m (approx.) so by that 1961 date the Island had just

4.20 million people. Japan had grown to 92.93 million by then – i.e. by 22.2 times that of Ireland, whose population was a little over half of its 1841 figure. Today, ROI is still only 72.88% of its 1841 population, but that's not the full picture. At its lowest point in the census of 1961 the ROI part was just 43.17% of its 1841 population of 6,528,799. By 2011 the ROI had recovered 47.78% of the 1841-1961 population loss and the recovery was up to 52.27% by the 2016 preliminary census total. Today, the island's population of 6.62 million comprises a 72% living in ROI with 28% in NI.

Looking ahead, the 2050 projections for a total island population is in the 9-10 million range. Here it is necessary to make the obligatory disclaimer for professional demographers. They are always reticent in projecting levels of growth that are more than twenty years out, primarily because it means having to make fertility predictions for birth-mothers, some of whom have not yet been born!

Significant dissimilarities, in comparing 19th century Ireland with Japan, commences with their political systems and governance. Japan's and legacy notes the Shogun's embrace of western technology: especially of a famous Scottish influence. Enter Aberdeenshire's entrepreneur and industrialist Thomas Blake Glover. The Japanese Times, for its part, notes an issue of cultural disparity:

However, there's an anomalous legacy of Glover and his ilk, too, thanks to the persistence of a mid-Victorian typology of discrete ethnicities with which he would have felt quite at home. Hence, in the received wisdom of today's Japan, Glover's fame has slipped far below that of the Tosa revolutionary Sakamoto Ryoma, despite the latter quite likely having been less influential in bringing about the Meiji Restoration. But Sakamoto is now better remembered, not because of Glover's dubious dealing, but because he is imagined to better encapsulate the modern Japanese spirit.

3. Early Industrialisation – Comparing Japan and Ireland:

Persisting with this 'spirit', the first imported and then locally-produced Bicycle epitomises Japan's infatuation with early technology and industrialisation as exemplified by Jane Jacobs in *her* book (1969). In 19th century independent Japan with accelerating city industrialisation is contrasted with the colonially, 'subjugated' Ireland as Jacobs described; it focused on primitive agriculture with London's iron grip on limiting industrialisation so that their colonies do not compete with mainland Britain. The contrasting outcome: Japan's dramatic progress in technical prowess - its adoption and in further adaptation of western industrialisation, demonstrated in its meteoric technological mastery; conclusively demonstrated in the astonishing naval outcome at Tsushima, in its comprehensive defeat of the Tsarist Russia's navy in 1905.

Ireland in contrast, experienced a very limited scale of Industrialisation: first Belfast grew from a small town in 1800 to exceed Dublin's population in the census of 1911. Thus Belfast, for the first and only recorded time, was then larger than Dublin. Ireland's fraught history of stultified industrialisation, culminated in an eight-year period of fratricidal military belligerence, starting with the failed Rising of 1916, then the War of Independence and a bitter Civil War, which resulted in partial Independence by way of Free State status in December 1922, an economic 'war' with Britain and culminating in the 1948 Declaration of the Republic of Ireland (ROI). Thus today's Dublin is about twice the population of Belfast, pending the 2021 census, the UK census being held every ten years.

Heavy manufacturing Industry developed quickly in Northern Ireland with its foundation of shipbuilding, linen, and engineering compared with food, drink and tobacco in RoI. The South's traditional agriculture with focus on food/ drink exports to Britain is such that even today agriculture is still over-dependent and the uncertainties posed by 'Brexit' will present further challenges!

Today's political division of the island's 6.61 million people has the RoI 4.76m as a Member State of the EU; Northern Ireland at 1.85m is part of 67m UK which has voted to exit the EU. Ireland's geography is described as having a Tundra level of population density of only 78.32 per sq. km. as at 2016 despite its temperate-climate location.

Such demographic sparsity creates significant public and private service-delivery problems due to inevitable dis-economies of scale. At 84,431 sq.km. Ireland is marginally smaller than the US State of Indiana. In contrast, Japan at 377,930 sq.km., is some 5.52 times bigger than the surface area of the RoI and it is 4.48 times the size of the entire island of Ireland.

As the next Table shows, it surprises most people including myself, that in 1841 the island of Ireland's population density, at that point was over 40% greater than Japan's. However, with the Great Famine of 1845-1849 and the enforced emigration combined with an absence of sizeable cities, quickly shrunk with its spectacular collapse of population so that even with today's recovery, and with an absence of even medium-sized cities it is less than one-quarter as dense as Japan.

Table 2: Japan and Ireland Density comparisons

Population per sq.km.	Japan	Ireland	Ireland as % of Japan's density
1841	71.31	99.96	140.18
1961	245.89	50.34	20.47
2016 (p)	334.43	78.41	23.45
2031 (f)	364.39	94.99	26.07

Source: Brian Hughes, based on Populstat.info.HTML

Because of its sustained emigration, Ireland is responsible for a world diaspora that is now estimated at over seventy million. Japan's population, having 'topped out' at 127.33 million in 2010, has marginally declined to 126.9 million in 2016, thereby being 19.2 times the size of Ireland's total 2016 population. Japan's population contraction, to-date, is of modest proportions but can, if it chooses, allow some non-indigenous in-migration so as to maintain its economic workforce. Source populstat.info.html

It is almost futile to compare Japan and Ireland cities: Tokyo is by far the world's largest one and there are many other sizeable ones by comparison with Ireland's cities. The next Table sets out the Irish cities in rank size order. In applying Zypf's 'Law' (1949) of City Rank Size, it states that the size of a country's second and subsequent city should equate to the inverse of its rank order, one-half, one-thirds and so on. The following Table 3 confirms the fragile sizes of Ireland's smaller cities and their Gini-coefficient 'shortfall' in population compared with Zypf's Law.

The following 2011 data of Table 3 city population is used because the 2016 populations for city size will not be published by the CSO until mid-2017 and the next UK census is in 2021..

Table 3: All-Island City Populations in 2011 (thousands):

City ('000)	Rank Order	2011 Population (a)	Where Dublin = 100.00%	Zipf's Law Population (b)	Zipf Target Shortfall/ [Surplus.] (b)- (a)	Zipf % extent of Shortfall [(b)-(a)/ (b)]
Dublin	1	1,110.6	100.00	1,110.6	0.0	N/A
Belfast	2	515.00	46.37	555.3	40.3	7.26
Cork	3	198.6	17.88	370.2	171.6	46.35
Derry	4	93.6	8.43	277.7	184.1	66.29
Limerick	5	91.4	8.26	222.1	130.7	58.86
Galway	6	76.8	6.92	185.1	108.3	58.51
Waterford	7	51.5	4.64	158.7	107.2	67.55
Aggregate city population 'shortfall' in relation to Dublin:					742.2	41.95

Source: CSO Principal Demographic Results, Censuses of 2011: Table 7, Areas data, together with 2008 estimates for Belfast and Derry are sourced from NISRA. Official settlement figures are not available for 2016. Both Lisburn and Newry are excluded from this earlier Table of 2011 population size. The approximate 2016 populations of ROI cities, as per this author's estimates are: Dublin at 1.165m., Cork at 0.215m., Limerick at 0.094m., Galway 0.081m and Waterford at 0.053m.

Whilst Waterford is the next largest settlement after Galway, exclusive of settlements north of the border, Belfast's population includes that of contiguous Lisburn, Glengormley, Castlereagh, Carrigfergus, Newtownabbey, Bangor together with seven smaller settlements, based on NISRA 2008 estimates, *vide*, <http://ninis2.nisra.gov.uk/public/pivotgrid.aspx?dataSetVars=ds-1931-lh-69-yn-1971,1981,1991,...> Derry's includes New Buildings, Strathfoyle and Culmore.

Analysis: Brian Hughes.

Note: This aggregate 'shortfall' in population represents 11.60% of the all-Ireland 2011 population of 6.4 million.

The Gini Coefficient shortfall for above Table is calculated at 41.95% which reflects a considerable level of city-size distortion, mitigated somewhat by Belfast's 'relative normality' and Derry's (2008) inclusion on the basis of the stated size-difference with Limerick (2011). The measure of Ireland's distortion in city size is compatible with a 'basket' of Western European cities, *vide* Eurostat populations, 2011. This however, notes that smaller countries have a greater size variance in comparison with larger ones, due to their 'primate settlement' effect of their largest cities. This finding supports the view that for small countries or provinces, as in the cases of the Republic and of Northern Ireland, primacy is to be expected, simply based on the limited size of entity. This is supported in research by Mansury, Y. and Gulyas, L. (2006). Some cited opponents to excessive urbanisation and agglomeration would argue the opposite: that Dublin and Belfast are too large!

For the RoI cities on their own, the Gini shortfall is more pronounced, at 70.65% and at over one million, representing 22% of its total 2011 population. Nevertheless, in terms of achieving scale economies, future Irish governments should seek to reduce such Rank-size and Gini shortfalls: a policy initiative that would require them to commit to seriously growing the State's 'provincial' cities, especially having regard to the increasing importance of the Producer Services sector and in particular, of the economic dynamics of the 'knowledge economy', based on sufficiency of human resources and in recognition of the role of economic clusters, vide Strange (2005), *vide* Appendix 5.

Vital to any country's economic prospects is not just its population endowment but in particular, its density as evidenced in its cities. This next Table is an up-to-date summation of the island of Ireland:

Table 4: Composition of Ireland, cities and population density - 2016

	Republic of Ireland	of Northern Ireland	RoI % of Island
2016 (p) Population	4,757,976	1,855,000 (est.)	71.95%
Cities – population	1,614,000 (5)	885,000 (4)	64.59%
Remainder of pop.	3,143,976	970,000	76.42%
Surface Areas	68,466 sq.km.	15,965 sq.km.	81.09%
Density per sq. km.	69.49/ sq.km.	116.19/ sq.km.	78.32/ sq.km.

Source: Brian Hughes, based on Eurostat and on his 2016 estimates for cities

These data confirm that whereas the RoI has over 81% share of the Island's surface area, it comprises just over 64% of its city population and 76% of the entire population. This Table also shows that the RoI population density is only 67% of Northern Ireland. The reality is that even after gaining limited Independence in December 1922, the RoI's population continued to languish out to 1961, having practically no urban or industrial policy strategy to counteract the continuing outflows of mainly rural emigration. With only one metropolitan-sized city, Dublin, the difficulty in retaining population remains a persistent problem to this day, with net outward migration in almost every other part of the State.

A significant factor in retarding the State's economic growth has been a long-standing government antipathy towards the development of its cities. At its lowest point of population in 1961 the aggregate population of the five cities was 33.1% of State compared to 29.2% for the world's cities share of world population. However, by 1986 the State's cities share of population had remained almost static at 33.8% when the share of all cities had risen to just over 40% of world population. This divergence persists where the 2016 (preliminary) State population share in its cities is just 34.1% at a time when the corresponding figure for aggregate world cities has risen to 54% of world population. The following data confirms the inexorable eastward shift of Ireland's overall population distribution and recent growth performance, the next Table sets out the contrasting picture as between the East and West of Ireland (see next Table 5, showing the 5 'provincial', demographic components of RoI).

Table 5: Provincial Populations - Imbalanced Recent Growth Performances

5 Provinces:	Census 2011 Populations	Preliminary 2016 Populations	2011-2016 pop. growth contributions	5-year % growth	% of State surface area	% share of Population growth
Dublin	1,273,069	1,345,402	72,333	5.68%	1.35	42.62%
Rest of Leinster	1,231,745	1,285,318	53,573	4.35%	27.26	31.56%
Munster	1,246,088	1,280,394	34,306	2.75%	35.12	20.21%
Connacht	542,547	550,742	8,195	1.51%	24.74	4.82%
Ulster (part)	294,803	296,120	1,317	0.45%	11.53	0.79%
Ireland	4,588,252	4,757,976	169,724	3.70%	100.00	100.00%
Source: Brian Hughes analysis of CSO 2011 Census and 2016 CSO Preliminary Data						

This Table comprises RoI’s provincial composition where Dublin (city and county) is separated from the remaining eleven Leinster counties and that of Munster, then Connacht and finally the three Ulster counties. Table 5 highlights the striking 2011-2016 growth differences and sharply dis-improving population performances contrasting Dublin and the smaller-populated provinces, especially when they are compared with the State’s overall growth. Population densities (not shown): Dublin City + County is 21 times the density of Rest of Leinster, 27 times that of Munster and 43 times the density of Connacht + Ulster (pt.). The Greater Dublin Area, comprising counties Dublin, Kildare, Meath and Wicklow, at 1.9 million people for the first time exceeds 40% of State population and is also larger than Northern Ireland. The Rest of Leinster has replaced Munster in the 2016 rank order and all-Leinster comprised 74.18% of total RoI 2011-2016 population growth.

4. Absence and Failures of City-growth Spatial Policies:

When the first opportunity did present itself to espouse the planned acceleration of urban growth for RoI in the form of the Buchanan Plan of 1969, it was firmly rejected by that government on the grounds that it would be too disruptive and biased in favour of cities. That Plan would have required an accelerated programme for housing construction, principally in the provincial cities of Cork and Limerick, together with more modest expansion for six other moderate sized cities and towns. Significantly, support for the plan was confined to the Department of Finance.

Irish governments have always been wary of planned growth, that might seek to favour one location, county or province over others and so the only other spatial plan had to wait until the 21st century to emerge. As with our cities, politics and planning do not make for friendly bedfellows in Ireland! That is why, for future spatial planning to achieve ‘buy-in’, it must first be de-politicised whilst also obtaining cross-party political support. Shortly after the millennium, the introduction of the National Spatial Strategy (2002-2020) was based on the premise of *Balanced Regional Development* (BRD), *vide* Appendix 1. It has proved to be a near-complete failure – in this writer’s opinion – because BRD is unviable in unrealistically seeking to support all regions, towns and villages – it is non-discriminatory, with “a one for everybody in the audience” approach to growth expectation.

Until it was quietly withdrawn after only nine of its eighteen year life-cycle in 2012, all that the NSS had succeeded in doing was to accelerate the formation and proliferation of hundreds of additional and villages and many small towns together with thousands of additional one-off houses and increasing long-distance commuting. RoI's settlement pattern now comprises over 200 (mainly) small towns and nearly 700 villages of up to 1,500 in population – the minimum threshold which defines the smallest populated 'town'. It is interesting to note the recent announcement of the latest government initiative for 600 small towns and villages with an initial budget of €60 million; that is an average of €100,000 per settlement, spread over a three-year timeframe.

In maintaining widespread population dispersal, after 2002 the five cities lost further population share and some of the eighteen other growth centres called 'Gateways' or 'Hubs' have stagnated and some have even lost population. In short, poor strategic choices were made in the selection of growth centres and too many of them were chosen. Sligo notably has lost population over the last three censuses; Portlaoise was not selected despite the fact that it achieved the same population growth (2006-2011) as the aggregate growth of the three Midland-designated 'Gateway' towns of Athlone, Tullamore and Mullingar. Dundalk was however, selected as the north-east Gateway despite the impressive growth of Drogheda with Laytown-Bettystown-Mornington, now emerging as Ireland's sixth city. Fast-growing Drogheda-LBM may now have passed out the smallest city Waterford in its 2016 population, yet to be confirmed. The population details for individual settlement won't be available until mid-2017.

5. The Critical Policy Issue:

The key to Ireland's future rate of growth rests primarily with the city and with its human resource-base. To what extent will both public policy formulation and the private sector's economic response enhance the growth of Ireland's cities? Will the forthcoming National Planning Framework (NPF) policy recognise the nature and change of work in the 'knowledge economy', to densification and with its demographic growth increasingly drawn to its urban-agglomerating cities?

Will there be adequate acknowledgement of the formation of new work clusters similar to the 'knowledge cluster' of the Grand Canal area of south Dublin city or to Dublin's 'aircraft leasing cluster' which funds and manages about half of the world's commercial aircraft? To what extent will the New Economic Geography with its large potential multipliers be cherished and acknowledged in the thrust of Ireland's spatial policy formation, *vide* Appendix 3? These are the major issues that hopefully will be addressed in the NPF, to be formally launched by Minister for the Environment Simon Coveney at Maynooth University.

At present, Ireland's (all island) demographic centroid is moving further east and is now positioned, co-incidentally, close to Maynooth, which is located just 25 kilometres west of Dublin's city centre. To-date there is no formal spatial acknowledgement that Ireland's population growth is focused on the east coast, generated by the dual concentration of Dublin and Belfast (DB) metropolitan regions *vide*, Irish Times, 27.12.2016 headline, where Minister Coveney has invited the citizenry to debate role of secondary cities in forthcoming NPF. The opportunity to provide for a sixth city along the DB corridor is prescient, especially given the Brexit geo-political developments now emerging.

6. Good Spatial-Economic Practice and Harsh Economic Realities:

This writer's theoretical expectation and advocacy is that based on Japanese and other countries' experience that the direction of public spatial policy backed up with international and private investment support, should seek to achieve Pareto-Optimality wherein a win-win series of outcomes will eventuate for this entire island. This objective is not just laudable or desirable but in Ireland's case, it is an essential one, given the national legacy of debt and issues of future major economic uncertainties. Strategic spatial opportunities must therefore be grasped so as to avail of 'core' growth and 'peripheral' spill-over spatial policy outcomes.

Today, urbanisation and urban agglomeration still challenge many of our rural-based politicians as discomfiting concepts - ones that have attracted a stubborn political reluctance and even resistance, to recognise and acknowledge the potential to grow our provincial cities - this despite the fact that RoI is still only about 63% urban (2016 Preliminary Census), the five cities comprise just 1.6 million or just one-third of the near 4.76 million population of the Republic. With the demise of most 1960-1980s branch plants, industrialisation has largely bypassed or even deserted many Irish provincial towns but the services base of its cities is consolidating, featuring cerebral rather than physical output, reflecting modern Ireland's ambitions and enthusiasm for education and added value.

Post the 2009 Troika Bailout and international 'rescue' (IMF+EU+ECB), Ireland continues to retain a credit-worthiness standing as reflected in its current bond yields, despite its high 90% debt-GDP ratio. However, even with its political and economic stability Ireland remains very vulnerable to a trading position as an off-shore island economy. Likewise, our demography remains potentially fragile with propensity for two-way migration, now inward in direction since 2015. The State continues to be vulnerable as one of the most Globalised economies in the world with a rating of 170% , that is Exports + Imports / GDP.

The RoI has just one metropolitan city region plus the four much smaller Provincial cities, with their average 110,000 population which is just one-eleventh the size of and just one-third the density of Dublin. These provincial cities have an average density of 1,300 people per sq.km. Dublin's population density is approaching 4,000 and is about 6,300 for Japanese cities. Apart from the slower domestic economy, Ireland's growth expectation is FDI industry-based together with an over-dependence on agricultural. Exports: notable areas include Pharmaceuticals, Professional Consultancy, Software, Cloud-media, Medical Devices, Information Technology, Aircraft Leasing and Financial Services.

Given that nearly 75% share of RoI's 2011-2016 population growth is in Leinster (including Dublin) a reasonable case can be made for the nomination of one additional city in this part of the country. In proposing Drogheda as that new city, recognition is also being given to the pressing need to reinforce the Dublin-Belfast Corridor, given the post-Brexit geo-political context and need for all-island consolidation. The physical agglomeration of these two towns plus the fact that one of them is Ireland's largest populated town presents a clear-cut candidate for Ireland's next city.

7. Ireland's emerging new city – Drogheda-LBM ('Whitaker City'):

This prime example of urban agglomeration is located just twenty minutes from the Dublin Port Tunnel and 31 miles north of Dublin and reinforces the Dublin-Belfast Corridor, Drogheda together with another large (+10,000-populated) town, Laytown-Bettystown-Mornington (LBM) together match the population of Waterford city.

This application of the EU Harmonised Density Measure (Sq. Km.) is a very recent (2015) example of an OECD standardised practice for assessing urban agglomeration. First is set out the four-step criteria as exemplified in an Austrian city: known as the 'Graz Model' and as is then applied to Drogheda plus LBM, thus:

Until 2015, there was no harmonized definition of 'a city' for European and other countries as member of the Organization for Economic Co-operation and Development (OECD). This undermined the comparability, and thus also the credibility, of international analysis of cities. To resolve this problem, the OECD and the European Commission has developed a new definition of a city and its commuting zone in 2011. This new definition works in four basic steps and is based on the presence of an 'urban centre' a new spatial concept based on high-density population grid cells. Source: Dijkstra, L. and Poelman, L. (2015), *European Cities – Functional Urban Area Definition*, European Commission, DG Regio.

- Step 1: All grid cells with a density of more than 1 500 inhabitants per km² are selected.
- Step 2: The contiguous^[1] high-density cells are then clustered, gaps^[2] are filled and only the clusters with a minimum population of 50 000 inhabitants (Map 1.2) are kept as an 'urban centre'.
- Step 3: All the municipalities (local administrative units level 2 (or LAU2) with at least half their population inside the urban center, are selected as candidates to become part of the city (Map 1.3).
- Step 4: The city is defined ensuring that 1) there is a link to the political level, 2) that at least 50 % of the city population lives in an urban center and 3) that at least 75 % of the population of the urban center lives in a city (Map 1.4)^[3]

In most cases, as for example in Graz, the last step is not necessary as the city consists of a single municipality, that covers the entire urban center and the vast majority of the city residents live in that urban center. This is the usual case in Europe but not so in Ireland where the position in Drogheda, Waterford, Athlone or Carlow, together with other growing Irish settlements, are increasingly expanding over two or more counties, for which traditional governance implementation with the old-fashioned county system of local administration is no longer suited.

Here, the provisions of the radical reform policy of Putting People First (2014) will assist in overcoming the Louth-Meath boundary conundrum if an appropriate multi-county administrative system for local government is advised. The full 110 square kilometer matrix is set out in Appendix 4. At the merging interface of Drogheda-LBM, the specific example of this urban fusion, comprising the twenty-four square kilometre-area where Drogheda is agglomerating with LBM, the Harmonised OECD/ E.U. test of cell clusters is applied. The author's analysis is articulated in the next section, 8.

Drogheda (part)

Laytown-Bettystown-Mornington (part)

823	5	46	112	275	1,059
2,411	2,470	673	752	748	691
435	861	56	13	1,224	2,162
45	13	106	11	90	705

The related issue of density is especially significant in sparsely-populated countries or regions where the emergence of agglomeration is infrequent or indeed, where the concept of urban agglomeration is counter-cultural. A country that is apathetic to the development of its cities is unlikely to be focused on density, urban agglomeration or perhaps even to matrix-clustering. Asia, with its burgeoning mega-cities, not least that of Japan, stands in sharp contrast with Ireland’s temperate climate, yet handicapped with its tundra density of population and the ensuing dis-economies of scale.

8. Analysis of Population Grid Data:

In this case, the core cell clusters of 2,470 and 2,162 are at one-remove from each other with respect to their surrounding 8-cell positioning, *vide* Dijkstra and Poelman (2015). On that basis, Drogheda+LBM in the population data of 2011 would appear to fail the second-step requirement for the four-rule contiguity. However, should that particular population cell of 1,224 in that same census of 2011 grow to equal or exceed 1,500 in a future (e.g. in 2016 or a subsequent census), then the EU Harmonisation criterion would have been met. This would mean that the 18.4% shortfall of 2011 in that particular cell’s population, would then have to be made good and depending upon the extent of that cell’s share of the growth that has occurred during 2011-2016 in this fast-growing St Mary’s Electoral District.

So, this leads on to the principal confrontational issues of this Paper: of the NSS (2002-2020) being replaced by NPF: When will it happen? What format will it take? Will it address the Irish Urban vs. Rural dilemmas? Will there be a provincial-city focus for growth to counterbalance Dublin? Otherwise, what is to prevent Dublin emerging as Ireland’s 21st century citystate, *vide* Hughes (2010) PhD?

Focusing on the sustainability of Balanced Regional Development (BRD), as set out in Appendix 1 for its 8-point definition, those who still support BRD are strongly reluctant to accept radical change despite the overwhelming evidence of the old spatial policy’s contribution to one-off housing, to rural and small town proliferation and to city/ urban dilution? Likewise is the need to link that policy’s failure and to take responsibility for its dismal demographic growth-outcome for so many of its 23-nominated Gateways and Hubs.

Thus, as an initiative to support the recognition of Ireland’s sixth (or is it fifth in size?) I will ‘christen’ Drogheda-LBM as ‘Whitaker’ city in honour of its august, past resident (1916-2017).

9. Applications for Urban Economic and New Economic Geography theory:

This section is Urban Economic in theme. Japan's most celebrated international urban economist Masahisa Fujita notes that the nineteenth century German Landowner Johann Heinrich Von Thünen in his pioneering work, has provided the foundation of both Urban Economics and the new economic geography (NEG). In Fujita's opinion, Von Thünen's (1826) thinking on industrial agglomeration was not only amazingly advanced for that time, but in many respects remains novel even today. Fujita uses the Von Thünen (1826) bid rent model as was transformed by William Alonso (1960, 1966) to further his own work on the urban sphere. Furthermore, Fujita showed *...that if Thünen's well-known theory on agricultural land use is unified with Fujita et al.'s pioneering work on industrial agglomeration by using modern tools, then we achieve a prototype of the New Economic Geography model.*

What are these modern tools? Even for non-math readers, Fujita's literature on cities is surprisingly accessible, viz. the fulsome and descriptive text of his *Urban Economic Theory – Land Use and City Size* (2003), Cambridge University Press. This **provides ...an examination of the economic reasons determining choice of location. It develops, through analysis of the bid rent function, a unified theory of urban land use and city size.**

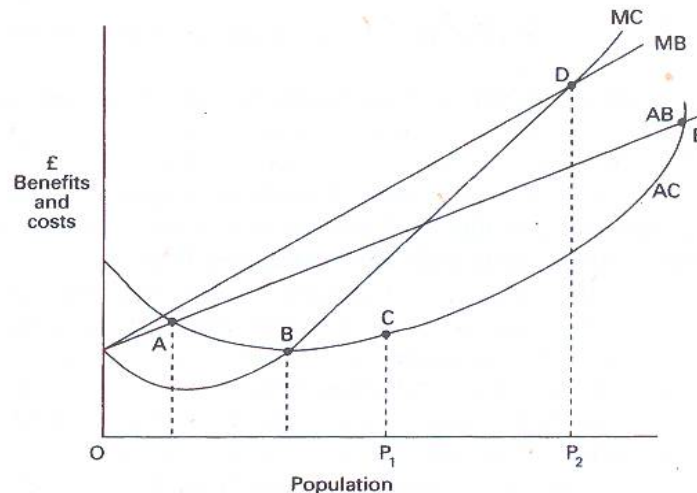
In summary, the modern-day Japanese giant is Fujita who together with Krugman and Venables (*The Spatial Economy*, 2001, MIT Press), and likewise, in Fujita and Thisse (*The Economics of Agglomeration*, 2013, Cambridge) – have produced this body of pioneering work - which has contributed to unifying the new urban economics with the new economic geography, and in doing so has illuminated our understanding and beneficial use of these disciplines, vide, Appendix 3.

10. Urban Agglomeration and Demography - the drivers and location for future growth:

In her 1969 Appendix, Jacobs demonstrated diagrammatically how and why specialised economic concentration occurs in cities. Her five-stage set of diagrams show:

- The Simple Export-Generating Process
- The Import-Replacement Process
- Export Generation into Large Cities
- The Two-Reciprocating Systems, (for simple and subsequent cycles) and
- Correlation of these four stages with conclusions as to the nature and change of 'work' which Jacobs foresaw, as becoming increasingly cerebral and services-orientated.

It is useful to cite some of the major players, dates and their principal contributions, resulting from Von Thunen's above-described Urban Economic foundation of 1826. Then William Alonso in his Paper to the Regional Science Association (1971) explained his five inflection points – Costs and Benefits of City-Size, in his graphical portrayal of population size, plotted against Average and Marginal Costs and Benefits. This 1971 context was primarily based on an industrial-manufacturing city as contrasted with the 'knowledge economy' city of present-day. This overall perspective is shown as follows with Inflection Point D reflecting the optimum city size for current citizens and Point E is the optimum perspective of in-migrants:



Alonso (1971): MB = Marginal Benefits; MC = Marginal Costs; AB = Average Benefits; AC = Average Costs.

This was followed by J. Vernon Henderson's explorative works, commencing in 1974 on urban economics and geography, *The effects of Urban Concentration on Economic Growth* (2000). The continuity of city rank-size and the 40-year monitoring of world cities, which together with Wang, H.G. (2007), is confirmation of the (1949) Rank Size Rule of Zipf. Likewise, the Alonso (1971) descriptor for his Point 'A' as representing a city of 100,000, the start point for minimum threshold size, was influenced by *Central Places in Southern Germany*, Christaller, W (1933) as modified by Losch, A. *Economics of Location* (1954) with its Land Use and Transport Interface of city rank size, with due allowance for accessibility.

Fujita's Land Use and City Size work on housing lot size and population density changes within a city (1989) clarified the issue of residential equilibrium within a monocentric city. In turn, this raises a further issue – one that is driven by the fundamentals of the new economic geography. Ireland's recent demographic history proves that specialisation and the location of economic activity cannot be spread or resourced in a way that is envisaged by Balanced Regional Development. Such activity increasingly is spatially clustered, vide Appendix 5.

The scene-setting quotation taken from Fujita and Thisse is very clear *...Economic activities are not concentrated on the head of a pin, nor are they spread evenly over a featureless plain. On the contrary, they are distributed very unequally across locations, regions and countries, generating contour lines that vary with time and place.* P.1, Fujita and Thisse (2013).

Likewise future population spread will be increasingly 'lumpy' as propounded by the World Bank's *World Development Report (2009): Reshaping Economic Geography*. This viable alternative to BRD is the centripetally driven core-periphery model, as described by the treble chain-stages of Krugman's NEG Nobel-winnings research findings and publication (years) as follows:

- **Increasing Returns and Intra-Industry Trade (1979)**, leading to
- **Increasing Returns and Transport Costs (1980)**, and then incorporating
- **Transport Costs and Interregional Labour Mobility (1991)**,

also predicated on reduced transport costs and assuming the availability of skilled labour. The choice is stark: Full agglomeration or perfect spread, as set out in the Regional Studies Association's *Spatial Economic Analysis*, Vol.4, No. 1, P.19. Brakman and Garretsen (2009), *The Tomahawk Bifurcation* from the Krugman Model (1991).

Given the circumstances of Ireland as a progressive western economy, with its proclivity for short-termed political horizons and its preoccupation with resolving local issues and on current expenditure rather than on some element of capital investment, this inevitably capital-spend contraction becomes the norm, despite its mandatory urban economic imperative for securing future growth. With Ireland's current economic recovery there is some 'early growth' evidence for the east, primarily GDA, but much more is required for achieving an all-region set of results for the following objectives:

- **Sustained investment in infrastructural improvement**
- **A positive land-use/ transportation interface with long-term goals**
- **City densification and increased building heights**
- **Monocentric morphologies as opposed to Polycentric spread of commuter belt**
- **Leading to reduced home-to-work, schools and college-journeys**
- **Edge-city policy and land management**
- **The focus on arresting the proliferation of rural one-off housing**
- **Co-ordinated transportation projects such as Dublin's Eastern By-pass and Metro North**
- **Improved competitiveness linked to supply of affordable accommodation**

Much work remains outstanding in the application of demography to the NEG literature. For instance as it was only in 2015 that the European Union agreed to adopted a unifying approach to the measurement and definition of the 'city' and as shown: how this population density, one-kilometre grid, approach called the 'Graz Model', as applied by this writer in identifying Ireland's newest, yet to be confirmed, city at Drogheda-LBM. In contrast to this, the mistaken focus in 2011 was to concentrate on the 100-metre rule, to divide off and separate Bearna from Galway and Balrothery from Balbriggan, in an attempt to underplay the impressive 2006-2011 growth of these two large settlements.

Ireland has an underdeveloped and scattered settlement structure. The emerging realisation is that modern industry and business services will see further clustering in specific urban locations because face-to-face relationships matter. The concept of 'cottage industry' remains an idealistic hope that hasn't happened and given the slowness in Irish rural broadband roll-out, the time frame is pushed back into the next decade and with RoI Broadband reaching just one-million homes to-date.

The Irish Housing supply crisis and related national competitiveness issues of rent and house-price affordability largely arises in part, to the continuing over-concentration on building one-off rural housing and to a less than effective management of the existing housing stock. Instead, there is a need to address the potential for urban densification, the recycling of brown-field sites and to construction output matching locational-demand for housing. And thus the current mismatch of housing shortages with the need for demographic concentration and settlement-size growth remains a major stumbling block for the Irish economic and its competitiveness ambitions.

Focusing on city-specific examples of good practice – at all times driven by solid evidence base and on proven urban economic theory - there is a huge dilemma for Irish Government, maintaining fiscal balances for capital and/ or current expenditure? One example of good practice is the current debate on legislative provisions for an elected Mayor for Dublin. City governance and International promotion are interlinked, as constantly articulated by Dublin City Council.

Looking to the future with optimism, one of Ireland's 'Fifth Cavalry' rescuers has been The European Investment Bank's (EIB) in its recent role in Ireland's financial bailout. Increasingly it may also have an expanded resource role, as potential funder of choice for much-needed capital infrastructure. The question is: can sources such as the EIB be used as a substitute for direct Government funding for capital purposes in off-balance sheet ways? This, for Ireland continues to be an important issue because for the foreseeable future, most taxation revenues are likely to be used to fund current spending including public-sector pensions. Dependable sources of capital investment are predicated by the need for all capital investment propositions to be stress-tested for viability.

11. Some major issues for Ireland's cities:

So what are the major issues and objectives for Ireland's cities and larger settlements:

To improving their environment: Brown-field vs. green field development. For Ireland: the emergence of the Strategic Development Zone concept – there are just ten of them as of today. Their benefit - of direct grant of Planning Permission by An Bord Pleanala (the Irish Planning Board).

Best use of natural environment: Our visitors will be able to sample Dublin's superb geographical appointment, the bay, the mountains, its centrality and accessibility. The physical endowment of proximity to sea, access to the rural environment, its temperate climate.

Commuting and the sustainability of satellite towns: The Alonso/ von Thunen value/ distance relationship critical to Ireland's competitiveness - driven by property values, both commercial and residential. The Hall-Pain (2006), *The Polycentric Metropolis* findings of North-west European city-regions regarding Dublin's excessive mono-centricity.

Centripetal agglomeration: The need for further densification and use of brown-field sites – 2016 Census evidence for the five Irish cities and a sixth potential one.

Growth elsewhere – other settlements: If not in provincial cities, where will future growth be expected to occur? Limitations on future agricultural output with climate change penalties for methane? The food industry: – its ability to diversify? Limitations for agriculture production, due to bovine-generated methane gas constraints.

Reduced home/work commuting: Residential locations must empathise with employment location.

Intensive recycling of brown-field sites: Uses of existing Utilities, Infrastructure and Social Goods – schools, etc. The importance of Urban Design to add value to urban renewal on a human scale.

12. Presentation of theories/methods and Conclusions:

This Paper concludes with a brief citation of related theories, methods, their limitations and conclusions, thus:

Theories: The Von Thunen-Alonso Value-Distance foundation of Urban Economic theory; The application of Central Place Theory, Christaller, 1933 and its transportation variation, Losch, 1944, in discerning viable urban growth centres; the application of Zipf's Law; Alonso's Value to Distance trade-off; the now-standardised EU Matrix Harmonisation measure (the Graz model) 2015 and its demographic model that informs the emergence of RoI's sixth city - Drogheda-LBM.

Methods: Demographic Analysis, emerging cities Drogheda – 2016 population to be confirmed, as complying with the 2015 EUH criteria, combining Theories and Methods.

Limitations: Whereas sound theory is based on life experience, today's uncertainties include the BREXIT outcome and Trump election! The prospect of changing Trade patterns, the extent of flexibility and cohesion of the future EU? National legacies of High State Debt/ GDP ratio; Making hard choices between future further Current and reduced Capital Spending; Prospects of increasing inflation and rising interest rates.

If there is belated political recognition then there will be more positive emphasis on the opportunities to grow our cities. The potential for our provincial cities to contribute to overall economic growth has remained largely unexploited in Ireland's spatial policy strategy to date. Buchanan was rejected in 1970 and the National Spatial Plan of 2002 was fundamentally anti-city despite its empty rhetoric. Therefore the forthcoming National Planning Framework will provide the opportunity to rectify past policy weaknesses so as to provide new directions for top-down city-led growth to the regions. In doing this Irish policy-makers and politicians may contribute to reversing the decline in rural areas.

On their own, bottom-up attempts to arrest this decline, have been both unrealistic and largely unsuccessful. They have been based on futile balanced regional development idealisms, devoid of economic or financial direction. Whereas one is not dismissive of effective bottom-up initiatives, increasingly top-down concentrations of 'lumpiness' are the way forward as heralded by the World Bank (2009), if they are focused on city-led initiatives, evidence-based on the compelling theories of urban economics and of the new economic geography (NEG).

Alongside this is the need to devise a positive, yet careful EU approach to European and world migration which needs to be addressed in ways that accommodates refugees and economic migrants without unduly disrupting the economies and populations of recipient countries in the first world. Whilst recognising the evidence of urban overdevelopment, Japan is proof positive of the benefits that derive from fostering urban agglomeration and in availing of the economies that arise from urban densification and for urban technology. This for Ireland must also be the desired spatial policy approach.

Ireland's considerable potential for growth arises from a number of attributes, recognising its uniquely low density of population and educational attainment, albeit significantly handicapped by the absence of sizeable cities. We have pointed to Ireland's positive demographic trend despite the economic collapse of the first decade of this new millennium and to unavoidable austerity

impositions. This paper is premised on 'optimism'; the by-word of Ireland's man of the 20th Century, T.K. Whitaker. The Republic of Ireland, hopefully, can and will remain as a committed member of the European Union as its principal and only English-speaking nation.

This research also recognises the geographic opportunities resulting from Ireland's unique international location – within the east/ west UK to US and Canadian economic sphere of the world's major English speaking nations. As to the possibility of RoI's National Planning Framework espousal of a policy for Irish city-growth, its authors should heed Fujita et al. (2001, 31) ...*The interaction between economies of scale and endogenous market size can lead to a cumulative process of agglomeration.* Earlier, Kaldor (1940) in what is known as Kaldor Improvements had found that ... *Agglomeration with compensation from core to periphery can make both regions better off when trade costs are sufficiently low.* This provides a strong message for scale economics and freeness of trade.

Given the medium-term uncertainties facing both Ireland's economy, the legacy of its financial debt and the need for a radical change in its spatial strategy, there is the need to provide a political leadership that is able to recognise past policy errors so as to avoid repeating the same mistakes out to 2040. Ireland must therefore plan for what is likely to succeed rather than continuing to strive for what is certain to fail. This requires an acute understanding of Demographic Trends, of Urbanisation, Densification, Agglomeration and Lumpiness which must replace the unattainable myth of 'balance'.

Thus the leadership, to both cherish and recognise the potential of Ireland's cities – with their spatial and economic policy opportunities – so as to deploy related theories and techniques that have developed world-wide, not least those of Japanese urban scholars, not least those pioneering Urban Economic achievements of Masahisa Fujita.

I wish to thank my DIT colleague Dr Lorcan Sirr for his review of this Paper and for his kind assistance in the preparation of the accompanying Powerpoint Presentation and finally, to Dr Lorna Carson, Director of the Trinity Centre for Asian Studies, Trinity College Dublin, for the opportunity to present this Paper to the Eco-Urbanites Symposium, January 2017.

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Appendix 1

The Eight Key Concepts of Balanced Regional Development in the 2002-2020 NSS

- The key concepts (of the NSS) are potential, critical mass, gateways, hubs, complementary roles and linkages.
- Potential is the capacity that an area possesses, or could in future possess, for development, arising from its endowment of natural resources, population, labour, its economic and social capital, infrastructure and its location relative to markets.
- Critical mass relates to size and concentration of population that enables a range of services and facilities to be supported. This in turn can attract and support higher levels of economic activity and improved quality of life.
- Gateways have a strategic location, nationally and relative to their surrounding areas, and provide national scale social, economic infrastructure and support services. Further development of the five existing gateways at Dublin, Cork, Limerick/ Shannon, Galway and Waterford is a key component of the NSS.
- In addition, a small number of other large towns, which have the potential capacity to become gateways and lead development in their regions, will play a key role in achieving a more balanced role in regional development.
- Hubs: A number of towns will act as hubs, supporting the national and international role of the gateways and in turn energising smaller towns and rural areas within their sphere of influence.
- Complementary roles for other towns, villages and rural areas; various medium-sized towns in each region will act as 'local capitals' providing a range of services and opportunities for employment. Within the spatial framework provided by the NSS, rural potential will draw upon local economic strengths, supported by a stronger structure of smaller towns and villages as a focus for economic and social activity and residential development.
- Linkages in terms of good transport, communications and energy networks are vitally important to enable places and areas to play to their strengths.

Source: The National Spatial Strategy (2002-2020: 12)

A Note on Ireland's Political Decision-Making: The recent negotiations between Ireland's two main political parties, regarding the extent to which rent control should apply to urban areas, provided interesting insights as to why 'scientific' evidence and research should be allowed to outweigh the 'political' reasons for making such decisions. In a similar manner, scientific research should be applied when the selection of growth centres considered by the Government for the forthcoming National Planning Framework.

Nowhere in this heated and controversial debate, to date, has there been evidence from like-minded Irish politicians of appreciating the spill-over effects that cities play in benefiting their regional spheres-of-influence. Neither do they appear to understand the top-down endowments that are central to the core-peripheral growth of successful city regions which underwrite the dynamics of urban economics, of central place theory and of the new economic geography findings which underscored Paul Krugman's Nobel Prize award for economics achievements of 2008.

Balanced Regional Development as a spatial and economic policy has singularly failed to acknowledge why cities exist and the urban agglomeration reason for their growth. Ireland's demographics confirm that it has encouraged the proliferation of one-off housing, small towns and villages to the detriment of city concentration and growth-centre formation, advocated by The World Bank in 2009.

Likewise, there has been a critical political failure to acknowledge that rural living and their associated sparse populations imply enormous costs to the State, the Private Sector and to the taxpayer of the inordinate costs in maintaining services: to unviable branch banking and post offices, rural one and two-classroom schools, 'scattergun' broadband provision, garda stations, the ambulance service, GP practices as well as the upkeep of the inordinate length of Ireland's rural road structure. It has also reinforced Ireland's political system in perpetuating 'clientalistic' parliamentary politics at the expense and neglect of pressing policy formation and legislation enactment.

Given the five-fold or €160 Billion *increase* in the State's National Debt over the past decade as well as private citizens' debt burdens and likewise of their long-term cost of servicing, Ireland now needs to focus its increasingly limited resource of current and fixed capital expenditure into a few centres for growth rather than in continuing to practice 'Balanced Regional Development' with its implicit, failed 'one for everyone in the audience' approach. Instead, future policy formulation will have to foster Specialisation and long-run location of activity that fuses the Fujita and Krugman approaches to Trade Theory with Economic Geography.

Specifically, there is an urgent need to reduce the ever-widening population disparity between Dublin's 1.17 million population compared with just 110,000, the average size of the State's four provincial cities. In turn, such substantially-enlarged cities would provide the necessary gravity mass of 'lumpiness' and would then be in a much better position to benefit their regions and to then become the dynamic cores to create enhanced employment and rectify the demographic imbalances that currently prevail outside of the Greater Dublin Area.

The standing down of the 2002-2020 National Spatial Strategy was primarily due to its inappropriate core policy of *Balanced Regional Development* when applied to a sparsely populated country. We need to continuously remind our politicians of their past calamitous decision-making including their rejection of the principal recommendations of the Buchanan Report for city growth in 1969 and the 2003 debacle for 'scattergun' Public Sector Decentralisation.

APPENDIX 2

Apropos this Paper's reference to Ireland's recent population dynamics. Shown below are the contrasting Regional performances of both the Census populations (2011 and 2016 (Preliminary)) together with the varying regional contributions to growth for that five-year period to April 2016.

Table: Irish Planning Regions - Population Growth, 2011-2016

	Census 2011	Census 2016 (Prel.)	Population Growth	% regional population growth rate	Population Growth % contribution
Dublin	1,273,069	1,345,402	72,333	5.68%	42.62%
Mid East	531,087	559,404	28,317	5.33%	16.68%
Midlands	282,410	291,941	9,531	3.37%	5.62%
South East	497,578	511,070	13,492	2.71%	7.95%
East Border area	<u>256,563</u>	<u>265,740</u>	<u>9,177</u>	<u>3.58%</u>	<u>5.41%</u>
East of State	2,840,707	2,973,557	132,850	4.68%	78.27%
South West	664,534	689,750	25,216	3.79%	14.86%
Mid-West	379,327	385,172	5,845	1.54%	3.44%
West	445,356	453,413	8,057	1.81%	4.75%
West Border area	<u>258,328</u>	<u>256,084</u>	<u>-2,244</u>	<u>-0.87%</u>	<u>-1.32%</u>
West of State	1,747,545	1,784,419	36,874	2.11%	21.73%
State	4,588,252	4,757,976	169,724	3.70%	100.00%

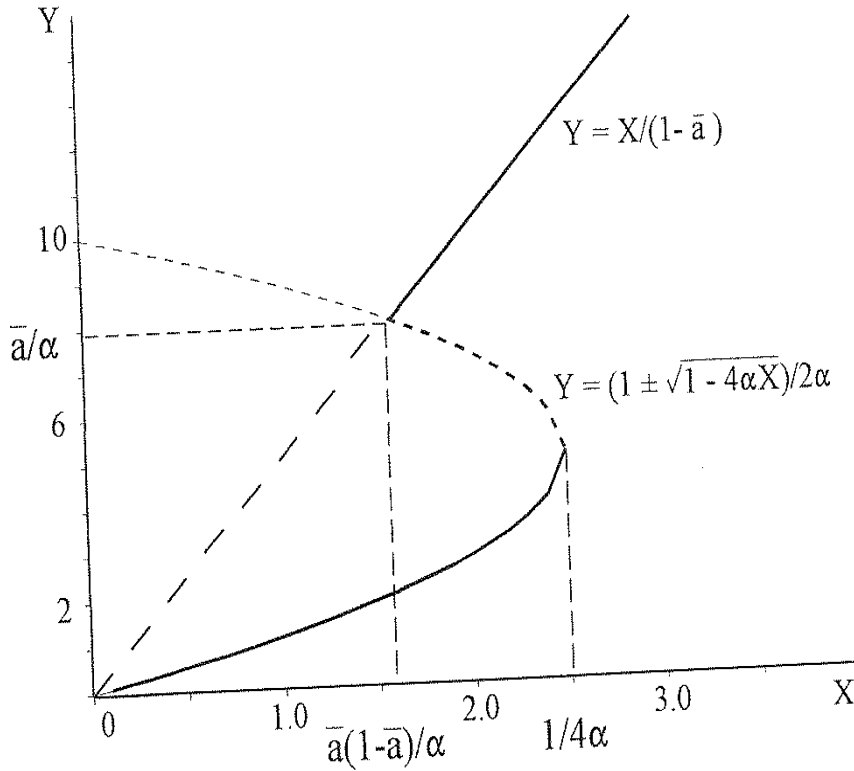
Source: Brian Hughes analysis of CSO 2011 Census and 2016 CSO Preliminary Census data.

Note: East Border includes Louth, Cavan and Monaghan; West Border comprises Donegal, Sligo and Leitrim. The corresponding all-Border Region figures are: 514,891, 521,824, 6,933, 1.35% and 4.08%, respectively.

During 2011-2016 the Greater Dublin Area alone, comprising the Dublin and Mid East regions, contributed 59.30% of the total State growth. Of note in the above data, is the contrasting east-west performance to State population growth; 78.27% versus 21.73%. The 2016 census also confirms a return to net in-migration and thus previous intercensal growth rates can be expected to resume. For instance, in 2002-2006 the State population grew by 322,645 (+8.26%) and during 2006-2011 it was up by a further 348,404 (+8.22%). Thus, in the nine years to April 2011, the State population grew by 671,049 (+17.13%) above the 2002 level, as confirmed in these twenty-first century censuses.

Appendix 3

Figure 7.2: Equilibria in the Base Multiplier Model of Fujita *et al.* (2001: 29)



In this quadratic-based equation model approach to depicting a growth-shift stimulation, it is noted that after the 'break point', equating to 1.6 on the 'X'-axis is reached, then the former sedate slope of the settlement's growth curve below that point, is followed by a leveraged and sudden 'jump' from 2 to 8 on the 'Y'-axis, its 'multiplier' effect. Following that burst of growth, a significantly steeper growth progression ensues; as depicted by the forty-five degree angle of the post-bifurcation event, as shown by the thick black line, occurring after the 'sustain point' is reached.

In turn, this theory adds support to explain Dublin's current emergence of economic buoyancy, coming on top of that settlement's unexpected, near-65,000 population increase (2006-2011) and even larger one of 72,300 (2011-2016). If this is the case, is it then possible to envisage for the future, a replication of such a multiplier 'shift' outcome for other cities – but most realistically for Cork, in developing Ireland's 'missing' hierarchical tier of 200,000 to 500,000 in settlement size?

Appendix 4

The complete matrix for the twin settlement of Drogheda and LBM confirms a grid formation in a north-south depth of ten kilometre rows. The respective core populations are set out in an ‘all-border’ format, comprising fourteen medium-density central grids totalling 11,297 in population for LBM, located east of and next to the twenty grids totalling 37,669 for Drogheda. In all, these adjoining 34 sq. km. grids comprise a **core** agglomeration population of 48,996 with an average density of 1,440 people per sq. km., set out as follows:

Drogheda-LBM 2011 census Population Spread – OSI Map Grid References:

<u>Grid cells</u>	<u>6/7</u>	<u>7/8</u>	<u>8/9</u>	<u>9/10</u>	<u>10/11</u>	<u>11/12</u>	<u>12/13</u>	<u>13/14</u>	<u>14/15</u>	<u>15/16</u>	<u>16/17</u>	<u>Totals</u>
79/80	131	54	86	9	28	107	58	97	40	37	-	647
78/79	26	6	27	59	58	84	52	83	5	-	-	400
77/78	20	17	61	16	449	153	79	65	99	-	-	959
76/77	74	219	2,643	3,308	2,423	10	5	80	489	306	-	9,557
75/76	1,212	1,534	3,226	3,553	823	5	46	112	275	1,059	-	11,845
74/75	1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	-	18,314
73/74	73	553	494	705	435	861	56	13	1,224	2,162	185	6,761
72/73	42	20	80	62	45	13	106	11	90	705	392	1,566
71/72	5	25	87	-	85	5	15	20	35	443	1,378	2,098
70/71	51	25	5	61	76	43	52	253	223	21	8	818

APPENDIX 5

Figure 3: Urban Clusters



After: [Strange](#) (2005)

A principal weakness of this NSS proposal for the midlands ATM gateway, is the absence of a nucleus as 'A' in the figure above, and for existing settlements or their size, there is little to indicate or encourage where development might take place. Mullingar's 'R' location is preferable in terms of Dublin's Sol proximity as is evidenced in its more rapid population growth. However, it has little current commercial or development activity, Curran (2008). It is uncertain how settlement spatial clustering could occur in the absence of a sizeable nucleus – where 'A' might represent, geographically, the towns of Clara with a population of 3,001 or perhaps even Moate having 1,888 people in the 2006 census - especially in a very low-density agricultural setting, with modest levels of industrial development activity and in an absence of tertiary-level agglomeration.

Walsh, in Bartley and Kitchin (eds) (2007: 52), whilst not specifically defining UA, articulates Dublin's critical mass in the context of local and regional potential, thus:

It has been defined as the size, concentration and characteristics of populations that enable a range of services and facilities to be supported and which, in turn, can attract and support higher levels of economic activity. The transformation that has occurred in Dublin since the early 1990s illustrates the importance of critical mass. Dublin's success has been assisted by its population size and structure, level of education, the availability of educational resources, the mix and clustering of different types of labour pools in niche sectors, transport links to other regions and countries, the informal network of people and expertise that provide the scale of critical mass to support rapid economic progress.

