



A Study of Religious Residential Segregation in Northern Ireland, 1981-2011

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Abstract

Using individual level census data along with a temporally consistent geography from the Northern Ireland Longitudinal Study (NILS) this paper sets out to investigate how the intensity and nature of religious residential segregation in Northern Ireland has evolved in the period between 1981 and 2011. The findings of this paper reveal that residential segregation levels increased sharply over the turbulent period of 1981 and 1991, remaining high until 2001, with levels decreasing in the most recent peaceful and politically stable time period leading up to 2011. These trends align with the Smith and Chamber's 'ratchet thesis' (1991) and the empirical findings of previous aggregate census based studies of segregation (Shuttleworth & Lloyd, 2009). Furthermore, long term religious compositional change has contributed to the Catholic community experiencing declining levels of exposure to Protestants thus becoming more isolated over time. As a product of its declining population and in the context of peace, the Protestant community is experiencing enhanced social contact with Catholics over time which has reduced historically high levels of isolation.

Keywords: *Religious residential segregation; ethno-national division, violence, Northern Ireland, religious population change.*

Stockholm Research Reports in Demography 2021:14

ISSN 2002-617X

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1.0 INTRODUCTION

Amidst the rising tide of inter-communal violence of the late 1960's and early 1970's a local field of residential segregation research arose to capture the impact intensifying violence was having on the socio-spatial separation of Protestants and Catholics (Poole and Boal, 1973, Doherty, 1989; Poole & Doherty, 1996). Faced with a lack of micro-level census data, researchers relied on the use of aggregate decennial census data. The results of these studies unanimously found that between 1981 and 2001 Northern Ireland's two religious communities were growing further apart in the housing market causing residential segregation intensity to rise (Boal, 1982; Doherty & Poole, 1997; Shuttleworth and Lloyd, 2013). In the post 2001 census era, Northern Ireland has undergone dramatic societal change which has saw the region return to relative peace encouraging greater economic prosperity, yet there has been a dearth in empirical studies on the scale and intensity of segregation. The lack of up-to-date evidence on segregation levels is unfortunate given the importance Northern Ireland's political and civic leaders have placed on tackling the structural problem of segregation which prohibits the inability to monitor progress (Byrne, Hansson, & Bell, 2006). With an overt focus placed on assessing the intensity of segregation over time, the local segregation field has overlooked the nature of residential segregation specifically how division is felt and experienced between and within groups members at the neighbourhood level. To address this research gap, this paper uses the NLS to take the pulse of segregation levels in Northern Ireland between 1981 and 2011. The paper seeks to accomplish this in a number of ways; firstly, the index of dissimilarity (D) is used to determine if and to what extent segregation levels have responded to changing levels of violence, in particular to increased peace and political stability in the under researched post-2001 era. Secondly, assess the impact a long-term growth of the Catholic population and a decline of the Protestant population has affected the nature of segregation. This will be achieved by investigating changing levels of within and between religious interaction using the isolation (xPx) and interaction (xPy) indices. This paper will be the first to assess residential segregation in a longitudinal setting which provides the benefit of a temporally consistent geography based on 2001 Super Output Area (SOA) boundaries which reduces the perennial problem of inter-census boundary changes.

2.0 BACKGROUND LITERATURE

2.1 Context

Since 1981, Northern Ireland has witnessed an unprecedented wave of political, demographic, social, and economic change (McDowell & Shirlow, 2011). Specifically, it has been the country's path to relative peace that warrants the greatest attention given the centuries long animosity that has existed between the Protestant and Catholic communities (Brewer & Higgins, 1998; McEvoy, 2000). Beginning in 1969, Northern Ireland entered into a period of unprecedented civil unrest which has become known as the 'Troubles' which lasted until the end of the 20th century (Balcells, Daniels, & Escribà-Folch, 2015). The 'Troubles' were characterised by frequent and violent outbursts between the two rival religious groups and state security forces, claiming the lives of some 3,532 people between July 1969 and 31st December 2001 (Sutton, 2002). The Troubles are said to have ended with the signing of the Good Friday Agreement in 1998, which paved the way for formal power sharing in 2007 through the restoration of the Northern Ireland Assembly. Notwithstanding the immense social and political progress made to date, decades of violence and animosity has left a long term physical and social imprint on society especially in the communities most affected by the Troubles (Hamilton, Hansson, Bell, & Toucas, 2008). The most visual of which has been the physical separation of Protestant and Catholics who live in largely separate residential areas demarcated by community specific territorial markers such as flags, murals and peace walls (Bryan & Gillespie, 2005). The most prominent of which are found in public authority housing estates, which also experienced the highest level of troubles related violence and deaths (Graham & Nash, 2006).

2.2 Societal Impact of Segregation

Residential segregation has been found to be detrimental to society at large and has been viewed to be a lasting obstacle to enduring peace and reconciliation. By its very nature, residential segregation prevents meaningful inter-religious social contact and mixing, instilling a ‘them’ and ‘us’ society, which negatively impacts on inter-community relations (McGrellis, 2004). This spatial and social distance can foment a sense of mistrust and misunderstanding that can quickly escalate, especially during community specific celebrations including Saint Patrick’s Day and the Twelfth of July (Byrne, Hansson, & Bell, 2006; Shirlow, 2001).

Furthermore, ongoing segregation and division continues to have a negative effect on a range of wellbeing outcomes. French (2009) found a clear spatial pattern between the intensity of residential segregation and the usage of anxiety and depression related medicines. After controlling for deprivation living in areas with high levels of segregation was correlated with a higher likelihood of receiving prescription medication for anxiety or depression, suggesting a link between poorer mental health and segregated areas (French, 2009). Similarly, Maguire and O’Reilly (2015) found that segregated areas with physical barriers, more commonly known as ‘peace walls’, increased the likelihood of being prescribed an antidepressant medication. Moreover, O’Reilly and Stevenson (2002) who surveyed 1,694 people and found that the quality of mental health was highly related to an individual’s or wider neighbourhood’s experience of the Troubles.

Tackling segregation and division has been viewed in policy circles as an “economic imperative” in the wider context of fiscal austerity (OFMDFM, 2005: 15). This is exemplified by a Northern Ireland Assembly commissioned study carried out by Deloitte (2008), which noted that segregation and division costs Northern Ireland an additional £1.5 billion each year (Deloitte, 2007: 88). This additional expenditure reflects the need for a larger, more sophisticated police force, a duplication of schools and teacher education institutions based on religious ethos, and the health costs relating to physical and psychiatric trauma from the Troubles (Deloitte, 2007). Segregation has been known to restrict economic opportunities by those who fear crossing segregated boundaries for employment this is exemplified by the Shankill-Falls peace lined which has restrictive opening times (Plöger, 2007).

2.3 Policy Context

Since its restoration in 2007, the Northern Ireland Assembly has pledged to tackle the structural problem of segregation in all its forms (OFMDFM, 2005). The first stimulus came through a report published in 2005 titled “A Shared Future,” which set out a visionary framework to achieving a more cohesive society that promotes and celebrates religious and ethnic diversity (OFMDFM, 2015). The report firmly opposed the historic approach of “separate but equal” which required the duplication of public services such as schools and leisure centres serving to sustain segregation. Instead, the report recommended the allocation of public services must be indifferent to the underlying religious geography (OFMDFM, 2005: 15). In a more recent paper published in 2013 titled ‘Together: Building a United Community’, policy makers further outlined specific proposals to tackle segregation, including the creation of 10 new shared neighbourhood developments, immediate reduction and eventual removal of all peace walls by 2023, and the provision for shared educational campuses (OFMDFM, 2009: 9). The Northern Ireland Housing Executive, a public body that oversees the management of social housing, has acted on its responsibility to deliver a more integrated society. The Housing Executive has adopted a two-pronged approach through the ‘Shared Future Housing Programme’ and the ‘Shared Neighbourhood Programme’ (NIHE, 2018). The ‘Shared Future Housing Programme’ promotes integrated living from the onset in new housing developments such as ‘Carran Crescent’ in Enniskillen built in 2006 (NIHE, 2018). The second approach under the ‘Shared Neighbourhood Programme’ is aimed at creating cohesive communities living in existing housing stock by celebrating differences and encouraging neighbours to sign a ‘neighbourhood charter’ (NIHE, 2018).

2.4 Theoretical Study of Residential Segregation

Religious segregation has existed in the North East corner of Ireland in what is now Northern Ireland for centuries; however, the formal study of this regional socio-geographical phenomenon is only a relatively recent development beginning in the 1950's (Clayton, 1998; Poole & Doherty, 1996). Throughout this time, academics have approached residential segregation from two main theoretical standpoints; the Chicago School of Sociology and behavioural geography.

The predominant body of residential segregation research both globally and locally has drawn on the theoretical and methodological grounding from the Chicago School of Sociology. Informed by ecology, a prominent theory put forward by Park (1952) argued that humans like other biological species have an innate desire to live amongst people of a similar biological or social trait such as religion, ethnicity, or social class who live collectively in defined areas known as 'natural areas' (Hess, 2001; Park, 1952). In the context of Northern Ireland, religion has acted as the main marker of inter-group differences. The seeds of this current division were sown during the Plantation of Ulster of the 17th Century, which saw a wave of mainly Scottish and English planters settle in the North Eastern Counties of Ulster (Bell, 2013; Brewer, 2003). From the outset, Protestants maintained a spatial and social distance from fellow Catholics in strategically located garrison towns such as Enniskillen and Londonderry to ensure maximum safety from the possible threats of rebellions.

A common misconception surrounding the religious division and conflict in Northern Ireland is that it is rooted in purely theological differences between the two groups. Instead, academics such as Boal (1987) have argued that Protestant and Catholic identities should be framed as 'ethno-national' identities. Religious affiliations act as poles around which deeper layers of identity coalesce including culture, national identity, and political allegiances form. The most important are cultural and national differences, with Protestants connecting with a British identity whereas Catholics with an Irish identity, which has given rise to competing, and opposing claims of nationhood. Boal and Livingstone (1984) reason that territory in contested regions, such as Northern Ireland, can take on new meanings with segregation coming to represent a 'microcosm of national division' (Boal & Livingstone, 1984: 175). Thus, segregation allows the two ethnic communities to maintain their cultural identity and reaffirm their national allegiances irrespective of the overarching constitutional position of the country (Boal & Livingstone, 1984: 1975). Similarly, Anderson (2008) outlines how interfaces are not

just “proxies in the political fight over disputed state borders which are some distance from the city” rather they are fully part of the dispute itself (Anderson, 2008: 20). The ethno-national interfaces are even more significant than the Irish border.

Theories from the field of behavioural geography have also been influential in understanding why residential segregation levels change over time. This second strand of residential segregation research has sought to frame changes in segregation patterns as a behavioural response to wider political events and violence reflective in the types of areas people migrate from and to. Boal and Livingstone (1983) is credited as being the first to apply behavioural geography in the Northern Ireland context by drawing on the ‘frontier’ thesis to conceptualise the link between violence and residential segregation. The authors reason that heightened violence induces a behavioural response amongst residents of religiously mixed areas to feel more insecure and unsafe, which initiates migratory flows toward respective religious heartlands that consequently increases segregation levels (Boal and Livingstone, 1983). The authors focus on Cupar Street in West Belfast, once a religiously mixed area, precariously positioned between Protestant Shankill road and the Catholic Falls road. With the onset of violence during 1969 residents fled, leaving the area to become something of a ‘no man’s land’ (Boal & Livingstone, 1983). Similarly, Darby (1986) found that during the initial phase of the troubles heightened violence and fear caused ‘refugee like movements’ of people moving to areas where their religion dominated, which resulted in de-mixing and greater residential segregation. Surmising the body of work to date, Smith and Chambers (1991) used the term ‘ratchet effect’ to describe the pattern of segregation rising during periods of violence and declining during peace times. Based on this logic one would expect segregation to have declined since the signing of the Good Friday Agreement in 1998. The link between violence and segregation is a self-perpetuating one, as increasing violence often contributes to a greater sense of insecurity and distrust which often leads to segregation, increased segregation and a lack of contact and common knowledge and understand sows the seeds for enhanced violence (Boal. 1982; Byrne, 2006).

2.5 Religious Population Change

Religious demography lies at the heart of Northern Ireland's foundation, which in 1921 was predicated on having an inbuilt two-thirds Protestant majority (Ollerenshaw, 2013). In the decades that followed the establishment of Northern Ireland, the Catholic minority posed no demographic threat to the Protestant political establishment. A historically high Catholic fertility rate, well above replacement levels was counteracted by an outflow of young emigrating Catholics in a process known as the demographic 'safety valve' (Compton, 1982: 91). The natural demographic safety valve ensured that the traditionally less fertile Protestant population maintained its majority position continuing to elect Unionist members of Parliament, administering pro Unionist policies.

The winds of demographic and social change began to blow amidst the growing destabilisation of the world economy during the late 1960's and 1970's. With a sharp decline of traditional manufacturing in Western economies such as mainland Britain, America and Canada, the economic returns once afforded to young emigrating Catholics no longer held true. Instead, young and unemployed Catholics choose to remain in Northern Ireland. With the demographic overflow mechanism beginning to shut down, the Catholic population within the region began to grow (Compton, 1985; McGregor & McKee, 2016). Given that elections in Northern Ireland are treated as informal referenda on the constitutional integrity of NI, a growth in the Catholic share of the electorate has prompted public discussion over the constitutional future of NI (Anderson & Shuttleworth, 1994).

3.0 DATA

This paper makes full use of individual level census data accessed from the safe setting of the Northern Ireland Longitudinal Study (NILS). The NILS sample is made up of c.28% of the Northern Ireland population (approximately 500,000 people). Members are added to the NILS study based on two preconditions; firstly, that the individual has a valid health card which is managed by the Health and Social Care Business Services Organisation (O'Reilly, Rosato, Catney, Johnston & Brolly, 2012). Secondly, the individual must have a birthdate that matches one of the 104 random dates dispersed across the year (O'Reilly, Rosato, Catney, Johnston & Brolly, 2012). After selection, each NILS member's health card data is linked to census and administrative data. The decennial census data provides a vast amount of detailed individual and household level data which reflects the range and depth of questions asked at each census, including the NILS member's current religion. To ensure temporal comparability, the religious data was categorised into the three broad categories of 'Protestant and other Christian', 'Roman Catholic' and 'no religion'. Members belonging to 'Other' religions and faiths have been excluded on the basis that this category was not included in the 1981 census, preventing temporal comparisons to be made.

To counteract the problem of inter-census boundary changes, the 2001 Super Output Area boundaries have been superimposed on previous ward boundaries for 1981, 1991, and subsequent SOA reconfigured boundaries in 2011. Whilst providing detailed socio-demographic information, the decennial data does suffer from limitations, the most serious of which is under enumeration. Under enumeration from non-response was a problem most associated with the 1981 census and to a lesser extent in 1991. The situation arose as a result of a large minority of the Catholic population especially in working class areas refusing not to complete either the entire census form or refusing to declare a religious affiliation (Compton & Power, 1986). The opting out of the census by a section of the Catholic community reflected anger surrounding the hunger strikes of 1981, Irish Republicans felt they had the legitimate right not to complete a British census form. Having considered this limitation, the paper proceeds to draw on data relating to members who have declared their religious identity which falls into the three categories of 'Catholic', 'Protestant' and 'no-religion'.

4.0 METHODOLOGY

4.1 Conceptualising and Measuring Residential Segregation

In their extensive review of the global residential segregation literature, Massey and Denton (1988) conceived of segregation as an inherently multidimensional phenomenon. Massey and Denton (1988) recognised that segregation can be experienced and felt differently between and within social groups. Accordingly, Massey and Denton (1988) proposed five dimensions along which segregation can be conceptualised and measured, consisting of: evenness, exposure, concentration, clustering, and centralisation. Given that this study is a Northern Ireland wide examination of residential segregation, the paper will restrict the analysis to the dimensions of population evenness and social exposure, excluding the urban based dimensions of population concentration, clustering and centralisation.

4.2 Population (Un)evenness

To quantify the degree of spatial(un)evenness between the Protestant and Catholic communities the paper will draw on the Index of Dissimilarity (*D*). The Index of Dissimilarity (*D*) has been the dominant measurement of segregation locally (Doherty, 1989; Doherty and Poole, 1997; Shuttleworth & Lloyd, 2009; Maguire, French, & O'Reilly, 2016), nationally (Sabater, 2008) and internationally (Massey, Rothwell, & Domina, 2009; James & Taeuber 1985). The index measures the proportion of a group that would be required to move residence in order to produce a spatially uniform distribution to that of the group being compared (Peach, 1975). A key feature of the index according to Sabater and Finney (2015) relates to the index being “invariant to the size of the populations being studied” (Sabater & Finney, 2015: 274). This feature is particularly beneficial to the context of Northern Ireland where long term religious population change has taken place.

The index of dissimilarity formula is expressed as;

$$D = 0.5 \sum_{i=1}^n \left(\frac{x_i}{X} - \frac{y_i}{Y} \right) \quad (1)$$

where x_i and y_i are population counts for the two religious' groups in SOA unit i , of which there are $n=890$. X and Y are the respective total population counts for the two groups across Northern Ireland. The index is expressed as a score ranging from 0 indicating complete population evenness across space between two groups which indicates the absence of

segregation. Scores close to 1 indicates a degree of spatial unevenness between two populations across space.

To complement the between group analysis, the paper will also use an adjusted form of D known as the segregation index (IS) which measures single group population unevenness. The segregation index' (IS) conceived by Duncan and Duncan (1955) is computed by calculating the evenness of a group compared with the rest of the sub-populations combined (Duncan and Duncan, 1955: 494). This enables the paper to compare levels of spatial unevenness between the main religious and non-religious groups separately over time.

The segregation index formula is expressed as;

$$IS = 0.5 \sum_{i=1}^n \left(\frac{x_i}{X} - \frac{t_i - x_i}{T - X} \right) \quad (2)$$

where x_i are the number of Protestant/Catholics in SOA i and t_i represents the total number of people in SOA i . T represents the total number of Protestants and Catholics and X the total population in all 890 SOAs. Important to note that the segregation index will be calculated for the Protestant and Catholic communities separately. Like the Index of Dissimilarity, a score close to 0 indicates that a group is evenly distributed across space, and a score of 1 indicates a high degree of spatial unevenness.

4.3 Population Exposure

Incorporating Massey and Denton's (1988) dimension of exposure provides an opportunity to gain an insight into how residential segregation is felt and experienced by the average person at the neighbourhood level (Doherty and Poole, 1997). The paper will use two variants of Liberson's (1954) P^* exposure index which includes the single group isolation index (xP^*x) and the multi-group interaction index (xP^*y). The isolation index measures the probability that a member of a given group will meet other members of the same group in a neighbourhood (Massey & Denton, 1988). Using this approach, the paper will be able to calculate the changing levels of isolation exhibited by each religious community over time.

The isolation index formula is as follows;

$$xP^*_x = \sum_{i=1}^n \left(\frac{x_i}{X} - \frac{x_i}{t_i} \right) \quad (3)$$

where x_i is the population count for a given group in SOA unit i , X represents the total population of the group under investigation, and t_i reflects the total population of all groups found in area i .

The second variant of Liberson's P^* - the interaction index, measures the level of interaction between members of different groups. The index measures exposure asymmetrically, capturing how segregation is felt and experienced from the perspective of different groups. Unlike the index of dissimilarity, Liberson's interaction index is solely dependent upon the group's population size (Robinson, 1980:307). The amount of contact by group A with group B is not the same for group B with group A.

The interaction index was calculated using the following formula;

$$P^*_x = \sum_{i=1}^n \left(\frac{x_i}{X} - \frac{y_i}{t_i} \right) \quad (4)$$

where x_i and y_i are population counts for two groups in areal unit i , X represents the total population of a given group and t_i reflects the total population of all groups found in area i .

5.0 RESULTS

5.1 Religious Demographic Change

As a prelude to the main analysis, the paper will first take time to recognise the immense shift of the religious makeup of Northern Ireland's population over the past 40 years. Northern Ireland is highly unique in a UK and Western European context with 93.5% of its population at the time of 2011 census identifying themselves as either Protestant or Catholic. The figures draw attention to the importance religion plays in structuring everyday life in the country (Anderson & Shuttleworth, 1994; Doherty & Poole, 1997).

Empirical confirmation of a long-term religious demographic change is confirmed by charting the changing religious signature of the NLS study between 1981 and 2011. The results depicted in table 1 shows that the proportion of Protestants in the NLS study has declined from 52.9% in 1981 to 42.7% in 2011. Meanwhile, the Catholic share of the NLS study has increased from 28.4% in 1981 to 41% in 2011, the shift in religious population dynamics has helped to close the differential between the two communities over time. The relatively low proportion of Catholics in the 1981 census in the NLS is partly explained by a significant minority of Catholics failing to declare a religious identity or not completing the census form. The true size of the Catholic population is likely to be larger than what has been reported here. The size of the non-religious population increased from 11.1% in 1991 to 16.3% in 2011, making it Northern Ireland's fastest growing community. However, given the unique challenges of the 1981 census, it is likely that the growth of the non-religious population would have been greater.

Table 1: Population size by religious and non-religious communities.

Community	1981		1991		2001		2011	
	Count	%	Count	%	Count	%	Count	%
Catholic	96608	28.4	169792	38.8	182193	40.5	196352	41
Protestant	179906	52.9	218713	50	211575	47	204736	42.7
No Religion	63521	18.7	48644	11.1	56285	12.5	78000	16.3
Total	340035	100	437149	100	450053	100	479088	100

5.2 Population (Un)evenness

The first half of the segregation analysis will be devoted to the exploring population unevenness as an indicator of the changing intensity of segregation between the two communities using the index of dissimilarity (D) and separately for each community using the Segregation Index (IS). The results in table 2 establishes that Northern Ireland's housing market is undoubtedly segregated along religious lines, however the degree of segregation is not as extreme as that presented and sensationalised by the media (Anderson & Shuttleworth, 1998). Based on Poole and Doherty's (1996) classification, Northern Ireland narrowly meets the requirements for the region to be classified as highly segregated defined as a score above 0.6. Except for 1981 when D was at the very upper limit of the moderately segregated category, the remaining years of 1991, 2001 and 2011 were narrowly in the highly segregated category (Massey & Denton, 1993; 13).

Table 2: Index of Dissimilarity (D) by census year.

	1981	1991	2001	2011
Protestant/Catholic	0.59	0.63	0.64	0.61

Inspection of table 2 also shows that there are three time periods each with distinctive segregation levels. The first period between 1981 and 1991 witnessed an increase in the degree of spatial unevenness between Protestants and Catholics with D increasing by 0.4 from 0.59 to 0.63. The increase points to a growth in the degree of spatial and social polarisation arising from the two communities occupying different residential spaces. In the second time period between 1991 and 2001, there was a marginal increase to the already high levels of population unevenness between Protestant and Catholic communities. The increase is barely detectible with D rising from 0.63 to 0.64. Lastly, in the most recent time period between 2001 through to 2011, the degree of population unevenness declined by with D decreasing from 0.64 to 0.61. The decline is indicative of declining residential segregation intensity. Whilst segregation levels did decrease, they still remain above the levels experienced in 1981.

5.3 Segregation Intensity by Religion

Utilising the Segregation Index (*IS*), the analysis will now turn to comparing the levels of population (un)evenness separately for the main Northern Ireland's religious and non-religious communities. Applying Massey and Denton's (1993) segregation continuum to the *IS* results presented in figure 3, it is clear that the Protestant and Catholic communities are unsurprisingly highly segregated. In contrast, the non-religious community displays low levels of segregation which demonstrates that individuals of no faith are more evenly distributed across Northern Ireland's 890 SOAs. Inspection of table 3 highlights that Catholics are consistently more unevenly distributed across NI compared with the Protestant community. The forthcoming temporal analysis shows that this differential has accelerated over time. Between 1981 and 1991, a period which saw segregation rise between Protestants and Catholics, the Catholic population became much more segregated at a faster rate compared with the other communities. In keeping with the results of the index of dissimilarity, there are signs that from 1991 that both Protestants and Catholics are becoming less segregated, dispersing out of areas of high concentration.

Table 3: Segregation Index (*IS*) by community.

Segregation index (<i>IS</i>)	1981	1991	2001	2011
Catholic	0.51	0.61	0.6	0.56
Protestant	0.49	0.52	0.51	0.49
No Religion	0.16	0.21	0.24	0.21

5.3 Social Exposure

The second half of the segregation analysis will proceed to explore how the nature of segregation has changed. The analysis will centre population exposure which incorporates the use of the isolation index (P^*x) to gain a better understanding of the changing levels of social interaction between the two main religious communities have changed along with the use of the isolation (xP^*x) to measure intra-group social contact (xP^*x).

Results from the computation of the single group isolation index (xP^*x) show that during the initial stage of the study period between 1981 and 1991, Protestants were more isolated than Catholic counterparts. However, by 2001, a trend reversal took place which saw the Catholic community eclipse Protestants in becoming the most isolated group in 2011. In practical terms this means that at the neighbourhood level the average Catholic is having more contact with fellow Catholics than with members of other communities. In comparison, Protestant isolation levels have remained largely stable, reducing slightly which indicates lower levels of intra-Protestant contact. In keeping with the results of the other indices, NILS members of no religion or faith were considerably less isolated than those affiliated as either Protestant or Catholic, with levels dipping to a low in 1991 and rising slightly to a peak in 2011. From 2001 onwards both the Protestant and Catholic communities are experiencing declining levels of isolation, indicative of reduced segregative behaviour.

Table 4: Isolation Index (xPx) by community.

Isolation Index (xPx)	1981	1991	2001	2011
Catholic	0.5	0.66	0.66	0.63
Protestant	0.67	0.67	0.64	0.6
No Religion	0.21	0.13	0.15	0.19

The interaction index (P^*x) will be used as an indicator of the changing levels of social interaction between Protestants-Catholics in a typical SOA over time, which reveals a number of noteworthy findings. Firstly, across the entire study period, Catholics have a higher chance of coming into contact with a Protestant than the level of contact by Protestants with an individual belonging to the Catholic community. This finding reflects the underlying demography of the region, with Protestantism being the largest religious community and therefore can be found in greater numbers across a greater number of SOA's. Secondly, in terms of change over time, the level of interaction by Protestants with Catholics has increased, whereas the level of

interaction by Catholics with Protestants has decreased. Thirdly, the net effect has been a convergence in levels of social interaction, creating almost equal experiences.

Table 5: Interaction Index (P*x) by community.

Interaction Index (P*x)	1981	1991	2001	2011
Interaction Index C-P	0.28	0.25	0.23	0.23
Interaction Index P-C	0.16	0.19	0.2	0.22

6.0 DISCUSSION

An investigation of residential segregation over the four census time periods using the index of dissimilarity revealed three distinct phases of segregation intensity which provides empirical confirmation to Smith and Chambers' (1991) 'ratchet' thesis. Amidst continuing violence of the 'Troubles', segregation levels increased between 1981 and 1991. The results from this paper correspond to findings from earlier aggregate census-based studies (Doherty & Poole, 1997; Shuttleworth & Lloyd, 2009). The increasing spatial polarisation between the Protestant and Catholic communities can be partly explained by the role of internal migration in a highly volatile and hostile context. Internal migration has been cited as an important mechanism driving the growth of segregation. Violence directly and indirectly initiated 'refugee like' movements as people fled for safety to their respective religious heartlands, shaking up the underlying religious geography of Northern Ireland (Boal, 2002; Darby & Morris, 1974). Separation was also compounded by the construction of physical barriers between the two communities hindering potential for meaningful religious residential mixing.

In keeping with the analogous 'ratchet', segregation remained persistently high in the 1991-2001 period, a trend also observed by Lloyd and Shuttleworth (2009). Whilst violence reduced considerably, tensions remained high as both communities entered into a period of high stakes political negotiations surrounding the Good Friday Agreement in 1998. A key area of novelty for this paper was researching the understudied 2001-2011 period which revealed a modest decrease in residential segregation levels between Protestants and Catholics. The decline in segregation in the post Good Friday Agreement era accords with recent findings from the Northern Ireland Life and Times Survey (NILTS) which indicates a growing willingness across

the population to live in religiously mixed areas (ARK, 2016). Importantly, segregation levels in 2011 remain above 1981 levels which confirms a point raised by Boal (1981) that once established, residential segregation is very hard to eradicate, an experience shared by the United States where after decades of after the civil rights movement segregation remains high (Shapiro & Kenty-Drane, 2005).

In terms of intra-group behaviour, the level of segregation for the Protestant and Catholic communities is significantly higher than that observed by the non-religious community. Between the two main communities, Catholics are more unevenly distributed across NI, long with observing a greater increase in segregation over the 1981-1991 and 2001-2011 periods. The finding that the Catholic population is more segregated is reflective of the underlying geography with the presence of area with high concentrations of Catholics in locations such as West Belfast, Londonderry, West Tyrone and Moyle where there is an absence of Protestants and those of no religious faith. Whilst still unevenly distributed across Northern Ireland, Protestant areas of high concentration such as East Belfast, North Down and Coleraine contain a minority population of both Catholic and non-religious populations helping to reduce the overall degree of spatial unevenness score. In accordance with the index of dissimilarity both communities observed an equal drop in unevenness between 2001 and 2011 which points to the role of peace and relative stability on the aggregate population.

The second explanation centres on the role of religious population change both in terms of relative populations numbers and socio-economic performance. Demographic change can alter the composition of areas and in turn the aggregate levels of segregation in two main ways. Firstly, as a highly selection process internal migration has the potential to shift and sort different groups of people into different neighbourhoods. As the Protestant population has aged and experienced a greater number of deaths, a growing number of vacant homes have become available in areas once considered 'Protestant'. Occurring at the same time, a younger and more fertile Catholic population has grown, and given the lack of available housing in Catholic areas, Catholics have spread their geographical house search to include majority Protestant areas. This trend is most pronounced amongst upwardly mobile Catholics who are more willing to migrate to Protestant middle class areas devoid of religious trappings such as flags, painted kerb stones and murals. This is articulated in McPeake's (1998) qualitative analysis of residential search behaviour within the greater Belfast area found a growing willingness by upwardly mobile Catholics to search for potential homes in the predominantly Protestant suburbs of South Belfast and Lisburn (McPeake, 1998).

Religious demographic change has also impacted the way in which segregation is being felt both between and within communities over time. Results confirm that from 1981 to 2011, the Catholic community has experienced greater intra-group isolation and the Protestant community less so. Doherty and Poole (1997) and more recently Dorling (2011) also observed a similar pattern of increasing Catholic isolation. Doherty and Poole (1997) attribute this phenomenon to be the result of population change stating that “the average Catholic has been living in a progressively more Catholic environment since 1971 but the average Protestant has not been living in a more Protestant environment” (Doherty & Poole, 1997: 527). In practical terms this means that Catholics are more likely to meet fellow Catholics in any given area in NI. The effects of religious change can also be detected by following temporal change in the level of social interaction between Protestants and Catholics. It was found that Catholics are having progressively less contact with Protestants and Protestants greater contact with Catholics over time. A similar pattern of differential population change changing inter-group contact has been observed in the United States and Great Britain. Iceland and Sharp (2013) found that a decline of the White American population corresponded to a decline of isolation levels meanwhile a growth of the Hispanic and Asian communities caused social isolation to increase amongst these groups. Likewise, Lupton and Power’s (2004) analysis of inter-racial contact in the US noted that Whites are coming into greater contact within non-Whites as a result of ethnic suburbanisation, a trend also noted by Iceland and Sharp (2013). Charles (2013) comparison of exposure levels between 1980 and 2000 found that Hispanics and Asians have declining levels of exposure with Whites, meanwhile the level of exposure by Whites with other groups has increased. With a decline in the index of dissimilarity and segregation index displayed by both communities, other causes such as behavioural shift by the Catholic community towards greater segregation can be ruled out. This means that as the Catholic community grows it will have a greater role in shaping the segregation dynamics of Northern Ireland, in a similar way Protestants have done as the majority group in previous decades.

7.0 CONCLUSION

With access to individual level census data along with a consistent geography, results from this paper have theoretically confirmed the central tenant of the ‘ratchet thesis’ that segregation is highly sensitive to the prevailing level of violence (Smith & Chamber, 1999). Residential segregation levels increased during the turbulent 1981-1991 period, with levels remaining persistently high during the politically tense 1991-2001 period. With access to the 2011 census data this study has been able to empirically confirm that residential segregation has declined since 2001, responding to relative peace and stability. This shows that the NLS is a representative study which accords with previous studies using aggregate based census data which confirms the usefulness of both sources of data. In addition to the intensity of segregation, the nature of segregation at the neighbourhood level has also changed between 1981 and 2011. The most important finding relates to the Catholic community becoming more isolated over time and experiencing less contact with fellow Protestants. This paper attributes this temporal development to the long-term demographic shift which has saw the average SOA become more Catholic and less Protestant over time.

Acknowledgments

The author would like to thank the help provided by the staff of the Northern Ireland Longitudinal Study (NLS) and the NLS Research Support Unit is acknowledged. The NLS is funded by the Health and Social Care Research and Development Division of the Public Health Agency (HSC R&D Division) and NISRA. The NLS-RSU is funded by the ESRC and the Northern Ireland Government. The author alone is responsible for the interpretation of the data and any views or opinions presented are solely those of the author and do not necessarily represent those of NISRA/NLS. I would also like to thank feedback provided by Dr Ian Shuttleworth and Dr Cate McNamee from Queen’s University Belfast and Professor Gunnar Andersson from Stockholm University. This work was supported by the Queen’s University Alumni PhD Scholarship.

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