

## Article

# Demographic Instability as a Barrier to Remote Economic Development in the North: Are Cities the Answer?

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**Abstract:** Remote and sparsely populated northern peripheries in Australia, Europe and North America experience high rates of population turnover and struggle to recruit and retain populations. There has been discussion about the extent to which their larger urban centres may be key to navigating common ‘boom and bust’ cycles, thus contributing to more stable and resilient demographic and economic development in their jurisdictions. This paper examines the population development in twelve remote northern jurisdictions dominated by a large city, comparing urban and regional growth patterns around periods of economic boom and bust since 1990. It was expected that periods of high population growth would be initially led by regional areas where resource projects are commonly located, but that the cities would ultimately benefit more from high growth periods and suffer less from periods of low population growth. It was also expected that cities would retain key populations better than regions because of a growing global urban preference. Results suggest that regional areas did grow more at the start of high growth periods, but there was no universal experience of higher city growth throughout the two boom and bust cycles. Rather, each city and region had unique growth pattern properties. Cities must not be assumed a priori to be the drivers of demographic development, but attention needs to be paid to what types of cities promote less volatile growth and development potential in the regions.

**Keywords:** resource peripheries; boom and bust; resource cycle; Jack London Effect; urban preference; population growth; population retention; northern cities



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## 1. Introduction

There has been increasing discussion in recent times about the role of cities and urbanisation in the socio-economic development of remote and sparsely populated jurisdictions across the northern fringes of Europe, North America and Australia [1–5]. Often referred to as ‘the North’ within their nation-states, these remote jurisdictions are subject to a range of unique development challenges due to their physical isolation, small and sparse populations, entrenched dependence on external decision makers and marginalised populations [6–9]. Many of these jurisdictions continue to rely on natural resource extraction that occurs outside of large urban areas for export income. However, broader economic security increasingly comes from service sectors (especially, but not only, government services) which are substantially city-based [10]. Centralisation of transport and processing infrastructure for resource industries has also been a trend over the past several decades [3,11]. At the same time, the economic benefits of ‘attractive’ industries such as tourism have become more and more concentrated in urban environments [12]. With this increasing economic focus on ‘the city’ has come an increasing demographic focus, with cities typically (but not always) having faster growing populations than the rest of the jurisdiction [13]. City-focused development may therefore offer some opportunity to address persistent demographic challenges that have been strongly linked to economic

development challenges brought about by a dependence on resource export, large-scale construction projects and recurring economic 'boom and bust' cycles [14,15].

Specifically, this research examines the extent to which northern cities 'do better' than the remainder of their sparsely populated jurisdictions ('regions') in attracting population during periods of high growth (population 'booms') and retaining population during periods of low growth or even decline (population 'busts'). The argument being that if cities can help 'smooth out' demographic booms and busts, they can also be the drivers of increased economic and demographic resilience, and ultimately contribute to more sustainable development that is less about chasing temporary resource projects, which may generate short-term economic benefits but often come with considerable long-term environmental and social costs.

Demographic instability brought about by high levels of population turnover and challenges in recruiting and retaining skilled and professional workers has been a focus of northern and remote area geography research for at least the past two decades [16–18]. Demographic instability is a cycle in which high population turnover leads to a sense of temporariness which stimulates further turnover and demographic imbalances, such as an excess of working age males and a deficit of residents post working age. These are seen as factors in discouraging women, families and seniors from moving to, or staying in, the North [11,19,20]. A lack of economic opportunities for local-born people and a pattern of escalator migration among in-migrating early career workers also create a volatile youth population [21,22]. The resultant socio-economic system has little resilience to economic shocks, particularly as mobile and temporary population cohorts are likely to leave the North when economic conditions deteriorate, thus exacerbating experiences of economic bust and diverting (policy and investment) attention away from those left behind [23].

The solutions to these demographic challenges proposed in the literature have largely been about processes of more balanced economic development, but also lifestyle factors such as quality, variety and availability of housing, education and leisure opportunities [24–26]. Economies need to diversify into sectors which employ women and provide career paths, including in service-related industries and creative industries [27–29]. Northern jurisdictions need to pay attention to providing world class education at all levels (including university education) [30,31]. More people will be attracted and retained if there are high quality recreation and leisure facilities, including for culture-based activities [32,33]. People need to be encouraged to 'embed' themselves in the North through home and business ownership [26,34,35].

These sorts of development approaches necessarily focus attention on urban areas as sites which can build the necessary infrastructure and provide the necessary opportunities for a steady transition to a more balanced economy and demography [2,25]. At the same time, cities continue to be (and perhaps have increasingly become) the sites of 'stimulus' activity—typically large infrastructure construction projects—that northern governments encourage to provide immediate economic and demographic dividends [3,36]. Such developments are likely to reinforce an 'urban preference' for people living in, working in or visiting the North. It is not clear whether any demographic dividends of these development efforts can ultimately disperse beyond the city and benefit non-urban areas. The question whether the few urban growth centres develop in tandem with, separate from, or even at the expense of their remote hinterland regions, remains an important one for regional development initiatives across the North. Settlement systems in remote areas are different in that they are much more disconnected (physically, through infrastructure, but also through economic and social ties) than those in more densely populated contexts, including many rural and agriculture-dominated areas across Europe, North America and Australia [4,7]. City-focused development strategies may, thus, lead to even more polarised development rather than generate positive spillover effects in the hinterland.

Across the North, there is a set of jurisdictions which feature a relatively large city amidst otherwise sparsely populated areas. Twelve such jurisdictions have been identified for this research (Table 1). Each has a dominant urban centre that contains typically more than 40% of the jurisdictional population and is five or six (or more) times the size of the

next largest centre. They include four jurisdictions in Australia (Northern Territory, Central Queensland, North Queensland, Far North Queensland), six across the Fennoscandian North (Lapland and North Ostrobothnia in Finland, Norrbotten and Västerbotten in Sweden, Troms-Romsa in Norway and Iceland), and two in North America (Alaska in the US and Newfoundland and Labrador in Canada). Their cities typically range in size from about 80,000 residents (Luleå and Tromsø) to about 200,000 (Townsville and St John's), but there are outliers in Rovaniemi (63,000 inhabitants) and Anchorage (nearly 300,000 inhabitants).

**Table 1.** Cities and regions in the study.

Country	City	Jurisdiction	City Population 2019 (Nearest '000)	Proportion of Jurisdictional Population (%)
USA	Anchorage	Alaska	292,000	40
Australia	Rockhampton	Central Queensland	120,000	49
Australia	Cairns	Far North Queensland	163,000	56
Iceland	Reykjavík	Iceland	131,000	36
Finland	Rovaniemi	Lapland	63,000	36
Canada	St John's	Newfoundland and Labrador	213,000	41
Sweden	Luleå	Norrbotten	78,000	31
Finland	Oulu	North Ostrobothnia	205,000	50
Australia	Townsville	North Queensland	195,000	44
Australia	Darwin	Northern Territory	147,000	60
Norway	Tromsø	Troms-Romsa <sup>1</sup>	77,000	46
Sweden	Umeå	Västerbotten	129,000	47

<sup>1</sup> A new region Troms og Finnmark was created in 2020, but this research uses data for the previous county of Troms-Romsa (in existence from 1964–2019).

Of course, the cities and jurisdictions in this sample are diverse. Their economic bases differ, although natural resource extraction and related industries (processing and transport) are prominent in all. Their political structures are different, not just within the context of national political systems (and Iceland being a nation-state of its own), but in terms of their jurisdictional responsibilities (with Anchorage, Rockhampton and Cairns not being political capitals and Townsville being only a de facto political centre). Their histories are different, with the possibility of applying Keskitalo and colleagues' [37] distinction between an 'old North' of the European Arctic and a 'new North' of North America and Australia. A different historical delineation may be between those cities whose centrality really only emerged around and after World War II (which would include Umeå and Rovaniemi, for example), and those well-established prior to that (which would include St John's and Rockhampton). In any case, acknowledging the diversity of the sample is important, and allows the research to investigate, not just whether cities make a difference in demographic development across the North, but the extent to which the type of city might matter in these processes.

#### *City-Regional Population Growth Differentials: Following the Resource Cycle, Plateau Hypothesis and the Jack London Effect?*

Demographic development in these northern jurisdictions has been described as following a cycle closely linked to the commodity cycles which impact economic development [38]. The start of a commodity boom attracts population to sites of construction, for example, of new mines or workers camps or transport and processing facilities, often outside the city [17,18,39]. Proceeds of the boom, particularly once the construction phase has ended, are used to underwrite construction projects (often in the city) and to boost employment in the public sector [10,36]. Temporary residents leave the jurisdiction as the boom winds down and, in the case of a bust, longer term residents may follow as more jobs are lost and local consumer markets decline [18,26,40].

Anecdotally at least, there is evidence that cities might suffer less than regions from commodity shocks because their economies have, over time, become increasingly disconnected from natural resource extraction and there is political will to sustain city-based investment in public services, universities and city-making projects [2,5,10,25,30]. While city growth might slow during resource cycle busts, it is unlikely to decline in absolute terms, providing the foundation for a demographic equivalent of Haycox's [41] 'plateau' hypothesis regarding economic development in the North (specifically applied to Alaska). Under this hypothesis, northern development is not a process of oscillation around a slowly shifting median, but a series of steps along a long term upward growth trajectory. Cities are potentially better suited than regions to serving as population 'containers' between these steps because of their demographic dominance and social and economic infrastructure.

Huskey [34] has more specifically promoted the role of the city in sustainable economic development in the North (again through the Alaskan example). Huskey has proposed a 'Jack London Effect' whereby cities such as Anchorage are able to retain businesses which service the resources sector even as resource extractive activity declines after a boom period. Business owners may be able to ride out periods of low economic growth by downsizing their operations, diversifying or seeking contracts outside of their own jurisdiction. In the same way, cities may be better able to retain population by providing people with opportunities to further their education or diversify their employment between periods of high growth [30].

The aim of this research was to examine demographic development for twelve northern jurisdictions and compare city and regional population growth patterns around periods of economic boom and bust. Specifically, the study sought to identify the extent to which city and regional population growth followed the cyclical pattern of the resource cycle model, and whether cities were benefitting more from boom periods (following the plateau hypothesis) and suffering less than their regions during the bust (following the 'Jack London Effect'). The research focused on the period 1990–2019, which broadly encompasses two global commodity price cycles. The first was the Asian investment boom of the early and mid-1990s, followed by the Asian financial crisis in 1997/1998. The second was the global commodity demand surge of the early 2000s led by increasing consumption in China but followed by the global financial crisis (GFC) starting in 2008. Since 2008, economic conditions have become more mixed, with some commodities (iron ore, timber, precious metals) continuing to benefit from China's growth while others (coal, oil, natural gas, some fish varieties) have experienced depressed markets due to changing patterns of demand including, but not solely, as a result of environmental concerns.

These global cycles are likely to have played out differently in each northern jurisdiction. They produce different resource commodities, because they have different domestic economic conditions, and because they are differently situated in commodity markets (through patterns of future selling, for example). There is no expectation, therefore, that demographic cycles will be aligned across the sample. There is an expectation that periods of relatively high population growth and relatively low population growth will be apparent and broadly linked to the two global cycles, with expected differences between city and regional experiences. This mirrors findings from studies in other contexts, including central and southern Europe, for example [42–44], where periods of economic expansion and recession have led to spatially heterogeneous demographic shifts within regions. These shifts include increasing urbanisation and demographic polarisation around larger cities, along with rural shrinkage through outmigration, population aging and declining fertility rates in hinterland areas. City-regional growth differentials may become even more pronounced in remote and sparsely populated northern settings where settlements are more internally disconnected and migration systems tend to be more externally oriented [4,16]. These issues have received very little attention in the academic literature on northern development to date. Therefore, this study aims to fill a geographic gap by collating and documenting demographic data from multiple northern peripheries to better understand city-regional population dynamics around economic boom and bust cycles.

Our guiding assumptions are that city growth, while usually higher than regional growth, will be higher still during periods of overall low population growth, as cities retain populations better than regions. This is a result of general agglomeration dynamics, including the benefits of shared infrastructure and services, more diverse economies and more ample demand linkages emerging from larger service populations. This should continue to be the case for key subpopulations, including children (representing families), youth, working-aged men and women and seniors. Regions may grow relatively more at the onset of a period of overall high growth because of the region-based construction activity that occurs at the start of major resource projects. However, cities are likely to grow more during and after a boom as they both benefit from resource income investment and retain population as projects wind down. The existence of these patterns across the sample would support the idea that cities have the capacity to contribute more than regions to a more stable and resilient demographic (and therefore economic) development in the North. Variations in experiences between individual jurisdictions would suggest that ‘the city’ is not a sufficient construct, but that characteristics of the city and the jurisdiction make a difference in whether cities are the answer to demographic instability in the North.

## 2. Materials and Methods

The research examined population development patterns for all 12 jurisdictions from 1990 to 2019, focusing on three geographic levels:

1. Jurisdiction, which is the total unit of analysis (nation, province, subprovincial unit);
2. ‘The city’, which in most cases refers to the local government area incorporating (and named after) the city of interest. In the Australian and Canadian cases, ‘the city’ was defined by Census divisional boundaries bearing the city name;
3. ‘The region’, which is the portion of the jurisdiction not included in the city.

Data were drawn from the national statistics agencies in each country, except in the case of Alaska where data came from the Alaskan Department of Labor and Workforce Development. Each agency has an online database from which annual (1990–2019) estimates of total population for the jurisdiction and ‘the city’ were extracted. While local government areas (and, hence, city boundaries) had changed over time in most cases, except in Australia, the databases had mapped historical data to contemporary borders. Except in the Australian cases, the same databases provided annual estimates of age and sex composition (five-year age groups) of the populations.

For the Australian cases, cities (and jurisdictions, excluding the Northern Territory) were defined according to their current (2016) Census geographies. Historical age and sex data mapped to those boundaries only existed from 2001. Jurisdictional boundaries could, however, be concorded to older data for total population counts. Age and sex data could be extracted from printed publications for the years 1996–2000 (Australian Bureau of Statistics catalogue numbers 3235.3 and 3235.7). There was consequently a break in series between 2000 and 2001 for city data (but not for jurisdictional data, where it was possible to concord the different geographies). Growth rates for 2000–2001 for the Australian cases are excluded from the analysis. There is also no Australian age and sex analysis for the years prior to 1996.

Pre-1990 total population data (used only to examine the long-term differentials between city and regional growth rates) were also most often extracted from the national statistical databases, but in the case of Alaska and the Australian jurisdictions, some data needed to be sourced from printed publications and municipal websites.

Annual growth rates (AGR) were calculated where  $P$  is the population of interest and  $t$  is the reference year— $AGR(t) = (P(t) - P(t - 1))/P(t - 1)$ . Where sets of years were used in the analysis (for example, a set of four years representing Alaska’s high growth period 2009–2012), the AGR was the average annual AGR.

Populations of interest were:

4. Total population;
5. Population aged 14 years and under (‘children’), intended to represent young families;

6. Population aged 15–29 years ('youth');
7. Male population aged 30–64 years ('working age males');
8. Female population aged 30–64 years ('working age females');
9. Population aged 65 years and over ('seniors').

Each AGR for the total population for the jurisdiction as a whole was given a quintile rank such that the highest 20% of AGR values were ranked in quintile 1, and the lowest in quintile 5. Periods (called 'events') of high growth were defined as a minimum of three consecutive years featuring a minimum of two quintile 1 AGRs and no AGR lower than quintile 3. Low growth events were defined as a minimum of three consecutive years featuring a minimum of two quintile 5 AGRs and no AGR higher than a quintile 3. In practice, only one low growth event (Far North Queensland 1996–2000) had a quintile 3 in a low growth period. There were quintile 3 AGRs in North Ostrobothnia's 1990–1995 high growth event (bracketed by three quintile 1 years) and Troms-Romsa's 2011–2016 high growth event. North Ostrobothnia had two quintile 1 years in 2004 and 2005, but these were bracketed by quintile 4 and 3 years, meaning that the qualification standard of three high growth years for an event was not met.

The primary part of the analysis focused on comparing city and regional AGRs for various populations before (three years), during and after (three years) high and low growth events. We also analyse AGRs for the first three years of low growth events. Comparison was of the difference in AGRs for the period of interest with the difference in AGRs across the set as a whole. This approach was taken in recognition (see Table 2) that cities almost always grow at higher rates than regions, and what was important to this analysis was whether growth rate differentials at particular times were higher or lower than the 'normal' differentials. The significance of the difference between the 'normal' AGR differential and the differential for a period of interest was calculated using a one sample t-test, with critical value of t being  $\alpha < 0.1$ . The results indicate whether the city-regional growth differential was higher than expected (i.e., higher growth in the city) through symbol '☑', lower than expected (i.e., higher growth in the region) through symbol '☒', or about as expected through symbol '?'. Missing data in tables is represented by symbol '–'.

**Table 2.** Total population growth rates for cities.

City	Average Decadal Growth 1910–2019 (%)	Linearity of Decadal Growth (r <sup>2</sup> )	Average Annual Growth 1990–2019 (%)	Linearity of Annual Growth 1990–2019 (r <sup>2</sup> )	Difference Average City vs. Region Growth (Absolute %)
Anchorage <sup>1</sup>	87	0.95	0.9	0.93	−0.2
Rockhampton	21	0.89	1.1	0.97	0.5
Cairns	31	0.89	2.2	0.99	1.2
Reykjavik	25	0.82	1.0	0.98	−0.4
Rovaniemi	20	0.94	0.5	0.93	1.4
St John's	15	0.98	0.5	0.65	1.4
Luleå	8	0.95	0.5	0.97	0.9
Oulu	25	0.95	1.4	1.00	1.6
Townsville	24	0.94	1.7	0.98	1.1
Darwin	82	0.91	1.9	0.98	1.1
Tromsø	16	0.96	1.4	0.99	1.6
Umeå	15	0.98	1.2	0.98	1.6

<sup>1</sup> Data only available from 1920.

### 3. Results

Table 1 shows the population sizes of the cities included in the research, and the proportion of the population of the jurisdiction which lived in the city in 2019. Rovaniemi was the smallest of the cities with a population of 63,000, and Anchorage was the largest at 292,000. The average proportion of the population living in the city was 45%, but Darwin (60%) and Cairns (56%) were somewhat high outliers and Luleå (31%) was a low outlier.

Average decadal growth rates for cities between 1910 and 2019 ranged from 8% for Luleå to 87% for Anchorage. Table 2 also estimates the linearity of growth for the city via a regression coefficient. All coefficients were above 0.8, meaning a very high linearity of growth over the period.

Likewise, there was very high linearity of growth in each city population between 1990 and 2019, with AGRs ranging from 0.5% (in three cases) to 2.2% (Cairns). These AGRs were higher than regional AGRs in all cases except Alaska (where the region outgrew the city by an annual average of 0.2%) and Iceland (0.4%). The average difference in AGR across all cases was 1%.

As outlined in Table 3, city decadal growth rates were higher than region decadal growth rates in all cases (noting the limited data for Lapland and North Ostrobothnia in Northern Finland). The biggest differential was 61% for Alaska (Anchorage grew by 87% each decade since it was formed as a city in 1920, while the rest of Alaska grew at 26% per decade). The smallest differential was in Norrbotten (8% for Luleå and 4% for the rest of Norrbotten). While all regions grew between 1910 and 2019, there were five cases (Newfoundland and Labrador, Norrbotten, Troms-Romsa, Västerbotten and Northern Finland) where there was low linearity in growth patterns. There was higher linearity in AGR 1990–2019 (all coefficients above 0.6), but six regions experienced average annual population losses. The average annual growth rate for those regions which grew was 0.92%, and for those which lost population it was  $-0.47\%$ .

Table 4 describes high (blue) and low (red) growth events as discussed in the Methods section. Seven jurisdictions experienced high growth events in the period 1990–1999, and all but one (North Queensland) experienced a low growth event in the period between 1994 and 2004. This period (1990–2004) may be considered a cycle of population development similar to an economic boom and bust cycle. Similarly, there was a common experience of high growth (seven cases) between 2004 and 2012, with two other jurisdictions (Norrbotten and Troms-Romsa) having high growth events starting but not ending in that time. Six jurisdictions experienced low growth events beginning after 2012 and lasting until the end of the series. In contrast, Iceland and Västerbotten were experiencing high growth events at the end of the period and Iceland had a low growth event (2010–2013) slightly earlier than other jurisdictions. Nevertheless, the period 2005–2019 presents as a second population cycle.

Table 5 shows the AGRs for high and low growth events for the jurisdiction (columns two and three), city and region. Low growth events resulted in annual population loss in four jurisdictions (Lapland, Newfoundland and Labrador, Norrbotten and Västerbotten), and the lowest jurisdictional AGRs for high growth events were 0.3% in Norrbotten and 0.4% in Lapland. Only Luleå (Norrbotten 0.7%) as a city had an AGR for high growth events lower than 1%, and only Rovaniemi (Lapland) and St John's (Newfoundland and Labrador) as cities lost population during low jurisdictional growth events. Newfoundland and Labrador region actually lost population (0.1% AGR) during the jurisdiction's 2008–2012 high growth event, and regional population growth was very low in Lapland, Norrbotten and Västerbotten even during high growth events. Only Alaska (0.3%), Far North Queensland (0.7%) and Iceland (0.5%) regions had positive AGRs during their jurisdictions' low growth events.

Table 6 indicates whether city-regional growth differentials were higher than expected (marked with symbol '☑') or lower than expected ('☒') during different stages of each population cycle. The first symbol represents the first cycle (1990–2004) and the second represents the 2005–2019 cycle. For example, in the three years prior to a jurisdictional high growth event, cities grew less than expected on three occasions in the first cycle and four occasions in the second cycle. No city grew more than expected in the first cycle (missing data indicated by '-'), but two (Cairns in Far North Queensland and St John's in Newfoundland and Labrador) did so in the second cycle. There were also two occasions in the second cycle where comparative growth rates were not significantly different from 'normal' ones (indicated by '?'). Reading across the rows, each jurisdiction had a mixture of stages and cycles where the city and the region grew more than expected. For example, Lapland region grew more than expected during high (cycle 1) and low (cycle 2) growth events, but the city (Rovaniemi) grew more than expected after the high growth event and before the low growth event.

Table 3. Total population growth rates for rest of region.

Jurisdiction	Average Decadal Growth 1910–2019 (%)	Difference Average City vs. Region Growth (Absolute %)	Linearity of Decadal Growth	Average Annual Growth 1990–2019 (%)	Linearity of Annual Growth 1990–2019
Alaska <sup>1</sup>	26	61	0.92	1.1	0.98
Central Queensland	9	12	0.82	0.6	0.90
Far North Queensland	16	15	0.96	1.0	0.99
Iceland	12	12	0.79	1.4	0.95
Lapland	n.a	n.a <sup>2</sup>	n.a	−0.9	0.98
Newfoundland and Labrador	5	11	0.40	−0.8	0.89
Norrbotten	3	4	0.07	−0.4	0.92
North Ostrobothnia	n.a	n.a	n.a	−0.1	0.60
North Queensland	15	9	0.97	0.6	0.86
Northern Territory	51	31	0.94	0.8	0.84
Troms-Romsa	3	13	0.36	−0.2	0.61
Västerbotten	1	14	0.31	−0.4	0.90
(Northern Finland)	(1)		(0.11)		

<sup>1</sup> Data only available from 1920. <sup>2</sup> Regional data were only for the whole of northern Finland until 1950. For the whole of northern Finland, decadal growth was 1% and linearity was 0.11.

Table 4. High and low growth events (jurisdiction) since 1990.

Jurisdiction	1991			1995			2000			2005			2010			2015			2019					
Alaska	1	1	1	4	5	4	4	4	2	3	1	2	3	3	1	1	2	2	4	5	5	4	5	5
Central Queensland	4	3	2	4	5	3	4	4	5	3	2	2	1	2	1	1	1	1	3	2	1	2	3	5
Far North Queensland	3	1	1	1	1	5	3	4	5	4	2	4	2	3	2	2	1	1	2	3	4	2	3	5
Iceland	4	2	3	4	4	5	4	4	2	2	3	5	4	3	1	1	1	2	5	5	5	5	3	3
Lapland	1	1	1	2	4	3	4	5	5	5	5	4	2	3	4	2	2	1	1	2	2	3	4	3
Newfoundland and Labrador	1	2	2	4	5	5	5	5	5	4	4	3	3	4	4	3	1	1	1	1	1	2	2	2
Norrbotten	1	1	1	2	5	5	5	5	5	4	4	3	3	4	2	4	4	3	2	2	1	2	2	4
North Ostrobothnia	1	1	3	3	1	4	5	5	4	1	2	4	4	1	1	3	2	2	2	2	2	3	4	4
North Queensland	4	3	3	3	4	4	4	4	2	2	2	2	2	1	1	1	1	2	3	5	5	5	5	5
Northern Territory	4	2	2	2	1	1	2	3	3	4	5	5	5	3	3	2	1	1	3	4	2	1	4	5
Troms-Romsa	1	3	2	2	4	5	5	5	2	4	5	5	3	4	4	2	2	2	2	1	1	1	3	1
Västerbotten	1	1	1	2	3	5	5	5	5	5	4	3	2	3	4	4	4	3	3	4	4	2	2	1

Numbers are the quintile (1 = highest, 5 = lowest) of growth.



**Table 5.** Average annual growth rates (%) in jurisdictions and cities for high and low growth events.

Jurisdiction	High	Low	City High	City Low	Region High	Region Low
Alaska	2.1	0.2	2.2	0.0	2.0	0.3
Central Queensland	1.7	0.0	1.8	0.3	1.6	−0.3
Far North Queensland	2.6	1.0	3.8	1.4	1.3	0.7
Iceland	2.3	0.5	1.5	0.5	2.8	0.5
Lapland	0.4	−1.0	1.2	−0.2	0.0	−1.4
Newfoundland and Labrador	0.7	−1.3	1.9	−0.7	−0.1	−1.5
Norrbotten	0.3	−0.7	0.7	0.3	0.1	−1.0
North Ostrobothnia	0.8	0.3	1.5	1.3	0.3	−0.5
North Queensland	2.0	0.0	2.5	0.7	1.8	−0.6
Northern Territory	2.5	0.1	3.1	0.7	1.9	−0.7
Troms-Romsa	0.8	0.1	1.5	1.1	0.3	−0.5
Västerbotten	0.8	−0.3	1.9	0.7	0.0	−1.0

**Table 6.** Higher city growth by stage of cycle.

Jurisdiction	Pre High	High	Post High	Pre Low	Low	Post Low
Alaska	−☒	☑ ?	−−	−−	? ☒	? −
Central Queensland	−−	−☒	−☒	? ☑	? ☑	☑ −
Far North Queensland	☒ ☑	☑ ☑	−?	−?	? ☒	☒ −
Iceland	−☒	−☒	−☑	☑ ☑	☑ ?	☑ ?
Lapland	−−	☒ −	☑ −	☑ −	☒ −	? −
Newfoundland and Labrador	−☑	−☑	−☒	☒ −	☒ −	☑ −
Norrbotten	−☒	☒ ☒	−?	−−	☑ −	☒ −
North Ostrobothnia	☒ −	−−	−−	−?	☑ ☒	☑ −
North Queensland	−?	−☒	−−	−−	−☑	−−
Northern Territory	☒ −	? ☑	? ?	−☑	☒ ☑	? −
Troms-Romsa	−?	−☑	☑ −	☒ −	? −	☒ −
Västerbotten	−☒	☑ ?	−−	−−	? −	? −
City growth above average	0–2	3–4	2–1	2–3	3–3	4–0
Regional growth above average	3–4	2–4	0–2	2–0	3–3	3–0
Cases	3–8	6–10	3–6	4–5	11–7	11–1
Total city high growth	18%	44%	33%	56%	33%	33%
Total region high growth	64%	38%	22%	22%	33%	25%

Legend: ☑ higher growth in the city; ☒ lower growth in the city/higher growth in the region; ? normal growth; − missing data.

Table 7 considers just the three years after a jurisdictional high growth event. Each relevant cycle for each jurisdiction is described in a separate row. Cases where the three years included the start of a jurisdictional low growth event are marked with an asterisk (\*). In five of the fifteen cases, city populations of children grew more than expected, while in six cases, region populations of children grew more than expected. Reading across the rows, most cases were either dominated by growth in city populations (Norrbotten 1, Västerbotten 1) or region populations (Lapland 1, North Queensland 2). Alaska's experience of the second cycle for children and seniors was opposite to the experience of the first cycle. A number of jurisdictions, including Alaska and the Northern Territory, generally experienced no difference in city-region AGR differentials during this stage of cycles.

Table 8 is structured in the same way as Table 7 but refers to the first three years of a low growth event (unless already included in Table 7). The last two rows of the table provide a summary of results from Tables 7 and 8.

**Table 7.** Population retention/growth after high growth events <sup>1</sup> (average annual city growth rate (three years) in % minus average annual growth rate for rest of region).

Jurisdiction/Cycle (15 Cases)	Children	Youth	Working Age Males	Working Age Females	Seniors
Alaska 1 *	☑	?	?	?	☑
Alaska 2 *	☒	?	?	?	☒
Central Queensland 2	?	?	?	☑	☑
Far North Queensland 2	☒	☑	?	☒	☒
Iceland 2 *	?	☒	☑	?	☑
Lapland 1	?	☑	☒	☒	☒
Newfoundland & Labrador 2	☑	☒	?	☑	?
Norrbottnen 1 *	☑	☑	☑	☑	?
Norrbottnen 2	?	☑	?	?	☒
North Ostrobothnia 1 *	☑	☑	☑	☑	☒
North Queensland 2 *	☒	?	?	☒	☒
Northern Territory 1	☒	?	☒	?	?
Northern Territory 2	☒	?	?	?	?
Troms-Romsa 2	☒	?	☒	☒	☑
Västerbotten 1 *	☑	☑	☑	☑	☒
City high growth	5 (33%)	6 (40%)	4 (27%)	5 (33%)	4 (27%)
Region high growth	6 (40%)	2 (13%)	3 (20%)	4 (27%)	7 (47%)

Legend: ☑ higher growth in the city; ☒ lower growth in the city/higher growth in the region; ? normal growth. \* Also start of a low growth event. <sup>1</sup> Including where those three years included a low growth event.

**Table 8.** Population retention/growth at the start of low growth events <sup>1</sup> (average annual city growth rate (three years) in % minus average annual growth rate for rest of region).

Jurisdiction/Cycle (11 Cases)	Children	Youth	Working Age Males	Working Age Females	Seniors
Central Queensland 1	☑	?	☑	☑	☒
Central Queensland 2	?	☒	?	?	☑
Far North Queensland 1	☒	?	?	?	☒
Far North Queensland 2	☒	?	☒	☒	?
Iceland 1	☑	☑	☑	☑	?
Lapland 1	?	☑	☒	☒	☒
Newfoundland & Labrador 1	☒	?	☒	☒	?
North Ostrobothnia 2	☒	?	☑	?	☒
Northern Territory 1	☒	?	☒	☒	☒
Northern Territory 2	☑	?	☑	☑	?
Troms-Romsa 1	?	?	☑	☑	☒
City high growth	3 (27%)	2 (18%)	5 (45%)	4 (36%)	1 (9%)
Region high growth	5 (45%)	1 (9%)	4 (36%)	4 (36%)	6 (55%)
<i>Combined end of high event and start of low event</i>					
City high growth	8 (31%)	8 (31%)	9 (35%)	9 (35%)	5 (19%)
Region high growth	11 (42%)	3 (12%)	7 (27%)	8 (31%)	13 (50%)

Legend: ☑ higher growth in the city; ☒ lower growth in the city/higher growth in the region; ? normal growth. <sup>1</sup> Excluding where those three years featured the end of a high growth event (included in Table 7).

#### 4. Discussion

Northern cities have outgrown the remainder of their jurisdictions since the start of last century, and all but Anchorage and Reykjavík have outgrown the remainder of their jurisdictions in the past thirty years. Cities can, thus, rightfully be seen as the ‘demographic growth engines’ of northern peripheries, although the exceptions are also important. While population concentration in the city is similar in Alaska and Iceland (around 40%) as in other jurisdictions, both have multiple smaller urban areas which have become hotspots of population development linked to proximity to the large city (e.g., the Southern Peninsula in Iceland and the Kenai Peninsula and Matanuska-Susitna Borough surrounding Anchorage) and localised economic development (fishing, transport, oil extraction, tourism). Economic

development in the other jurisdictions has been more highly concentrated in the city, even for activities which rely on resources located in the region, such as forestry, hydropower generation, mineral processing or even tourism.

While Anchorage and Reykjavík have recently grown less than the remainder of their jurisdictions, they have still experienced absolute population growth since 1990 (both about 1% annually). In contrast, six northern regions have experienced absolute population loss. Five of these (excluding Newfoundland and Labrador) are in the 'old North' of Europe [37], where only one region (Iceland) has actually grown during this recent period. Regional growth in the 'new Norths' of Australia and America has, at around 1% annually, rivalled that of the European cities. Nevertheless, and excluding Alaska, Iceland and Central Queensland (where Rockhampton is the oldest city in Australia's north), the differentials between city and regional growth in the past thirty years have been quite similar at 1–1.5% per annum. Consequently, despite the relatively small size of northern cities compared to their southern counterparts, an urban preference is apparent across the North.

Both northern cities and regions have grown (or shrunk) in linear patterns when examined at the thirty-year scale. Even those cases where growth has been comparatively (to other cases) non-linear, regression coefficients are at worst moderate (0.60 for North Ostrobothnia, 0.61 for Troms-Romsa and 0.65 for St John's). Table 4 clearly shows, however, that, at the annualised scale and at jurisdictional level, there are clusters of years of relatively high and low growth. Furthermore, the clustering is somewhat similar across the set of jurisdictions and can be broadly mapped to the economic cycles around the Asian economic expansion and subsequent financial crisis (extending through to the early 2000s) and the China led commodity boom and global financial crisis (GFC) this century. Not all jurisdictions have been exposed to all four events (high growth in the early 1990s, low growth in the late 1990s, high growth in the 2000s, low growth in the 2010s), and some have experienced events earlier or later than others.

The second cycle is most interesting in this regard, with at least two jurisdictions (Iceland and Västerbotten) experiencing high growth since 2015 when many others have had periods of low growth (even Norrbotten and Troms-Romsa have had a relatively sharp drop-off in growth since 2017). A number of factors may be at play here. One is the differences in market fluctuations and market structures for the different staples commodities which underpin northern economies. Forestry, for example, has continued to perform well even as oil and gas have experienced downturns. Certain mineral resources (such as iron ore) are sold on long term future contracts, delaying the impacts of economic downturns. Even tourism patterns have varied, with some Arctic jurisdictions (including Iceland and Västerbotten) registering tourism growth [12], while the Northern Australian jurisdictions suffered considerable decline in the wake of the GFC. Another factor is the level and nature of government investment in response to global shocks, as has been seen in Iceland. For the European jurisdictions, the mid-2010s commodity downturn coincided with the 'European migrant crisis' which brought large numbers of new residents (at least temporarily) to both cities and regions [45].

While the economic literature posits the cycles observed here as waves of booms and busts [14,15,17], the demographic data also show periods of relatively 'normal' population development between periods of high and low growth. They also show that, while boom to bust can occur very rapidly (in eight out of thirteen high growth to low growth transitions), bust to boom is much rarer. In only three cases (Central Queensland, Northern Territory and Iceland) were there fewer than four years of 'normal' growth between a low growth event and a high growth event.

The differences between population growth rates for high growth and low growth events were similar for cities and regions (about 1.5%). However, in nine out of twelve cases, regions experienced absolute population loss during low growth events, while this occurred only twice for cities (Lapland and Newfoundland and Labrador). Newfoundland and Labrador region even experienced marginal population loss (0.1% per annum) during the jurisdictional high growth event 1995–2003. In those few cases (Luleå/Norrbotten,

Oulu/North Ostrobothnia and Tromsø/Troms-Romsa) where the cities experienced small differences in population growth for high and low events (below 0.5%), the regions experienced substantially higher (more than double) differences.

The analysis suggests that, while northern cities out-grow northern regions, they are typically similarly exposed to demographic cycles of high and low growth. The city pattern, however, with continuing (albeit small) population growth even during low growth events resembles that of Haycox's [41] 'plateaus', while regional growth is more likely to feature 'steps backwards'. Although this finding appears to mirror experiences in other (larger and more densely populated) city-hinterland contexts [42,43], the extent to which urban growth has occurred at the expense of the region (e.g., through regional outmigration into the city) is unclear. Recent research suggests that urban-regional migration systems in sparsely populated areas are more disconnected than in rural areas situated in metropolitan hinterlands [4,16,46], with urban centres growing more through external in-migration and regional areas losing populations to external destinations. While this has been beyond the scope of the present study, more comparative research across the North on the role of (internal and external) migration in urban versus regional population growth is needed to better understand the factors and processes influencing urban-regional growth differentials.

The apparent parallelism of city and regional growth rates (with cities growing 1–1.5% faster each year even during high and low growth events) diminishes when those events are broken down into the demographic stages suggested by the resource cycle model [34,35]. The data in this paper describe 75 stages associated with high and low growth events, the three years immediately prior to an event, the event itself and the three years immediately after an event. In 53 cases (71%), comparative city-region growth rates were significantly different to those observed across the thirty-year period as a whole. For example, while Umeå grew on average 1.6% faster annually than Västerbotten region across the period, in the three years prior to the 2016–2019 high growth event, it grew just 1% faster. Regional growth was higher than expected in 26% of the cases and city growth was higher than expected in 27% of the cases.

As expected, the stage immediately prior to a high growth event typically favoured regional population growth. Regional growth was higher than expected in seven out of eleven observed pre-high growth stages, while city growth was higher than expected in just two (Far North Queensland and Newfoundland and Labrador). However, there was not consistent evidence that cities out-grow regions during high growth events or immediately after high growth events. There were seven instances where cities grew more than expected during high growth events, but also six instances where regions grew more than expected (in three instances, growth differentials were about 'normal'). Likewise, cities grew more than expected in three post-high growth stages, but regions grew more than expected in two instances (Central Queensland and Newfoundland and Labrador). Comparative growth was about normal in four instances.

As expected, regional growth slowed earlier than city growth, with growth differentials favouring cities in five out of nine observed stages and favouring regions in just two instances (Newfoundland and Labrador and Troms-Romsa). Despite this, cities and regions were just as likely to experience higher than expected growth during low growth events (six out of eighteen cases each). They were also similarly likely to experience relatively high growth in post-low growth event stages (four out of twelve cases for cities, three for regions).

In summary, except for pre-event stages, cities and regions across the sample of jurisdictions were equally likely to benefit (relatively) more or suffer (relatively) less. Even within jurisdictions, the expected pattern of differential growth was rare. Iceland and the Northern Territory came the closest, with the regions growing faster prior to a high growth event, but the city typically exceeding expected growth after that. In other cases, however, growth was either city focused, region focused or consistent with normal trends before, during and after events. In Far North Queensland and Troms-Romsa, for example, cities grew more than expected before, during and after high growth events, but grew less

than expected around low growth events. In Central Queensland and Norrbotten (and possibly North Ostrobothnia and North Queensland), regions grew faster around high growth events but grew less than expected around low growth events.

There was no consistent experience of cities retaining population better (when compared to normal growth differentials) than regions after high growth events or leading into low growth events, meaning that the 'Jack London Effect' [34] was not immediately apparent at the population scale. There was also limited evidence for cities consistently retaining key subpopulations after the end of high growth events. In the fifteen post-high growth events observed, there were five instances where city growth in the child population (representing young families) was higher than expected, but six instances where region growth was higher than expected. For working age males, there were four instances favouring city retention and three favouring regions (in eight instances, growth differentials were about average). For working age females, there were five instances favouring cities and four favouring regions (six about average).

There was some evidence for cities retaining youth populations after high growth events. There were six instances where city growth in the youth population was higher than expected and just two (Iceland and Newfoundland and Labrador) where region growth was higher than expected. However, that leaves seven instances where growth differentials were about average. Similarly, regions were more successful than cities in retaining senior populations (seven instances compared with four). And this outcome was re-enforced by the observation that regions had comparatively high growth in senior populations in the early parts of six out of eleven low growth events. City retention of senior populations at the start of low growth events only occurred in Central Queensland. Otherwise, there were no clear patterns of population retention at the start of low growth events. However, when post-high growth and the start of low-growth event stages are combined, the possibility that cities retain youth populations better than regions is strengthened. In eight out of twenty-six observed stages, city growth in the youth population was higher than expected, while this was the case in just three regions. It must be kept in mind, however, that growth differentials were about average in 15 instances.

## 5. Conclusions

The research set out to investigate whether there has been a shared experience of population development across the northern peripheries of high-income countries in the past thirty years. Specifically, the research examined the extent to which the northern cities have been engines of population growth and have done better than regions in maintaining growth and retaining populations during a period which has featured at least two substantial boom and bust economic cycles. The framing of the research included an assumption consistent with a growing recent literature [4,6,8,9] that there is value in comparing the remote and sparsely populated northern jurisdictions of Europe, Australia and North America despite their very different histories and political environments. They may be assumed to be similarly exposed to the vagaries of resource cycles and have similar demographic constraints brought about by geographical isolation, harsh environments and the demographic domination of a single large urban centre [7–9]. The research did demonstrate, however, that there are different experiences between what has been termed (somewhat uncomfortably) the 'old North' of Europe [37] and the other Norths. The European North has grown more slowly in recent times and has experienced population decline outside the cities. Beyond the regional distinctions, the research has highlighted exceptional cases which feature regularly in the Discussion. Iceland, Newfoundland and Labrador, Central Queensland and the Northern Territory have regularly been cited as counterexamples of what might otherwise have emerged as trends or patterns. The uniqueness of these is apparent: Iceland is the only national jurisdiction, Newfoundland and Labrador is the only Canadian jurisdiction, Central Queensland is the jurisdiction closest to 'the South' in Australia and the Northern Territory is the only formal political

jurisdiction among the Australian cases. Similar identifying features of course apply to the other jurisdictions in the sample.

Nevertheless, or perhaps consequently, the process of comparison is valuable in testing theories which have implicit, if not explicit, application to resource peripheries in high income countries. The data here have shown (at least until very recent years) that these peripheries are likely to experience clearly identifiable and more or less shared periods of high and low population growth aligned with global economic cycles. There is also some evidence for Haycox's [41] observation that resource peripheries, such as Alaska, grow in a series of plateaus, and some addition to that theory showing that the plateau effect is sustained by the growth of cities (and perhaps their immediate surroundings) more so than regional growth patterns.

Evidence supporting the ideas that regions 'grow and slow' first at the onset of changes in demographic cycles, and that they grow less in the high and low parts of those cycles, is more mixed. There was a shared experience of relatively high growth immediately before population booms, suggesting a link to natural resources-led cycles whose early activity occurs at the sites of construction and extraction [17,18,38]. There was a shared experience of regions experiencing slower growth prior to population busts, however cities and regions were equally likely to have higher growth during booms and busts.

Most importantly, the research has found scant evidence of a consistent experience of a demographic 'Jack London Effect' [34], whereby northern cities retain population better than northern regions at the end of high growth periods and the start of low growth periods. Commonly accepted claims that the cities are demographically more resilient to common boom and bust resource cycles due to generic agglomeration dynamics need to be treated with caution. As witnessed quite recently in the case of Darwin in the Northern Territory [16], cities might be similarly vulnerable to population busts, with yet unclear consequences for regional population and economic development prospects. It is possible that cities better retain youth at these times, but otherwise, at least with the broad population categories used in this research, cities were not clearly shown to outperform regions, at least not relative to 'normal' differentials. In fact, the evidence that regions retain older populations better is at least as strong as the evidence that cities better retain youth.

This is not to propose rejecting demographic theories around the resource cycle or 'Jack London Effect' out of hand. The research here has been based on relatively few cases and a limited history. There has been limited opportunity to examine any detail about the circumstances unique to each case and each economic cycle which may have led to the observed outcomes here diverging from those theories. Particularly with the subpopulation analysis, insights were limited by the availability of data (age and sex) and the lack of potentially more insightful data (occupation or industry of employment, migration behaviour) across the sample set. Therefore, future research may examine the broad experiences documented here in more detail, including consideration of not just demographic nuances but possible explanations for different experiences, particularly in relation to different economic and demographic development approaches across the North.

The mythology around northern peripheries has long been focused on resource dependence, population sparsity and isolation. These concepts imply a non-urban centring of development processes which contribute to constraining economic and demographic development. However, a number of northern jurisdictions also feature (contextually) large urban centres with expanding service, cultural and knowledge industries. These have remained largely undertheorised to date [4,12,25] but may be the keys to unlocking greater regional development opportunities in the future [2,3]. For this to occur, the cities of the North need to buttress themselves demographically against the vagaries of resource cycles, retaining surplus populations who can be invested in new activities and growing local markets and critical mass. City-led growth is a feature in most places across the North, but regional growth patterns remain important. This means that future sustainable development policy should not be about 'the city' at the expense of the region [5], but

about taking advantage of the different capacities that cities and regions have to attract and retain people in the face of continuing vagaries of economic cycles.

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