Abstract

This article examines the migration flows of university-qualified labour (UQL) between cities and hinterland regions in the sparsely populated north of both Australia and Sweden. These peripheries have become increasingly urbanised in recent decades and have received substantial investment in urban higher education hubs that are expected to generate skills for their regions. Whether these skills remain within the few urban centres or are redistributed internally to benefit rural and remote locations is not known. The article identifies the extent to which there have been urban–rural ‘spillover’ or ‘sponge’ effects in UQL migration flows within the north and establishes whether there has been a ‘disconnect’ in the regional exchange of UQL. Drawing on recent Australian census and Swedish register data, the results suggest that ‘spillover’ and ‘sponging’ of UQL have been limited, particularly in Northern Australia where cities appeared quite disconnected from their hinterlands. Spillover was more common in Northern Sweden, but cities with universities targeting regional skill needs did not necessarily generate more net-migration gains for their hinterland. The discussion illustrates why urban–rural human capital relationships in northern peripheries may be more diverse and complex than assumed and flags what policy lessons can be drawn from comparing different northern peripheries.

KEYWORDS

human capital, Northern Australia, Northern Sweden, sponge city, university-qualified labour, urban–rural spillover

1 INTRODUCTION

The persistent shortage of university-qualified labour (UQL) in sparsely populated northern peripheries of high-income countries has been recognised as a substantial challenge to northern development (Nord & Weller, 2002). In countries such as Australia, Canada, Sweden, Finland, or Iceland, populations are highly polarised between a densely populated metropolitan south and a relatively vast and underdeveloped north, and studies have consistently shown that northern peripheries tend to experience net losses of UQL through migration within those...
countries (Bjarnason & Edvardsson, 2017; Bjerke & Mellander, 2017; Corcoran et al., 2010; Delisle & Shearmur, 2010; Haapanen & Tervo, 2012; Rehák & Eriksson, 2020). Much less attention has been paid to migration flows in northern peripheries themselves, despite substantial investment going to the establishment of northern universities and higher education hubs to address regional skill shortages (Bjarnason & Edvardsson, 2017). These hubs are typically located in the few larger cities and are expected to produce UQL and also to serve as part of the broader urban-based knowledge and amenity infrastructure for recruiting and retaining northern UQL (Nord & Weller, 2002). The extent to which rural and remote hinterland locations might benefit from such urban-centred higher education strategies is currently not known. Specifically, it is not clear whether the cities are more likely to divert UQL away from their hinterland areas or serve as gateways to those areas and it is not known how intense urban–rural UQL exchanges might be.

This article examines UQL migration in the contexts of Northern Australia and Northern Sweden to increase our understanding of the role of northern cities as providers of UQL for their hinterland regions. Our study framework considers three hypothesised relationships between northern cities and regions. The first hypothesis assumes that growing UQL populations in urban centres will eventually lead to ‘spillovers’ of surplus UQL to rural areas, particularly if that labour is ‘home-grown’ in the north and if universities target regional student markets and skill shortages (Nord & Weller, 2002). The second assumes that cities become ‘sponges’ that grow at the expense of the hinterland (Argent et al., 2008), drawing in students and labour from the region who then fail to return to rural areas (Bjerke & Mellander, 2017). The third suggests that the economic and demographic development of northern cities is substantively disconnected from that of their regions, thus limiting migration and labour exchanges between city and hinterland (Carson, 2011).

The purpose of comparing two different northern peripheries is to see whether there have been similar experiences of internal UQL redistribution and city–hinterland relationships or whether differences in higher education and workforce strategies, regional development policies, and industry priorities could stimulate different outcomes. There is increasing recognition that northern peripheries in high-income countries such as Australia and across the Circumpolar North share a number of geographic, economic, demographic, and political characteristics that generate volatile population mobilities and impact migration systems in particular ways (Carson, 2011; Huskey, 2005; Taylor, 2016).

Key insights

We examine urban–rural migration flows of university-qualified labour (UQL) in Northern Australia and Northern Sweden to see how human capital is redistributed from a few urban growth centres to rural and remote hinterland locations. Regional UQL flows are quite disconnected in Northern Australia, whereas the Swedish cases demonstrate some urban–rural spillover of UQL in certain industries. Our study contributes to discussions about regional migration systems in northern peripheries and considers how different policy approaches to regional development and higher education may affect the production and distribution of skilled labour in the north.

Northern development policies and workforce strategies can and should therefore not be modelled on experiences documented in other rural contexts, particularly those in proximity to larger metropolitan centres in the south. Instead, there may be greater value in comparisons between different norths to advance our theoretical understanding of human capital flows in northern regions and to guide policy development that is more cognisant of northern-specific limitations and opportunities.

2 | BACKGROUND

An increasing number of scholars from Northern Europe and North America (Bone, 2003; Huskey, 2005; Keskitalo, 2019), but more recently also from Australia (Carson, 2011; Holmes, 2010; Taylor, 2016), recognise that northern peripheries of high-income countries face specific constraints when it comes to socio-economic development. These peripheries typically cover large, sparsely populated territories that are very distant from metropolitan centres in the south. Due to extreme climatic and ecological conditions, they have been poorly suited to systematic agricultural settlement and have come to rely on more opportune land uses (Bylund, 1960; Holmes, 2010). This pattern has generally led to a more discontinuous spread of settlements than exists in farming-dominated areas, generating many diverse special-purpose towns that have either relied on typical northern staples industries such as mining, forestry, and pastoralism or other national interests, such as defence, energy provision, nature conservation, and Indigenous
livelihoods (Bone, 2003; Holmes, 2010; Huskey, 2005). These settlements often operate as isolated population enclaves and are only poorly connected to larger, integrated functional regions, creating a sense of disconnect when it comes to intra-regional interactions such as migration and mobility exchanges, economic and demand linkages, transport connections, and social or cultural ties (Carson, 2011; Carson & Carson, 2014). Urban–rural exchanges of people and resources are often considerably weaker than in other rural contexts, particularly in areas where interdependent networks of productive services and town scenes have evolved around shared socio-economic histories, as observed in many farming-dominated peripheries, albeit in south-eastern Australia (Smailes et al., 2019).

Regional disconnectedness in the north is reinforced by high urban primacy ratios, truncated urban hierarchies, and increasing urban–rural divergence in economic and demographic terms. The few larger cities have generally grown their populations in recent decades, often on the back of strong investment in new economies based on service and knowledge industries, large-scale infrastructure, and extensive place marketing targeting external migrants and visitors (Carson et al., 2010; Westin, 2015). Meanwhile, those in smaller settlements in the hinterland have largely continued to rely on externally controlled boom and bust industries or development initiatives aimed at disadvantaged populations, leading to an increasing divide between the city and the hinterland, and between the ‘have and have nots’ (Taylor et al., 2011). This divide presents challenges for the development of human capital for northern regions, with different implications for city and hinterland locations that are currently not well understood.

There has been surprisingly little debate about the extent to which urban growth in the north might benefit or constrain human capital development in the hinterland. Proponents of conventional growth centre theories argue that increasing urban agglomeration will ultimately create positive ‘spillover’ effects for hinterland areas (Westin, 2015). In a migration context, such effects mean that rural areas well connected to urban centres may experience an inflow of people through sub-urban sprawl or counter-urban migration, mostly within commuting distance from cities and in well-connected high amenity areas (Argent et al., 2014; Partridge et al., 2007; Smailes et al., 2019). In contrast, there have been debates about cities becoming ‘sponges’ that ‘soak up’ surrounding rural populations, particularly young and educated people who are drawn to urban areas in search for better employment, services, education, and investment opportunities (Argent et al., 2008). Although these spillover and sponge metaphors have been criticised for being too simplistic and for not representing the complexity of rural in- and outmigration flows (Alexander & Mercer, 2007; Argent et al., 2008), there is still a dearth of literature on the role of non-metropolitan cities in intra-regional migration. In particular, it is not clear how urban–rural migration exchanges unfold in more sparsely populated, and presumably disconnected, northern peripheries where functional interdependencies within the region are expected to be weak. It is also not clear how urban–rural migration exchanges apply in the context of highly educated UQL populations, which are known to be among the most mobile and most difficult ones to retain in peripheral areas (Corcoran et al., 2010; Rehák & Eriksson, 2020).

2.1 A framework for studying urban–rural UQL flows in northern peripheries

The performance of northern UQL systems in facilitating regional access to human capital may be influenced by several factors. First, political ambitions in relation to ‘northern development’ are likely to play a role, as are the ways in which cities versus hinterland regions are prioritised in regional strategies. These strategies determine the scale and spatial concentration of investment and the extent to which higher education facilities, physical innovations or knowledge hubs, and higher skilled industries of employment cluster in the city, for example, as part of localised ‘city deals,’ or are deliberately decentralised across the region (Copus, 2018). They also determine the role of hinterland areas in regional economies and their skill needs; for example, in terms of whether they are problematised as areas of disadvantage (therefore requiring ‘generalist’ skills, such as those provided by public servants, health, education, or welfare workers) or are seen as sites of resource exploitation (requiring ‘specialist’ skills, such as those provided by mining engineers).

Second, the production focus and regional orientation of the higher education sector is a key factor in designing UQL systems that are more likely to produce and retain skills in the north. Specialised institutions that deliver education programs matching regional skill demands are generally assumed to deliver more beneficial labour outcomes for their regions (Nord & Weller, 2002). This assumption resonates with the literature on graduate migration, which emphasises that universities with a more applied and regionally targeted industry focus generate higher rates of regional graduate retention than traditional universities with a broader educational and research-intensive focus (Faggian & McCann, 2009; Rehák & Eriksson, 2020; Venhorst et al., 2010). Another common assumption is that targeting local students from
the region may boost UQL retention in the north (Nord & Weller, 2002), because graduates studying in their home regions have often been found less likely to leave than graduates studying away from home (Faggian & McCann, 2009; Haapanen & Tervo, 2012). Nevertheless, evidence for this idea continues to be limited for northern peripheries, with recent work in Sweden suggesting that students from the north may in fact use their local universities as a stepping stone to leave the region upon graduation (Rehák & Eriksson, 2020). Another study from northern Iceland (Bjarnason & Edvardsson, 2017) has noted that regional retention rates may also be misleading, as graduates staying in the north are primarily concentrating in the city, thus limiting opportunities for a spillover or return of UQL to the hinterland.

Of course, the impact of northern universities on facilitating access to skilled labour for their regions is far greater than the direct production of UQL. Universities help coalesce knowledge-based activities and resources that attract students and graduates from elsewhere (Bjarnason & Edvardsson, 2017). This effect may lead to an increasing urban agglomeration of professional skills and UQL in northern cities, particularly as few hinterland locations are able to provide similar (non-financial) rewards such as urban service and lifestyle amenities or career opportunities for accompanying families. On the other hand, increasing urban agglomeration might lead to local skill saturation and a more diverse pool of surplus UQL, some of whom could be incentivised to work in remote areas (Corcoran et al., 2010). Still, rapid growth trajectories in many northern cities in recent years could mean that local skill saturation and surplus labour are less likely, with cities themselves struggling to recruit and retain skilled professionals (Carson, 2011) and potentially having to compete with those in the hinterland for a small pool of UQL.

A key dimension of skilled migration in the north is the temporariness of labour markets. Northern peripheries are renowned for high population turnover and a strong reliance on short-term migrants and non-resident workers from external sources, and these have been features of both city and hinterland locations (Carson et al., 2010; Lundmark, 2006; Tonts et al., 2016). Common examples of such labour flows include ‘escalator migrants’ looking for better career opportunities or financial incentives or remote ‘experience seekers’ looking for more exotic or extreme work environments and lifestyle activities (Martel et al., 2013). Also, long-distance commuter flows, such as generated by fly-in/fly-out workers, have become common, particularly in remote locations hosting temporary resource projects (Storey, 2016; Tonts et al., 2016). These labour groups are commonly drawn to specific locations for specific purposes and for limited periods of time, after which they leave the north rather than circulate within the region in search of new opportunities. In this sense, both city and hinterland locations may rely on separate external UQL pipelines that bypass regional labour systems (Carson, 2011) rather than on a shared northern skill pool that can be mobilised and redistributed within the region.

Finally, considering urban–rural differences in industries and skill needs and asking how these encourage or stifle internal UQL migration between cities and hinterland regions are critical steps for researchers to take. That labour markets may be rather disconnected is suggested by urban–rural economic divergence in the north, which is exemplified by the (simplified) images of cities as creative knowledge, cultural, and service centres and of hinterlands as dominated by resource industries (Westin, 2015). Professional skills in the public service sector, comprising mostly administration but also including health and education, may be absorbed in cities where these services have increasingly been concentrated, although some spillover into hinterlands may be encouraged by targeted financial or career incentives (Corcoran et al., 2010). Urban–rural spillover may also occur if cities and their university sectors assume the role of specialist knowledge providers for hinterland industries, although there are indicators that even skilled jobs in the resources and manufacturing sectors are centralising into urban centres (Hedlund & Lundholm, 2015; Tonts et al., 2016). Meanwhile, new industries such as tourism are often promoted to diversify the resource hinterland, and are likely to face strong competition from the city’s growing private service sector (Müller et al., 2020). They are also renowned for their low levels of skills and high rates of seasonal employment, thus offering limited potential to grow the pool of resident UQL in the hinterland (Åberg, 2017).

Summing up, our study framework examines the extent of urban–rural spillover, sponging, or disconnect- edness in the regional migration flows of UQL in two northern peripheries. As outlined in the following case descriptions, the study considers differences in the regions’ political orientations to northern development, the regional orientation and production focus of their higher education sectors, and industry priorities. The findings then present how internal UQL flows have differed across the case regions, considering their urban agglomeration dynamics, local production capacity, the prominence of internal versus external mobility flows, and urban–rural differences across various industry sectors. The final discussion reflects on possible explanations for the observed differences and their implications for northern policy and theory development on UQL migration.
3 | DESCRIPTION OF CASES

‘Northern Australia’ in this research follows the definition adopted by the Australian Government’s most recent White Paper on ‘Developing Northern Australia’, with some slight modifications for the inclusion of statistical regions (described below). As illustrated in Figure 1a, Northern Australia comprises the following subregions:

- **The Northern Territory** (NT) is a limited-function province, with a population of 230,000 residents in 2016 who mainly lived in and around the capital city of Darwin (~137,000). Apart from some localised resource extraction, gas processing, and tourism, the NT economy is largely dependent on the public service sector (Carson et al., 2010). Darwin is the ‘home base’ for the NT’s sole university, Charles Darwin University, which had around 12,000 higher education students enrolled in recent years, about a third of them coming from within the NT and more than half enrolled through distance education. Apart from its prominent vocational training focus, many of its higher education and research programs also have an explicit northern (and in particular Indigenous) focus.

- **North Queensland** represents part of a provincial jurisdiction, with the capital city, Brisbane, located several hundred kilometres to the south. In 2016, North Queensland was home to around 940,000 residents who were predominantly residing in or near the coastal cities of Cairns (~240,000), Townsville (~229,000), Mackay (~170,000), and Rockhampton (~221,000). The economy is mixed, with substantial activity in mining (mostly influencing Rockhampton and Mackay), pastoralism and some agriculture (Rockhampton, Mackay, and Cairns), tourism (Cairns), and defence (Townsville). Townsville is also an important government administration post for the north. Two universities are headquartered in North Queensland—James Cook University and CQUniversity (formerly Central Queensland University). James Cook University has had around 20,000 students in recent years and is mainly based in Townsville but also maintains a campus in Cairns. It has a strong regional focus, providing a number of tropical and northern-oriented teaching and research programs, and targeting students from the north, with over 70% of domestic students coming from the northern state divisions. CQUniversity is based in...
Rockhampton but has campuses in Cairns and Mackay. Its recent focus has been on expanding its reach to interstate and international markets, with many degree programs and research centres located outside of Rockhampton and outside of the north altogether. It has had between 20,000 and 25,000 higher education students in recent years, about half of them enrolled outside of regional Queensland (in the capital cities or through distance education).5

- **Northeastern Australia** includes the Pilbara and Kimberley regions, some 1,500–3,000 kilometres north of the capital city, Perth. In 2016, the area had a population of just 94,000 residents, largely spread across several smaller urban centres (with fewer than 20,000 residents). The region has no ‘home’ university, and its economy is mainly dependent on mining, social services, and some tourism.

‘Northern Sweden’ consists of the two counties of Norrbotten and Västerbotten (Figure 1b), representing the northernmost part of what is commonly referred to as ‘Norrland’. Although Norrland stretches across more than half of the country (and includes more densely populated areas in Central Sweden), it is this northern part (‘Norra Norrland’) that dominates public discourse and media perceptions of the north in Sweden (Eriksson, 2008). This region represents Sweden’s Arctic, which is gaining attention in national and international place marketing and development strategies (Müller et al., 2020).

- In 2018, Västerbotten had a population of around 270,000 residents,6 the majority of whom lived in the capital city of Umeå (∼127,000 residents) and in the industrial coastal town of Skellefteå (∼72,000). Umeå has been the fastest growing urban centre in Northern Sweden for several decades, which has largely been attributed to the impact of the university and the associated university hospital (Westin, 2015). Umeå University has become one of Sweden’s larger universities (with ∼34,000 students in 20187), offering a broad range of education and research, which primarily concentrates in Umeå. The health and education sectors are among the city’s main employers, along with local government and public administration. The city is also renowned for its growing cultural sector (Müller et al., 2020). Meanwhile, the inland economy continues to rely primarily on the resources sector (mining, forestry, and energy), some tourism, and public services (in the municipal centres).

- Norrbotten had a population of around 250,000 residents in 2018. Its largest city is the county capital of Luleå (∼78,000 residents). Outside of Luleå, the regional population is concentrated along the coast in several smaller urban centres, including Piteå and Boden, which are within daily commuting distance of Luleå. The region’s university—Luleå University of Technology (LTU)—is one of the city’s main employers, along with an emerging information technology industry. LTU has a strong technological focus, with much of its education and research targeted towards industry partners to support the region’s main industrial sectors (mining, manufacturing, energy, and forestry). LTU has had around 15,000 students in recent years who are mainly based in Luleå.8 It has had a more explicit regional student focus than Umeå, with recent figures (Rehák & Eriksson, 2020) showing substantially higher rates of graduates who studied in their home region (∼60% compared with ∼47% in Umeå).

In both countries, the northern hinterlands have faced substantial development challenges in recent decades, illustrated by declining or stagnating populations, a continued loss of local services and employment, and the coming and going of ‘boom and bust’ resource projects. Both regions also have Indigenous populations with particular service needs, although this is more prominent in Northern Australia where Indigenous people in many remote communities struggle with poor health limited social and economic opportunities (Taylor et al., 2011). Despite similar challenges in both countries, political approaches to ‘northern development’ have differed. In Australia, there has been more explicit consideration of the regions outside of the main urban centres, including considerable external (that is, state and federal government) support, for example, through dedicated regional development agencies and regional offices for administration of health, education, tourism, or Indigenous service programs. Separate policies often exist for urban growth centres, as illustrated by recent ‘city deals’ for Darwin and Townsville.9 In Sweden, regional development policies are geographically more neutral and do not as overtly discriminate between city and hinterland in terms of economic, service, or infrastructure needs. Meanwhile, internal governance structures are stronger in Sweden because the counties act as fully self-governed provinces and because local governments retain relatively strong powers in decision-making, for example, on resourcing local services and administration.

These differences may influence the degree of urban–rural spillover or sponging of UQL. We might expect more spillover in the Australian case because the political orientation to the region is rather strong and arrangements exist, particularly in the public service sector, to
serve the region. Also, the northern universities (CDU and JCU, although less so CQU) are oriented to the regions’ skills needs, including in fields such as health, social, and Indigenous services. In Sweden, a less internally biased regional policy environment may inadvertently reinforce competition over resources to the detriment of the hinterland, leading to greater sponging or disconnectedness of UQL flows. In addition, cities in Northern Sweden have developed as well-known university towns and knowledge centres, and Umeå has been positioned on a national (and even international) rather than regional scale, meaning that a spillover of UQL to the hinterland might be more limited. Teasing out these differences offers an opportunity to investigate whether a shared northern pattern of urban–rural UQL exchange exists or whether different forms of ‘regional orientation’ are more likely to generate spillover, sponging, or disconnectedness.

4 | METHODS

The research used data from the national statistics agencies in Australia and Sweden to identify the size of the UQL cohort in the north, the extent to which internal migration affected the distribution of UQL between cities and regions, and the net gain of UQL resulting from internal migration. Differences in these measures of migration intensity among different industries of employment were also considered.

Data for the Australian case were drawn from the 2016 Australian Census, using customised data from the Tablebuilder online application. The following Census variables were used in various cross-tabulations:

- place of usual residence on Census night (2016);
- place of usual residence 5 years prior to Census night (2011);
- highest level of educational attainment (‘UQL’ meant the person had completed at least a 3-year university degree or postgraduate qualification); and
- industry of employment.

Usual residence data were obtained at Statistical Area 4 or SA4 level (the largest sub-provincial unit in the standard geographical classification system). Rockhampton, Mackay, Townsville, Cairns, and Darwin each had its own SA4, and each includes areas considered as being outside city limits but within daily commuting distance (Figure 1a). The remaining three SA4s—Queensland Outback, Northern Territory Outback, and Western Australia Outback (north)—were classified as regional. It would have been possible to use smaller spatial units to match more closely the boundaries set out in the White Paper on ‘Developing Northern Australia.’ However, the Australian Bureau of Statistics supresses release of tables with cells containing fewer than five respondents, which already presented occasional problems even at SA4 level. Spatial accuracy was therefore sacrificed for data coverage.

Data for the Swedish case were drawn from the ASTRID database at Umeå University, which contained individual-level data from Swedish population registers up to 2015. We obtained custom cross-tabulations of data about individuals who were resident in Västerbotten and Norrbotten in 2015 and 2010 to match the Australian Census data timeframes as closely as possible. The following data items were used:

- municipality of residence, 2015;
- municipality of residence, 2010;
- highest level of educational attainment (‘UQL’ meant the person had completed at least a 3-year university study program); and
- industry of employment.

There were two ‘city’ municipalities in the Swedish case—Umeå and Luleå (Figure 1b). For consistency with the Australian case, the nine municipalities considered to be within daily commuting proximity to city municipalities were included as part of the city regions. In Norrbotten, this group included Piteå, Boden, Kalix, Överkalix, and Älvsbyn, whereas in Västerbotten, this group included Robertsfors, Vindeln, Vännäs, and Norndalming. The remaining 18 municipalities were considered to be regional.

Migration rates were calculated as the number of movers expressed as a percentage of the 2015/2016 resident populations. Because both sources contained population-level data, and absolute numbers were rather small, tests of significance of difference were not used. Instead, the research team assessed whether observed differences could be considered important. Instances where the team agreed that differences were important are marked in bold in the tables. This approach typically resulted in differences of greater than 5% being considered important.

Industry of employment was classified into 12 groups, six of which were primary or secondary industries—mining, agriculture and forestry, manufacturing, energy, construction, and transport. The remaining six were considered tertiary or quaternary—public administration and safety, education, health, hospitality, wholesale and retail trade, and ‘other services’ such as finance, real estate, and consulting.
5 | RESULTS

At a broad ‘northern’ level, the proportion of UQL among the resident workforce was similar for both Northern Australia (19%) and Northern Sweden (22%) and considerably lower than their national averages (Table 1). However, the cities in Northern Sweden had relatively high proportions of UQL among the workforce (25%), similar to the Swedish average (27%). There was consequently a large difference between the proportion of UQL in the city workforce and in the regional workforce (16%). In contrast, the proportion of UQL in the workforce was similar right across Northern Australia, with only minimal difference between cities (20%) and regions (19%).

In both countries, working-age residents in cities were more likely to be studying at university than those in the regions. In Northern Australia, however, fewer city residents were studying (5.5%) than would be expected given the national rate (8.3%). This was not the case in Northern Sweden, where the differences between cities and region were far greater and where the rate of university study in the cities (10.9%) was more than double the national rate (5.1%).

Considering five-year population turnover rates (Table 1), UQL associated with Northern Australia was substantially more mobile than UQL in Australia generally and for both northern cities and regions. In contrast, UQL turnover in Northern Sweden (39%) was similar to the Swedish average (35%), although somewhat higher in the region (43%).

Table 2 shows the proportion of UQL in primary and secondary industries. There were much higher proportions in Northern Sweden than in Northern Australia for all industries except construction; however, northern rates overall were low compared to the UQL proportion of the total workforce shown in Table 1. In Australia, northern regions had a much higher proportion of UQL in the mining industry than northern cities, but otherwise the distribution of UQL between cities and regions was quite similar. In Northern Sweden, however, there were substantial disparities between high UQL proportions in city populations and low UQL proportions in regional populations for all sectors, including mining.

The Swedish pattern identified in Table 2 persisted with tertiary and quaternary industries (Table 3), albeit with much higher proportions of UQL in most of these industries. Only hospitality had a similar distribution

| TABLE 1 | Size, potential, and turnover of the UQL workforce |
|----------|---------------------------------------------|
|          | Resident workforce | Resident workforce | % resident workforce who were UQL | % working-age residents studying at university | 5-year turnover rate |
|          | 2015/2016 (n) | who were UQL (n) | who were UQL | |
| Northern Australia | 545,000 | 106,000 | 19 | 4.9 | 88 |
| Cities | 440,000 | 86,000 | 20 | 5.5 | 86 |
| Region | 107,000 | 20,000 | 19 | 2.7 | 98 |
| National comparison | 31 | 8.3 | 25 |
| Northern Sweden | 221,000 | 48,000 | 22 | 7.4 | 39 |
| Cities | 141,000 | 36,000 | 25 | 10.9 | 36 |
| Region | 80,000 | 13,000 | 16 | 1.1 | 43 |
| National comparison | 27 | 5.1 | 35 |

Note: Instances where the team agreed that differences were important are marked in bold.

| TABLE 2 | Proportion of workers in primary and secondary industries who were UQL |
|----------|-----------------|----------------|--------|--------|--------|--------|
|          | Agriculture and forestry | Mining | Manufacturing | Energy | Construction | Transport |
| Northern Australia | 1.9 | 4.4 | 2.0 | 1.3 | 2.4 | 2.5 |
| Cities | 1.8 | 2.8 | 2.2 | 1.5 | 2.4 | 2.6 |
| Region | 2.7 | 11.0 * | 1.0 | 0.6 | 2.5 | 2.5 |
| Northern Sweden | 7.1 | 12.5 | 7.7 | 15.8 | 1.9 | 9.5 |
| Cities | 27.0 | 37.4 | 15.5 | 26.1 | 3.9 | 16.1 |
| Region | 2.8 | 11.5 | 2.8 | 8.8 | 0.7 | 3.2 |

Note: Instances where the team agreed that differences were important are marked in bold.
between cities and regions. There was again a more even distribution between cities and regions in Northern Australia, except in ‘other services’.

Table 4 shows that internal migration intensity within the north was substantially higher in Sweden than in Australia. In Northern Australia, less than 10% of migrants to both cities and regions came from within the north, whereas 28% of city and 44% of regional in-migrants in Northern Sweden were from elsewhere in the north.

There was a higher city-to-city UQL migrant exchange in Northern Australia (67%) than in Northern Sweden (51%), perhaps because of the larger number of cities in the Australian case (Table 4). Conversely, the cities in Northern Sweden received a higher share of internal migrants from their northern regions (49% compared with just 33% in Northern Australia). In both cases, northern regions received a substantial majority of internal UQL migrants from the cities. Internal migration, however, had very small impacts on UQL populations overall, and those were in favour of cities in Australia (+0.4%) and regions in Sweden (+1.8%).

Table 5 shows that net-migration flows of UQL in primary and secondary industries were similar in direction in Australia and Sweden, with a flow away from the cities for agriculture and forestry and mining to the cities for TABLE 3  Proportion of workers in tertiary and quaternary industries who were UQL

|                  | Public administration and safety | Education | Health | Hospitality | Wholesale and retail trade | Other services |
|------------------|---------------------------------|-----------|--------|-------------|----------------------------|---------------|
| Northern Australia | 12.5                            | 24.5      | 23.7   | 4.2         | 4.3                        | 16.3          |
| Cities           | 12.5                            | 24.4      | 24.1   | 4.1         | 4.4                        | **17.2**      |
| Region           | 12.7                            | 25.1      | 21.8   | 4.3         | 3.4                        | 12.6          |
| Northern Sweden  | **36.9**                        | 53.4      | 32.1   | 5.7         | 6.0                        | 20.9          |
| Cities           | **48.2**                        | **77.0**  | **50.5** | 6.9         | **9.3**                    | **32.3**      |
| Region           | 20.3                            | 27.6      | 16.8   | 4.6         | 3.0                        | 10.2          |

Note: Instances where the team agreed that differences were important are marked in bold.

TABLE 4 Internal migration of all UQL workers (net as percentage of the 2015/2016 UQL population for that region)

|                  | % of in-migrants who came from the north | % of northern migrants from northern cities | % of northern migrants from northern regions | Net gain from internal migration (%) |
|------------------|-----------------------------------------|------------------------------------------|---------------------------------------------|-------------------------------------|
| Northern Australia | 8.4                                     | 70                                       | 30                                          |                                     |
| Cities           | 8.2                                     | **67**                                   | **33**                                      | 0.4                                 |
| Region           | 9.5                                     | 85                                       | 15                                          | **−1.8**                            |
| Northern Sweden  | **33.0**                                | 69                                       | 31                                          |                                     |
| Cities           | 28.0                                    | **51**                                   | **49**                                      | **−0.6**                            |
| Region           | **44.3**                                | 95                                       | 5                                           | 1.8                                 |

Note: Instances where the team agreed that differences were important are marked in bold.

TABLE 5 Net gain from internal UQL migration for primary and secondary industries

|                  | Agriculture and forestry | Mining | Manufacturing | Energy | Construction | Transport |
|------------------|--------------------------|--------|---------------|--------|--------------|-----------|
| Northern Australia |                          |        |               |        |              |           |
| Cities           | −0.1                     | −0.9   | 1.0           | 0.6    | 0.3          | 0.7       |
| Region           | 0.5                      | 1.2    | **−11.0**     | **−8.0** | −1.5         | **−4.1**  |
| Northern Sweden  |                          |        |               |        |              |           |
| Cities           | **−1.6**                 | −61.4  | −1.3          | 0.9    | −1.3         | 0.1       |
| Region           | 3.4                      | **8.1** | **4.3**       | −1.8   | **4.2**      | −0.4      |

Note: Instances where the team agreed that differences were important are marked in bold.
energy and transport. The magnitude of the population impacts for regional Northern Australia was higher than for regional Northern Sweden in manufacturing, energy, and transport, whereas outflow of mining UQL from the cities in Northern Sweden was substantial. Manufacturing and construction were the sectors where direction of flows differed between the two cases, with a small net gain to cities in Australia, but a moderate net gain to the regions in Sweden.

In contrast to primary and secondary industries, there were differences in the direction of flows of UQL in tertiary and quaternary industries (Table 6). Generally, flows were to the cities in all sectors in Australia, but to the regions in Sweden. Population impacts for the regions were small, however, except in wholesale and retail trade in Australia (−4.3%) and hospitality in Sweden (+3.1%).

Table 7 shows the regional population impacts of internal migration involving the various cities. Overall, just 36 of the 84 city–industry combinations exhibited a net gain in UQL for regional areas. Across all cities, and for most characteristics, net impacts were very small, typically less than 3%. Darwin benefited (albeit with small regional population impacts) from regional migration for all characteristics except UQL in agriculture and forestry, whereas Cairns benefited from regional migration except for UQL in mining. Migration involving Mackay slightly benefited the regions except for UQL in education and trade. Townsville mostly benefited from UQL migration in manufacturing and across the tertiary and quaternary industries, whereas the regions benefited in other primary and secondary industries. There was a mix of results relating to Rockhampton, with the only substantial regional population impact being a loss of manufacturing UQL to the city. There was also a mixed picture from Luleå, with net benefits to the regions in eight sectors (most notably mining) and small net losses from regional populations in four sectors. In contrast,

### Table 6 Net gain from internal UQL migration for tertiary and quaternary industries

| Public administration and safety | Education | Health | Hospitality | Wholesale and retail trade | Other services |
|---------------------------------|-----------|--------|-------------|---------------------------|---------------|
| **Northern Australia**          |           |        |             |                           |               |
| Cities                          | 0.4       | 0.5    | 0.3         | 0.1                       | 0.7           | 0.3           |
| Region                          | −1.8      | −2.6   | −1.5        | −0.4                      | −4.3          | −2.1          |
| **Northern Sweden**             |           |        |             |                           |               |
| Cities                          | −0.6      | −0.3   | −0.3        | −2.4                      | −0.8          | −0.7          |
| Regions                         | 2.2       | 1.0    | 0.9         | 3.1                       | 2.2           | 2.0           |

Note: Instances where the team agreed that differences were important are marked in bold.

### Table 7 Net gain of UQL for regions (as proportion of regional population) for each city

| Regional net gain               | Rockhampton | Mackay | Townsville | Cairns | Darwin | Umeå  | Luleå |
|---------------------------------|-------------|--------|------------|--------|--------|-------|-------|
| Total UQL population            | −0.2        | 0.1    | −0.2       | −0.6   | −0.9   | 1.6   | 0.2   |
| Agriculture and forestry        | −1.6        | 2.0    | 0.5        | −0.8   | 0.5    | 4.1   | −0.7  |
| Mining                          | 0.3         | 0.4    | 0.7        | 0.5    | −0.6   | 3.0   | 5.1   |
| Manufacturing                   | −6.5        | 0.0    | −4.5       | 0.0    | 0.0    | 2.9   | 1.4   |
| Energy                          | 0.0         | 0.0    | 2.2        | −3.6   | −6.5   | −0.9  | −0.9  |
| Construction                    | 0.5         | 1.1    | 0.6        | 0.0    | −3.7   | 2.1   | 2.1   |
| Transport                       | −1.2        | 0.6    | 0.0        | −2.6   | −0.8   | −0.9  | 0.4   |
| Public administration           | 0.3         | 0.0    | −0.3       | −0.4   | −1.4   | 2.0   | 0.2   |
| Education                       | −0.5        | −0.4   | −0.1       | −0.9   | −0.7   | 1.2   | −0.2  |
| Health                          | −0.1        | 0.1    | −0.5       | −0.6   | −0.5   | 2.2   | −1.3  |
| Hospitality                     | 0.3         | 0.0    | −0.1       | −0.2   | −0.4   | 2.1   | 1.0   |
| Trade                           | −0.6        | −0.4   | 0.4        | −1.2   | −2.5   | 0.8   | 1.3   |
| Other services                  | 0.2         | 0.1    | −0.5       | −0.9   | −1.0   | 0.9   | 1.2   |

Note: Instances where the team agreed that differences were important are marked in bold.
migration involving Umeå mostly benefited the regions, particularly in the forestry and agriculture sector, but also right across the tertiary and quaternary industries.

6 DISCUSSION

The research has revealed interesting differences between northern UQL systems in Australia and Sweden. The urban–rural divide in the proportion of UQL among the workforce was much greater in Northern Sweden than in Northern Australia, suggesting a higher degree of urban UQL agglomeration and potentially skill saturation, in Northern Sweden. Meanwhile, the cities in Northern Australia had similarly low UQL proportions as their regions across all sectors and industries, suggesting that cities and regions may be struggling to a similar extent to expand their UQL workforces. The Swedish cities also had much higher UQL production capacity than the Australian cities, reflecting their stronger reputation as nationally competitive ‘university towns’ able to attract large resident student populations. Although these northern university cities still struggle with relatively low graduate retention rates in a national context (Rehák & Eriksson, 2020), they seem to offer more potential for regional UQL spillover than the Northern Australian cities where resident student populations are relatively small.

Northern Sweden had much higher internal UQL migration, suggesting that it is perhaps more strongly connected as a functional region, with people circulating more commonly between cities and regions for education, work, and recreation purposes (Müller et al., 2020). In contrast, Northern Australia had very limited internal migration but much higher rates of external mobility and UQL turnover, illustrating the reported temporary nature of skilled workforces in the north (Carson et al., 2010; Tonts et al., 2016). Hence, although those in regions in Northern Sweden were able to benefit from a much more active internal migration system with a small UQL net gain or ‘spillover’, the opposite was the case in Northern Australia where sponging towards the cities was much more common. Such sponging was, however, very modest, which lends support to the argument that urban–rural UQL systems are disconnected in Northern Australia and in competition over a limited pool of volatile skills (Carson, 2011).

Although we expected that the apparent economic divergence between cities and regions in Northern Sweden (Westin, 2015) would generate greater disconnectedness, it is possible that differences in urban and regional industrial profiles have in fact generated opportunities for more complementary, rather than competing, labour migration flows. Primary and secondary industries are predominantly regional in Northern Sweden, with limited demand for these skills in the cities. Nevertheless, the production focus of the Swedish universities, and particularly Lulea’s relationship with mining, seems to generate surplus labour that is then drawn to the region where these skills are in demand. In contrast, the regions in Northern Australia had relatively large net outflows of UQL to northern cities in most primary and secondary industries, suggesting that these industries maintain a reasonably strong presence in and around the cities and divert some labour away from the regions. For example, Darwin emerged as a relatively strong ‘sponge’ for UQL in the energy and construction sector, whereas Rockhampton and Townsville emerged as strong sponges in manufacturing. The regional spillover in mining was also much smaller in Northern Australia compared with Northern Sweden, which may reflect the popularity of long-distance commuting practices from other Australian cities (Tonts et al., 2016), as well as a weaker focus of the northern university sector on producing UQL for its mining sector.

Differences in net-migration flows persisted across tertiary and quaternary industries, with the regions in Northern Australia commonly experiencing outflows and the regions in Northern Sweden having inflows. This outcome was somewhat unexpected, considering that the hinterland regions in Sweden are less privileged in regional policies and public service strategies than those in Northern Australia. Rather surprisingly, regional spill-over in Northern Sweden appeared primarily driven from out of Umeå, which has a large and externally oriented university with a more limited regional industry and engagement focus. It may be that Umeå’s ‘generalist’ approach to education, and its larger UQL production capacity, generates a surplus of broader and more flexible skills that are of use to the regions, especially in public administration. At the same time, we expected to see higher spillover of ‘specialist’ skills in health and education, given the declared focus of northern universities on these sectors and the prominence of recruitment and incentives schemes for health and education professionals in remote areas (Abelsen et al., 2020; Corcoran et al., 2010). In both cases, however, these flows were smaller than expected and had limited population impacts (favouring the cities in Australia and the regions in Sweden). Hence, the argument that universities producing ‘specialist’ skills for their regions are more likely to retain graduates in their regions (Nord & Weller, 2002), needs to be treated with caution. The observed differences between UQL flows in mining and health/education suggest that spillover may not emerge equally across different public and private sector industries.
Differences in regional spillover or sponging could also be the result of different settlement geographies and urban hierarchies. Although Northern Australia has multiple cities of similar size that may be ultimately competing for northern UQL, further decentralisation within the north might be hampered by a lack of smaller or intermediate urban centres in the hinterland. In contrast, the Northern Sweden case region has only two larger cities, but several notable urban settlements in the region, such as the industrial town of Skellefteå, the smaller administration centre of Lycksele, or the inland mining towns of Kiruna and Gällivare, and these may be better equipped to attract UQL due to more job opportunities and urban-style infrastructure and service amenities.

Different governance systems may also be partly responsible for the observed differences in UQL flows, particularly in the public sector. In Northern Australia, distant state and national capitals continue to retain considerable administrative control of the north (and consequently of senior bureaucrat positions). Meanwhile, Sweden's northern cities function more independently as provincial capitals and host most of their administrative workforce locally, which perhaps explains why they had much higher proportions of UQL in tertiary and quaternary sectors than the Australian cities. Public service provision within Northern Australia is commonly administered through regional offices located in the few administrative centres (Darwin, Cairns, and Townsville), thus leading to potentially greater centralisation and sponging effects in these cities. In Northern Sweden, local governments retain stronger political and administrative responsibilities, and they are expected to fill local skill needs more independently, which may allow for more flexible local recruitment strategies and more functional urban–rural UQL pipelines than regionally driven workforce strategies (Abelsen et al., 2020). Even in this case, however, the differences between Umeå (spillover) and Luleå (sponging) in directing public service UQL to the region are worth noting and require some further investigation.

It is possible that a greater degree of northern-ness is generated by factors such as extreme climate, population sparseness, greater distance between settlements, economic and land use constraints, and higher population mobility and does affect how cities interact with their regions in terms of population exchange. The more northerly locations in this research (Darwin and Cairns in Australia and Luleå in Sweden) showed higher degrees of ‘sponging’ across many industries, indicating that more isolated cities may be pressured to agglomerate UQL to remain competitive and make the best use of limited or volatile resources (Bjarnason & Edvardsson, 2017). To the south, cities are closer to one another, and to larger population centres outside of the north, providing easier access to a more dispersed pool of UQL. At the same time, the physical environment becomes less extreme and opens up opportunities for a broader range of industries and land use, along with less seasonal and more amenity-driven rural migration flows, than what is common in the far north. Although local amenity contexts have not explicitly been considered in this research, they may have an impact on urban–rural UQL flows (Bjerke & Mellander, 2017), and these are currently not well understood in northern contexts. Certain isolated locations, such as mining towns or tourist resorts offering more urban lifestyle and service amenities, may be more attractive to UQL flows from the cities, whereas much of the ‘low-amenity’ hinterland dominating northern peripheries does not seem to attract the type or volume of counter-urban migration observed elsewhere in the south (Argent et al., 2014; Holmes, 2010). This outcome is particularly an issue for Northern Australia, where the hinterland faces more apparent challenges in terms of lacking infrastructure and service amenities and more pronounced socio-economic problems in remote and Indigenous communities (Taylor et al., 2011).

7 | CONCLUSION

This article has examined the extent to which ‘spillover, sponge, or disconnectedness’ hypotheses apply in the case of UQL migration in Northern Australia and Northern Sweden and considered whether these settings share common experiences that may point towards a more northern-specific theorisation of urban–rural human capital flows. Although some of the literature suggests that these northern peripheries are more internally disconnected than other rural contexts (Carson, 2011; Taylor, 2016), the research has revealed considerable diversity in city–hinterland relationships and UQL flows between, and also within, the two case regions. The findings suggest that it is possible for northern cities to become net providers of human capital to their hinterland regions, even as populations and services increasingly centralise into the cities (Westin, 2015). This possibility was most obvious in Northern Sweden where regional spillover of specialist UQL in the primary sector (most notably mining) was rather strong and where even service industries in the regions benefited from the larger and more diversified UQL production in Umeå. Thus, there may be some merit in the Swedish approach to creating a more diversified university sector that focuses on specialised institutions targeting regional industries and also on large and nationally competitive universities with broader education offerings. A policy focus on regional needs may in fact be misdirected if it misunderstands those
needs as being primarily about ‘specialist’ skills in narrow industrial fields and ignores more flexible ‘generalist’ skills required in many service industries and administration.

In other instances, we could see that ‘sponge city’ migration flows (Argent et al., 2008) can emerge in the north and that such experiences were more common in Northern Australia and in the more northerly cities. Still, the net impacts of UQL migration flows in both spillover and sponge directions were generally quite small, which could signify stronger regional connectedness in the case of Northern Sweden (as illustrated by stronger mobility flows in both directions that might cancel out net effects) and greater disconnectedness in Northern Australia (as illustrated by the strikingly low rates of internal UQL mobility and the high rates of external mobility and UQL turnover). In this sense, settlements in Northern Australia seem to be more constrained in their ability to effectively engage with their regions as they face substantial challenges for maintaining growth themselves, perhaps due to their closer coupling with ‘boom and bust’ industries (mining/LNG, tourism, military, construction) and their greater dependence on external capital and control (Carson et al., 2010; Taylor, 2016).

As with any international comparisons, the range of place and country-specific geographic and institutional differences documented here makes it difficult to provide a simple theoretical conclusion about UQL migration systems in northern peripheries. The discussion suggests that local differences in policy approaches, governance systems, university focus, economic profiles, and demographic and settlement structures may each play a role in shaping urban–rural mobility flows in the north. Yet, confining this research to just a single jurisdiction would have risked drawing rather deterministic conclusions about ‘northern’ migration systems that ignore alternative experiences from other similar settings. Although regional disconnectedness is an apparent issue in Northern Australia (Carson, 2011; Taylor et al., 2011), as an idea it needs to be carefully nuanced because it certainly does not represent a preordained northern experience. Instead, the case comparisons have shown that there are opportunities for alternative policy approaches and higher education strategies to redistribute human capital flows in different ways. The value of international comparisons in this research context is therefore in highlighting more clearly what it is that makes the Australian north exceptional or different and in illustrating how policy approaches (for example, to regional development, workforce issues, or higher education) may be adapted in the future to encourage more positive outcomes for northern hinterland regions. The indications from this research are that policy that facilitates (for example, through greater UQL production, opportunities for diverse and complementary mobility flows, and more flexible local governance systems within a more neutral regional framework) may benefit hinterland regions more than policy that demands (such as by prescribing particular narrow types of UQL production, prioritising external recruitment of capital, or enforcing regional structures that are essentially city-centred).

We conclude, then, that there is value in continuing to expand northern comparative studies. This conclusion allows us to explore the distinctive features of northern human geographies in more detail while stepping away from common national-level (or ‘north–south’) comparisons, which have proven to be of little relevance to northern theory building and policy development in the past (Huskey, 2005; Nord & Weller, 2002). In this regard, understanding the differences and similarities between Northern Australia and Northern Sweden (and similar peripheries across the Circumpolar North) is crucial to rethinking the uniformity of northern geographies and migration systems. Although this article has focused on the regional migration flows of a particular population cohort—UQL—more research is needed to understand how the observed flows are mirrored in broader residential, labour, or visitor mobilities between cities and hinterlands in the north and how these flows might change over time as issues around urbanisation, centralisation of services, and socio-economic divergence continue to intensify.

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ORCID
Doris Anna Carson https://orcid.org/0000-0002-8439-2640
Dean Bradley Carson https://orcid.org/0000-0001-8143-123X

ENDNOTES
1 https://www.industry.gov.au/data-and-publications/our-north-our-future-white-paper-on-developing-northern-australia
2 https://www.cdu.edu.au/about/annual-report
3 Data referring to city regions at SA4 level.
4 https://www.jcu.edu.au/__data/assets/pdf_file/0005/492692/FINAL-Web-Version-JCU-Facts-and-Figures-2017-amended.pdf
5 https://www.cqu.edu.au/__data/assets/pdf_file/0024/82671/CQUniversity-2018-Annual-Report.pdf
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