TOWARDS A TRADE STRATEGY FOR MANITOBA

BUILDING ON LOCAL CLUSTERS FOR GLOBAL SUCCESS

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REPORT PREPARED BY
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EXECUTIVE SUMMARY

The purpose of this report is to identify the areas within the Manitoba economy that offer the best prospects for increasing trade. More exports equal more growth. More growth is essential for increasing the quality of life of Manitoba residents. In order to achieve this the province must be home to world-class companies that produce world-class goods and services. Strategic action is required to ensure that the business environment is optimized for global competitiveness in key sectors. This requires strong relationships and communication between business, government, economic development organizations, and post-secondary education institutions. A cluster approach is the best way to build and enhance these communities.

Jurisdictions that are able to identify and strategically support a core set of local specializations typically sustain higher levels of growth and prosperity. The research conducted during this study show that Manitoba has strong specializations in agriculture, transportation & logistics, as well as the manufacturing of the equipment and vehicles that these sectors rely on. Additionally, there are a number of newer fast-growing sectors such as digital services, life sciences, insurance, and creative & cultural that are colliding in highly innovative ways with the traditional provincial strengths.

Extensive quantitative and qualitative research was conducted in producing this report. A detailed statistical analysis of trade, business, employment, technological innovation, and inclusion patterns is found in Section 3. A series of 61 interviews with business leaders, government officials, and economic development professionals provided greater insights into issues facing the Manitoba economy (please refer to Section 4). This research is the basis for the identification of six high-potential clusters for further development in the coming years. They are:

- Digital & Precision Agriculture
- Proteins
- Next Generation Buses
- Transportation & Logistics
- Aerospace
- Urban Economy Cluster (digital services, insurance, creative & cultural)

This report recommends developing formal clusters based on these areas of the Manitoba economy. Clusters are mechanisms for tackling ‘collective action’ problems that businesses are facing. These can be issues relating to talent, trade, infrastructure, regulatory environments, innovation or anything that individual companies cannot effectively tackle on their own. When they work best, clusters are business-led organizations that work in partnership with the public sector, non-governmental organizations, and post-secondary education institutions in order to address pressing challenges. Clusters function well when focused on specific projects. Working with the World Trade Centre Winnipeg on accessing new markets and increasing exports is the optimal place to start. The WTC Winnipeg is experienced in helping business overcome key barriers to trade and brings an international network to help identify key global opportunities for Manitoba.

COVID-19 PROLOGUE

The research for this report was conducted between November 2019 and March 2020. It was initially drafted in March 2020 just as the COVID-19 pandemic was fully emerging. Thus, there was little mention in the interviews about the impacts of the pandemic on the trade prospects for Manitoba. With a few months of hindsight, it is now possible to partially gauge these impacts as we know that COVID-19 is having, and will continue to have, disproportionate impacts on some sectors relative to others.

This report is about identifying Manitoba's most globally competitive sectors for trade. COVID-19 will not fundamentally change what the province's top capabilities are. The impact is being primarily felt on the demand side and not the supply side. The biggest questions concern how long it will take for demand to come back to previous levels and how will demand change consumer preferences in the long run. A lot has been written about these questions over the past few months. The truth is that no one has precise answers to them. Permanent change will occur in some areas of society and the economy, but much of it is likely overstated.

With that in mind it is clear that the six recommended clusters are being impacted in distinct manners and degrees. This can be sorted into three broad categories. The two agricultural related clusters are generally less impacted as food is an essential good that has experienced minimal disruption to this point. The transportation and logistics of food products and other essentials is also less affected. This is quite distinct from the movement of people which has experienced one of the largest drops of any sector. Thus, aerospace and bus manufacturing are going to be hard hit in the near to medium term. These clusters will likely need additional support for a longer period of time in order to survive the crisis. The third grouping are the elements of the 'urban economy'. Many of the companies in this cluster that provide e-commerce solutions are doing extremely well. They may not fit into traditional definitions of merchandise trade, but they have the same impact on the provincial economy when it comes to serving non-local customers and bringing in a surplus of capital to Manitoba. This represents one of the biggest opportunities as the economy continues to recover. As Manitoba has seen fewer cases of COVID-19 and is reopening earlier than many other North American jurisdictions, it can potentially use its first-mover position to its advantage.

On a general note, there will likely be a period of increased regulation especially as it pertains to health and safety. Such regulations will be important to regaining customer trust. They also must be done in a responsible manner and not overstep. Finding this balance will require a healthy dialogue between business and government. A cluster approach is an optimal way to achieve this. Consumers will likely be placing a higher priority on health and safety and so this effort should be seen as an opportunity to further build a local brand based on trust and reliability.

ABOUT THE AUTHOR

Gregory M. Spencer is an independent economic development consultant with specific expertise in clusters and innovation ecosystems. Greg recently returned from Ireland to resume his consulting career after being a faculty member in the School of Geography at University College Dublin (UCD).

Prior to moving to Ireland, he was a Senior Research Associate with the Martin Prosperity Institute at the University of Toronto's Rotman School of Management. After completing his doctorate, Greg worked at the Munk School of Global Affairs where he became the Manager of Local IDEAs (Indicator Database for Economic Analysis). This project advanced the quantitative analysis undertaken by the Innovation Systems Research Network (ISRN) across two five-year SSHRC funded Multi-Collaborative Research Initiatives on clusters and creativity and innovation in Canadian city-regions. In advance of undertaking his doctoral studies, Greg worked for four years at the Local Futures Group in London (UK) where he rose to Principal Consultant and Head of R&D.

Greg has produced a large volume of high impact reports on clusters and economic development for federal and provincial ministries as well as local and regional governments. He has worked with leading think tanks such as The Brookings Institution and Nesta and with international organizations such as the European Commission. In addition to publishing his research in top academic journals, Greg has written op-eds published in The Globe and Mail, The Toronto Star, and The Guardian (online).

Greg has a B.A. in geography from Bishop's University, a M.Sc. in urban planning, and a Ph.D. in economic geography both from the University of Toronto.

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1. INTRODUCTION

The purpose of this study is to evaluate the current and prospective areas of international strength within the Manitoba economy. The information collected and presented in this report is intended to inform the selection of 4-6 traded clusters that will be made operational over the coming years. Making strategic economic development decisions can sometimes be seen to be controversial as it is interpreted as government 'picking winners' in a market-driven economy. The alternative is having no strategy. In a system with finite resources the former option is preferable as it seeks to optimize return on investments. This report attempts to provide a thoroughly researched set of best options increasing trade using a cluster approach. While striving for objectivity, it is recognized that such strategic decisions always involve a degree of human values which introduces a certain amount of subjectivity. These processes tend to work best when subjective elements are plainly stated and openly debated.

The structure of the report is as follows. The remainder of the first section outlines the big picture context of clusters, trade, and how they work together in the contemporary global economy. The second section provides a brief overview of the quantitative and qualitative research that informs the findings. Section three presents the results of the quantitative research across five subthemes: trade, business, employment, innovation, and inclusion. The fourth section highlights the key messages heard during the interviews that comprised the qualitative research. These messages are organized across five themes: talent, trade, infrastructure, regulatory environment, and innovation. Section five provides a summary of the findings using a matrix of key indicators for 14 potential clusters. The sixth and final section offers recommendations including six proposed clusters: digital/precision agriculture, proteins, next generation buses, transportation & logistics, aerospace, and an urban economy mixture of financial services, digital services, and creative & cultural industries. This section also outlines the key elements of cluster governance good practise.

The research contributing to this report was undertaken between November 2019 and early March 2020 just prior to the COVID-19 pandemic directly impacting Canada and its economy to a full extent. Therefore, the economic impact does not appear in the data used for the statistical analysis nor was it prominent in the qualitative interviews conducted with key stakeholders. The report was drafted in late March to early April 2020 after the impact started to be felt.

1.1 Clusters as an Economic Development Tool

As a policy instrument, the cluster concept was first proposed by Harvard economist Michael Porter during the 1990s[1]. His 'diamond model' became the standard in both academic and policy making circles in the subsequent decades (see Figure 2.1). The model consists of four elements that work in concert within local environments in order to generate and sustain economic growth. The first element is 'firm strategy, structure, and rivalry'. In simple terms, this means that the local environment impacts the intensity of

[1] Porter, M. E. (2000). Location, Competition, and economic development: local clusters in a global economy. *Economic Development Quarterly*, 14(1), 15-34.

competition, as there are more rivals in close physical proximity. Being able to closely monitor and quickly respond to competitor behaviour is credited with sharpening company strategy. The second component of the model is 'demand conditions'. Innovation is often customer driven. Being in close geographic proximity to many sophisticated consumers of a firm's products is seen as helping companies respond to specific and evolving demands. The third point of the diamond model is 'related and supporting industries'. Minimizing the total distance travelled within a supply chain can greatly increase its overall efficiency. Learning from buyer-supplier relationships can also be aided by being located in the same local environment. The final element of the model is 'factor (input) conditions'. In a knowledge-based economy the local labour market is the leading factor. A region's collective capabilities is reflected in the strength and specific skills of its workers. The quality and quantity of local talent is now the top place-based trait impacting firm location and expansion plans. The quality of local infrastructure is another important factor. Institutional and regulatory environments also play a significant role.

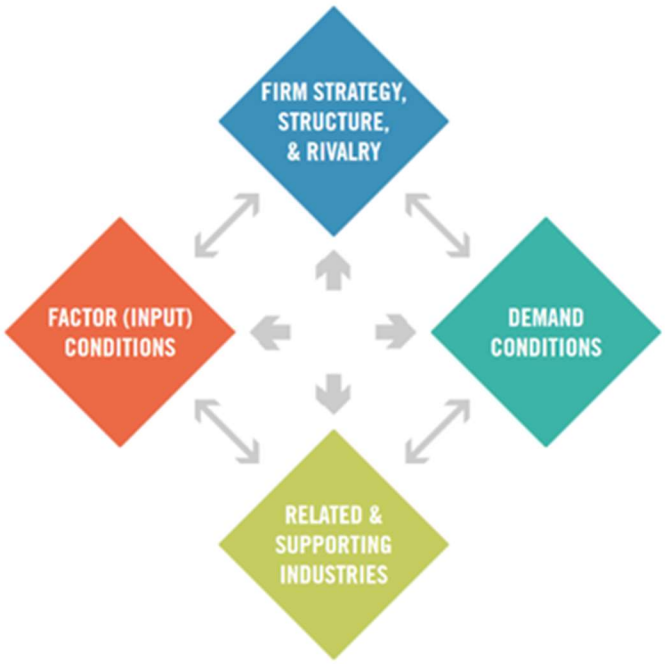


Figure 1.1.1

The Porter Diamond Cluster Model

Source: https://www.isc.hbs.edu/competitiveness-economic-development/frameworks-and-key-concepts/Pages/the-diamond-model.aspx

Clusters are not simply the geographic co-location of these four components of Porter's diamond model. In a true cluster there is a degree of cooperation and coordination between them. Collective strategy can play a major role in the global competitiveness of constituent firms. By working together on shared needs such as specific infrastructure, related higher education and training programs, regulatory issues, and technology standards, firms within clusters can improve their chances of having greater success in the global marketplace.

Successful cluster initiatives are almost universally business led. One of the very fair criticisms of the cluster concept is that from a government policy perspective, they have often failed to deliver the expected returns. Such situations are often the result of overly active and ambitious public programs that attempt to create clusters from scratch. Well-functioning clusters are typically the result of long-developing industries that coalesce around the sense of collective action in order to address particular needs of the business community. The temptation for jurisdictions to seek to generate 'the next Silicon Valley' is understandable, but rarely work in practise. This does not mean that there is not a role for government. Just the opposite, the public sector is a necessary partner in that it is the main provider of many factor conditions such as physical infrastructure, educational programs, and regulatory frameworks. In this respect, government can work best in partnership with business in order to develop and strengthen clusters.

1.2 The Importance of Trade

Over the long run, any economic unit, whether it be a household, a company, or a jurisdiction needs to bring in more capital than it spends. A positive trade balance for Manitoba is imperative if it is to maintain a high standard of living for its residents. Over the past two decades, the province's foreign trade balance has gone from being virtually balanced to being in significant deficit. Attempts to limit imports are usually a zero-sum game as they invite retaliation. Even if a province wanted to pursue this course, it is mostly the realm of the federal government. Instead, efforts to grow exports must be a central aspect of Manitoba's overall economic development strategy.

In a globally competitive economic landscape this means that companies in the province need to be producing goods and services that people in other parts of the world need and want. Jurisdictions like Manitoba that are in fully developed countries like Canada cannot generally compete on a low-cost basis. Competing on quality is the best path to prosperity. High value-added products are typically the result of efforts investing in innovation. Successful innovation systems rest on the skills and capabilities of the labour force. Other major factors that need coordinated policies include infrastructure and the regulatory environment. Formal clusters are shown to be an effective way to focus these elements while building a stronger trade presence.

1.3 Clusters in the Global Economy

Interconnections in the global economy have come into sharper focus in 2020. The past three decades have been a period of greatly increasing international trade. Improved transportation and digital technologies along with reduced tariff restrictions have enabled transnational corporations to further spread their operations to the locations deemed optimal. One of the impacts of this trend is that places have become increasingly specialized in what goods and services they produce. As functions and industries generate differing levels of value, there has also been a degree of increasing economic inequality between places at the sub-national scale. In such an environment, it is imperative for jurisdictions to place their economies on the high-end of the value chain. Doing this across the board is a difficult proposition. It is also hard for

individual companies to compete globally completely on their own. A cluster approach provides an intermediate scale for succeeding in the world economy. Prosperous jurisdictions like Manitoba need to continue to support a portfolio of local specializations that are the platform for world-leading companies selling world-leading products.

2. METHODOLOGY

The purpose of this report is to inform strategic decisions on the development of traded clusters. Identifying the areas of the Manitoba economy with the best prospects for future growth is a central goal of the research. This is not simply about identifying the largest and fastest growing sectors, but rather forming a deeper understanding of change within the provincial economy in conjunction with global trends in changing technologies and consumer behaviour. Insofar as clusters are designed to tackle collective issues facing business communities, the research also attempts to understand the key challenges that may be creating headwinds in certain areas of the economy.

2.1 Quantitative Analysis

The main goal of the quantitative analysis is to provide a clear sense of the scale, quality, and momentum of key clusters within the Manitoba economy. An important step in any cluster study is defining the statistical boundaries using standard classification systems. Drawing the edges in different places can have significant impacts on measuring the relative characteristics of clusters. Traditional academic studies commonly use definitions that are universal to national economies. This approach allows for like-to-like comparisons between places.

As this report is primarily concerned with developing a deeper understanding of single place, a different method is applied. Instead of adopting existing definitions created in the US by Michael Porter's team[2] and Canadian-specific definitions developed by the Innovation Systems Research Network (ISRN)[3], cluster definitions for this study are based on the specific structure of the Manitoba economy. The focus of this report is on trade, thus export data from Statistics Canada was used to identify Manitoba's key areas of strengths. Ultimately, 14 clusters were defined using this information along with some of the initial qualitative analysis and literature review. The detailed cluster definitions for this study can be found in Appendix A.

The 14 clusters provide the framework for the analysis. The quantitative analysis in Section 3 compares the clusters across five major themes: trade, businesses, employment, innovation, and inclusion. Datasets from Statistics Canada, Dun & Bradstreet Hoovers, and The United States Patent and Trademark Office are the main sources for the analysis. A set of summary indicators are presented in Section 5.

[2] Delgado, M., Porter, M.E. & Stern, S. (2016) Defining clusters of related industries. Journal of Economic Geography, 16(1), 1–38.
[3] Spencer, G. M. (2014). Cluster Atlas of Canada. Toronto: University of Toronto/Industry Canada.
Spencer, G. M., Vinodrai, T., Gertler, M. S., & Wolfe, D. A. (2009). Do clusters make a difference? Defining and assessing their economic performance. Regional Studies, 44(6), 697-715.

2.2 Qualitative Analysis

The qualitative analysis consists of a literature review of recent reports on the Manitoba economy[4] and 61 interviews. The interviews were typically one hour in length and were primarily conducted in person during four week-long trips to Manitoba between December 2019 and March 2020. Interviewees included government officials engaged in economic development, leaders of chambers of commerce, industry associations, academic leaders, innovation experts, and private businesspeople. The goals of the interviews were to gauge the accuracy of the quantitative analysis and to better understand the key issues facing the provincial economy and the sectors within it. The main themes of the interviews provide the structure for Section 4. They are: talent, trade, infrastructure, regulatory environment, and innovation. Every attempt was made to cover a wide range of clusters and communities within the province.

[4] For example see:
Angus, D. & Gamey, B. (2018) Growing Manitoba's Economy: Co-chairs' findings and recommendations.
Deloitte (2017) Framework for Economic Alignment and Growth. *Ministry of Growth, Enterprise and Trade*.
KPMG (2017) Manitoba Fiscal Performance Review Phase 2 Report Business Case – Reducing Direct Support to Business.
Heigh, J. (2018) Regional Economic Development: Final Report. *Winnipeg Metropolitan Region*.
Murray, R.W. (2019) For the Benefit of All: Regional Competitiveness and Collaboration in the Metro Region of Winnipeg. *Dentons*.
Wixon, K. (2017) Look North Report and Action Plan for Manitoba's Northern Economy. *Look North Task Force*.

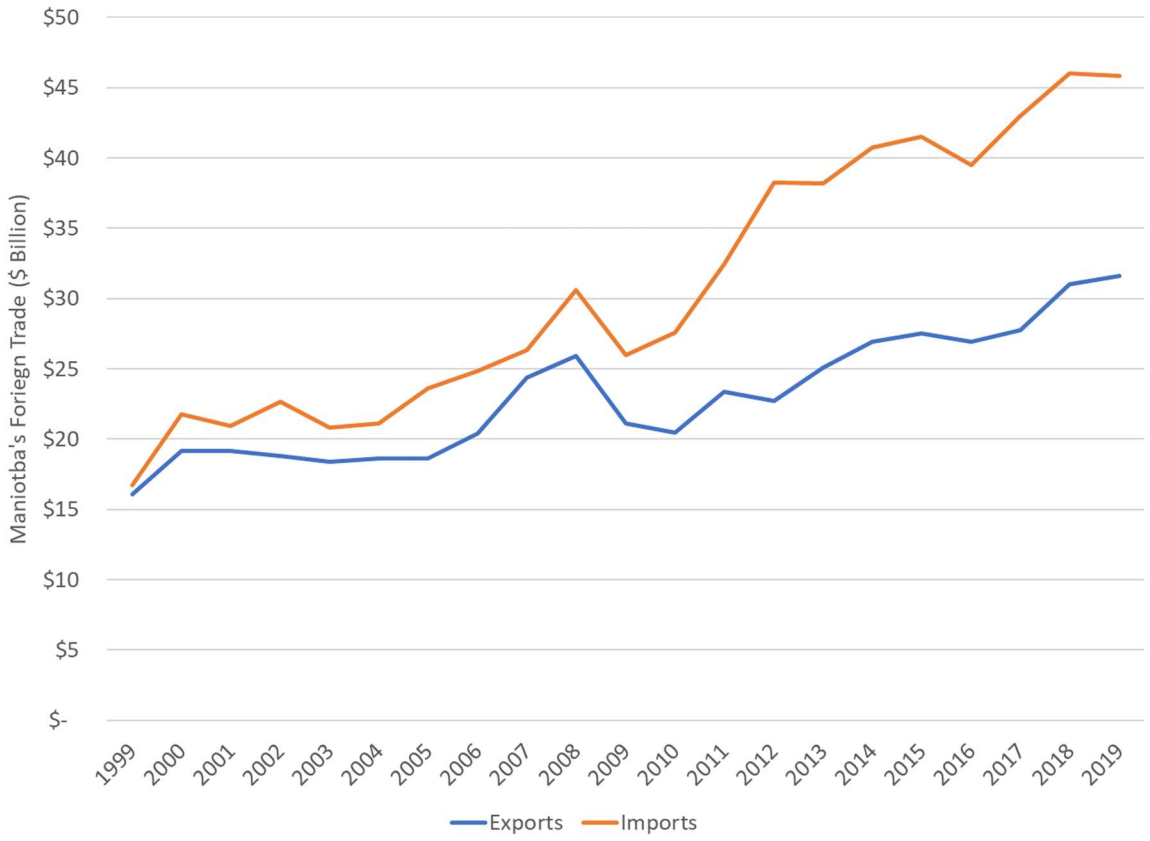
3. QUANTITATIVE FINDINGS

This section provides a big picture analysis of the Manitoba economy. The analysis is trade-focused while using a cluster framework. The intention is to highlight the main areas of economic strength in the province using the most recent statistical evidence.

3.1 Trade

With less than 40 million inhabitants, Canada is a relatively small market in global terms. Trading is thus more important to the country than many other nations. This is especially true for the province of Manitoba, with a population under 1.5 million.

Figure 3.1.1
Manitoba's Foreign Trade Volume, 1999-2019

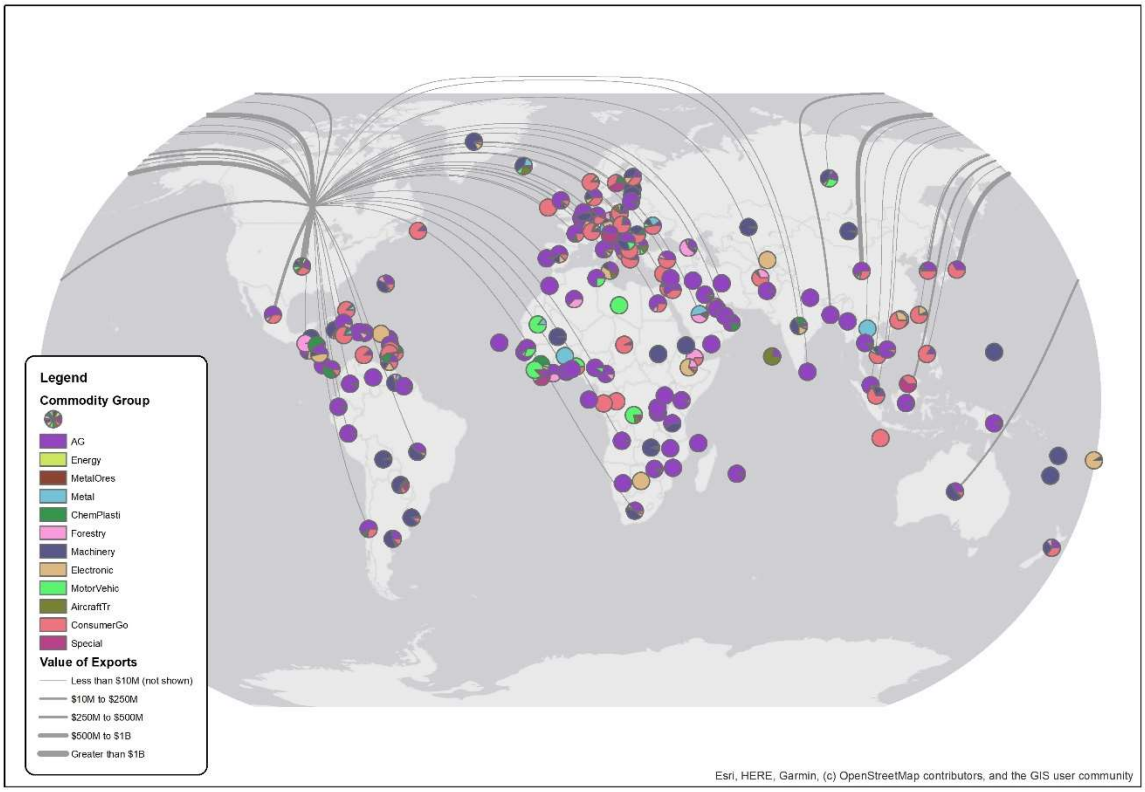


Source: Statistics Canada. Table 12-10-0133-01 Canadian international merchandise trade by province and country, and by product sections, customs-based, annual (x 1,000)

Though the value of Manitoba's exports has roughly doubled over the past two decades, the value of imports has nearly tripled. The upshot is that a substantial trade deficit has been created since 1999 when it was close to being balanced. Over the long run, jurisdictions need to be at least balanced, or ideally in surplus, if they are to be economically sustainable. A trade deficit such as the one Manitoba has developed can be tackled in two ways. One is that imports can be reduced, usually involving some type of restrictions.

In 2019, Manitoba-based companies exported goods to 172 different countries in the world. Figure 3.1.2 below maps the top export destinations (vectors) and product categories (pie charts). Agricultural goods are the top category by volume as well as the most diffused geographically. Most other categories are highly weighted to the United States as the primary destination. Consumer goods is a second category that has a somewhat larger set of national markets. Economic diversification has long been a goal of Canada and Western provinces in particular. This can be accomplished in two ways; one is through sectoral diversification and the second is through market diversification.

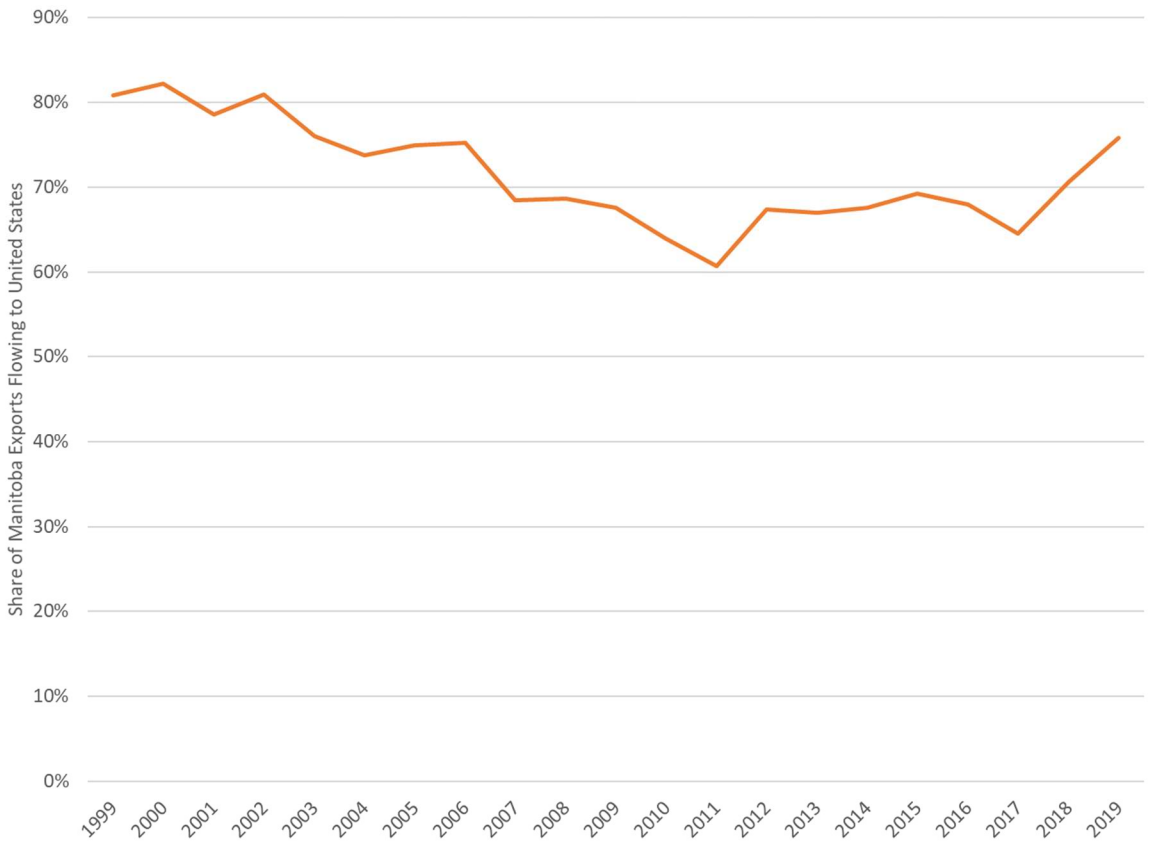
Figure 3.1.2
Manitoba's International Export Volume by Top Countries and Product Category, 2019



Source: Statistics Canada. Table 12-10-0133-01 Canadian international merchandise trade by province and country, and by product sections, customs-based, annual (x 1,000)

Canada's longstanding top trading partner is the United States. Manitoba is no exception. This is expected as the United States is a large market in close physical proximity, with many shared cultural touchpoints. Free trade agreements have been in place for the past three decades and have further entrenched this relationship. While the United States will almost certainly be Canada's and Manitoba's top trading partner, there is also a degree of risk associated with being so heavily weighted to a single market. As we have witnessed recently, global trade and geopolitical events can quickly and unexpectedly cloud such arrangements. Having a wider range of trading partners allows for quicker adjustments to be made when such events unfold. Greater diversity often generates greater resiliency.

Figure 3.1.3
Share of Manitoba's Exports Going to the United States, 1999-2019

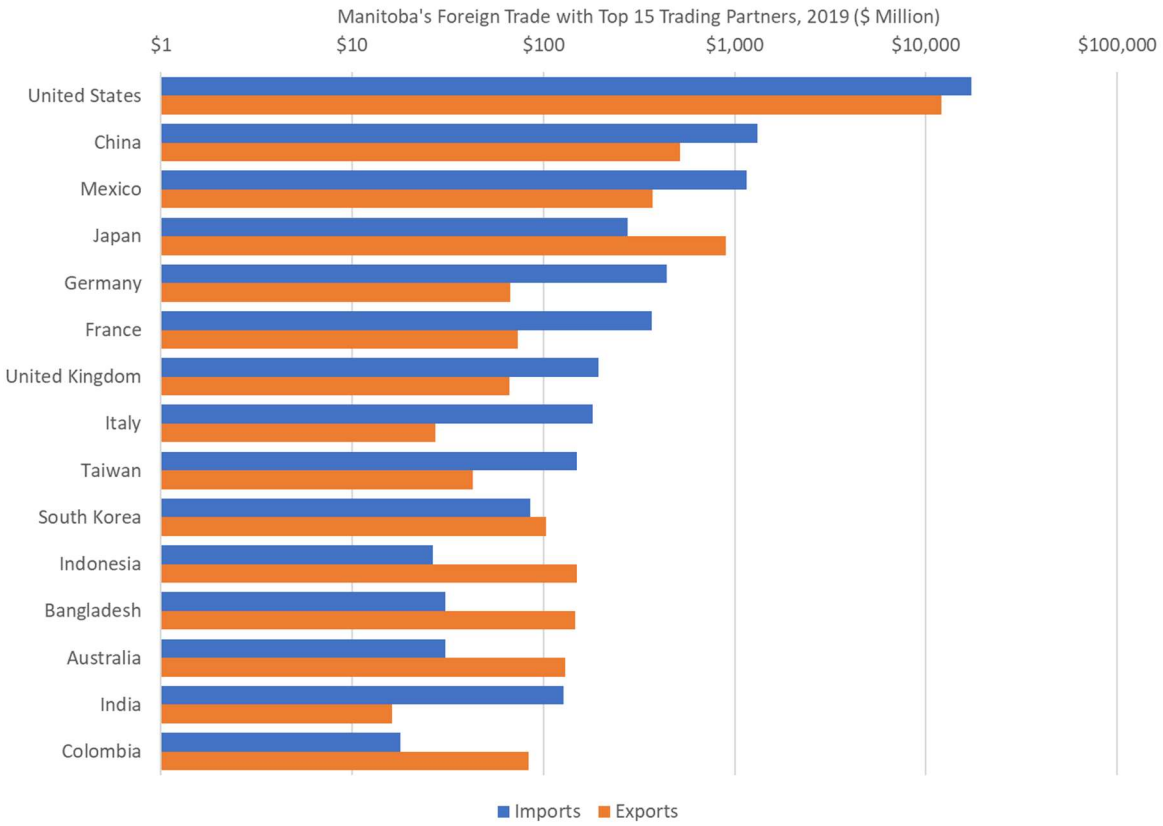


Source: Statistics Canada. Table 12-10-0133-01 Canadian international merchandise trade by province and country, and by product sections, customs-based, annual (x 1,000)

Figure 3.1.3 shows the reliance of Manitoba's economy on the United States as an export destination over the past 20 years. In 1999 over 80% of the province's exports flowed to the United States. This number gradually decreased to just over 60% by 2011. Much of this decrease was due to increased trade with Asian

countries, especially Japan and China. The United States accounted for between 60% and 70% of Manitoba's exports from 2011 to 2017 when a significant reversal began. By 2019 the United States raised its share back to over 75%. Much of this reversal is related to geopolitical factors between Canada and Asia.

Figure 3.1.4
Manitoba's Trade Levels with Top 15 Countries by Total Value, 2019



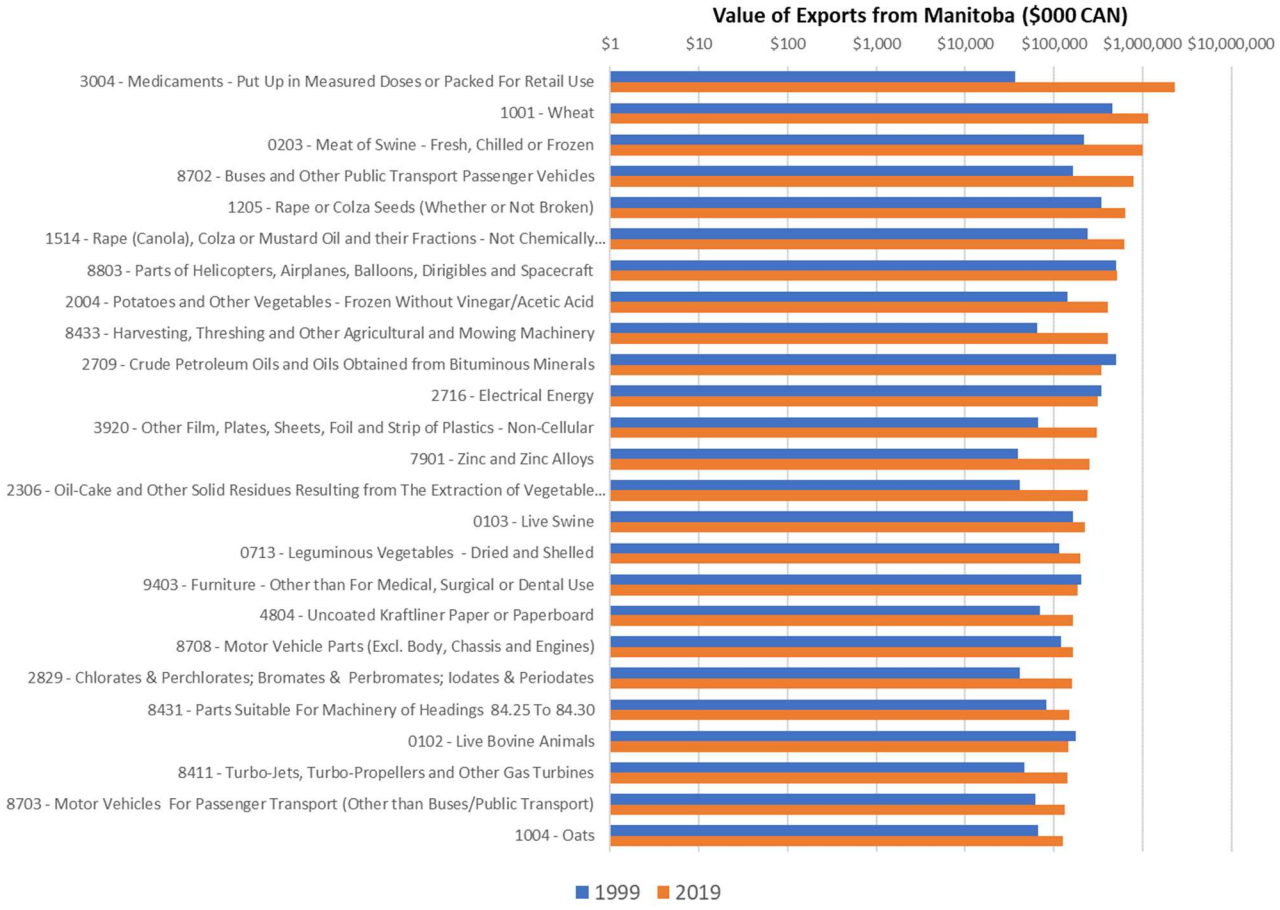
Source: Statistics Canada. Table 12-10-0133-01 Canadian international merchandise trade by province and country, and by product sections, customs-based, annual (x 1,000)

There was over $20 billion of trade between Manitoba and the United States in 2019. The balance of trade slightly favoured the United States, though both sides enjoyed over $10 billion in exports. Figure 3.1.4 shows Manitoba's top 15 trading partners in 2019 by total value (note the logarithmic scale). After the United States, the next three most significant countries are China, Mexico, and Japan. Manitoba experienced trade deficits with the first two, but a significant surplus with Japan. Agricultural products, especially pork, have been major sources of export growth in Asian markets in recent years. Places 4-7 are occupied by the largest four economies in Western Europe. Germany, France, the United Kingdom and Italy all enjoyed notable trade

surpluses with Manitoba in 2019. Pacific Rim and South Asian countries accounted for spots 8 through 14. Manitoba had a positive trade balance with South Korea, Indonesia, Bangladesh, and Australia.

Manitoba's top export commodities are mainly produced by the agriculture, aerospace, bus manufacturing, agricultural equipment and life sciences sectors (please see Figure 3.1.5). The number one commodity by value in 2019 was medicaments. This category was also the fastest growing between 1999 and 2019. Much of this growth is due to a single product being provided to the American government by a single production facility. Wheat and pork products occupy the second and third places on the chart with buses coming in fourth. Parts for aircraft are the seventh largest commodity export by volume, while harvesting equipment is ninth. All of these commodities have grown in value in real terms since 1999.

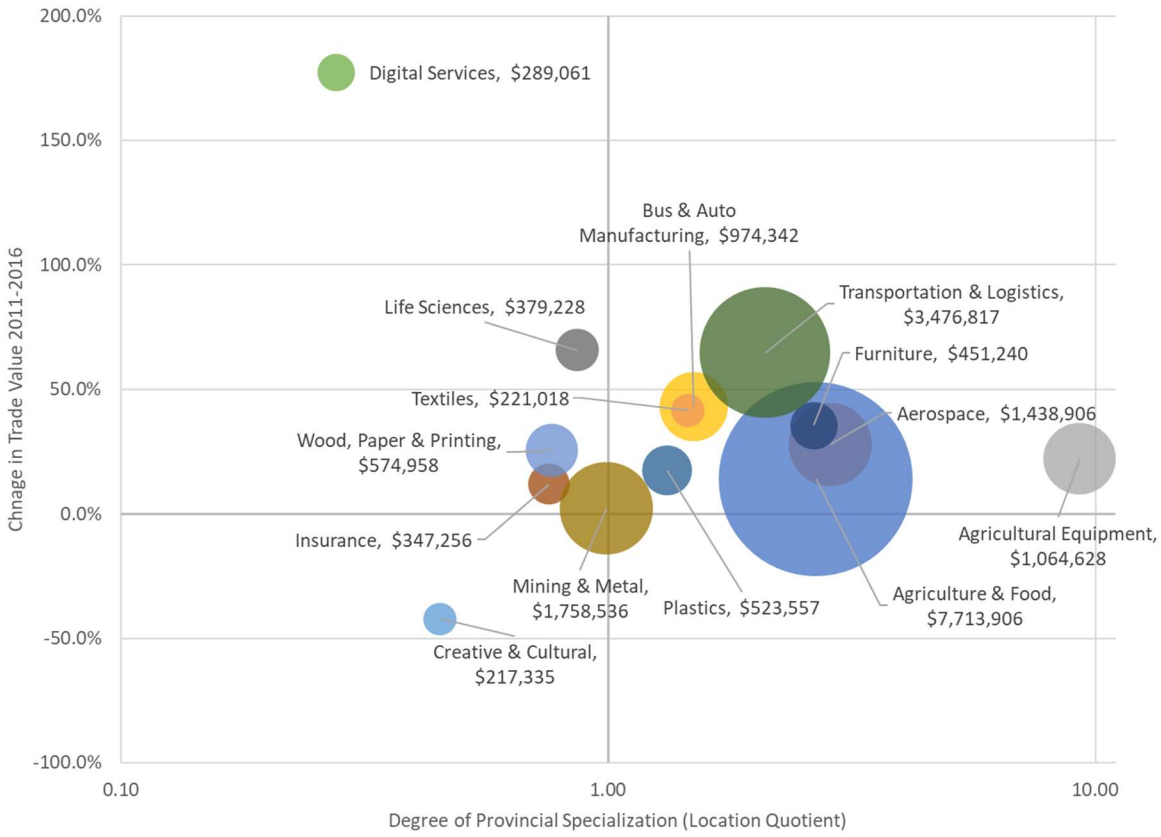
Figure 3.1.5
Manitoba's Top Export Commodities (HS4) by Value, 1999 & 2019



Source: Statistics Canada. Canadian International Merchandise Trade Database.

Figure 3.1.6 displays the value of exports in relation to clusters across three dimensions. The x-axis measures Manitoba's trade specialization (location quotient), the y-axis reports the growth rate, and the size of the circles display total value. Clusters in the top-right quadrant are specializations that are also growing. Aerospace, agriculture & food, agricultural equipment, bus manufacturing, furniture, plastics, textiles, and transportation & logistics are all examples of Manitoba clusters that are specialized and growing in trade value. Life sciences and digital services are the fastest growing by value, but do not yet represent provincial specializations.

Figure 3.1.6
Trade Volume, Growth, and Specialization by Manitoba Cluster



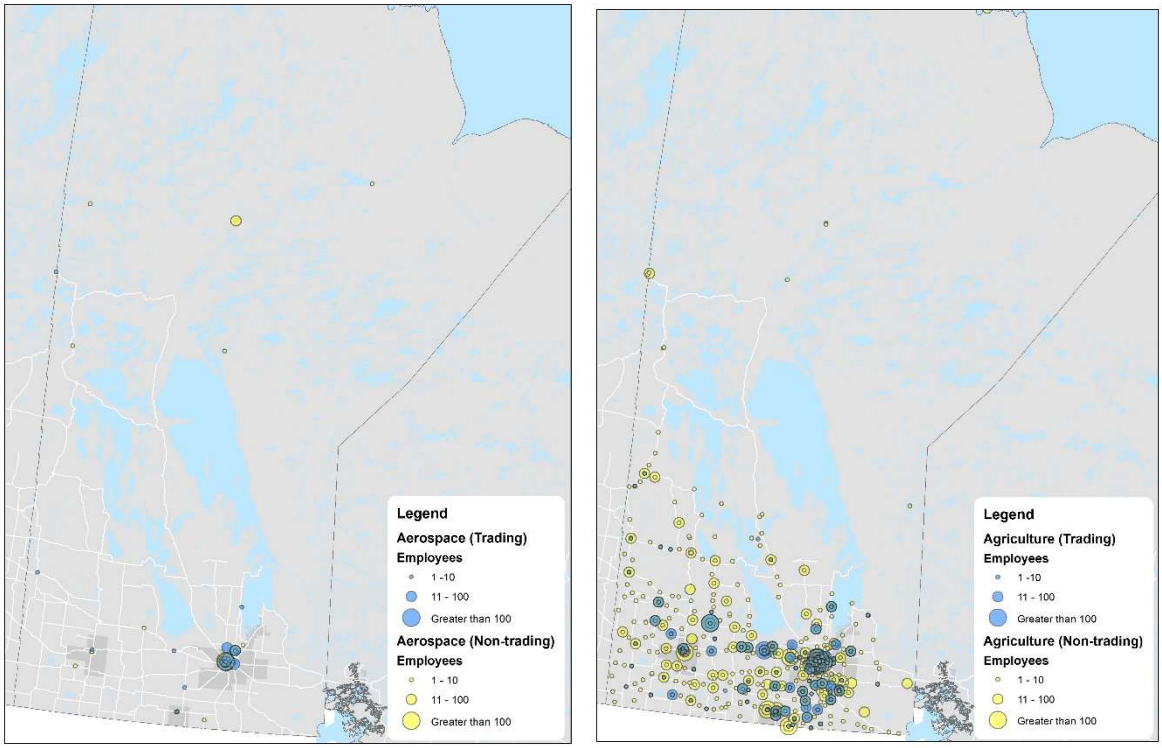
Source: Statistics Canada. Table 12-10-0098-01 Trade in goods by exporter characteristics, by industry of establishment (x 1,000)

3.2 Businesses

When analysing aggregate trade data, it is always important to keep in mind that countries and provinces do not trade with each other, but that companies operating within them do. Trade data is an aggregation of millions of choices and decisions of firms as well as end-customers. With this in mind, it is important to

account for which businesses are actually responsible for producing products that are destined for foreign markets. It is also imperative to understand what barriers to trade firms are facing with a view to finding solutions to these issues. Larger firms are more likely to partake in international trade than their smaller peers. Multinational corporations are largely responsible for shaping trade patterns as they move goods across borders but within company structures. Developing a sense of these flows and the location decision making behind them is crucial for understanding overall trade patterns, especially at a sub-national scale.

Figure 3.2.1
Maps of Aerospace and Agriculture & Food Business Establishments in Manitoba, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Business data was purchased from Dun & Bradstreet in order to produce detailed cluster maps for Manitoba. Figure 3.2.1 shows examples of these maps for the aerospace and agriculture & food clusters. A full set can be found in Appendix B and Appendix C of this report. The data contains information such as the detailed industry/cluster (4-digit NAICS), number of employees, full address, corporate family, and importantly, indicates whether a business is engaged in foreign trade. When mapped, the data indicates the relative spread versus geographic concentration of a cluster. It can also paint a picture of the number of large anchor firms relative to the amount of small and medium sized enterprises (SMEs) in Manitoba. The trade data in conjunction with the other variables enables analysis on the common characteristics of trading versus non-trading firms. This in turn allows for the identification of firms that fit a trading profile that are not yet

engaged in exporting. Direct outreach in such cases can be undertaken to better understand the obstacles that may be preventing firms from accessing foreign markets.

Statistics Canada conducted a survey in 2017 in order to better understand the difficulties that Canadian firms face with exporting their products to foreign markets. Figure 3.2.3 shows the levels of difficulty by specific issue as reported by business respondents. The number one issue claimed by businesses is transportation costs. This goes to show that the most traditional of factors of business location relative to markets remains true despite changes to information, communication, and transportation technologies. The next set of factors involve knowledge and information. Identifying foreign customers, uncertainty of foreign or international standards, identifying foreign partners, suppliers or distributers, and foreign legal or administration obstacles are identified by at least 40% of respondents as being at least somewhat difficult. This suggests that services providing information, knowledge and experience in these areas is highly valuable and needs to be supported, especially if more SMEs are going to expand their exporting activities. At the bottom of the list, lack of management know-how, concerns over intellectual property (IP) protection, and access to financing are the factors of least concern.

Figure 3.2.3
Canadian Businesses Reporting Difficulties with Exporting, 2017

Source: Statistics Canada. Table 33-10-0104-01 Difficulty of obstacles when exporting or attempting to export goods or services by industry and enterprise size.

Much of world trade is comprised of the movement of intermediate goods across country border but within company structures[5]. The networks of transnational corporations are also major conduits of information and knowledge. The largest firms are able to pick and choose locations for specific functions within their operations. These firms often act as anchors for clusters as they sustain local supply chains. In aggregate this creates patterns of world trade based around the connectivity of industry specific clusters rooted not so much in countries but in metropolitan regions and their surrounding areas. Understanding the structure of these patterns is crucial to understanding the power dynamics of industry-specific world trade.

Clusters trade with other clusters. They are typically becoming more functionally specialized as the global economy is becoming more interconnected. These local specializations are linked together in global value chains[6]. As each function contributes varying levels of value to a final product, there are varying levels of economic prosperity by local jurisdiction. One of the main goals of cluster policy should be to attempt to raise the value-added proposition of the local specialization.

Figure 3.2.3 and Figure 3.2.4 show the global corporate network structures of the digital services and life sciences sectors[7]. These images are constructed by mapping the parent-subsidiary relationships of the largest transnational corporations in each sector. Addresses of business are assigned to their nearest (within a maximum distance of 300km) urban area of over 300,000 population (N=1860)[8] in order to aggregate the individual company data to places. The number of connections between places as well as the overall network pattern can then be analyzed using specialized software and algorithms in order to determine the relative positions of clusters within global value chains. For example, this analysis identifies San Jose, Seattle, and San Francisco-Oakland as the top three clusters in the digital services industry. For life sciences the top clusters are located in New York, Chicago, and Basel.

This analysis was run using the top five specializations in Manitoba: agriculture, agricultural equipment manufacturing, aerospace, bus manufacturing, and transportation & logistics. Winnipeg (includes business within 300km radius) ranked 104th in the world in terms of its degree of centrality to the overall network. This ranking puts it in the 94th percentile. Being in a more central position generally denotes having more power through corporate control of decision-making. It is also generally correlated with higher value-added functions. The top clusters globally for the aggregate of these sectors are Memphis, Atlanta, Minneapolis-St. Paul, and Chicago. The data also highlight the strengths of Winnipeg's connections to these places. Its strongest connection, as measured by the number of parent-subsidiary relationships, is Minneapolis-St. Paul. Within Canada, Winnipeg's strongest ties are to Saskatoon, Toronto, and Calgary.

This analysis can help identify the location of the most important nodes in global value chains. It is important for any economic development initiative to have a sense of this geography with a view to building and maintaining strong connections to the sources of power within any given sector. The goal should be to move

[5] Dicken, P. 2007. Global Shift: Mapping the Changing Contours of the World Economy. New York: Guilford Press.
[6] Gereffi, G. 2018. Global Value Chains and Development: Redefining the Contours of 21st Century Capitalism. Cambridge University Press.
[7] Methodology based on: Taylor, P. J., Derudder, B. (2016). World City Network. London: Routledge.
[8] United Nations Department of Economic and Social Affairs. 2018. World Urbanization Prospects. https://population.un.org/wup/Download/

Winnipeg (and the province overall) closer to the centre of these networks. The underlying company data indicate the specific companies and the details of the functions within their global operations that drive trade. This is highly valuable knowledge for both increasing export levels and growing foreign direct investment.

Figure 3.2.3
Global Corporate Connections for the Digital Services, 2019

Figure 3.2.4
Global Corporate Connections for the Life Sciences Industry, 2019

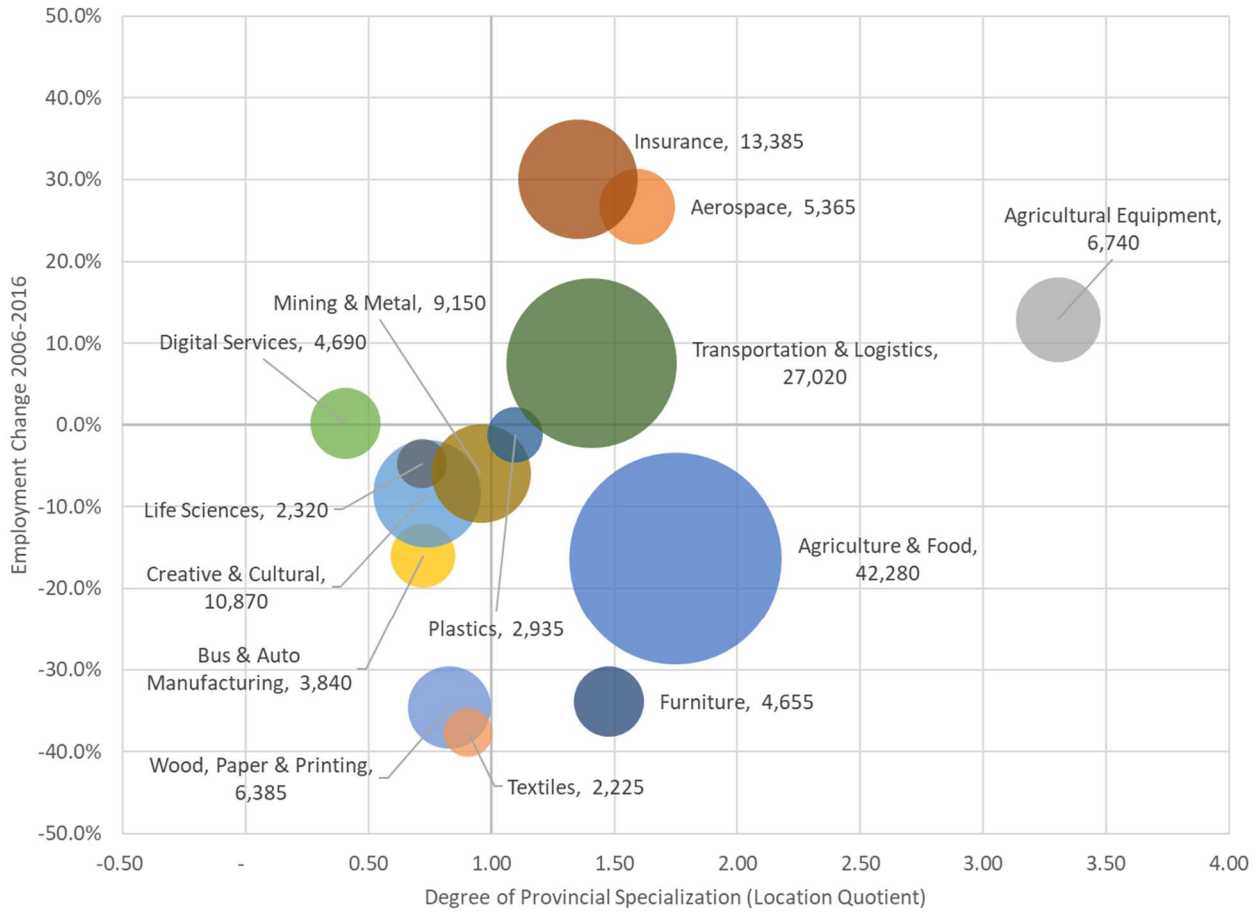
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

3.3 Employment

More trade ultimately leads to more and better jobs. More and better jobs ultimately raise the standard of living. By producing goods and services that people in other jurisdictions want to buy, it brings capital into a local economy. That capital is in part spent on labour. Labour in turn spends that money on goods and services within the local economy which creates additional jobs. All of these transactions are taxed, which raises capital for essential public services such as schools, hospitals, and other critical infrastructure. High quality job growth is what will raise the quality of life in Manitoba. Traded clusters are at the core of this growth.

Figure 3.3.1 shows cluster employment across three dimensions. The x-axis represents Manitoba's employment specialization (location quotient), the y-axis displays employment growth over a ten-year period, and the size of the circles signifies the total number of jobs. The clusters in the upper right quadrant are the ones that are Manitoba's specializations that are also growing. Aerospace, agricultural equipment manufacturing, insurance, and transportation & logistics are the four clusters that fulfil these criteria. Agriculture & food is the largest cluster in terms of employment, but it is not showing signs of employment growth. A positive way to interpret this however, is that if the cluster is growing in terms of output while reducing the amount of labour, then it is becoming more productive. Bus manufacturing does not show up as an employment specialization because it cannot be statistically separated from auto manufacturing with this data (4-digit NAICS). Digital services shows a troublingly weak level of under-specialization for the province.

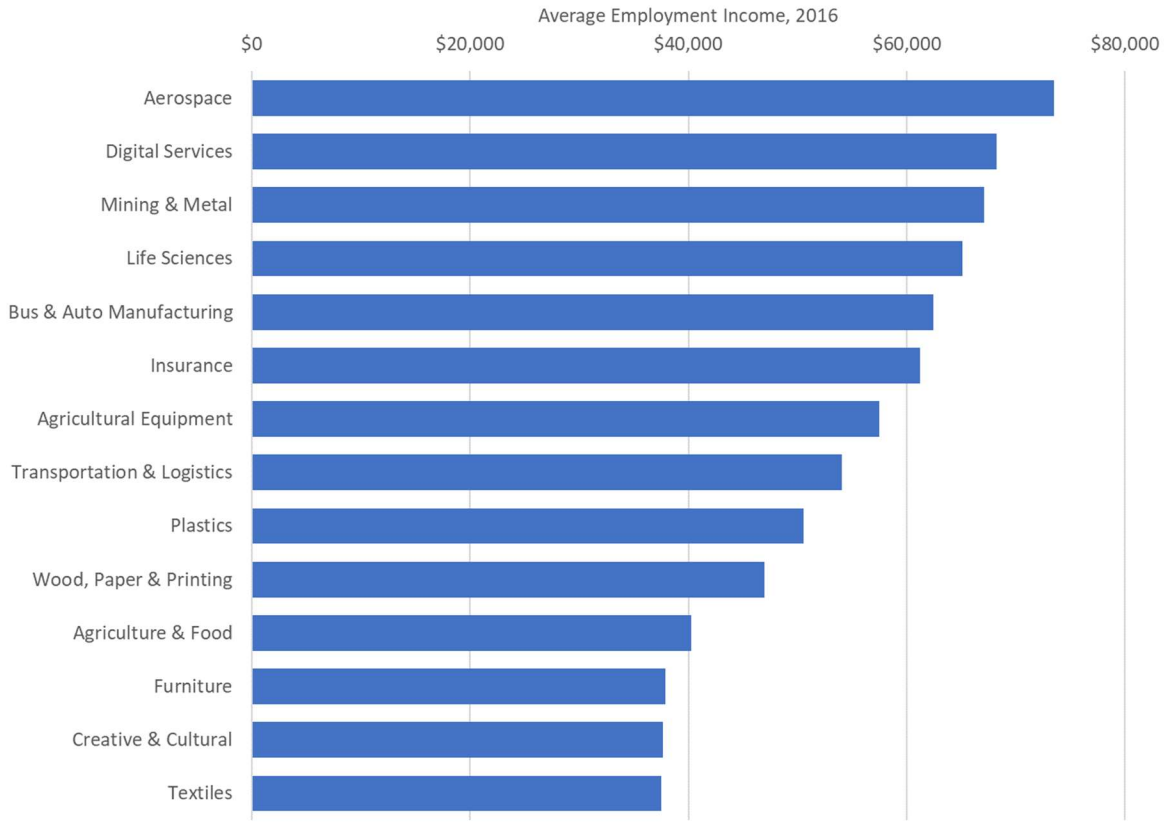
Figure 3.3.1
Employment, Growth, and Specialization by Manitoba Cluster



Sources: Statistics Canada. 2006 Census. Table 97-559-XCB2006009.; Statistics Canada. 2016 Census. Table: 98-400-X2016290.

Job quality is as important, if not more so, than employment quantity. Comparable wage levels are a simple way to gauge the quality of employment in each cluster. On this measure aerospace, digital services, mining & metal, life sciences, bus manufacturing, and insurance are at the top of the rankings (please see Figure 3.3.2) offering average employment incomes of over $60,000 per year. Agriculture & food is the most plentiful cluster in terms of the number of jobs in the province but is fourth from bottom in terms of average incomes. The lowest average incomes are provided by furniture, creative & cultural, and textiles.

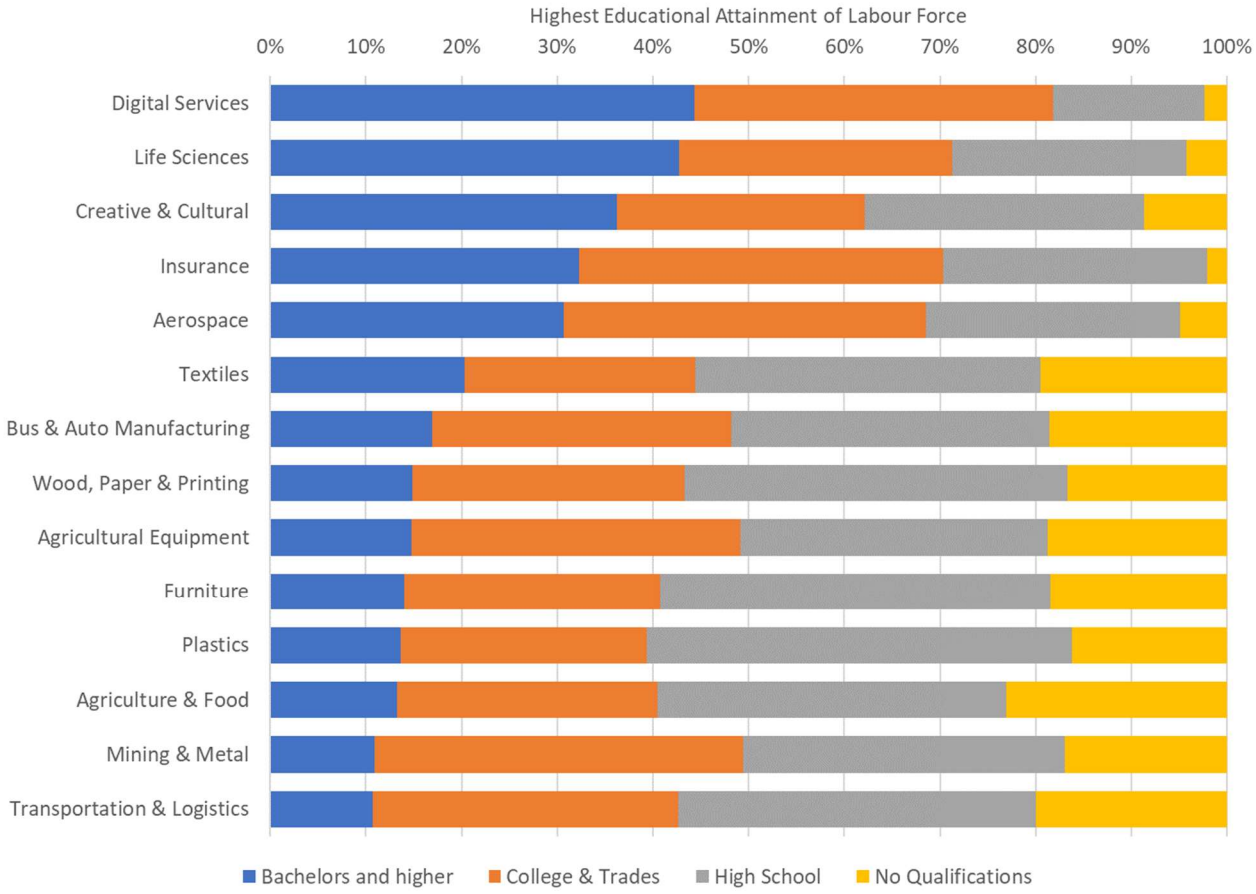
Figure 3.3.2
Average Employment Incomes by Manitoba Cluster, 2016



Source: Statistics Canada. 2016 Census. Table 98-400-X2016358.

In most cases highest incomes are earned by those who tend to perform tasks that are knowledge-based and less routine as opposed to highly routine physical labour. The level of education typically required for jobs within clusters is a proxy measure for the 'knowledge-intensity' of work. Figure 3.3.3 shows the highest educational attainment level of the labour force for each cluster. The clusters are ranked according to the share of the labour force with a bachelor's degree (or higher). Digital services, life sciences, creative & cultural, insurance, and aerospace occupy the top five places with at least 30% of workers possessing bachelor's degrees. When college degrees are added, over 60% of each cluster's labour force have tertiary qualifications.

Figure 3.3.3
Highest Educational Attainment of Labour Force by Cluster, 2016



Source: Statistics Canada. 2016 Census. Table: 98-400-X2016359.

At the bottom of the educational attainment ranking are agriculture & food, mining & metals, and transportation & logistics. This poses somewhat of a conundrum for the Manitoba economy as some of the largest employers are the least knowledge-intensive. Insofar as knowledge-intensity tracks jobs quality and productivity levels, there are crucial strategic decisions about future growth trajectories for the province. If Manitoba is going to increasingly more towards higher value-added activities it will have to find ways to make the larger clusters more knowledge intensive and/or refocus growth on different sectors.

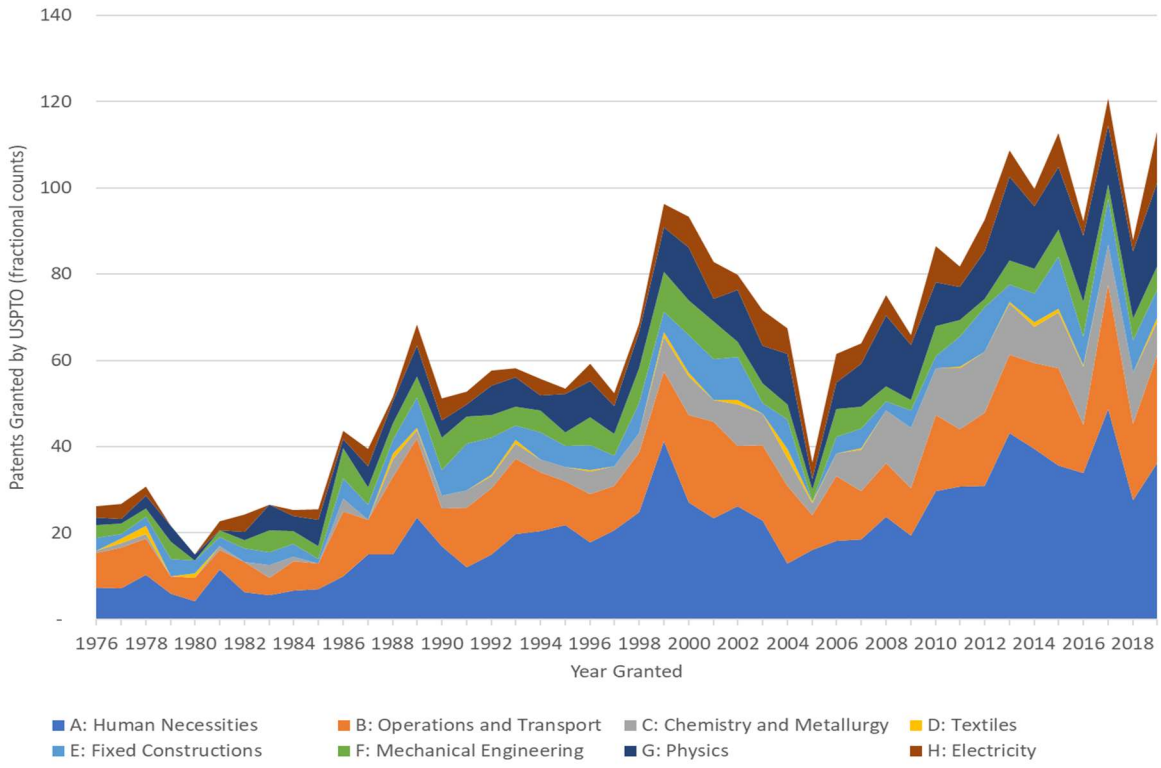
3.4 Innovation

The ability to produce goods and services that people in other jurisdictions want to buy requires constant innovation. Places like Manitoba need to compete primarily on quality rather than cost. Quality requires

knowledge. Knowledge requires learning. A constant commitment to learning, and the ability to apply that learning, is increasingly what separates successful companies from the pack.

Innovation is notoriously difficult to measure on an economy-wide systemic level as much of it is small-scale and incremental. One way to gauge world-leading innovation within an economy is to account for the amount of patenting activity. Patents are legal claims to intellectual property and signal potentially leading edge economically valuable knowledge. One of the benefits of patent data is that because it is a public claim on intellectual property all of the underlying information is open and accessible as well as increasingly standardized on a global scale. It can tell us who is undertaking research and development by individual inventors (the primary filing entity) and the organizations that they represent. Patent data also reveals what type of inventions are being created through detailed technological classification systems. It also indicates where innovation is being done according to the places of residence of inventors. Data from the United States Patent and Trademark Office (USPTO) is fully digitized and publicly available dating back to 1976. This allows for analysis for changes over time. Canadian-based inventors will typically file their intellectual property claims in Canada as well as the United States in order to maximize its legal protection.

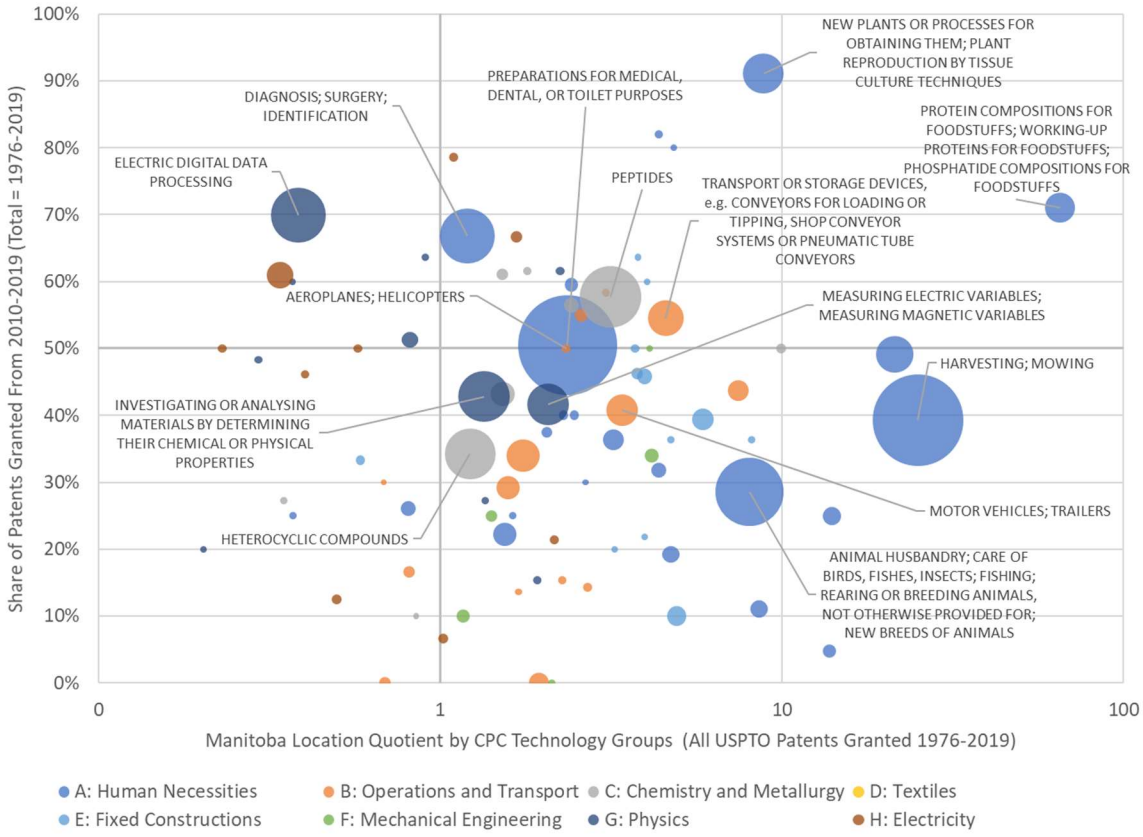
Figure 3.4.1
Patents Granted by the USPTO to Manitoba-based Inventors by Section and Year



Source: PatentsView. United States Patent and Trademark Office (USPTO) database 1976-2019. www.patentsview.org

Figure 3.4.1 shows the number of patents granted by the USPTO to Manitoba-based inventors from 1976 to 2019 by broad technological category. Time of patent application to time of granting normally takes 3-4 years. Granting date generally reflects work that was actually performed a few years prior. Most patents are the result of efforts by teams of inventors and thus multiple individuals are typically recorded for each patent record. In cases where inventors are located in different jurisdictions, fractional counting based on inventor splits is applied. There is a clear upward trajectory in the amount of patenting activity in Manitoba since 1976. This tracks global trends in intellectual property protection. The largest technological category is 'human necessities' which covers a wide range of scientific contributions from agriculture to life sciences. 'Operations and transport' is the second most common patenting field in Manitoba. 'Physics' which includes digital and communications technologies has been the fastest growing category in recent years.

Figure 3.4.2
Top Patent Technology Groups Granted to Manitoba-based Inventors, 1976-2019

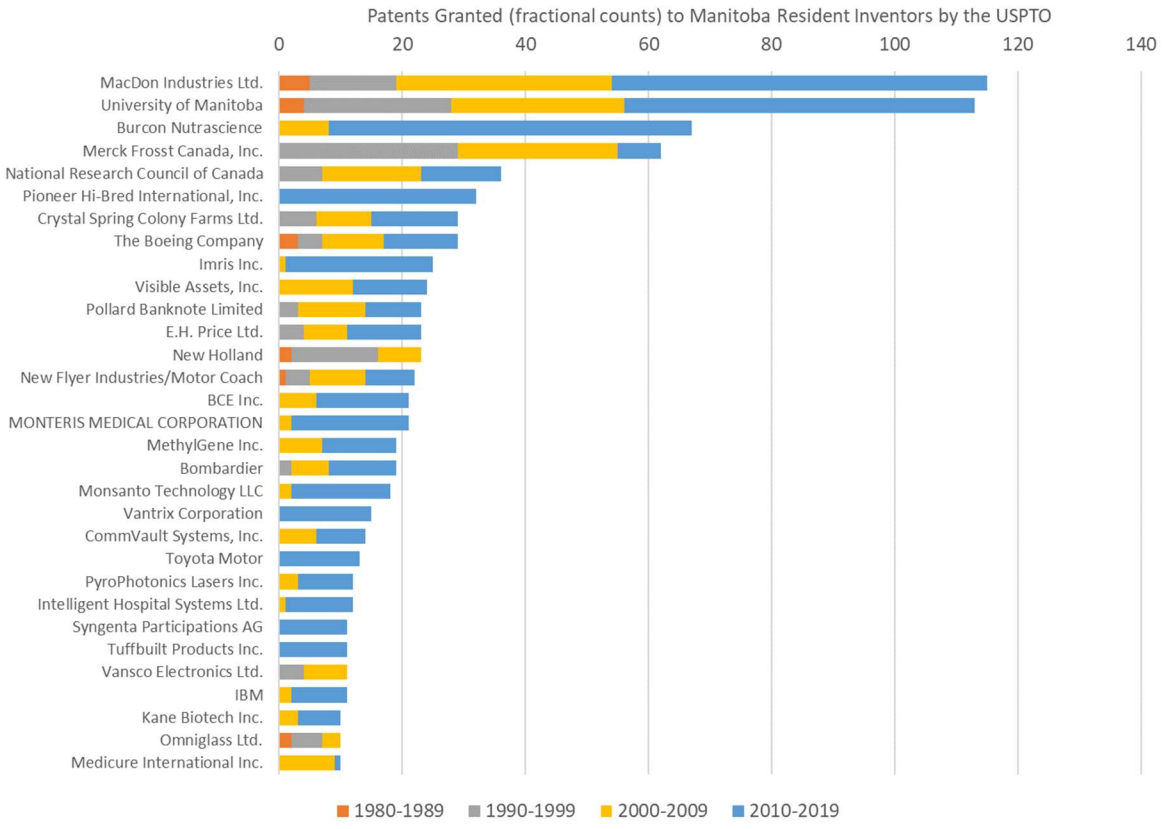


Source: PatentsView. United States Patent and Trademark Office (USPTO) database 1976-2019. www.patentsview.org

Most of Manitoba's key technology advantages relate to the agriculture & food, life sciences, bus manufacturing, and aerospace clusters. Figure 3.4.2 summarizes the top patented technologies in Manitoba between 1976 and 2019 on three dimensions. The x-axis represents Manitoba's technological specializations,

the y-axis denotes recent momentum based on the share of patents being granted in the past decade, and the size of the circles shows the total number of patents (fractional count). The upper right quadrant contains the technologies being developed in Manitoba that are recently expanding areas of specialization. The two most notable scientific specializations are 'new plants or processes for obtaining them' and 'protein compositions for foodstuffs'. Both of these technological categories are extreme specializations that have seen a great deal of momentum in recent years in Manitoba. They are the core of the emerging protein industry at the intersection of the agriculture & food and life sciences clusters. 'Harvesting and mowing' equipment is another top technological specialization in the province but has not seen as much momentum in recent years. There has been a surge in 'electric digital data processing' in the past decade but it remains a far-off specialization for the province.

Figure 3.4.3
Top Manitoba Patent Assignees by Decade



Source: PatentsView. United States Patent and Trademark Office (USPTO) database 1976-2019. www.patentsview.org

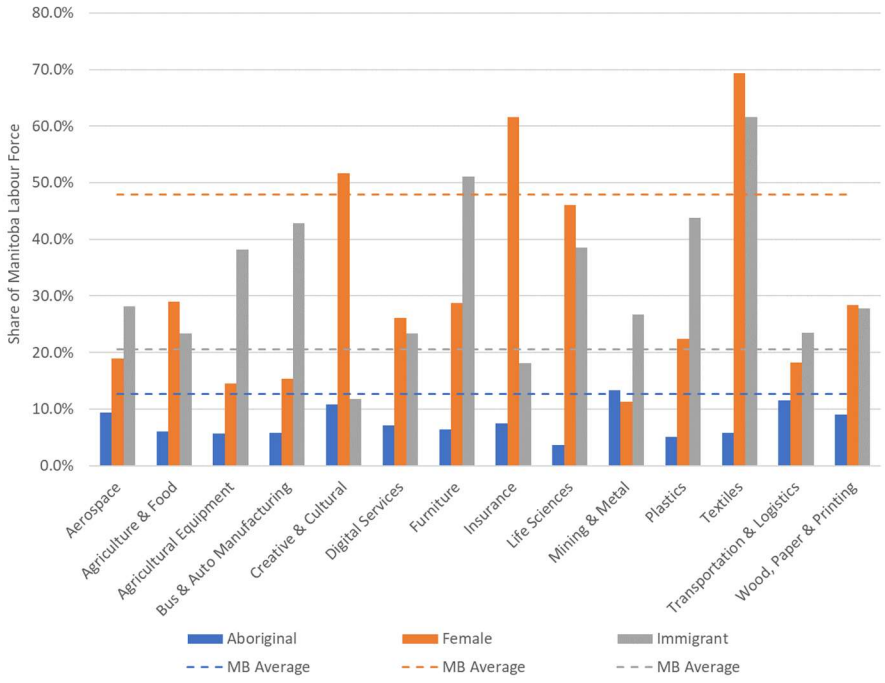
The most prolific patenting organizations in Manitoba over the past four decades give additional insights into the sources of innovation in the province. Figure 3.4.3 shows which patent 'assignees' were the most prevalent in each of the four past ten-year periods. The number one patenting company in Manitoba is

MacDon Industries with nearly 120 patents. Its amount of patenting has steadily increased over time. The University Manitoba is the second most prolific patenting organization in the province with over 110 granted in the past 40 years. This is a good indication of commercially viable research and development being undertaken at the province's premier research-intensive university. Burcon Nutrascience (joint venture partner of Merit Functional Foods) is third on the list with nearly 70 patents, most of which have been granted in the past ten years. This firm is one of the companies leading the development of the nascent protein industry. Merck-Frosst is the fourth highest ranking organization on the list, but unfortunately has mostly withdrawn from Manitoba in recent years. The National Research Council takes fifth place, demonstrating the importance of government funded R&D activities in the province. The remainder of the top patenting organizations are concentrated in the agriculture & food, life sciences, aerospace, and bus manufacturing clusters.

3.5 Inclusion

The benefits of economic growth are maximized when everyone is included in it. Inclusion can also be a source of economic growth when traditionally underemployed groups are able to reach their full potential. Figure 3.5.1 displays the share of the labour force for each cluster that are Aboriginal, female, or immigrants. These levels are compared against the average for the entire provincial labour force.

Figure 3.5.1
Aboriginal, Female, and Immigrant Share of Manitoba Cluster Labour Force, 2016



Sources: Statistics Canada. 2016 Census. Table 98-400-X2016358.; Statistics Canada. 2016 Census. Table: 98-400-X2016359.

Mining & metals is the only cluster that employs people of Aboriginal descent at an average rate. All other clusters are below average, many drastically so. There is a clear and troubling disconnect between many of the core economic sectors in Manitoba and its Aboriginal population. Part of this disconnect is certainly due to geography. Mining & metals has a strong presence in the North while most of the others do not. Attempts by these industries to make efforts to expand northward could have many benefits.

Textiles, insurance, and creative & cultural are the only clusters that employ women at an above average rate. Life sciences is nearing the average level. Apart from the four clusters mentioned, all others employ women at a rate of less than 30%.

Immigrants makeup an above average level of the labour force in 12 of the 14 clusters. Only creative & cultural and insurance are below the provincial rate. This suggests that the majority of traded clusters have difficulty finding people with the required skills from within Manitoba, which points to possible gaps in the education system.

4. QUALITATIVE FINDINGS

The qualitative findings are based on a review of the recent reports written on the Manitoba economy and a series of 61 interviews conducted between December 2019 and March 2020. The purpose of this aspect of the research was to gain a deeper understanding of the strengths and weaknesses of the provincial economy while homing in on some of the key issues facing specific sectors. While the focus is on trade, it needs to be acknowledged that economic development involves a set of deeply interrelated mechanisms. It was also important to gain an appreciation for how prospective clusters are currently functioning via industry associations, supply chains, and linkages to higher education. This section is organized on five themes that framed the interviews: talent, trade, infrastructure, regulatory environment, and innovation. The main messages are highlighted in each subsection.

4.1 Talent

Talent was the most commonly cited issue facing businesses in Manitoba. There are serious concerns about finding enough people with the necessary skills to fuel future expansion in the province. This was generally true across all sectors consulted.

- The most commonly mentioned shortages are in a variety of engineering fields and top-end management.
- High degree of satisfaction with Red River College. It is seen by all sectors as being highly responsive to the needs of industry.
- There are general levels of satisfaction with the quality of University of Manitoba graduates but concerns about quantity (especially engineering).
- Some frustrations with the speed of change at the University of Manitoba in response to the current needs of the economy.
- Immigration and related programs have worked well for many businesses and industries. Immigration is seen as a vital aspect to current and future success. Recent change to immigration programs at the lower end of the skills spectrum has begun to hurt some industries such as furniture manufacturing and agriculture.
- Employers have a hard time attracting people from other parts of Canada if they do not have an existing connection to Manitoba.
- Top employers feel they benefit from lack of competition for labour but acknowledge that their gain may be at the detriment to smaller players in the local ecosystem.
- Lower labour costs in the province are seen as an advantage.
- Less churn/turnover in the Manitoba labour force than elsewhere is seen as an advantage.

4.2 Trade

Expanding trade is acknowledged to be an essential component of business growth. Large businesses typically have the experience, resources, and networks to handle trade related issues. Small and medium sized firms and less established larger firms typically require additional help.

- Agriculture and agricultural equipment have global markets while most other clusters are focused on the United States.
- Non-tariff barriers are seen as the top issue. This is especially true for agriculture in cases of health and safety being used by foreign countries to limit imports. For the bus manufacturing industry "Buy America" provisions to public sector procurement are a major obstacle.
- Some expressed desires for the current federal government to make clearer choices when dealing with conflicts between trade and conflicting environmental, geo-political, and reconciliation issues. Businesses want less uncertainty.
- There are no major concerns with the CUSMA agreement.
- There are sentiments in the agriculture industry that the CETA agreement is working better for European business than Canadian producers.
- The Canadian 'brand' is seen as a positive especially in the agricultural sector. This is potentially at risk if safety and quality are compromised in a highly public manner.

4.3 Infrastructure

Infrastructure in Manitoba is mostly seen as a strength for doing business in the province. Its central location and connections are a boon to trading businesses and clusters. Hydro as a clean source of power is felt to be important as downstream customers are increasingly demanding sustainability goals be achieved.

- There is a general desire to see infrastructure spending be strategically aligned with economic development goals.
- CentrePort is a special asset that is beginning to hit its stride as a key intermodal terminal with unique trading regulations. Close attention needs to be paid to the degree that it is contributing to economic development and efforts should be made to continue to build on its momentum.
- Reliability issues with Hydro in specific places, especially in parts of Winnipeg. Blackouts and brownouts can be costly to sensitive manufacturing businesses.
- The quality of road connections from Winnipeg to the US border need to be improved.
- Railways generally works well and are an advantage. Agriculture is lower priority to railway companies than oil & gas and so has a big stake in pipeline construction that will help free capacity and potentially lower costs.
- Road access to Northern Ontario Ring of Fire a possible source of future growth.
- The Port of Churchill is seen by some as a potential source of growth & development opportunity for the North. The mothballed spaceport has some potential for the aerospace industry.

- The airport is a significant asset that will continue to expand as long as its 24-hour operating status is protected. Need for more direct flights to key destinations (e.g. Los Angeles for creative & cultural; London for insurance).
- Water and wastewater are an issue in certain places. There are some specific local issues and permitting problems.
- Digital infrastructure needs to be improved in many rural areas.

4.4 Regulatory Environment

Regulatory issues are highly specific on an industry-by-industry basis. One consistent message is that the focus should be on getting regulations 'right' rather than reduced. The view that safety standards in particular are important for maintaining a high reputation and strong national brand. With that in mind it is vital to ensure that regulations are up-to-date through a constant process of government-industry communication and learning. Clusters can be an effective tool for facilitating this interaction.

- The downside to regulations often arises from unintended consequences. Well meaning regulations can have secondary negative impacts that outweigh the primary positive intentions.
- Regulations are often misunderstood and misapplied due to a lack of understanding and expertise. This sentiment was mainly directed at local government rather than provincial or federal.
- Regulations are integral to some industries such as insurance. This strengthens companies in local markets but makes selling across regulatory jurisdictions difficult.
- Major public breakdowns in safety – especially food, life sciences, and transportation – are the biggest threat to a range of clusters. Compliance enforcement is needed to tackle the very few bad actors that can spoil the reputation of the entire business community.
- There is a need to monitor the regulatory environment in a comparative manner. It is important to keep apprised of regulations that are directly compromising competitiveness by being misaligned with global best practises.

4.5 Innovation

Innovation is something that all leading companies are focused on. They do not need to be told that they need to be doing it. That being said, there are many ways in which public sector involvement is vital to a healthy ecosystem.

- There are a range of shared innovation assets and facilities in the province that have had a significant impact on a number of clusters. All of these assets involve some degree of public funding. Though some seem to be underutilized. Clear decisions need to be made about which will be supported and which will not.

- Post-secondary relationships with industry on innovation projects are mostly going well. Red River College receives a great deal of praise from the business community. The University of Manitoba is seen as slower to respond but in recent years has begun to pick up momentum. Programs such as Mitacs are viewed positively from both universities and industry.
- Incubator and scale-up organizations such as North Forge are just finding their feet and should produce growing returns in the coming years.
- The private sector has ramped up investment in R&D facilities especially in the agriculture & food cluster. Digital/precision agriculture, proteins and an increasing shift toward higher value-added consumer products are sources of strategic direction.
- Newer industries such as digital services express concerns about not being understood and appreciated in the province. Many supporting programs do not fit their needs.

5. SUMMARY OF FINDINGS

This section consolidates the quantitative analysis presented in sections 3 and 4 of this report. Figure 5.1.1 below provides quantitative rankings and relative qualitative assessments across a range of key indicators. The purpose of this information is to inform funding decisions going forward. It is not as simple as adding up the columns to provide an overall score as there are no weights attached to each indicator.

Figure 5.1.1
Ranking Matrix of Manitoba Clusters

Cluster	Trade Volume	Trade Growth	Trade Specialization	Foreign Trade as a Share of All Trade	Share of Businesses with Foreign Trade	Employment	Employment Growth	Employment Specialization	Average Incomes	Labour Market Qualifications	Labour Force Inclusion	Share of Jobs Outside Winnipeg CMA	Global Connectivity	Local Spillovers	Technological Innovation	Future Opportunity-Vulnerability
Aerospace	4	7	2	2	6	8	2	3	1	4	5	12	●	●	●	●
Agriculture & Food	1	11	3	7	10	1	11	2	11	13	10	1	●	●	●	●
Agricultural Equipment Mfg.	5	9	1	9	3	6	3	1	7	7	14	3	●	●	●	●
Bus & Vehicle Manufacturing	6	4	6	4	2	11	10	12	5	8	12	7	●	●	●	●
Creative & Cultural	14	14	13	11	13	4	9	11	13	5	3	9	●	●	●	●
Digital Services	12	1	14	14	12	9	5	14	2	1	13	13	●	●	●	●
Furniture Manufacturing	9	6	4	10	7	10	12	4	12	12	2	8	●	●	●	●
Insurance	11	12	12	13	14	3	1	6	6	3	5	10	●	●	●	●
Life Sciences	10	2	10	1	9	13	7	13	4	2	7	6	●	●	●	●
Mining & Metals	3	13	9	12	4	5	8	8	3	6	9	2	●	●	●	●
Plastics Manufacturing	8	10	8	3	1	12	6	7	9	14	10	11	●	●	●	●
Textiles Manufacturing	13	5	7	8	5	14	14	9	14	9	1	14	●	●	●	●
Transportation & Logistics	2	3	5	6	11	2	4	5	8	11	7	5	●	●	●	●
Wood & Paper	7	8	11	5	8	7	13	10	10	10	3	4	●	●	●	●

Top-tier Mid-tier Bottom-tier

The summary matrix displayed in Figure 5.1.1 contains three broad groupings of indicators. The first set measures various aspects of trade. The top five clusters in terms of total trade value are agriculture & food, transportation & logistics, mining & metals, aerospace, and agricultural equipment manufacturing. Of these, only transportation & logistics is also in the top five in terms of percent growth (2011-2016). Digital services and life sciences are the fastest growing along with the aforementioned transport sector and bus manufacturing. Relative to the other provinces and territories agricultural equipment, aerospace, and agricultural equipment are Manitoba's top specializations in terms of trade. Life sciences, aerospace, and plastics manufacturing are the most oriented towards foreign markets relative to interprovincial trade. There is a clear bias in the trade data towards clusters that primarily produce physical goods. Clusters such as creative & cultural, digital services, and insurance produce products in ways that do not show up in traditional trade statistics and so careful consideration should be made when making judgments about these industries.

The second set of indicators measure various aspects of employment. The largest clusters by trade are also typically the largest by employers as agriculture & food and transportation & logistics take the top two spots in the rankings in both categories. This changes however, in spots three and four which are occupied by insurance and creative & cultural respectively. Insurance, aerospace, agricultural equipment manufacturing, transportation & logistics, and digital services represent the top five clusters in terms of employment growth (2006-2016). Agricultural equipment manufacturing, agriculture & food, and aerospace are Manitoba's top three areas of specialization measured by employment (location quotient).

Job quantity and job quality are in some cases inversely related. Although agriculture & food and transportation & logistics are the top two sources of employment, employment incomes in these clusters rank in the bottom 50%. The best paying jobs on average are found in aerospace, digital services, mining & metals, life sciences, and bus manufacturing. Average incomes are highly correlated with the typical skill level of jobs with a cluster. As measured by the educational attainment of members of the labour force (tertiary degrees) digital services, life sciences, insurance, aerospace, and creative & cultural round out the top five.

The labour market inclusion indicator is designed to assess the degree to which typically underrepresented and marginalized groups make up the workforce of each cluster. The indicator is an index of the share of aboriginal, female, and immigrant workers. Textiles, furniture manufacturing, wood, paper & printing, and creative & cultural are the most inclusive to these groups. The final labour market indictor assesses geographic spread of employment across Manitoba. With nearly 60% of the province's population living within the Winnipeg Census Metropolitan Area, the capital region is its main economic engine. In recent decades larger places have typically produced a greater share of economic growth. The concern is that smaller communities are at a greater risk of being left behind in the contemporary global economy which favors greater scale and connectivity. Agriculture & food, agricultural equipment manufacturing, and mining & metals are the clusters that produce the largest share of jobs outside the Winnipeg Metro. Textiles, digital services, and aerospace are the clusters most concentrated in the capital region.

The third set of indictors rely more on qualitative analysis of cluster dynamics such as connectivity, spillovers, innovation, and future opportunities and vulnerabilities. Clusters are most often defined by their internal structures and dynamics, but it is vital to understand that strong local clusters are nodes in global value chains. The global connectivity indicator is a mix of quantitative analysis of a subset of the clusters as well as a qualitative assessment based on the presence of anchor firms in the province. Agriculture & food, agricultural equipment manufacturing, and bus manufacturing are in the top tier of clusters on the global connectivity indicator due to the local presence of the headquarters of globally competitive firms such as Richardson, MacDon, and New Flyer Industries. These anchor firms give the local clusters weight in the global systems in which they operate. Transportation & logistics is also in the top tier also due to the presence of anchor firms, but also due to the province's central location and well-developed infrastructure. The railway connections are particularly vital.

Clusters of related firms not only benefit their core industry, but they often have wider spillovers into other clusters and areas of the local economy. The local spillover indicator is an assessment of the degree to which a cluster interacts and supports additional segments of the Manitoba economy. Agriculture & food is listed in the top tier partly because of its sheer size. Many additional jobs are the result of a strong agriculture & food sector. There are also many supply chain connections from farms, to initial processing, to consumer goods, packaging, and distribution. The agricultural cluster is also a major consumer of locally produced goods and services such as equipment, feed, fertilizer, and insurance. Transportation & logistics is a vital cluster within the wider economy as all other local goods producers rely on it in order to get their products to market. A healthy transportation & logistics cluster is an attractive asset for the province looking to entice foreign direct investment. Digital services are an increasingly important component of any local economy as all sectors are rapidly introducing information technologies into their operations. There is currently a dearth of digital services in Manitoba relative to other parts of the country. This is a situation that needs to be urgently addressed. The creative & cultural cluster plays an important role across the economy in a number of ways. Any company needing to brand their companies and image rely on this sector. This is also true for the province as a whole. If Manitoba is going to create a recognizable brand in the global marketplace, it is the local creative & cultural cluster that is going to develop it. Another key contribution of the province's creative & cultural cluster is that a vibrant arts and entertainment scene is shown to play a major role in attracting and retaining talent across the entire economy. On many traditional economic scores, the creative & cultural cluster performs less well, but its true value is likely measured by the quality of life benefits that it provides to all Manitobans.

All areas of the economy continually make efforts to innovate. The technological innovation indictor assesses the extent to which local clusters are global leaders in their particular fields. Manitoba is at the frontier of specific intersections between the life sciences and agriculture. Plant-based protein science is the area of most success and most promise. Manitoba is one of the top jurisdictions in development agricultural equipment. This is a long-standing source of strength and world-leading expertise. Three globally prominent aerospace firms generate key technologies in Manitoba. The downside in this cluster is that none of these firms is locally headquartered and thus their continued presence and R&D investment is somewhat more tenuous. New Flyer Industries is one of the top bus manufacturers in the world and thus at the forefront of technological development. There are two areas where technology is currently changing quickly. One is

electric engines and the other is autonomous driving. Digital services is an industry defined by rapidly evolving disruptive technologies. Manitoba is fortunate to have produced two globally competitive firms in the past decade with Bold Commerce and Skip the Dishes. Video game production is another area that is just beginning to develop high end technologies within Manitoba. In this respect, Ubisoft is a highly welcome addition to the province. Continued success in this cluster will largely depend on investments made in talent development and immigrant attraction efforts.

Moving forward in the contemporary global economy means competing on knowledge. Being able to produce world class products means being at the fore of product and process innovation. It is increasingly difficult to compete in industries that are primarily driven by (low) cost considerations. The clusters most likely to succeed in Manitoba in the future are the ones who are led by firms that are heavily invested in research and development activities. These include agriculture & food, digital services, and insurance. Conversely, the most vulnerable clusters are the ones at the mercy of global commodity prices and unfavourable labour cost differentials. These include mining & metals, wood, paper & printing, furniture manufacturing, and textiles.

6. RECOMMENDATIONS

6.1 Economy-Wide Initiatives

It cannot be stressed enough that a large part of economic development is getting the basics right. This is easier said than done. In the context of the contemporary global economy the most important resource is human capital. The most consistent message heard is that the largest barrier to future growth within Manitoba was the potential shortage of workers with the required levels of skills. There is a general level of satisfaction with the quality of human capital graduating from tertiary education institutions as well as newcomers to the country. The issue is quantity. Manitoba needs to ensure that the highest demand college and university programs are able to scale with the needs of the economy and that economic class immigration programs are working as they are intended.

A second area that is crucially important to the business community is infrastructure. This is largely under direct government control and should be strategically aligned with economic development. At times the involvement of multiple levels of government can complicate the picture as well as competing interests between local jurisdictions. The implementation of regional government structures within Manitoba should focus on creating efficiencies with regards to infrastructure development and maintenance. Airports are increasingly important assets for economic development. The presence of a 24-hour airport is especially beneficial for trade. Every effort should be made to improve and expand Winnipeg's airport especially in the wake of the current global crisis. Neighbouring CentrePort is now demonstrating the beginning of its true potential as a catalyst for economic growth in Manitoba. It is a near perfect example of how the focusing of infrastructure and resources can be used to spur economic development.

Infrastructure development can also be used to reduce geographic inequalities. In many instances rural and northern communities continue to fall behind their southern urban peers. Significant expansion and enhancement of transportation and digital infrastructure needs to occur in these places if they are to be able to reach their fullest economic potential.

A third area that Manitoba is leading is the push for reduced barriers to interprovincial trade. The province's central geography and strong transportation infrastructure put it in a position to benefit greatly from higher volumes of east-west trade. Manitoba is also somewhat of a bridge between the resource sectors that are strongest in the west with the manufacturing sectors that are more prominent in Quebec and Ontario. A continued push to see freer interprovincial trade become reality is needed.

6.2 Evaluation of Prospective Clusters

There is much evidence to suggest that the most successful jurisdictions are the ones that are able to cultivate a set of interrelated core competencies within their economies. This is not just stand-alone local specializations, but about the synergies between clusters. The mixing of different areas of expertise is often

where the most profitable innovation occurs. The application of other clusters such as digital services, life sciences, and creative & cultural to the set of more traditional core clusters is where the most interesting things are currently happening in the Manitoba economy.

The company Farmers Edge provides a clear-cut example. They are applying a range of digital services, in conjunction with agricultural equipment, in order to improve efficiency in agricultural production. The big potential payoff is the possibility of creating entirely new markets for agricultural insurance in countries that do not currently have any due to a lack of data. Although not locally sourced, these technologies rely on satellite information provided by the aerospace industry. A combination of no fewer than five strengths in the Manitoba economy are being applied to create a high growth company. There are not very many other jurisdictions that can boast this range of related competencies. This is the type of opportunity that Manitoba needs to be looking for and aggressively pursuing. In this spirit a set of high potential cluster opportunities are presented below in no particular order.

Digital & Precision Agriculture

Agriculture is the largest cluster in Manitoba. It is hard to overstate the potential of applying digital & precision techniques to further enhance the sector's productivity. There are five related trajectories that each offer significant growth opportunities for Manitoba. One is the digital service providers, which in their own right represent a set of businesses that did not exist a decade ago and are growing quickly. Second is the integration of digital technology into traditional agricultural equipment. Third is that productivity gains that they can deliver to the agriculture industry are potentially massive. Fourth is the development of entirely new markets. Many developing countries do not currently have agricultural insurance due to a lack of data. Digital agriculture is creating this data and creating new insurance markets as a result. This is the biggest opportunity for Manitoba. If it becomes a global leader in this field, Winnipeg could become the agricultural insurance capital of the world. The fifth area of opportunity is quality assurance due to food traceability throughout the production system. This is especially relevant in a post-COVID-19 environment which will likely see an increased level of demand for safety.

Proteins

Manitoba's leading scientific contributions are in the field of proteins. Domestic champions and large transnational corporations are making big investments in this area in the province. These investments are also receiving significant backing by the governments of Manitoba and Canada. The data show a clear level of world leading research and development being undertaken in the province especially in conjunction with the life sciences industry. One of the big opportunities from a cluster perspective is not just with the core protein firms but with establishing supply chains based on the by-products of protein extraction processes. Further along this should also be extended to moving the cluster from food ingredients to higher value-added consumer goods. There are clear sources of growing demand for high quality pork products in key Asian markets as well as plant-based alternative proteins in more established North American markets.

Next Generation Buses

Bus manufacturing is one of Manitoba's top export products. Innovation in vehicle technology is at an inflection point in two respects. One is the move away from internal combustion engines to hybrid and electric power. The second is autonomous driving technology. Manitoba is home to one of the world's leading bus manufacturers that is currently grappling with these changes. A successful transition to these new technologies will expand market share and create many high paying jobs. There are three sources of headwinds that a cluster approach could address. One is the transition of a work force that will need retraining in light of the changing technologies. Second is public sector procurement regulations, particularly in the United States, that require a certain share of domestic production. Third is that the current global pandemic is hitting public transportation particularly hard. It is likely that this industry will need more support than most in order to deal with the crises. Using the local market as a test-bed for fully integrating next generation buses into the supporting infrastructure is a possible strategy that could provide short term stability with a view to increasing exports over the longer term.

Transportation & Logistics

This cluster is the ultimate facilitator of trade. While a strong industry on its own, it is a platform that all other goods producing clusters depend on. In other words, a successful transportation & logistics cluster will greatly enhance the success of all others. Manitoba's central location and well-developed rail infrastructure are built-in advantages that others cannot replicate. CentrePort and a 24-hour airport are special opportunities that should act as a focal point for further cluster initiatives. Twin factors of increased e-commerce and a premium on product safety is likely to heavily impact this sector through the pandemic and beyond. Tracking and tracing will continue to grow in importance. This industry will be at the fore of these efforts.

Aerospace

Aerospace provides the highest wages of all clusters in the province. The Manitoba aerospace cluster is anchored by three major firms. Jobs in this sector are on average the highest paying of any sector. These firms invest heavily in research and development. One of the challenges is that none of the big three are locally headquartered and so there is degree of vulnerability to the aerospace cluster. This is compounded by a fairly thin local supply chain. Similar to the bus industry, aerospace is one of the more vulnerable clusters with regards to the COVID-19 pandemic. Commercial passenger aircraft are likely to experience a heavy drop in demand over the near-to-medium term. Diversifying into other areas of aerospace in the meantime is a suggested strategy over this time period. A possible opportunity exists in redeveloping the spaceport in Churchill. There is a growing need for satellite technology in other clusters, especially digital agriculture and transportation & logistics. This represents a potential hybrid cluster.

Urban Economy Cluster

The urban economy cluster is the fastest growing cluster in Manitoba. Big cities tend to attract and support certain sectors more than others. The top financial services, digital services, and creative & cultural clusters are typically found in major centres. They are primarily human capital centric clusters that do not require as much physical space as they do not typically produce physical goods. They are most often highly concentrated in city centres. This physical proximity enhances the personal relationships and networks that underpin the dynamics of these clusters. Relative to its size, Winnipeg should be succeeding more than it already is in these sectors.

While not typically associated with traditional conceptions of trade, this cluster provides similar economic impact. When a video game that was developed in Manitoba is bought by consumers elsewhere, or when a patron purchases a ticket at a theatre to see a film shot in the province, it has the same net effect as trade – it generates a positive flow of capital. Such transactions do not show up in standard trade statistics, but they are an increasingly important source of economic activity for Manitoba.

6.3 Cluster Governance

The simple goal of any cluster initiative should be to build and sustain world class companies that produce world class products and services. Any strategy should be laser focused on these targets. If they are achieved many additional benefits, such as the creation of high-quality jobs or the expansion of the tax base, will be realized. With this in mind, one of the most important aspects of cluster governance is that they need to be business led. Top-down government led cluster initiatives rarely succeed and are often off-target with their strategies. Identifying leaders in the business community that will propel cluster initiatives forward is crucial.

Government and third sector agencies involved in economic development do have important roles to play. They are there to help business succeed by helping them solve problems. As was outlined earlier in this report there are a set of issues that individual businesses cannot address on their own. Trade, talent, infrastructure, regulatory environment, and innovation are areas where businesses need supports. Clusters are about creating structures and strategies that address these challenges. When they work best, clusters foster stronger communication and trust between the relevant partners. Relationships and networks are the backbone of any successful initiative.

It must be stressed that many of the ingredients of clusters are already in place. Manitoba has a relatively high degree of social capital. Within industry circles most people know most people. There is a spirit of cooperation in the community. The various sector councils have been very effective in building relationships and delivering programs and services to its membership. There are a number of effective university-industry and college-industry linkages. New cluster initiatives should build on existing networks and institutions rather than start from scratch.

One of the most effective ways to implement cluster initiatives is to study what has worked elsewhere. It is always a good idea to stay informed on what competitors are doing, but also there are many collaborative opportunities in similar jurisdictions. Before rushing to develop cluster initiatives, it is a good idea to identify

best practises that are specific to certain industries. Understanding what works (and what does not) on an industry-specific level is highly advisable. This can involve a range of activities up to and including study visits to relevant jurisdictions.

Cluster initiative ultimately need to have clear reasons to exist. If they are not providing bottom line benefits to the participating companies then they should be shuttered. With that in mind, a degree of patience and persistence is required before such benefits can truly be measured. Starting small with clearly identified issues that can be tackled on a project specific basis are good way to gain momentum. Once up and running the success of clusters will become evident to others who will want to join or create additional initiatives. Together these clusters can become the brand that Manitoba uses to sell itself to the world.

Implementing a cluster initiative is a collaborative process involving a range of partners. It ultimately needs to be driven forward by business, but often needs to be sparked by public sector or other partner action. The following suggests practical next steps to carry forward the recommendations provided by this report:

1. Select clusters to move forward with
2. Gauge interest among key businesses and stakeholders
3. Choose a cluster leader and give them resources to develop the cluster
4. Identify leading global clusters and study best practises in trade
5. Convene cluster members to identify key issues and develop a cluster trade strategy
6. Establish metrics for successful cluster trade strategy execution
7. Implement cluster trade strategy
8. Monitor cluster trade performance and make adjustments when needed

ACKNOWLEDGEMENTS

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APPENDIX A – CLUSTER NAICS DEFINITIONS

CLUSTER	Industries (NAICS)
AEROSPACE	3364 Aerospace product and parts manufacturing 4881 Support activities for air transportation
AGRICULTURE & FOOD	1110 Farms (except Greenhouses and Aquaculture) (1111 to 1124 and 1129) 1150 Support activities for farms (1151 and 1152) 3111 Animal food manufacturing 3112 Grain and oilseed milling 3113 Sugar and confectionery product manufacturing 3114 Fruit and vegetable preserving and specialty food manufacturing 3115 Dairy product manufacturing 3116 Meat product manufacturing 3117 Seafood product preparation and packaging 3118 Bakeries and tortilla manufacturing 3119 Other food manufacturing 3253 Pesticide, fertilizer and other agricultural chemical manufacturing 4131 Food merchant wholesalers 4171 Farm, lawn and garden machinery and equipment merchant wholesalers 4183 Agricultural supplies merchant wholesalers
AGRICULTURAL EQUIPMENT	3331 Agricultural, construction and mining machinery manufacturing 3362 Motor vehicle body and trailer manufacturing 4171 Farm, lawn and garden machinery and equipment merchant wholesalers
BUS & AUTO MANUFACTURING	3361 Motor vehicle manufacturing 3362 Motor vehicle body and trailer manufacturing 3363 Motor vehicle parts manufacturing
CREATIVE & CULTURAL	5111 Newspaper, periodical, book and directory publishers 5112 Software publishers 5121 Motion picture and video industries 5122 Sound recording industries 5151 Radio and television broadcasting 5152 Pay and specialty television 5191 Other information services 7111 Performing arts companies 7112 Spectator sports 7113 Promoters (presenters) of performing arts, sports and similar events 7114 Agents and managers for artists, athletes, entertainers and other public figures

	7115 Independent artists, writers and performers 7121 Heritage institutions

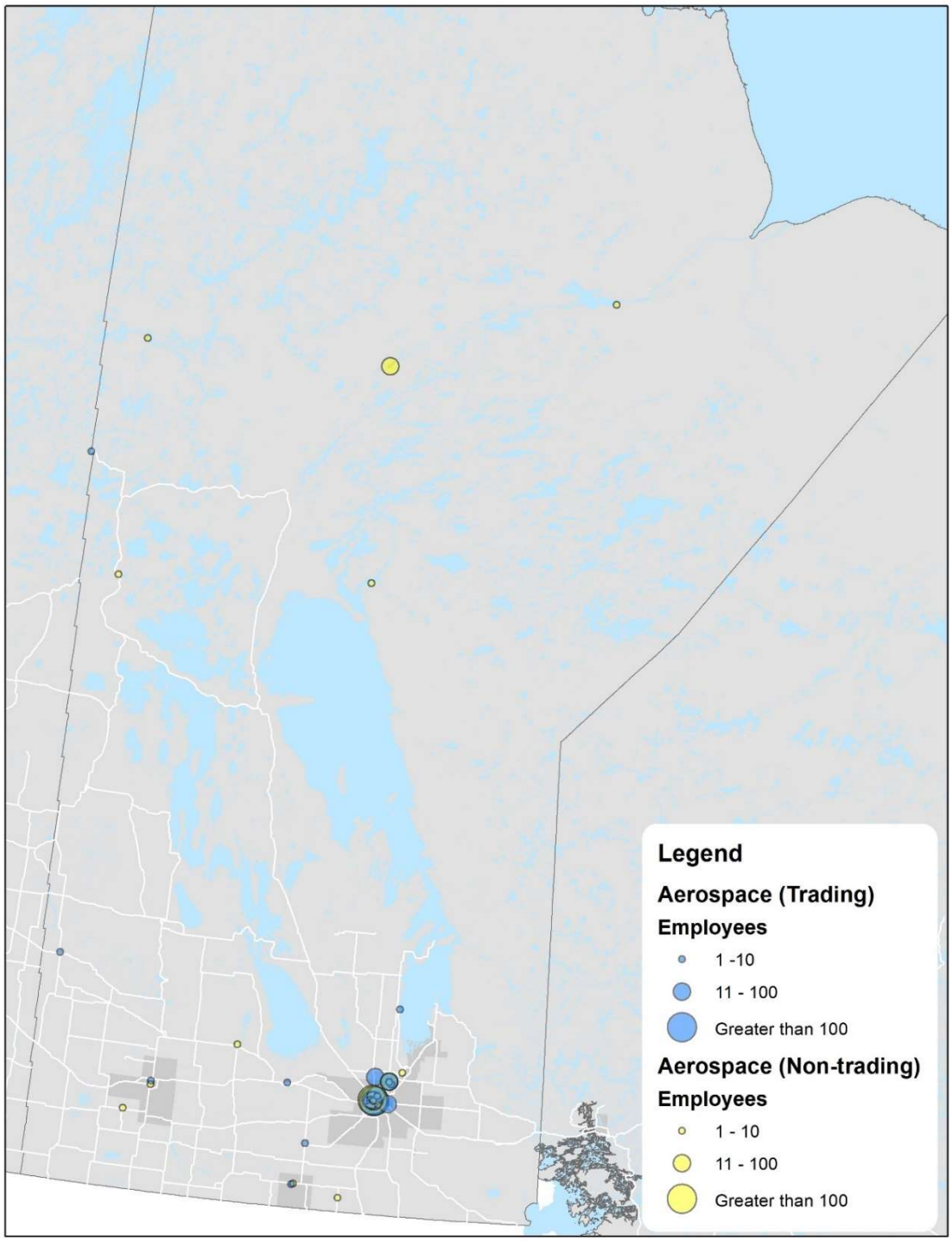
CLUSTER	Industries (NAICS)
DIGITAL SERVICES	5112 Software publishers 5182 Data processing, hosting, and related services 5415 Computer systems design and related services
FURNITURE	3371 Household and institutional furniture and kitchen cabinet manufacturing 3372 Office furniture (including fixtures) manufacturing 3379 Other furniture-related product manufacturing 4143 Home furnishings merchant wholesalers
INSURANCE	5241 Insurance carriers 5242 Agencies, brokerages and other insurance related activities
LIFE SCIENCES	3254 Pharmaceutical and medicine manufacturing 3391 Medical equipment and supplies manufacturing 4145 Pharmaceuticals, toiletries, cosmetics and sundries merchant wholesalers
MINING & METAL	2122 Metal ore mining 3311 Iron and steel mills and ferro-alloy manufacturing 3312 Steel product manufacturing from purchased steel 3313 Alumina and aluminum production and processing 3314 Non-ferrous metal (except aluminum) production and processing 3315 Foundries 3321 Forging and stamping 3322 Cutlery and hand tool manufacturing 3323 Architectural and structural metals manufacturing 3324 Boiler, tank and shipping container manufacturing 3325 Hardware manufacturing 3326 Spring and wire product manufacturing 3327 Machine shops, turned product, and screw, nut and bolt manufacturing 3328 Coating, engraving, cold and heat treating and allied activities 3329 Other fabricated metal product manufacturing
PLASTICS	3261 Plastic product manufacturing
TEXTILES	3131 Fibre, yarn and thread mills 3132 Fabric mills 3133 Textile and fabric finishing and fabric coating

	3141 Textile furnishings mills 3149 Other textile product mills 3151 Clothing knitting mills 3152 Cut and sew clothing manufacturing 3159 Clothing accessories and other clothing manufacturing 4141 Textile, clothing and footwear merchant wholesalers

CLUSTER	Industries (NAICS)
TRANSPORTATION & LOGISTICS	4811 Scheduled air transportation 4812 Non-scheduled air transportation 4821 Rail transportation 4841 General freight trucking 4842 Specialized freight trucking 4881 Support activities for air transportation 4882 Support activities for rail transportation 4884 Support activities for road transportation 4885 Freight transportation arrangement 4889 Other support activities for transportation 4931 Warehousing and storage
WOOD, PAPER & PRINTING	3211 Sawmills and wood preservation 3212 Veneer, plywood and engineered wood product manufacturing 3219 Other wood product manufacturing 3221 Pulp, paper and paperboard mills 3222 Converted paper product manufacturing 3231 Printing and related support activities

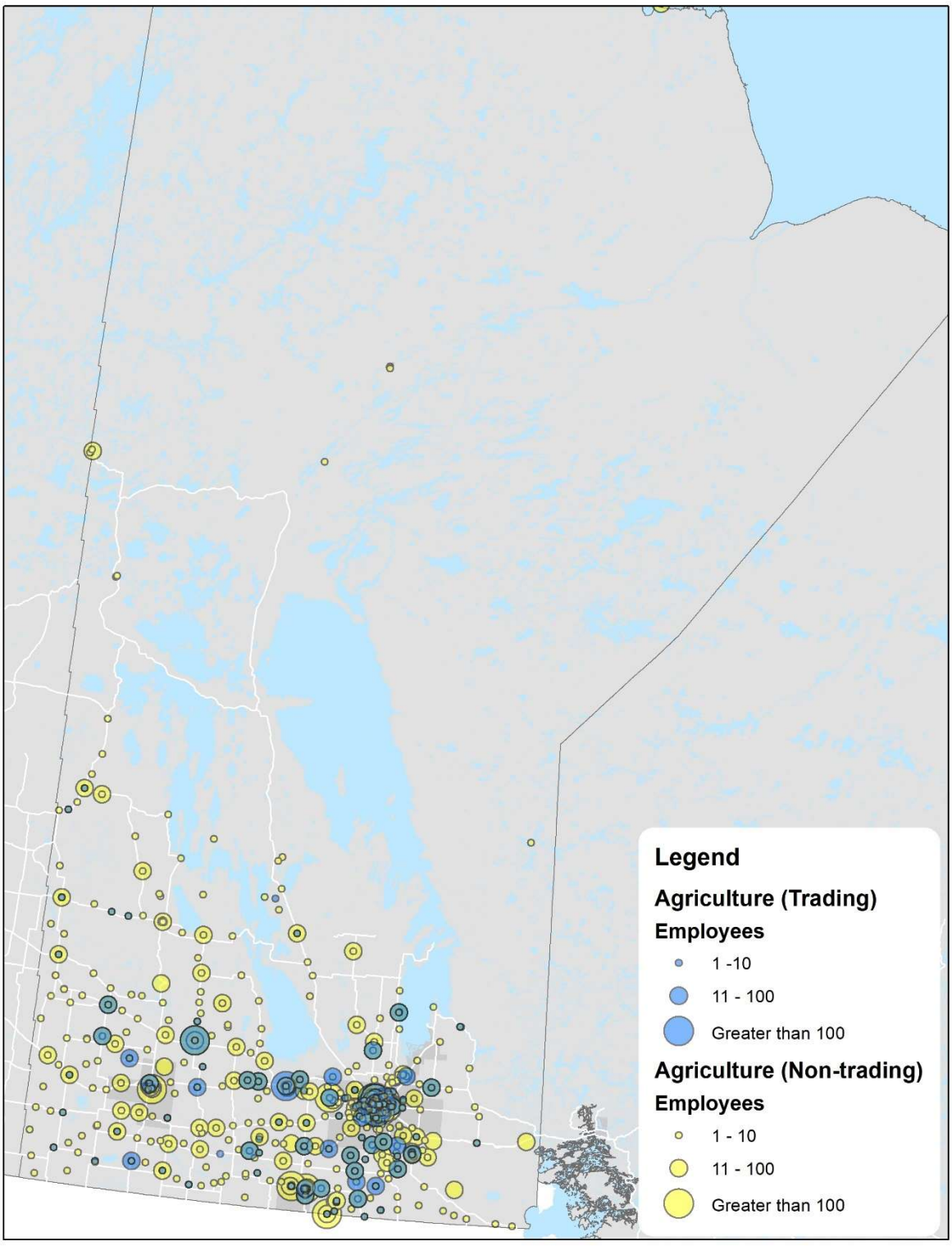
APPENDIX B – MANITOBA CLUSTER MAPS

Figure B.1
Aerospace Business Locations in Manitoba, 2019



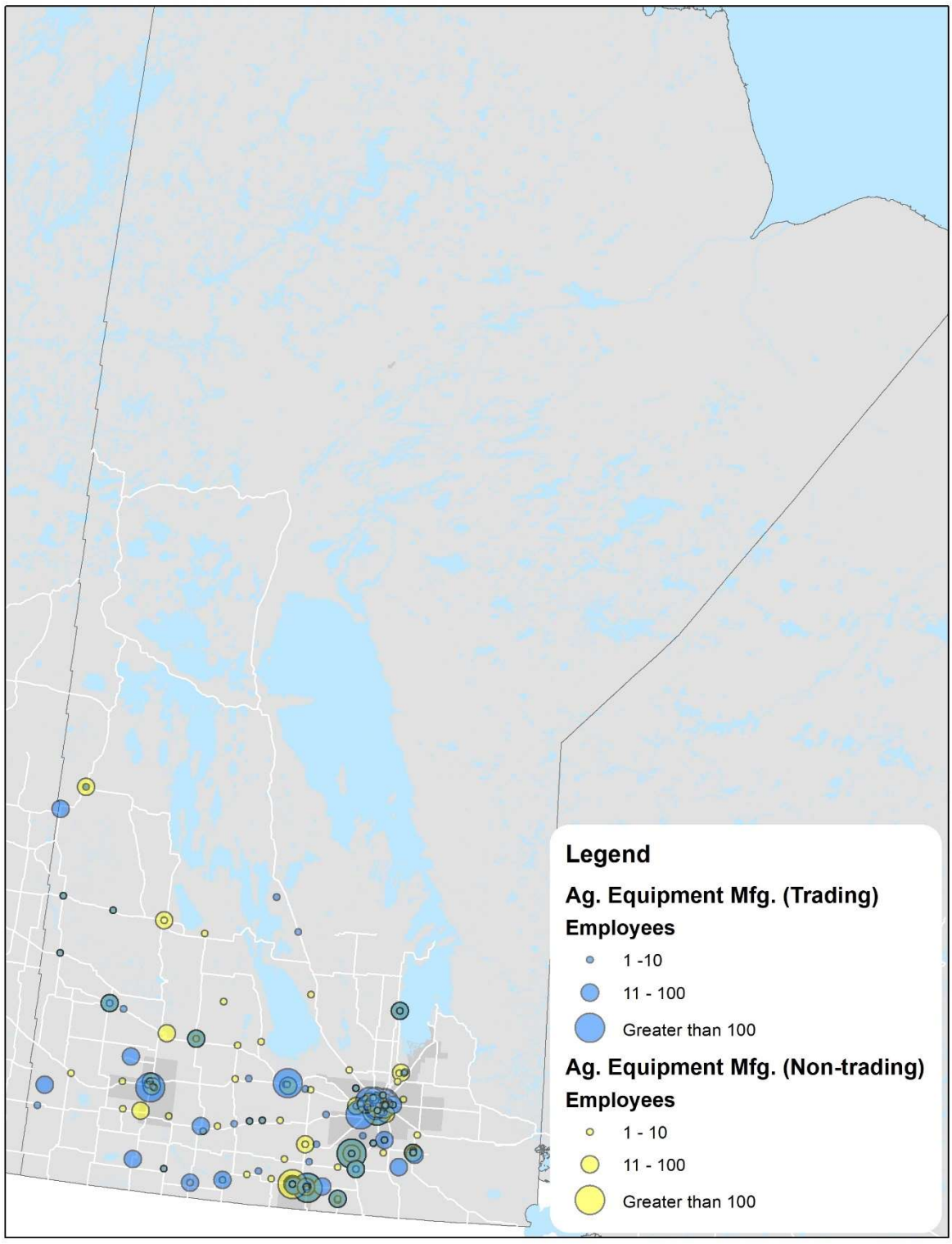
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.2
Agriculture & Food Business Locations in Manitoba, 2019



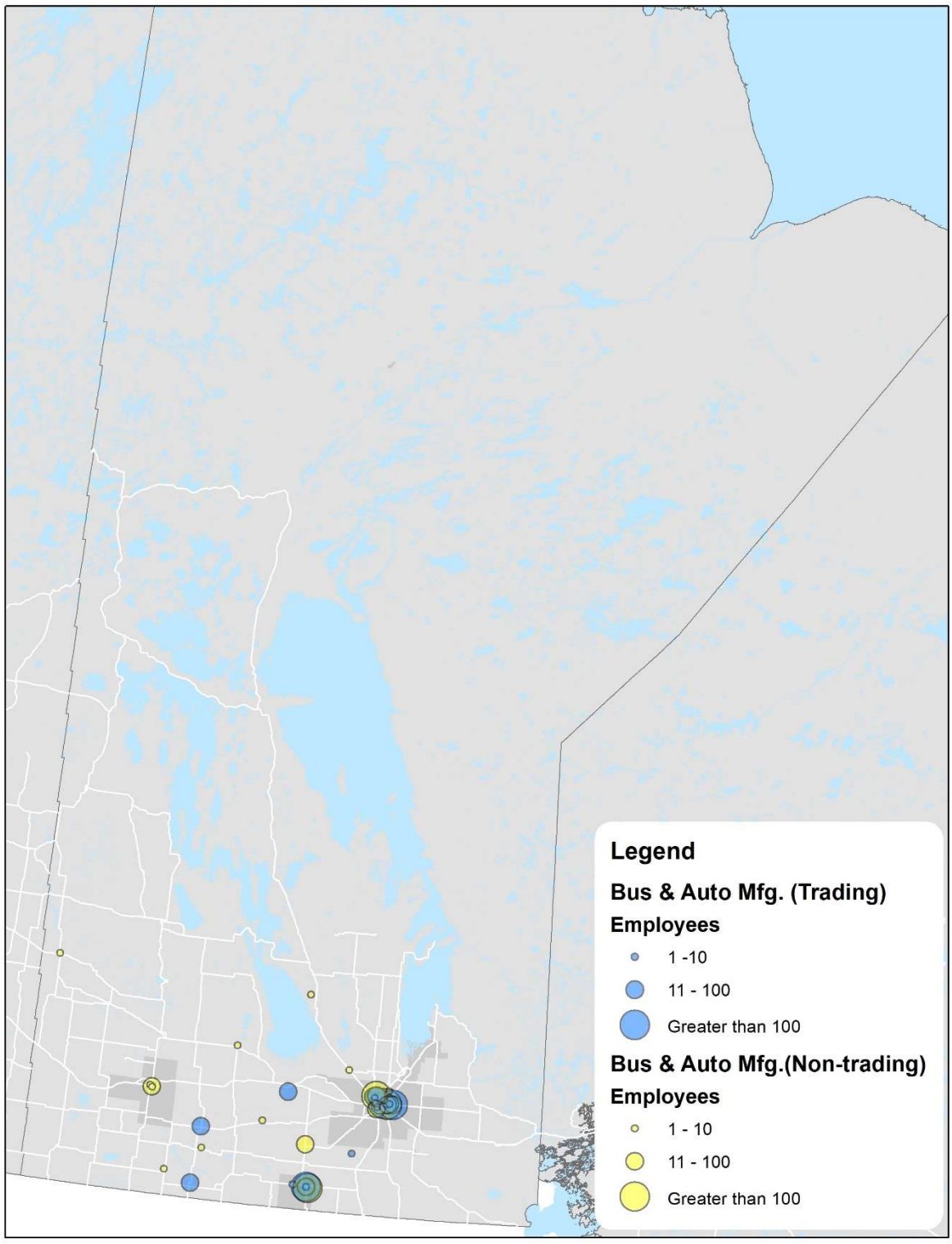
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.3
Agricultural Equipment Manufacturing Business Locations in Manitoba, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.4
Bus & Auto Manufacturing Business Locations in Manitoba, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.5
Creative & Cultural Business Locations in Manitoba, 2019

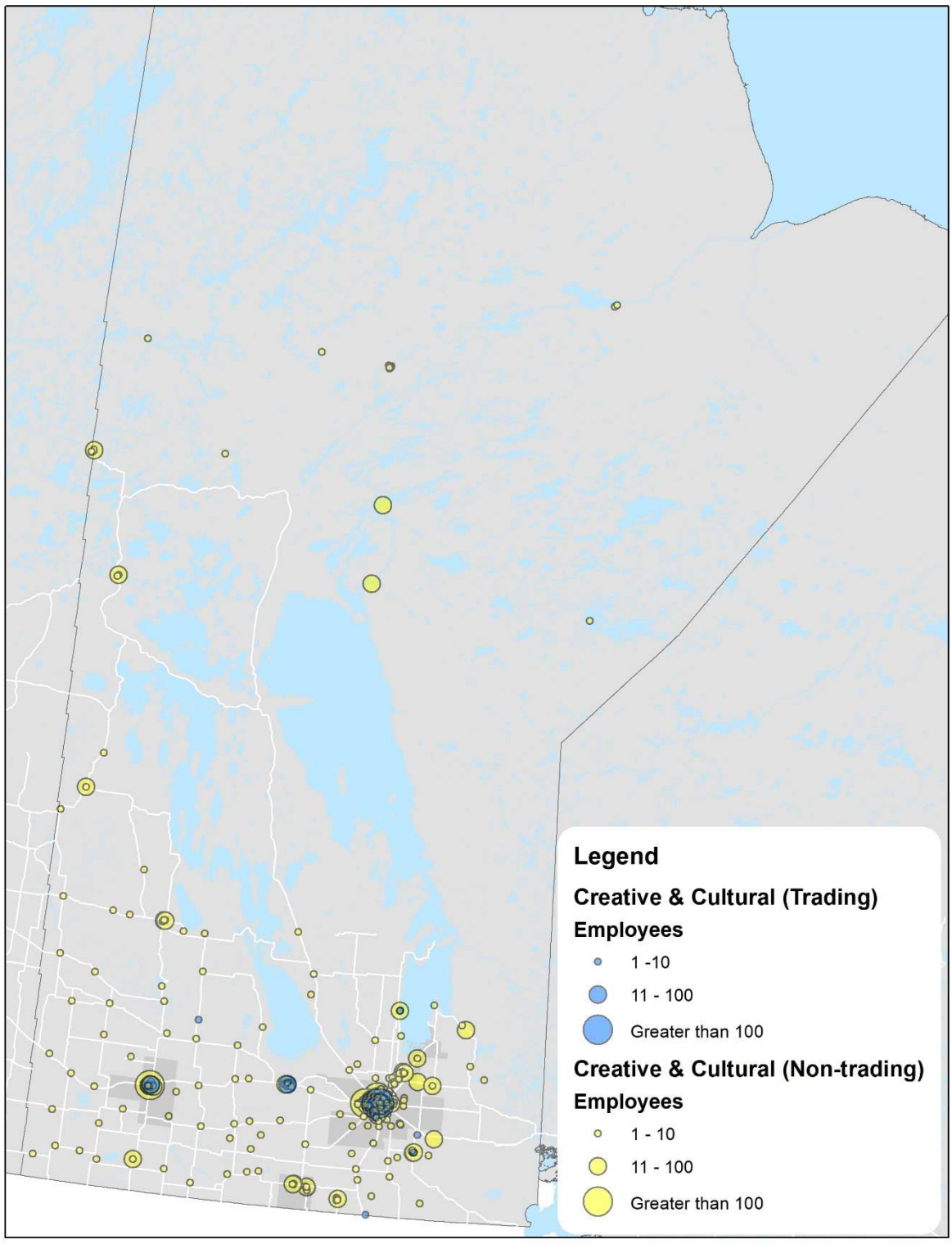


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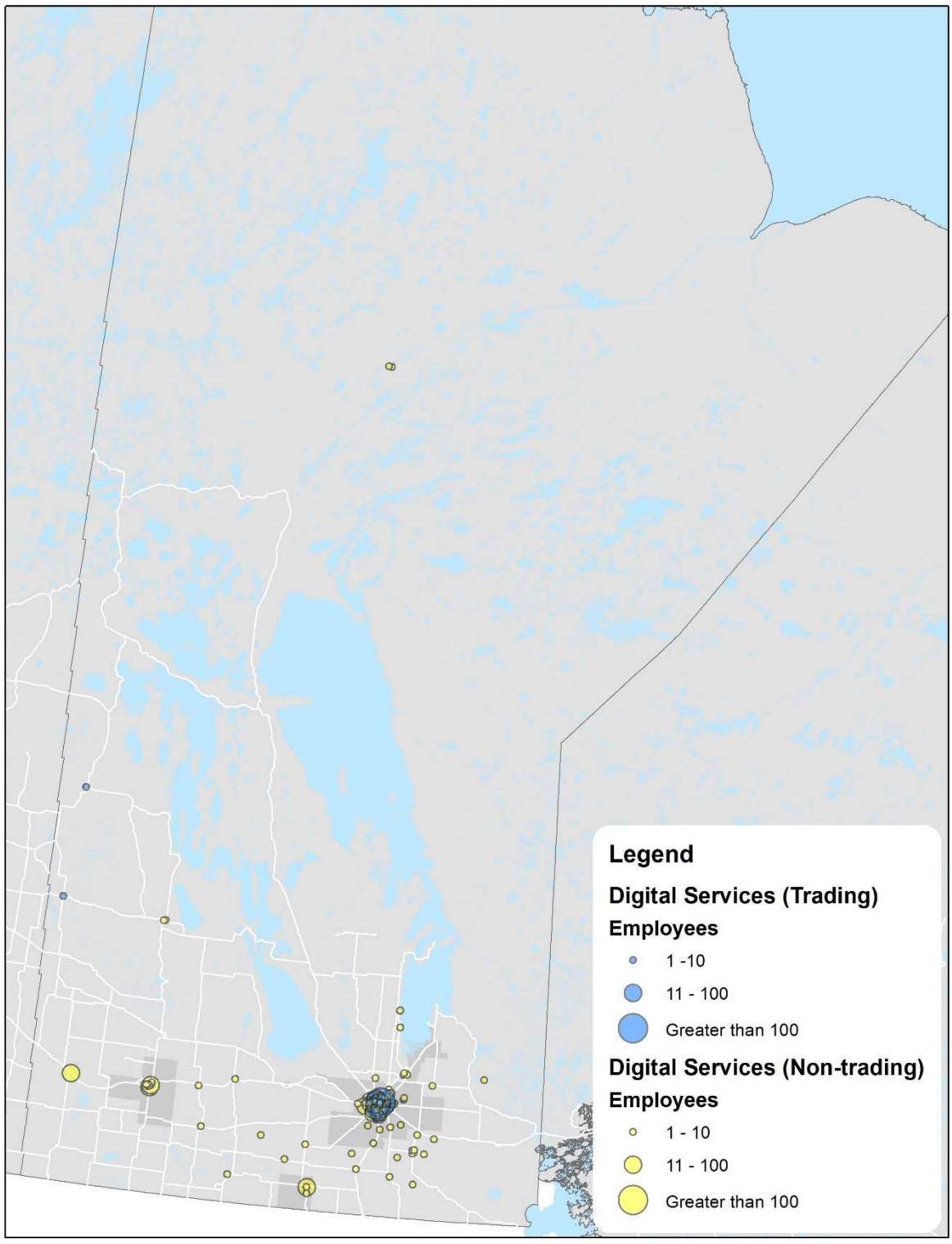
Figure B.6
Digital Services Business Locations in Manitoba, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.7
Furniture Business Locations in Manitoba, 2019

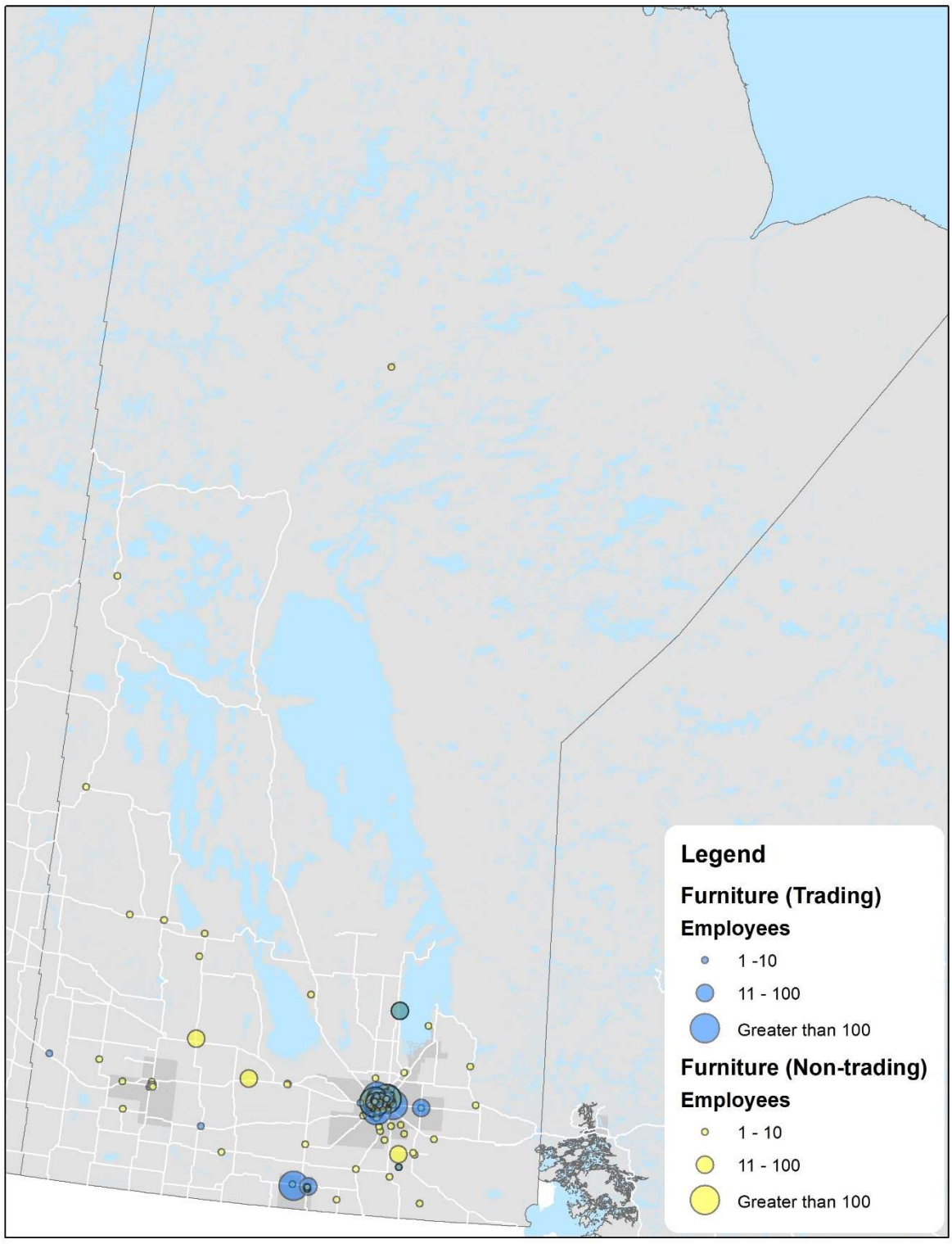


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Figure B.8
Insurance Business Locations in Manitoba, 2019

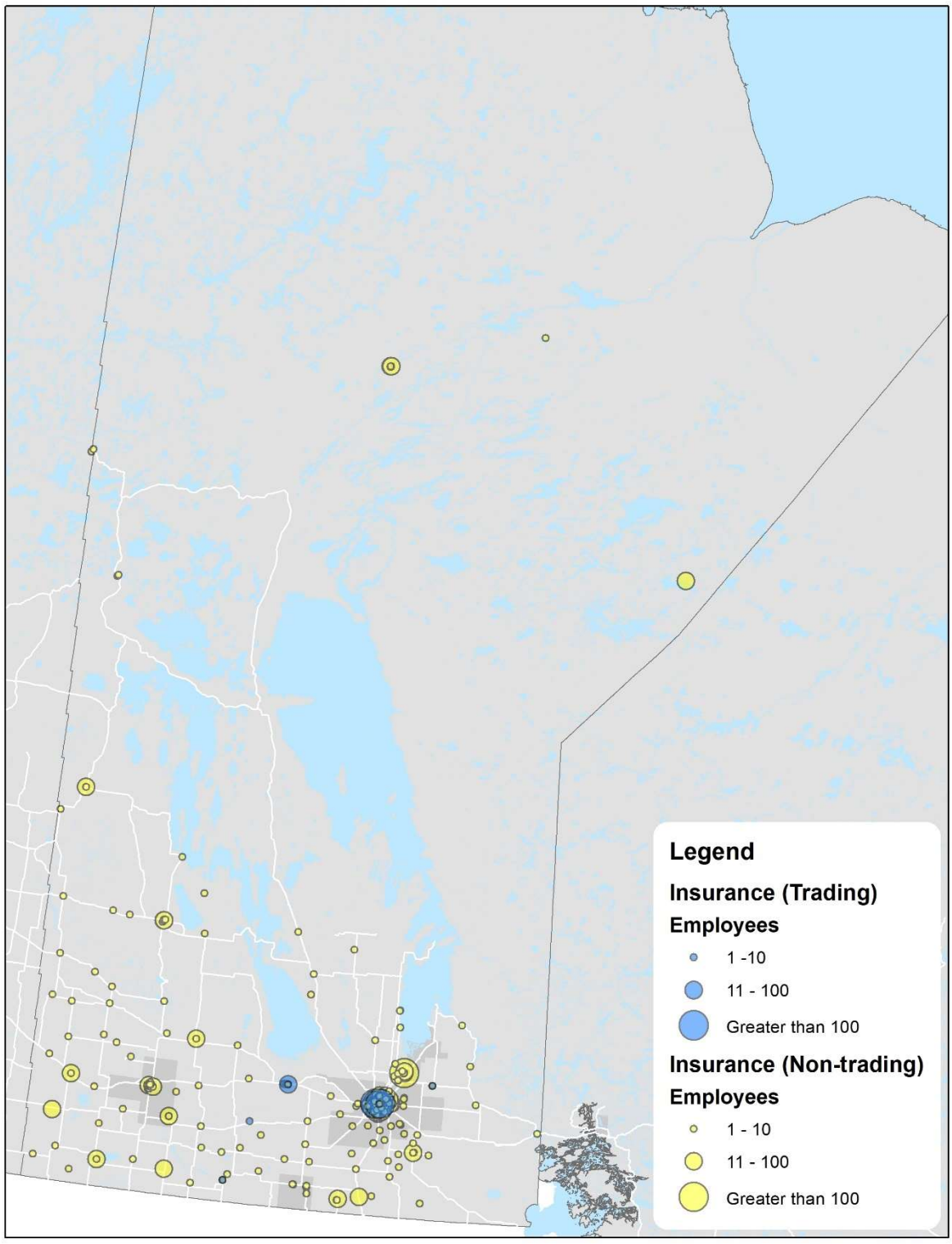

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Figure B.9
Life Sciences Business Locations in Manitoba, 2019

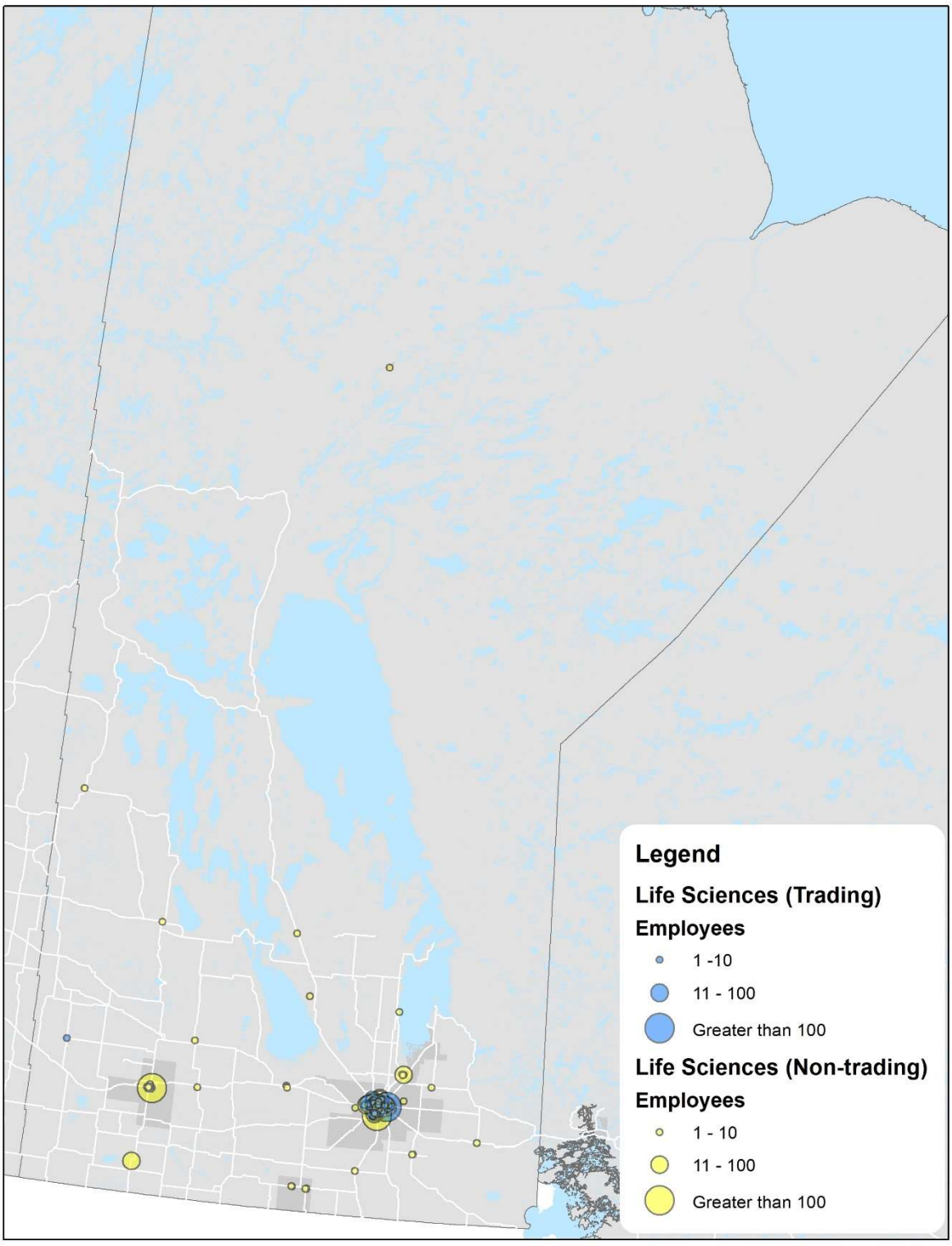

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Figure B.10
Mining & Metals Business Locations in Manitoba, 2019

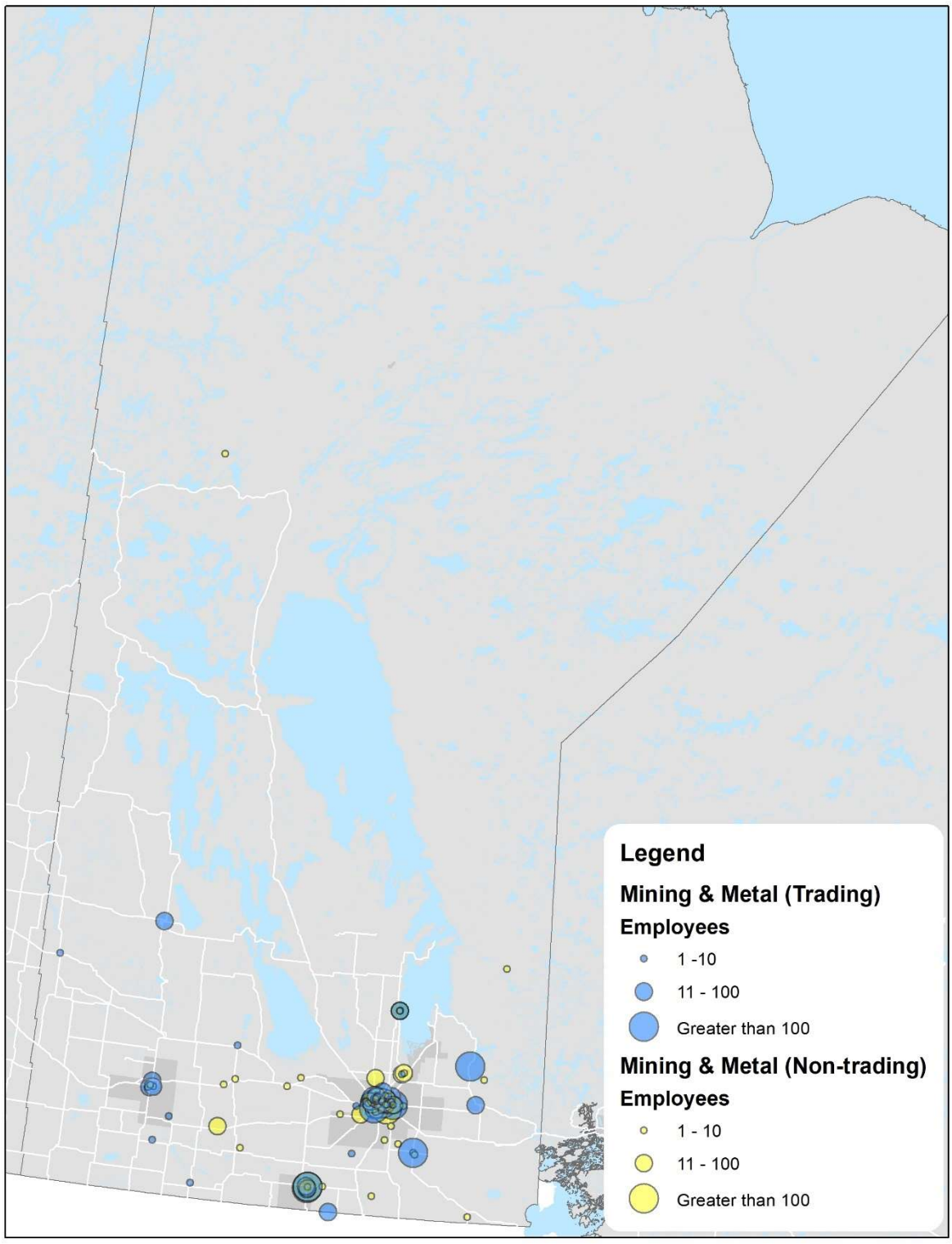

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Figure B.11
Plastics Business Locations in Manitoba, 2019

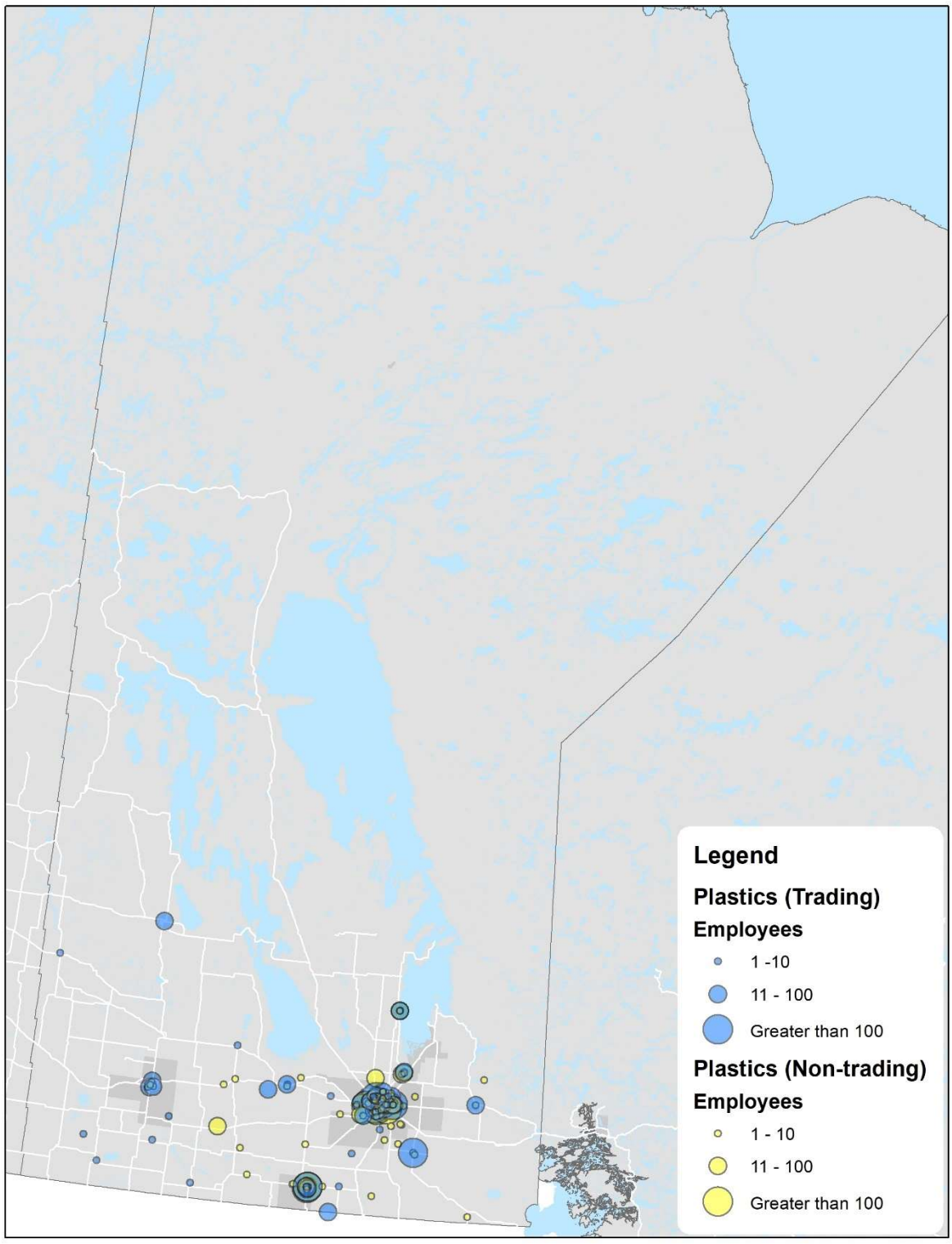

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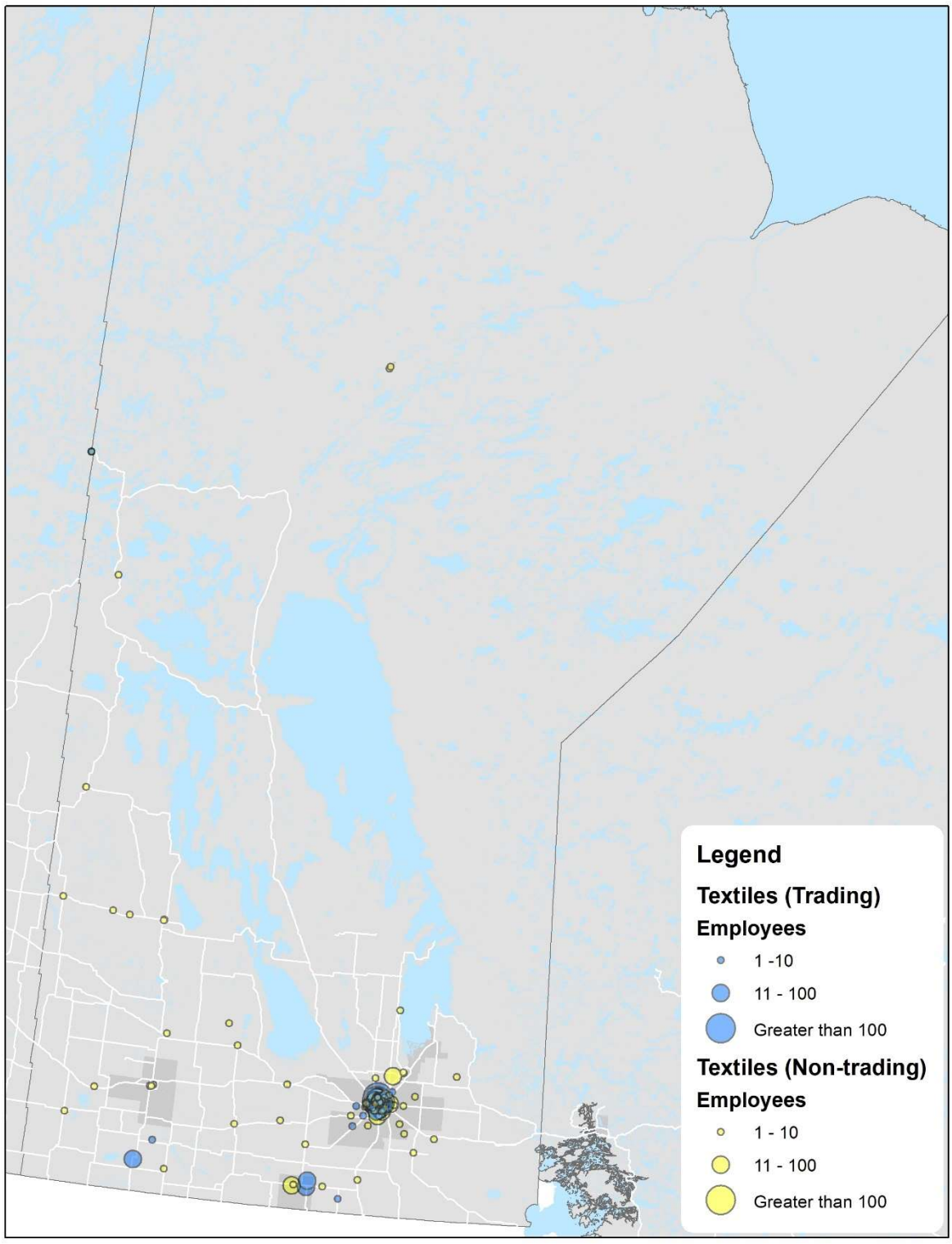
Figure B.12
Textiles Business Locations in Manitoba, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure B.13
Transportation & Logistics Business Locations in Manitoba, 2019

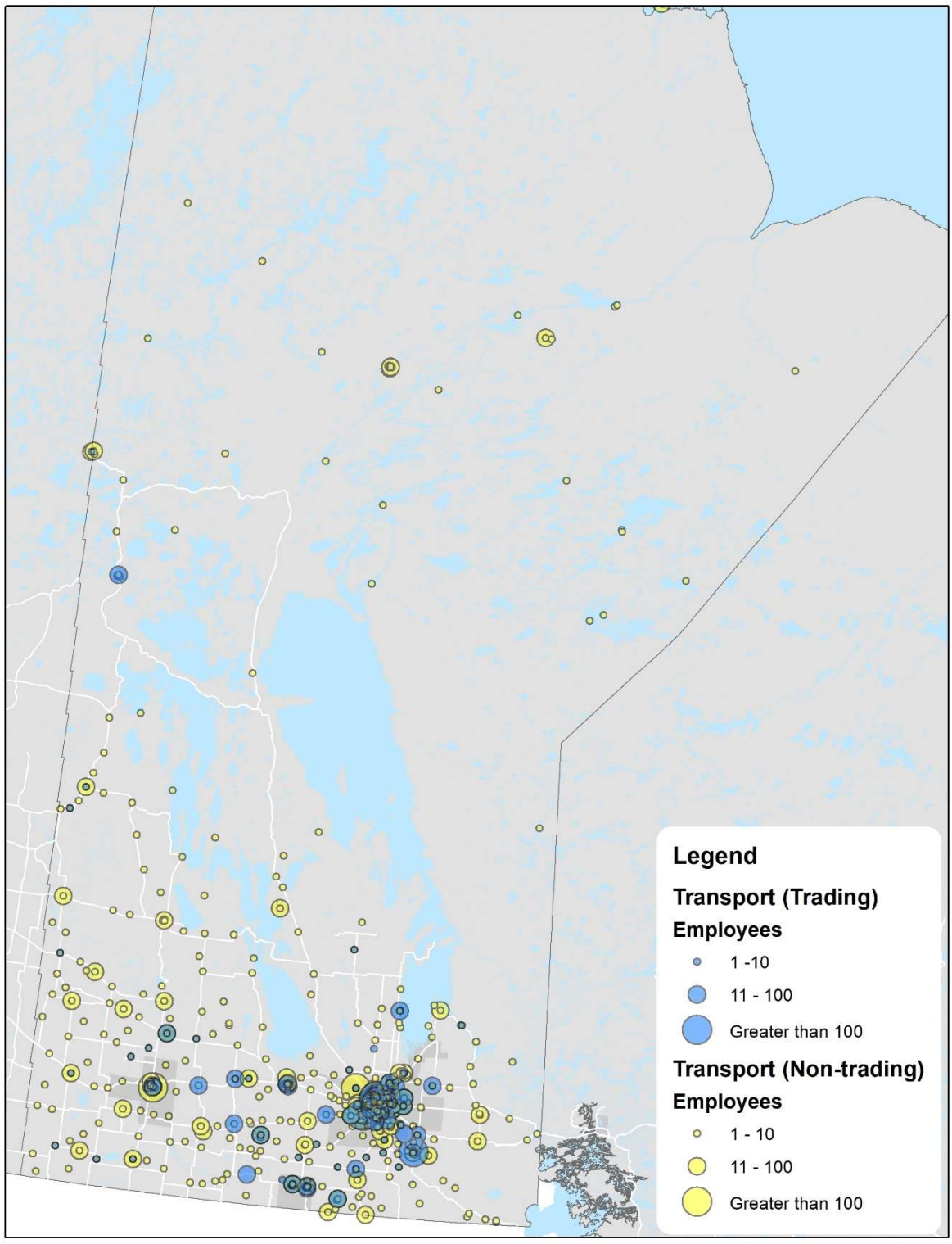


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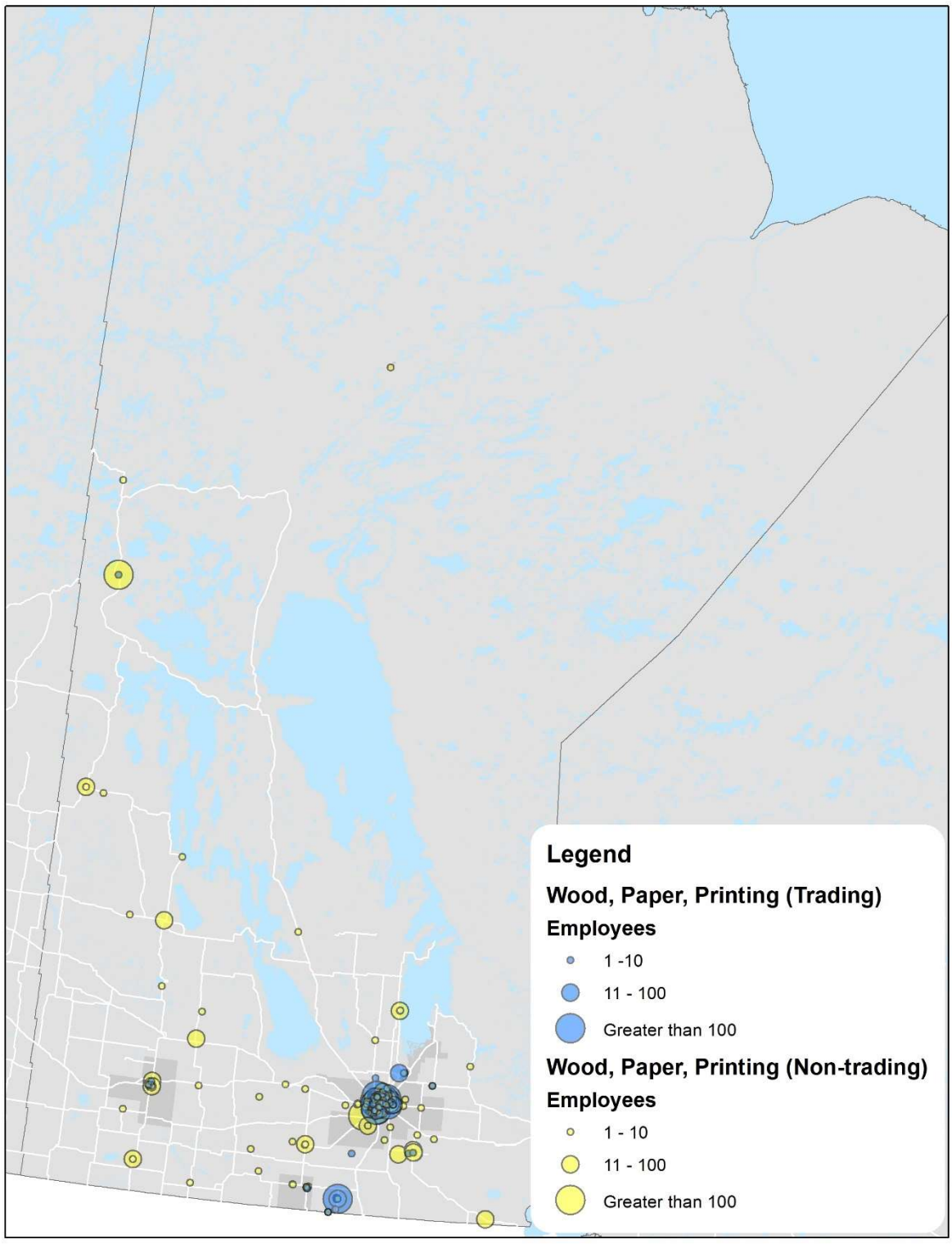
Figure B.14
Wood, Paper & Printing Business Locations in Manitoba, 2019



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APPENDIX C – WINNIPEG AREA CLUSTER MAPS

Figure C.1
Aerospace Business Locations in The Winnipeg Metro Area, 2019

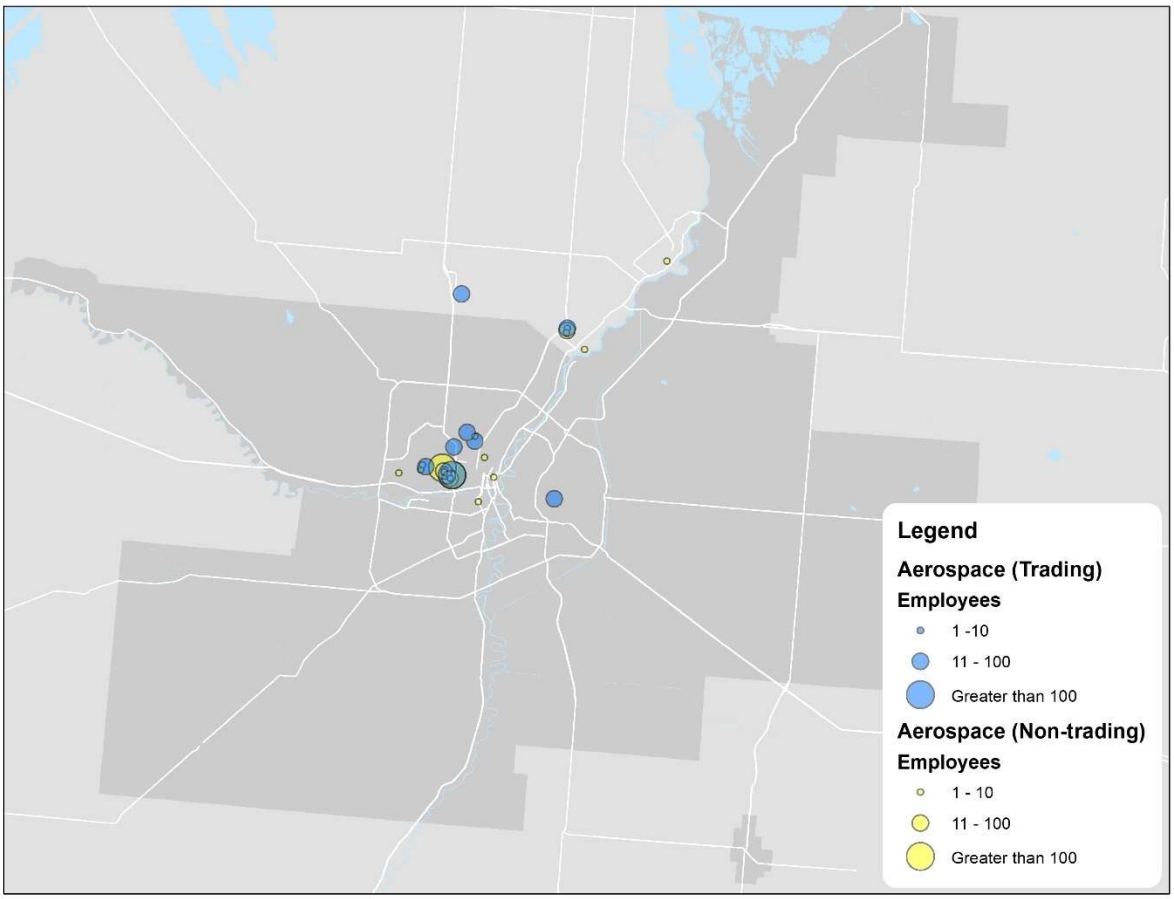

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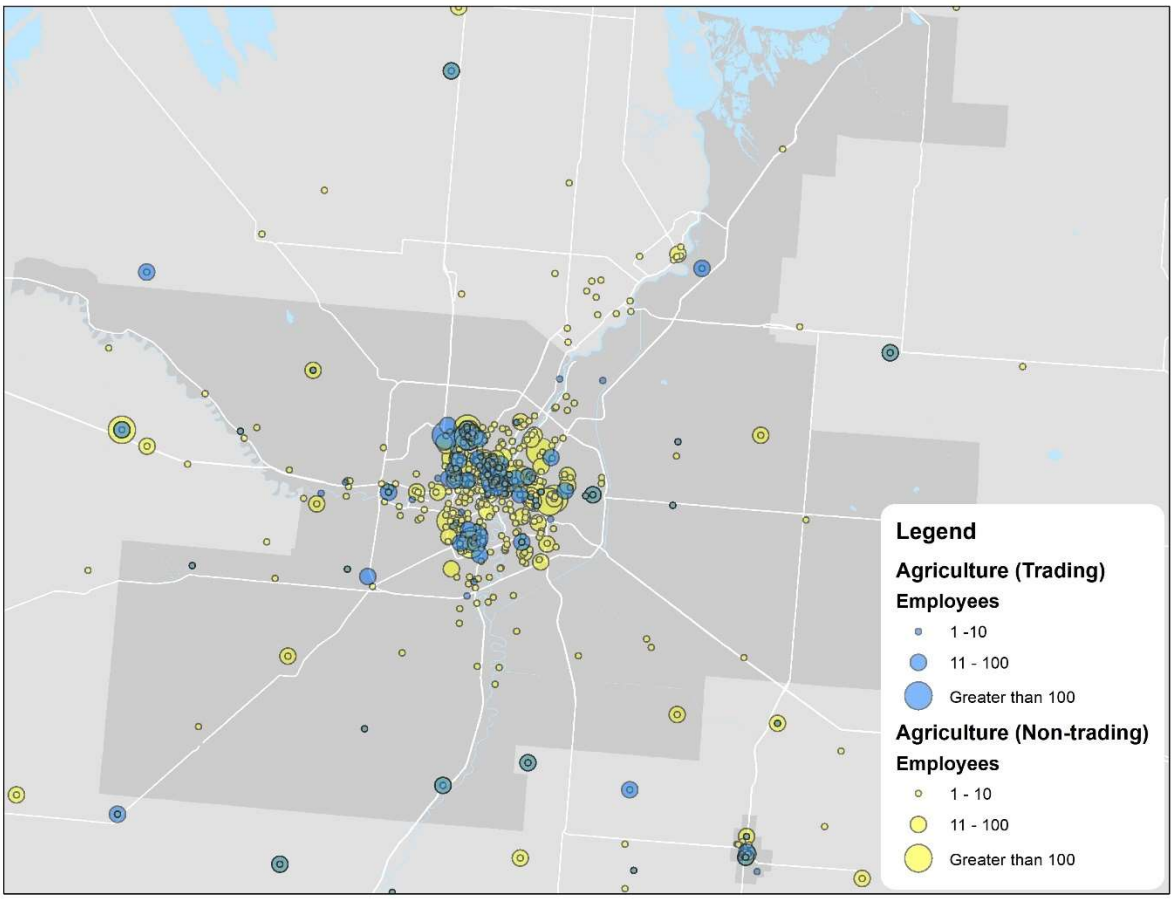
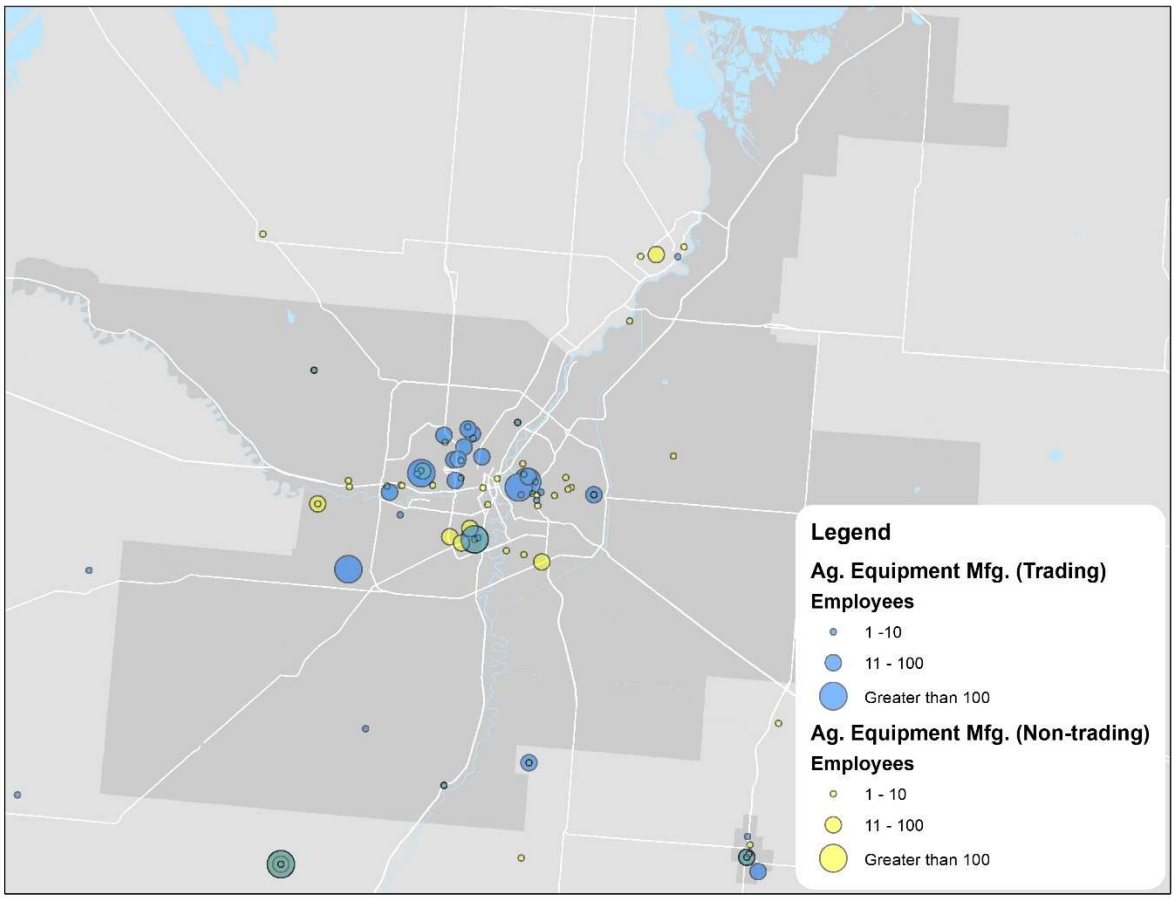
Figure C.2
Agriculture & Food Business Locations in The Winnipeg Metro Area, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.3

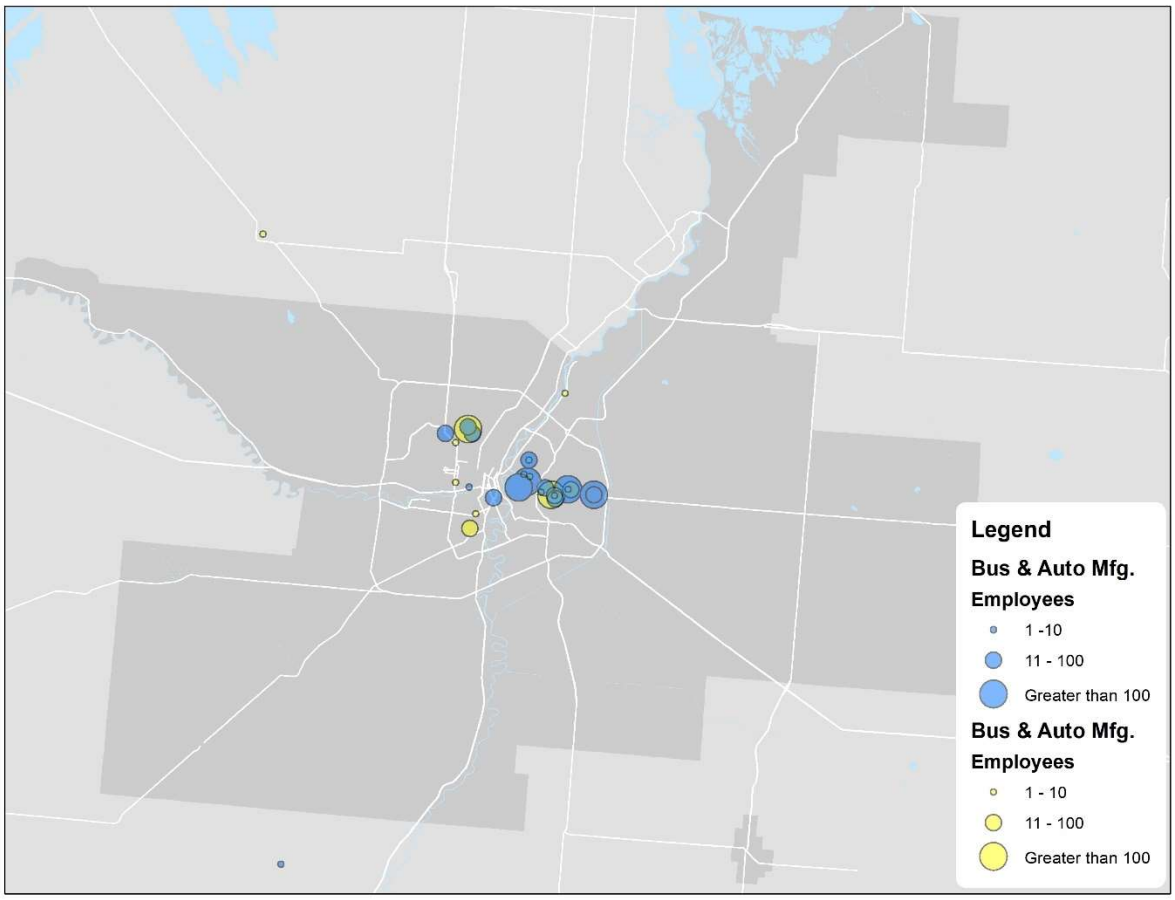
Agricultural Equipment Manufacturing Business Locations in The Winnipeg Metro Area, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

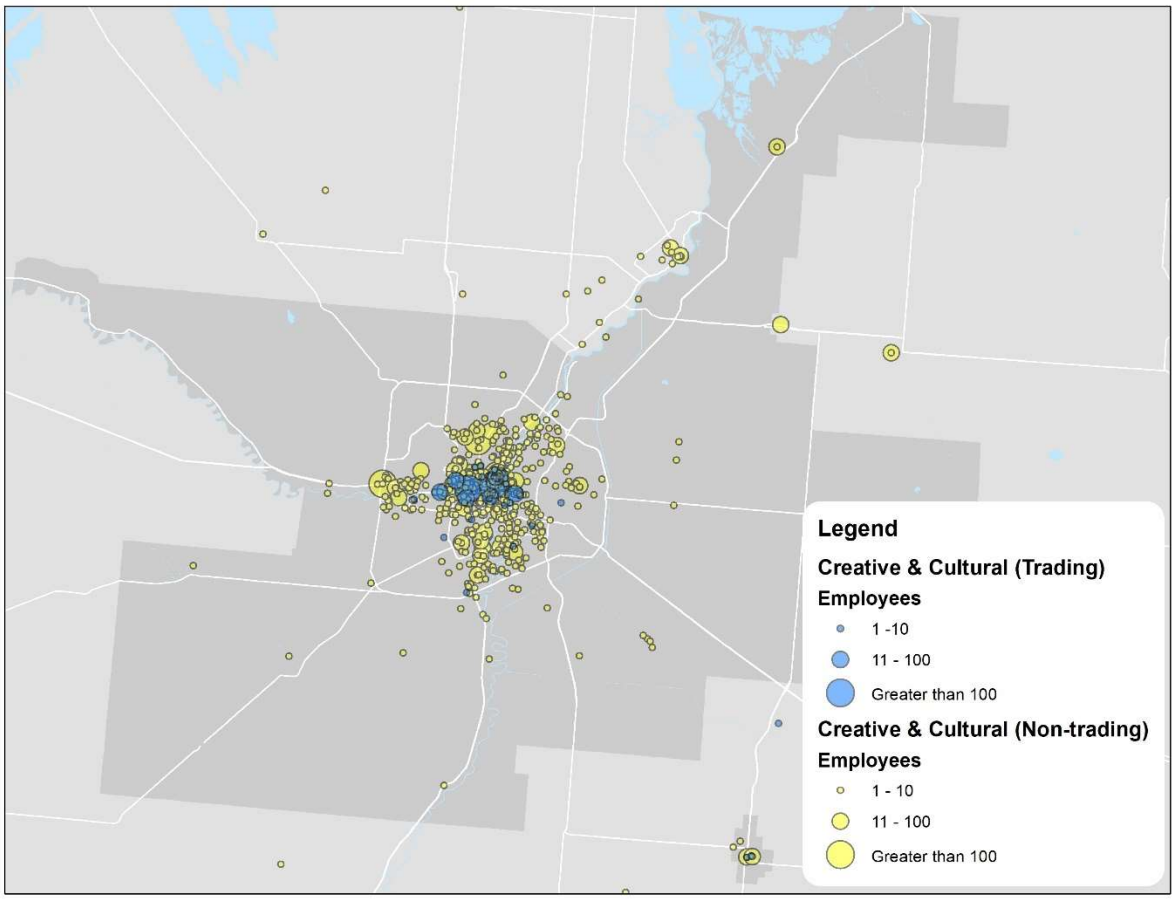
Figure C.4

Bus & Auto Manufacturing Business Locations in The Winnipeg Metro Area, 2019



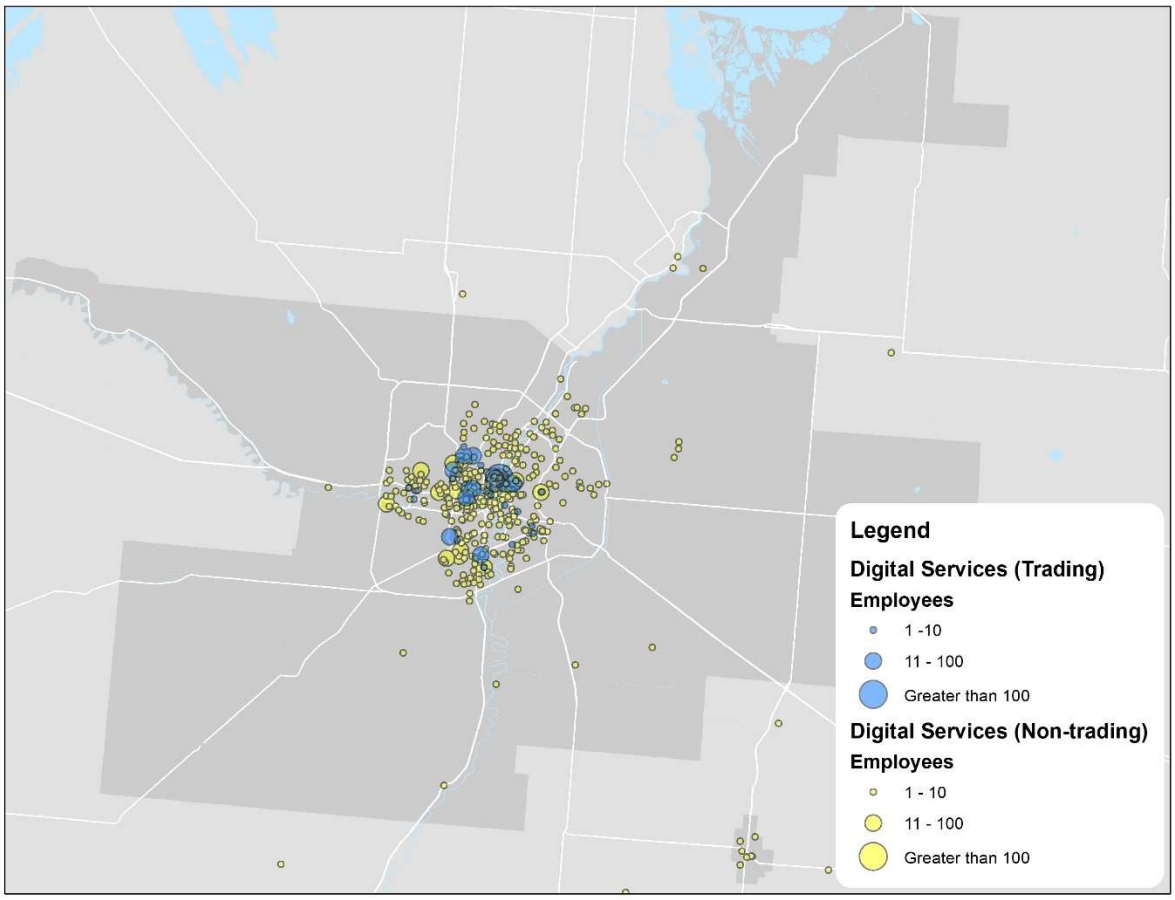
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.5
Creative & Cultural Business Locations in The Winnipeg Metro Area, 2019



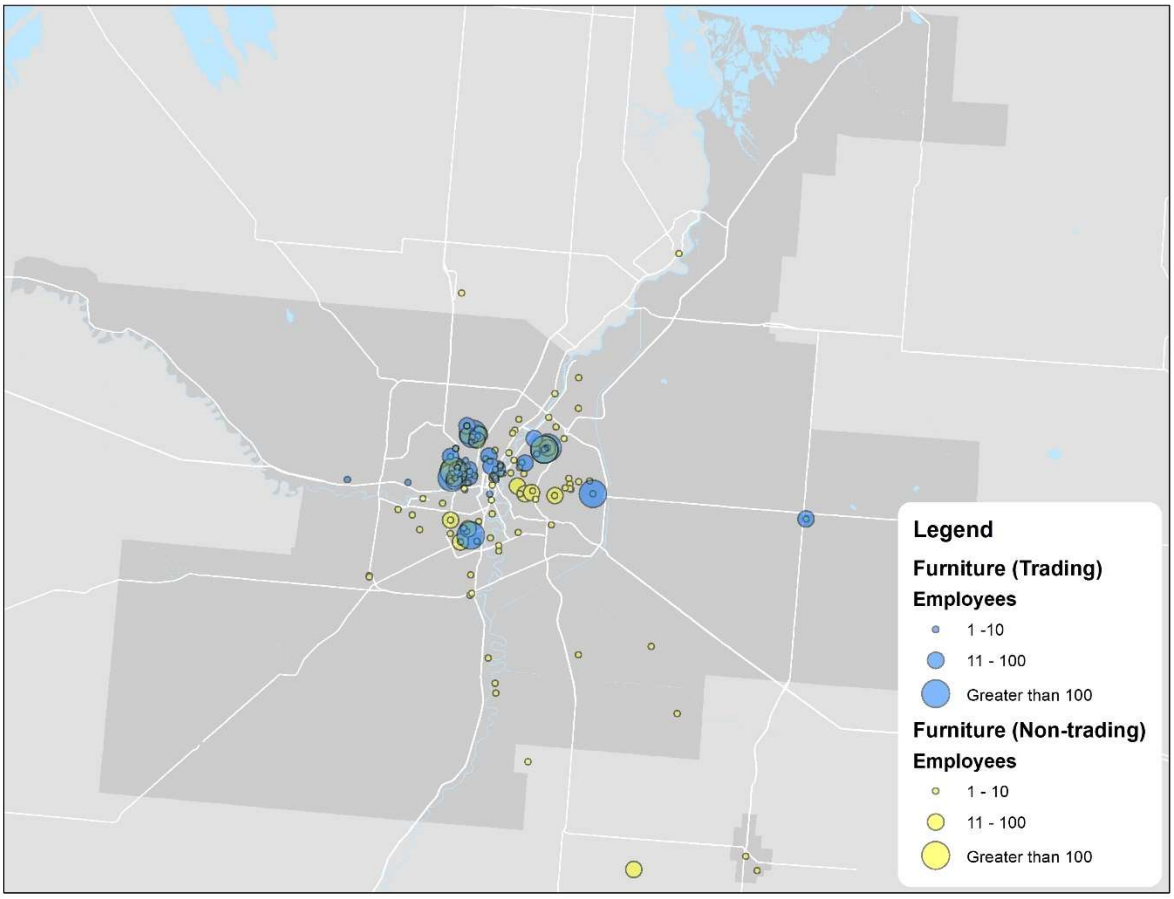
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.6
Digital Services Business Locations in The Winnipeg Metro Area, 2019



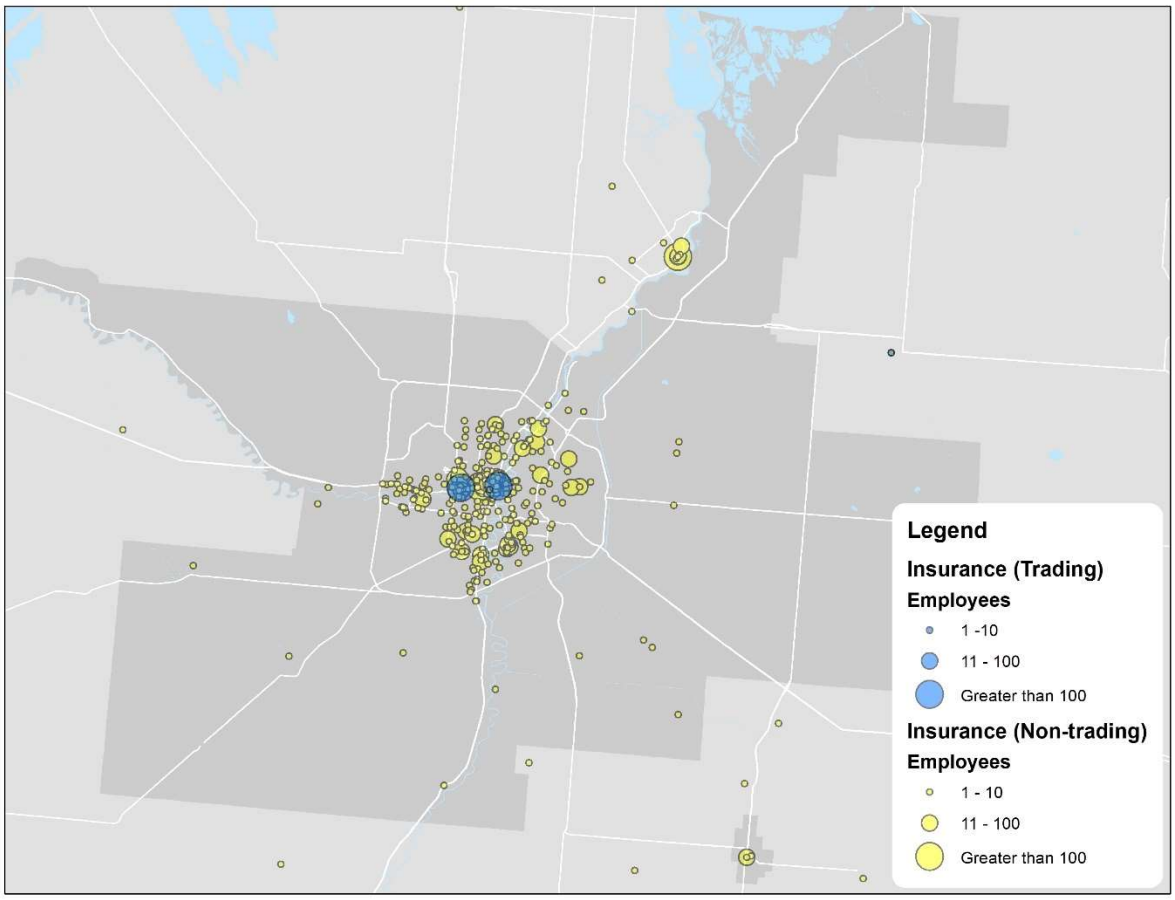
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.7
Furniture Business Locations in The Winnipeg Metro Area, 2019



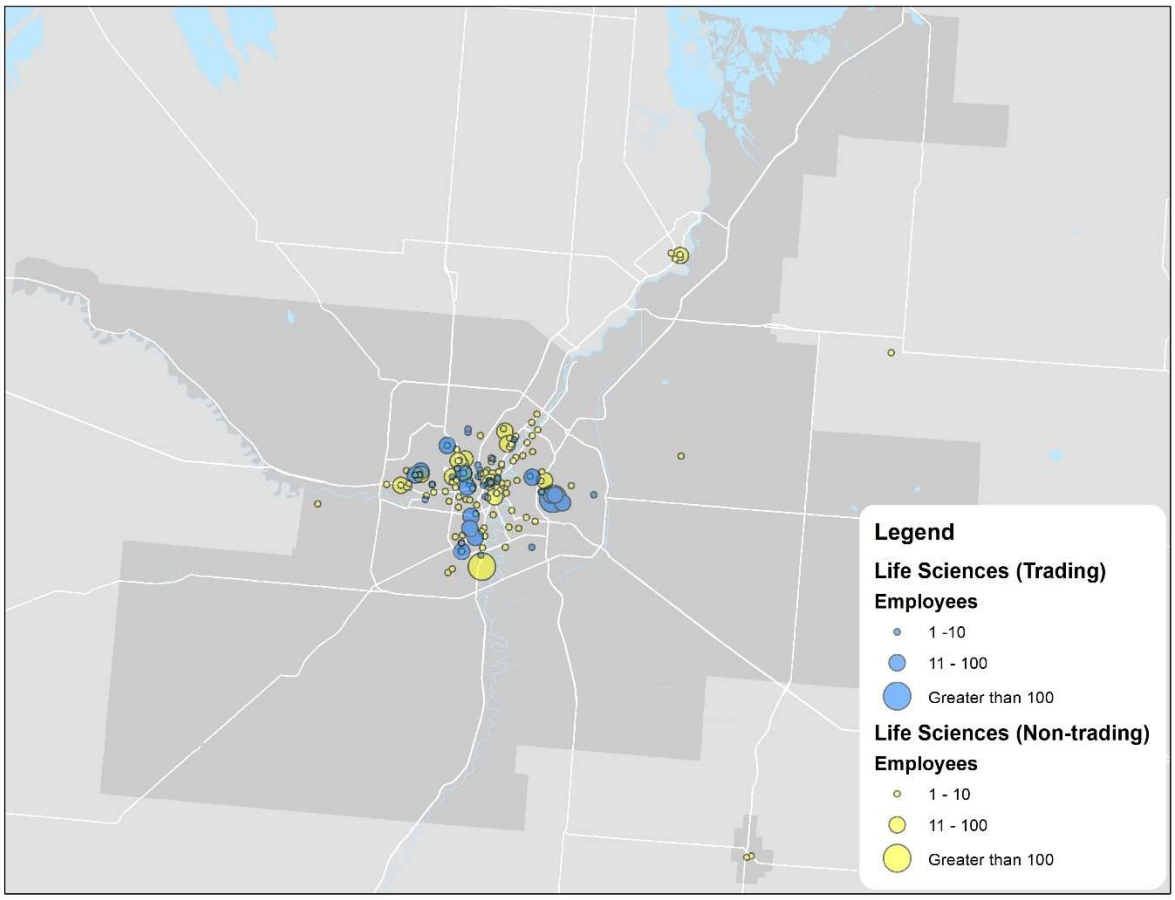
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.8
Insurance Business Locations in The Winnipeg Metro Area, 2019



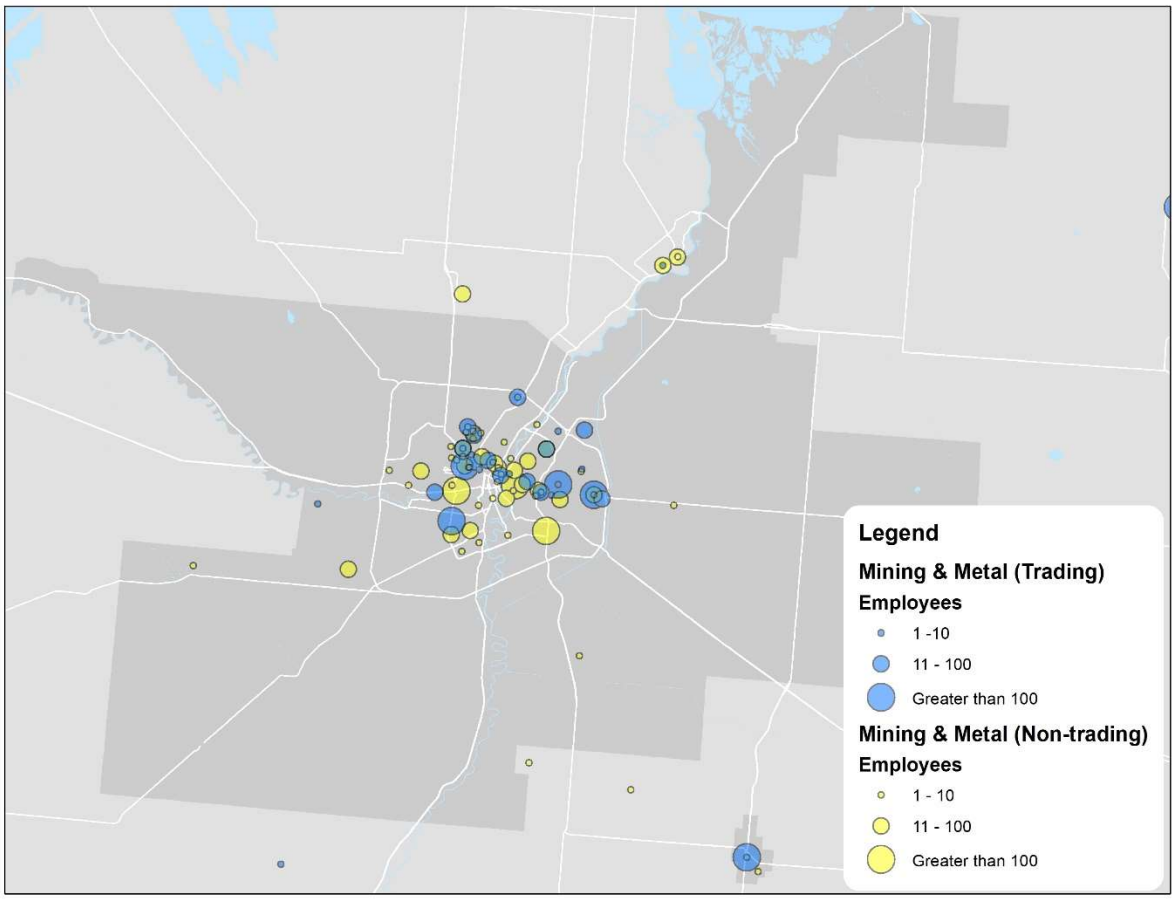
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.9
Life Sciences Business Locations in The Winnipeg Metro Area, 2019



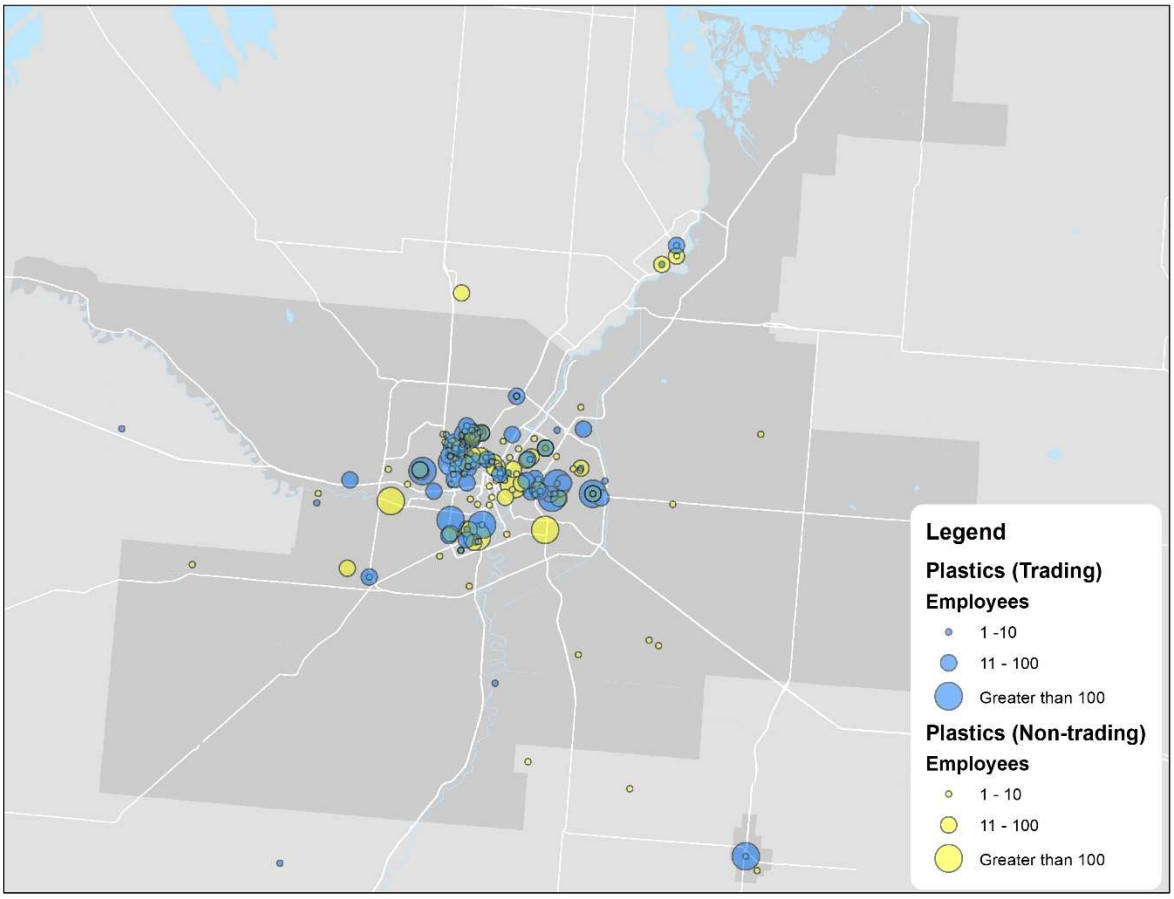
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.10
Mining & Metals Business Locations in The Winnipeg Metro Area, 2019



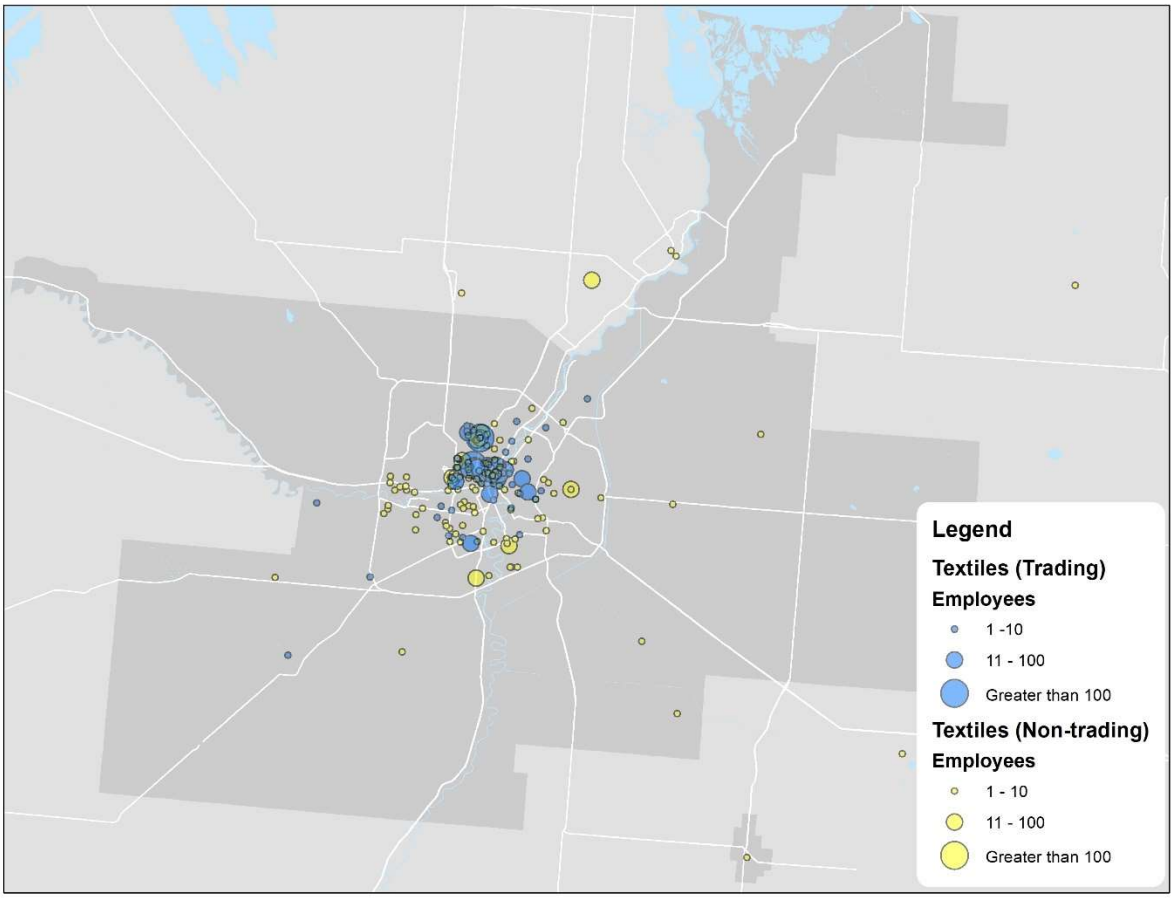
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.11
Plastics Business Locations in The Winnipeg Metro Area, 2019



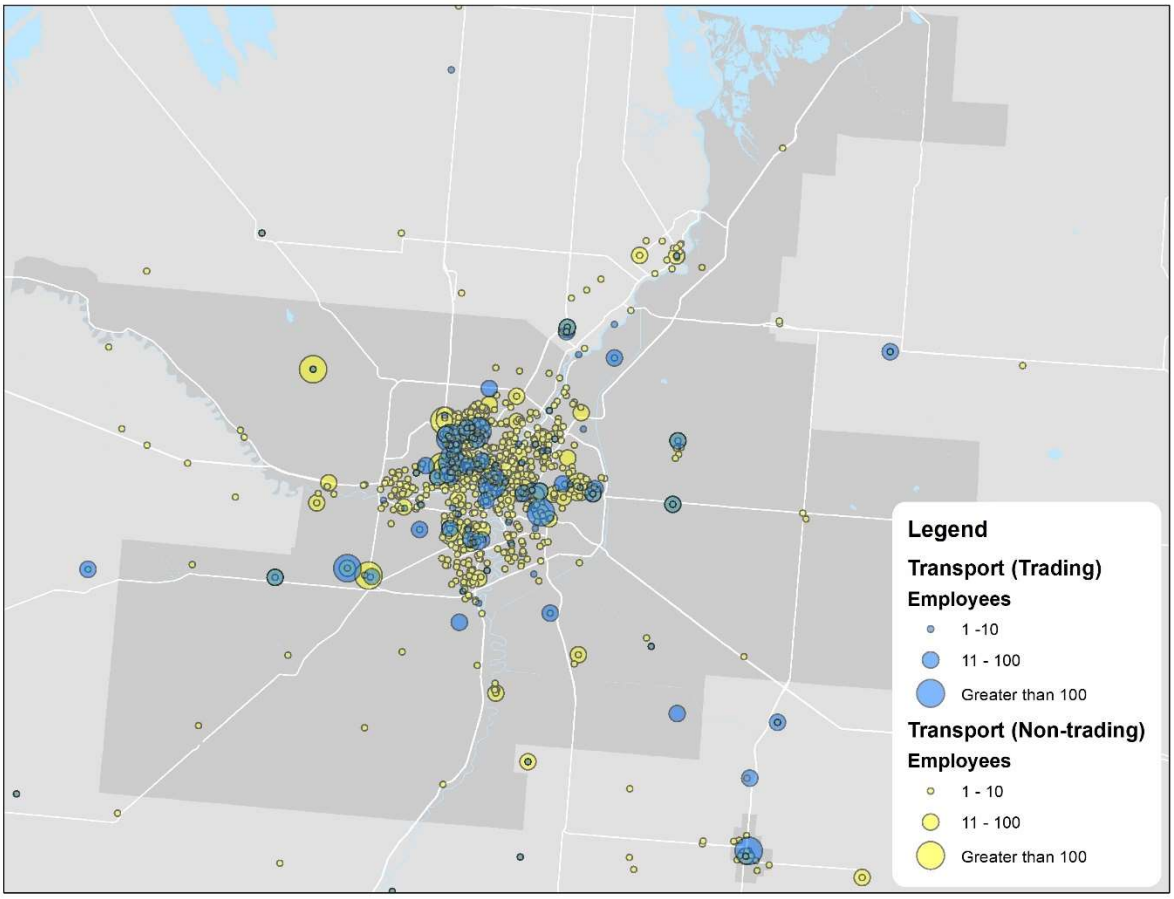
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.12
Textiles Business Locations in The Winnipeg Metro Area, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

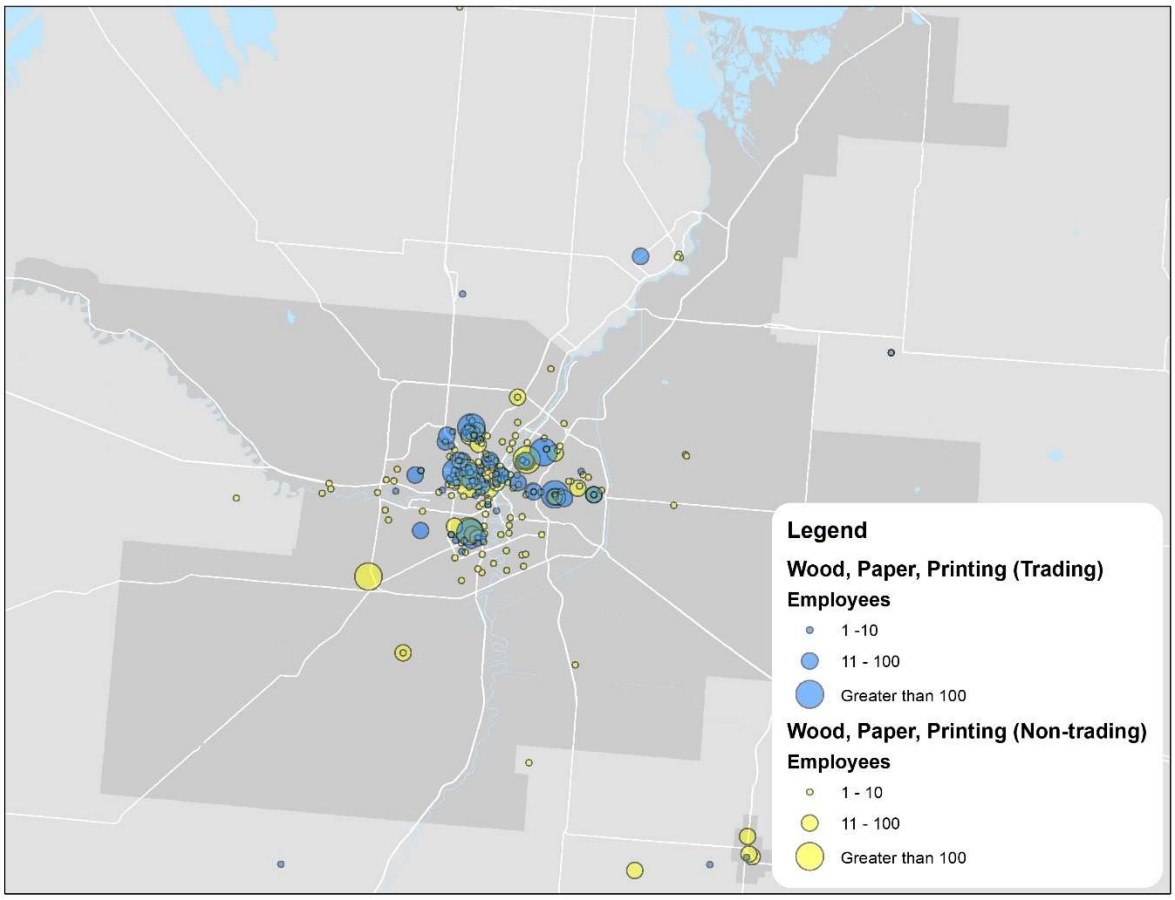
Figure C.13
Transportation & Logistics Business Locations in The Winnipeg Metro Area, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure C.14

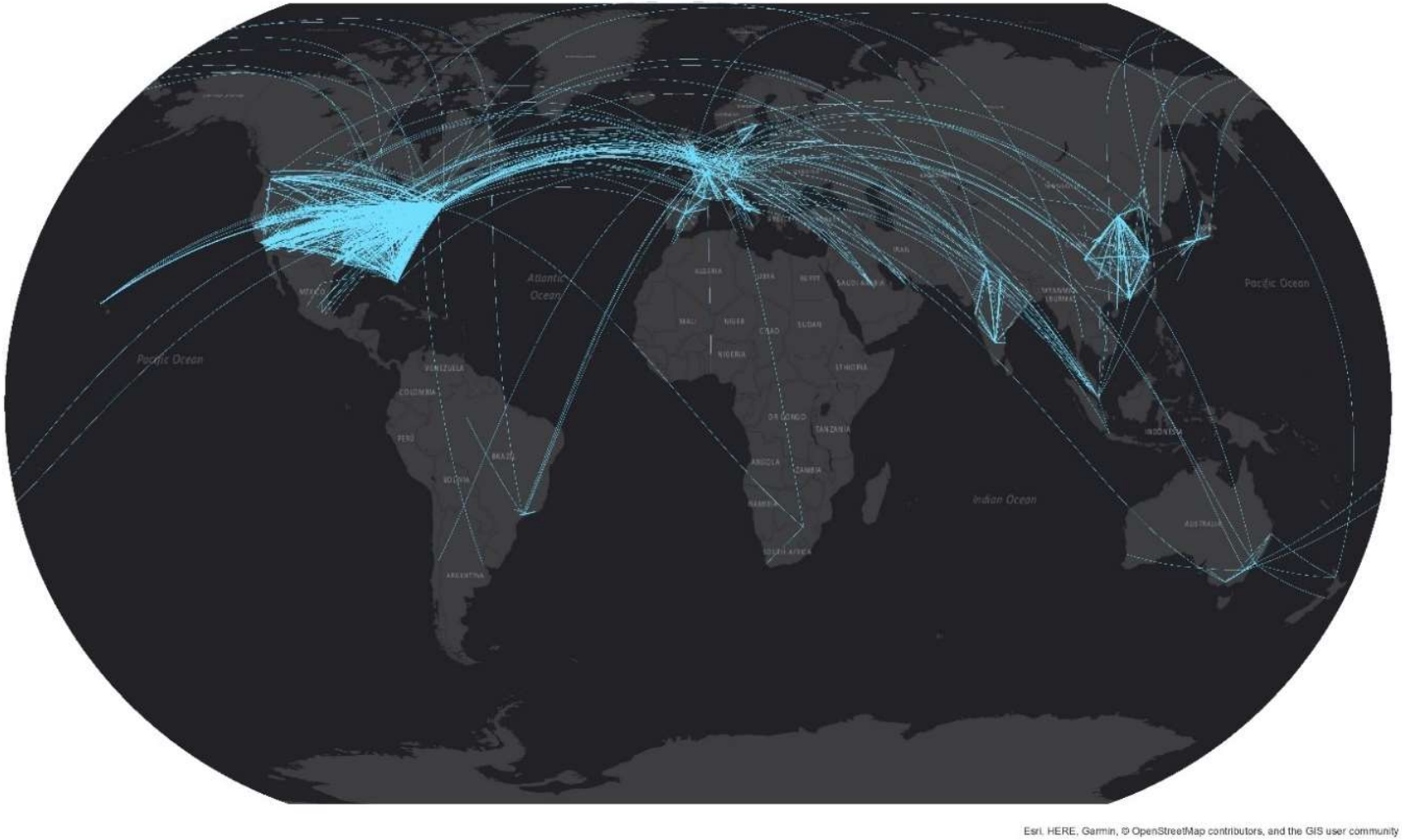
Wood, Paper & Printing Business Locations in The Winnipeg Metro Area, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

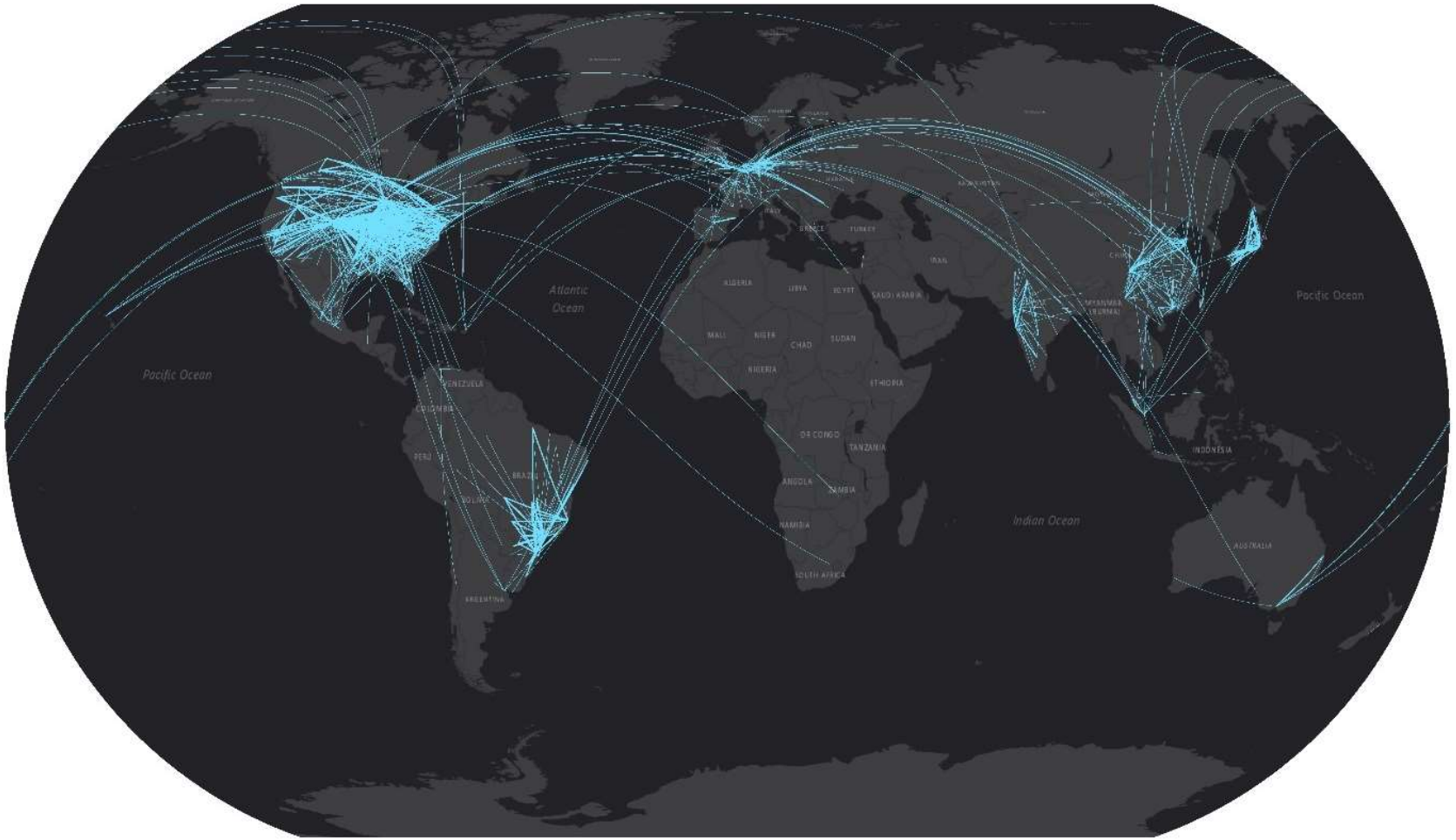
APPENDIX D - CLUSTER CONNECTIVITY MAPS

Figure D.1
Global Corporate Network of Leading Aerospace Companies, 2019



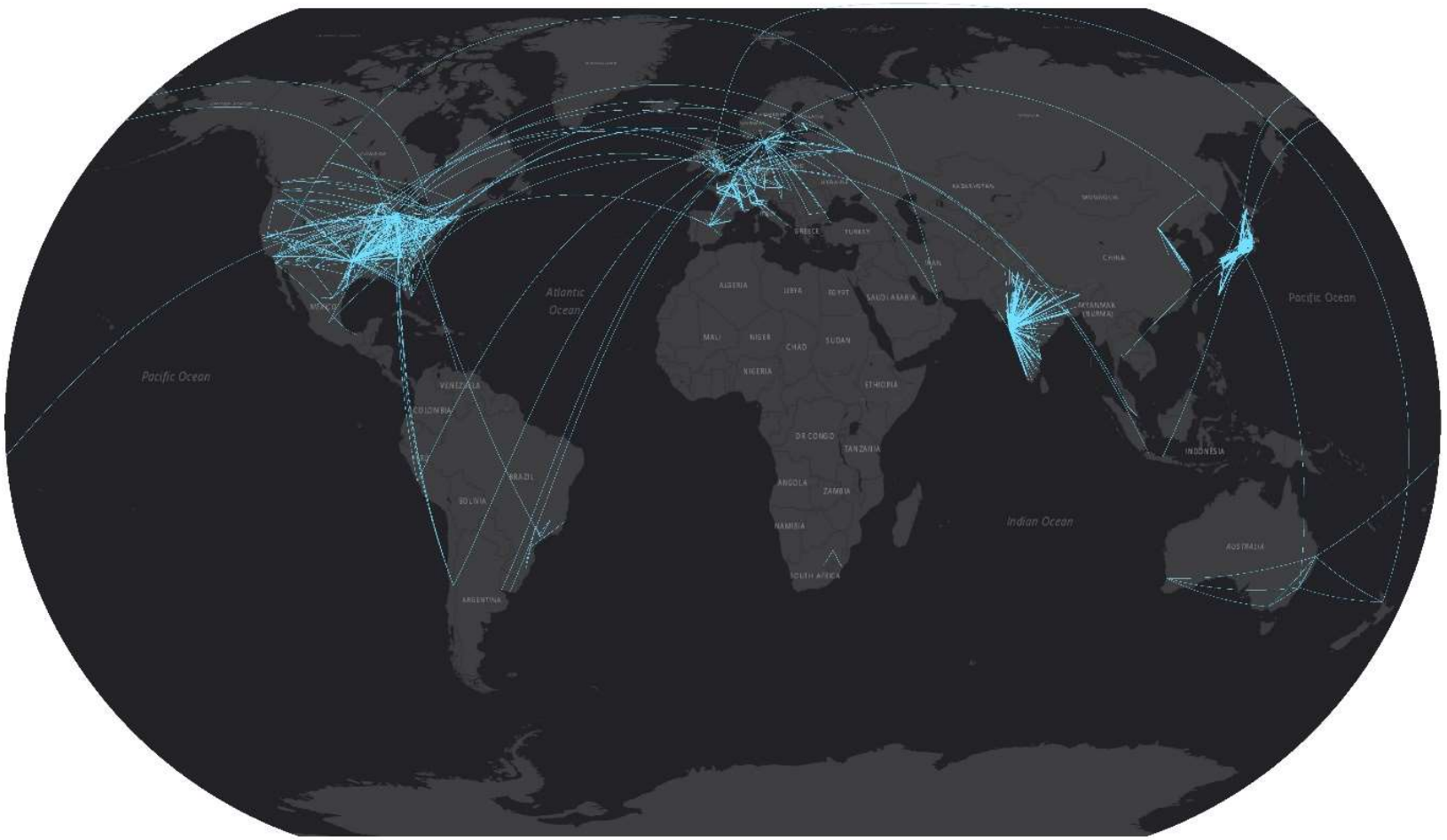
Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.2
Global Corporate Network of Leading Agriculture & Food Companies, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.3
Global Corporate Network of Leading Agricultural Equipment Manufacturing Companies, 2019

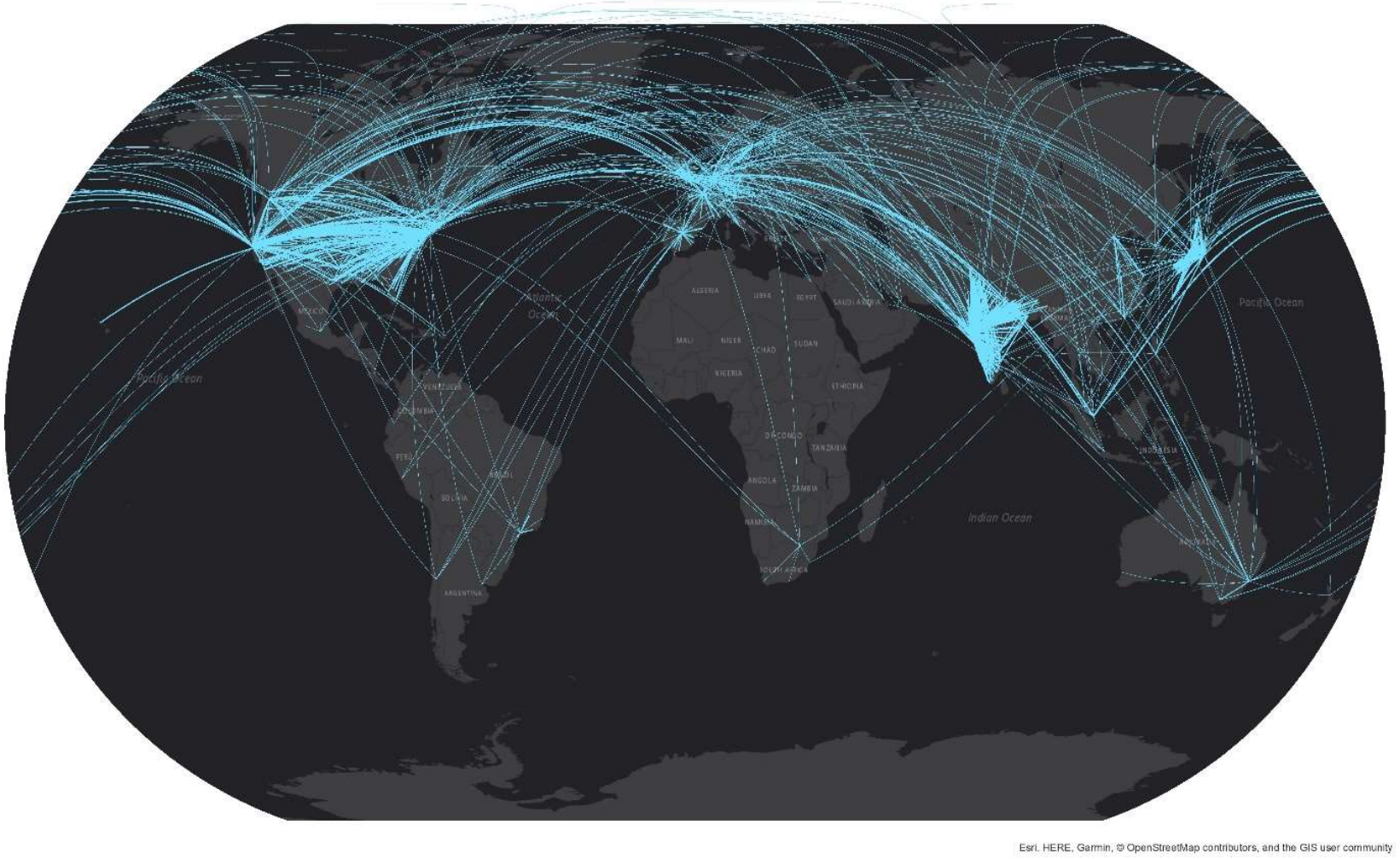


Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.4
Global Corporate Network of Leading Bus Manufacturing Companies, 2019

Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.5
Global Corporate Network of Leading Digital Services Companies, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

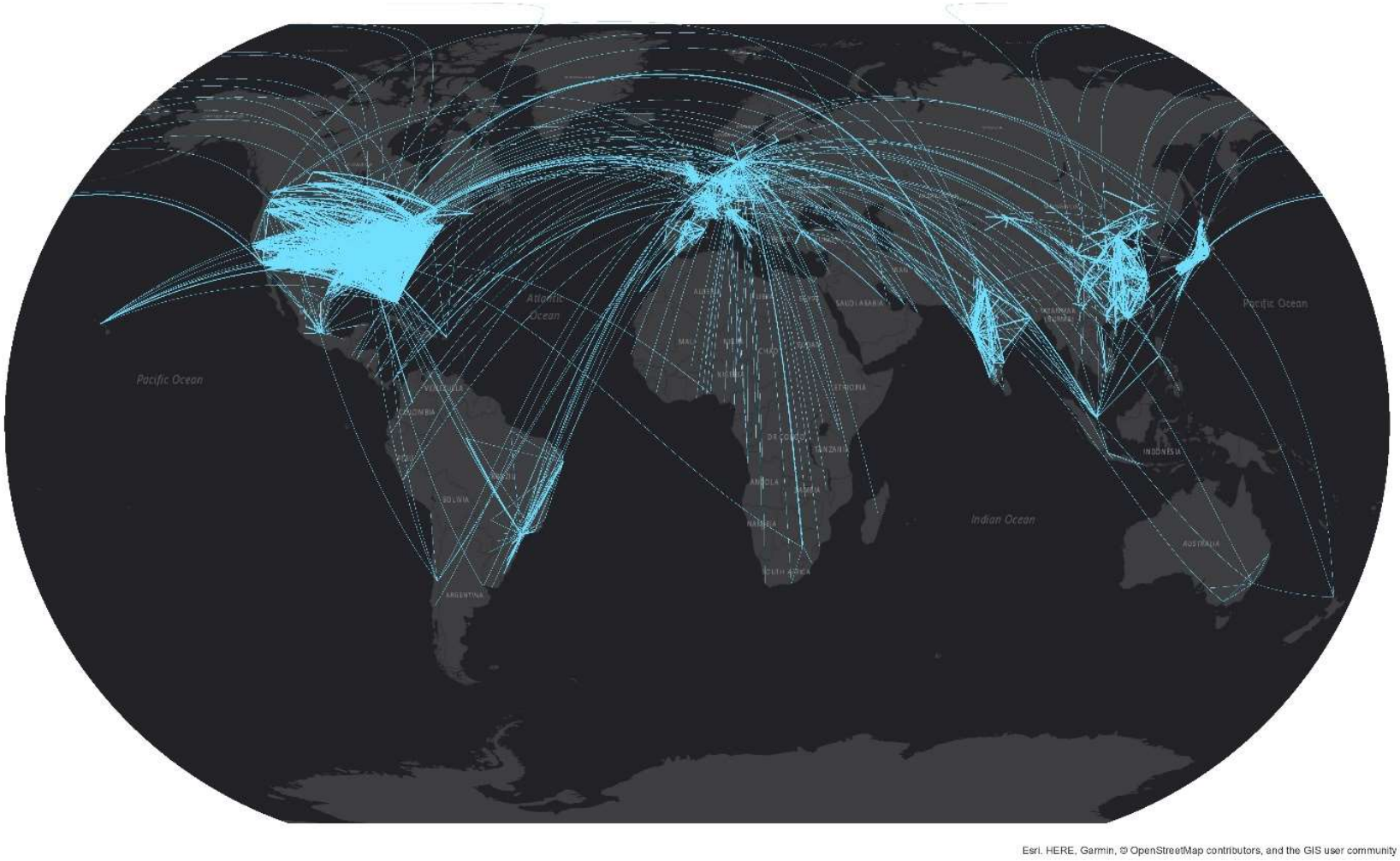
Figure D.6
Global Corporate Network of Leading Life Sciences Companies, 2019

Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.7
Global Corporate Network of Leading Mining Companies, 2019

Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

Figure D.8
Global Corporate Network of Leading Transportation & Logistics Companies, 2019



Source: D&B Hoovers Database Subscription. https://app.dnbhoovers.com/

APPENDIX E – TOP IMPORTERS OF MANITOBA'S TOP COMMODITY EXPORTS BY VALUE