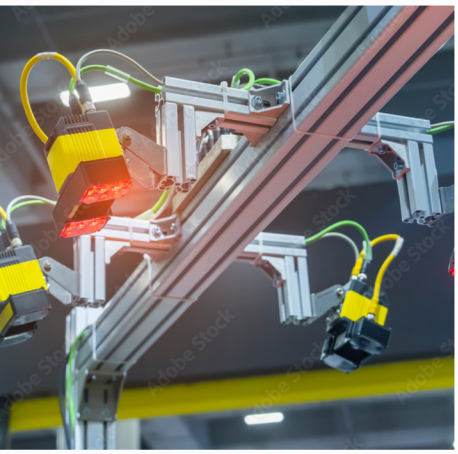
TRILLIUM @ 10

THE WAY FORWARD FOR ONTARIO'S MANUFACTURING SECTOR



TRILLIUM NETWORK
FOR ADVANCED MANUFACTURING

Executive Summary

TRILLIUM NETWORK FOR ADVANCED MANUFACTURING

The Trillium Network for Advanced Manufacturing was founded nearly ten years ago. At this time, Ontario's manufacturing sector faced headwinds, and was struggling to reinvent itself. Things have changed considerably over the past decade. Ontario's manufacturing sector has received record levels of capital investment. The province is home to a growing electric vehicle (EV) supply chain. There is renewed interest in the manufacturing sector across Ontario.

That said, challenges to competitiveness and prosperity persist. Some are similar to those faced ten years ago. Some are new. Suffice to say there is more work to do to ensure the long-term sustainability and competitiveness of Ontario's advanced manufacturing sector.

This report has three objectives:

1. Summarize the accomplishments of the Trillium Network for Advanced Manufacturing over the past decade;
2. Compare the state of manufacturing in Ontario today to its state ten years ago; and,
3. Contribute to conversations about an advanced manufacturing strategy for Ontario.

The first section of the report summarizes the accomplishments of the Trillium Network for Advanced Manufacturing. These include, but are not limited to:

- Establishing Ontario Global 100 (OG100) in collaboration with BDC;
- Creating TrilliumGIS, the organization's flagship manufacturing asset- and capability-mapping platform;
- An ongoing program of work in support of automotive industry transitions;
- Support for MEDJCT and other partners related to better understanding the protective personal equipment (PPE) manufacturing industry during the COVID-19 pandemic;
- A series of reports focused on the manufacturing workforce, with an emphasis on promoting gender diversity; and
- Raising awareness of exciting Ontario manufacturers and manufacturing-related initiatives on our official podcast 'Making it in Ontario'.

The second section examines the state of manufacturing in Ontario today to its state ten years ago. It highlights a number of successes, such as employment growth and capital investment. It also highlights several concerning trends, such as stagnant productivity, a decreasing number of 'good' jobs, and a decline in manufacturing's contributions to GDP relative to other parts of Ontario's economy. Much of this is due to structural changes, including the growth of relatively low-value industries (e.g. food) vis-a-vis higher-value industries (e.g. vehicle assembly, aerospace, primary metal, pharmaceuticals). It concludes that having a well-conceived strategy to guide Ontario's manufacturing sector is more important than ever.

The third section makes strategic recommendations. These are meant to contribute to ongoing efforts by MEDJCT and other partners to develop and advance an advanced manufacturing strategy for Ontario. In general, our recommendations suggest value in an approach that favours quality over quantity, that seeks more investment and growth in higher-value industries, and that seeks to transform lower-value industries into higher-value industries. Our recommendations focus on three subject areas: investment incentives, talent and workforce, and automation and technology.

Ontario's general approach to manufacturing investment incentives was developed in the mid-2000s. This approach emphasized securing manufacturing 'footprint' and employment, rather than growth and transformation. We recommend updating this approach by:

- Creating more targeted and aggressive incentives for new 'greenfield' investments in higher value-added industries;
- Recalibrating incentives for incumbent manufacturers; and,
- Shifting the focus from maintaining and creating jobs as the primary metric to creating value (e.g. productivity growth, increased contributions to GDP, greater proportion of 'good' jobs).

Ontario's highly educated workforce is a source of competitive advantage. However, manufacturers consistently face challenges in attracting and retaining key personnel. We recommend:

- Expanding partnerships between manufacturing industry stakeholders and Ontario universities beyond engineering faculties;
- Developing a manufacturing-specific skilled trades strategy led by Ontario colleges; and,
- Placing more emphasis on creating desirable and high-paying jobs that inspire a new generation of talent to choose a career in advanced manufacturing.

Investing in automation and tooling technologies is a necessary component of a forward-looking advanced manufacturing strategy. It is also closely related to a modernized approach to investment incentives and workforce development. We recommend:

- Tying (certain) investment incentives to the adoption of novel and innovative (and preferably Ontario-made) automation and tooling technologies;
- Treating automation and tooling technology as its own industry, and supporting that industry so that it can develop the next generation of technologies for use in automotive and non-automotive industries; and
- Promoting Ontario-made automation and tooling technologies and homegrown 'champion' automation and tooling technology companies.

The report illustrates the unique and innovative approach espoused by the Trillium Network for Advanced Manufacturing. The Trillium Network's approach is informed as much by what we are–a university-based non-profit organization–as it is by what we are not. We are not an industry association, a government agency, or a for-profit consultancy. As such, our analysis is data-driven and objective. We look forward to supporting the growth and competitiveness of Ontario's advanced manufacturing ecosystem for the next ten years.

TABLE OF CONTENTS

FOREWORD

The Trillium Network was founded a decade ago. It was established to ensure industry stakeholders understood the important role of manufacturing in the province. Its core work was intended to support the growth and competitiveness of manufacturing in Ontario. Much of this work has been carried out in collaboration with a diverse network of ecosystem partners.

At that time, Ontario's manufacturing sector was struggling in the wake of the Great Recession of 2008-2009 and an environment that was generally perceived to be unfavourable for growth and competitiveness relative to the United States and Mexico. This had much to do with a policy environment that largely ignored the importance of manufacturing to the province's economy and overall prosperity.

While Ontario's manufacturing sector certainly faced headwinds, it was by no means–and contrary to the opinion of some–dead in the water. Manufacturing continues to be a major contributor to Ontario's GDP (second only to real estate), employment (second only to healthcare and social services), business R&D spending (in most years more than 40 per cent of all business R&D spending), and capital expenditures ($15.9 billion in 2024, or 14 per cent of total capital expenditures in Ontario).

This report has three objectives. The first is to provide more detail about the accomplishments of the Trillium Network over the past decade. Many of these accomplishments were achieved in collaboration with a diverse group of ecosystem partners. The second objective is to analyze the performance of Ontario's manufacturing sector since 2014. It does so by focusing on several key metrics related to GDP, employment, and productivity. In so doing, it demonstrates that while narratives related to manufacturing have changed considerably, the sector's performance has been decidedly mixed. This reminds us about how much work is left to do, and why it is important to have a strategy to support the long-term growth and competitiveness of manufacturing in Ontario. The third objective draws upon our work over the past decade to propose several key elements of a provincial manufacturing strategy. These include recalibrated approaches to investment incentives, a workforce and talent strategy, and a more refined approach to automation and technology. Much of this section expands on the sterling work done recently by the Ontario Advanced Manufacturing Strategy Council.

Parts of this report are meant to be provocative. Some of the findings, despite being objectively sound, may be unpopular in some circles. Certain information and analysis in this report challenge established (and often outdated) narratives about Ontario's manufacturing sector. This is done because, as our research and analysis lead us to believe, a new, innovative, and performance-driven approach is needed to ensure the long-term competitiveness and prosperity of manufacturing in Ontario.

Underpinning this approach is a comprehensive strategy that is both well-intentioned and focused on meaningful and measurable objectives. It should not simply be a compendium of zero-sum asks from stakeholders or lobbying groups. The strategy should help guide and incentivize the actions of stakeholders, not the other way around.

Bold strategies have shaped the manufacturing sector in Canada since 1879. At the federal level, the National Policy, the Auto Pact, and integration with the United States and other trading partners through trade agreements were integral in determining the trajectory of the manufacturing sector in Canada. At the provincial level, the nationalization of the electricity sector in Quebec in the 1960s stands up as the greatest example of a strategy that ultimately shaped a province's economy, and its manufacturing sector, for decades to come. The latter, a Herculean effort if there ever was one, is evidence of the sheer scale of the strategic initiatives that are ultimately required to re-shape the economy of a province over the long-term.

The eventual strategy must recognize that Ontario is an affluent jurisdiction. Given that this is the case, the strategy should aim to build and augment a manufacturing sector that is well-equipped to absorb the costs associated with doing business in an affluent jurisdiction. It should not simply seek to reduce the costs of doing business, especially in an environment where governments are necessarily asked to incentivize manufacturing investments.

The strategy must have its foundation in objective, data-driven, and unbiased analysis. As such, the Trillium Network is in a unique position to support this strategy. This is as much about what we are–a non-profit organization based at a university–as what we are not. We are not an industry association. We are not a government agency. Nor are we a consulting firm with a profit motivation.

The strategy must focus on supporting particular elements of the manufacturing sector. Policies that improve the general business environment are helpful, but, alone, are not sufficient to create meaningful growth and improve competitiveness. Manufacturing is a diverse sector. The needs of companies involved in industries such as pharmaceuticals, steel, aerospace, and food processing are distinct. The diverse set of industries that comprise the manufacturing sector also affect the province's economy very differently. Focusing on those that contribute the most to prosperity and sustainability must be a core tenet of the strategy.

Finally, the strategy must recognize that Ontario's economy is incredibly diverse. Ontario is at once the home of Canada's federal government, the epicentre of Canada's technology and finance industries, a large network of world-leading research universities, the location of the country's most fertile large-scale agricultural lands, as well as 45 per cent of all domestic manufacturing capacity. Ensuring that stakeholders, policy-makers, and the general public are aware of the important role that manufacturing plays in Ontario's prosperity is no easy feat. Ensuring that manufacturing remains a priority can be even more challenging.

TRILLIUM @ 10: OBJECTIVES and ACCOMPLISHMENTS

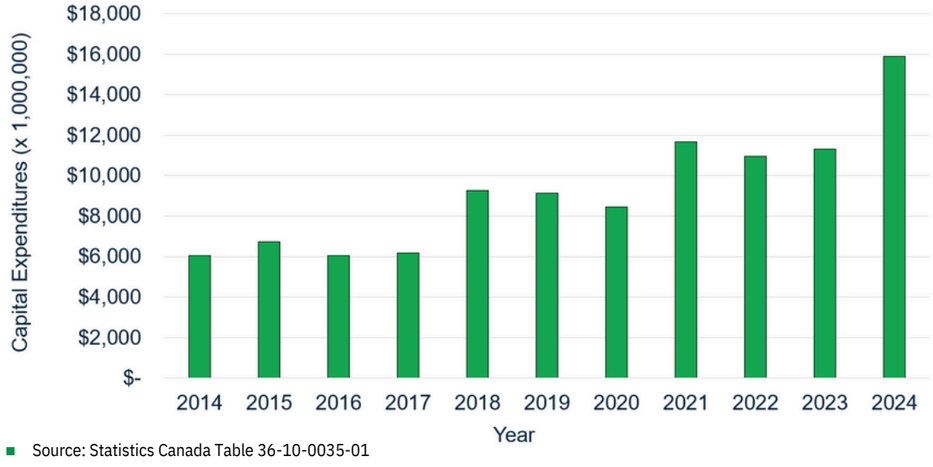
Much has changed in Ontario's manufacturing sector–and in the world–since the Trillium Network was established nearly 10 years ago. The COVID-19 pandemic fundamentally changed how we go about our lives, at least for a while. Russia's invasion of the Ukraine, conflict in the Middle East, and the rise of authoritarian states have disrupted the global economic order.

At home, the governments of Canada and Ontario changed in 2015 and 2018, respectively. Both the provincial Progressive Conservative and the federal Liberal governments have prioritized manufacturing to a greater degree than their predecessors. Both have played a role in strengthening narratives related to manufacturing.

Both should be lauded for their efforts in attracting record levels of manufacturing investment over the past four years (Figure 1). While these investments are promising, it remains to be seen whether they will be enough to grow Ontario's advanced manufacturing sector over the long term and, crucially, improve its competitiveness.

The objectives and initiatives of the Trillium Network also evolved over the past decade. This section examines the organization's objectives and accomplishments over that time. It also emphasizes how the Trillium Network evolved in order to optimize its efforts to support Ontario's advanced manufacturing ecosystem.

Figure 1: Ontario Manufacturing Capital Expenditures, 2014-2024



Source: Statistics Canada Table 36-10-0035-01

The Trillium Network's initial objectives were based partly on recommendations made in the Lawrence Centre's **Future of Canadian Manufacturing** report. These recommendations focused on business-to-business mentorship and better coordination of government investment attraction initiatives.

To address the first recommendation, the Trillium Network established Ontario Global 100 (OG100) in collaboration with the Business Development Bank of Canada (BDC). OG100, which was administered by Trillium Network staff in its early days, is a network of CEOs from more than 60 companies. Founding members include Linamar, Martinrea, Toyota Motor Manufacturing Canada, and Siemens Canada. Other members include the CEOs of small and medium-sized Ontario-based manufacturers from the automotive, automation, aerospace, food, beverage, and appliance industries. Members collaborate regularly to learn from one another, and from business and government leaders, to help grow their companies, expand into new markets, and manage supply chains.

To address the Lawrence Centre report's second recommendation, some of the Trillium Network's earliest work focused on how governments could most effectively attract investment. This led to recommendations that the provincial government establish a single-window, 'concierge' organization to coordinate investment attraction efforts. In so doing, it helped lay the foundation for Invest Ontario, the province's investment attraction agency.

Other early initiatives included company profiles, asset-mapping, and support for Ray Tanguay's Automotive Advisor report. Since 2015, the Trillium Network has profiled nearly 200 innovative small and medium-sized Ontario-based manufacturers. These profiles helped to raise awareness of both the successes and challenges faced by these companies. They also helped to establish a constructive narrative about the sector and to grow our network. While less of a core focus today, Trillium Network staff occasionally profile companies when opportunities arise. Recent profiles of **MacLean Engineering** and **Westhill Innovation** provide valuable insight into the myriad ways that Ontario manufacturers are involved in the electrification of transportation.

Asset-mapping played an important role in the initial years of the Trillium Network. While the earliest iterations of these initiatives were markedly different from those that the organization is involved in today, they helped set the stage for the current version of TrilliumGIS. More on this below.

The Trillium Network also played an important role in supporting and coordinating activities related to Ray Tanguay's 2018 **Drive to Win** report, which has proven instrumental in establishing a renewed vision for the automotive industry in Ontario. (Tanguay served on the board of the Trillium Network from 2015 to 2022). Interestingly, it was through the latter two initiatives that Brendan Sweeney, the current Managing Director of the Trillium Network, became acquainted with the organization's founder and first Managing Director, Paul Boothe.

As the Trillium Network achieved most of its initial goals, and as its leadership changed late in 2019, the organization's objectives evolved. One updated objective was to conduct in-depth analysis of key industries, charting their evolution over the decade between 2010 and 2019. One such **report**, released in May 2020, focused on the ever-important automotive industry. It concluded that Canada should aggressively pursue opportunities to encourage EV-related investment and develop innovative policies and programs to do so. Another **report**, published in June 2020, charted the rapid growth of the Canadian-owned (i.e. craft) beer industry, the fastest-growing segment of manufacturing in the last decade. Both of these reports proved instrumental in shaping the direction of the Trillium Network over the next few years.

Like many others, the Trillium Network pivoted at the outset of the COVID-19 pandemic. This involved transitioning from in-person to virtual operations and reorienting our work to support our partners. By the end of April 2020, we had identified and published a list of more than 100 Ontario manufacturers that had begun manufacturing PPE and hand sanitizer. We also helped identify companies that purported to manufacture PPE in Ontario but were simply re-selling imported goods. While the latter task was unpopular at first, it proved after fraudulent hand sanitizer was discovered on the shelves of a well-known discount retailer in October 2020.

Throughout 2021 we continued to support our partners, including MEDJCT, with research related to the PPE and life sciences manufacturing industries. Some of this work involved better understanding the structure and competitive dynamics of Ontario's medical device industry. This industry is one that fits Ontario's broader economic profile well but had received relatively little attention prior to the pandemic. We also engaged in a project to help provincial government partners understand the experience of small manufacturers that pivoted production during pandemic. This involved surveys and interviews with nearly 100 companies, whose experiences were mixed.

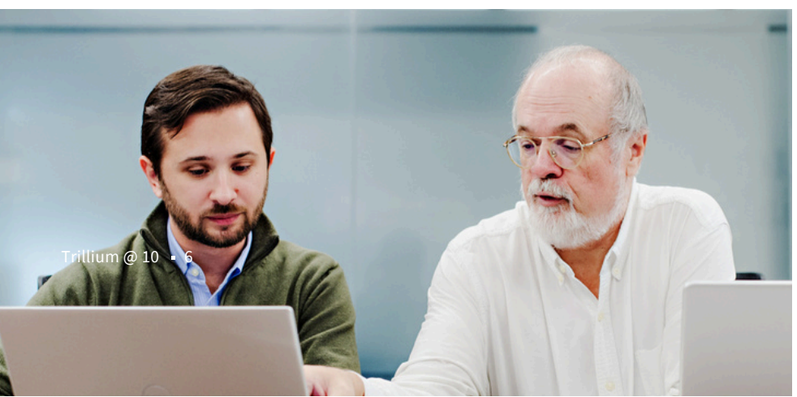
Around the same time, we began to focus on the subject of diversity, equity, and inclusion (DEI) in Ontario's manufacturing sector. The subject of gender diversity emerged as a particular priority.

Increasing the number of women working in manufacturing, especially in higher-earnings sectors and occupations (i.e. the coveted 'good jobs'), has proven to be an elusive goal for manufacturers. Engaging women and other underrepresented groups is vital in manufacturing, and across the economy, where talent is synonymous with competitiveness.

Frustrated with a growing series of reports that identified the lack of gender diversity in manufacturing but offered few solutions, we chose a different approach. Through this approach, we sought Ontario manufacturers that were actively and purposefully implementing strategies to address the gender gap. While examples of these companies were few and far between, through this project, we did uncover several companies that were making real and measurable progress. They included automaker Honda of Canada Mfg., biopharmaceutical manufacturer Sanofi Pasteur, and craft beverage producer Muskoka Brewery. These three companies were the subject of our landmark report '**Gender Diversity and Ontario Manufacturing: Lessons from Five Leading Companies**', published in February 2021.

The report taught us that progress was always intentional and efforts to engage women and promote DEI were reflected throughout broader company strategies and culture. As a follow-up to the report, we also worked with Muskoka Brewery, helping the company earn the Women in Governance's gender parity certification (gold-level, no doubt). Muskoka Brewery remains the only Ontario-owned manufacturer, and the only small or medium-sized manufacturer, to earn this certification.

In March 2021 the Trillium Network launched its official podcast, '**Making it in Ontario.**' It is the only podcast dedicated exclusively to understanding advanced manufacturing in Ontario. Between 2021 and 2023, host Nick Persichilli explored Ontario companies and ecosystem partners involved in manufacturing industries as diverse as ice cream, cosmetics, robotics, and satellites. Some popular episodes featured leaders from Ontario-based companies such as MDA, Eclipse Automation, Linamar, Yorkville Sound, and Precision Record Pressing. After a pause during the second half of 2023 and the first half of 2024, 'Making it in Ontario' was relaunched in September 2024. Over the Fall of 2024, co-hosts Sweeney and recovering economic developer Michelle Samson explore subjects such as productivity, the foundational elements of a future-looking manufacturing strategy for Ontario, and how Ontario-based manufacturers are building cultures and creating opportunities for the next generation of manufacturing leaders.



A former geography professor at McMaster University, who taught Sweeney in the early 2000s, used to ask his class about an axe that had purportedly been in his family for nearly a century. The handle of this particular axe had been replaced three times, while the head of the axe had been replaced twice. Given these changes, he asked, was it still the same axe? Although the axe had undergone significant modifications, there remained an element of continuity, and its function had largely stayed the same over time.

A similar story can be told about **TrilliumGIS**, the organization's flagship asset- and ecosystem-mapping platform. TrilliumGIS is currently in its fourth iteration. Each iteration has been better than the last, at least as measured by the number of users, which has increased by more than 3,000 per cent since 2019.

The technology underlying TrilliumGIS has evolved considerably since its launch in 2017. Much of this is thanks to the efforts of our friends at Luna Geospatial, a London-based geospatial technology service provider founded in 2022. More importantly, the data presented on TrilliumGIS has improved by leaps and bounds. TrilliumGIS was originally populated with expensive, and too often inaccurate, information sourced from a third party. Beginning in 2019, Trillium Network staff began to supplement, and eventually replace, those data with an internally-designed and developed directory of manufacturers.

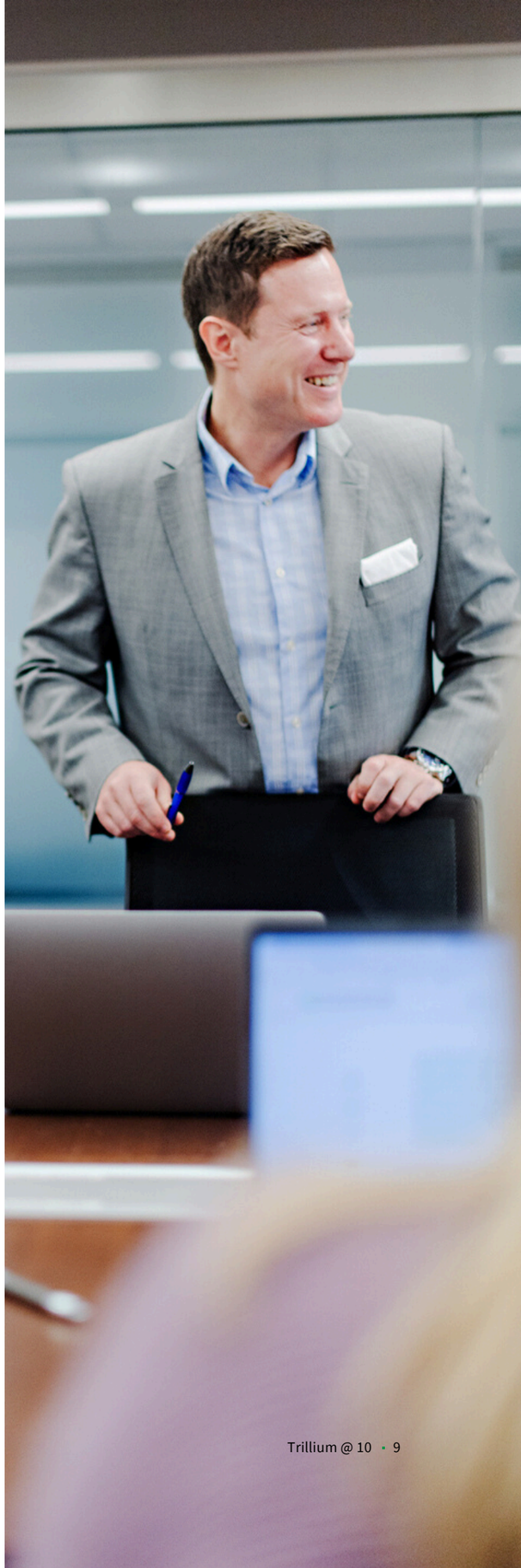
This directory has become the most comprehensive list of manufacturers that exists in Ontario. Information is collected, validated, and updated through techniques developed and refined by Trillium Network staff. TrilliumGIS relies exclusively on publicly available information, which means we can share that information with our partners to support investment attraction, business retention, and other economic development initiatives. The latest iteration represents a shift from simple-asset mapping to broader ecosystem-mapping. In addition to more than 12,000 manufacturing establishments, it features information about 18 specific supply chains and more than 300 ecosystem partners.

As the Trillium Network's body of knowledge grew, we sought new ways to disseminate our research and analysis. Our podcast and series of full-length reports were and continue to be important mediums to do so. Our series of data bulletins published throughout 2022 and 2023 allowed the organization to disseminate research in a more concise and accessible manner. These became an important part of our renewed mission: to be the preeminent source of objective and data-driven information about the advanced manufacturing sector in Ontario. This was something that, through strategic discussions with our board of directors, we agreed was lacking and increasingly important in an era of misinformation.

Finally, a large proportion of our work over the past five years has focused on the automotive industry and its ongoing transformation. This included initiatives to help economic development partners in York Region define and promote the automotive industry, conducting supply chain analysis in collaboration with NGen and the APMA, and building an economic impact model of the entire EV supply chain in partnership with Clean Energy Canada. To the best of our knowledge, this is the only model of its kind in Canada, and it has been deployed on several occasions to support major government investment attraction initiatives.

The Trillium Network has been called upon by the media on more than 100 occasions over the past three years to comment on the automotive industry. This includes defending government support for major investments in the face of uninformed criticism alongside partners such as the APMA. It includes multiple appearances on TVO's *The Agenda*. Despite our best efforts to raise awareness of the broader advanced manufacturing sector, more than 95 per cent of Trillium Network media coverage has been focused on the automotive industry. Our work on other industries, from aerospace and automation to craft beer and cosmetics, has received scant attention from the media. It is an organizational goal moving forward to increase the amount of attention the media pays not just to the automotive industry but to the broader manufacturing sector.

This section oulines the Trillium Network's most significant accomplishments over the past decade. It also shows how the priorities and mission of the organization have evolved. The next section focuses on how Ontario's advanced manufacturing sector has fared over the past decade. It takes a deeper dive into several key metrics beyond the number of jobs.

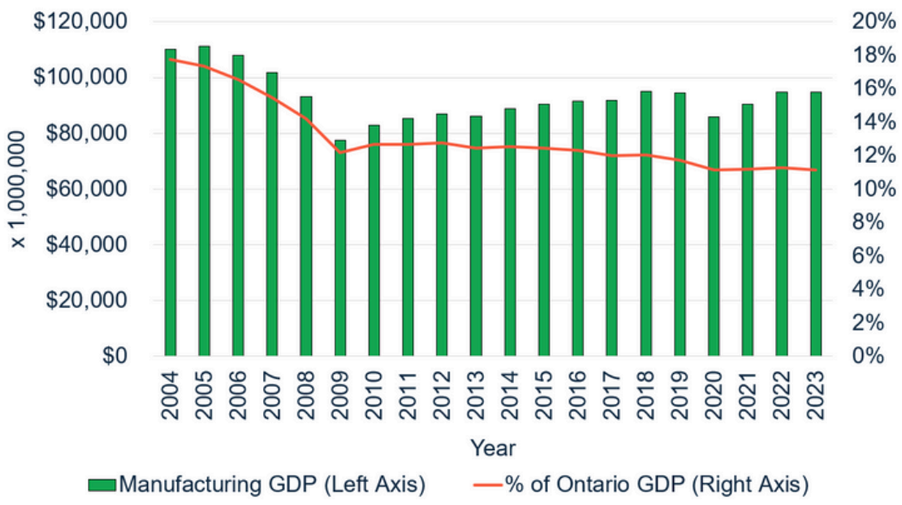


THE STATE OF MANUFACTURING IN ONTARIO: 2014 vs. 2023

A few important notes about Ontario's manufacturing sector:

- Ontario's manufacturing sector is part of a large, diverse, and vibrant economy in an affluent (and expensive) part of the world. As such, manufacturing stakeholders compete with one another and with other sectors for scarce resources, such as talent and capital, as well as for the attention of policymakers.
- Ontario's manufacturing sector is more diverse than the manufacturing sectors in almost every other sub-national jurisdiction in Canada and the United States (Quebec and Pennsylvania are the only exceptions). While the automotive industry has long been the focal point of Ontario's manufacturing sector, it is now rivaled in size (measured by the number of employees) by the province's food manufacturing industry. This presents both opportunities and challenges. Opportunities for cross-industry innovation and collaboration abound, and it is easier for a diverse sector to weather downturns in one industry. However, a diverse sector means that Ontario is home to less productive industries that have low profit margins and offer employees relatively low rates of compensation (e.g. furniture) as well as more productive industries with high profit margins that offer employees high rates of compensation (e.g. aerospace), and everything in between.
- Public narratives suggest that Ontario's manufacturing sector has undergone a resurgence since 2020. This is related to the attention the sector received during the COVID-19 pandemic and excitement related to large EV-related investments announced over the past three years. Amid the excitement, however, several concerning metrics must be, at minimum, recognized and ideally addressed through a well-conceived strategy designed to improve the long-term competitiveness of the sector.

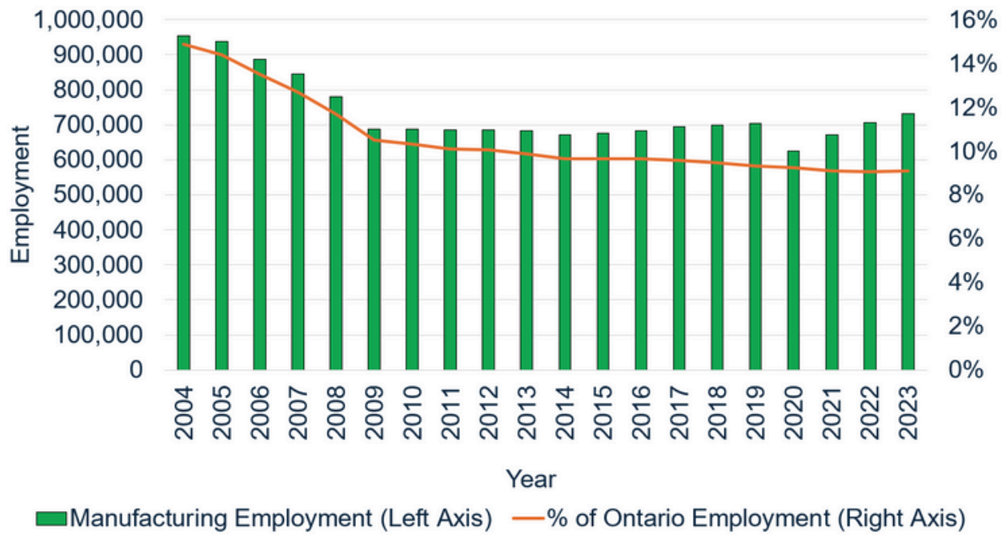
Figure 2 - Ontario Manufacturing Contributions to GDP, 2004-2023



Source: Statistics Canada Table 36-10-0402-01

Ontario manufacturing witnessed a period of growth in the latter half of the 1990s and early 2000s. During this time, manufacturing's contributions to Ontario GDP reached record levels (Figure 2), and the sector consistently employed more than 900,000 people (Figure 3). At certain points during this period, manufacturing accounted for nearly 20 per cent of Ontario's GDP and more than 17 per cent of employment.

Figure 3 - Ontario Manufacturing Employment, 2004-2023



Source: Statistics Canada Table 36-10-0402-01

The state of Ontario's manufacturing sector changed considerably between 2004 and 2013. Manufacturing's contributions to Ontario GDP fell by nearly 30 per cent between the more prosperous period leading up to the peak in 2004 and the depths of the Great Recession in 2009. In that period of just five years, the manufacturing sector shed more than 266,000 jobs. While the sector recovered to some degree between 2009 and 2013, its contributions to GDP and employment remained considerably lower than the peak years in the late 1990s and early 2000s.

The Trillium Network was conceived and founded on the heels of this challenging period. This section compares the state of Ontario's manufacturing sector at the Trillium Network's outset a decade ago to its current state. To do so, it focuses on three key metrics: employment quality, GDP, and productivity. We recommend that these three metrics provide the foundation for measuring the performance of the sector and the success of a strategy designed to support advanced manufacturing in Ontario.

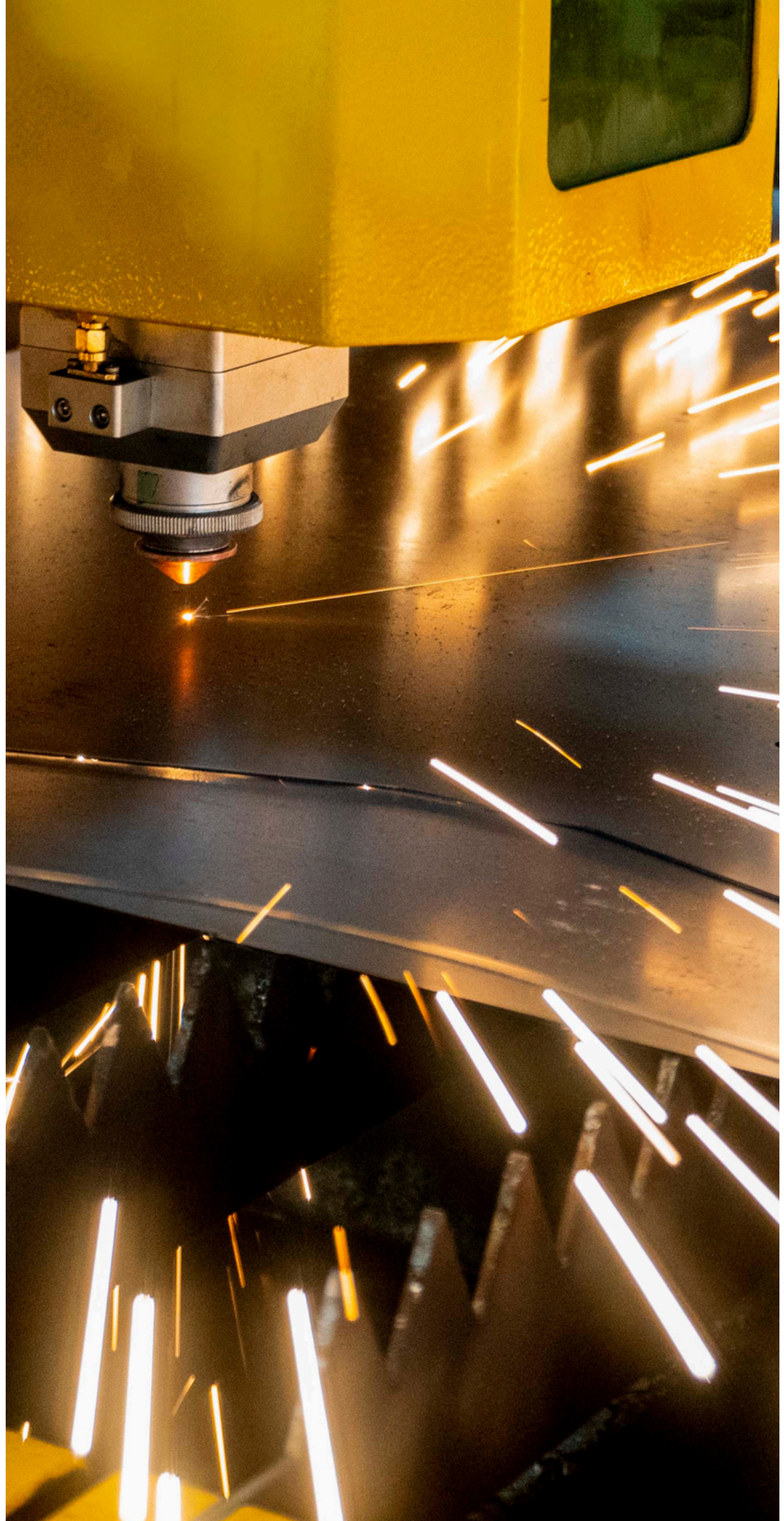
Manufacturing has long been lauded for its ability to provide 'good' jobs. More specifically, for much of the 20th century, the manufacturing sector provided relatively high-paying jobs for people who otherwise would have struggled to find a high-paying job. The manufacturing sector also had relatively low education requirements, provided competitive fringe benefits, and allowed employees to enjoy a middle-class lifestyle from a relatively young age. By extension, governments did not have to invest significantly in post-secondary education for a large proportion of the manufacturing workforce and reaped the benefits of those workers' income and consumption taxes from a relatively young age.

Supporting a sector that provides good jobs is a sound policy. But not all manufacturing jobs are good jobs. The Trillium Network has developed a ‘good jobs metric’ to determine the relative quality of manufacturing jobs. This allows us to identify what proportion of manufacturing jobs offer compensation above the Ontario average, and how this has changed over time.

During the early and mid-2000s, approximately 69 per cent of manufacturing jobs were good jobs. A decade ago, and following the restructuring and job loss that occurred during the recession of 2008-2009, 67 per cent of manufacturing jobs were good jobs. Fast-forward to 2023, and that number has fallen to 62 per cent. This is problematic.

There are two main reasons for this decline. First, the structure of Ontario’s manufacturing sector changed between 2014 and 2023. While employment in high-compensation industries such as vehicle assembly, primary metal, and aerospace increased nominally, employment in low-compensation industries, such as food manufacturing, increased considerably. In short, most of the manufacturing sector employment growth over the past decade occurred in low-compensation industries. Second, average compensation growth across all industries was 35 per cent, whereas compensation growth in manufacturing was only 31 per cent (inflation over this period was 25 per cent). A decade ago, manufacturers offered a compensation premium of approximately 15 per cent; today, that premium is closer to 11 per cent. Reversing this trend by focusing on increasing high-compensation manufacturing employment vis-a-vis employment in low-compensation industries must be a strategic priority moving forward.

The second key metric for assessing the overall health and performance of Ontario’s manufacturing sector is GDP. In 2014, manufacturing contributed nearly $89 billion to Ontario's GDP, and accounted for 12.5 per cent of the province’s GDP. These contributions increased to more than $95 billion in 2018. They have since decreased to just under $95 billion in 2023, accounting for just 11.1 per cent of GDP. This marked the manufacturing sector’s lowest proportional contributions to GDP in Ontario on record.



This decrease since 2018 is problematic in its own right, but even more so when considering that employment in Ontario’s manufacturing sector increased by more than 33,000 during the same period. To this effect, GDP per manufacturing employee has decreased by nearly $3,000 over the past decade. This further demonstrates the changes to the structure of Ontario’s manufacturing sector, as well as several other factors discussed below. The decrease in GDP per employee is closely related to the third, and perhaps most problematic metric: productivity.

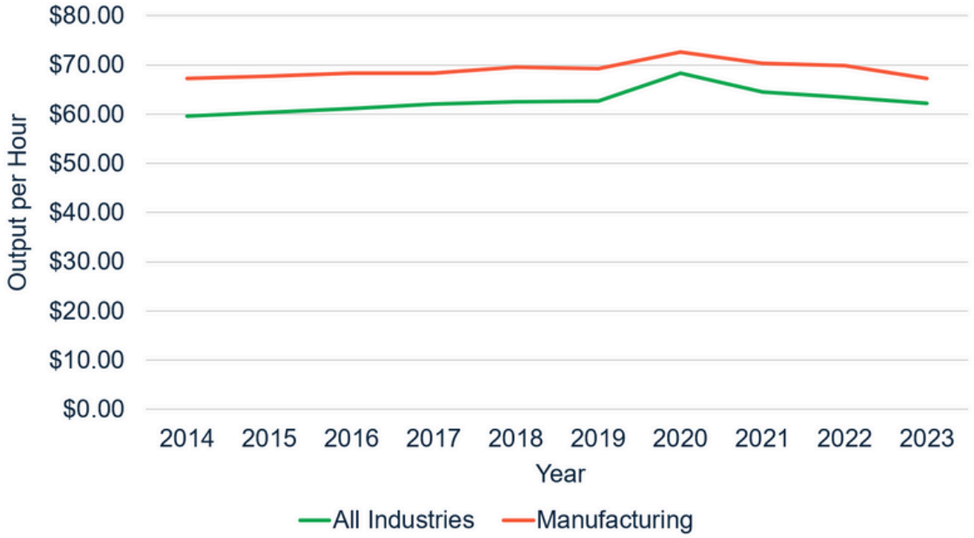
Productivity is an important measure of the competitiveness of a sector. In its simplest form, productivity is defined as the value of output per hour worked per employee. That said, productivity is a complex subject, especially in manufacturing, where several specific factors directly influence it. These include:

- Industry;
- Capital intensity;
- Plant size;
- Company size;
- Input and output prices; and
- Capacity utilization.

A **recent report** jointly published by the Trillium Network and NGen provides a more detailed analysis of productivity in Canada’s manufacturing sector. This report confirms that productivity growth is closely related to prosperity. Increased productivity leads to increased profitability, investment, and compensation growth. Over the past decade, Canada's productivity growth has slowed, affecting manufacturing and many non-manufacturing industries.

In Ontario, manufacturing productivity increased between 2014 and 2020 but has decreased since (Figure 4). Several factors contribute to this decline. One is the growth of less productive industries (e.g. food) relative to more productive industries (e.g. chemical). Another contributing factor is low rates of capacity utilization in key industries, such as vehicle assembly, without a commensurate decrease in employment. A third factor is the continued emphasis on job creation. This has too often come at the expense of investments in capital, technology, and innovation, and by extension, productivity and prosperity.

Figure 4 - Ontario Labour Productivity, 2014-2023



- Source: Statistics Canada Table 36-10-0489-01

If stagnant productivity is not the foremost concern for policy-makers and industry stakeholders, it should be. The automotive industry is perhaps the most obvious example of how manufacturing productivity has declined. Ontario's vehicle manufacturing productivity *decreased* by 30 per cent between 2014 and 2023. These metrics are by no means consistent across the five automakers that assemble vehicles in Ontario. Productivity at assembly plants owned by Japan-based automakers, as measured by the total number of vehicles manufactured or by the number of vehicles manufactured per employee, is consistent with or greater than the rates witnessed in the mid-2010s. Conversely, productivity at plants owned by US-based automakers, most of which have been operating well below capacity for the past five years, has plummeted. Without a strategy to significantly improve productivity in key industries, such as automotive assembly, large swaths of Ontario's manufacturing sector risk becoming uncompetitive or simply unimportant.

Table 1 compares several key manufacturing sector metrics in 2014 and 2023. These metrics suggest that Ontario's manufacturing sector may be facing more challenges related to long-term competitiveness than is readily apparent. Incoming investments–especially those in EV battery cell manufacturing facilities–will prove important but alone are not sufficient to chart a new course for the entire sector. A well-conceived strategy to guide the future of the sector is more important than ever.

Table 1 - Ontario Manufacturing Key Metrics, 2014-2023

	2014	**2023**
Employment	670,415	732,060
% of Ontario Employment	9.7%	9.1%
% Good Jobs	67.5%	62.2%
GDP	$88.8B	$94.8B
% of Ontario GDP	12.5%	11.1%
GDP per Employee	$132,388	$129,474
Productivity	$67.20	$67.30

- Ontario Manufacturing Key Metrics, 2014-2023

THE WAY FORWARD: A MANUFACTURING STRATEGY FOR ONTARIO

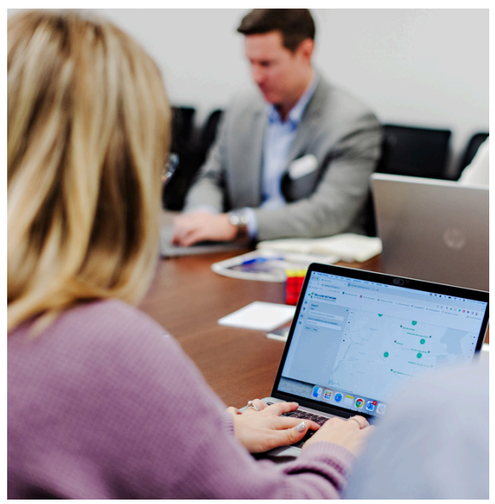
Ontario needs a strategy to guide its manufacturing sector now more than ever. The ad hoc approaches to supporting the sector taken since the mid-2000s have yielded middling results as they relate to GDP, job quality, and productivity. While reducing red tape and the overall cost of doing business is useful, it is not sufficient on its own. There is every indication that the Ontario Made Manufacturing Investment Tax Credit will prove valuable, although it is too soon to understand its effects. Competing for investment with large U.S. jurisdictions (e.g. Michigan, Ohio, California, Texas, Illinois, Pennsylvania), Mexico, and overseas jurisdictions requires a more comprehensive and multi-faceted approach.

Our approach to strategy is in many ways consistent with that of renowned University of Toronto professor Roger Martin. It offers a set of integrated choices that we believe can serve as the foundational elements of a manufacturing strategy for Ontario. At a high level, the report presents a strategy that focuses on doing *better* rather than doing *more* (or, arguably, doing better as a prerequisite to doing more), and focusing on *quality* over *quantity*. In an era of scarce resources–notably talent, land, and money–and increasing competition within the province for those resources, we conclude that success is best achieved through the modernization and optimization of existing capabilities and assets.

We also recognize that Ontario is a high-cost jurisdiction. This is unlikely to change in the near future. Our proposed focus on quality over quantity is aimed at developing a manufacturing sector that is more productive, more profitable, and better equipped to absorb the costs associated with doing business in an affluent jurisdiction. It does not propose to develop a manufacturing sector based on low costs, as such an approach is both unrealistic and unsustainable.

One of our core proposals involves a shift away from job creation as a primary goal. Rather, the goals of the strategy are to improve the three metrics examined in the previous section: 1) contributions to GDP, 2) the proportion of ‘good’ manufacturing jobs, and 3) productivity.

There are a multitude of ways that these metrics can be improved. We focus on three broad categories: investment incentives, talent and workforce, and technology and automation.



Investment Incentives

Incentives have played an important role in attracting major new manufacturing investments to Ontario since the late 1970s. They are seemingly ubiquitous today, and essential to economic development strategies across much of Canada and the United States. The common approach to investment incentives was developed as a means to secure certain segments of the province's manufacturing footprint immediately before and during the Great Recession of 2008-2009. These incentives were not designed to attract greenfield investments nor to increase contributions to GDP, good jobs, or productivity.

To improve the three metrics discussed above, we propose:

- A more aggressive yett selective approach to incentives for new (i.e. greenfield) manufacturing investments; and
- A recalibrated approach to incentives for incumbent manufacturers.

To be successful, these incentives must be coordinated across provincial and federal government agencies. A tall order for sure, but one that is not beyond today's policy-makers.

It is worth providing some background before we go further. Put plainly, the general purpose of incentives is to attract investment to a particular jurisdiction, where that investment would otherwise go to another jurisdiction (due to lower operating costs and/or greater incentives) or not materialize at all. Incentives come in the form of low-interest loans or lines of credit, tax credits, tax breaks, and increasingly, grants (i.e. non-repayable contributions). In most cases, incentives are conceived of as 'co-investments' by governments.

Those co-investments are designed to provide a 'payback' or return in the form of government revenues that are greater than the initial incentives. They may also be designed to ensure that a strategically-important industry or company continues to invest in or maintain production facilities and employment during a crisis.

Ontario is distinct from most U.S. jurisdictions in that it offers incentives to support incumbent manufacturers as well as incentives to attract new investment*. The former were initially offered to a small number of automakers in the mid-2000s and extended to smaller manufacturers through several provincial and federal programs beginning in 2009. These incentives usually come in the form of low-interest loans or grants. Many include employment covenants, although these covenants are seldom made public.

These types of incentives were conceived of as a means to support manufacturers during a devastating period for Ontario's manufacturing sector. The province's electronics industry had been decimated in the 2000s after its two largest companies–Nortel and BlackBerry parent Research in Motion–closed their Ontario-based manufacturing operations. US Steel was in the process of winding down its integrated steel-making operations in Hamilton. Four U.S.-owned vehicle assembly plants closed between 2003 and 2012, alongside hundreds of automotive parts factories.

New manufacturing investments were few and far between in the decade following the Great Recession of 2008-2009. The period between 2010 and 2019 marked the first decade in living memory in which no automaker built a new vehicle assembly plant in Ontario. Simply retaining the province's existing manufacturing footprint seemed to be all that could be done in the face of competition from the United States, Mexico, and China.

Ontario's fortunes have changed considerably since 2020. Record levels of capital investment, first in the food and chemical industries and more recently in the automotive industry, are expected to anchor a substantial portion of the province's manufacturing sector for several decades. It is unclear, however, if these investments are enough to improve the trajectory of the entire sector as it relates to the three metrics discussed in Section 2.

The North American manufacturing landscape also changed considerably over the past two decades. So have the prospects of more greenfield investments. The governments of Ontario and Canada should be credited for their efforts to improve the business environment, promote the province as a place to invest in manufacturing, and secure major EV-related investments from Honda, PowerCo, and Nextstar Energy. Given these changes, it only makes sense to recalibrate the approach to incentives, which was developed during a crisis. This should be

*The United States announced incentives to support incumbent automotive parts manufacturers during the transition to EVs through its Drive Forward Fund in September 2024.

done with the goal of optimizing the economic benefits associated with new manufacturing investments and with investments by incumbent manufacturers. Simply securing production or retaining jobs is no longer good enough. We can do better.

To not offer incentives for greenfield investments is, as Roger Martin might put it, stupid on its face. It would make Ontario uncompetitive for any worthwhile investment. We recommend incentives for new investments that are at once aggressive (i.e. a greater proportion of the total investment), selective, and targeted.

The 'selective' element of this approach involves targeting investments in industries known for their productivity, that pay well, and that can make substantial contributions to GDP. Examples of such industries include vehicle assembly, aerospace, EV battery cells and materials, chemicals, dairy products, pharmaceuticals, primary metal, and high-value electronics (e.g. medical devices, wireless communication equipment). We can be reasonably assured that offering more aggressive incentives to attract new investments in these industries will concomitantly help achieve the goals of improving productivity, increasing the number and proportion of 'good' manufacturing jobs, and boosting contributions to GDP. Some of this work is already underway via Invest OntarioSome of this work is already underway via Invest Ontario, and we recommend intensifying efforts while narrowing the focus.

This approach also involves *not* offering new incentives for greenfield investments in lower-value industries that are not export-oriented. Companies in these industries are free to invest in Ontario if they choose. However, it should be understood that their value in helping achieve the aforementioned goals tends to be limited and that they will absorb scarce resources such as land, talent, and indeed the tax revenue that finances incentives that are essential to attracting investments in higher-value industries.

The practice of offering incentives to incumbent manufacturers began in the mid-2000s. The governments of Ontario and Canada provided Ford and General Motors with substantial incentives to modernize existing assembly and powertrain manufacturing facilities in 2004 and 2005, respectively. These incentives were initially designed to stop the bleeding associated with the retreat of U.S.-based automakers and their parts suppliers between the early 2000s and the Great Recession of 2008-2009. In certain high-profile cases, these incentives did not stop the bleeding, but slowed it…somewhat. In other cases–Toyota, Honda, and ArcelorMittal Dofasco come to mind–they have had the desired effect of incentivizing important capital investments that serve as the foundation of Ontario's manufacturing sector.

It is a good time to reconsider whether the policies put in place 20 years ago under some duress to ensure that a small number of large U.S.-based companies survive a recession, or not abandon Ontario altogether, are still appropriate. The problem is that these incentives appear to be well-liked (or at least well-used) by manufacturers of all stripes. (They are certainly well-liked by a growing cottage industry of consultants who help manufacturers in completing funding applications). Taking them away entirely will attract criticism.

That said, questions regarding the efficacy of incentives for incumbent manufacturers remain. Have these incentives helped some manufacturers maintain strategically important production and employment in Ontario? Probably. Have they led to aggregate improvements in productivity, job quality, and innovation? There is little evidence to suggest that this is the case.

We recommend recalibrating, or updating, the form and purpose of incentives for incumbent manufacturers. This would involve offering incentives in the form of market-rate loans or lines of credit, which would convert to grants in whole or in part if certain conditions are met. In all but the most exceptional circumstances, those conditions should not be explicitly tied to job creation or retention. Rather, they should be tied to productivity improvements, increasing the proportion of 'good' jobs that offer above-average compensation, and increasing value-added output (and, presumably, contributions to GDP). This approach would ultimately help individual manufacturers increase their competitiveness and by extension, profitability. It would help manufacturing employees improve their standard of living and ability to consume locally. Finally, it would increase the likelihood that the 'co-investing' governments realize a 'payback', or sustainable return on the incentives they provide over the long term.

Individual manufacturers should be required to present a plan to achieve the aforementioned conditions. That plan should involve adopting new technologies to help them achieve their objectives, although the incentives should be, for the most part, technologically agnostic. They should recognize that investing in new-to-that-manufacturer technology is important but that investments in technology must meet manufacturers where they are. Some manufacturers may be able to improve productivity and increase the number of high-paying jobs through AI-enabled robots. Others may simply need to update their ERP system. More on technology later.

Talent and Workforce Development

Ontario's highly-educated workforce is an important competitive advantage for its manufacturing sector. The province's network of universities and colleges and an immigration system that helps manufacturers access talented people from around the world are at the foundation of this competitive advantage. At the same time, manufacturers are consistently and emphatically vocal about the challenges they face in attracting and retaining employees. Addressing these challenges so that Ontario manufacturers can fully leverage the competitive advantages associated with the province's highly-educated workforce must be a central component of a manufacturing strategy.

The diversity and quantity of well-paying jobs across the economy is one of the main reasons Ontario manufacturers face challenges attracting and retaining employees. In addition to manufacturing, Ontario is home to large and innovative finance, ICT, healthcare, professional services, real estate, construction, education, utilities, and mining industries. This is one of the reasons Ontario is so affluent.

Having to compete for top-flight talent with other manufacturers *and* with employers in other sectors poses a distinct and pressing challenge for companies in Ontario's manufacturing sector. In this sense, Ontario manufacturers have more in common with their counterparts in jurisdictions with large and diverse economies that include manufacturing (e.g. California*) than those in neighbouring jurisdictions that have large manufacturing sectors (e.g. Michigan, Ohio, Indiana).

*California's economy is massive. So is its manufacturing sector. Electronics manufacturing in California contributes nearly as much to the U.S. GDP as the entire manufacturing sector does to Canada's economy. There are as many (or more) lessons to learn from California as there are from Michigan or Ohio.

At the same time, unemployment in Ontario is on the rise, and manufacturing job vacancies are nearing a 10-year low. The unusually tight labour markets of 2021 and 2022 are a thing of the (recent) past (Figure 5). While this is a concern for the broader economy, it presents an opportunity for enterprising manufacturers to proactively recruit and develop the next generation of talent. To do so effectively, manufacturers must develop recruitment strategies that inspire highly-educated persons, including women, youth, and newcomers to Canada, to join the manufacturing sector. In so doing, manufacturers could gain a sort of 'first mover' advantage during a period of rising unemployment. If manufacturers become the entry point for the next generation of highly-educated Ontarians, they can shift their focus from recruitment to retention and talent development.

Figure 5 - Manufacturing Job Vacancies in Ontario, 2015-2024

Source: Statistics Canada Table 14-10-0442-01

Making employment in manufacturing more desirable is a core element of a successful recruitment strategy. The foremost way to make jobs more desirable is to increase compensation, including pay and fringe benefits. Increasing compensation, and the premium paid by manufacturers versus employers in other sectors, is a *sine qua non* for attracting talent in a competitive market such as Ontario.

The challenge, as we noted earlier, is that the number and proportion of manufacturing jobs in Ontario offering above-average compensation have decreased over the past decade. This has made careers in much of the manufacturing sector less desirable compared to those in other sectors, where compensation has increased at a higher rate.

There are two ways in which the proportion of 'good' manufacturing jobs can increase. First, the proportion of employment in higher-compensating industries (e.g. aerospace, vehicle assembly, primary metal, pharmaceutical products) can increase relative to lower-compensating industries. This is the inverse of what has happened in Ontario over the past decade. Second, manufacturers in lower-compensating industries can make concerted efforts to increase compensation. Their ability to do so almost inevitably involves improving productivity.

This brings us to a chicken-and-egg scenario. Improving productivity means investing in talent and technology. In order to improve productivity, manufacturers must invest in both technology and talent. The two are, in most cases, closely related. Integrating, operating, and upgrading advanced manufacturing technologies requires talented and educated employees. To access those employees, manufacturers must offer above-average compensation. To sustainably increase compensation, manufacturers must improve productivity…you get the point.

Talent, technology, and productivity improvements are inextricably linked. Therefore, a successful manufacturing strategy must integrate all three elements without prioritizing one over the others. While ensuring that compensation is competitive must be a core component of a talent-focused manufacturing strategy, several other areas should also be addressed to improve the desirability of manufacturing careers and improve manufacturers' recruiting and retention efforts.

This section of the report focuses on four specific areas. They include:

- Understanding the workforce needs of different manufacturing industries;
- Greater engagement with universities;
- A manufacturing-specific skilled trades strategy; and
- A new and more sustainable approach to diversity, equity and inclusion (DEI).

Occupational Diversity

Different manufacturing industries have different needs when it comes to the workforce. Some industries rely extensively on tradespeople. These include metalworking and machinery. Others rely more on engineers. These include aerospace and electronics. Others still rely extensively on those with a science background. Pharmaceutical product manufacturing is the best example of such an industry. This is explored in more detail in a Trillium Network data bulletin from 2022.

Supporting investment and addressing workforce-related challenges requires an industry-by-industry approach. Increasing the number of tradespersons in manufacturing will help metalworking and machinery companies, but be of little relevance to pharmaceutical product manufacturers. Similarly, a science-focused approach to the manufacturing workforce will help pharmaceutical product manufacturers but may be of little relevance to other manufacturers.

Keeping the needs of manufacturers in specific industries relative to Ontario's existing workforce in mind is important in the context of investment attraction initiatives. Considering the current composition of the industry, and how it changes over time (e.g. the growth of food processing and the contraction of vehicle assembly), is an important component of a talent and workforce strategy for manufacturing.

Greater Engagement with Universities

Ontario's colleges have close ties to manufacturing, and manufacturers engage extensively with colleges across the province. Enrolment in Ontario's universities, however, is more than twice that of enrolment in colleges. Universities also have far more resources that can be deployed towards supporting innovation, R&D, and advanced training. While deep and productive partnerships exist between engineering faculties at Ontario universities and manufacturers, there are fewer ties between other faculties and the sector.

A talent and workforce strategy for manufacturing should focus on better engagement between manufacturers and the non-engineering faculties (e.g. science, health science, business) of Ontario universities. This may lead to new opportunities for hundreds of thousands of highly-educated Ontario students. It may open up a massive new pool of talent for manufacturers, and in so doing, help renew an aging manufacturing workforce. The vignette below provides just one example of how this can happen, with a focus on initiatives at the University of Guelph designed to support the province's dairy product industry.

Guelph Food Innovation Centre (GFIC) and OLG: 'Luxury' Ice Cream Bars

The University of Guelph's GFIC is heralded as one of the world's foremost centres of 'ice cream excellence.' Through a partnership between the GFIC, Ontario Lottery and Gaming Corporation (OLG), and Toronto-based ice cream producer Creamery X, groups of upper-year-level undergraduate food science and marketing students developed and produced novelty ice cream bar flavours. Each of the four flavours–rare oil painting, private island, designer handbag, and grail sneaker–were inspired by things a millionaire (or a lottery winner/gagnant) could afford.

The four groups of students spent the better part of a semester identifying flavour compounds, matching them to food products, developing a marketing strategy, and producing an ice cream bar that actually tastes good. The eventual products were sold at a series of events and pop-ups across Toronto and Muskoka in the summer of 2022. More importantly, a cohort of science and business students from the University of Guelph developed skills, capabilities, and experiences that are invaluable to ice cream and food ingredient manufacturers across the province.

For more information see **this article** from Guelph Today.

A Manufacturing-Specific Skilled Trades Strategy

Trades-related occupations are vital to a number of manufacturing industries. These include, but are not limited to, electricians, industrial mechanics (i.e. millwrights), operating engineers, machinists, and tool and die makers. Metalworking, machinery, primary metal, and aerospace all rely extensively on the trades. Other manufacturing industries, however, require fewer tradespersons. These industries include pharmaceutical products, electronics (including medical devices), food, and beverage.

While the trades are important to manufacturing, the construction sector employs nearly five times as many tradespeople. Pay is considerably higher in the construction sector, although working conditions can be more demanding. A majority of these tradespeople belong to building and construction trade unions such as the International Brotherhood of Electrical Workers (IBEW) or the United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry (UA).

There are two important things to take from this. First, most strategies and programs to encourage people to consider a career in the trades serve the higher-paying construction sector first and foremost. The construction sector is important, and construction trades are a noble pursuit. Those who support these pursuits are doing similarly noble work. The problem is that these strategies and programs tend to be of little use to manufacturers. In fact, they may effectively serve to steer candidates away from manufacturing and towards construction. Second, building and construction trades unions such as the IBEW and UA play an important role in recruiting and administering the work assignments, pay, and benefits of members who are employed in the construction sector. Much of this work happens alongside employers in that sector. That said, they play little to no role in the manufacturing sector.

There exists a gap between manufacturers and the trades in manufacturing that does not exist in the construction sector. Industrial unions, such as Unifor and the United Steelworkers, are unlikely to fill this gap given the relatively low union density in Ontario's manufacturing sector. Additionally, these unions focus primarily on negotiating and administering collective agreements and do not offer the 'hiring hall' function that building and construction trades unions offer to employers. Industry associations are also unlikely to fill this gap. Almost every industry association is voluntary and few represent a majority of the employers in any given industry.

The most likely candidates to fill these gaps are colleges. Colleges already play an important role in recruiting and training manufacturing tradespersons. We propose a trial program whereby colleges take more responsibility for training and administering the apprenticeships of those seeking a trades-related career in manufacturing. As part of this program, student apprentices affiliated with a college would be offered semester-long work placements in three or more manufacturing industries (e.g. automotive, aerospace, food, machinery). This is similar in some ways to the university-based co-operative and experiential education programs that are successful at developing talented engineers.

The hours accrued in these work placements–under the supervision of certified tradespersons–would count towards their certification, as they would in a traditional apprenticeship program. Student apprentices would receive broader exposure than they would if they apprenticed at one employer, and their future career prospects would depend less on the willingness of a single employer to keep them on. Employers would face a lower risk of investing in an apprentice only to see them leave for higher wages upon completion of their training. Employers would also have the opportunity to engage with a greater number of potential tradespersons, which would help them identify desirable candidates.

Diversity, Equity, and Inclusion (DEI)

Ontario's manufacturing sector has a mixed record when it comes to DEI. Women are under-represented in manufacturing and tend to be concentrated in lower-paying industries and lower-paying occupations. Visible minorities and newcomers are over-represented but are concentrated in lower-paying industries. Moreover, persons under the age of 25 made up only about two per cent of the manufacturing workforce over the past decade. The lack of diversity in much of Ontario's manufacturing sector presents challenges to competitiveness moving forward. More information is available in a series of Trillium Network data bulletins.

Summary

Ontario's highly-skilled and highly-educated workforce is perhaps the most important competitive advantage for the province's economy. Manufacturers need to expand their talent pool and engage a more diverse workforce if they want to improve competitiveness. Otherwise, someone else–whether in manufacturing or another sector entirely–will reap the benefits of doing so. This is especially the case for manufacturers that rely heavily on skilled tradespersons, occupations from which women and visible minorities are largely absent.

There has been significant emphasis placed on preparing younger workers, newcomers, and other under-represented groups for careers in manufacturing. Less emphasis has been placed on helping manufacturers develop career opportunities that are highly desirable for younger workers, newcomers, and other under-represented groups. In addition to competitive compensation and benefits, manufacturers must focus on creating inclusive and innovative work environments and cultures that inspire the next generation of talent to choose a career in the sector. We at the Trillium Network feel that this part of the conversation has largely been overlooked, especially in such a competitive and dynamic labour market.

Exploring how innovative Ontario manufacturers are modernizing their human resources practices and company cultures to attract, retain, and inspire the next generation of talent is the focus of a new program of work at the Trillium Network. We will be exploring this issue in detail on our podcast, 'Making it in Ontario', over the next few months.

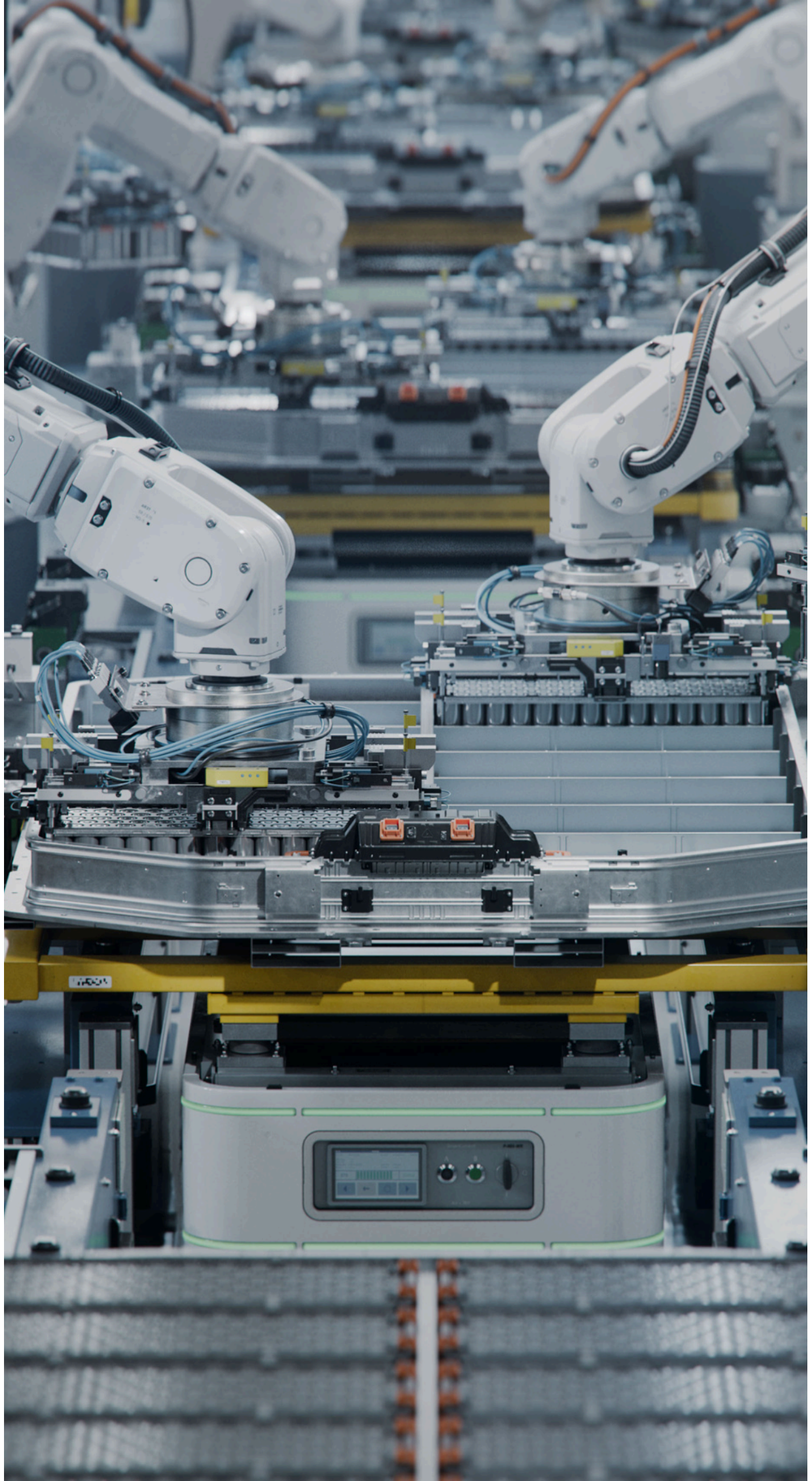
One final note: if industry stakeholders are serious about engaging the next generation of talent, they should incorporate into a strategy the one thing that is desired but has proved so elusive for younger persons in Ontario: access to housing. In a province that once offered immigrants from the Netherlands, Poland, and other parts of Europe citizenship in exchange for a few seasons of agricultural labour, could we not find a way to collaborate across multiple layers of government to help address manufacturers' need for talent and the desire of younger persons to own a home? Doing so could take pressure off housing markets in Ontario's largest communities and lead to renewal in smaller, manufacturing-dependent cities across southern Ontario that are facing aging populations.

Technology and Automation

Accelerating the adoption of novel and innovative technologies in support of business objectives is vital to a forward-looking manufacturing strategy. If done effectively, increasing the pace of technology adoption will improve productivity, job quality and desirability, profitability, and the manufacturing sector's contributions to prosperity. Supporting the development and production of novel and innovative manufacturing-related technologies in Ontario would provide further benefits. These benefits would compound and build off one another, and help the province create not just a competitive but a world-leading advanced manufacturing ecosystem.

There are several things that can help achieve this. In this report, we focus on the following:

- Tying the adoption of novel technologies and innovative technologies to investment incentives;
- Re-characterizing automation and tooling technology development and manufacturing as its own industry, rather than an appendage to other industries (e.g. automotive);
- Promoting made-in-Ontario automation and tooling technologies within Ontario (and Canada) as a means to reduce the province's (and country's) dependence on imports, and to further develop exports;
- Fostering Ontario-owned 'champion' automation and tooling companies; and
- Better coordinating the activities of discrete industry associations for the benefit of the entire automation and tooling industry.



Incentives and Tax Credits

It is increasingly important to tie the adoption of novel and innovative production technologies to government investment incentives and tax credits. This is especially important for manufacturing SMEs. These technologies should be truly novel and innovative. In other words, these should be game-changing technologies that Ontario manufacturers would not otherwise adopt if they did not have access to incentives or tax credits.

Incentives or tax credits for capital investments are effective at helping reduce the costs of business for manufacturers. However, if they are offered indiscriminately, there is little evidence that they will actually lead to the adoption of the newest and most novel production technologies. A greater emphasis should be placed on evaluating the types of capital investments that incentives and tax credits will support, and their potential effects on productivity and sustainability.

It should also be understood that investments in new and novel production technologies require parallel investments in talent. These investments in talent should be included within the overall incentive package.

Trillium @ 10 ▪ 32

Automation and Tooling: A Stand-Alone Industry

One of the first Trillium Network projects under the leadership of Brendan Sweeney involved quantifying the economic impact of Canada's manufacturing automation and tooling industry. This project was carried out in collaboration with the then-fledgling industry association Automate Canada between November 2019 and April 2020. The results of this project are available **here**.

The project involved identifying several industry segments (as defined by four-digit NAICS codes) that produced machinery and tooling, developed software used in production, or provided production-related IT services directly to manufacturers. It then identified the proportion of those industries' output that went directly to the manufacturing industry in Canada or abroad. From there, we calculated the GDP and employment within these industries that were directly associated with manufacturing.

The estimated economic impact of these industries was significant. Our results showed that when combined, Canada's manufacturing automation and tooling industry contributed more than $7.2 billion to GDP in 2019. This ranked the automation and tooling industry, as we defined it, ahead of Canada's vehicle assembly industry ($6.5 billion) and behind Canada's aerospace manufacturing industry ($8.2 billion). Similarly, the industry employed more than 58,000 people, approximately half of whom worked for more than 500 Ontario-based companies. An out-sized proportion of those companies are based in the Windsor-Essex and Waterloo regions.

For decades, much of Ontario's automation and tooling industry was simply characterized as an appendage to the automotive industry. Those who characterized the industry as such often did so with good reason: the automotive industry was the largest and most dominant customer of many or most Ontario-based automation and tooling companies. Fast-forward to 2024, however, and the automotive industry represents only one important customer among several for many automation and tooling manufacturers. There are also a growing number of technologies that cut across different industries and sectors. Re-defining the manufacturing automation and tooling industry is therefore an increasingly important initiative.

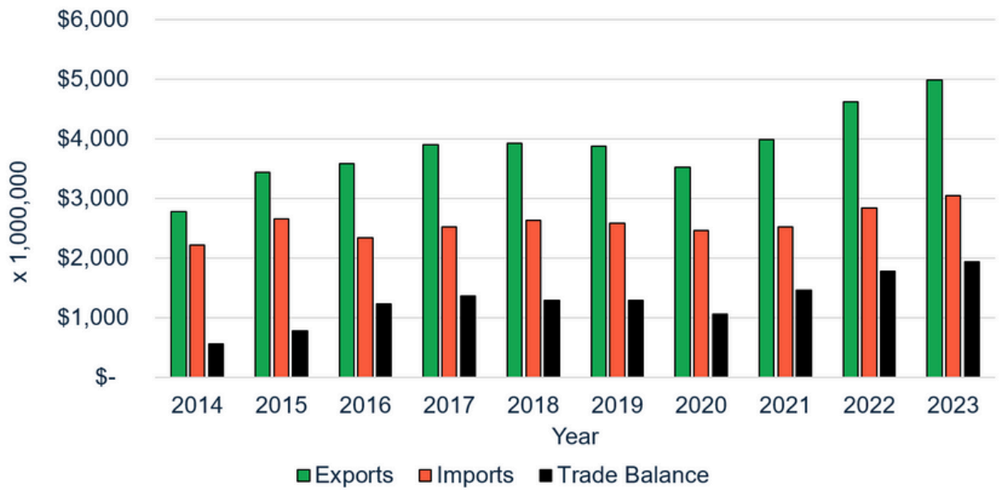
Moreover, re-defining automation and tooling as its own industry using an amalgamation of different NAICS codes is similar to the manner in which Statistics Canada defines the **ICT sector**. In doing so, it demonstrates the importance–and potential–of an industry that is an increasingly important part of Ontario's advanced manufacturing ecosystem, and vital to its long-term competitiveness and profitability.

Promote Ontario-Made Automation and Tooling Technologies

Once Ontario's automation and tooling industry is better defined, industry stakeholders can begin to promote it more emphatically. This would involve promoting Ontario as a place for homegrown and foreign companies alike to invest in the production and development of automation and tooling technologies. It would also involve initiatives designed to help Ontario-based companies grow export markets in the United States and with other trading partners.

As mentioned above, Ontario-based automation and tooling companies have a strong reputation for supplying the automotive industry in Canada and the United States. In fact, Ontario's industrial and metalworking machinery trade balance with the United States is nearly $2 billion in the province's favour (Figure 6). Much of this has to do with exports of automation and tooling technologies from Ontario to vehicle assemblers and automotive parts manufacturers in the U.S. This includes machinery used to assemble EVs and EV components.

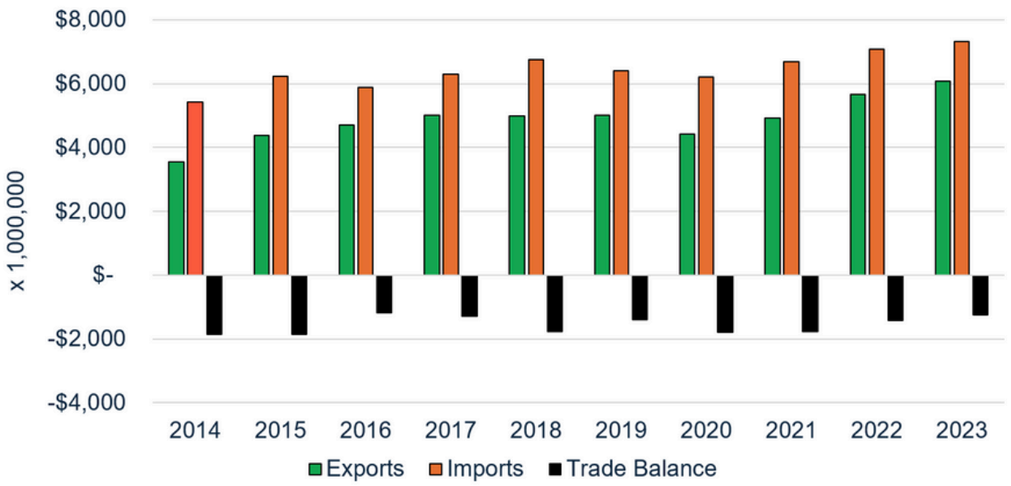
Figure 6: Ontario and U.S. Industrial and Metalworking Machinery Trade, 2014-2023



Source: ISED Trade Data Online

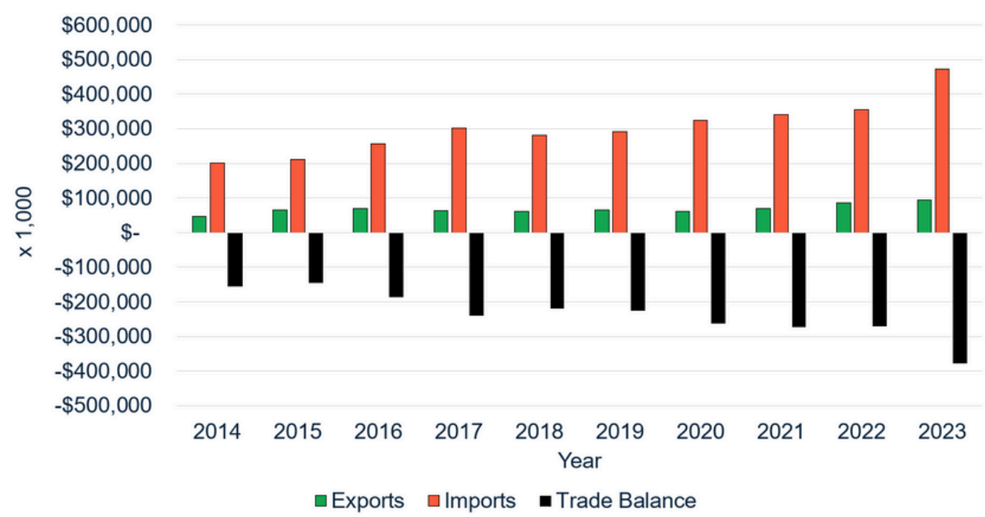
Notwithstanding that, Canada's overall trade balance in industrial and metalworking machinery is negative (Figure 7). One of the main reasons for this is that other important and fast-growing manufacturing industries–namely food–rely heavily on advanced machinery imported from the United States, Germany, France, and Italy (Figure 8). Food manufacturing in Ontario is growing, is less subject to market cycles than the automotive industry, has strong linkages to the province's agriculture sector, and is generally important to public well-being. An initiative to promote Ontario-made automation technologies in the province's food manufacturing industry could have substantial positive long-term effects for the broader manufacturing sector.

Figure 7: Total Ontario Industrial and Metalworking Machinery Trade, 2014-2023



Source: ISED Trade Data Online

Figure 8: Ontario Food Manufacturing Equipment Trade, 2014-2023



Source: ISED Trade Data Online

This negative trade balance will likely increase in the next few years as large EV battery cell plants, which will rely almost entirely on imported machinery, come online. There probably isn't much we can do to change this in the short-term given the highly specific nature of the machinery in EV battery cell plants. A well-defined manufacturing strategy could, however, focus on developing and promoting the capabilities of Ontario-based companies. It could also encourage foreign direct investment in food processing and EV battery manufacturing technologies. The latter initiative could allow Ontario to emerge as a platform to serve the North American EV battery industry.

Ontario has unique advantages vis-a-vis other jurisdictions given the importance of software in advanced automation and tooling systems. Integrating software–including artificial intelligence–is increasingly important to advanced manufacturing automation and tooling systems. This is one place where Ontario's advanced manufacturing sector can truly leverage the well-developed clusters and networks of software and other ICT capabilities that exist in Waterloo and the Toronto region.

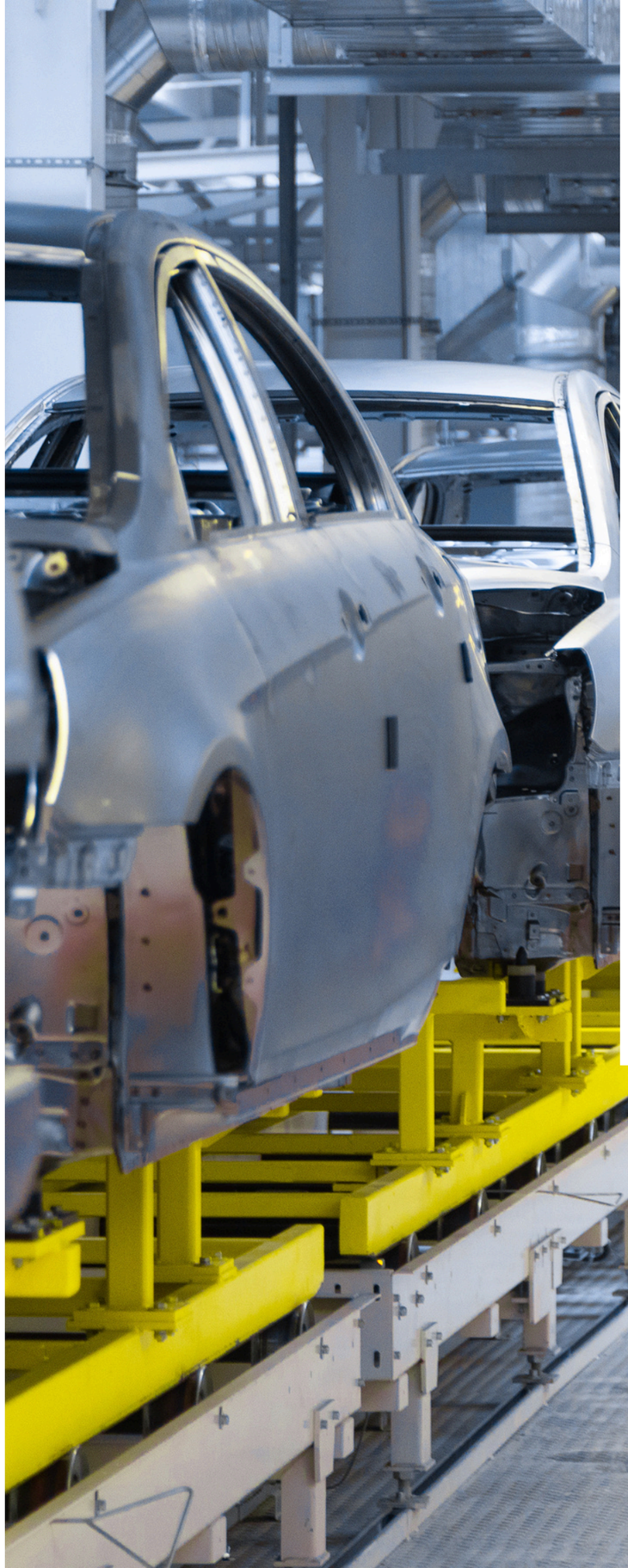
Foster Ontario-Based Automation Champions

Our 2020 study with Automate Canada identified more than 500 Ontario-based automation and tooling technology manufacturers. These were all ‘bricks-and-mortar’ manufacturers, and did not include several hundred additional manufacturing automation technology service providers. Most of these companies are locally-owned.

Some of the largest and most prominent of these companies identified in 2020 included Valiant TMS (Windsor), ATS Corporation (Cambridge), Eclipse Automation (Cambridge), CenterLine (Windsor), and Hibar Systems (Richmond Hill). These companies have two main things in common: they were founded in Ontario and they develop and manufacture world-class manufacturing automation technologies. However, three of these companies are no longer Ontario-owned. Valiant TMS was sold to a consortium of Chinese investors in 2016. Tesla (yes, that Tesla) acquired Hibar Systems in 2019. Ireland-based IT services and consulting company Accenture acquired Eclipse in 2022. While each of these companies continues to operate in Ontario (and in the case of Hibar Systems and Eclipse, their Ontario manufacturing footprints have grown considerably since being acquired), they are no longer under Canadian control. Illinois-based SyBridge Technologies also acquired and consolidated several Windsor-based tooling and mold manufacturers in 2020 and 2021. The company has not clarified its long-term intentions as they relate to its Canadian operations.

On one hand, the acquisition of Ontario-based automation and tooling technology companies by the likes of Accenture and Tesla is a vote of confidence in the capabilities that exist in the province. It also begs the question: what do Accenture and Tesla know about these companies that local stakeholders might not? On the other hand, it is much more difficult to promote and reap the benefits of ‘homegrown champions’ when they are owned by global companies.

Ontario would benefit from having more homegrown champions in the automation and tooling technology industry. At the very least, the most important Ontario-owned automation and tooling technology manufacturers must stay that way. An important component of a manufacturing strategy for Ontario would therefore involve identifying, fostering, and promoting these types of companies, but not doing so in a way that leads to their acquisition by large foreign companies.



Greater Collaboration Among Associations

Industry associations play an important role in Ontario’s advanced manufacturing sector. Whether it is Canadian Manufacturers and Exporters (CME) leadership sitting on the OAMC or the Automotive Parts Manufacturers’ Association (APMA) engaging in trade negotiations, these organizations are vital ecosystem partners.

The voices of automation and tooling technology manufacturers, and of the automation and tooling technology industry, need to be amplified and unified. The lack of a province-wide association or council that speaks on behalf of the industry is detrimental to the industry’s progress. This is perhaps the reason why the OAMC did not include a representative of the automation and tooling industry.

There are several organizations that represent the interests of smaller, discrete groups. They include the sibling organizations Automate Canada and the Canadian Association of Mold Makers (CAMM), the Canadian Tooling and Manufacturing Association (CTMA), and the Canadian Robotics Council (CRC). The APMA has a tooling and automation committee, which focuses on the automotive parts industry.

These organizations are known to collaborate formally on some occasions. Many share common members. Advancing partnerships among these and other related organizations as a means to promote Ontario-made automation and tooling technologies at home and abroad seems like a fruitful and low-risk endeavour.

CONCLUSION

Advanced manufacturing is vital to Ontario's prosperity and economic well-being. The manufacturing sector has undergone substantial changes over the past decade. Some of these changes, such as record levels of capital investment since 2020, are promising. Others, such as stagnant productivity, and a decrease in the number and proportion of well-paying jobs, are less promising.

This report demonstrates that Ontario needs a well-conceived strategy to guide its advanced manufacturing sector now more than ever. This strategy should emphasize quality over quantity, should emphasize the growth of high-potential industries and companies, and should focus on improving key metrics such as productivity, contributions to GDP, and job quality. To achieve this, we recommend novel and innovative approaches to investment incentives, talent and workforce development, and technology and automation.

The recommendations in this report are based on the data-driven and objective research of the Trillium Network for Advanced Manufacturing. They are meant to complement and supplement the efforts of the Ontario Advanced Manufacturing Council and other stakeholders that are developing strategies to guide the province's advanced manufacturing sector into the future. We look forward to contributing to these, and other initiatives, over the next decade.

Trillium @ 10

People of Trillium

Brendan Sweeney
Managing Director

Paul Boothe
Founder,
Managing Director

Denise Deschênes-McKay
Associate Director

Erman Sener
Associate Director

David Moloney
Deputy Director

David Hudson
Deputy Director

Alister Smith
Deputy Director

Greg Keenan
Strategic Adviser

Danielle Gagnon
Financial
Administrator

Jonathan Soriano
Program Officer

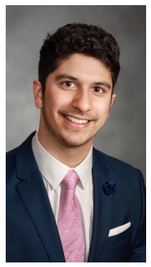
Shannon Miller
Program Officer

Natasha Bartlett
Program Manager

Nick Persichilli
Communications
Officer

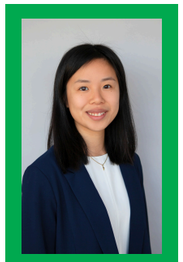
Riley Kemp
Program Officer -
GIS Specialist

Umair Khot
Research Associate



David Zhang
Program Officer

Jake Anderson
Research Associate



Eva Kwan
Research Associate

Talissa Watson
Research Associate

Michael Cox
Strategic Data
Analyst

Drake Kindred
Program Officer

Jack Mordue
Program Officer

Kevin Madden
Research Associate

Andrew Rebus
Research Associate

Brandon Chang
Research Associate

Anu Lalith Kumar
Research Associate

Kriti Jangpangi
Research Associate

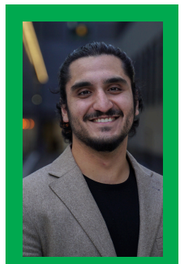
Andrew Horne
Program Officer

Bing Feng
Program Officer

Kane Geng
Communications
Assistant

Kristine Clarin
Communications &
Marketing Assistant

Michael Chiang
Research Associate



Johar Prirzada
Program Officer

Ben Whitney
Board of Directors

Scott Mackenzie
Board of Directors

Jayson Myers
Board of Directors

Alison Newton
Board of Directors

Paul Madden
Board of Directors

Darryl Spector
Board of Directors

Ray Tanguay
Board of Directors

Ian Howcroft
Board of Directors

Carol Stephenson
Board of Directors

In Memoriam

Richard Dicerni

Co-founder

1949 - 2023

TRILLIUM NETWORK
FOR ADVANCED MANUFACTURING

Trillium Network for Advanced Manufacturing
Room 6306
Social Science Centre
Western University
London, ON N6A 5C2

info@trilliummfg.ca

519 661 3351