

How can Public Policy help Sustain a Globally Competitive Canadian Automotive Industry?

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Executive Summary

The benefits to Canada and Canadians of a globally competitive automotive industry with production and research capabilities in Canada are multiple. These include the attraction of foreign direct investment; direct and indirect employment of tens of thousands of Canadians in ‘good’ manufacturing and professional jobs; opportunities for hundreds of small and medium sized businesses, especially auto parts suppliers, that support the automotive industry; and demand and opportunities for expanding Research and Development capabilities. Attracting investment in expanded automotive production is intensely competitive as many countries around the world seek the economic benefits of an automotive industry. As a result, Canada is facing considerable challenges in maintaining its automotive footprint in the current period. This has occasioned public debate over the possible role that governments should or should not play in supporting the automotive industry; and if government is involved in supporting this industry what are the strategies and policies most likely to be successful in securing Canada a global automotive production platform.

This report addresses many of these questions. It is based on research done by an expert research team supported by Automotive Partnership Canada to develop evidence about manufacturing policy options and levers available to governments for use in support of Canada’s automotive industry. Our research recognizes that the policy tools available to governments to support industry have been restricted by free trade agreements and dominant global trade norms. Our research team looks for best practice policy around the world, seeking to understand how Canada can learn from other countries about how best to leverage its strengths in supporting the automotive industry.

Introduction

The automotive industry contributes significantly to Canada's economic prosperity through investment, employment and technological innovation. In 2013, it contributed \$16 billion to Canada's Gross Domestic Product, \$65 billion in exports (or 15% of Canada's total exports), and employed approximately 120,000 people directly (Yates, 2014; Sweeney 2014; CAPC, nd). The automotive industry has one of the greatest spin-off employment and R&D effects of any industry worldwide due in part to the "highly developed supply chain and also to downstream spending effects" (Stanford, 2014, p.8; see also Hill, Menk, and Cooper, 2010). It is estimated that over half a million people's jobs are dependent on automotive manufacturing in Canada.

Although public policy played a critical role in the automotive industry's development worldwide in the mid-20th century, many western governments came to eschew such industry support in the wake of widespread beliefs about the need for governments to get out of the way of business to let markets work. The 2008-9 financial crisis challenged this way of thinking and many governments began experimenting with new tools of industrial policy. These policies are altering the global economic and political landscape of the automotive industry. For Canada to secure a future in this rapidly changing landscape of automotive manufacturing, a consensus is beginning to emerge that a more activist role for government is necessary.

Canadian Industry

Canada's place in the global automotive industry has been challenged by competitors from Mexico, the U.S. South and South East Asia (Holmes, 2014). In 2014 Canada dropped to the tenth largest light-weight vehicle producer in the world, from eighth in 2004 and fourth in 1999, with Mexico moving into the top ten producers (OICA). Without any domestically owned vehicle manufacturers, assembled vehicles in Canada are produced entirely by American and Japanese owned multinational corporations, namely Ford, Fiat-Chrysler, General Motors, Honda and Toyota. Canada has an extensive network of automotive parts producers, the majority of which are Canadian owned, a handful of which are large global MNC's (See Table 1 of Parts Producers by ownership, size). As well, many of the world's top Tier One parts manufacturers have operations in Ontario. Canada's automotive industry is export dependent, especially on the U.S. In 2014, 79.3% of Canada's total trade by value was with the U.S., including 97% of automotive exports (Holmes, 2014).

Table 1: Canadian Automotive Parts Supplier Plants by Nationality of Ownership and Size of Company, 2015

	# of Plants	% of All Plants	Top 100	% of All Plants	Not Top 100	% of All Plants
Canada	483	67%	86	12%	397	55%
USA	116	16%	55	8%	61	8%
Japan	54	7%	25	3%	29	4%
Germany	26	4%	13	2%	13	2%
Other	44	6%	13	2%	31	4%
Total	723	100%	192	27%	531	73%

Source: Automotive Policy Research Centre Industry Profile, 2015 (<http://aprc.mcmaster.ca/profile>)

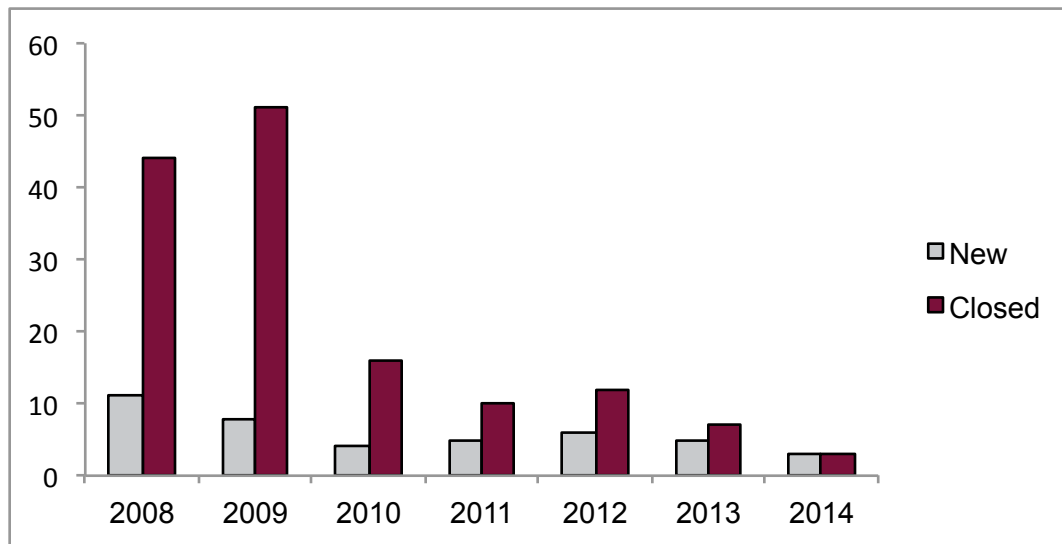
Note: Top 100 firms as listed by Automotive News (2013). To be updated July 2015.

Although the integration of Canada's automotive industry with the U.S. dates back to 1965 with the signing of the Autopact¹, continental integration was deepened in the 1980s and early 1990s by the signing of free trade agreements with the U.S. and Mexico. The process continued in the last decade due to ongoing shifts in OEM (Original Equipment Manufacturers) strategy. In efforts to reduce costs coupled with government pressures to produce in home markets, OEM's around the world are tending to produce a larger share of their vehicles closer to the markets where those vehicles are sold. As the U.S. is the dominant market in the North American region, this makes Canada increasingly reliant on the U.S. market for its automotive products. Whilst Canada's proximity to the U.S. market gives it an advantage in attracting new investment from offshore OEMs, recent trends towards U.S. protectionism incent OEM's to invest in the U.S.

Over the last ten years, Canadian automotive vehicle and parts producers have faced much greater competition within the North American region. Vehicle and parts producers have made significant investments in the southern U.S. and Mexico, including investments by German and Korean car manufacturers whose market share in North America is growing. Since 1993 when Hyundai closed its production facility in Québec, there have been no investments by German or Korean automakers in Cana-

da, although some affiliated parts makers have invested in Canada. Since 2004, Canada has received over \$1 billion in investment in Greenfield assembly operations (with one new assembly facility by Toyota), compared to over \$15 billion in Mexico. Since the 2009 economic crisis, there have been 9 new assembly plants built or announced in North America – and almost every one of them (including Toyota’s recent announcement of a new Mexican plant to build its Corolla, currently assembled in Canada) is located in Mexico. During the same time period, there has been significant churning in the automotive parts sector in Canada. Since 2008, 145 automotive parts plants have closed, 55 of which were U.S.-owned and 34% of which were unionized. In the same period, 41 auto parts plants have opened, 18 of which are Canadian owned and 12% are unionized. See Figure 1 for year by year information on auto parts supplier openings and closures.

Figure 1: Auto Parts Suppliers, Openings and Closures in Canada, 2008 – 2014



This reconfiguration of the North American automotive industry has resulted in greater production in Mexico, production that is primarily destined for export. In 2013, Mexico exported 82.6% of its total output of the automotive industry, 68% of which went to the U.S. The result has been greater competition between Canada and Mexico to produce automotive products for the American market. Canadian parts makers also face competition for supplying the Canadian assembly operations as Mexican parts producers are exporting a growing volume and value to Canada (Holmes, 2015). In addition to very low total labour costs and a government that has systematically removed any restrictions on foreign investment, Mexico has the added advantage of proximity to markets in Central and South America, and free trade agreements with many of these countries as well as with Japan and the European Union.

Clearly, Canada cannot compete with Mexico on cost alone. That led some to conclude that the country’s OEMs could be sustained by focusing on the assembly of higher value, more luxurious vehicles. Those notions may have been dispelled, however, by recent investment announcements in Mexico by luxury automakers like BMW, Mercedes and Audi. This trend highlights the need for a renewed strategy going

forward by governments and others involved in automotive investment attraction in Canada.

The importance of maintaining the Canadian automotive industry, and the dangers of losing our automotive industry to competitors was underscored by a report prepared by APRC Industry Research Assistant Dan Irvine, with support from Unifor, the union representing Canadian autoworkers. The report studied the impact on families and several communities of a major loss of automotive investment and production (Irvine, 2014). This report found that plant closures and industry reorganization since 2001 had a decisive negative effect on family incomes and the middle class in Windsor, one of Canada's premier auto cities. These effects were felt especially hard by young workers and families, including those outside the automotive industry. This report is a reminder of the critical importance of the auto industry to Ontario and Canada's economy.

More evidence in this regard was provided by a recent economic study prepared by the Centre for Spatial Economics, commissioned by Unifor (Somerville, 2015). This report analyzed the spin-off economic, employment, and fiscal effects resulting from the potential closure of a major automotive assembly complex (GM's two assembly plants in Oshawa, which face an uncertain future due to a lack of future investment commitments and product mandates). The report estimated that GM Oshawa's closure would result in the loss of up to 33,000 jobs in total, depress average wages across the labour market, reduce Canada's GDP by over \$5 billion, and permanently reduce fiscal revenues to the Ontario and federal governments by a combined total of over \$1 billion per year.

Government policy and practice have had a significant impact on the fortunes of the automotive industry in the U.S. and Mexico (Galvin et al., 2014) and hence on competition with the Canadian industry. It is critical that Canadian governments understand this role and the potential role for policy in growing a globally competitive Canadian automotive industry. In this paper, we discuss some of the key outcomes of our policy research, aimed at identifying policy levers that can be used to sustain and potentially grow a globally competitive automotive industry in Canada.

Attracting Investment

There has been much media concern expressed about Canada's perceived weak performance in attracting new automotive investment over the last five years. The focus of attention has been on investment in Canada's automotive assembly capacity, although the reluctance of major auto parts companies to make new investments in Canada is also cause for concern. According to a 2014 report by the Canadian Automotive Partnership Council (CAPC), Canada's share of total automotive investment and production has declined significantly (CAPC, 2014, p.8). Greg Keenan, of the *Globe and Mail*, reported BMW's 2014 announcement of a \$1 billion investment in a new automotive assembly plant in Mexico, concluding that: "Mexico has won new auto investments worth \$2.4-billion (U.S.) in one week, just \$800-million less than the \$3.2-billion invested by auto makers in Canada since 2010" (Keenan, 2014). In April 2015 the process was repeated when both Ford and Toyota announced significant incremental investments in Mexico. Even more worrisome, Canada's declining share of investment is happening at a time of relatively strong capital investment in automotive

assembly capacity in North America (Faria, 2015).

According to research done by Charlotte Yates and Wayne Lewchuk, there are multiple factors that make a country attractive to automotive investors. Their research concludes that the major factors determining investments are proximity to major markets, availability of a skilled and literate/numerate labour force, total labour costs (including costs associated with health benefits, pensions, work stoppages, or threats thereof), logistics, trade relations with major markets, production quality, and government incentives. The relative weight of these factors varies by region. Especially important is whether companies have existing production facilities in a country/region, as well as a developed auto parts supply network. The sunk investment associated with a currently operating assembly operation needs to be calculated in investment decisions especially in terms of the high cost of shutting down a facility versus the benefits of maintaining the said facility.

Yates and Lewchuk also point to the importance of relationships as a factor in shaping investment decisions. Interviews with industry and other stakeholders repeatedly point to the importance of visits with corporate leaders and companies by senior government officials, such as when Prime Minister Paul Martin visited Toyota during a trade mission to Japan. This visit is argued to have been critical to securing Toyota's recent investment in assembly in Canada. Investment decisions, notwithstanding the growing reliance on site location firms, are human decisions, rather than purely scientific ones, shaped by economics as well as political, social and cultural relationships and norms. Consequently, the relationships and lines of communication across the different levels of government and between governments and companies are critical to success in attracting investment.

Yates and Lewchuk's research has paid particular attention to the question of the role of incentives in Canada and the U.S. in determining investment decisions. They point to the high variation in the value of incentives offered by jurisdictions. Whereas incentives in Canada are valued fairly consistently at between 20% and 25% of fixed capital spending, incentives in the United States vary much more widely and tend to be greater in value, ranging from 20% to over 50% of the value of investments. If one counts long term commitments to tax free status offered by some U.S. states, the value of incentives for some projects such as the Sterling Heights, Michigan Chrysler plant was greater than the actual company's capital spending on a new or retooled facility. The specific characteristics of incentive packages differ between the two countries, in large part due to legislative restrictions on what Ontario governments, especially municipalities can offer to companies as incentives. For example U.S. states and cities/communities often offer cash, free land, and long-term tax free investments, whereas Ontario's legislation prohibits municipal bonusing and tax incentives to attract investment.

Yet our research concludes there are several factors that are under-valued in a comparative analysis of incentives by Canadian and American governments. A significant portion of investment incentives in the U.S. South is focused on training and education upgrading of the workforce. Interviews and data analysis confirm that the Canadian workforce has a higher overall level of education and is more disciplined, stays longer at a job and is knowledgeable of working in the automotive industry. Moreover, publicly funded community colleges have developed relationships with

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and training programs for automotive assemblers that require less cash incentive to establish than is required in the U.S. Interviews done as part of Lewchuk and Yates’s research confirm that the value of training incentives offered in the U.S. is worth millions of dollars. The same incentives are available in Canada, but as already sunk public investment in the colleges and universities system. This means that the real value of what Canadian jurisdictions can and do offer to support new automotive investment is understated and undervalued.

The value of relationships is the second variable that is almost always overlooked in analyses of recruitment of automotive investment. Interview after interview point to the importance of relationships between the investing company and government officials involved in negotiating incentives. It is not possible to place a tangible dollar-level value on their importance, but anecdotal stories of important social functions such as BBQs between company officials and U.S. state governors are the more colourful examples of the very real power of relationships in establishing successful business ties. This should come as no surprise as relationships have long been recognized in business as building the trust, responsiveness and social networks and long-term relationships between companies and governments that are critical for productive business relationships and deepening an understanding of the value of national competitive advantages. The subtlety – and under-appreciated aspect – however, is that it is governments, rather than other companies, that are building these business relationships in order to secure investment.

The final factor that is undervalued in shaping investment is the importance of a well-conceived advanced manufacturing strategy that articulates individual policies into a coherent course of action and is founded on coordination across multiple levels of government. In a highly competitive environment where Mexico and the U.S. have developed such strategies and are actively recruiting investment, delays in communication, an inability to coordinate across multiple levels of government, conflicts between officials at different levels of government or contradictory business incentive programs all undermine the ability of Canada to be successful in its recruitment of investment. Lewchuk and Yates’s research also revealed how a lack of communication across different departments within government can hinder the effectiveness of implementing policy aimed at attracting investment. A more sustained discussion of this factor leads us to our second key finding about how policy shapes the development of the automotive industry.

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Government Coordination of Policy and Industry Supports in a Multi-level Government

The 2008-09 crisis in the financial industries reminded many governments of the importance to financial stability and vitality of a more balanced economy, which includes a robust manufacturing sector. As manufacturing had been hollowed out in many countries over the previous two decades, its renaissance required government action. Many governments rediscovered industrial policy levers in their search for means to protect themselves from the worst effects of the 2008-09 financial crisis by securing greater investment and innovation. An example can be found in Canada's 2009 rescue plan for then-bankrupt GM and Chrysler. Canadian governments agreed to participate in the bi-national (U.S. and Canada) effort to rescue GM and Chrysler from collapse on the condition of commitments to the 'Canadian manufacturing footprint'. These compelled each company to maintain a share of its total North American production in Canada commensurate with the share of funding provided to companies as part of the rescue package offered by the Canadian governments: 16% for GM, 20% for Chrysler. These commitments expire in 2017.

While this example looks very similar to policy levers used as part of the Autopact from the 1960s to 1990s, new forms of industrial policy tend to be distinct from these older forms of industrial policy. This is in part a consequence of free trade agreements, in particular the WTO and NAFTA, which restrict the ability of a country to use a subsidy in a way to distort trade, support domestic industries at the expense of foreign competition, inhibit the ability of foreign investors to operate within its territory, require a specific domestic content or level of employment or to require the transfer of technology or knowledge. Governments are therefore constrained in what they can do to support a particular industry (NAFTA, 2013; WTO, 2013a, 2013b). The challenge of Ontario's green energy policy by Japan, the EU and ultimately the WTO is a reminder of the difficulties of navigating this policy terrain. Consequently governments are reluctant to be seen to be picking winner or losers. Yet, governments around the world have adapted with new industrial policies often aimed at supporting entire economic sectors, such as Advanced Manufacturing, with policy supports aimed at attracting investment through subsidies, bolstering R&D through the use of tax credits, and in some cases using procurement policies to support domestic producers.

New industrial policy is in part rooted in enabling industry capabilities through new forms of governance and government investment. Pat Galvin, Elena Goracinova, and David Wolfe conclude that laying the conditions for successful technological innovation and competition requires forms of "networked governance" wherein firms, research institutions (including universities) and governments collaborate to push forward innovation and commercialization with the aim of securing a competitive advantage in manufacturing, especially in emerging technologies. Examples of successful networked governance and innovation can be seen in Germany's government investment in Fraunhofer institutes, which bring together industry and university researchers, to engage in applied research aimed at supporting the commercialization of innovations (Galvin et al., p.7-8; 88-93).

For these collaborative initiatives to succeed, according to Galvin et al., "... officials work to improve policy coordination across multiple levels of governance." This coordination is especially important, yet challenging, in multi-level governance

arrangements which characterize federal systems of government, in Mexico, U.S., Germany and Canada, to name a few. Yet as David Wolfe's research team demonstrate through their research, most of these countries, with the exception of Canada, are engaged in courses of action that have improved coordination across a network of stakeholders, including governments. By supporting the collaborative interaction between companies, universities and other key stakeholders, governments are creating the conditions under which innovation is more likely to occur. Examples relevant to the automotive industry from other countries include specific sub-regional government initiatives, often aimed at securing a future in emergent areas of technological innovation such as hybridization and lightweight materials. Their research increasingly points to the importance of the institutional configuration of governments' roles in developing and pursuing successfully industrial policy.

Canada is seen by many analysts and stakeholders as lagging behind in this capacity to coordinate multi-level government initiatives. Some governments remain reluctant to develop active policy support for manufacturing, believing that industry players and markets shoulder responsibility for the future of industry. Provincial and federal governments have not developed well-coordinated manufacturing policy responses, although many individual policies benefit the automotive industry. Canadian governments have tended to rely on discrete policies and actions in support of individual automotive company plans. Examples include the federal Automotive Innovation Fund and the Ontario Jobs and Prosperity Fund, both of which have been crucial in securing investment in Ontario's automotive industry and yet are not articulated as part of a larger automotive strategy. Other policies important to the industry are investment in improved logistics such as the construction of the new bridge from Windsor to Detroit, Research and Development tax credits, assistance in developing export markets and low corporate taxes. Yet these individual policies and programs are individually articulated, and often flounder on lack of coordination across governments or departmental ministries. One example of the latter can be found with the federal Automotive Investment Fund which offers financial support in the forms of loans to automotive companies investing in Canada, but whose value is undermined by Canada Revenue Agency which has insisted on charging taxes on all the monies received through AIF in the first year (CAPC, 2014). According to interviews with industry and economic development stakeholders, coordination between the federal and provincial governments is often impeded by political distrust, bureaucratic silos and lengthy periods of time needed to coordinate across multiple ministries and levels of government. Often municipalities are brought into discussions around automotive investment often too late for them to have a decisive impact on investment decisions (Lewchuk and Yates). This is often related to the fact that in jurisdictions outside of Canada, municipalities are active partners in the investment attraction function, facilitated by their legal capacity to offer direct financial incentives. Such activities by municipalities are illegal in Ontario, a fact that contributes to municipalities being brought in late to the investment process, often after location decisions have been made.

The challenges of cross-government coordination in Canada contrast to the experiences in the U.S. and more recently Mexico where coordination across levels and Ministries of government has been significantly improved, and decision-making turn around is quick. Governments in Canada are aware of their institutional limitations and have begun working to overcome these to make policy more effective. But governments in the U.S., Mexico, Great Britain and elsewhere have a lead that Canada needs to

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overtake.

The Auto Industry of the Future: Canada's place

Networked governance and a reluctance to 'pick winners' does not preclude strategic government investments in the automotive industry, based on understandings of Canada's emerging technological and production capabilities. Technological mapping is defined by Industry Canada:

as a document outlining future market demand and the recommended means to meet this demand. A roadmap does not predict future breakthroughs in science or technology; rather, it forecasts and articulates the elements required to address future technological needs. A roadmap describes a given future, based on the shared vision of the people developing the roadmap and provides a framework for making that future happen technologically. (Industry Canada, 2007, p. 3).

Technology mapping is done by many countries around the world, as it allows them to develop a more comprehensive understanding of technological trends, how new technologies can address certain 'big' social, environmental or economic questions and therefore also allows some planning and coordination, including possible government support, of particular industries. It is also used by many major automotive supply companies, such as BorgWarner which deploys more than 30 roadmaps (Warrian and Smitka 2015). Canada does not have a policy tradition of engaging in technological mapping, although members of our APRC research team are working on developing such a technology map for vehicle electrification.

We are living at a juncture of technological transformation of the automobile, two trends of which have particular potential for the growth and global competitiveness of the Canadian industry. Those two trends are 1) the pursuit of lower vehicle emissions in efforts to reduce air pollution and 2) the vehicle as a hub of connectivity. Together, these are generating momentous change in the design and production of the automobile. Changes range from the shift from internal combustion to electrical propulsion methods (Petrunic, 2014), engineering and refining of lightweight materials (and the technologies needed to implement them) for auto design and the manufacture of the auto body and parts (Warrian and Smitka, 2015), optimizing engine fuel efficiency, and aerodynamic styling including a move to improve small car driving experiences. These changes are transforming the automotive industry, with significant social, economic and infrastructural effects, including which auto parts companies are likely to grow in these markets (Rutherford and Holmes, 2014), changes to trade patterns as countries such as China have especially strong demand for more fuel efficient vehicles, and planning around the future skills sets needed for employees. Petrunic (2014) has been studying many of the impacts of electrification of vehicles, including policy implications such as expected need for new public infrastructure to support charging of electric vehicles.

Canada's fuel efficiency regulations track similar rules developed in the U.S., in large part due to the integrated nature of the Canadian and American automotive industries. Rising gas prices which pushed consumers to seek ways of reducing their

consumption, combined with fuel efficiency policies, created the conditions whereby companies invested massive R&D dollars to continuously improve fuel efficiency through new technologies aimed to shift the automobile from its reliance on gasoline-powered internal combustion engines (ICEs). Although declining gas prices may have impacted the immediate urgency of developing more fuel efficient vehicles, companies continue to push ahead in their research and design to achieve fuel efficiency improvements. This includes hybrid-electric vehicles, and in the case of Toyota, those powered by fuel cells. Yet there remain many technological frontiers to be traversed for assemblers to be successful in their pursuit of a low emission and fuel efficient vehicle that can travel long distances and deliver the power expected by consumers at a cost below \$40,000. This demand for technological innovations opens opportunities to auto parts firms, R&D consortiums as well as technology firms seeking to enter the automotive industry. Governments around the world are scrambling to support R&D and secure investment within their own borders that will provide their automotive industry with the competitive advantage to spawn innovations, products and companies capable of providing assemblers with the technological answers to these as yet unanswered questions.

Canadian governments have joined in this competition, investing significantly in R&D efforts and introducing policies aimed at encouraging private investment in fuel efficiency technologies. The federal government's Automotive Innovation Fund, first introduced in 2008, allocated "\$250 million over five years to support automotive firms' strategic, large-scale research and development (R&D) projects to build innovative, greener, more fuel-efficient vehicles" (Industry Canada, <https://www.ic.gc.ca/eic/site/auto-auto.nsf/eng/am02257.html>). The program was renewed in 2013 with a similar mandate. The federal government also invested in a Canada Excellence Research Chair in Hybrid Powertrain, held at McMaster University by Ali Emadi. In addition to the various tax incentives and credit programs aimed at encouraging investment in automotive R&D, Ontario's Green Energy Act (2009) and Smart Grid Fund (2011) are aimed at supporting green infrastructural development in support of the adoption of electric cars (Petrunic 2014, p. 23). Québec has been especially active in using the leverage provided by provincial ownership of Hydro-Québec to engage in policy innovation regarding electricity generation and transmission, with the government allocating millions in support of their Québec Transportation Electrification Strategy and related technological development programs (<http://www.hydroquebec.com/about-hydro-quebec/transportation-electrification/>; <http://www.timetoelectrify.ca/2014/03/16/quebecs-transportation-electrification-strategy-2013-2017/>).

What evidence do we have that these policies have had the desired effects of increasing R&D and business opportunities for Canadian located automotive companies? Canada is producing the only hybrid Toyota Lexus outside of Japan and recently Honda announced that it will produce for export to Europe the next generation of CR-V in its Canadian plant. Most recently, Ford's President of the Americas, Joe Hinrichs, announced that Ford would make its next generation GT sports car in Markham, Ontario, working with Multimatic Inc., a global auto parts supplier with expertise in lightweight, carbon fibre materials. These investments speak to Canada's specialized expertise in lightweighting and electrification. Strategic support from governments in these areas will likely be critical in maintaining and expanding a cluster of companies and skilled workforces in these areas, capable of continual innovation.

Embedding computing systems within automobiles to develop advanced

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connectivity between the driver, the vehicle and their environment is the second technological development that promises to transform the automobile, disrupt the automotive supply chain and open up opportunities for Canadian firms and its automotive industry. Google's experiment with the driverless car symbolizes these new developments. The recent comment by Don Walker of Magna Corporation that it is the "best contract manufacturer in the world" (Keenan, 2015) and would be an ideal partner to manufacture a Google car or an Apple car underscores Canada's expertise as well as opportunities for investment and productive capacity in areas related to the connected car. There are many layers to the development of a 'connected car' that range from preventing alcohol-impaired drivers from driving their cars to developing the car as a centre of communication and media connectivity. These open up a range of opportunities for Canadian companies that have already developed innovative technologies for the car of the future, but face challenges in commercializing their inventions.

According to a report done by APRC Industry Research Assistant Ata Munim and Charlotte Yates with support from the Automotive Parts Manufacturers Association and Toyota Motor Manufacturing Canada on the Connected Car (Munim and Yates, 2014), there are dozens of Canadian companies with expertise and, in many instances, innovations in electrical and electronics parts making potentially suitable for inclusion in the automobile of the future. More than 40 of these are small or start-up firms not currently active in the automotive industry. The Connected Car report observed that industry partners associated with the Connected Car project realized that Canadian companies have "very strong technical capabilities and potential in the information technology and electronics sectors that can be utilized in the automotive industry," but many of them do not have experience or the supply chain connections with the large vehicle makers, thus limiting the potential market for Canadian innovations (Munim and Yates, 2014, p. 3-4) Therefore, one of the key goals of the Connected Car project was to "promote Canadian innovation" by developing a "Canadian story" about technological integration achieved through successful collaboration between universities, private enterprise, and governments. Consequently, the Automotive Parts Manufacturers Association with support from Toyota Motor Manufacturing Canada Inc. developed the Connected Technology Vehicle Showcase (CVTS), or the Connected Car project. The primary objective of the project was to create a connected car demonstration vehicle featuring Canadian-made technologies that promoted Canadian capabilities directly to automotive assemblers for the purpose of increasing new business opportunities, commercializing Canadian technological innovations and creating industry employment. The resulting demonstration vehicle highlighted Canada's capabilities in this area, including the existence of a range of small innovative companies with parts suitable for vehicles, the skilled expertise in electrical and electronic engineering coming out of University of Waterloo and the critical importance of QNX Software Systems, a subsidiary of Blackberry, that is based in Ottawa and specializes in providing operating software for numerous technological platforms². QNX provided the industrial design for the vehicle and the technology to integrate the various systems produced by multiple companies. According to one respondent, "[QNX] was really the glue that brought all these partners together and allowed them to interact with each other in a real production-like environment" (Munim and Yates, 2014, p. 10). Most recently the Ontario government has provided support to the APMA to tour the Connected Car in order to showcase its innovations in key markets. The Connected Car project demonstrated the capacity for networked collaboration between technology and auto

parts companies with University and provincial government agencies.

Companies interviewed for the Connected Car research project reinforced a point made earlier in this report about the importance of tight coordination across multiple levels of government. They noted that multiple layers of government and the multiplicity of funding agencies spread across different levels of government (federal and provincial) made funding applications and applying for government support difficult to navigate successfully.

Conclusions

Conclusions

Our research has shown unequivocally that the automotive industry is critically important to the Canadian economy, businesses, automotive communities and the working people and their families living in those communities. Through attracting investment, the creation of thousands of good jobs, investment and business opportunities and R&D spin-offs, the automotive industry is critical to sustaining a balanced economy and a vibrant and sustainable middle class society. Yet, Canada's place in this industry is challenged by greater global competition. We have experienced more intense competition for investment, and are challenged to reduce the cost of production to compete. Our research to date points to the following as important considerations in future government action in support of the automotive industry:

- > Canada has many valuable individual policies aimed at incenting new investment and supporting existing automotive productive infrastructure. Sometimes these policies conflict with one another, or are complex to piece together into an attractive incentive package. Consequently, research points to the importance of adopting a government strategy in support of the automotive industry, or advanced manufacturing, that articulates individual policies into a coherent strategy and plan of action.
- > To achieve the above, it is important that governments learn from their neighbours and partners in the U.S., Mexico and U.K. where coordination across multiple levels of government or Ministries is organized around a principle of 'one-stop shopping', thus contributing to the responsiveness of government policy and action to industry opportunities.
- > To achieve R&D and productive innovation, evidence points to the importance of encouraging nested coordination between government, industry and Universities, something which Canadian governments are currently facilitating.
- > To attract automotive investment in the current globally competitive environment, governments around the world are offering incentives to automotive companies. If Canada wants to secure significant new automotive investment, it needs to continue to offer financial incentives to automotive companies, focusing in particular on sustaining and expanding Canada's OEM assembly operations. Those incentives need to be costed, taking into account sunk investments in Canada's public infrastructure that contribute to our competitiveness.

- > Relationships matter in attracting investment. Although difficult to quantify, relationships between government officials and companies based on trust, transparency and goodwill are important in the final investment decisions.
- > The high quality, low turnover, highly skilled, disciplined and educated Canadian workforce continues to be seen by automotive companies as a competitive advantage. Notwithstanding the higher cost of Canadian labour, the quality of our labour supply is important in attracting certain types of automotive investment.
- > Canada has a world class automotive supply chain with world class Canadian owned automotive parts suppliers. This is a significant competitive advantage in expanding our global automotive footprint.
- > Canada has competitive capabilities in two important emergent areas of automotive industry growth - improving fuel efficiency and developing the connected car. These areas of R&D and innovation are important strategic sites for government policy and R&D support. These could be a testing ground for a more strategic approach to support of the automotive industry.

Endnotes

1. The Auto Pact was a managed free trade agreement that came into effect in 1965. In exchange for removing tariffs on vehicles and automotive parts coming into Canada from the U.S., American vehicle manufacturers (and later Volvo) agreed to specified levels of Canadian content in vehicles, a formula for increasing the value added in Canada, which in turn established guarantees of ongoing investment.
2. In April 2015 General Motors Corporation announced that it was expanding investment in its engineering centre in Oshawa, Ontario to expand its research and development in greening vehicles and connected car technology.

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