Neither Core nor Periphery: Searching for Competitive Advantage in the Automotive Semi-Periphery

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The Story

1. The 'Automotive Semi-Periphery' … What's That?

2. Research Questions

   a. Can semi-periphery automotive countries continue to attract investment in traditional automotive manufacturing activities despite their diminished competitive advantages?

   b. What challenges do semi-periphery countries face in their attempt to transition beyond automotive manufacturing and towards knowledge-based activities more frequently associated with the core?

   c. Can Industry 4.0 make the automotive industries in the semi-periphery resilient / resistant?

Categorization of Automotive Regions and Countries

Core … Periphery … Integrated Periphery … Semi-Periphery

- Sturgeon and Florida (2000)
- Chanarron (2004)
- Sturgeon (2008)
- Lung (2004)
- Domanski and Lung (2009)
- Muniz, Raya and Carvajal (2011)
- Lampon, Lago-Penas, Cabanelas (2016)
- Jacobs (2016)
- Domanski (2017)

Pavlinek (2018)

"Global Production Networks, Foreign Direct Investment, and Supplier Linkages in the ***Integrated Peripheries*** of the Automotive Industry"

PLUS …

Brief discussion to the **Automotive *Semi-Periphery***

Consideration	Core	Semiperiphery	Integrated Periphery
Foreign ownership and control	Low to medium	High	Very high
Domestic global assembly firms	Yes	No	No
Number of domestic suppliers in the global top 100	High	Low	None or very low
Structure of automotive FDI	Outflows predominate	Mixed	Inflows predominate
R&D: Spending, number of R&D workers, patent applications	High	Medium	Low
Structure of assembled vehicles	High share of expensive vehicles	Mixed	High share of cheap/small vehicles
Structure of produced components	Higher share of technologically advanced components	Mixed	High share of generic and labor-intensive components
Capabilities of domestic suppliers	High	Mixed	Low
Supplier linkages	Predominantly developmental	Mixed	Predominantly dependent
Labour costs per employee	High	Medium to high	Low
Wage adjusted labor productivity	Low	Low to medium	High
Examples	Germany, United States	Britain, **Canada**	ECE, Turkey, Mexico

Categorization of Automotive Jurisdictions:

- *Core*
- *Semi-Periphery*
- *Integrated Periphery*

Canada is the prototypical automotive semi-periphery nation

Category / Zone	Core	Semi-periphery	Integrated Periphery
Countries	United States Germany Japan South Korea France Italy	UK Canada Spain Austria Belgium Sweden Finland	Mexico, Slovakia, Poland, Indonesia Iran, Czechia, Turkey, Russia, Thailand, South Africa, Malaysia, Romania, Argentina, Brazil, Slovenia, Morocco, Hungary Uzbekistan, Taiwan, Portugal
	China India		China India

Key Attributes			
Homegrown OEMs	Yes	No	No
R&D Spending	High	Low	None – Low
Labour Costs	High	High	Low
Foreign Ownership	Low - Medium	Medium - High	High
Homegrown Top 100 Suppliers	High	Low – Medium	None – low
Primary **Source of Competitive Advantage**	**Power**	**?**	**Low Cost**

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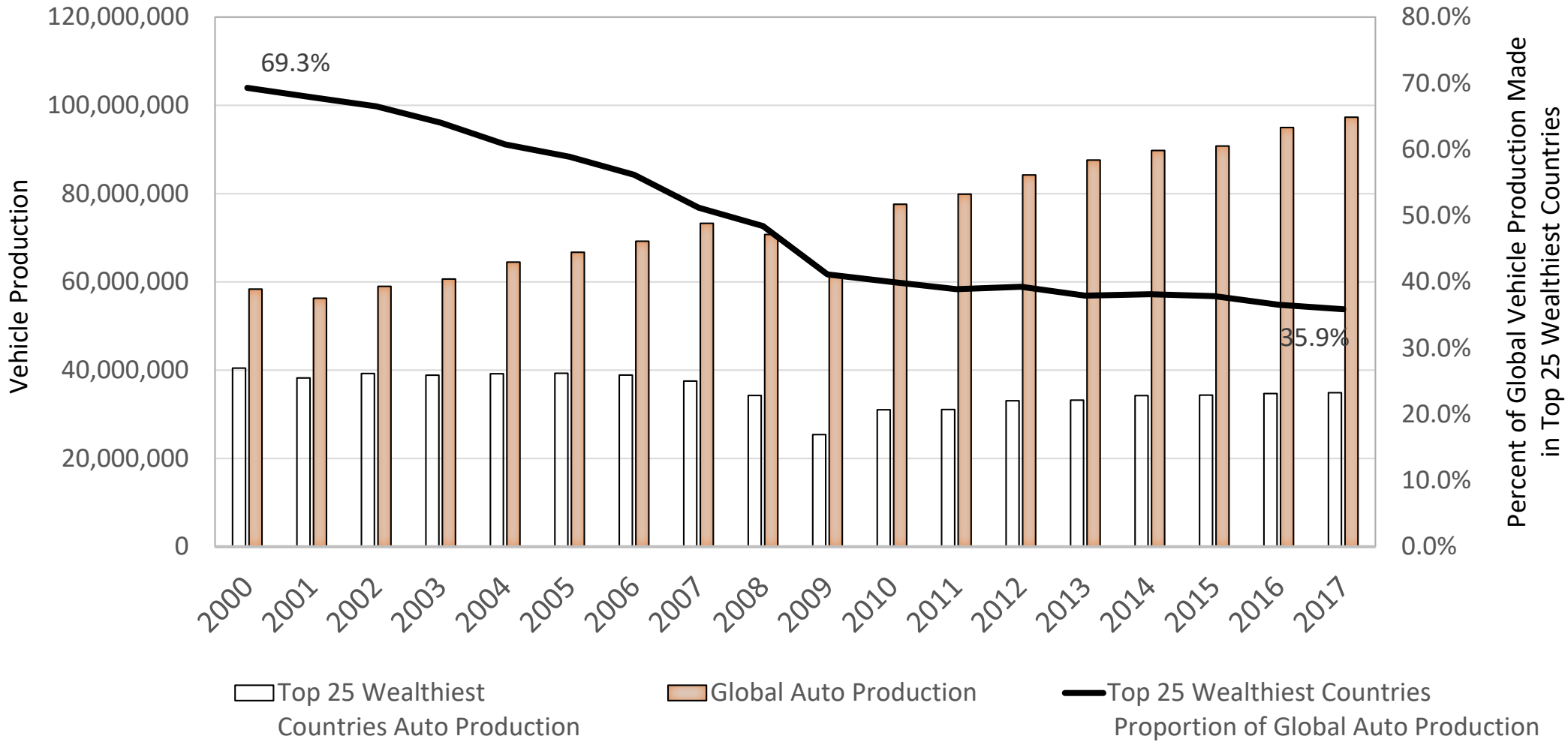
Government Support for Automotive Industry

- Manufacturing
- R&D

Program	Jurisdiction	Sector	Purpose	Type	Time Period	Value ($000)
Ontario Automotive Investment Strategy	Ontario	Automotive	Capital	Cash	2004-2012	500,000
Jobs and Prosperity Fund	Ontario	Manufacturing	Capital	Cash	2012-Present	1,230,000
Program for Strategic Industrial Projects	Federal	Automotive	Capital	Loan	2005-2008	303,716
Automotive Innovation Fund	Federal	Automotive	Capital	Loan	2008-2017	569,605
Strategic Innovation Fund	Federal	Manufacturing	Capital	Cash	2017-2022	1,260,000
Scientific Research and Experiment Development (SRED) Tax Credit	Federal	General	R&D	Tax Credit	1986-Present	n/a
Ontario R&D Tax Credit	Ontario	General	R&D	Tax Credit	Present	n/a
Ontario Innovation Tax Credit	Ontario	General	R&D	Tax Credit	Present	n/a
Sustainable Development Technology Canada	Federal	Manufacturing	R&D	Cash	2001-Present	989,000
Automotive Partnership Canada	Federal	Automotive / University	R&D	Cash	2013-2018	145,000

The Semi-Periphery's Declining Relevance for Vehicle Assembly:

Vehicle Production in the 25 Highest-Wage Countries (Core + Semi-Periphery)



The Semi-Periphery's Declining Relevance for Vehicle Assembly:

Vehicle Production in Semi-Periphery

		2000			2018		
Region	**Country**	**Vehicle Production**	**Share of Global Production**	**Share of Regional Production**	**Vehicle Production**	**Share of Global Production**	**Share of Regional Production**
North America	Canada	2,961,636	5.07%	16.73%	2,014,485	2.11%	11.55%
Europe	UK	1,813,894	3.11%	8.95%	1,604,328	1.68%	7.52%
	Austria	141,026	0.24%	0.70%	164,900	0.17%	0.77%
	Spain	3,032,874	5.20%	14.96%	2,819,565	2.95%	13.22%
	Sweden	301,343	0.52%	1.49%	226,000	0.24%	1.06%
	Belgium	1,033,294	1.77%	5.10%	308,493	0.32%	1.45%
	Finland	38,926	0.07%	0.19%	112,104	0.12%	0.53%
European Semi-Periphery		6,361,357	10.90%	31.37%	5,235,390	5.47%	24.54%
Total Semi-Periphery		9,322,993	15.97%	NA	7,249,875	7.58%	NA

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Canada's Transition to a Knowledge-Based Profile

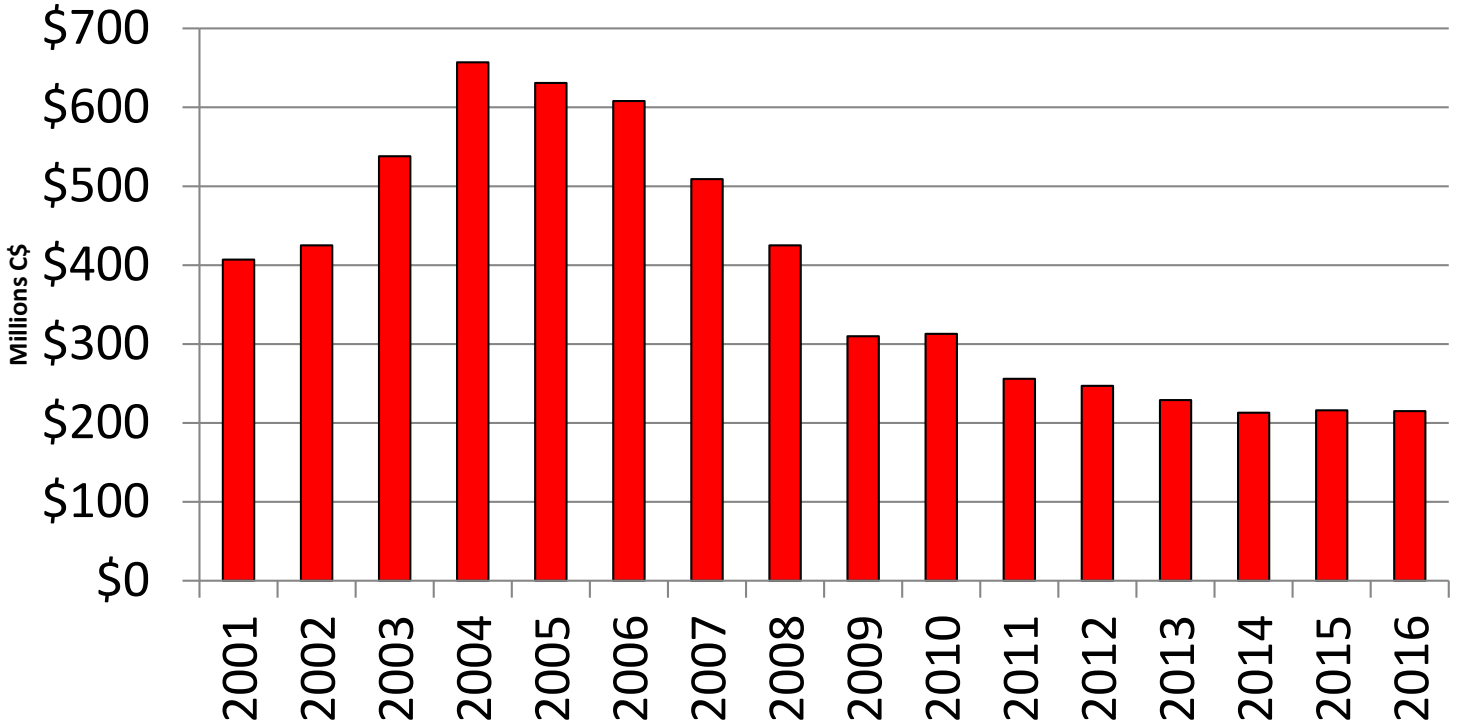
R&D as a means by which to …

> *"lock down and anchor the base, but at the same time, look to the future and be embedded at a very fundamental, elemental level in the technological disruption that will occur"*

Government of Canada

Interview

Automotive R&D Spending in Canada 2001 - 2016



Source: Statistics Canada (2018b; 2018c)

But … there are problems with spending data …

- Sector-level data not available
- No firm-level data
- Comparative analysis not available

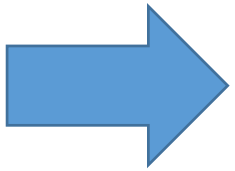
Patents

Why Patents?

- Reveal high-level patterns consistent with output-based statistics (i.e. spending)

But also …

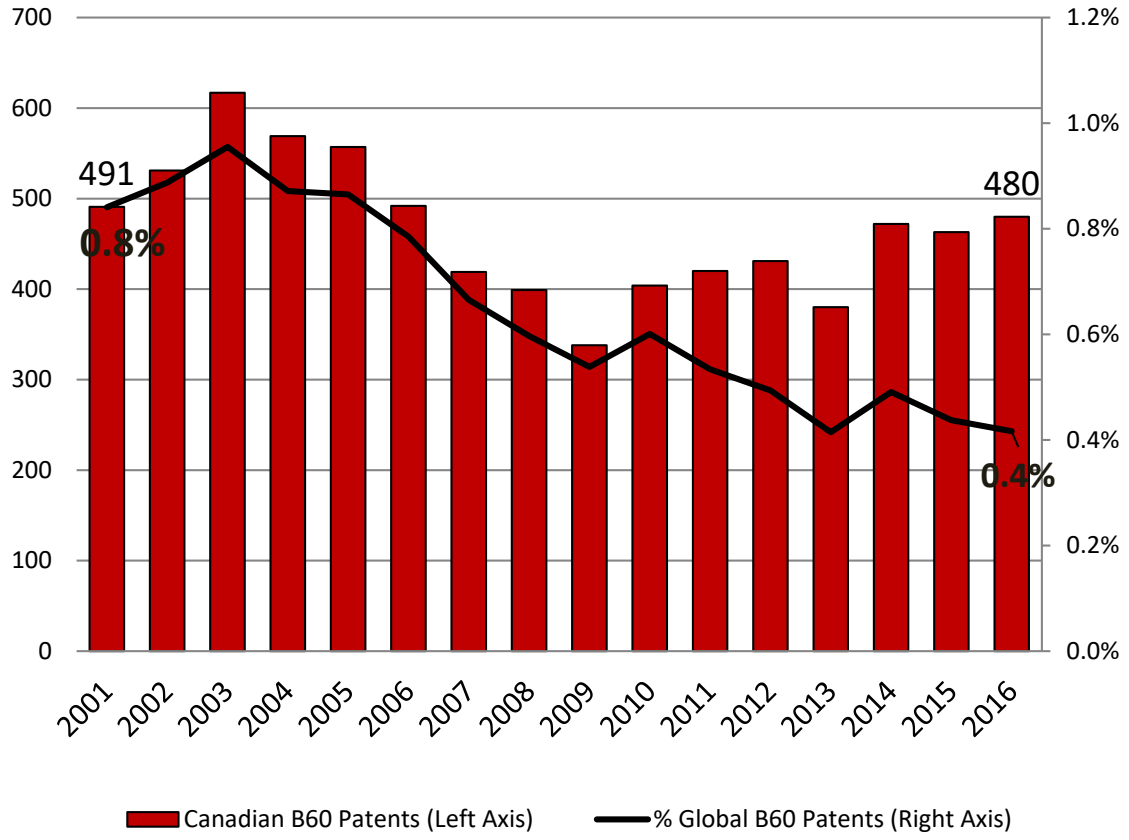
- Classified across technological fields (automotive, software etc.)
- Contain detailed geographic and firm-level information

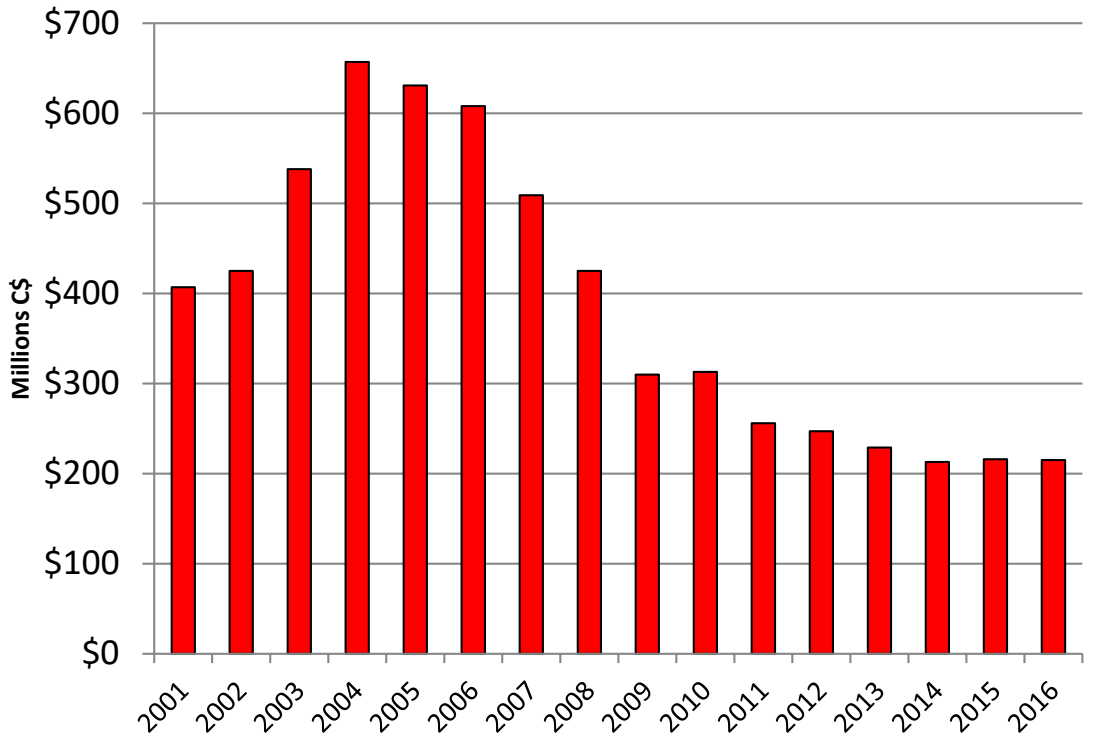


What did our Database yield?

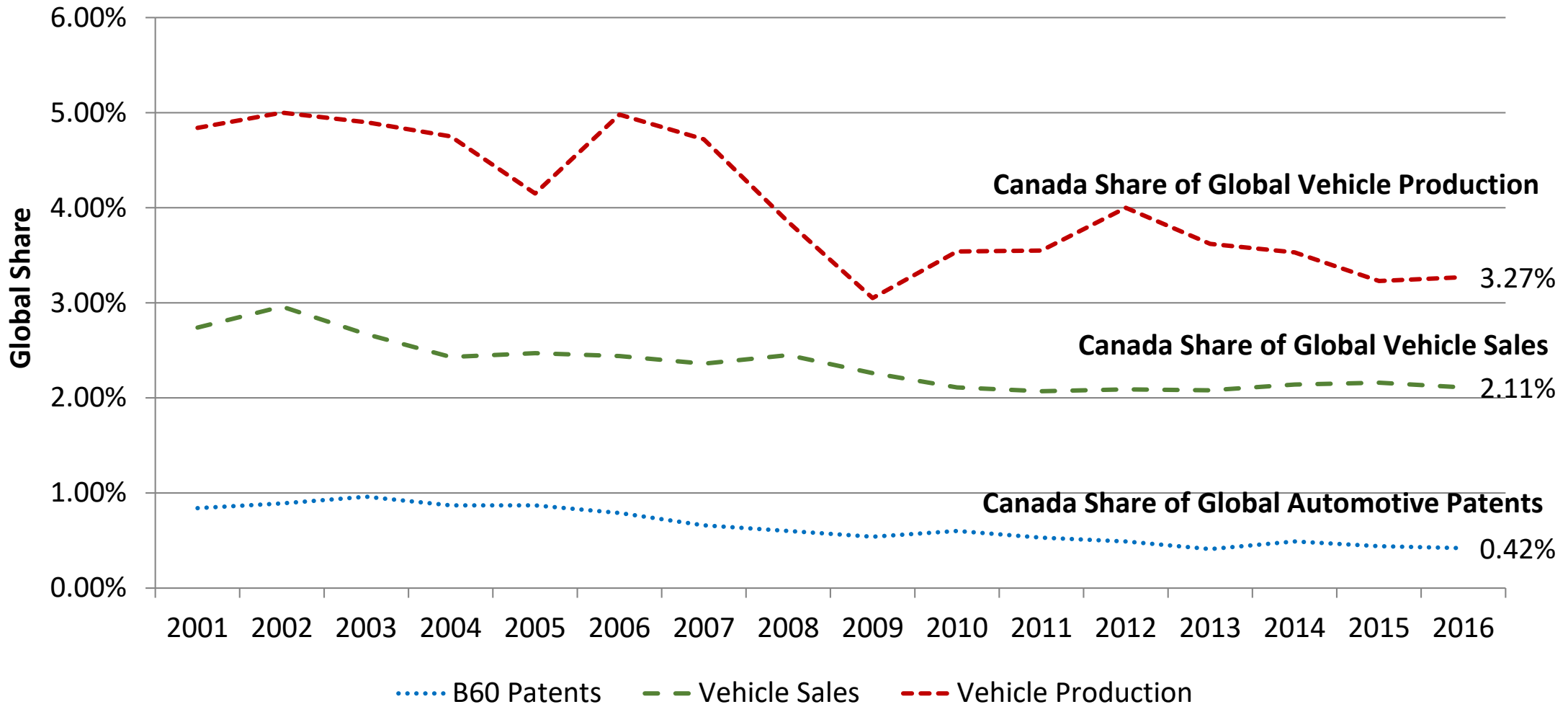
- 1,209,851 automotive-related patents filed between 2001 and 2016.
- Two methods to identify patents as automotive-related.
  1. International Patent Classification (IPC) of B60 (Automotive)
  2. Patents not classified as B60 deemed "automotive" if assigned to designated auto firms

Patents vs R&D Spending





Canada's Share of Global Vehicle Production, Vehicle Sales, and B60 Patents, 2001-2016

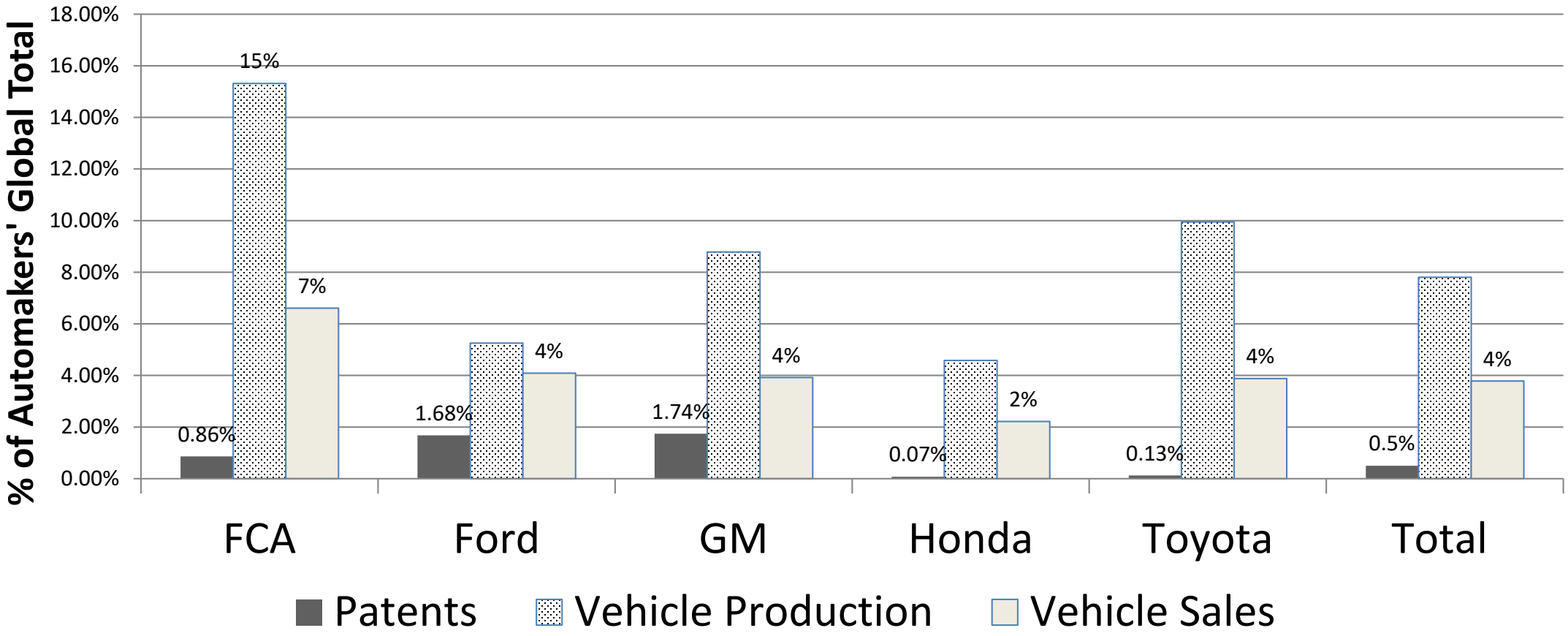


On the Importance of Automakers as a Means to Drive R&D …

'… there are only a handful of OEMs so attracting an OEM to your jurisdiction is an incredible thing. We're so lucky that we have five. That's an incredible base to start with and anybody else would die for that. And its an opportunity to not be squandered. You have to think of those OEMs as anchors that you can build around.'

OEM Executive Interview

Automakers' Canadian Subsidiaries' Total Patents, Vehicle Production, and Vehicle Sales as a % of Automakers' Global Total, 2001-2016



If not the OEMs, what about the Tier 1s?

"I thought the way ahead for Canada, because we don't have a Canadian-headquartered automaker, was to ensure that our Tier 1s were keenly aware of the capacity we had in technology."

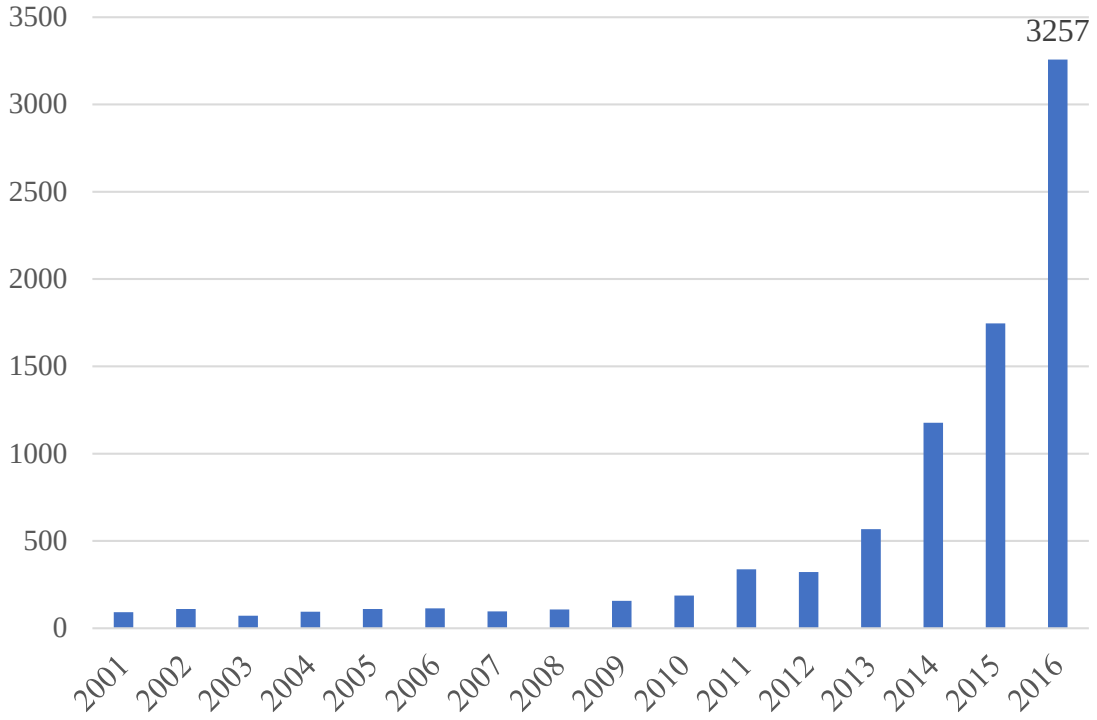
Senior Policy Maker Interview

Location of Canada's Global Top 100 Patents, 2001-2016

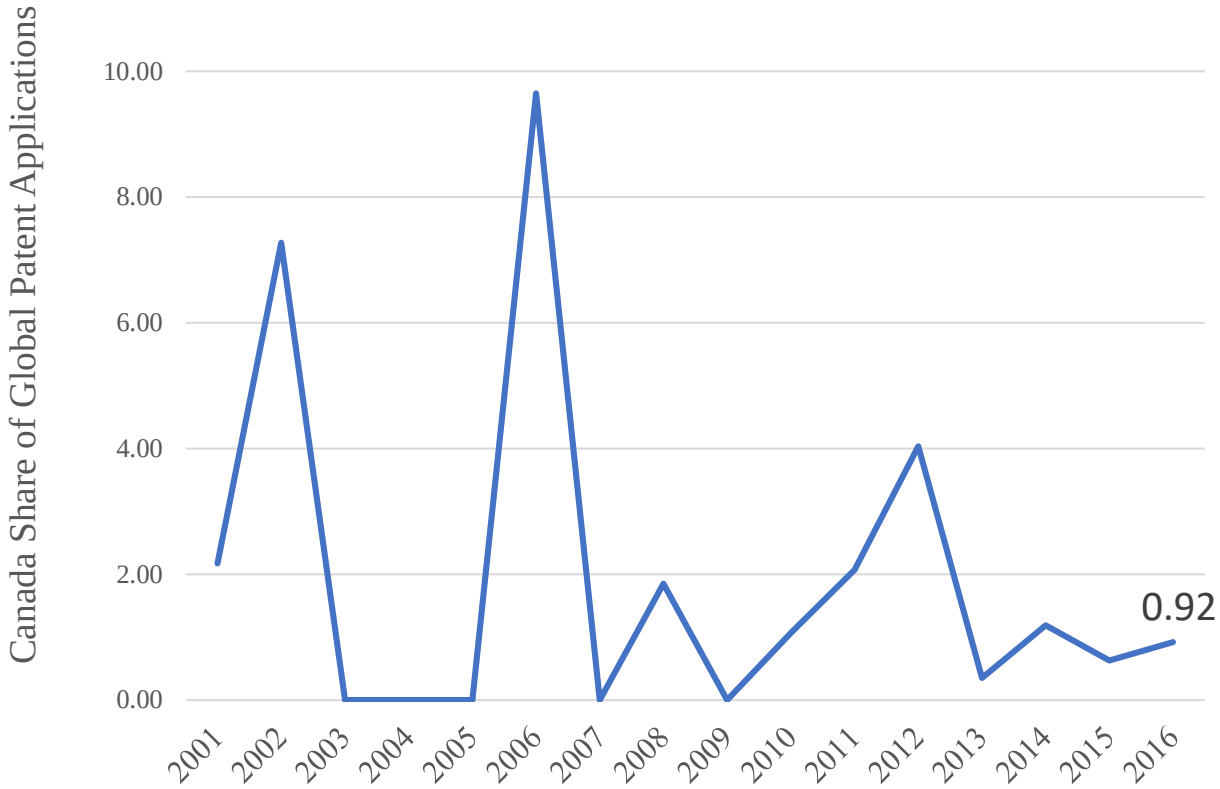
Company	Global Rank (2016)	Global Revenue US $000,000 (2016)	% of R&D in Canada	% of R&D Outside of Canada
Magna	3	36,445	18.2%	81.8%
Linamar	59	3,527	2.7%	91.3%
Martinrea	68	2,951	26.8%	73.2%
ABC Group	98	948	57.4%	42.6%
Multimatic	99	940	82.2%	17.8%

Connected and Autonomous Vehicle Patent Applications: 2001 – 2016

Global Volume

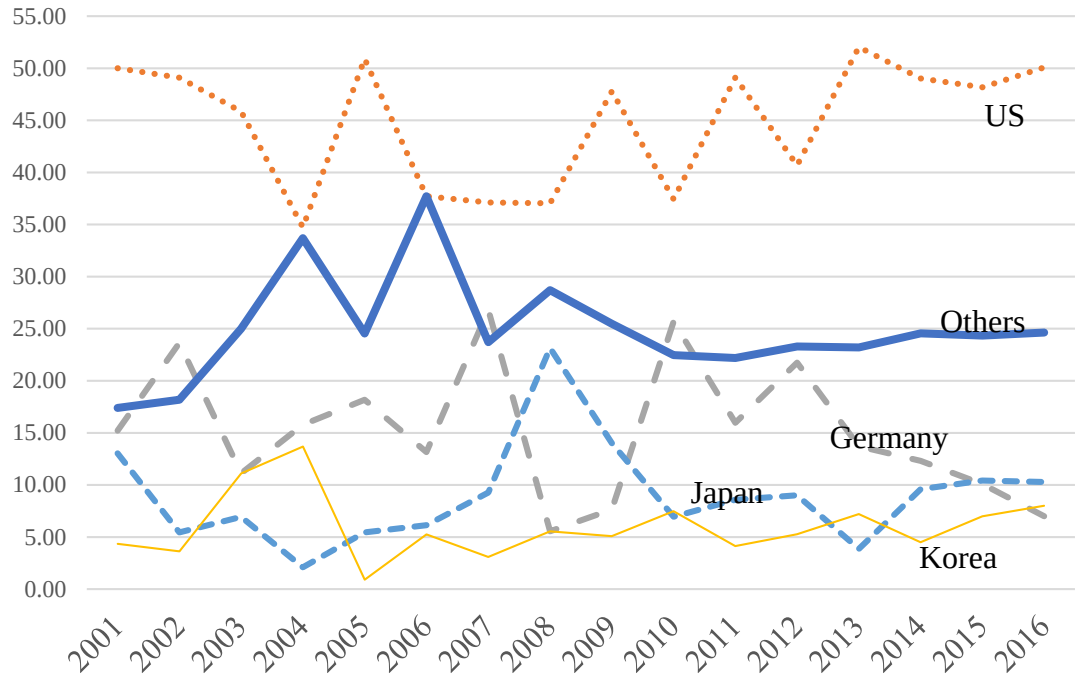


Canada

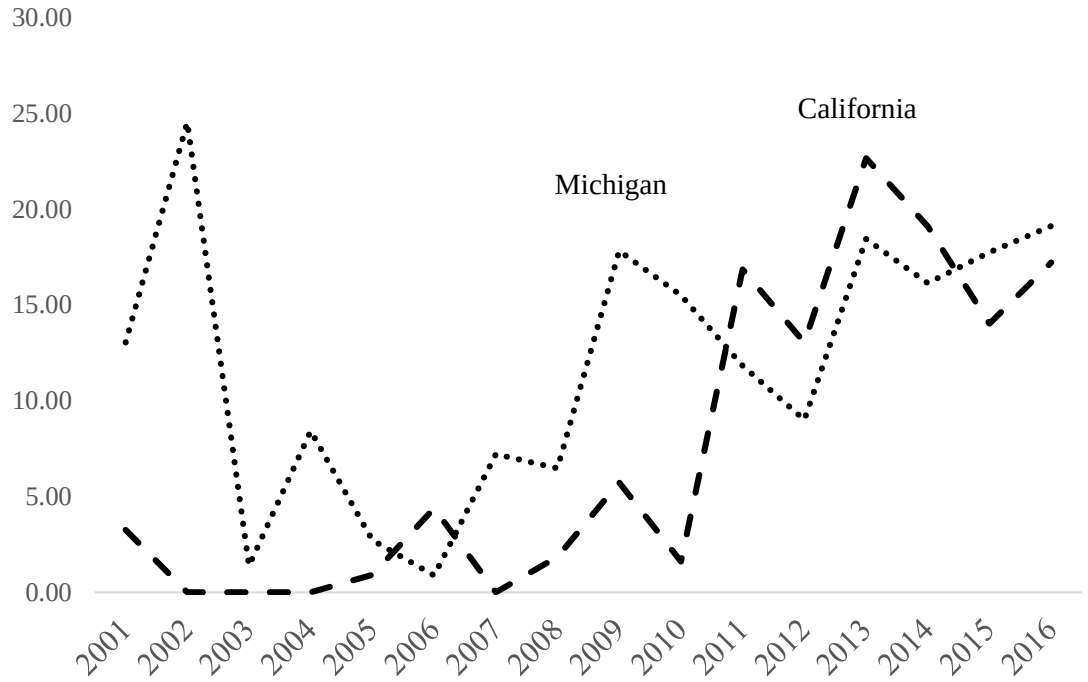


Global Location of Autonomous Vehicle Research

Share of Global AV-Related Patents



Michigan and California Share of Global AV-Related Patents



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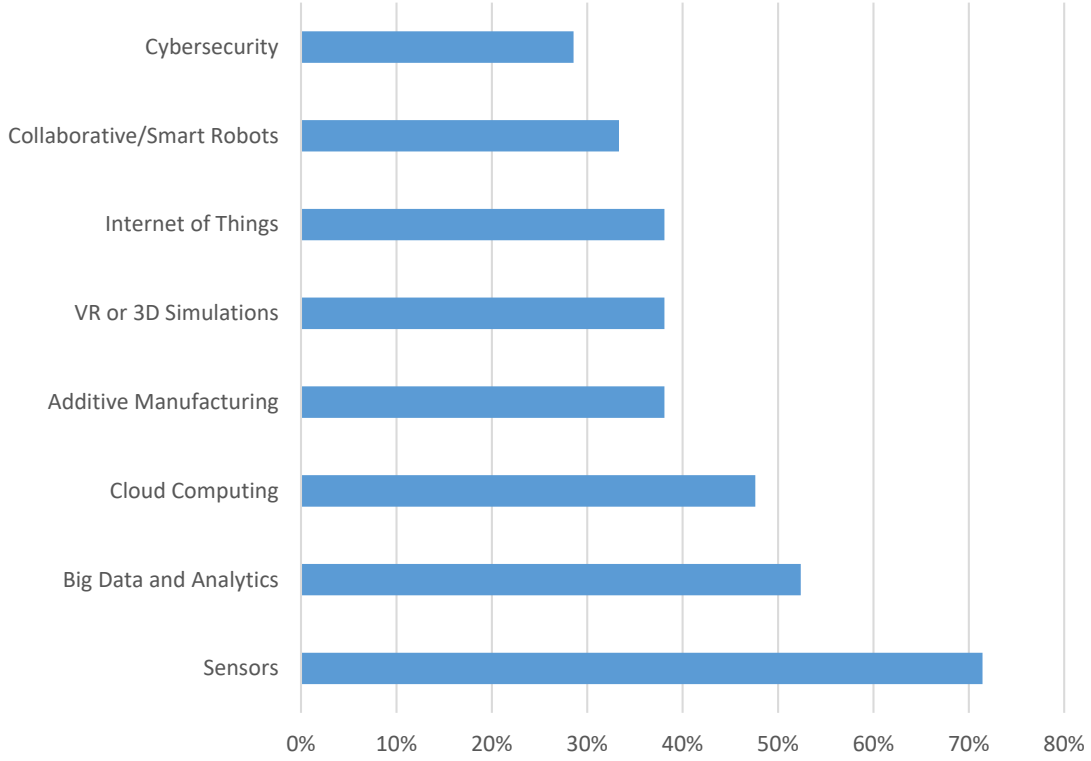
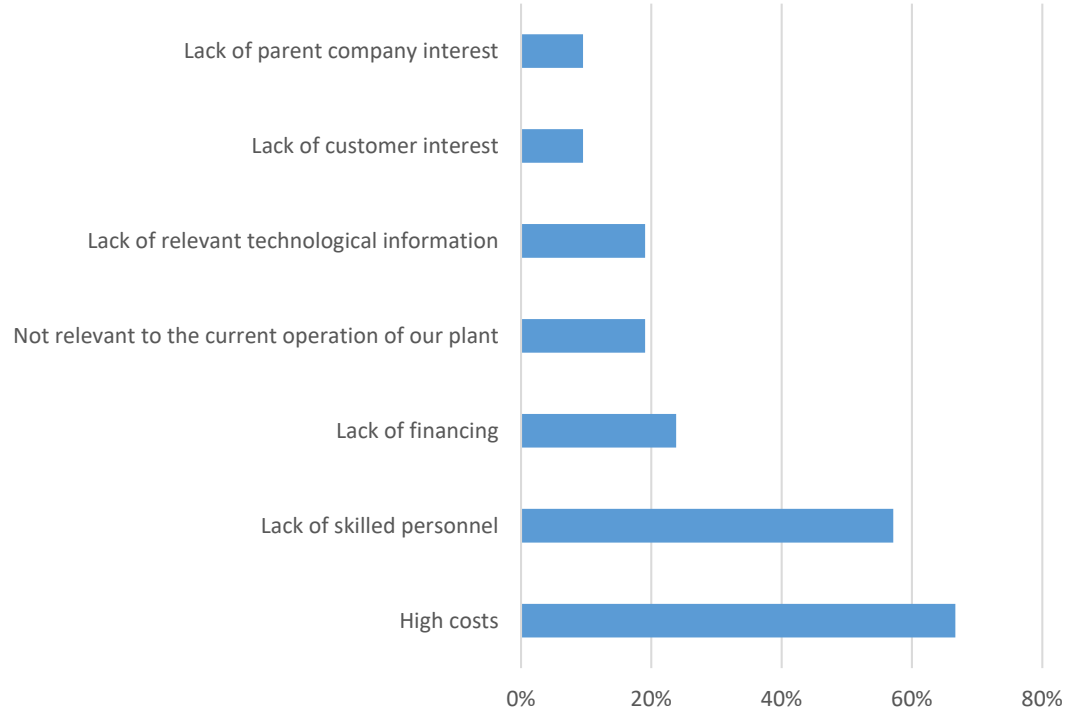
Industry 4.0: A Strategy of Resilience? … Resistance?

Q. Which of the following new production technologies are you currently using in your facility?



Q. Which of the following obstacles has your facility experienced implementing Industry 4.0?



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