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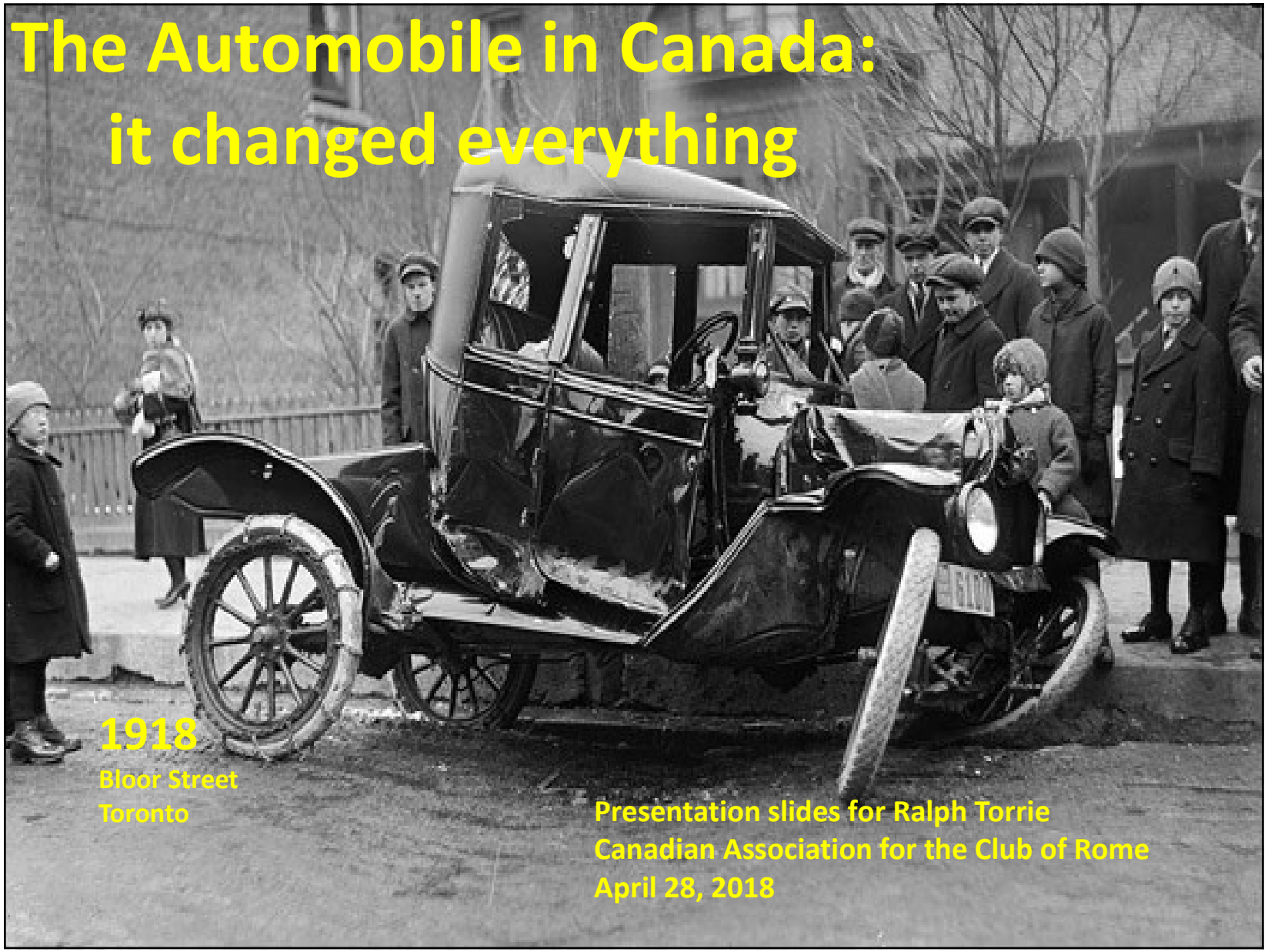

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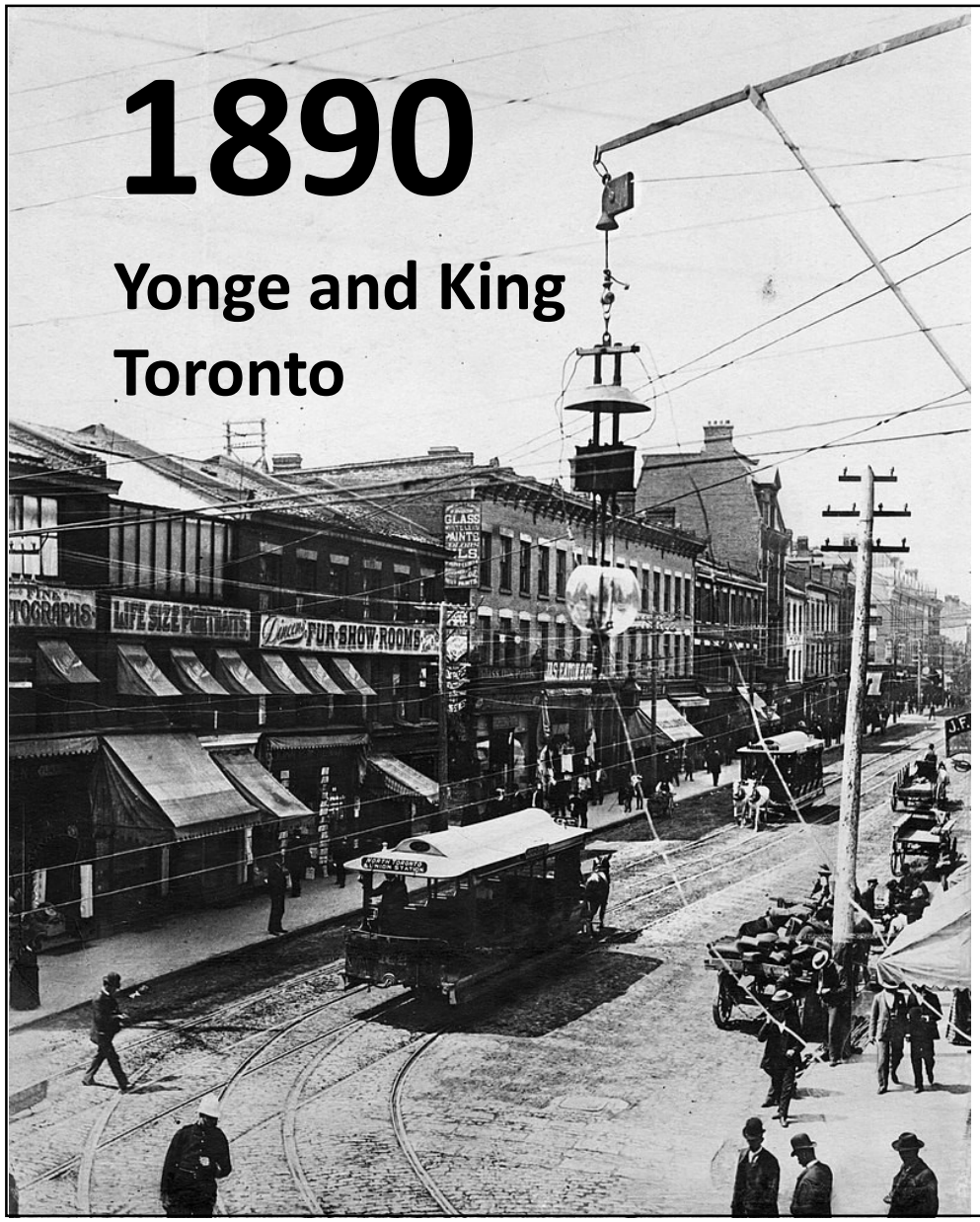

There were no virtually no automobiles in Canadian cities in the 1890's. Thousands of horses provided freight delivery, public transit, and carriage for the rich. Walking and cycling were prevalent. For most people, inter-city travel was rare, and goods and services were available within relatively short distances from home.

2

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- Urban horses were not counted in the agricultural Census, and data are therefore sparse, but by 1910, with a human population of 380,000, there would have been perhaps as many as 10,000 horses in Toronto, and as many as 50,000 urban horses in Canada.
- (There were 2 million horses on farms by 1910, and the horse population in Canada continued to grow until it peaked around 3.4 million in the early 1920's).

4

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- By the late 1800's, it was clear that continued dependence on horses for freight hauling and public transit was not sustainable in cities, and concerted efforts were underway to build electric trolley systems.
- Electric street railway systems proliferated in Canada in the 1890's, with an adoption rate that few if any technological innovations have ever surpassed.
- Toronto electrified its first "horse car" line in August of 1892. The last line was electrified 24 months later, in August 1894.

5

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Laying streetcar tracks at Church and Adelaide, Toronto, (Image in public domain, Toronto archives Sens 372, s0372_ ss058_ it0067.)

7

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Enter the motor vehicle

- The early cars actually were “horseless carriages”. The established carriage industry was instrumental in developing the car manufacturing industry (McLaughlin in Canada, Durant in the US, both carriage makers, were founders of General Motors.) The cars were open and occupied a similar physical footprint as the horse and carriage.

8

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Explosive growth…

- In 1903, Ontario became the first province to implement motor vehicle registration, registering 178 vehicles that year.
- By 1912, there 20,367 personal motor vehicles registered across Canada, and just two years it had more than doubled to 45,716. By 1920, there were 252,000, plus another 150,000 commercial vehicles. It would double two more times in the next ten years – by 1930 there over 1,000,000 registered personal motor vehicles in Canada, not counting motorcycles and commercial vehicles.

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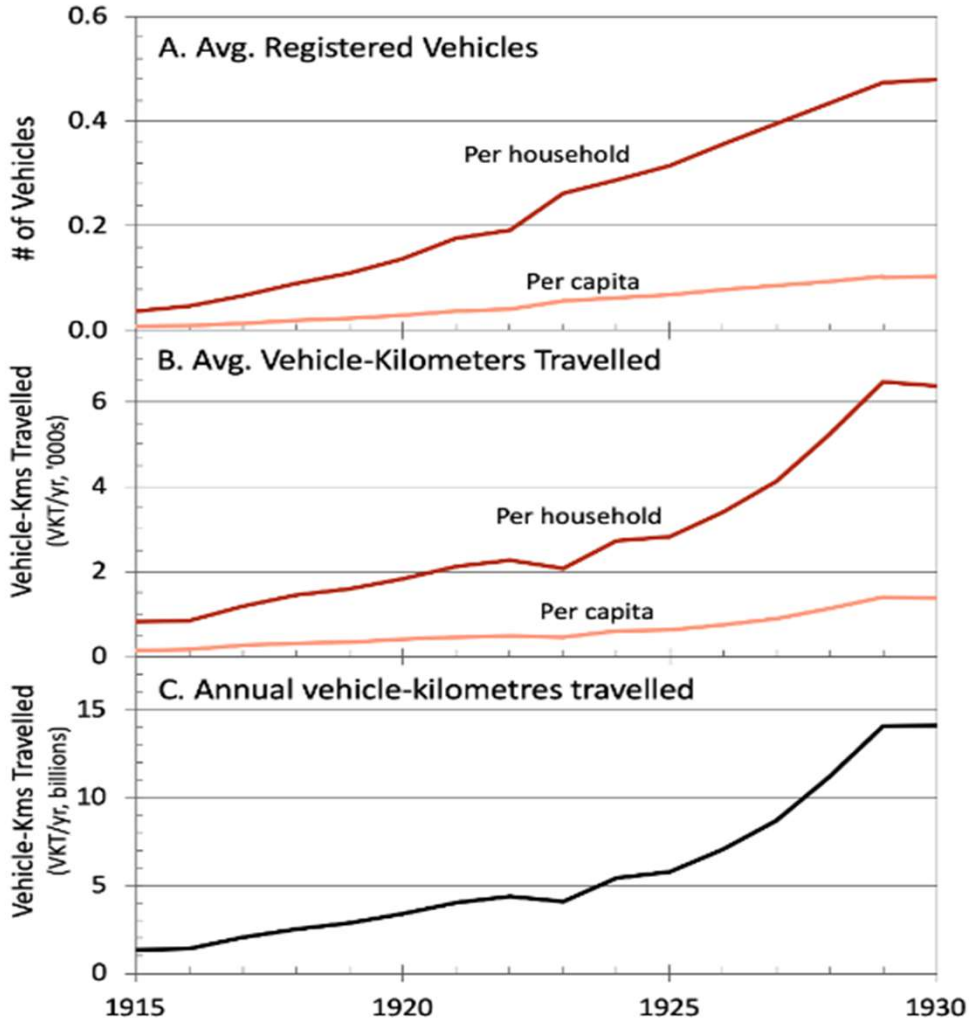

Car ownership and travel in Canada, 1915-1930. In just fifteen years, car ownership in Canada grew from 4% to 48% of all households (A), average annual car use grew to more than 6,000 vkt per household (B), and total aggregate distance travelled by cars grew ten-fold, from 1.3 billion to 14 billion vkt per year (C).

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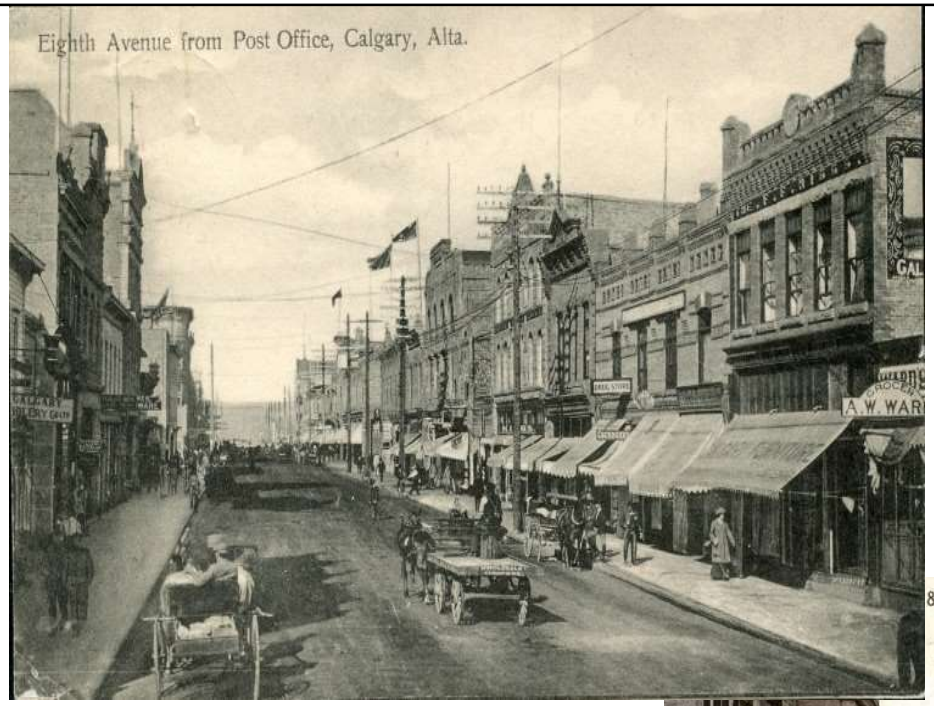
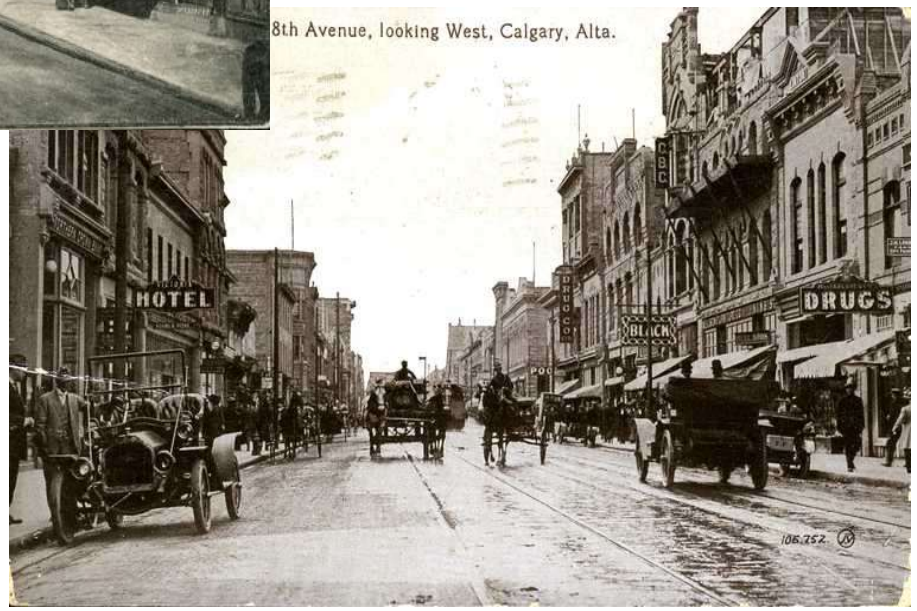


Calgary, 1909. (Image in public domain, accessed at http://www.prairie-towns.com/calgary-13.html)



Calgary, 1915. Streetcars, horse drawn delivery wagons, private automobiles. (Image in public domain, accessed at http://www.prairie-towns.com/calgary-105.html).

12

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Saskatoon, circa. 1910

Saskatoon, circa 1915?

14

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Winnipeg, Main Street, 1894. Electric streetcars are already in service, and share the road with horse drawn wagons, cyclists and pedestrians. (Image in public domain, accessed at http://www.prairie-towns.com/winnipeg-98.html)

Winnipeg, Main Street, 1912. The motor cars are now part of the scene in downtown Winnipeg, but share the road with electric streetcars, horse drawn wagons, cyclists and pedestrians. (Image in public domain, accessed at http://www.prairie-towns.com/winnipeg-98.html)

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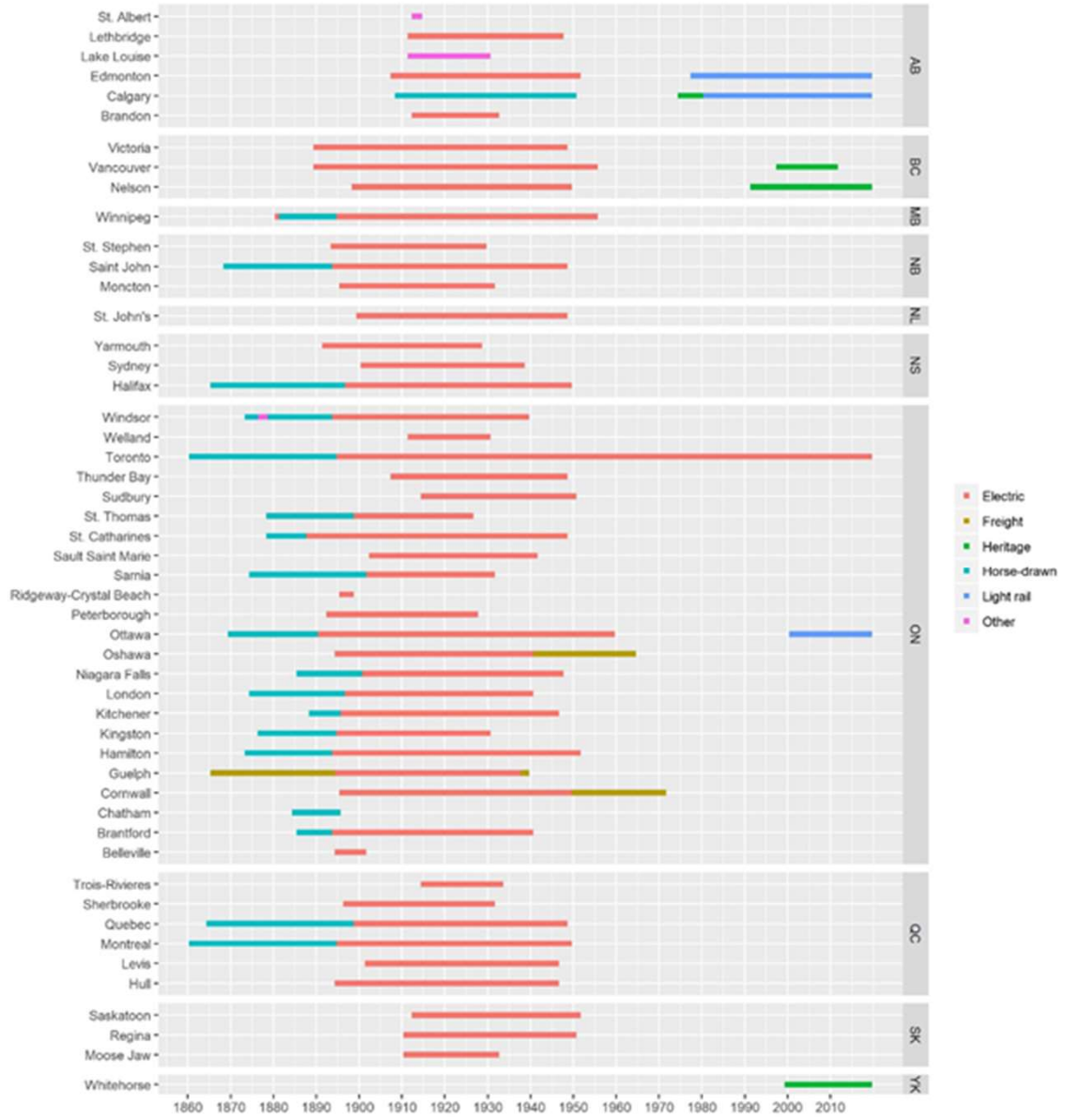
Canadian streetcar networks, 1860 to present.



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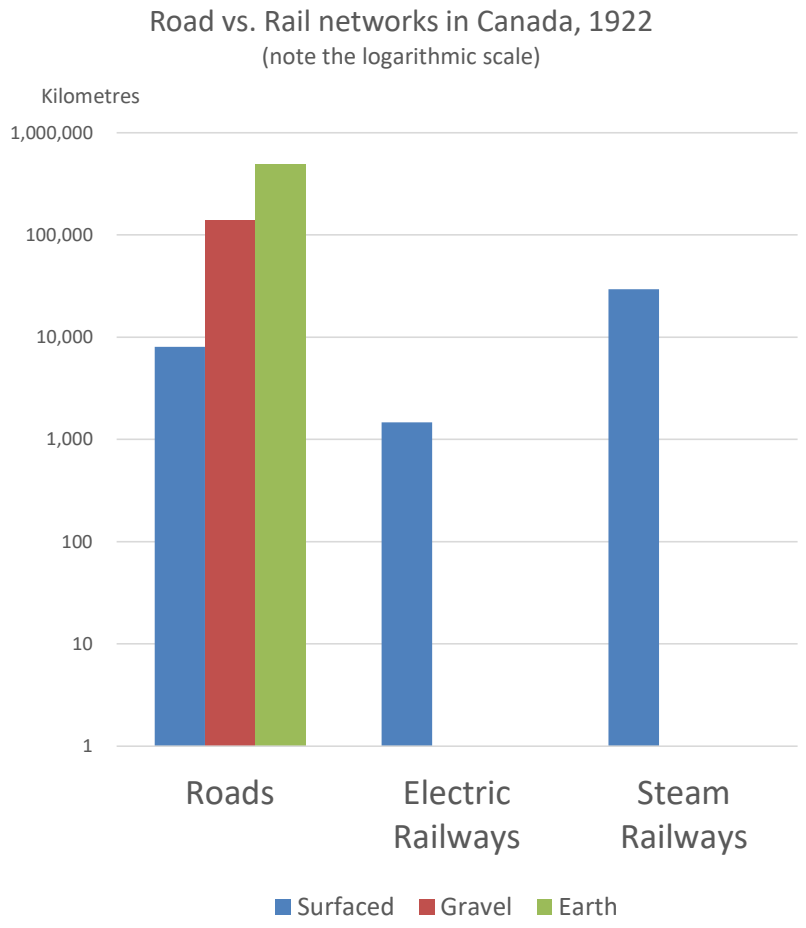
From the outset of the automobile, it had the advantage over rail of being able to use the existing road networks and (public!) rights-of-way. As early as 1922, surfaced roads alone (located mostly in cities and towns where the cars were most used) exceeded the extent of the electric railway network by an order of magnitude. It was clear very early that a car could take you anywhere there was a road, when you wanted to go, or would eventually be able to once the roads were improved.



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Clearing snow in Ottawa, 1920's

22

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The growth in registered motor vehicles was strong everywhere, but especially so in Ontario and on the Prairies. In fact, in 1920 Saskatchewan had more personal vehicles per capita and per household than any other province. Today, per capita vehicle ownership is still highest on the Prairies.

	Personal Vehicles per Household, 1911 to 2016								
Year	**PE**	**NS**	**NB**	**QU**	**ON**	**MB**	**SK**	**AB**	**BC**
1911	0.000	0.005	0.010	0.010	0.030	0.045	0.019	0.028	0.057
1921	0.09	0.12	0.16	0.11	0.27	0.30	0.36	0.27	0.25
1931	0.37	0.33	0.36	0.27	0.61	0.43	0.46	0.45	0.44
1941	0.34	0.38	0.35	0.29	0.70	0.46	0.46	0.50	0.48
1951	0.50	0.47	0.48	0.41	0.82	0.59	0.62	0.67	0.63
1961	0.85	0.89	0.85	0.76	**1.09**	0.94	0.93	**1.02**	**1.02**
1971	**1.16**	**1.12**	**1.09**	**1.05**	1.22	**1.10**	**1.04**	1.20	1.28
1981	1.26	1.33	1.17	1.17	1.25	1.28	1.18	1.50	1.18
1986	1.38	1.14	1.23	1.11	1.31	1.38	1.08	1.55	1.40
1991	1.39	1.18	1.30	1.16	1.36	1.34	1.37	1.43	1.42
1996	1.39	1.32	1.42	1.25	1.45	1.33	1.52	1.67	1.41
2001	1.42	1.44	1.52	1.29	1.52	1.36	1.61	1.81	1.46
2006	1.44	1.39	1.55	1.37	1.52	1.40	1.71	1.86	1.48
2011	1.55	1.44	1.61	1.41	1.52	1.54	1.84	1.94	1.51
2016	1.25	1.48	1.68	1.47	1.55	1.60	1.86	2.00	1.54

23

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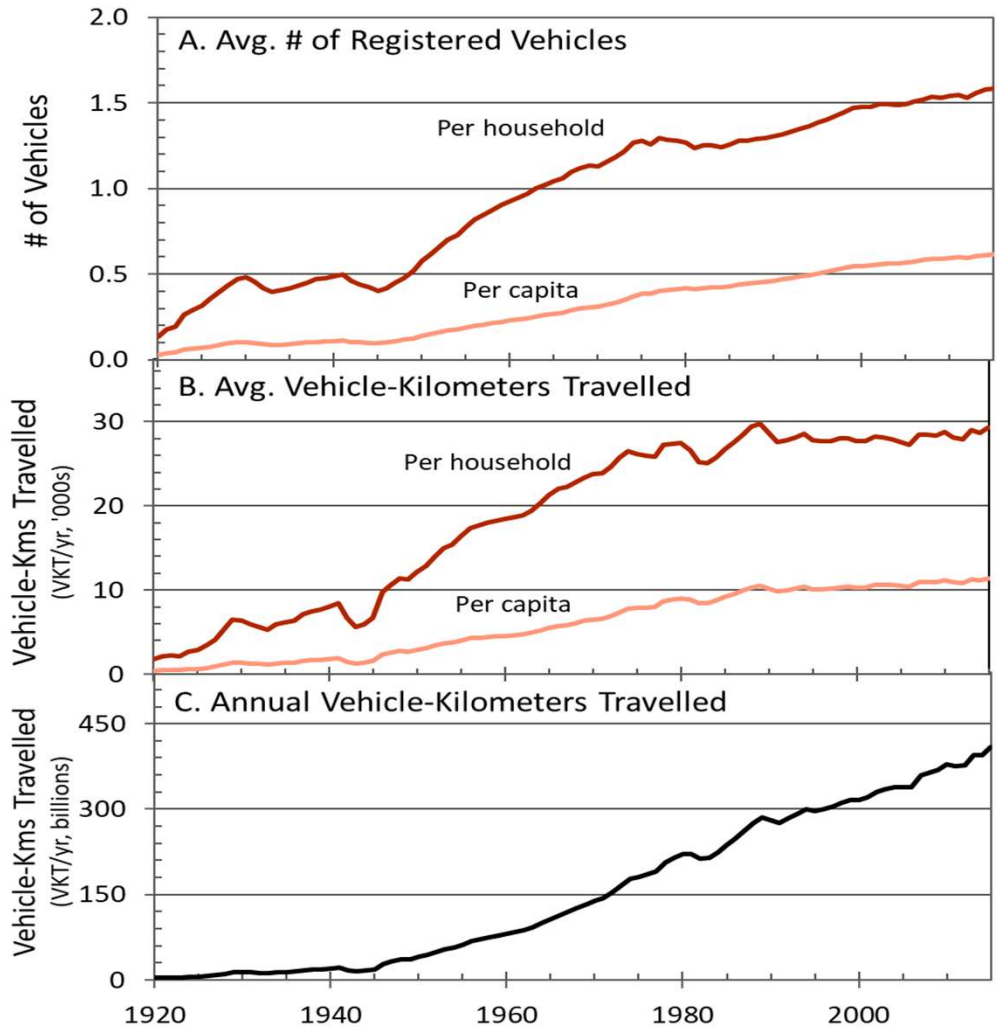

The growth in private automobile numbers (A), vehicle kilometers travelled per vehicle (B) and per household (C) and the total personal vehicle km travelled (D) in Canada from 1920-2015.

… By 1979 the role of personal mobility in providing the average Canadian with day-to-day access to employment, education, recreation, and other goods and services was 3-4 times higher than it was in 1949 and 20 times higher than it was before the Model T.

24

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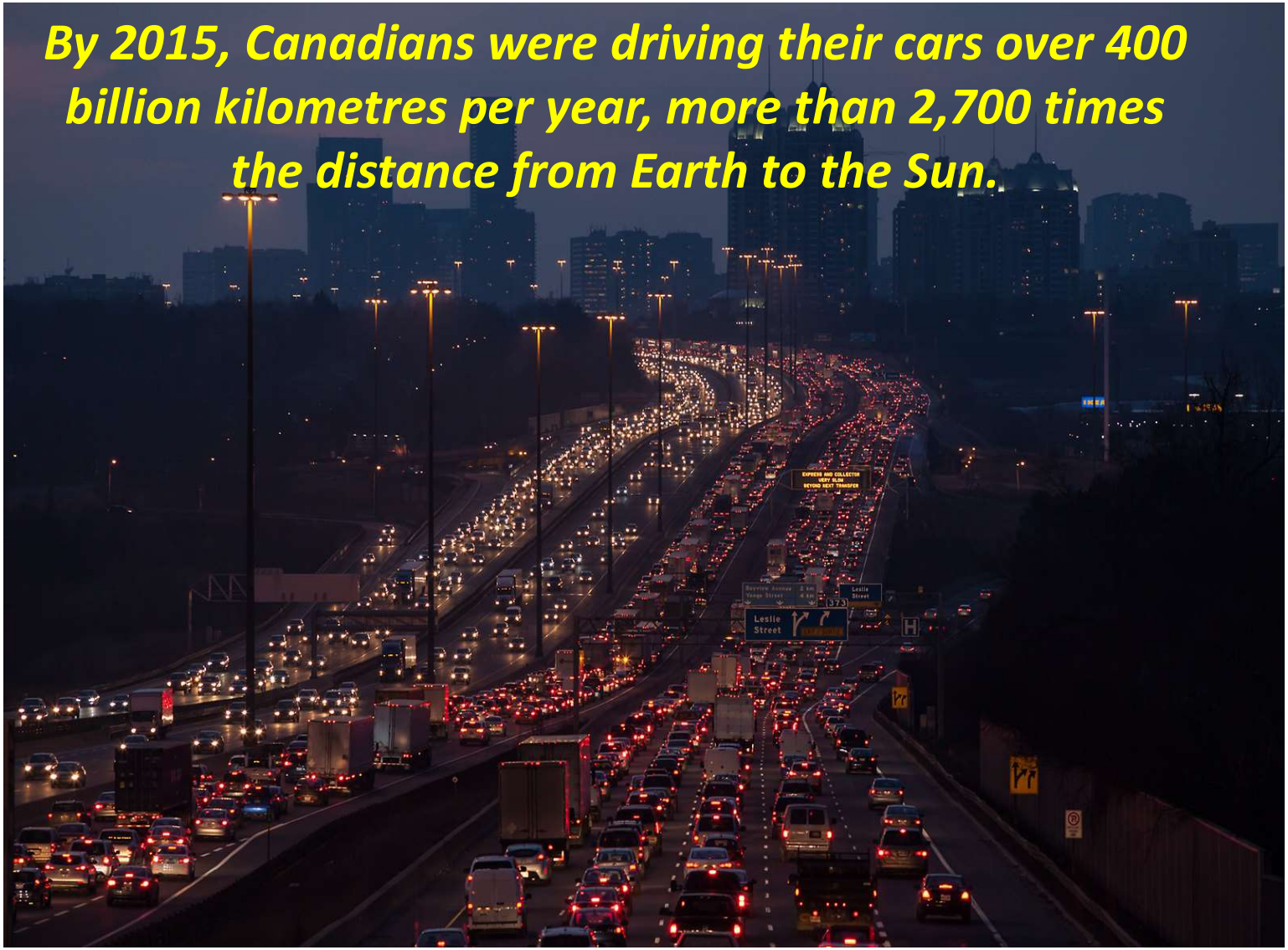

Rush hour on the MacDonald-Cartier Freeway (Highway 401) in Ontario. (Image: gtkenji, https://www.flickr.com/photos/38969864@N03/15899531477/)

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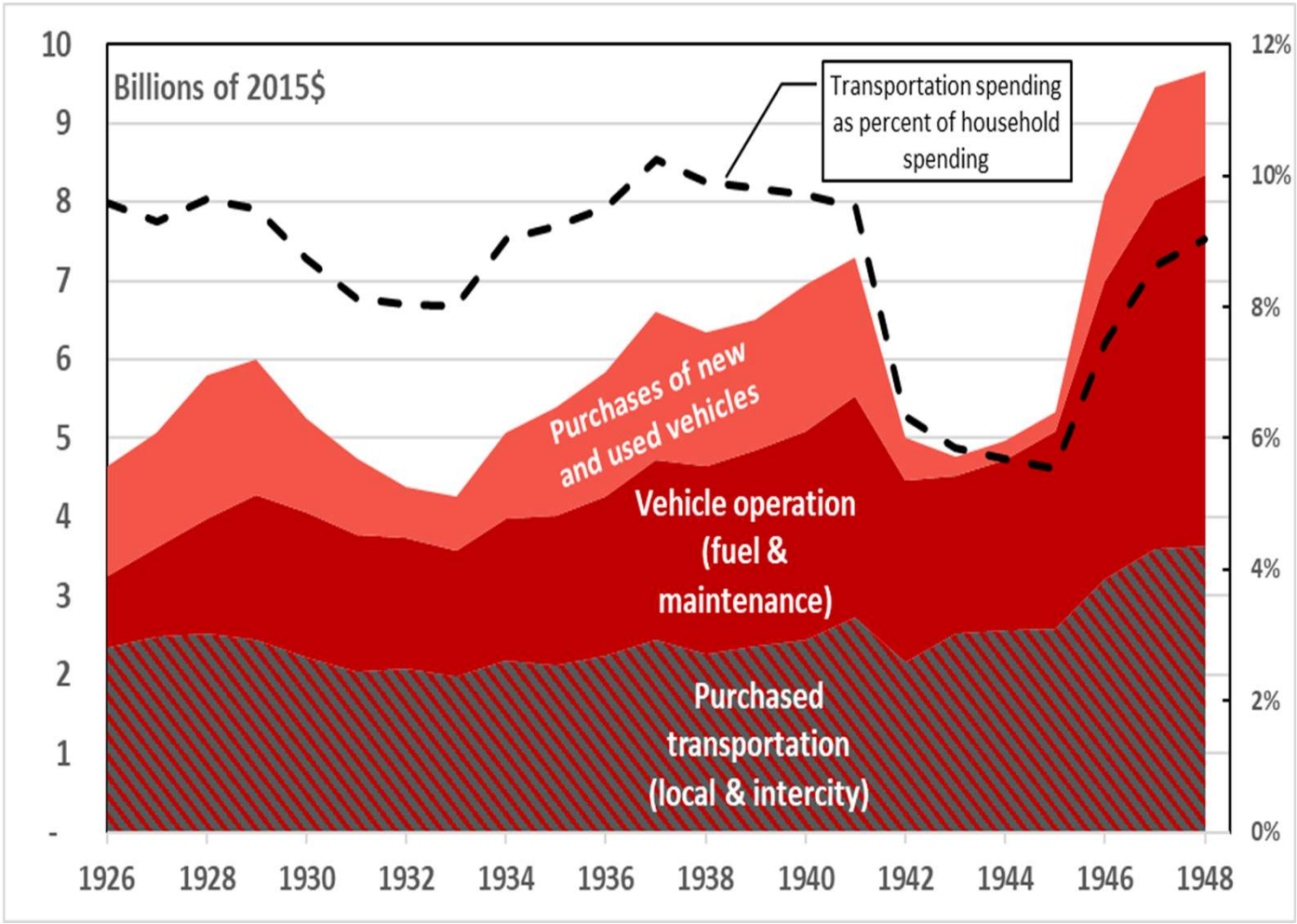

Total household spending on transportation, 1926-1948

26

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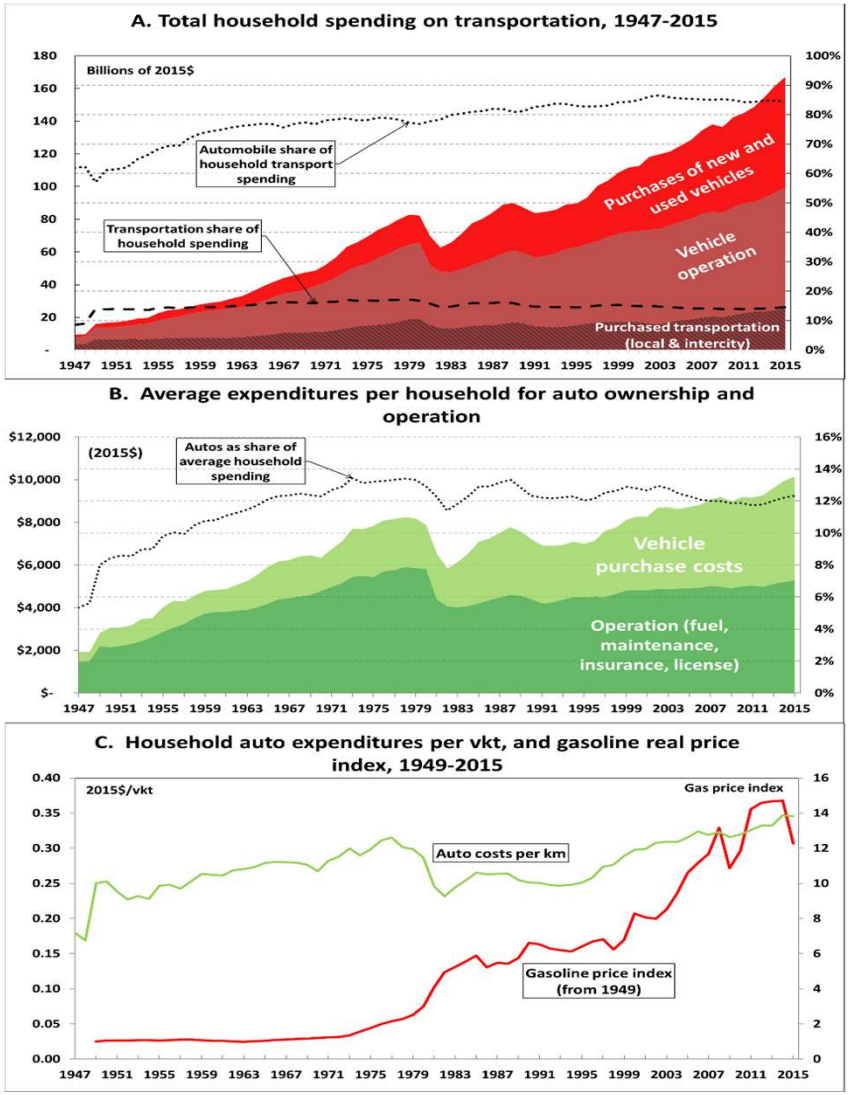

Figure 8. Household expenditures for automobile ownership and operation, 1947-2015.

"… By 1979 the role of personal mobility in providing the average Canadian with day-to-day access to employment, education, recreation, and other goods and services was 3-4 times higher than it was in 1949 and 20 times higher than it was before the Model T."

27

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Curb weight more than doubles, specific fuel consumption steady, 1920-1968

1920	1928	1949	1958	1968
Ford Model T	Ford Model A	Ford Custom	Chevrolet Bel-Air	Chevrolet Impala
				
540-750 kg	**1,027 kg**	**1,430 kg**	**1,690 kg**	**1,712 kg**
15.7 L/100 km *(11-18)*	**15.7 L/100 km**	**15.2 L/100 km** *(11.7-20.9)*	**15.7 L/100 km** *(11.7-12.3)*	**15.5 L/100 km** *(11.5-18.5)*
Photo: ModelTMitch - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=69615054	*Photo: Richard Smith - Flickr, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=329429*	*Photo: Public domain*	*Photo: Lars-Göran Lindgren Sweden - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=3272415*	*Photo: Public domain.*

Curb weights and fuel economies from https://www.automobile-catalog.com, Wikipedia, Model T Facts at https://web.archive.org/web/20130928165026/https://media.ford.com/content/fordmedia/fna/us/en/news/2013/08/05/model-t-facts.html, http://www.fuelly.com/car/ford/model_a/1928 .

… from 1920-1970, the curb weight of cars more than doubled while fuel consumption per vehicle was held in check, reflecting improvements in vehicle fuel efficiency on a par with the gains made in the more recent post-OPEC era.

28

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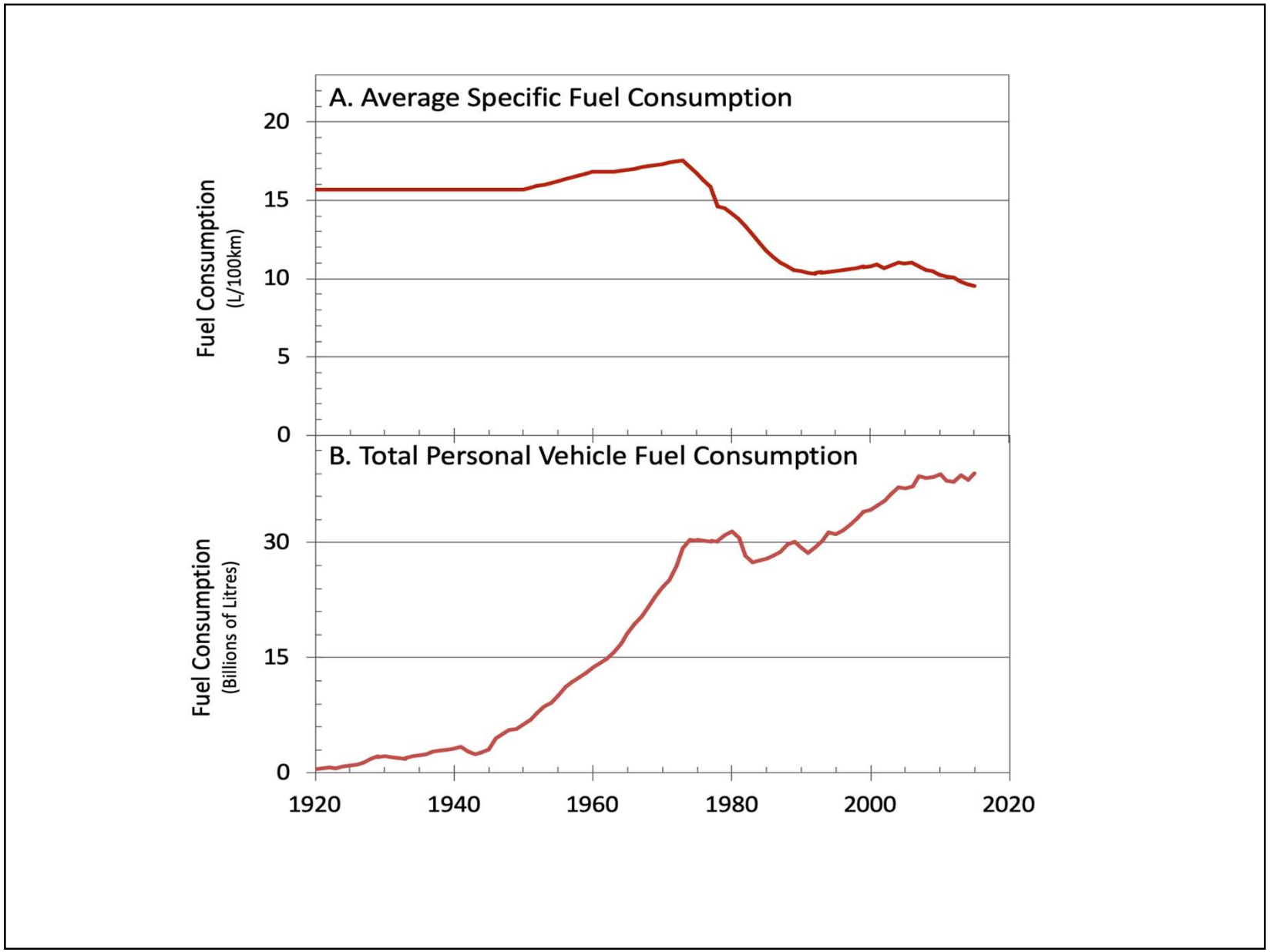

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Figure 11. Saskatoon in 1912. Cars operated on the existing public roads.(Image in public domain, accessed at http://www.prairie-towns.com/saskatoon-172.html)

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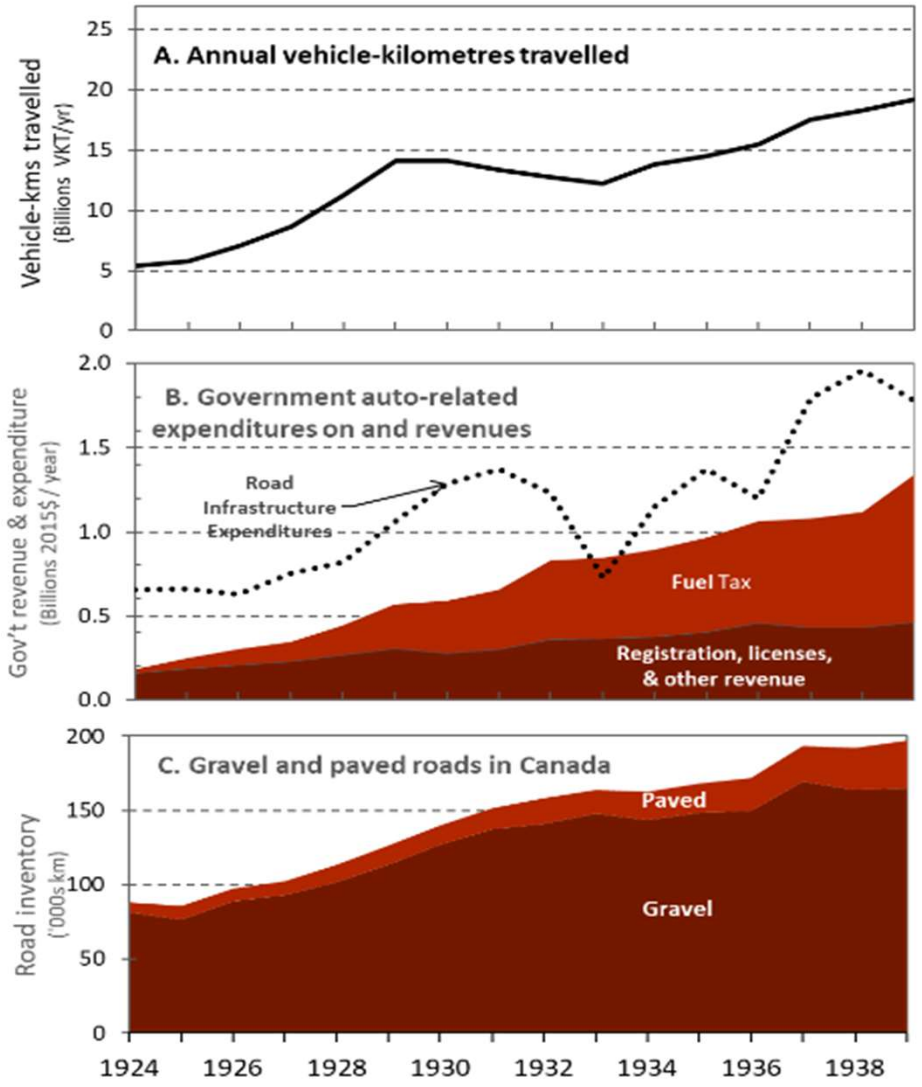

For the period 1924-1939, (A) total vkt travelled, (B) government revenue from and expenditures on road infrastructure, and (C) inventory of "improved roads" (i.e. gravel and paved, excluding earth roads).

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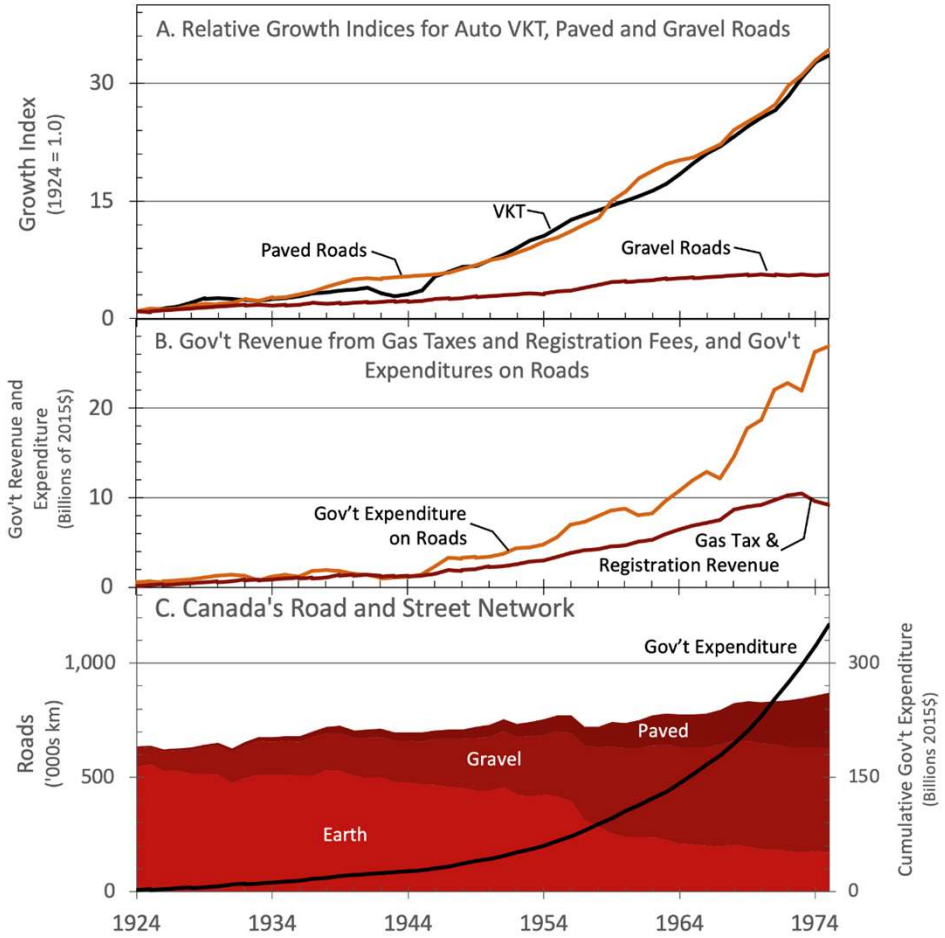

Between 1924 and 1975, governments – mostly provincial governments – spent more than $376 billion building and maintaining the road infrastructure in Canada, a cumulative total that now exceeds one trillion dollars…"

Long term trends in road infrastructure. A. Relative growth of vkt and paved roads. B. Expenditures vs. revenues for road infrastructure. C. The road inventory and cumulative spending on road infrastructure.

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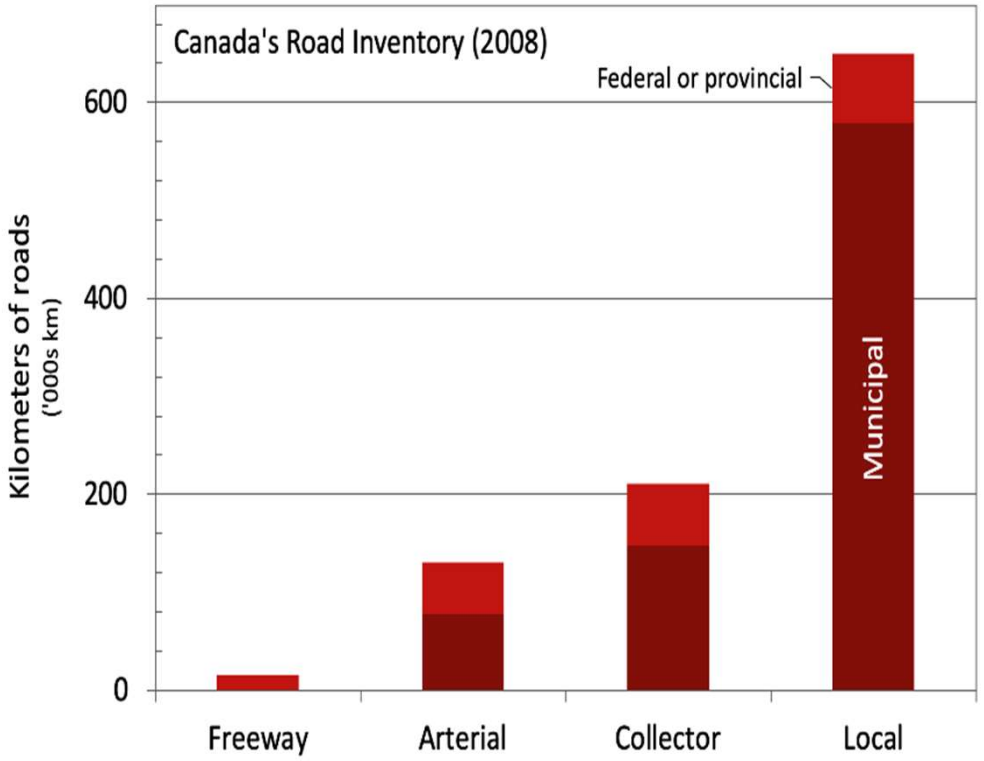

Canada's inventory of roads in 2008, of which 40% (400,000 km) are paved.

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Don Mills, Ontario, in 1939 on the left, and in 1965, on the right. (Photo: Survey and Mapping Services, City of Toronto)

Don Mills and Eglinton Road, 1975. (Photo: Colin McConnell, Toronto Star, accessed via Toronto Public Library.

34

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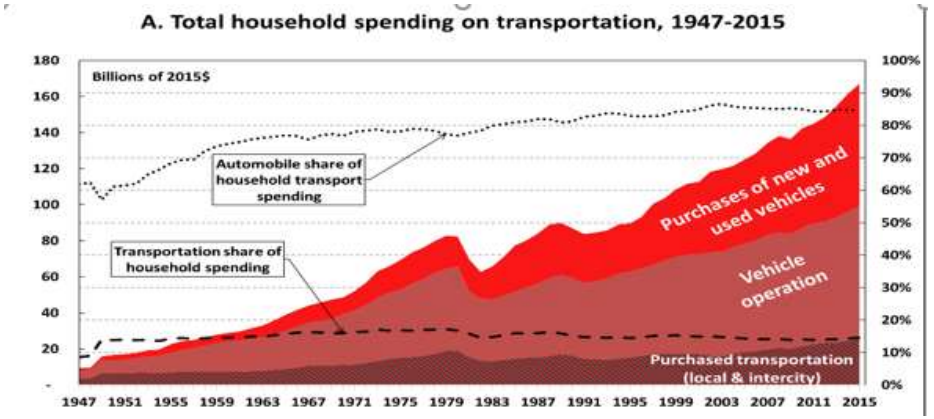
Household spending on automobile in the range of $160 billion per year



Government Expenditure on Road Infrastructure, 2015, in millions of 2015$	
Federal	1,358
Provincial	14,048
Municipal	11,883
Total	27,288

Government spending another $30 billion per year

And parking, another $40 billion, not counting the land, $70 billion if the land is included.

ANNUALIZED COST OF OFFSTREET PARKING (Billions of 2015$)						
	Construction	O&M	Land	**Total**	**Millions of stalls**	Per stall per year
Residential, SFD/SFA	$17.27	$0.21	$12.57	$30.04	26.2	1,146
Residential, Apartments	$3.99	$1.15	$3.90	$9.03	4.9	1,831
Subtotal, Residential	**$21.25**	**$1.35**	**$16.47**	**$39.08**	**31.2**	1,254
Commercial Surface Lots	$4.60	$2.78	$11.93	$19.30	13.9	1,388
Commercial Above Ground Parkades	$3.44	$0.42	$0.64	$4.49	1.4	3,237
Commercial Underground	$5.27	$0.61	$0.45	$6.33	1.2	5,162
Subtotal, Commercial	**$13.30**	**$3.81**	**$13.02**	**$30.13**	16.5	1,823
Total, Off-street Parking	$34.56	$5.17	$29.49	**$69.21**	**47.7**	1,452

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Observations and insights…

Access.

On a good road, even the cars from 100 years ago could maintain speeds of 60-70 km/hour, over ten times the speed of a horse drawn vehicle. First time car owners could suddenly travel ten times further with their travel time budgets, thereby expanding by 100-fold the territory in which they could directly access goods, services, employment opportunities, recreational and cultural experiences, and all the other amenities people value. Today, cars maintain speeds of 120 km/hour and more, often for hours at a time.

For all of pre-automobile human history, local travel (routine, daily, home-based trips) had been restricted to a few kilometres. The car changed the meaning of “local”, and that changed everything.

36

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Observations and insights…

Interconnectivity.

Along with the sudden, 100-fold expansion in the territory to which individuals had immediate access came a corresponding increase in the number of people with whom one could regularly interact. Innovations that increase human connectivity exhibit especially rapid uptake, and the car allowed cities to develop into extensive and intensively interconnected communities. This *expansion of interconnected adjacency* became the central fact of settlement patterns and urban development of the 20th century.

37

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Observations and insights…

Affordability.

In the early 1900's private vehicle ownership, with all the care and feeding of the horses that entailed, was prohibitively expensive and infeasible for most people. The economies of scale of industrialized mass production and the development and marketing of consumer credit products made cars affordable. The synergy between lower prices and consumer credit is an example of the *mutually enabling innovations in technology and business models* that drive disruptive and transformative change.

In 1910, when the price of a Model T was about $1,000, production workers in Canada had annual average earnings of $417, and the much smaller number of supervisory and salaried office employees averaged $994. By the mid 1920's, car prices reached historic lows in the range of $400, while average annual earnings of production and office workers had increased to $967 and $1,872, respectively. Buying a car was a major purchase, but with a combination of savings and financing, private transportation had become widely accessible.

38

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Observations and insights…

***Privacy and autonomy*.**

The freedom to go anywhere, any time, and do so in the privacy of one's own vehicle, are compelling attributes of the private automobile. These attributes, which had always been enjoyed by the rich, now became attainable by everyone. As car ownership grew, so did automobile "touring", Sunday drives, and even vacations involving long distance automobile travel. People no longer had to live within walking distance of their place of work or a trolley line that would get them there. The private automobile became equated with *enhanced personal freedom*.

39

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Observations and insights…

***Status*.**

The automobile represented industrialization, expansion of economic wealth and power, and the rise of consumerism, and car ownership became *symbolic of membership in the modern age*. Before it became a virtual necessity, car ownership was a status symbol, and the fancier the car the greater the status. The idea of the private automobile as an expression of one's identity and status has been promoted by the auto industry from the outset, for example through the creation and marketing of different brands targeting different demographics, personalities, genders and other customer categorizations.

40

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Has the automobile stalled?

- The automobile system accounts for about 13% of household spending and perhaps as much as 15-17% of GDP
- The private cost of car ownership has been relatively level, but the infrastructure cost continues to climb, running around $30 billion per year.
- While the average speed of automobiles in Canada is around 40 km/hour, when the time required to earn the money to pay for the system is added to the denominator, the effective speed is only about 20 km/hour, and declining. This raises the question of whether the automobile can continue to deliver on its central promise of affordable, flexible, convenient access, particularly in the face of growing competition from internet-based technologies that offer quicker, cheaper, and more convenient access to some amenities.

41

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42