

The Impact of Hiawatha LRT, Neighborhood Design, and Residential Self- Selection on Auto Ownership

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Outline

- Introduction
- Data and variables
- Results
- Conclusions and limitations

- Acknowledgements
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Introduction


- Why do we care about auto ownership?
- 2002 auto ownership
 - USA: 812 vehicles
 - EU: 500-600 vehicles
- Auto use

Table 1. Historical Data on Income, Vehicle Ownership and Population, 1960-2002

Country	Code	first data year (if not 1960)	per-capita income (thousands, 1995 \$ PPP)			Vehicles per 1000 population			Total Vehicles (millions)			ratio of Veh Own. to per-cap income	Population, 2002		
			1960 or first year	2002	Average annual growth rate	1960 or first year	2002	Average annual growth rate	1960 or first year	2002	Average annual growth rate		millions	density per sq KM	% urbanized
OECD, North America															
Canada	Can		10.4	26.9	2.3%	292	581	1.6%	5.2	18.2	3.0%	0.72	31	3	79
United States	USA		13.1	31.9	2.1%	411	812	1.6%	74.4	233.9	2.8%	0.76	288	31	78
Mexico	Mex		3.7	8.1	1.9%	22	165	4.9%	0.8	16.7	7.5%	2.58	101	53	75
OECD, Europe															
Austria	Aut		8.1	26.3	2.8%	69	629	5.4%	0.5	5.1	5.8%	1.91	8	97	68
Belgium	Bel		8.2	24.7	2.7%	102	520	4.0%	0.9	5.3	4.3%	1.48	10	315	97
Switzerland	Che		15.4	27.7	1.4%	106	559	4.0%	0.6	4.0	4.8%	2.89	7	184	67
Czech Republic	Cze	1970	8.9	13.6	1.3%	82	390	5.0%	0.8	4.0	5.1%	3.79	10	133	75
Germany	Deu		9.0	23.5	2.3%	73	586	5.1%	5.1	48.3	5.5%	2.20	83	236	88
Denmark	Dnk		10.6	25.9	2.1%	126	430	3.0%	0.6	2.3	3.4%	1.38	5	127	85
Spain	Esp		4.8	19.3	3.3%	14	564	9.2%	0.4	22.9	9.9%	2.74	41	82	78
Finland	Fin		7.4	24.3	2.9%	58	488	5.2%	0.3	2.5	5.6%	1.82	5	17	59
France	Fra		8.5	23.7	2.5%	158	576	3.1%	7.2	35.3	3.9%	1.26	61	108	76
Great Britain	Gbr		9.7	23.6	2.1%	137	515	3.2%	7.2	30.6	3.5%	1.50	59	246	90
Greece	Grc		4.5	16.1	3.1%	10	422	9.4%	0.1	4.6	10.1%	3.03	11	82	61
Hungary	Hun	1963	4.2	12.3	2.8%	15	306	8.1%	0.1	3.0	8.1%	2.87	10	110	65
Ireland	Ire		5.3	29.8	4.2%	78	472	4.4%	0.2	1.9	5.2%	1.05	4	57	60
Iceland	Isl		8.3	26.7	2.8%	118	672	4.2%	0.0	0.2	5.4%	1.50	0.3	3	93
Italy	Ita		7.2	23.3	2.8%	49	656	6.4%	2.5	37.7	6.7%	2.25	57	196	67
Luxembourg	Lux		10.9	42.6	3.3%	135	716	4.0%	0.05	0.3	4.7%	1.23	0.4	173	92
Netherlands	Nld		9.6	25.3	2.3%	59	477	5.1%	0.7	7.7	5.9%	2.19	16	477	90
Norway	Nor		7.7	28.1	3.1%	95	521	4.1%	0.3	2.4	4.7%	1.33	5	15	75
Poland	Pol		4.0	9.6	2.1%	8	370	9.5%	0.2	14.4	10.3%	4.51	39	127	63
Sweden	Swe		10.2	25.4	2.2%	175	500	2.5%	1.3	4.5	3.0%	1.15	9	22	83
Turkey	Tur		2.5	6.1	2.1%	4	96	7.7%	0.1	6.4	10.0%	3.62	67	90	67
OECD, Pacific															
Australia	Aus		10.4	25.0	2.1%	266	632	2.1%	2.7	12.5	3.7%	0.99	20	3	91
Japan	Jpn		4.5	23.9	4.1%	19	599	8.6%	1.8	76.3	9.4%	2.12	127	349	79
Korea	Kor		1.4	15.1	5.8%	1.2	293	13.9%	0.03	13.9	15.7%	2.40	48	483	83
New Zealand	NZL		11.1	19.6	1.4%	271	612	2.0%	0.6	2.4	3.2%	1.45	4	15	86

Commute mode split

Table 1: Trends in Modal Split for the Journey-to-Work (1960 - 2000)
(percentage of work trips by means of transportation)



Mode of Transportation	Census Year				
	1960	1970	1980	1990	2000
Total Auto	66.9	77.7	84.1	86.5	87.9
SOV	na	na	64.4	73.2	75.7
HOV	na	na	19.7	13.4	12.2
Public Transit	12.6	8.9	6.4	5.3	4.7
Walk	10.3	7.4	5.6	3.9	2.9
Bicycle	na	na	0.5	0.4	0.4
Work at Home	7.5	3.5	2.3	3.0	3.3
Other	2.6	2.5	1.1	0.9	0.8
All	100	100	100	100	100

Source: US Decennial Census, *Supplemental Survey: Journey-to-Work*, various census years, 1960 to 2000, as tabulated by Alan Pisarski and reported in A. Pisarski, *Commuting in America III*. Washington, DC: Eno Transportation Foundation, forthcoming in 2003.

Note: Only the 1960 Census work trip survey included a category called "not reported," which accounted for 4.3% of all 1960 responses. To make the 1960 distributions comparable with those of later years, which do not include an "unreported" category, the 1960 reported modal shares were scaled up by a factor of 1.045 so that their total would equal approximately 100%.

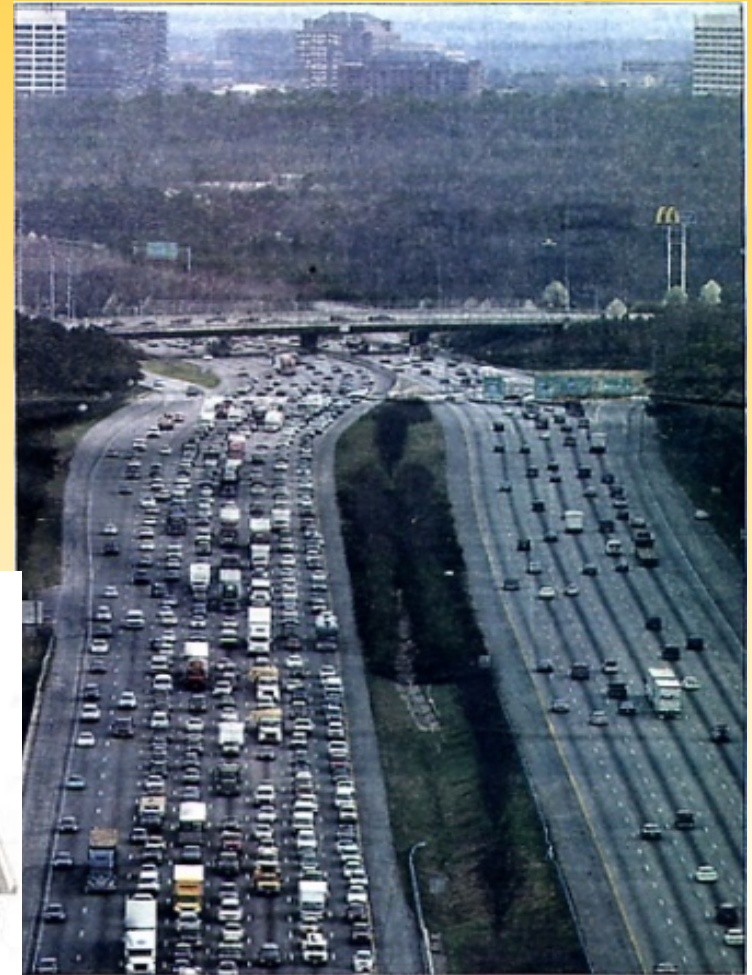
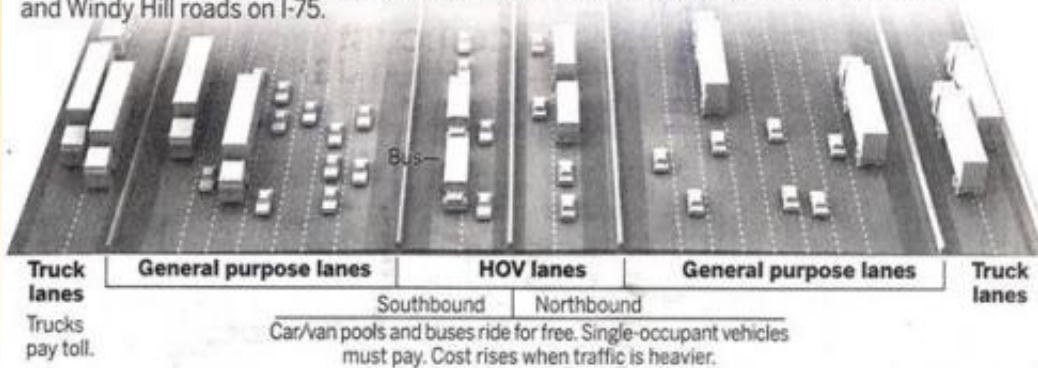
Will 23 lanes be enough?

Proposal would put I-75 among country's biggest
By Ariel Hart

It's wider than an aircraft carrier. Far wider than the carving on Stone Mountain. Wider than the White House stretched end to end, twice.

It's the planned I-75, all 23 lanes, coming soon to Cobb County. As currently conceived it's 388 feet across, wider than a football field is long

23 LANES: The state Department of Transportation is planning to expand I-75 (below) and I-575 in Cobb and Cherokee counties. The 23-lane stretch would be between Delk and Windy Hill roads on I-75.



Traffic heads north on I-75, just north of I-285, on Thursday. A proposal for the interstate is enough to make a road builder weep with joy, and make others wonder whether it's overkill.
LOUIE FAVORITE / Staff

Transitway investments

- Rail transit → location efficient neighborhoods → congestion mitigation
 - Transit use
 - Auto ownership and auto use (few)
 - Substitution effect or induced demand
- Research gap I
 - Self-selection: auto ownership → transit friendly neighborhoods

Research gap II

- Is the observed impact of rail transit on auto ownership
 - due to light rail transit (LRT) itself, or
 - LRT is sufficient.
 - due to characteristics of station area neighborhoods?
 - Without appropriate neighborhood design, LRT is not sufficient;
 - This offers guidance for planning practice.

Research gap III

- When comparing travel choice, previous studies often choose region/county/city as a contrast to TODs.
- Rail transit often replaces busy bus routes.
 - Control = TOD in terms of regional location, built environment, and transit service
- We are likely to overstate the impact of TODs on auto ownership.

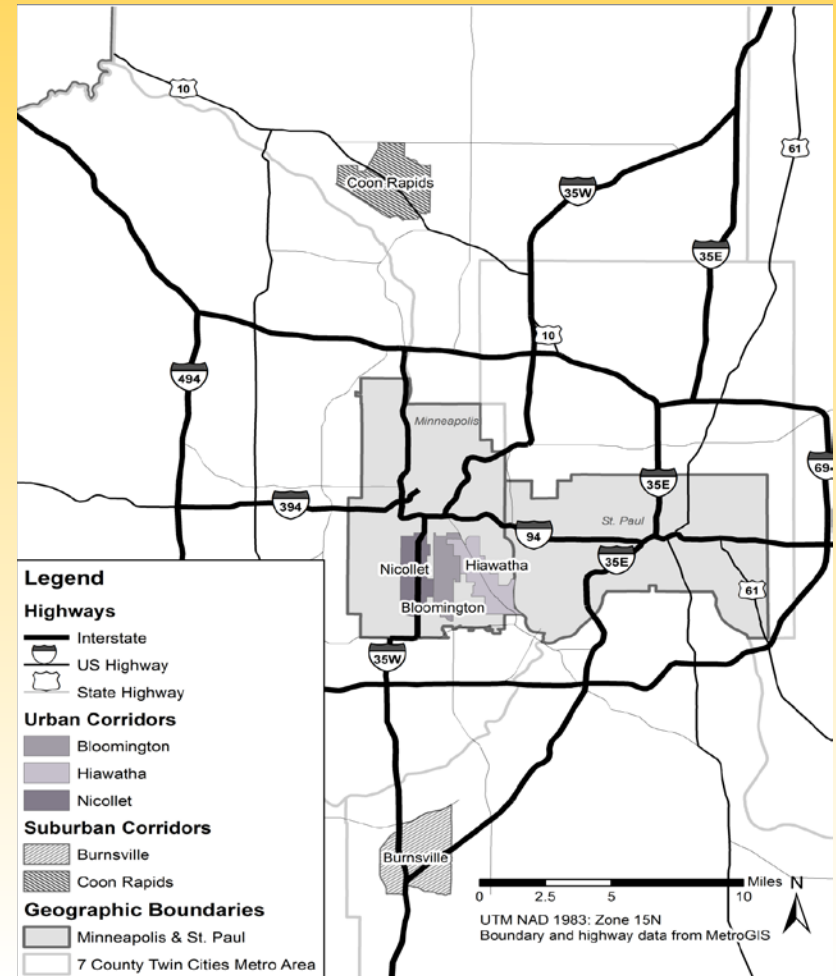
Purposes

The objectives of this study is to explore

- The impact of the Hiawatha LRT
- The impact of neighborhood characteristics
- The impact of residential self-selection on auto ownership.

Data

- Self-administered survey in May 2011
- Five neighborhoods
- **Movers:** moving in before its opening
- **Non-movers:** already living there before its opening
- 22.2% response rate



Variables

- **Number of autos in the household**
 - Movers: number of autos before they moved.
 - Change in the number of autos
- **Demographics**
 - Movers: changeable characteristics
 - Changes in demographics

Variables

- Neighborhood characteristics
 - Perceptions of 30 items
 - Movers: perceptions for their previous neighborhoods
 - Change in neighborhood characteristics
 - Objective measures (GIS application)
- Residential preferences
- Travel attitudes: factors
 - Pro-transit, pro-driving, pro-walking, etc.

Descriptive results

	Number of Autos			Change in # of autos		
Corridors	N	Mean	SD	N	Mean	SD
Burnsville	181	1.84	0.91	76	0.05	0.69
Coon Rapids	167	2.01	0.98	55	0.09	0.89
Hiawatha	494	1.63	0.87	261	0.15	0.86
Bloomington	240	1.69	0.86	108	0.16	0.58
Nicollet	193	1.63	0.85	79	0.04	0.82

Statistical control: Ordered logit models

Model for number of autos	Mode 1		Model 2	
Selected Variables	Beta	P-value	Beta	P-value
Bloomington	0.312	0.070	0.169	0.342
Burnsville	0.192	0.318	-0.257	0.208
Coon Rapids	0.502	0.012	-0.029	0.893
Nicollet	-0.022	0.906	-0.110	0.573
Perception of "large back yards"	0.109	0.099		
Number of businesses within a quarter mile	-0.018	0.004	-0.018	0.005
Pro-driving attitude			0.108	0.055
Pro-transit attitude			-0.364	0.000
Preference for "large back yards"			0.176	0.006
Preference for "lots of off-street parking"			0.284	0.000
Preference for "easy access to transit stop/station"			-0.161	0.015
N	1218		1202	
Veall-Zimmermann R ²	0.603		0.627	

Answers to research questions

- Is the difference in auto ownership attributable to residential self-selection?
 - At least partly
 - The presence of many attitudes
 - The preference drives out the perception of the same dimension of neighborhood characteristics.
 - Corridor dummy becomes insignificant.
 - Hiawatha does not have an independent effect.

Quasi-longitudinal analysis

Selected Variables	Beta	P-value
Bloomington	0.107	0.672
Burnsville	-0.307	0.302
Coon Rapids	0.099	0.773
Nicollet	-0.201	0.485
Change in the number of adults	1.372	0.000
Change in household income	0.146	0.000
Change in perception of "lots of off-street parking"	0.244	0.001
Change in perception of "close to where I work"	-0.144	0.047
Number of businesses within a quarter mile (current measure)	-0.015	0.048
N	538	
Veall-Zimmermann R ²	0.322	

Answers to research questions

- What neighborhood characteristics are associated with auto ownership?
 - Parking
 - Job access
 - Business density
- How big are the impacts of neighborhood characteristics on auto ownership?
 - Change in income: dominant
 - Business density: ~ 0.15

Conclusions

- The effect of Hiawatha LRT is due to self-selection. Does the LRT has no effect?
 - Hiawatha LRT offers an option to match travel attitudes.
 - Hiawatha LRT stimulates new development.
- Built environment correlates of auto ownership
 - Parking, job access, and business density
 - TOD-related Land use regulations

Limitations

- Preferences ↔ neighborhood characteristics
 - Overstate the importance of preferences
- Quasi-longitudinal (recall) vs. longitudinal