

Transportation

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Why are we here?



Why are we here?

I am here because you are
here.

You are here because I am
here.

But why at the University of
Minnesota?

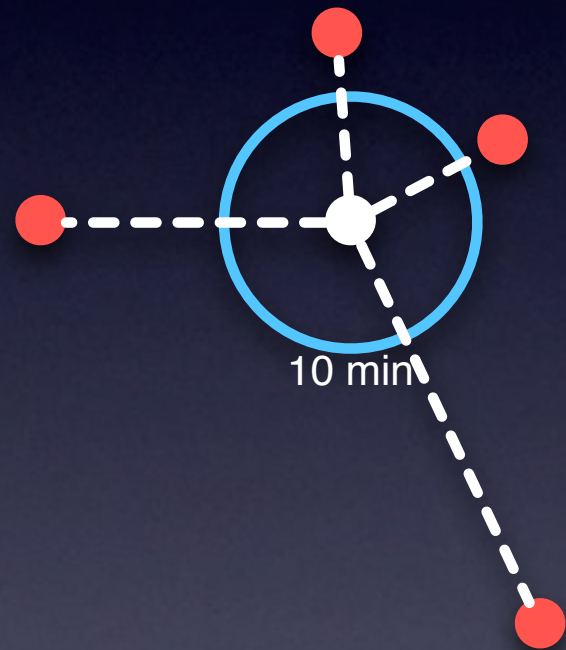
To be able to **access** the best
policy ideas in Minnesota.

Transportation is about
connecting people to destinations

It is not (only) about
congestion or speed of travel

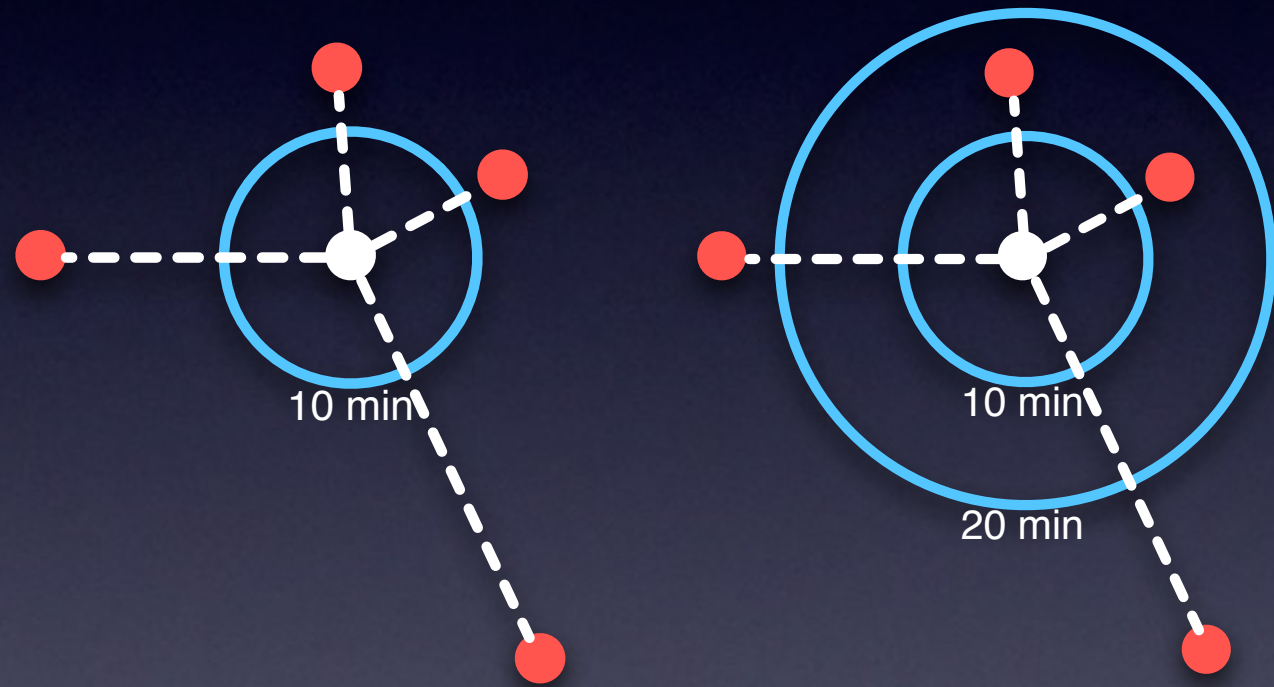
It is also about connectivity
and where things are

Cumulative Opportunities



10-minute
accessibility: 0

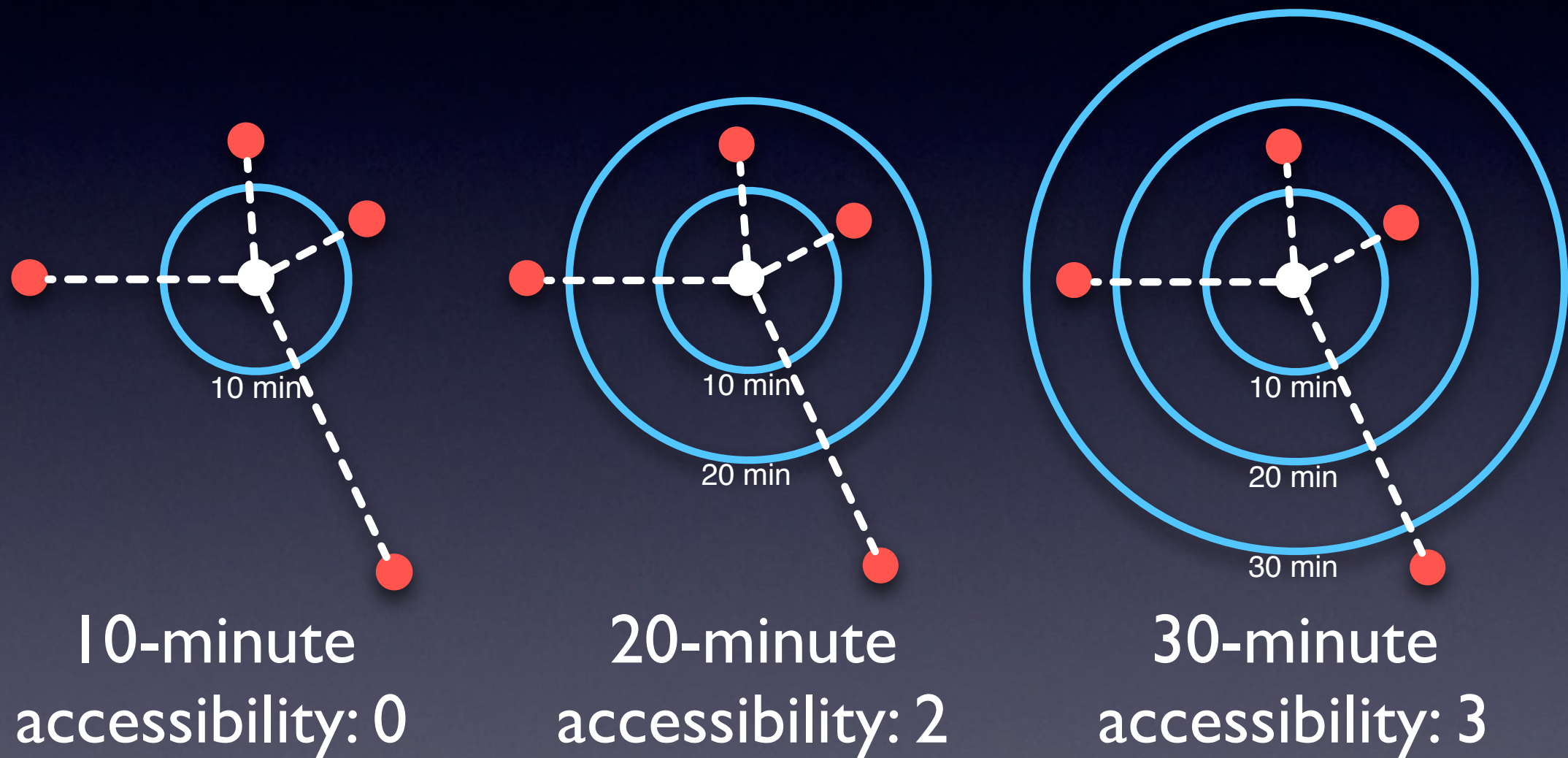
Cumulative Opportunities



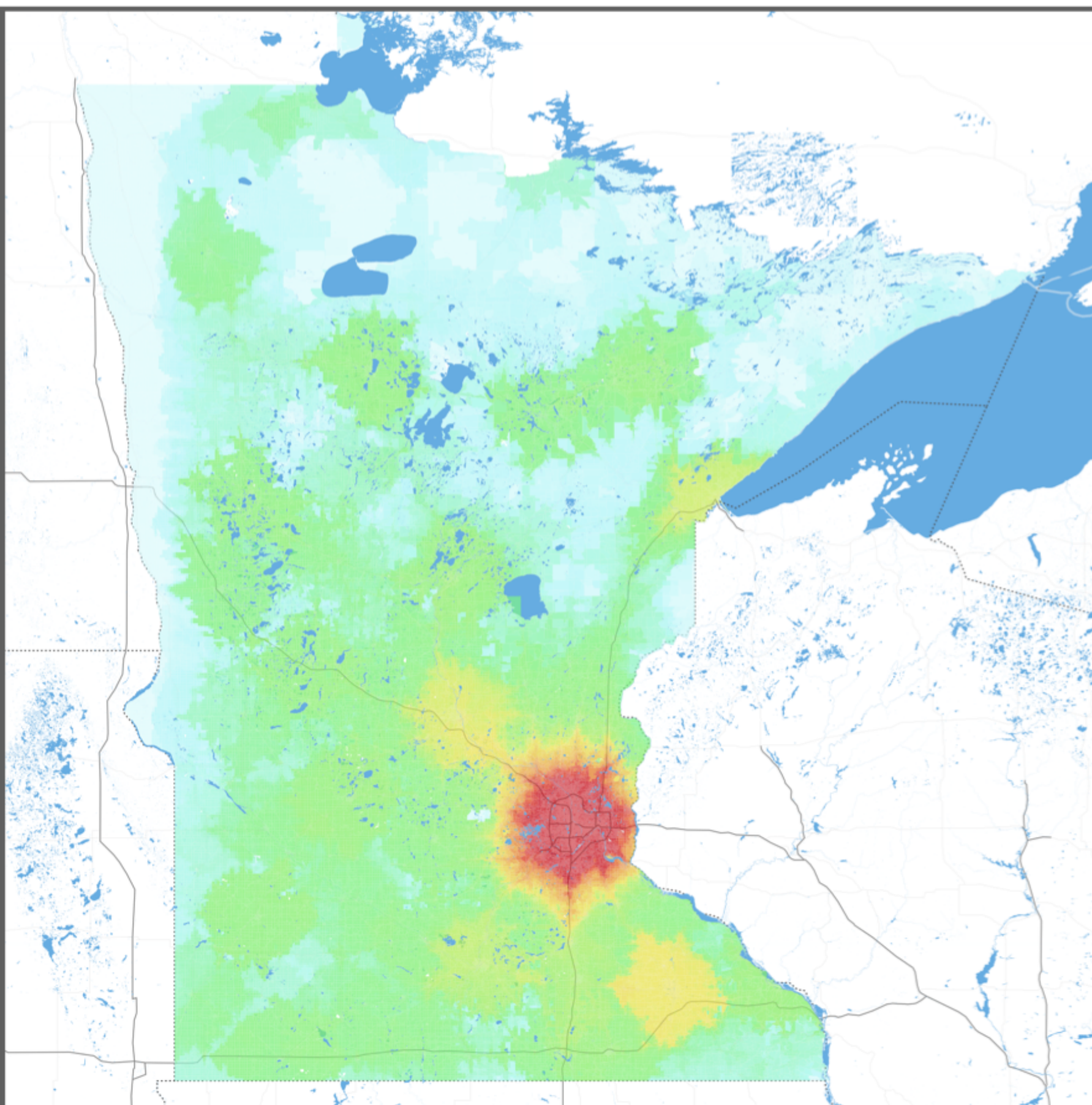
10-minute
accessibility: 0

20-minute
accessibility: 2

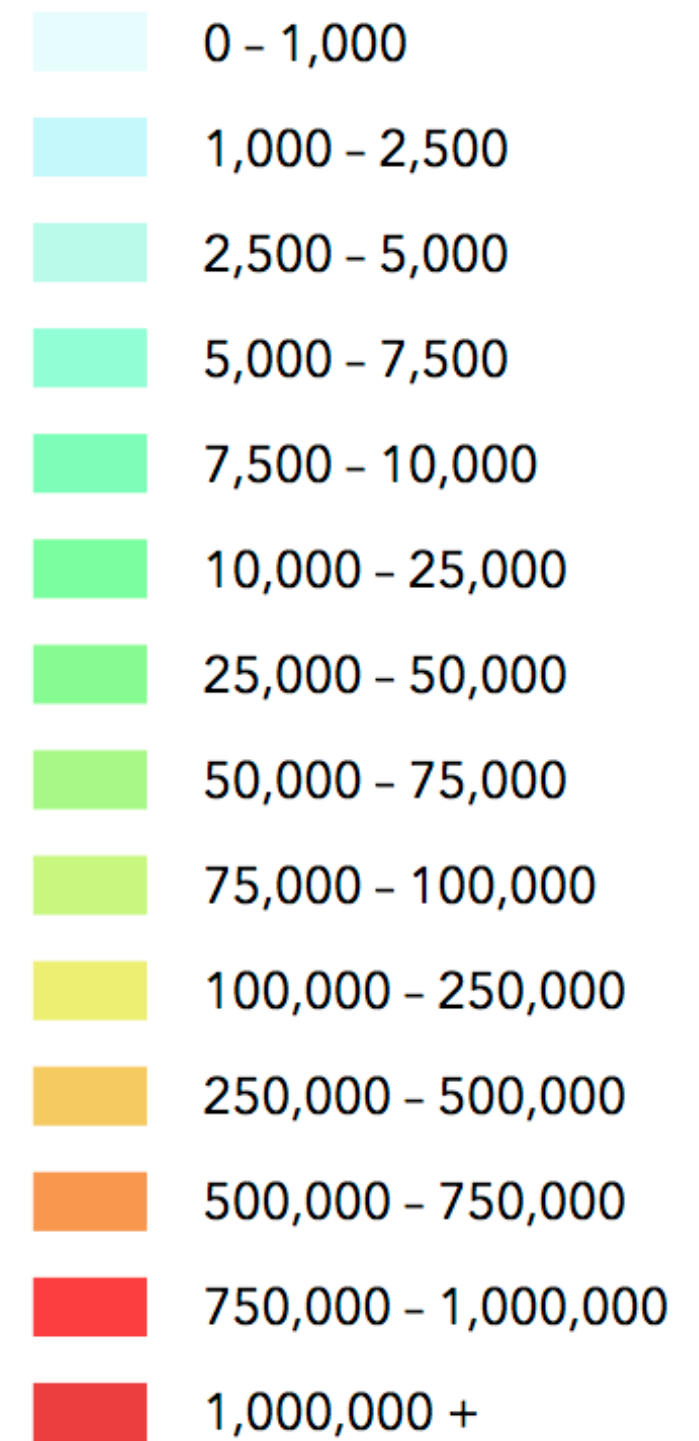
Cumulative Opportunities



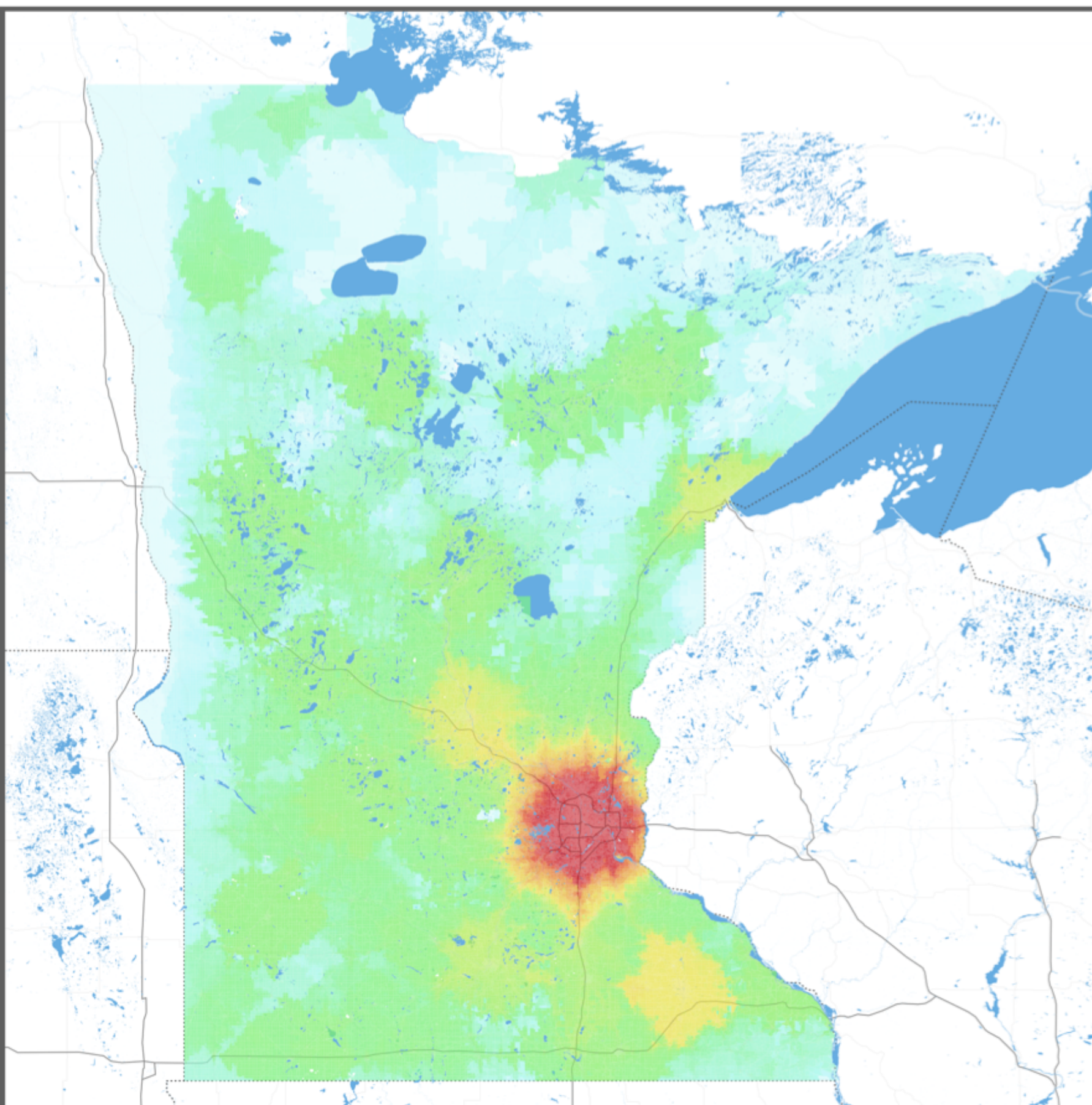
Minnesota



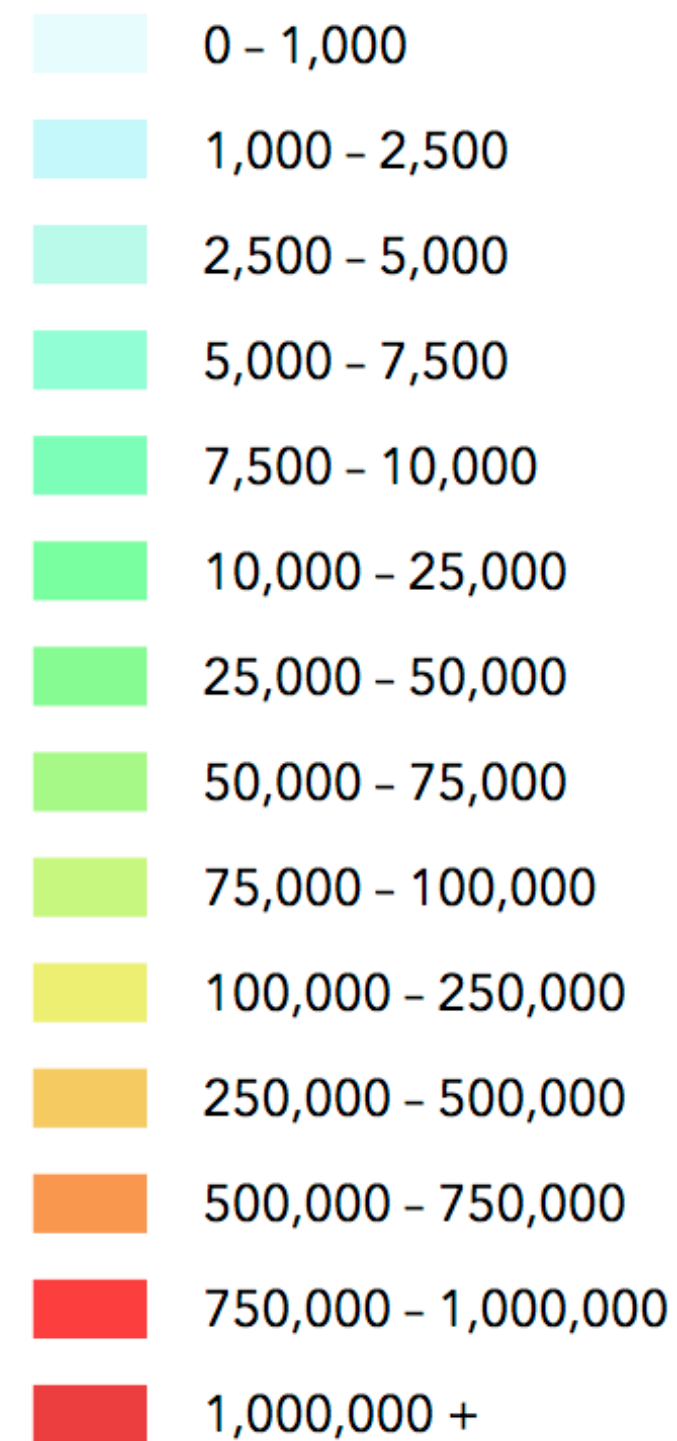
Jobs within 30 minutes by driving at 6am



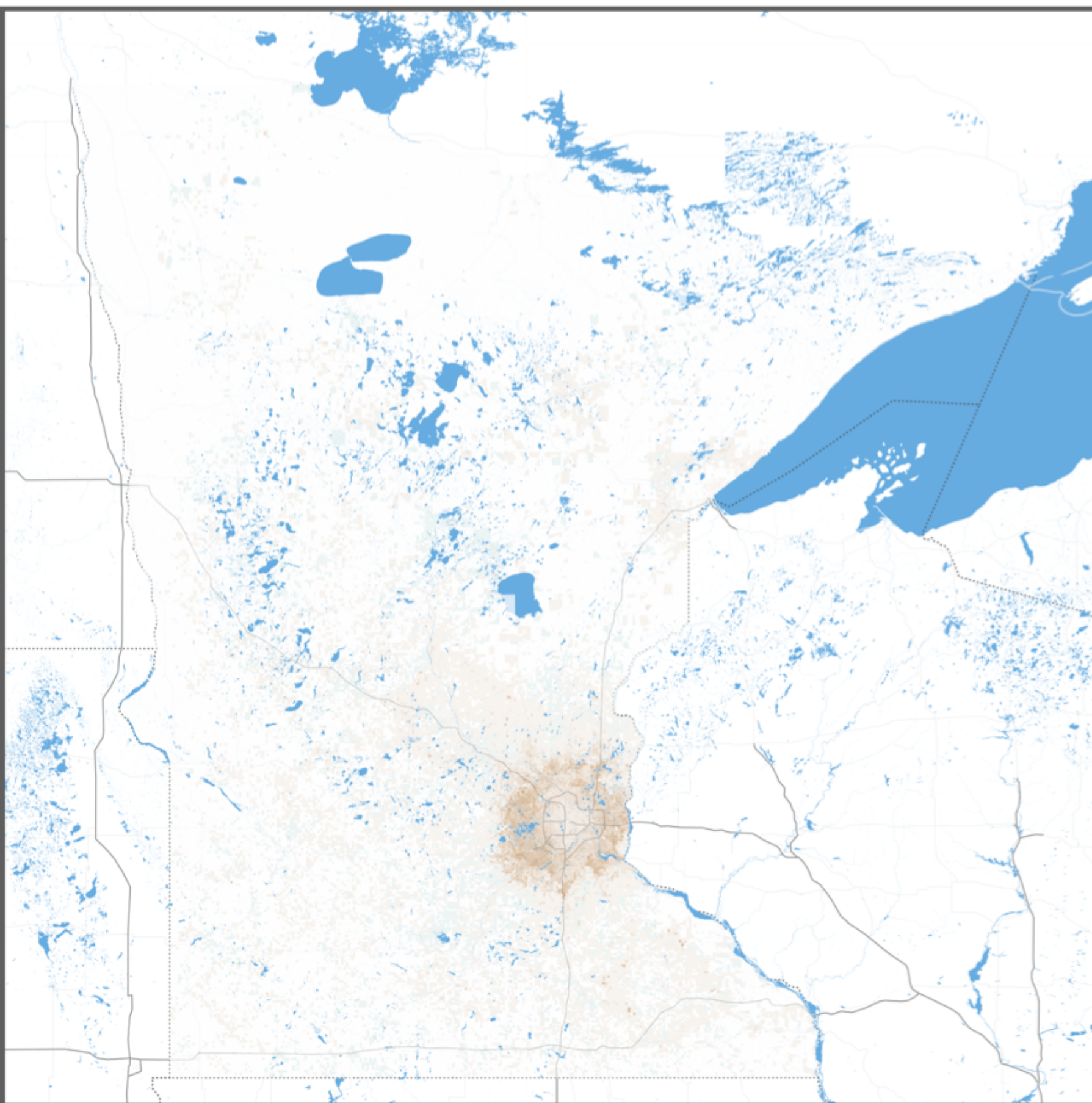
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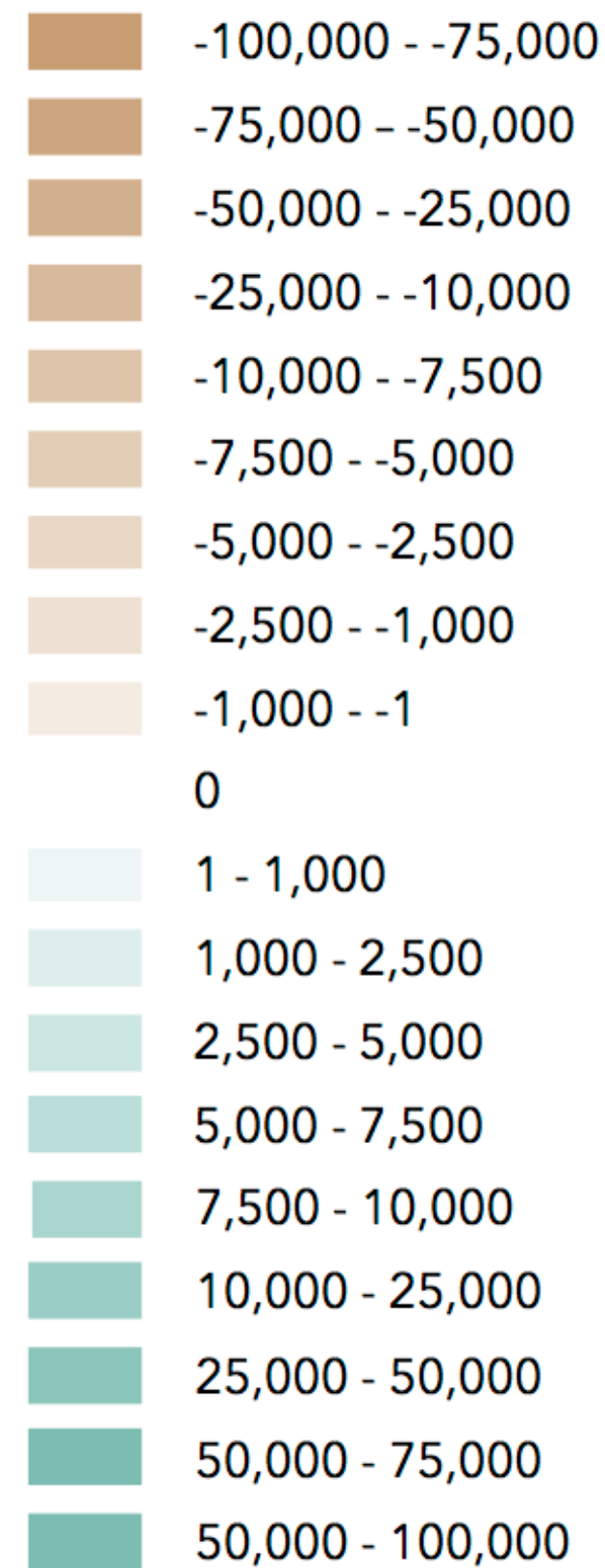
Jobs within 30 minutes by driving at 8am

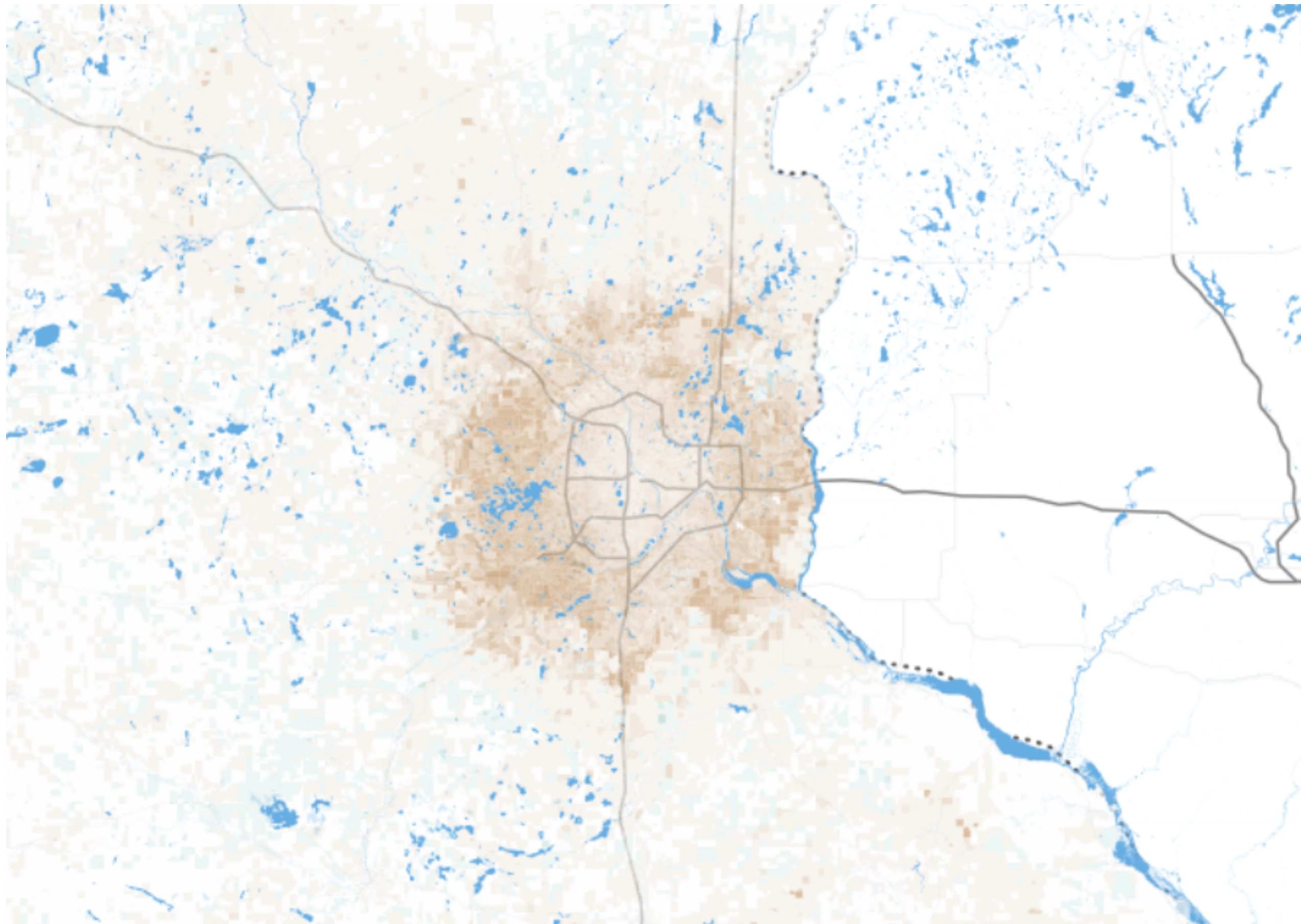


Minnesota



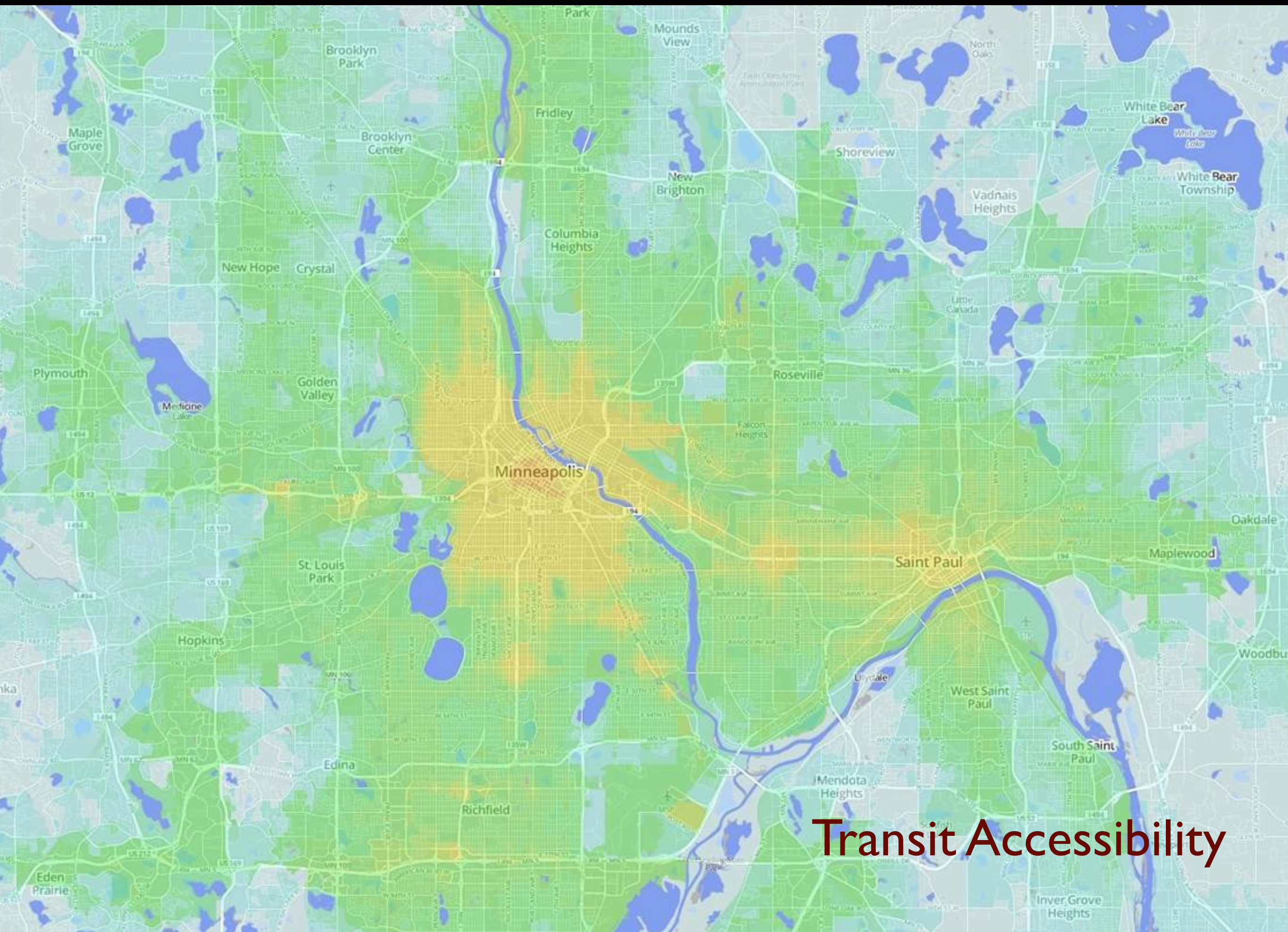
Jobs within 30 minutes by driving; 8am minus 6am



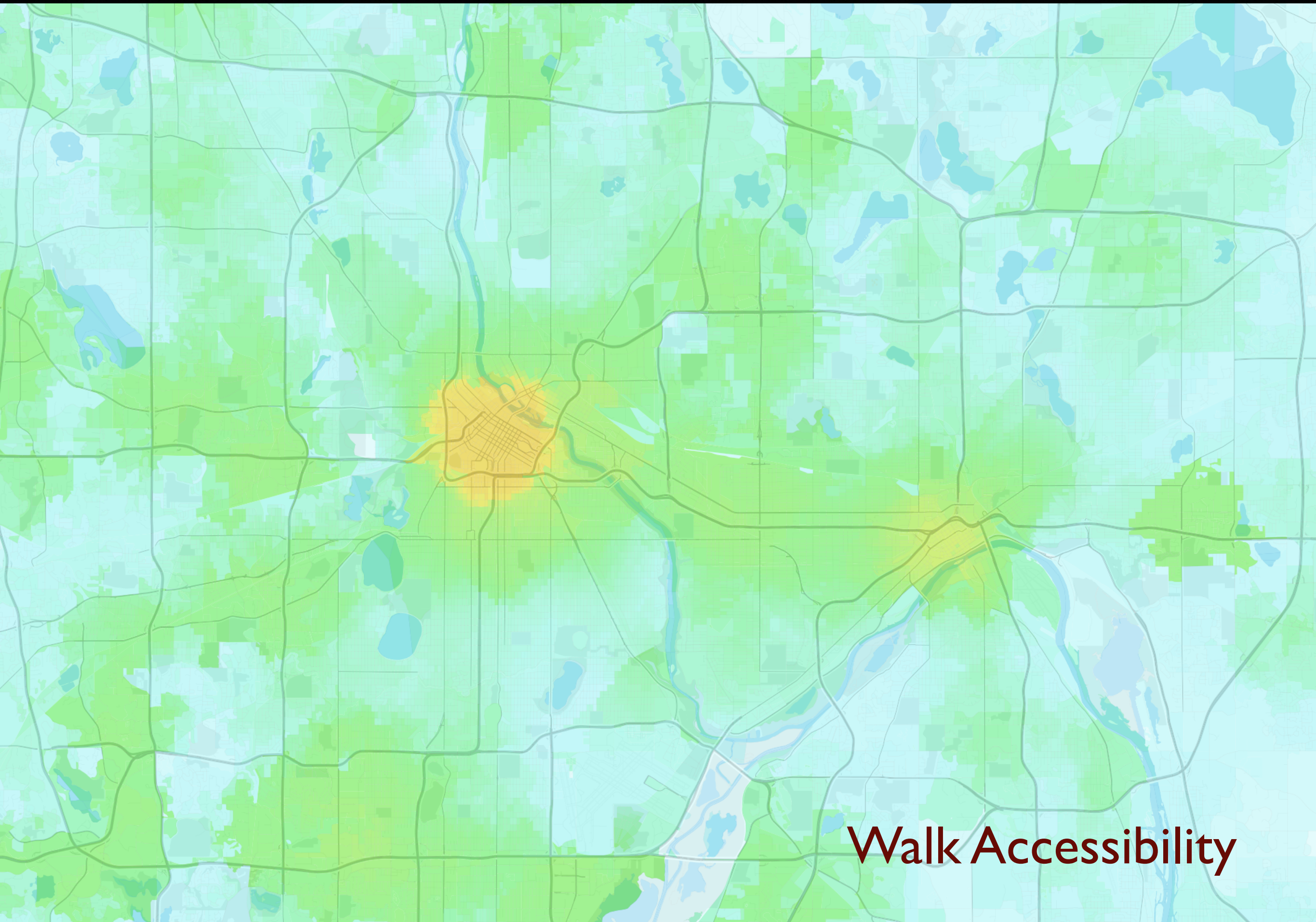


This applies across any and all modes

Data from National Accessibility Evaluation conducted by Accessibility Observatory
at University of Minnesota (MnDOT led project funded by 9 states and US DOT)



Transit Accessibility



Walk Accessibility

Clearly access by car is higher than by transit

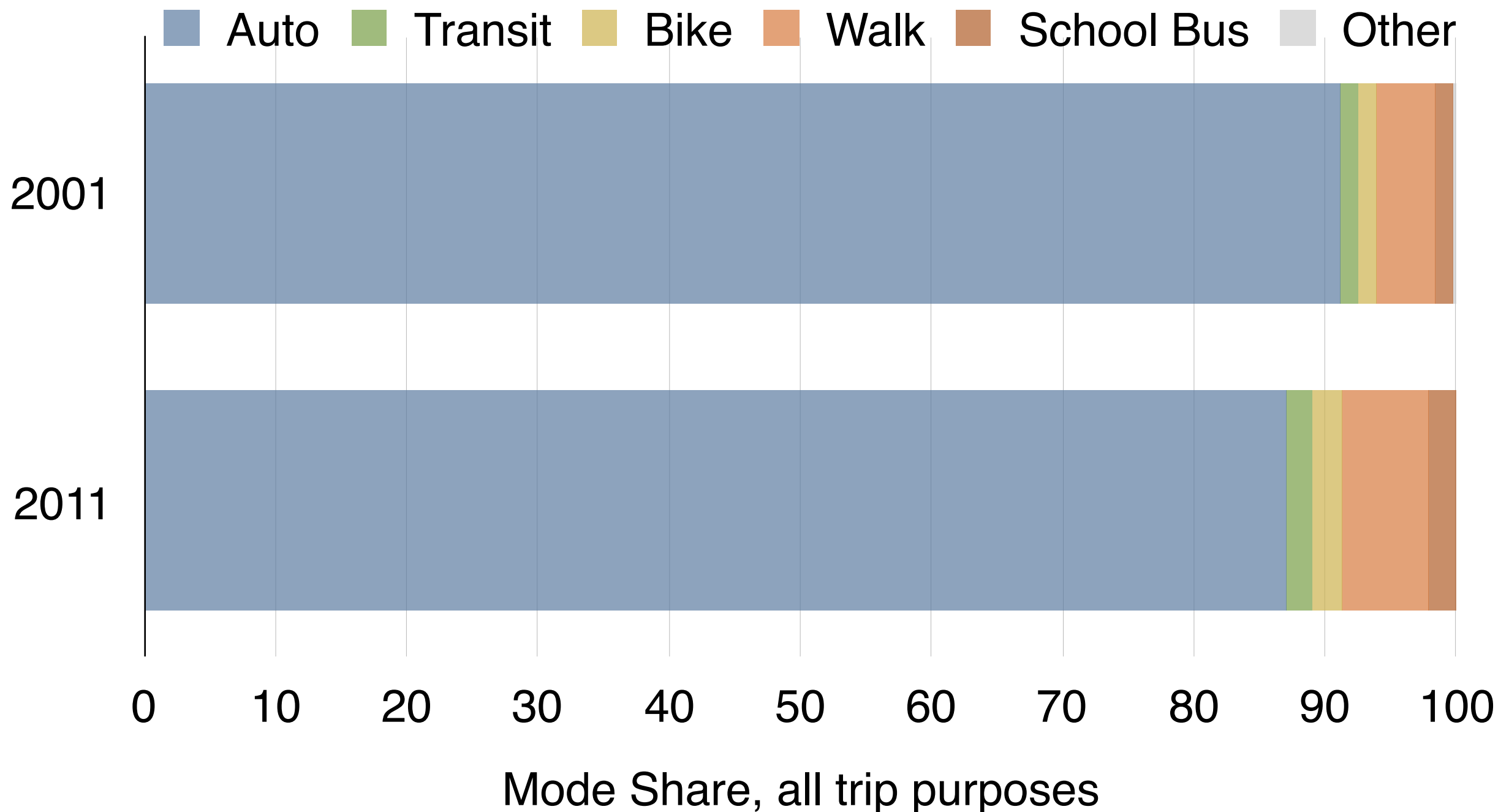
- So more people drive than take the bus or train.
- But many people value transit, and not just for work ...

The Transit Constituency

- MSP: Commuters Using Transit (to work): 5%
- MSP: Families using transit “sometimes, most of the time, or always” for work or school: 11%
- MSP: Families using transit for any purpose: 26%

Competing Modes

Figure 3.9 Mode Shares in Minneapolis - St. Paul Region,
Summer 2001 vs. Summer 2011

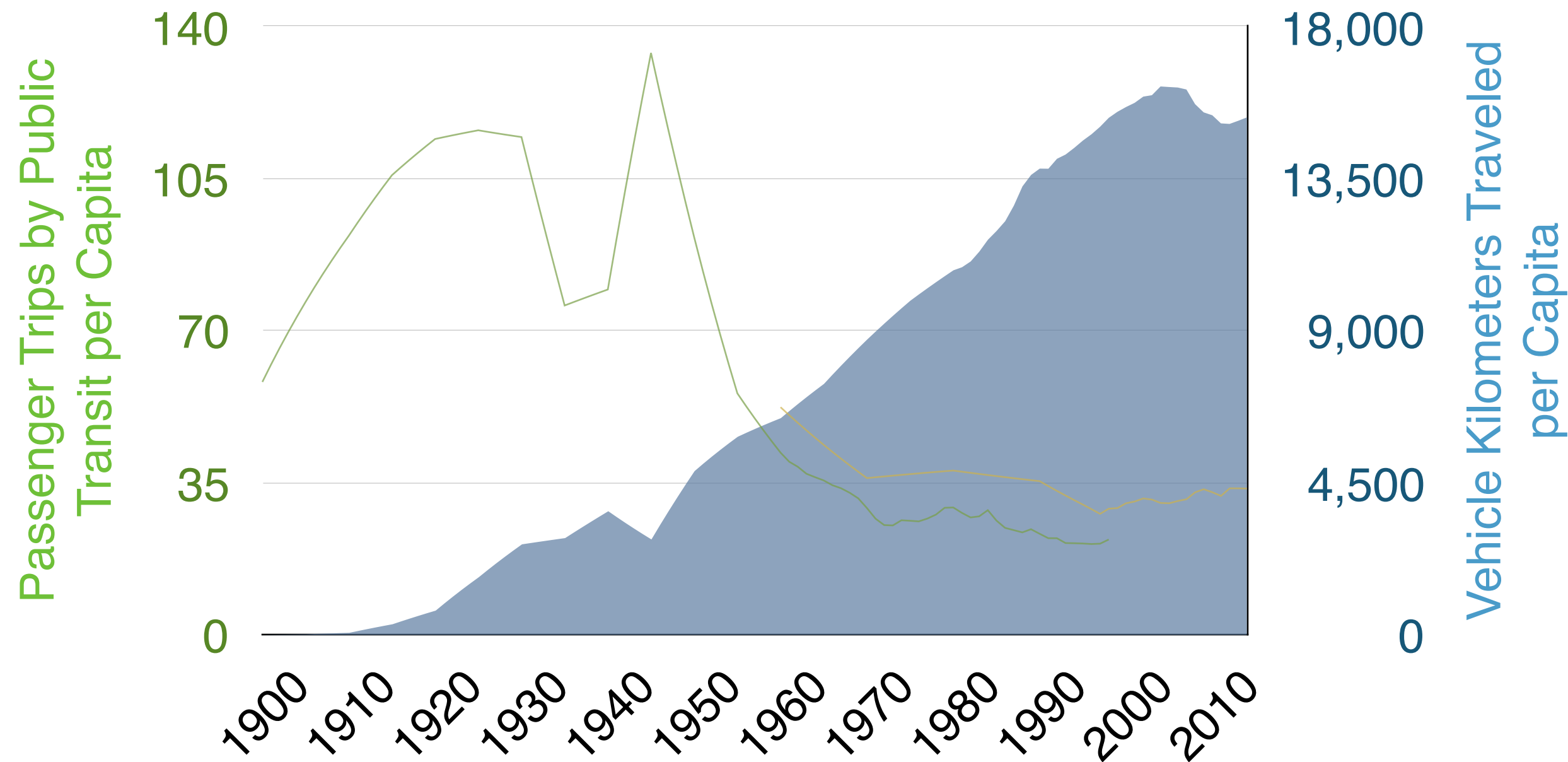


Congested cities tend to have higher accessibility

- Accessibility creates value, (which we see in land prices and wages), which causes demand, which creates traffic, which slows speed, which limits the amount of value created.
- Accessible places are more productive and attractive (otherwise why pay more to live near other people?)

What trends are taking place?

Figure 1.1: Climbing Mount Auto



- Vehicle Kilometers of Travel Per Capita
- Passenger Journeys by Public Transport Per Capita
- Unlinked Passenger Journeys by Public Transport Per Capita

Figure 1.2 Roadways per Capita in US (m)

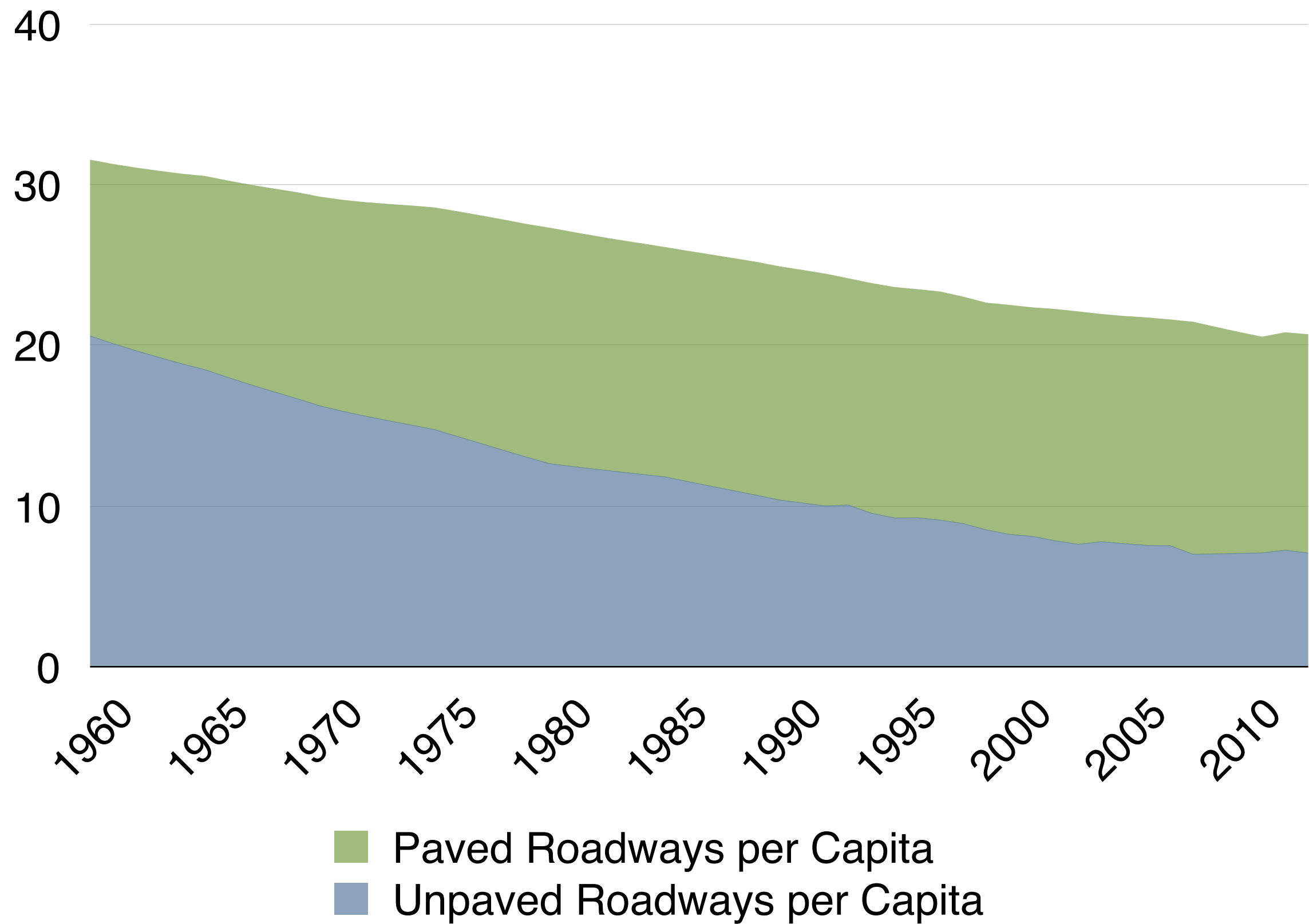


Figure 1.3 Registered motor vehicles in US

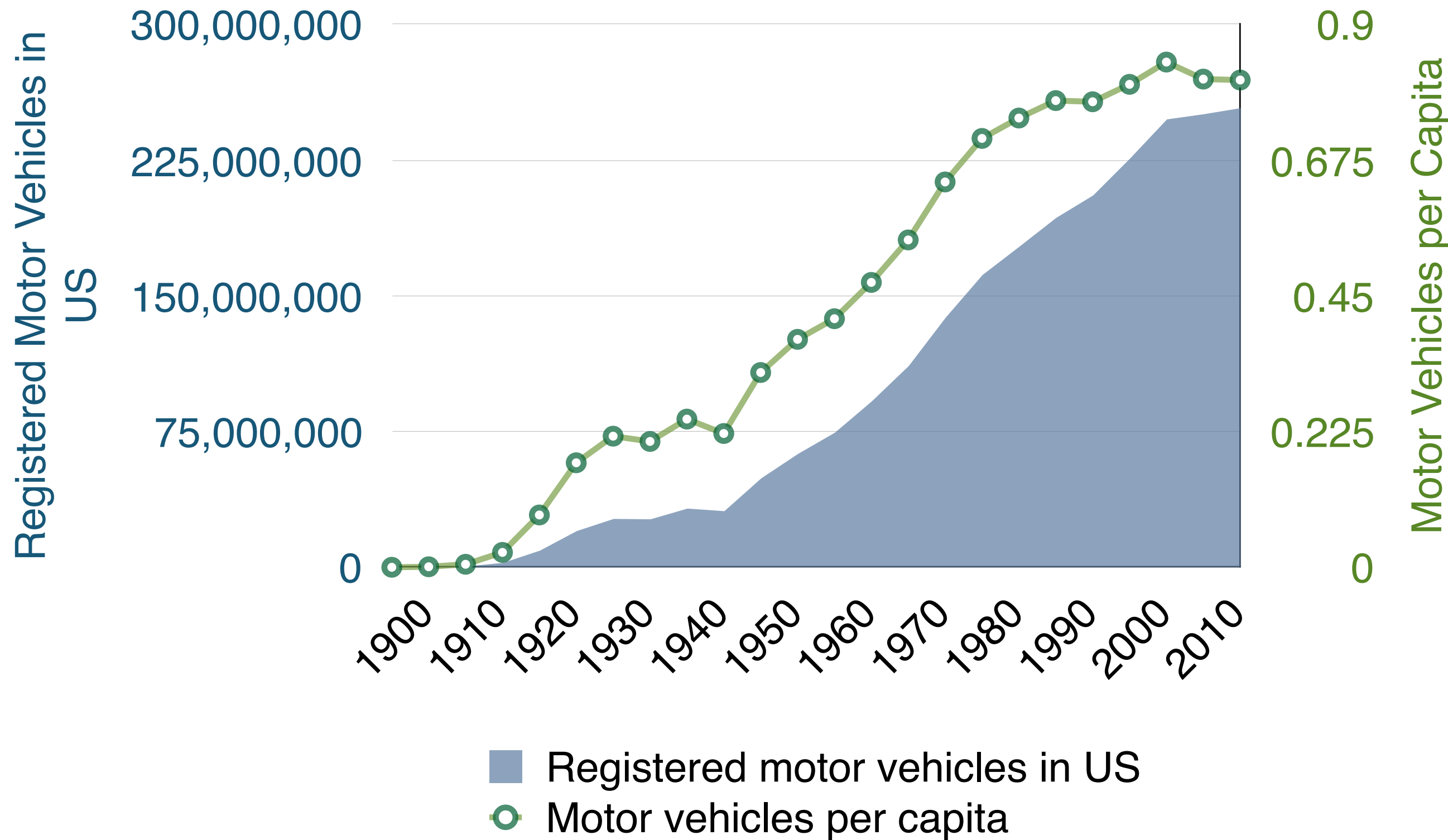


Figure 1.4 Total Time Spent
Traveling per capita
(minutes)

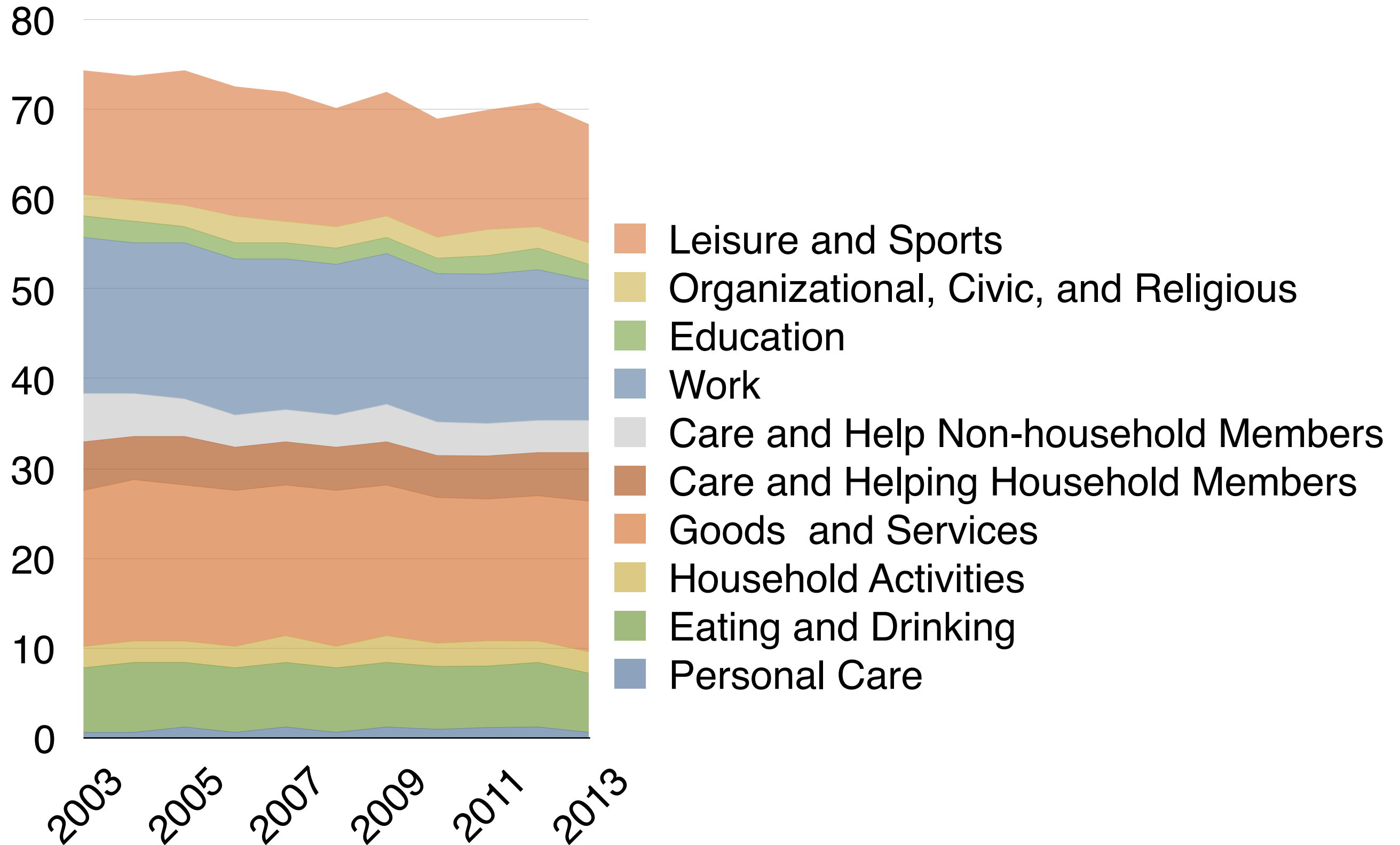
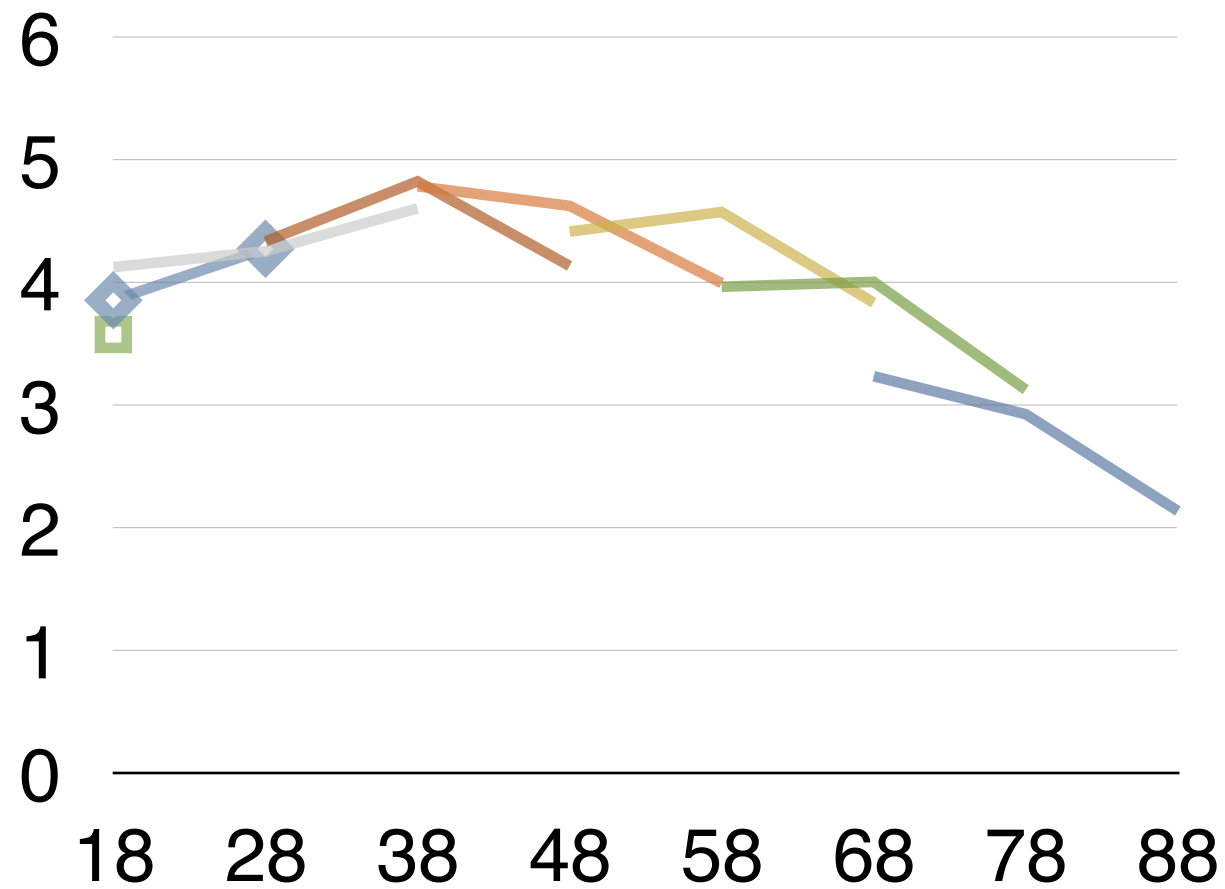


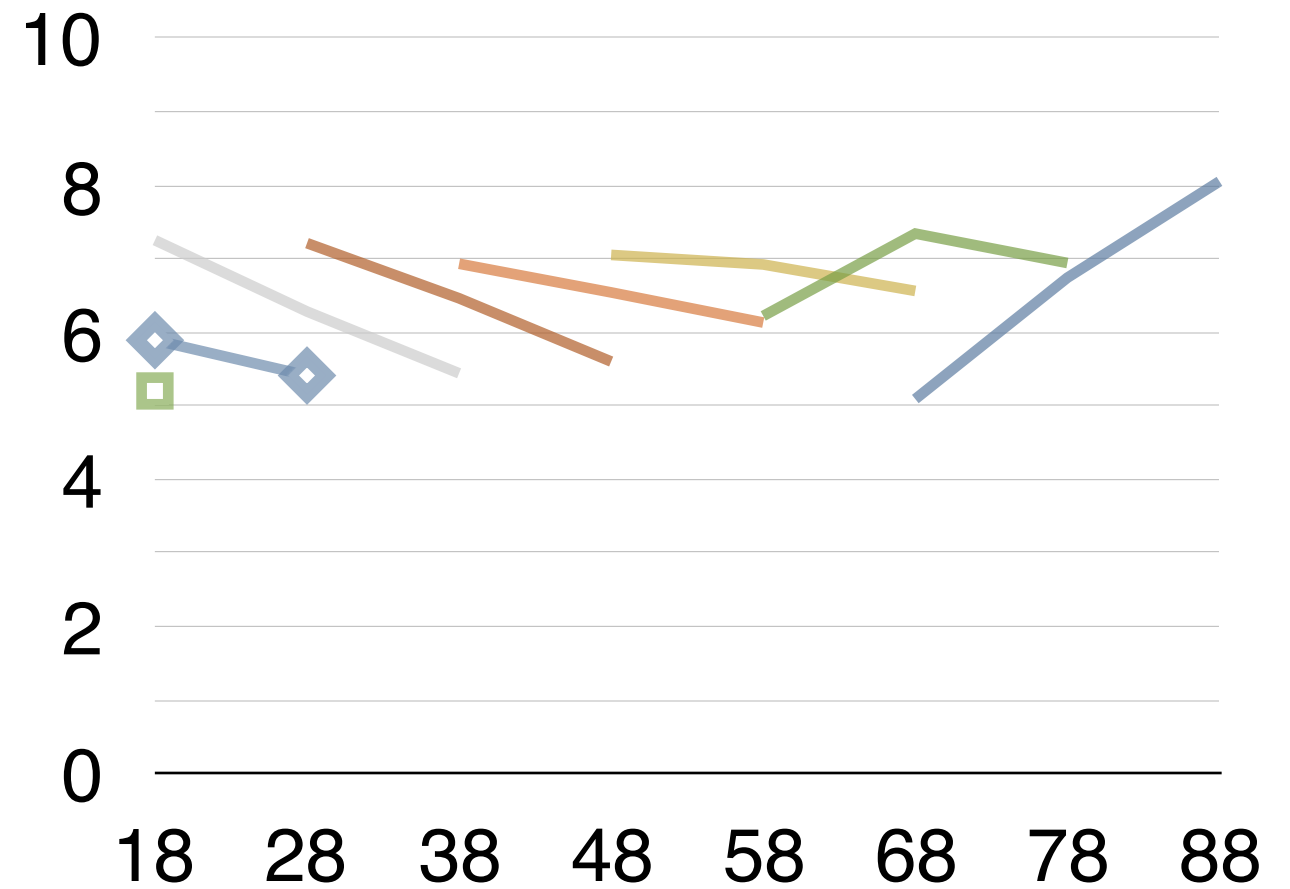
Figure 1.5 Person Trips per Day
by Age and Year of Birth



Age (lower bound)

- Born Before 1924
- 1934-1943
- 1954-1963
- ◊ 1974-1983

Figure 1.6 Average Trip
Distance by Age and Year of Birth
Cohort (Miles, All
Purposes)



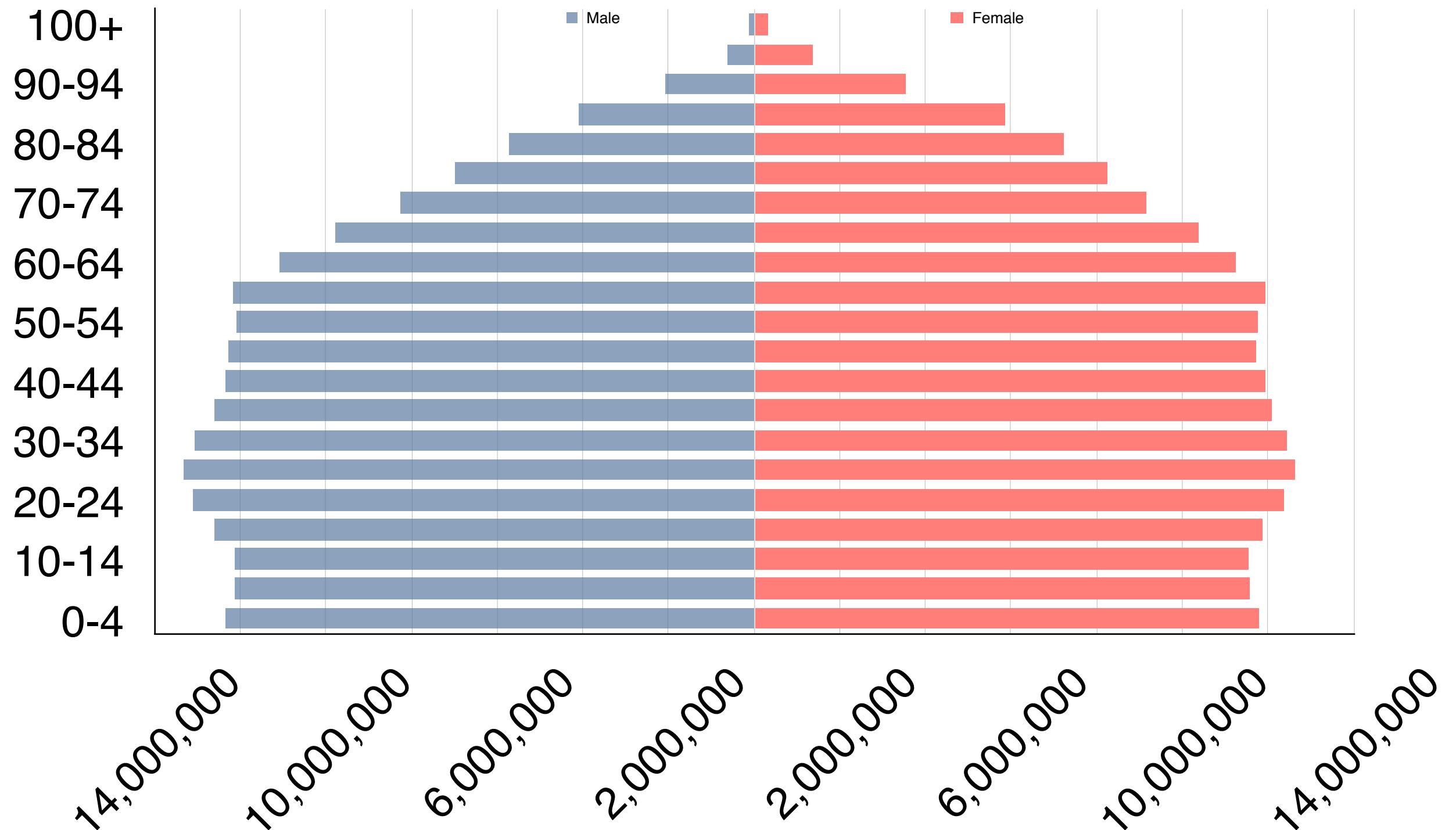
Age (lower bound)

- 1924-1933
- 1944-1953
- 1964-1973
- ◻ 1984-1993

Changing Demographics

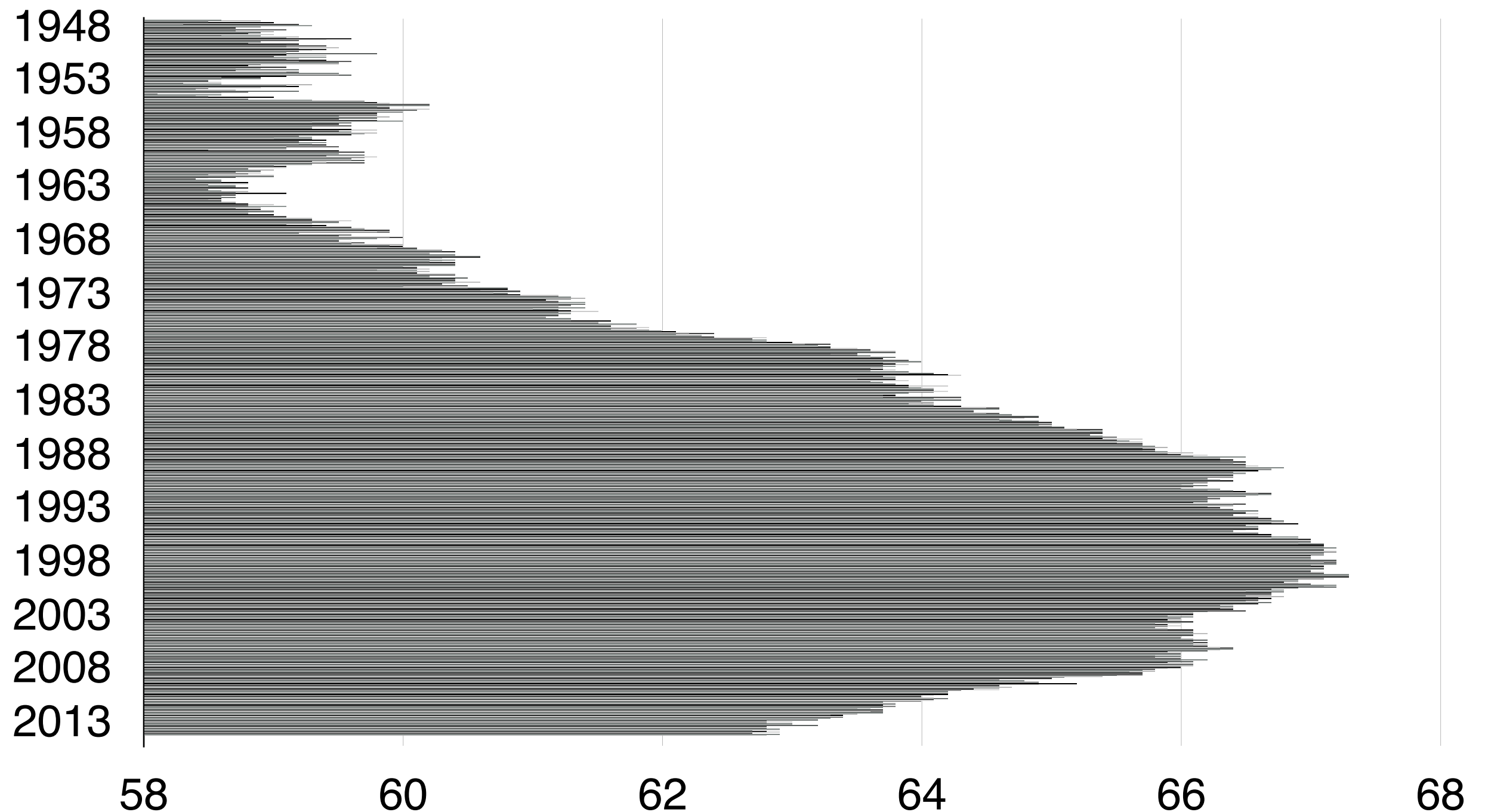
The End of
Traffic
&
the Future of
Transport

Figure 3.1 Population of Age Groups in US 2014



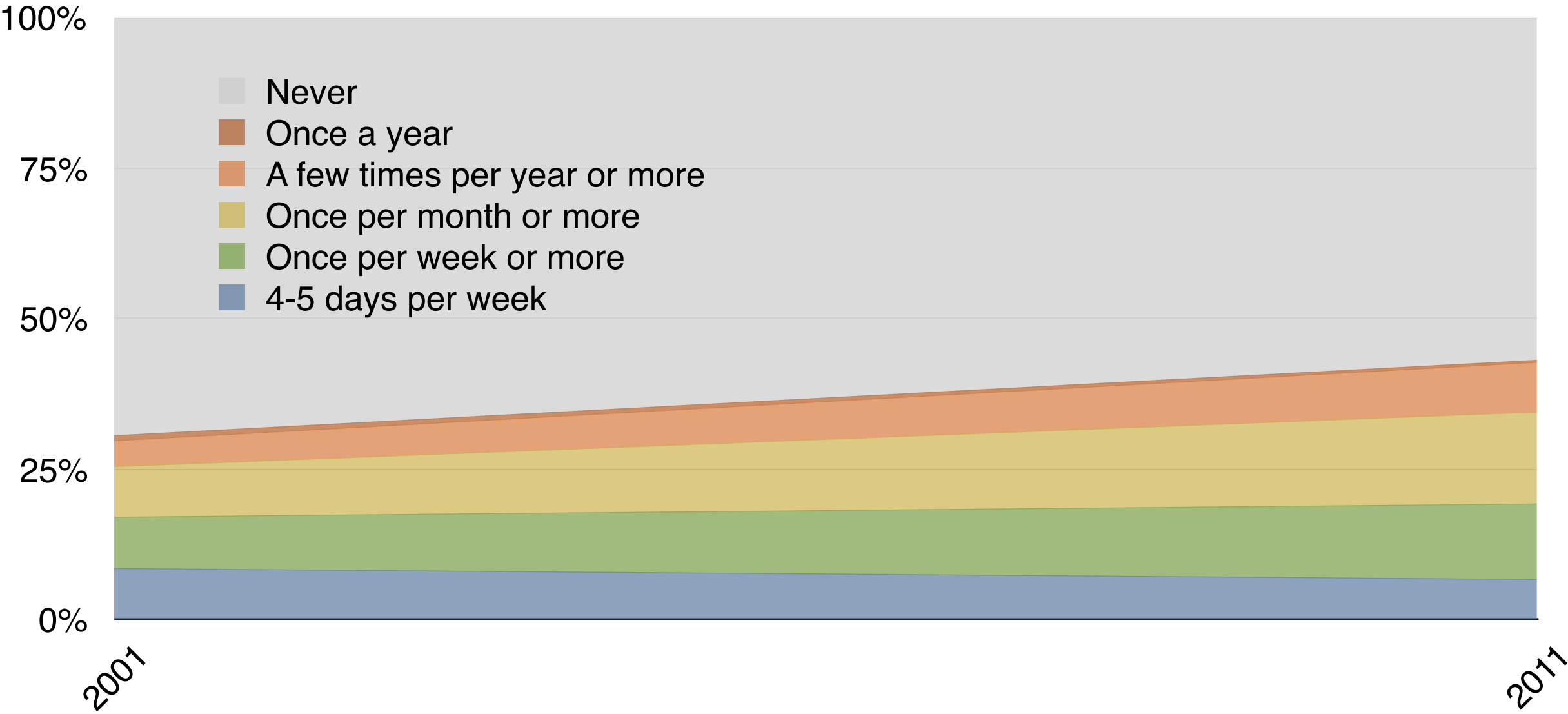
Changing Nature of Work

Figure 3.2 US Labor Force Participation Rate: 1948-2015

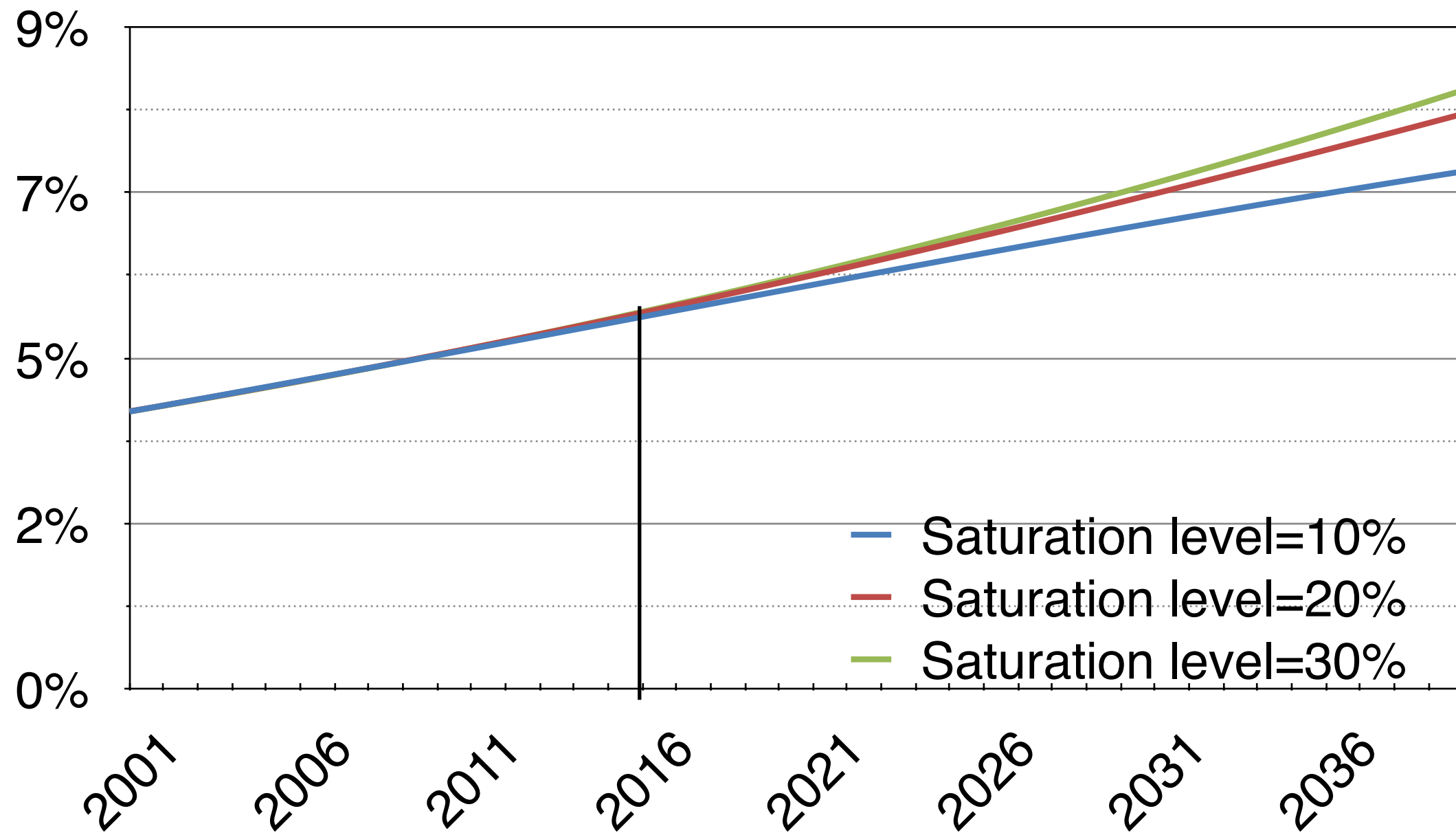


At Home Working

Figure 3.4 Telecommuting in Minneapolis- St. Paul Region

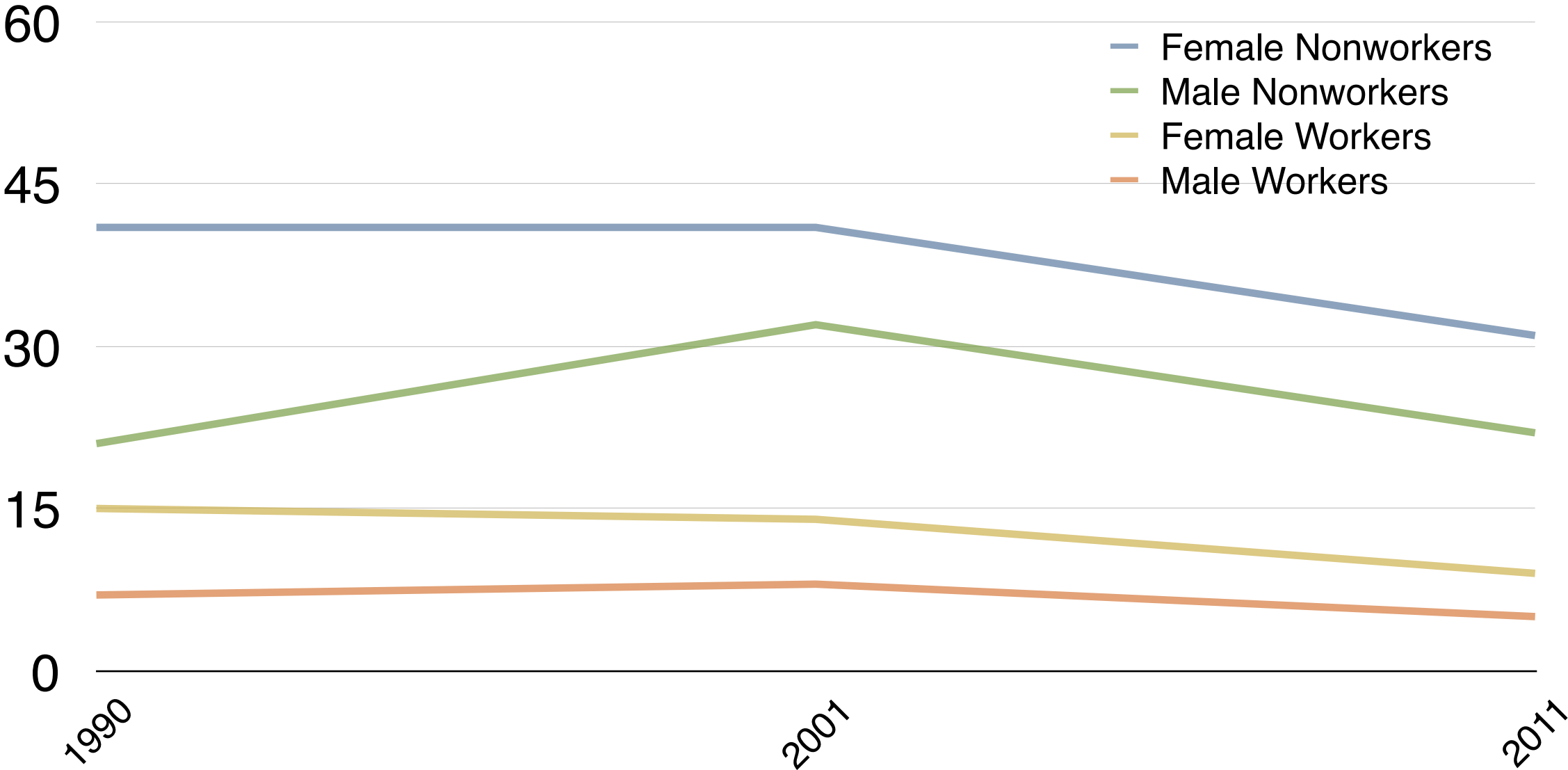


Telecommuting Trends and Projections



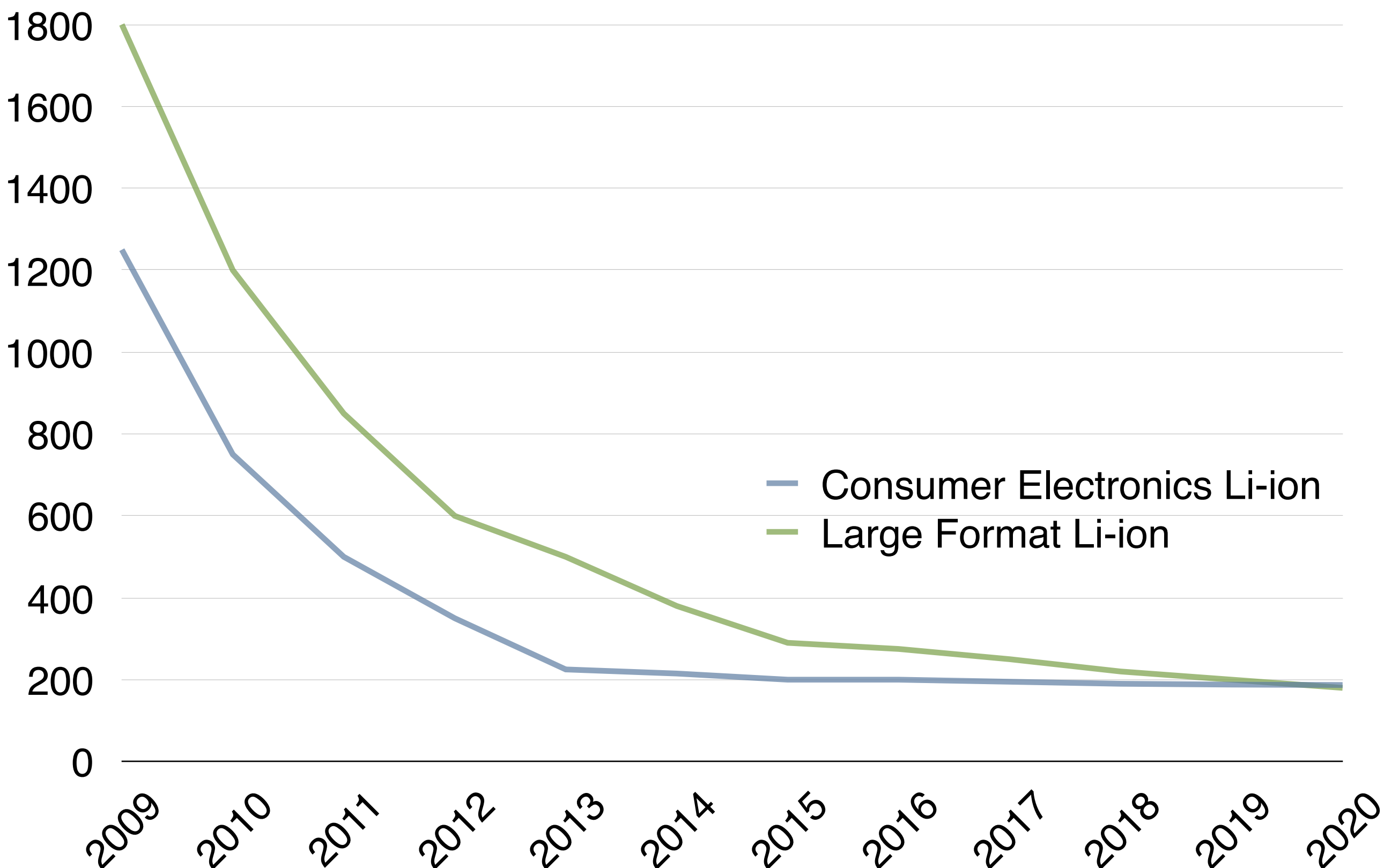
Online Shopping

Figure 3.5 Time Spent Shopping per Day in Minneapolis St. Paul Region (minutes)

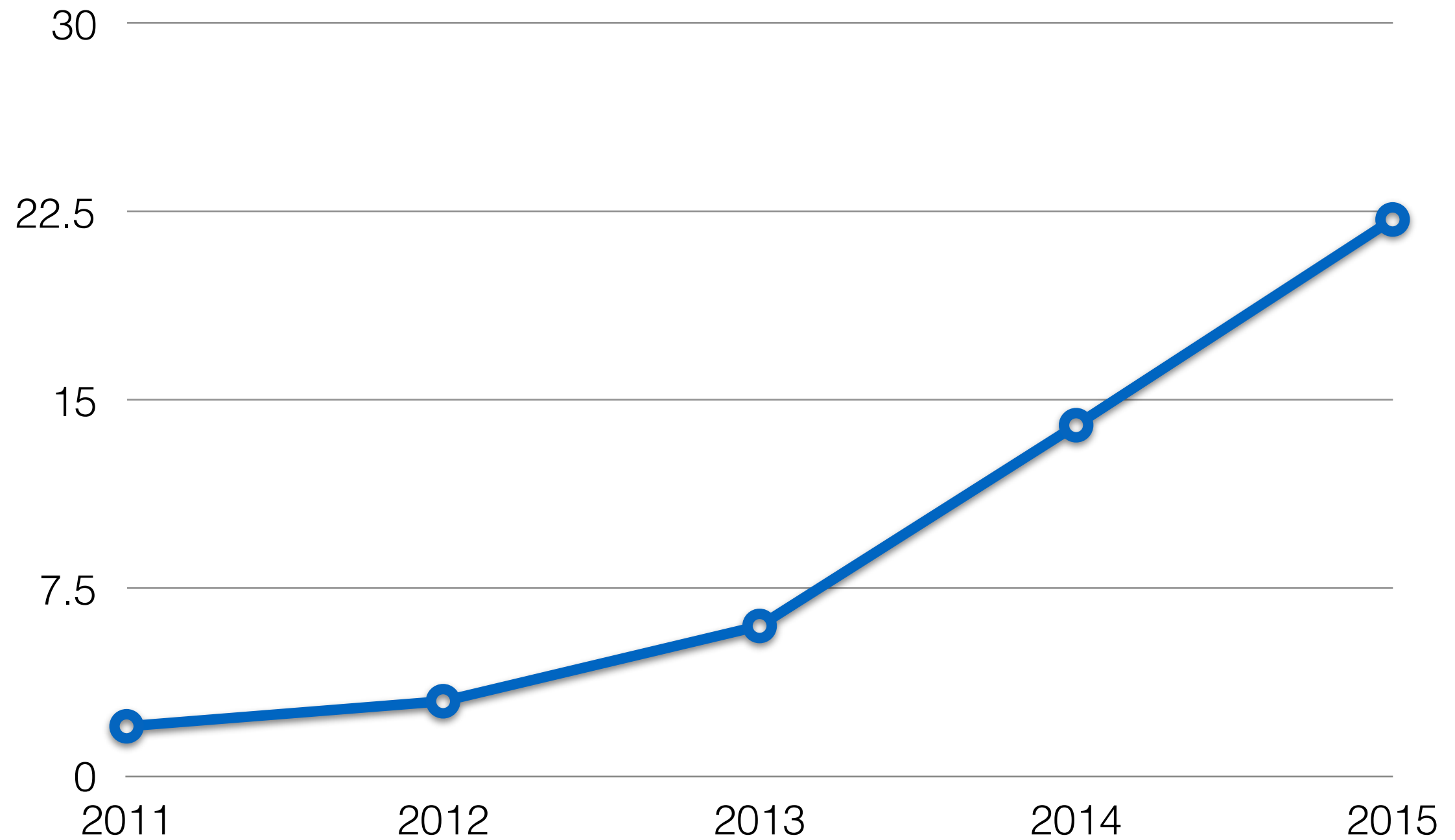


What trends are taking place?

Figure 5.2 Lithium Ion Battery Pricing by Cell Type (2009-2020) (\$/kWh)

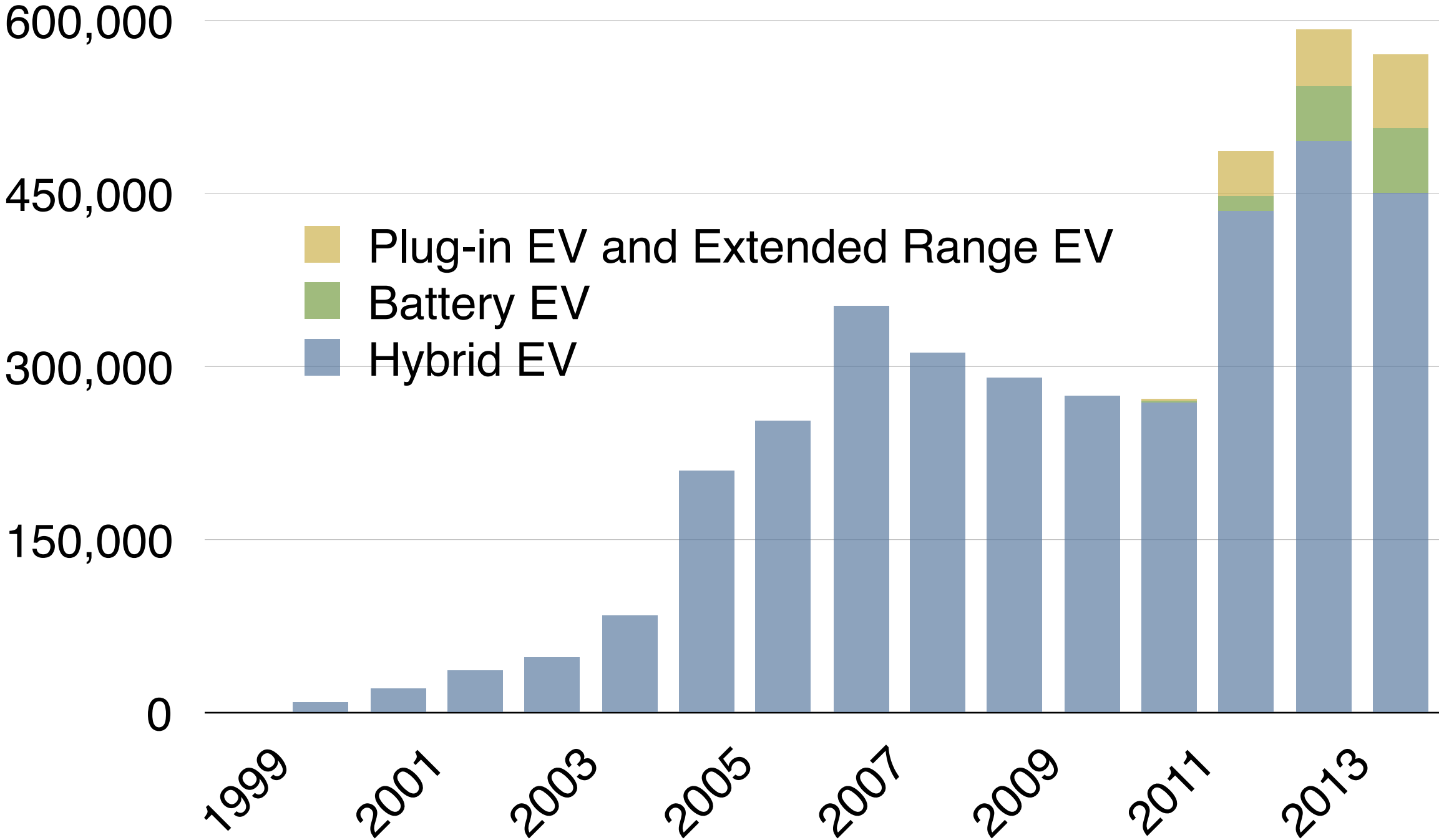


Norwegian Electric Vehicle Market Share

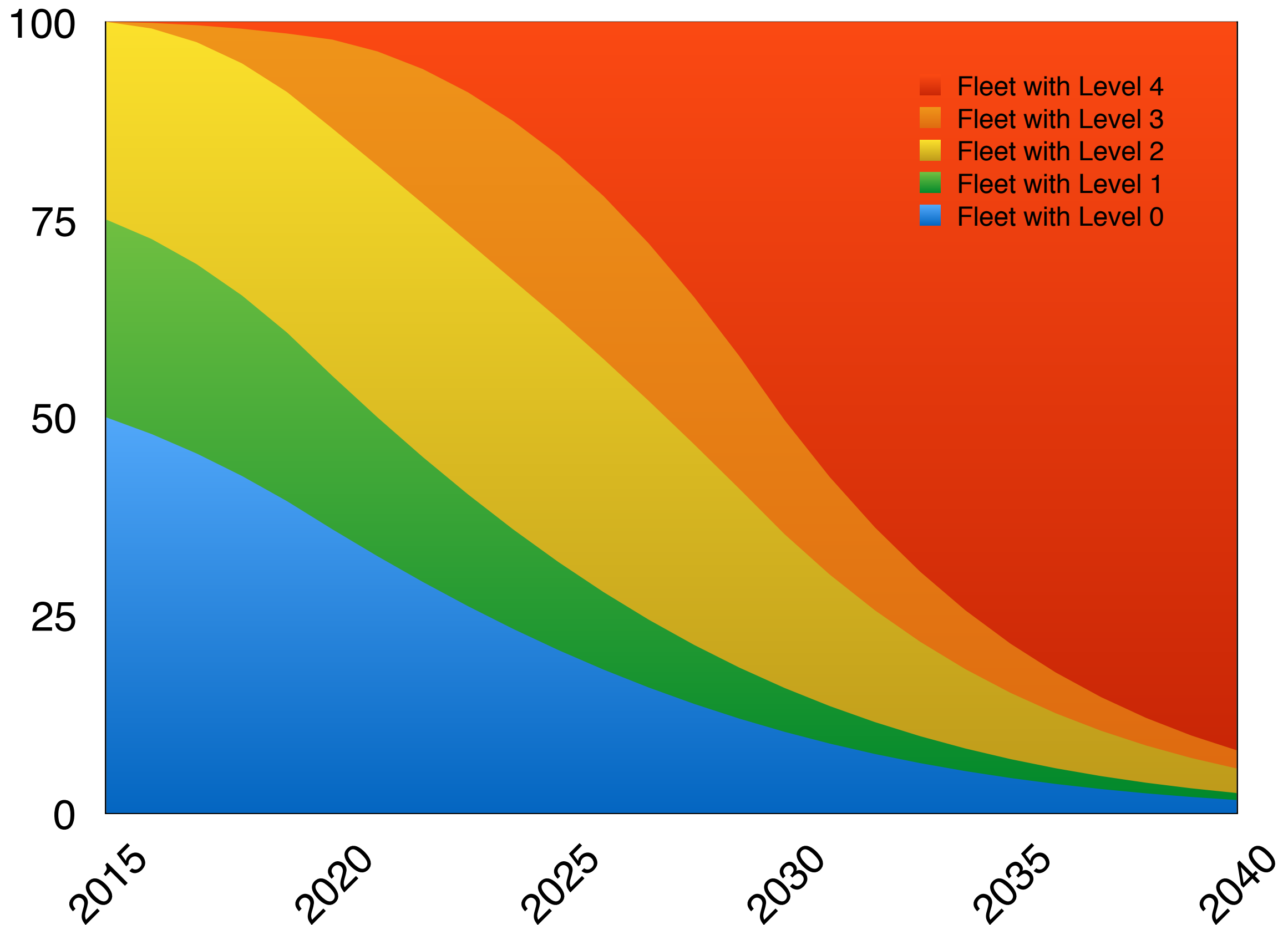


Norwegian Electric Vehicle Association,

Figure 5.1 US Sales of Electric Vehicles



US Vehicle Fleet by NHTSA Automation Level



A Cambrian Explosion of Vehicle Forms



“Google Car”

Shape-Sifting



MIT “Stackable City Car” Concept

Bigger



“Toyota Swagger”

And Smaller



GM Lean Machine



Toyota iRoad



Gogoro

with Fewer Wheels?



Ryno

What policies can Minnesota engage in to maintain or increase access?

1. Preserve

- The value (benefits - costs) of preserving existing links is generally far greater than the value of new links, especially new links serving future (speculative) development (development-oriented transportation).

2. Reduce & Reuse

- Most roads are under-used most of the time. There is ample capacity outside the peak.
- Most of the pavement is unused even at peak times; there are large gaps between vehicles both in terms of the headway between vehicles and the lateral spacing between vehicles. Americans drive 6 foot wide cars in 12 foot lanes, often on highways with wide shoulders.
- Most seats in most cars are unoccupied most of the time.
- Most cars contain far more weight than required to safely move the passenger. While bigger cars might be safer for the occupants, they are less safe for non-occupants. This is an inefficient arms race.
- Many roads are so wide we use them for storage of vehicles most of the day.
- There is excessive delay at traffic lights, especially during off-peak periods, wasting time and space.
- Smoothing and spreading demand brings peak travel times closer to freeflow times, and thus raises accessibility.

Policy Implication:

- Increased throughput per square meter of pavement due to Vehicle Automation (along with flattened demand) indicates fewer square meters of pavement are required.

3. Make investments that have high rate of return.

- The more benefits per \$ spent, the more things that can be built.
- Explicitly consider Benefits and Costs when making investments. This is hard since this requires forecasts of the future, which is changing.
- Focus on projects that most effectively expand accessibility for all, (efficiency), or for those with fewer opportunities (equity).

Cost per Daily Passenger Mile

Route	Cost	Daily Ridership	Line Length	Trip Length	Cost per Daily Rider	Cost per Daily Passenger Mile
Red Line	112,000,000	800	16	12	140,000	11,667
Northstar	317,000,000	2,400	40	24	132,083	5,503
SW LRT	1,820,000,000	30,000	12	4.7	60,667	12,908
Green Line	920,000,000	42,170	11	4.7	21,816	4,642
Blue Line	715,000,000	34,000	12.3	4.7	21,029	4,474
A-Line (Snelling)	25,000,000	3,500	10.3	3.9	7,143	1,832

4. Make investments that are flexible and adaptable.

- The next 50 years are going to see far more change than the past 50 years in transportation.
- Locking into investments serving today's (yesterday's) needs will lead to **future stranded investments and fewer resources to improve accessibility tomorrow.**

5. Accelerate the End of Congestion (and fund roads) via Pricing

Today's gas tax (which is better than many alternatives) does not

- account for cost inflation in the road sector.
- account for rising fuel efficiency.
- pay for local roads.
- pay for pollution.
- pay for crashes, which are borne individually through worsened health and life outcomes, and socially through the health care system.
- raise revenue from vehicles that do not use gasoline for fuel.
- recover pavement damage from heavy vehicles.
- address congestion, which requires time of day differentiation. Traffic congestion is a problem. It is not getting measurably worse over the past decade, but it is not getting obviously better. Even if traffic reduces in the aggregate, it won't disappear to zero in the next decade. Congestion reduces accessibility.

How to get to a replacement?

- EVs don't pay gas tax, yet use roads.
- Retaining the highway user fee principle requires charging EVs once a sufficient number make it relevant.
- Vary vehicle mileage charge for EVs and opt-ins (and eventually all vehicles) by location and time-of-day.

Thank You

- Questions???
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The End of Traffic & the Future of Transport



David M. Levinson & Kevin J. Krizek