

# The Case For More Moderate Growth in VMT: A Critical Juncture in U.S. Travel Behavior Trends

**Presentation for USDOT**

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# Center for Urban Transportation Research

The University of South Florida

Tampa, Florida



**National Center for Transit Research (NCTR/UTC)**

**Southeastern Transportation Center (STC/Southeastern Region 4 UTC)**

**National Bus Rapid Transit Institute (NBRTI)**

**Established by the Florida Legislature in 1988**

# Context

- An outgrowth of FDOT supported research:
  - Investigation of Florida Trends and Conditions
  - Exploration of the land use VMT relationship
  - Analysis of public transit implications of NHTS
- A TRB paper that got out of hand.
- Available online at  
<http://nhts.ornl.gov/2001/articles/index.shtml>

# Related Work

- Charles Lave (1991) – *Things Won't Get a Lot Worse: The Future of U.S. Traffic Congestion*, discussed effects of auto availability, labor force participation, age, income and vehicle availability on the growth of VMT and congestion.
- Department of Energy (1995) – Reviewed VMT forecasting issues including age, income and licensure rates.
- Schaper and Patterson (1998) – Reviewed factors contributing to VMT growth.
- Department of Energy (2001) – Age and gender were used to model future VMT.
- FHWA (2002) – *2002 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*, U.S. Department of Transportation, includes an estimate of VMT growth through 2020 documented in *Vehicle Miles Traveled 2001*.

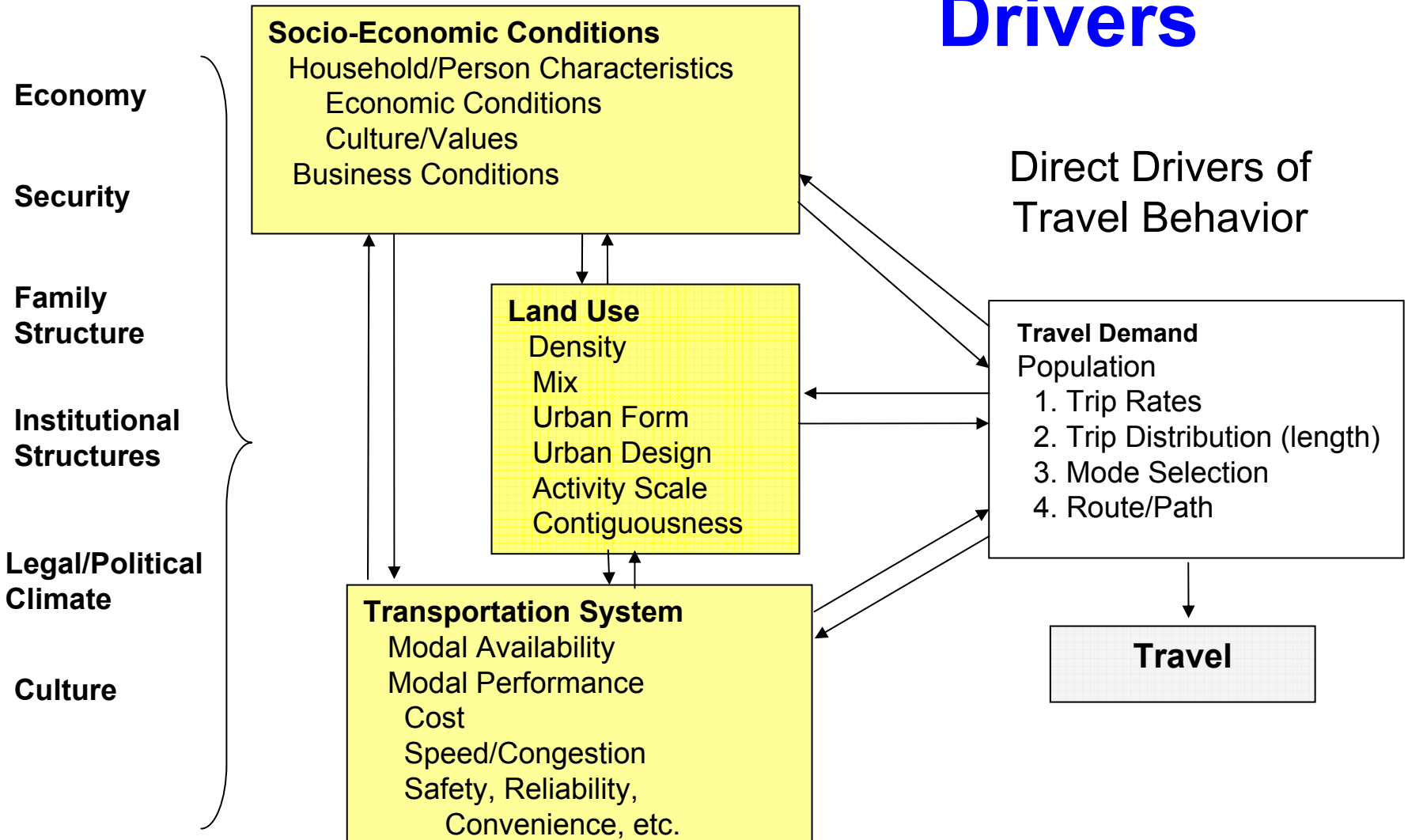
# Key Concepts

- NHTS and Census data help paint a picture of what is going on regarding travel and travel behavior.
- Several socio-demographic and transportation system performance trends are at critical juncture points.
- We are seeing a slowing in the pace of VMT growth that will continue absent new intervening phenomenon.
- Yet congestion may get worse.
- The rate of trip making appears to be the single largest contributor to growing travel demand.
- And there is much we do not yet know.

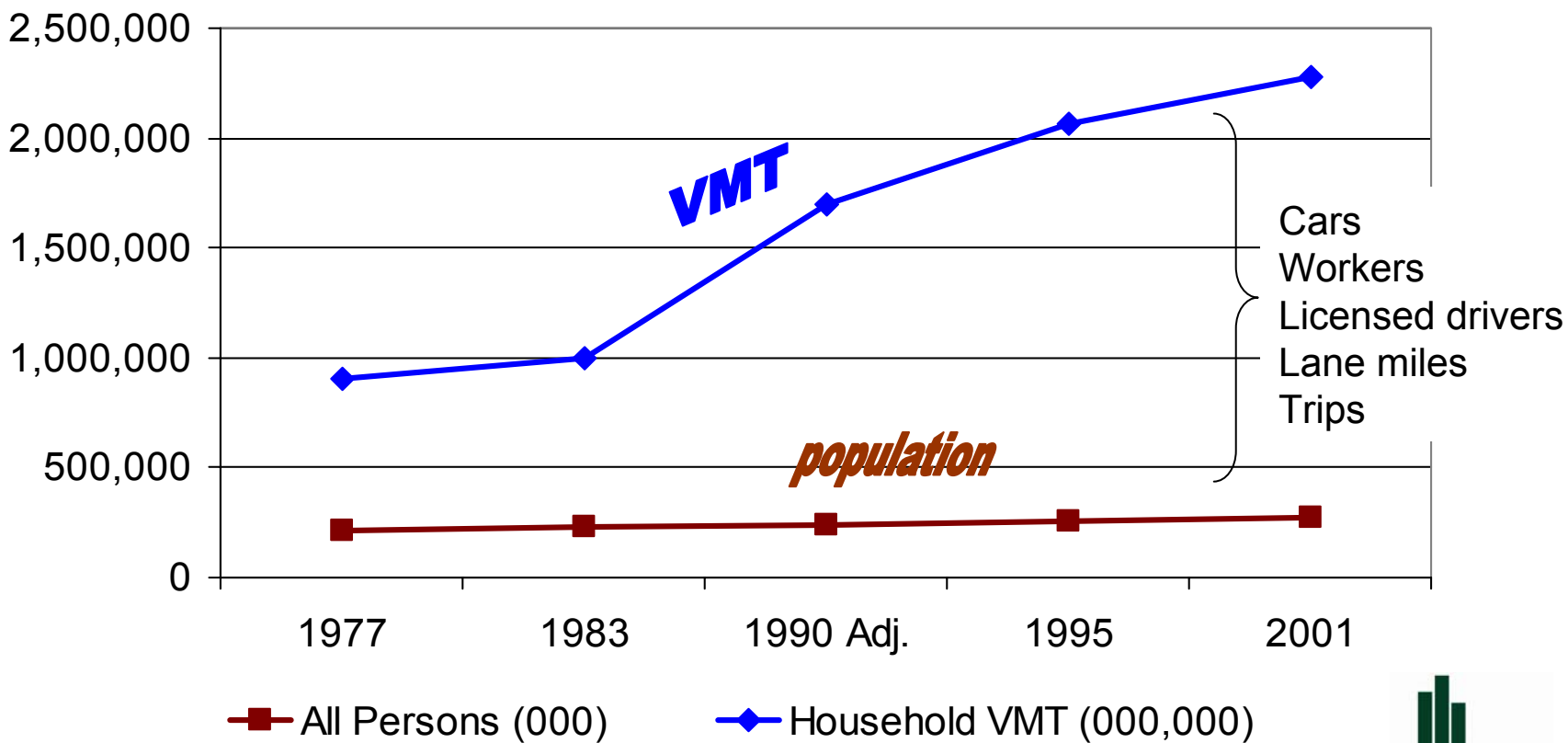
# Conceptual Model of VMT Growth Drivers

Indirect Drivers of Travel Behavior

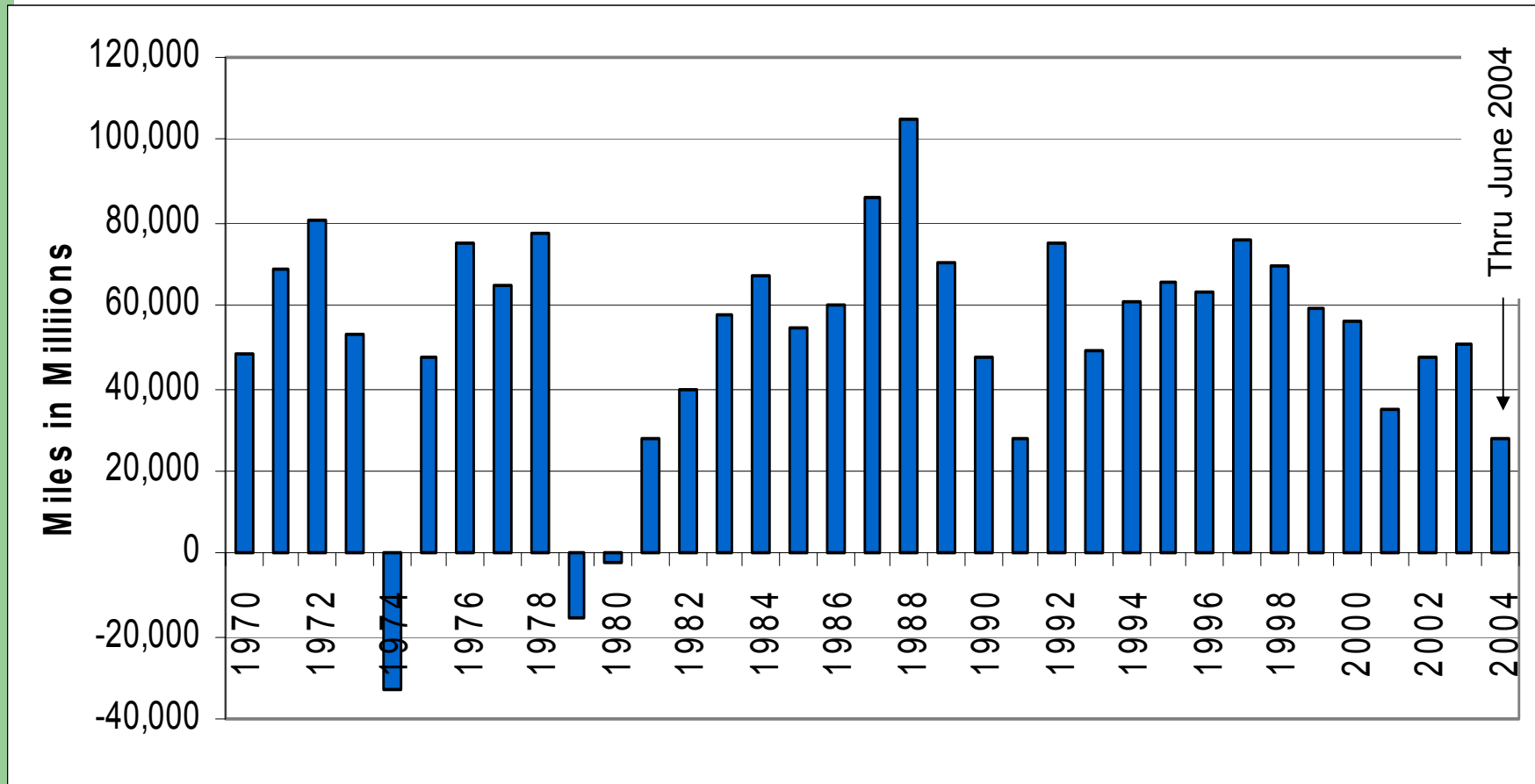
Direct Drivers of Travel Behavior



# Household VMT Growth Outpaces Population Growth

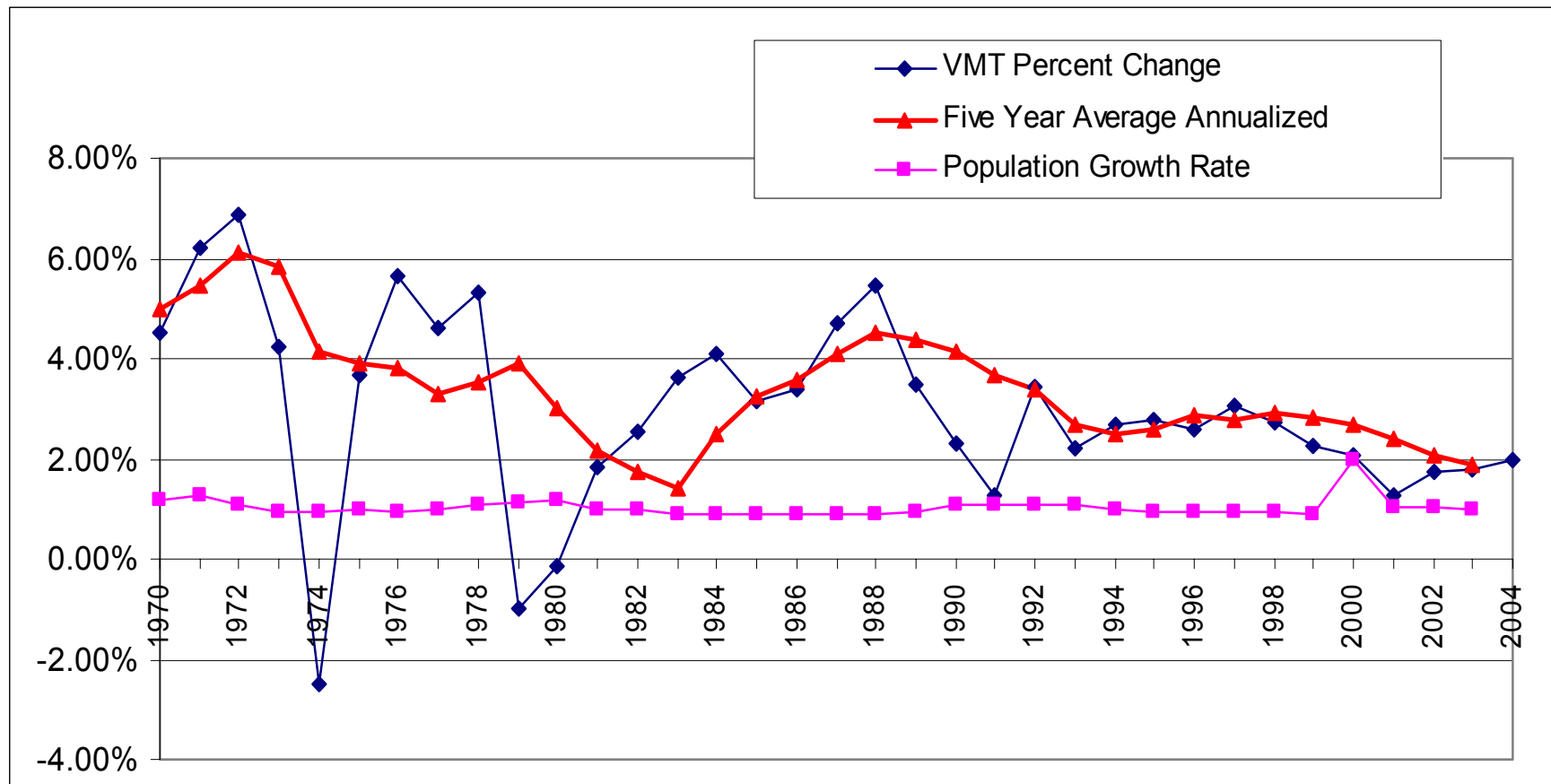


# Incremental Annual Growth in VMT



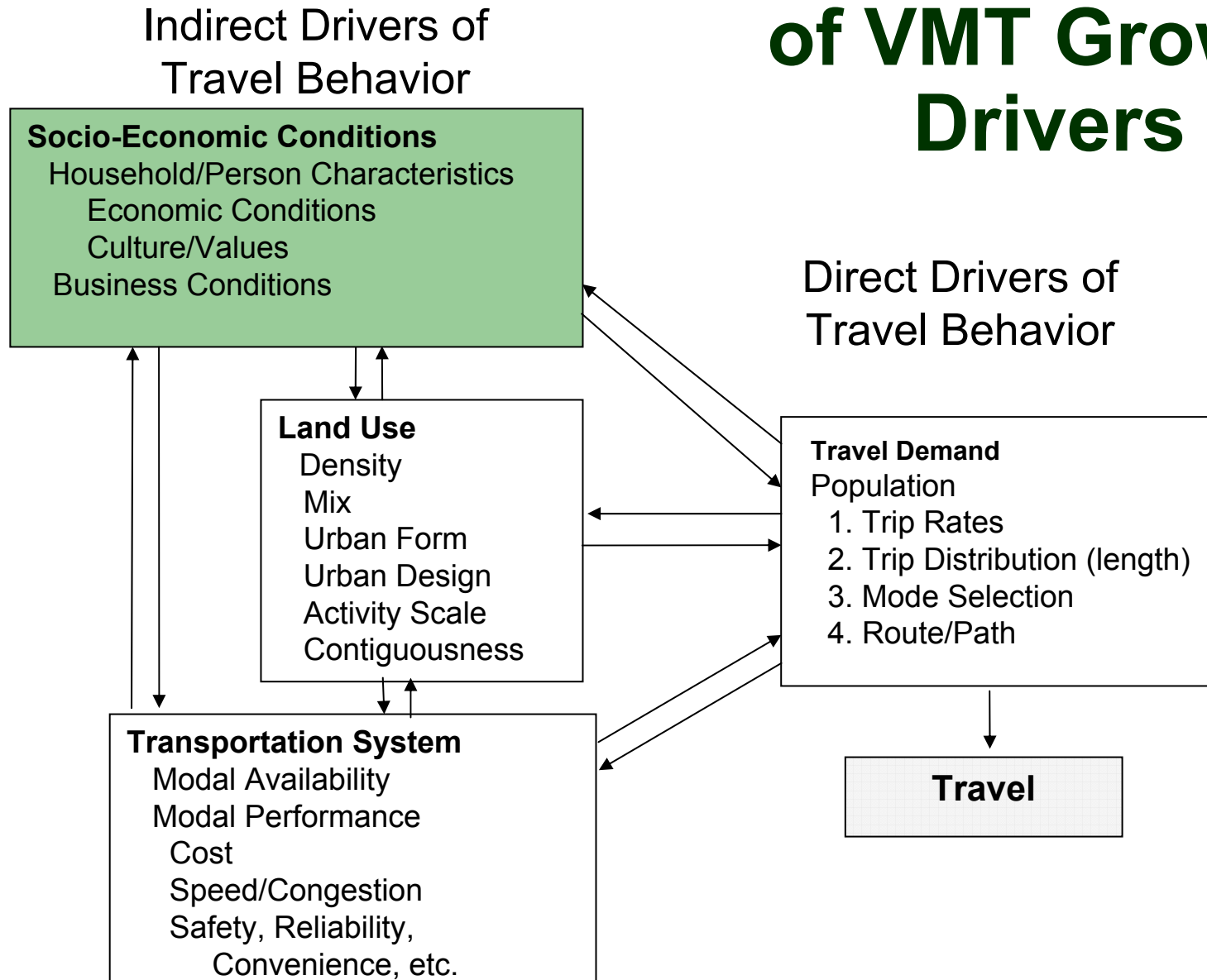


# Annual Change in VMT and Population

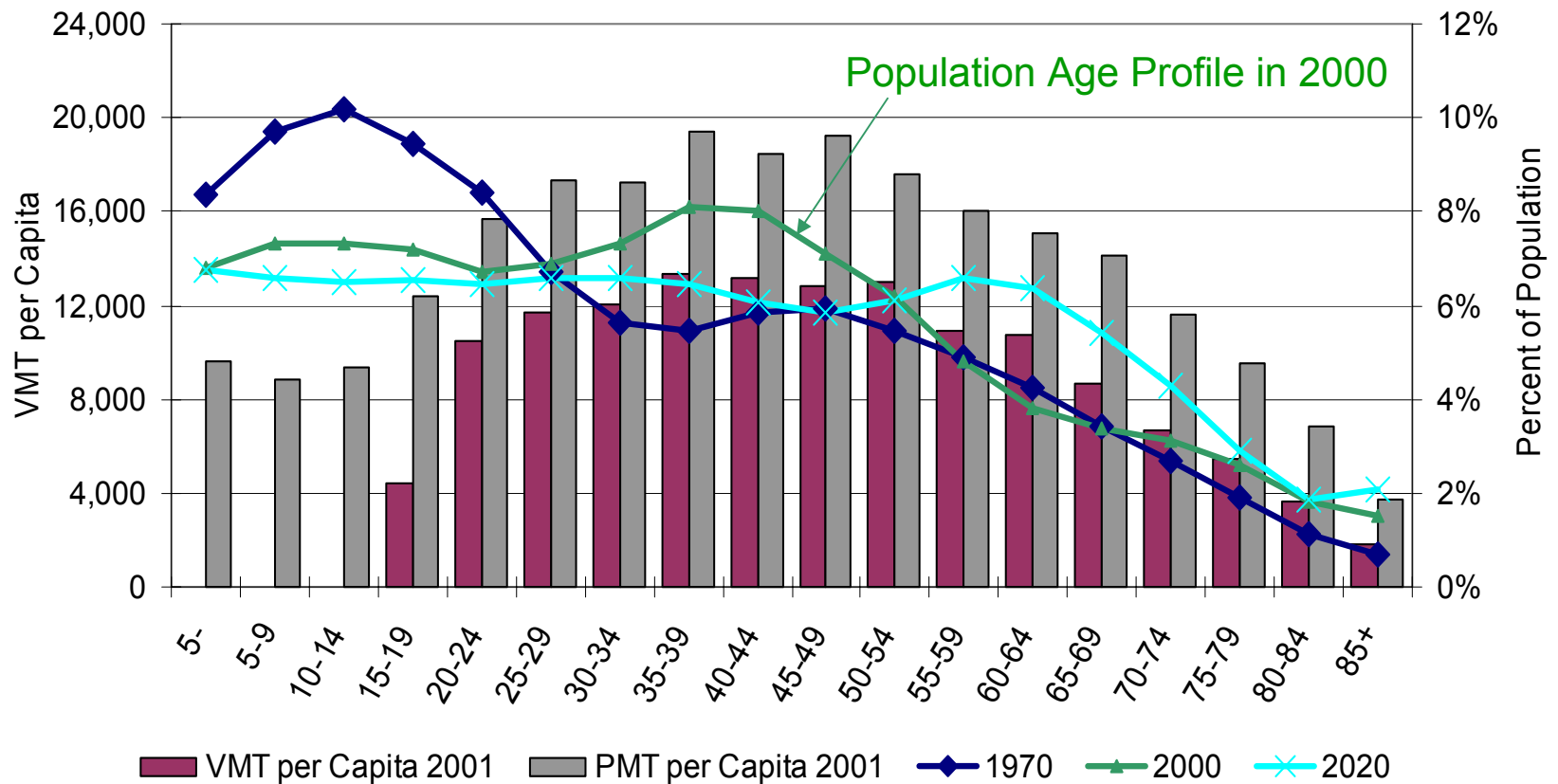


Source: FHWA, Highway Statistics Series, Census population estimates

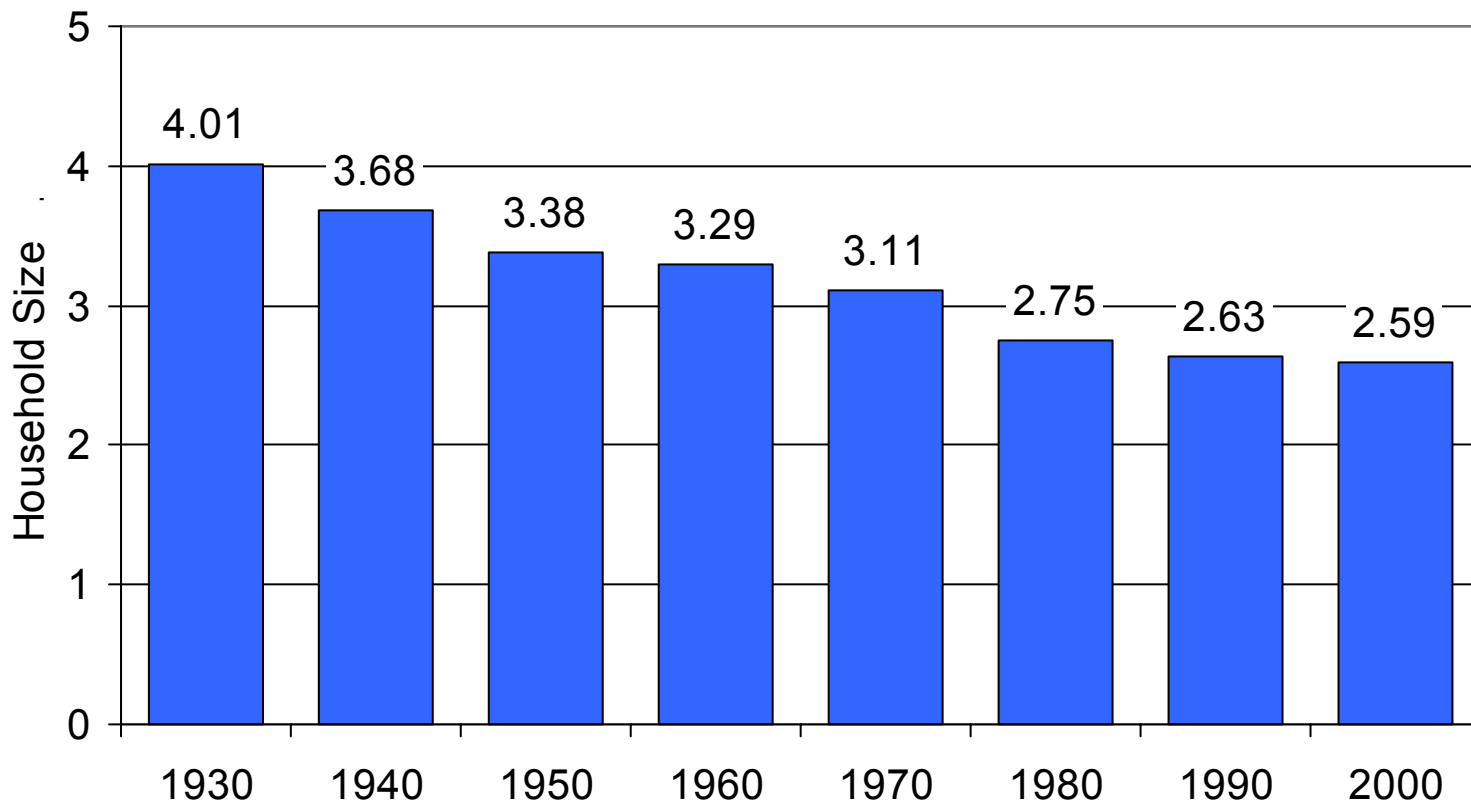
# Conceptual Model of VMT Growth Drivers



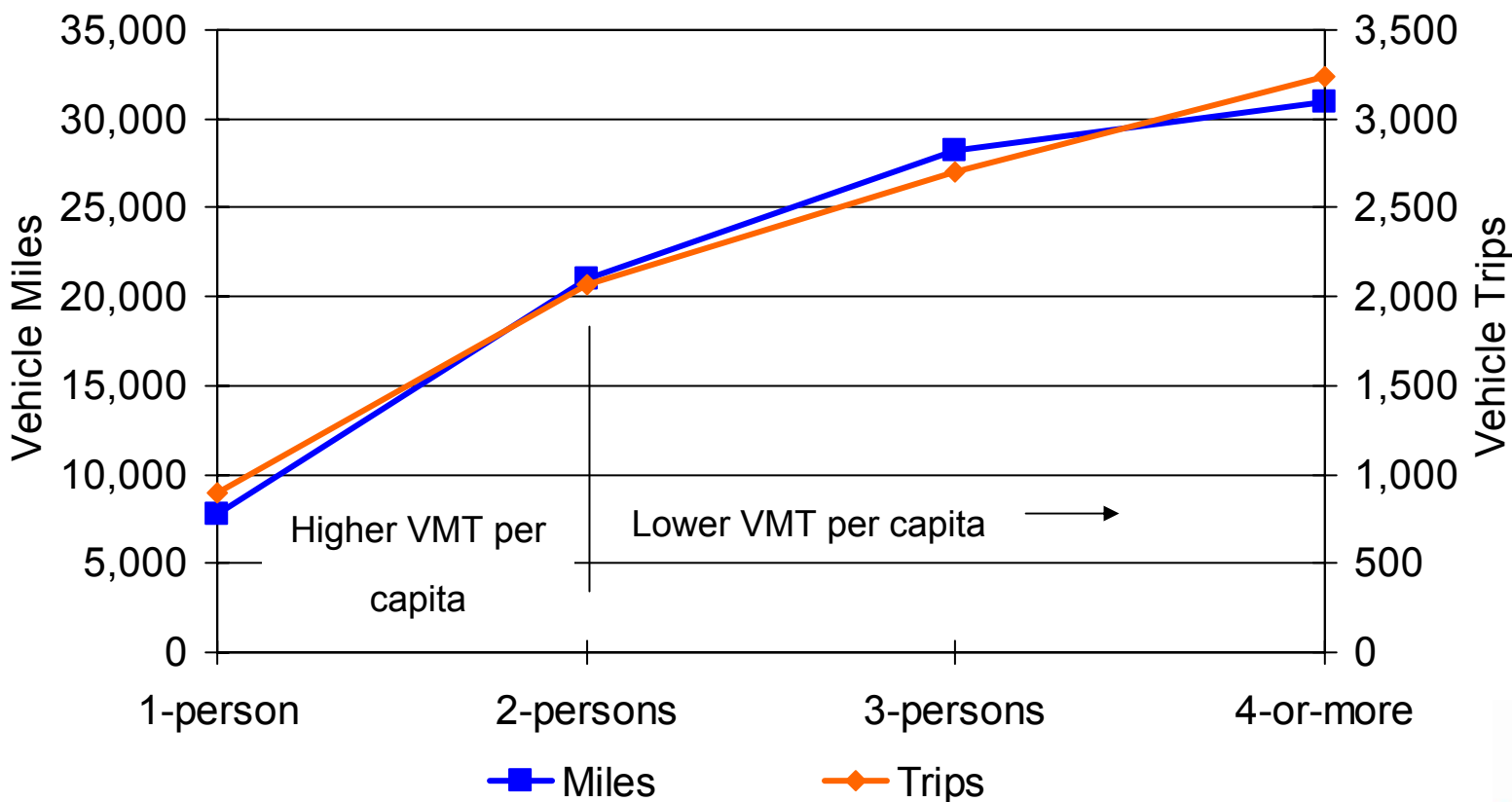
# U.S. Population is Concentrated in Peak Travel Age Cohorts



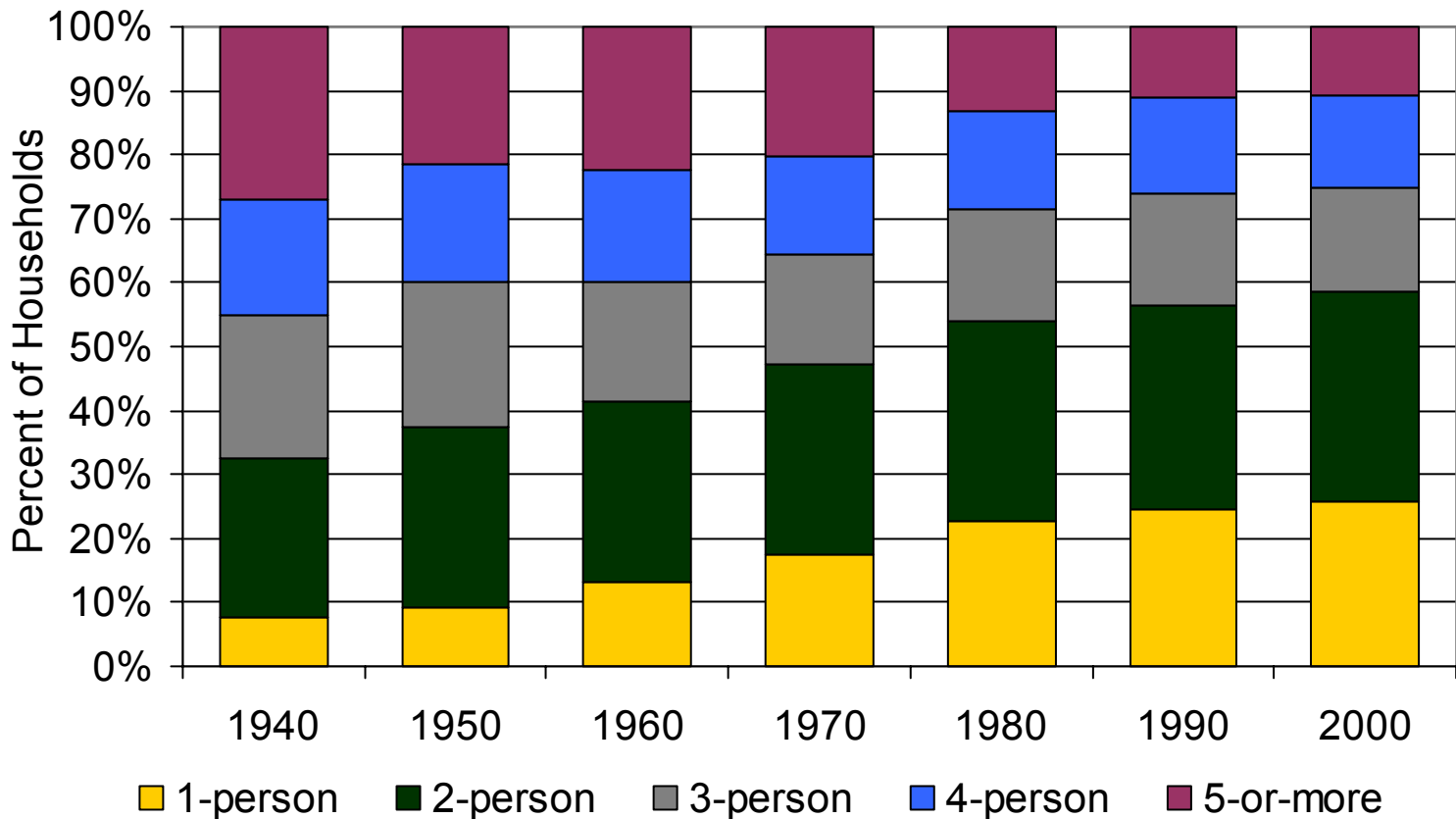
# Average Household Size is Stabilizing, 1930-2000



# Economies of Travel Beyond Two Member Households



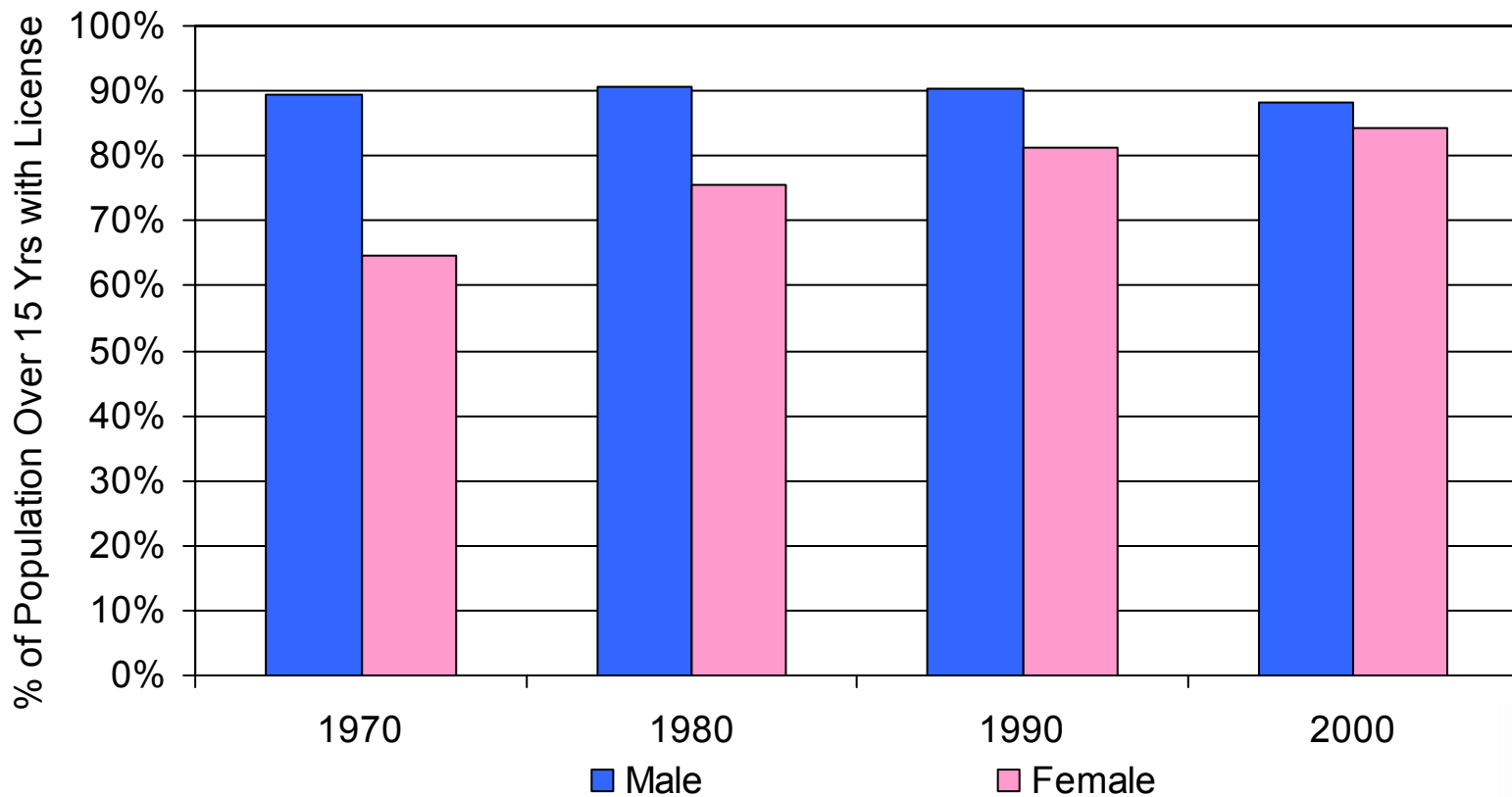
# Households Size May Have Contributed to VMT Growth, 1940-2000



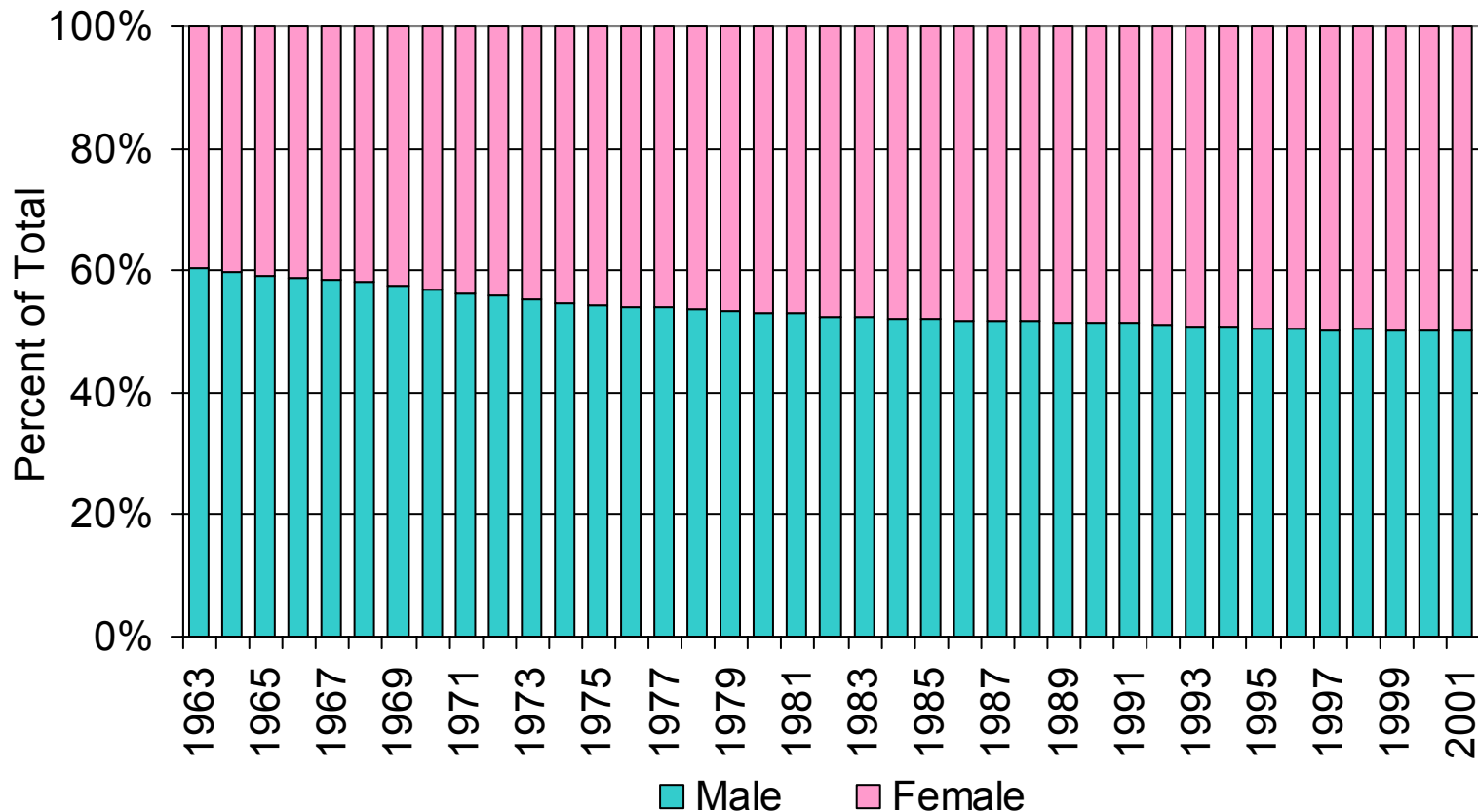
Source: U.S. Census Bureau



# Share of Population 16 Years of Age or Older with a Drivers License, 1970-2000

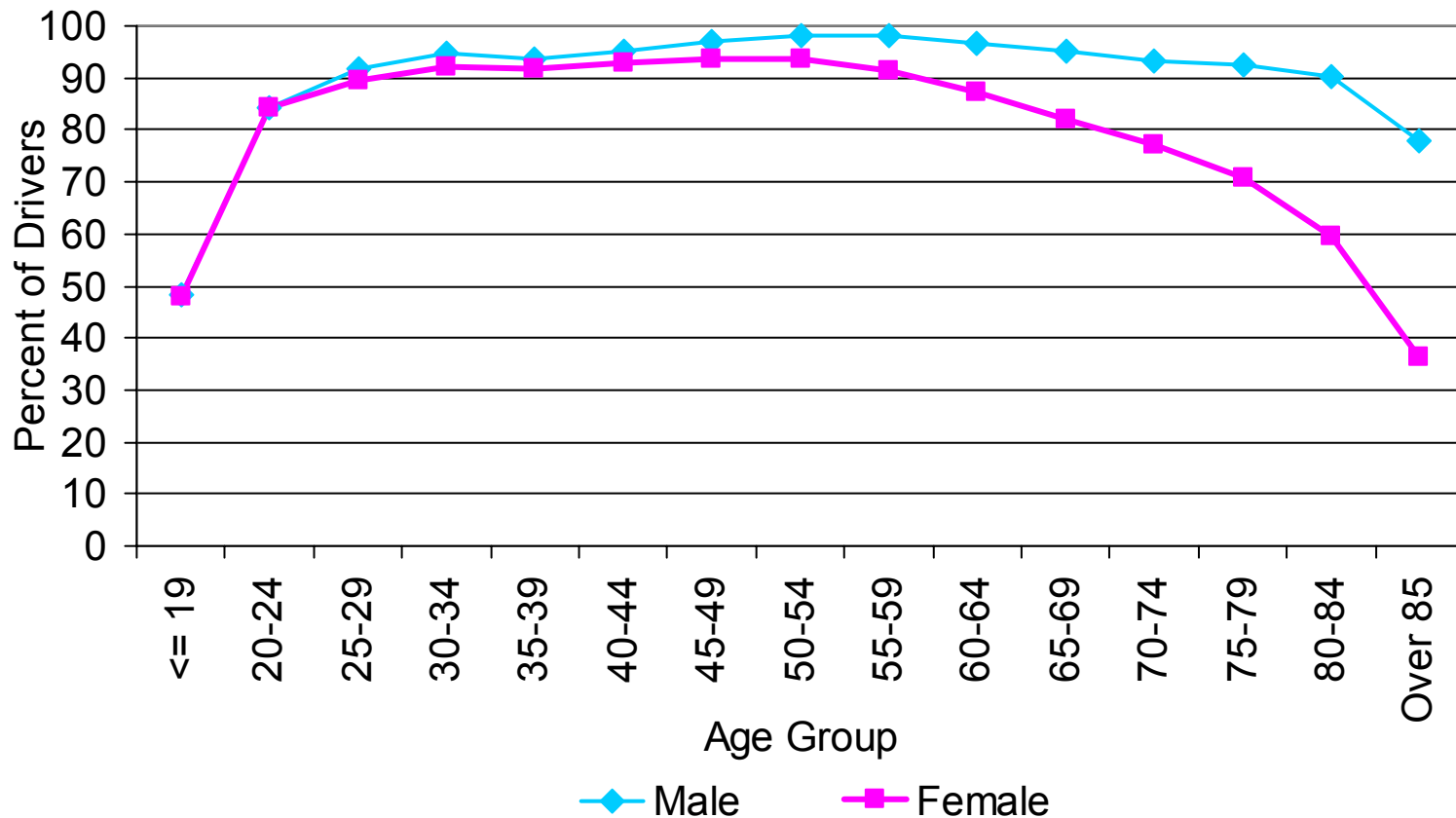


# We have reached Gender Equity in Licensed Drivers, 1963-2001

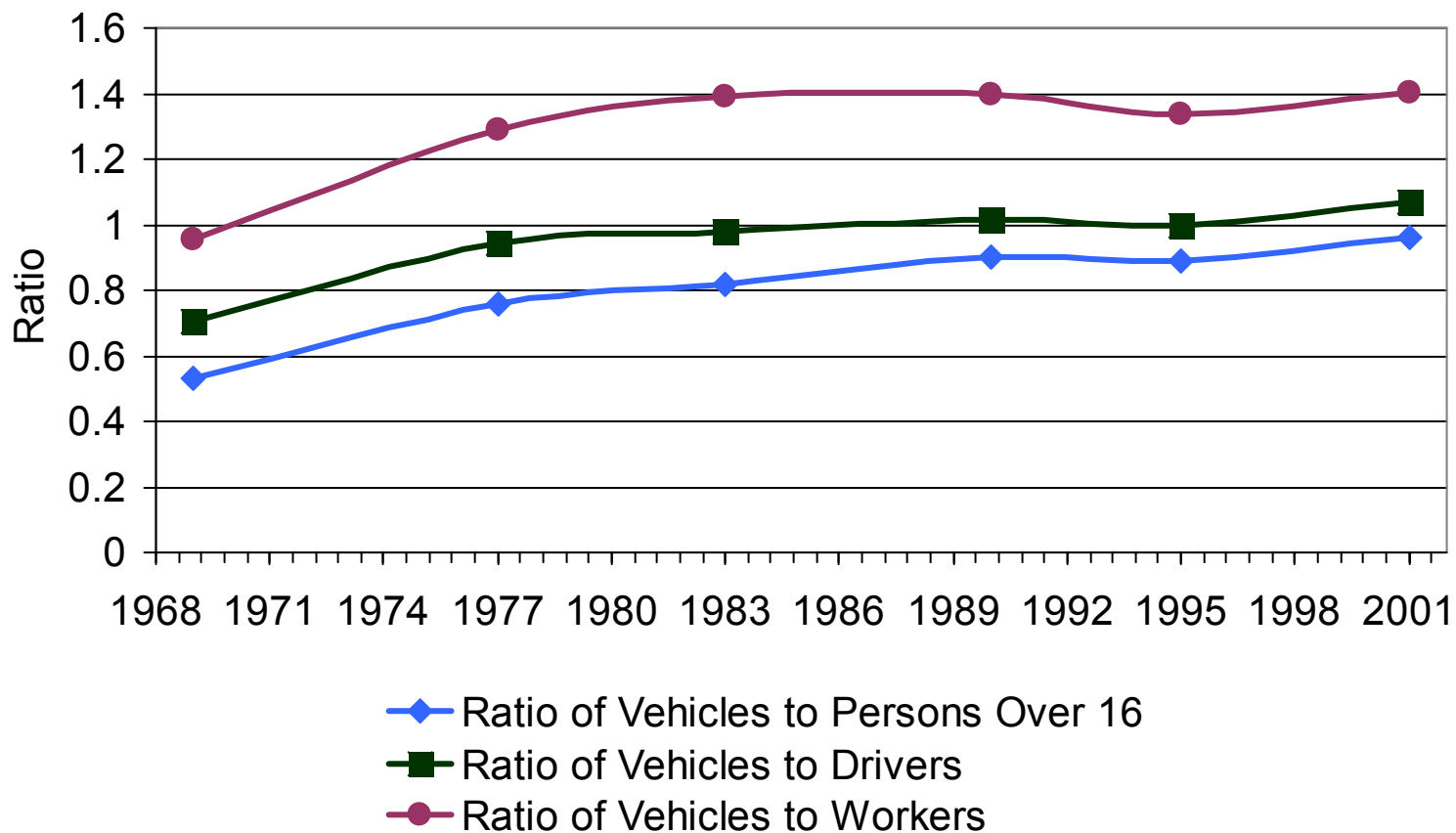




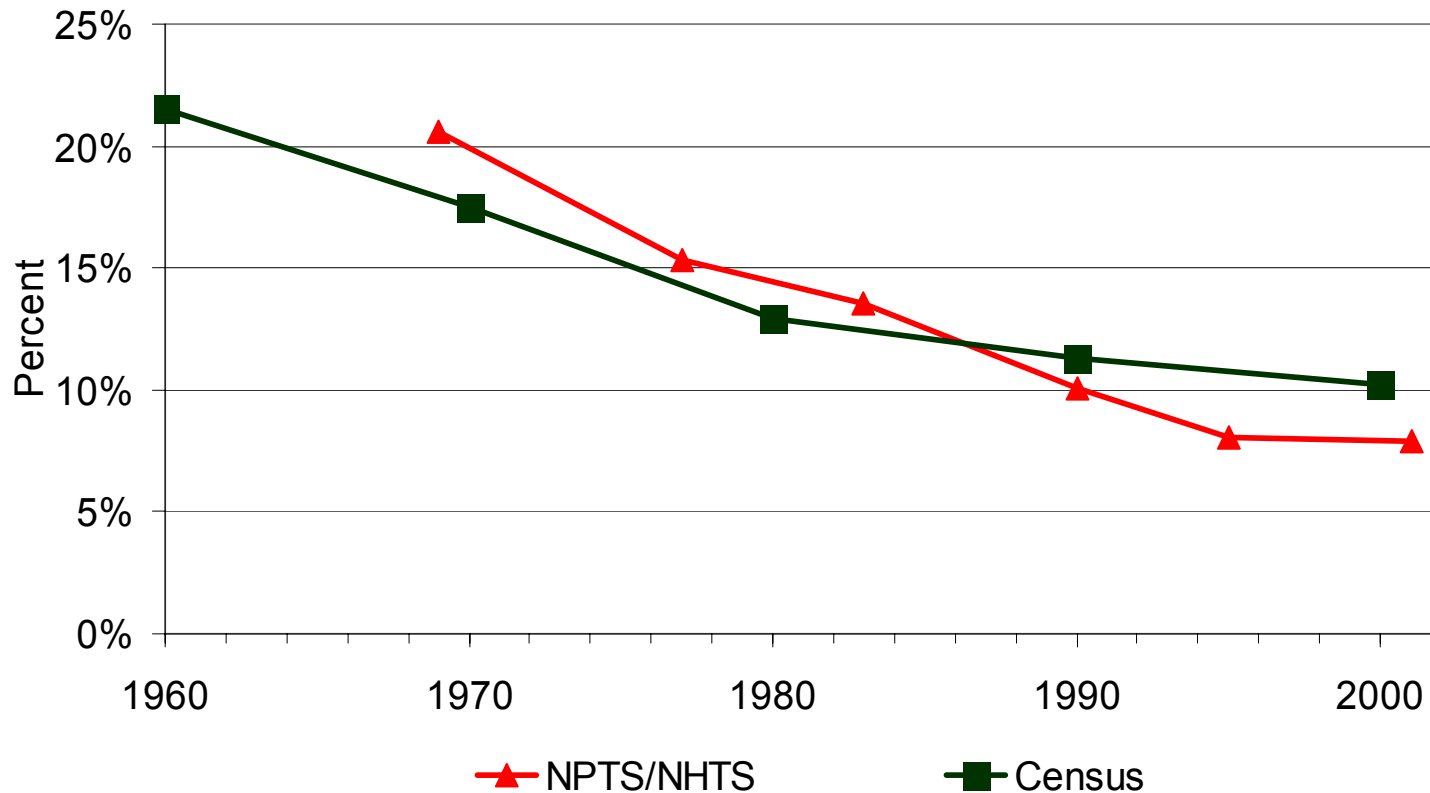
# Older Women Less Likely to Drive



# Vehicle Saturation? Vehicle Gluttony?



# Declining Zero-Vehicle Households

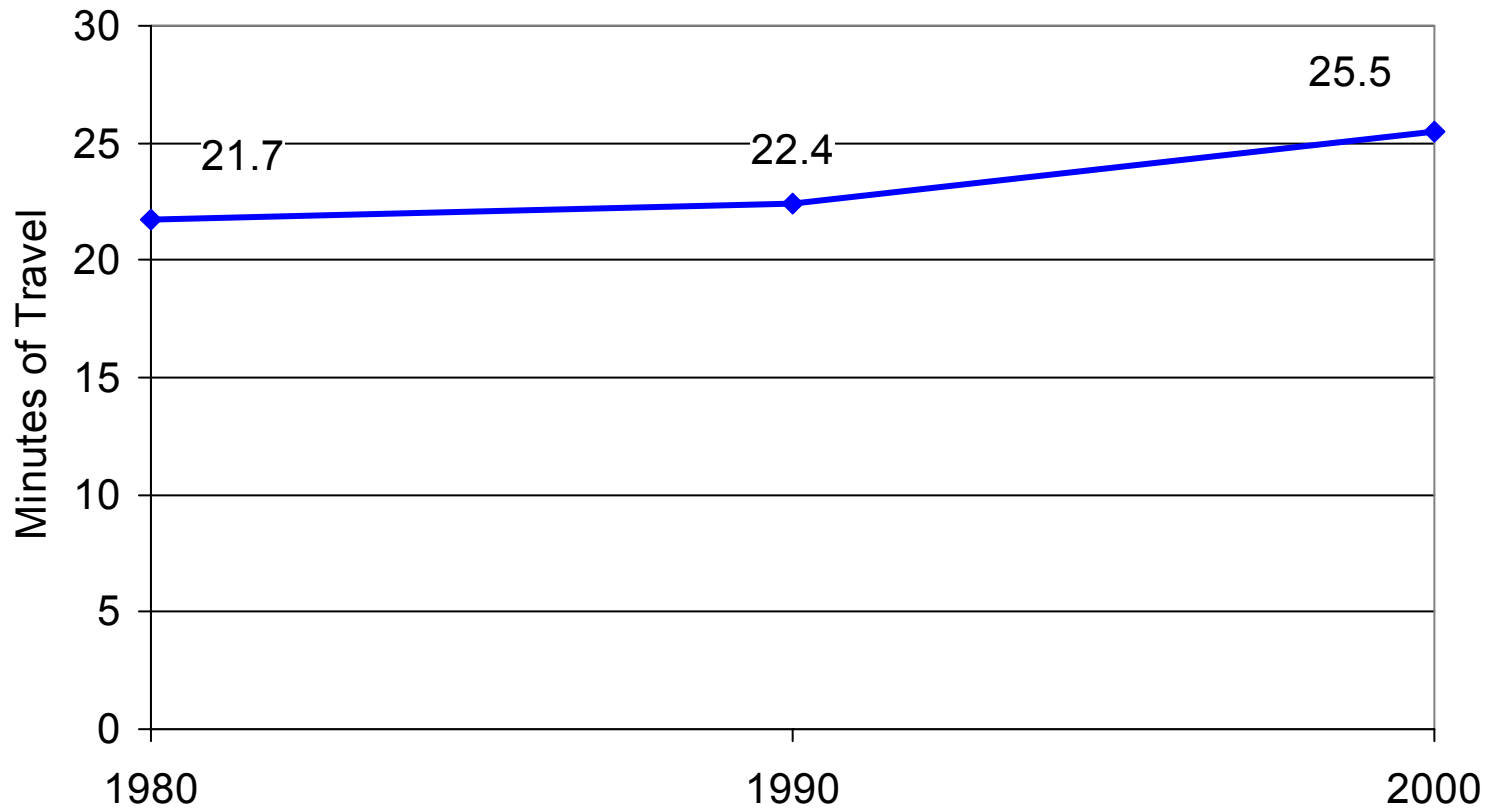


# Percent Teen Auto “Ownership”

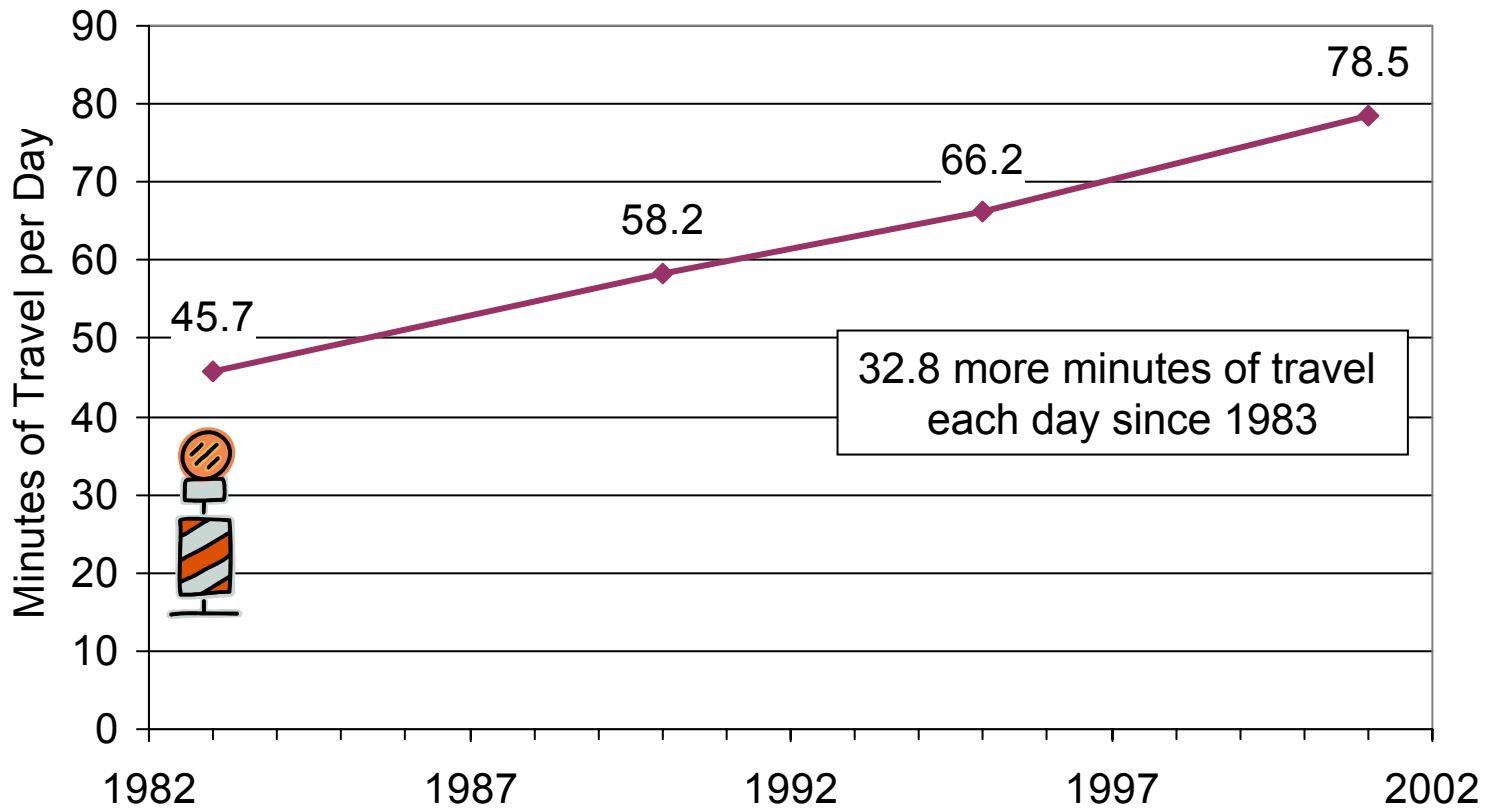
Age	Teens with Auto Available (percent)					
	1999			2003		
	New	Used	Total	New	Used	Total
16-17	1	14	15	9	36	45
18-19	5	12	17	11	47	58

Source: Teenage Research Unlimited, Associated Press, September 14, 2003.

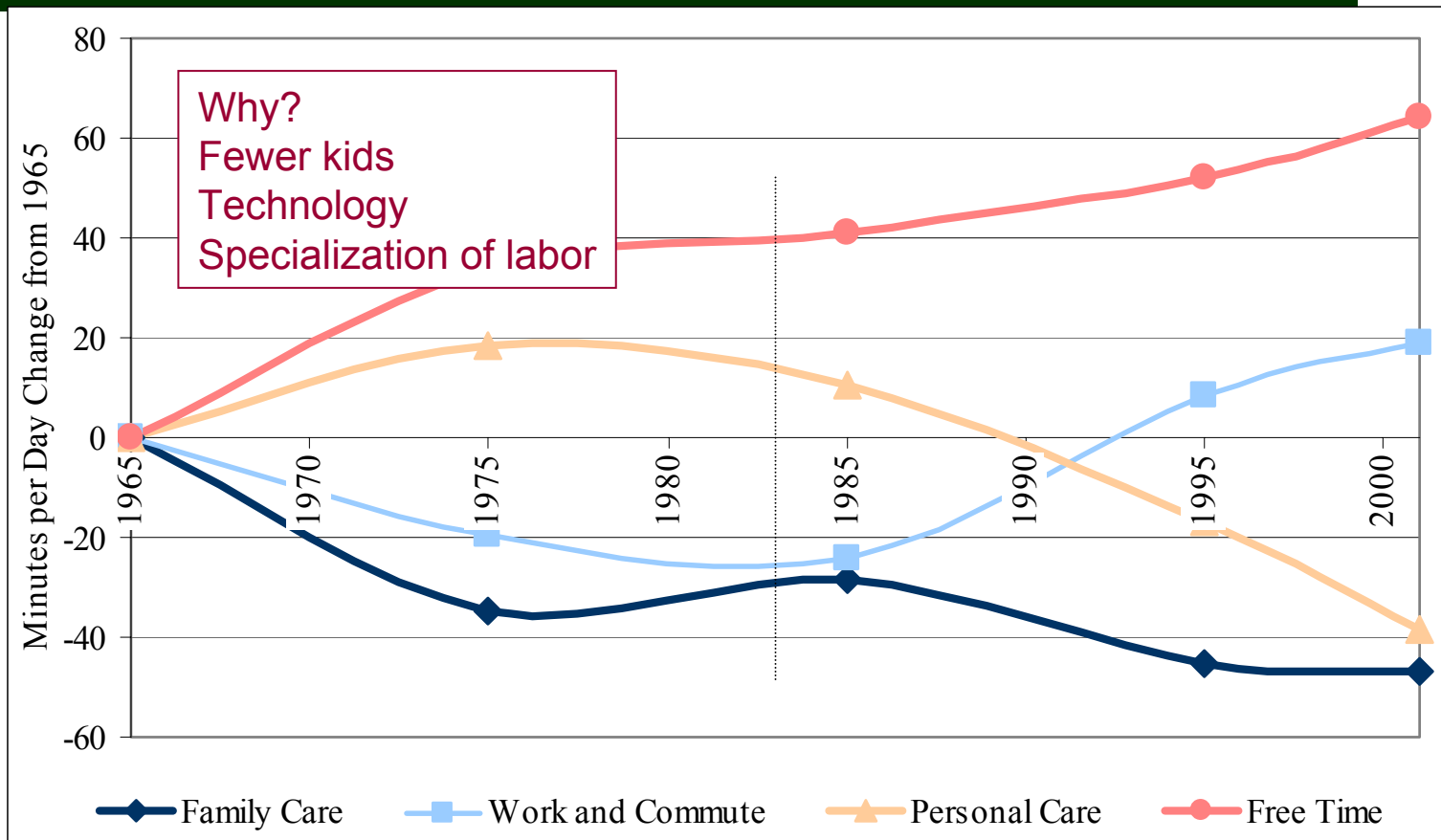
# Commute Times Are Growing



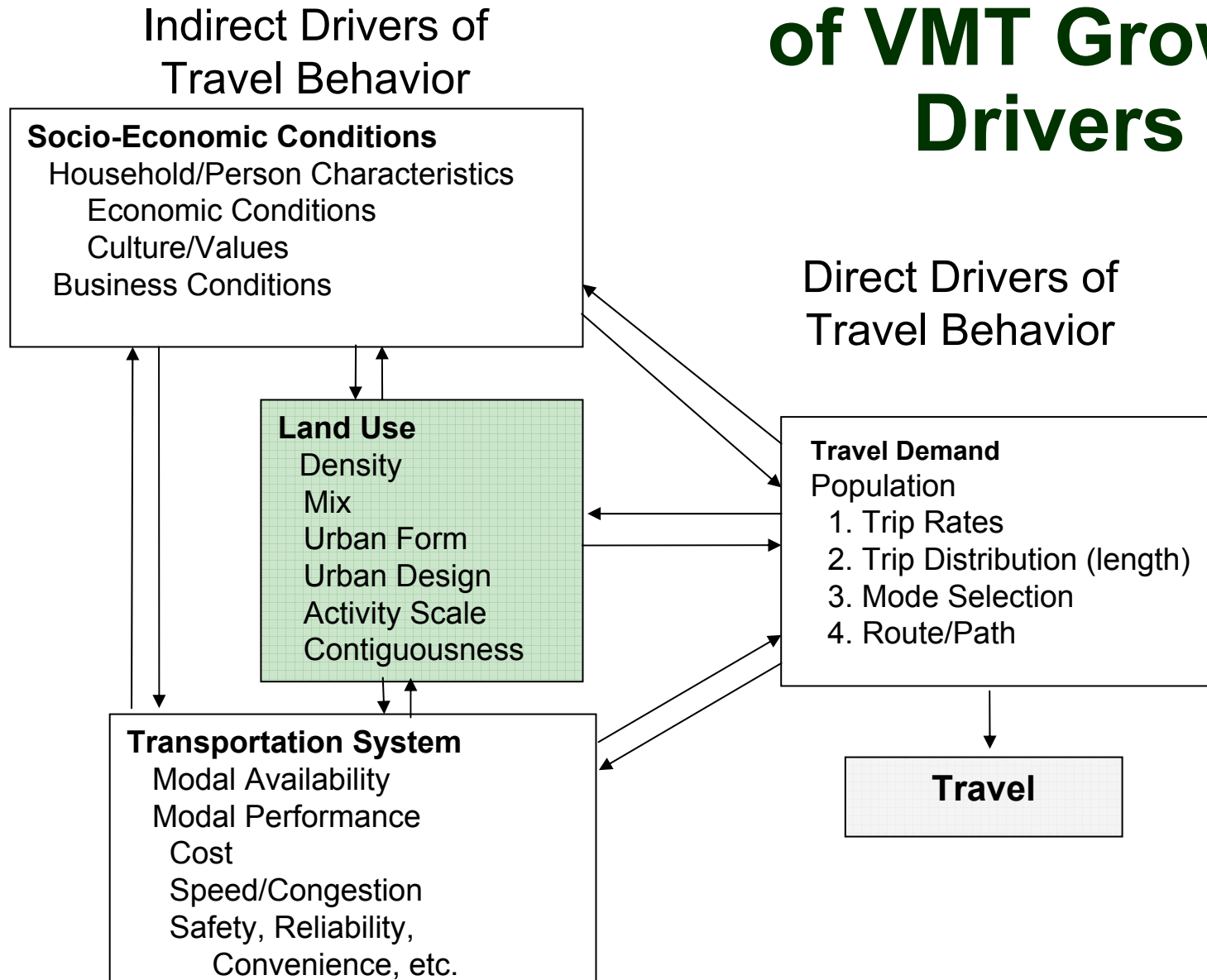
# Travel Time Budgets Have Grown 1.8 Minutes per Day per Person per Year



# Change of Time Spent by Major Time Use Category from 1965 (Minutes per Day)



# Conceptual Model of VMT Growth Drivers





# How Does Land Use influence Travel?

## Land Use Traits

Density  
 Mix  
 Urban Form  
 Urban Design  
 Activity Scale  
 Contiguosness



## Travel Demand

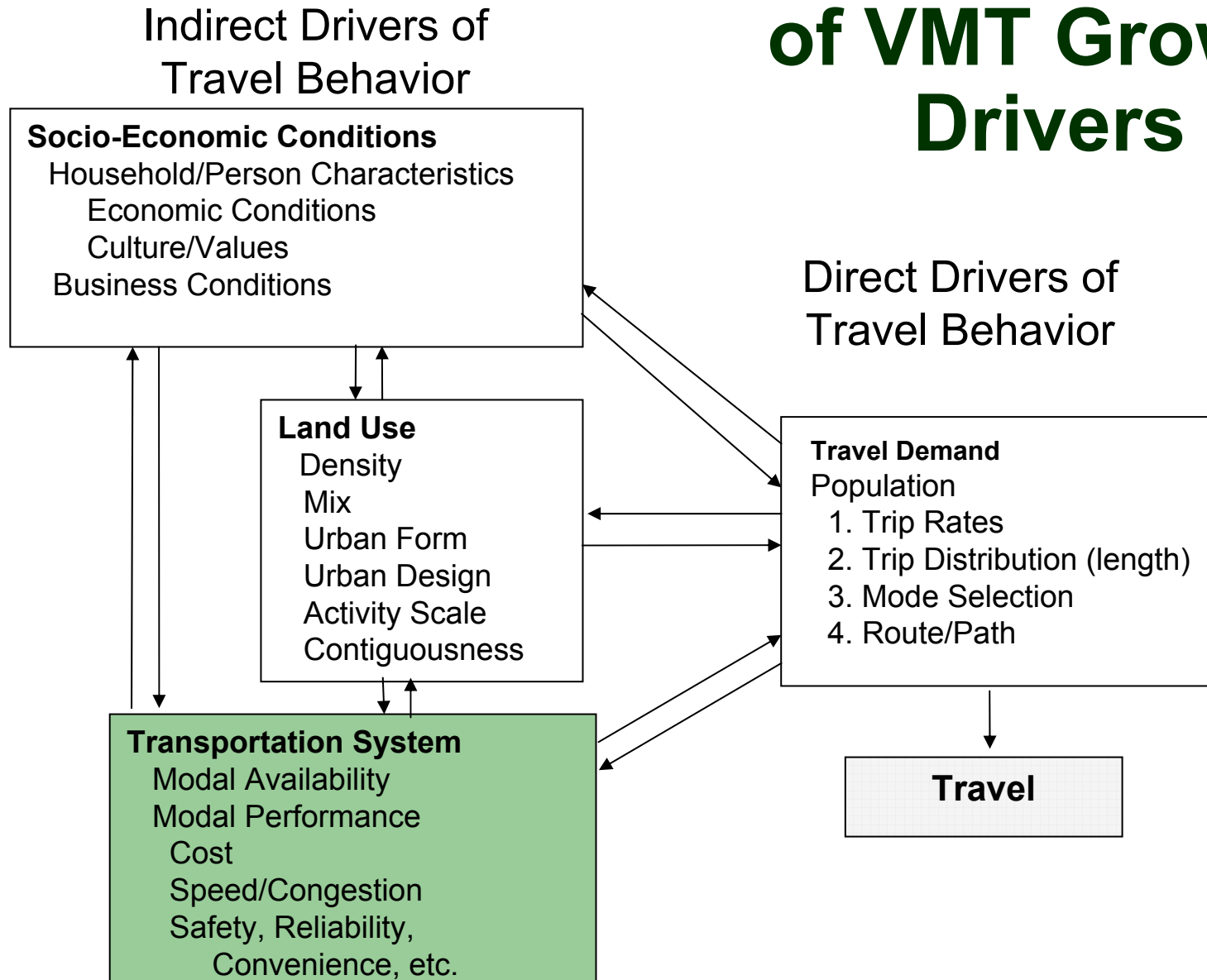
## Impact of “Better” Land Use

Trip Rates .....	Greater accessibility will tend to encourage trip making
Trip Distribution (length) .....	Greater accessibility will tend to reduce trip length
Route/Path .....	Greater accessibility will tend to produce shorter trips
Mode Choice .....	Greater accessibility and density enables competitive alternative modes

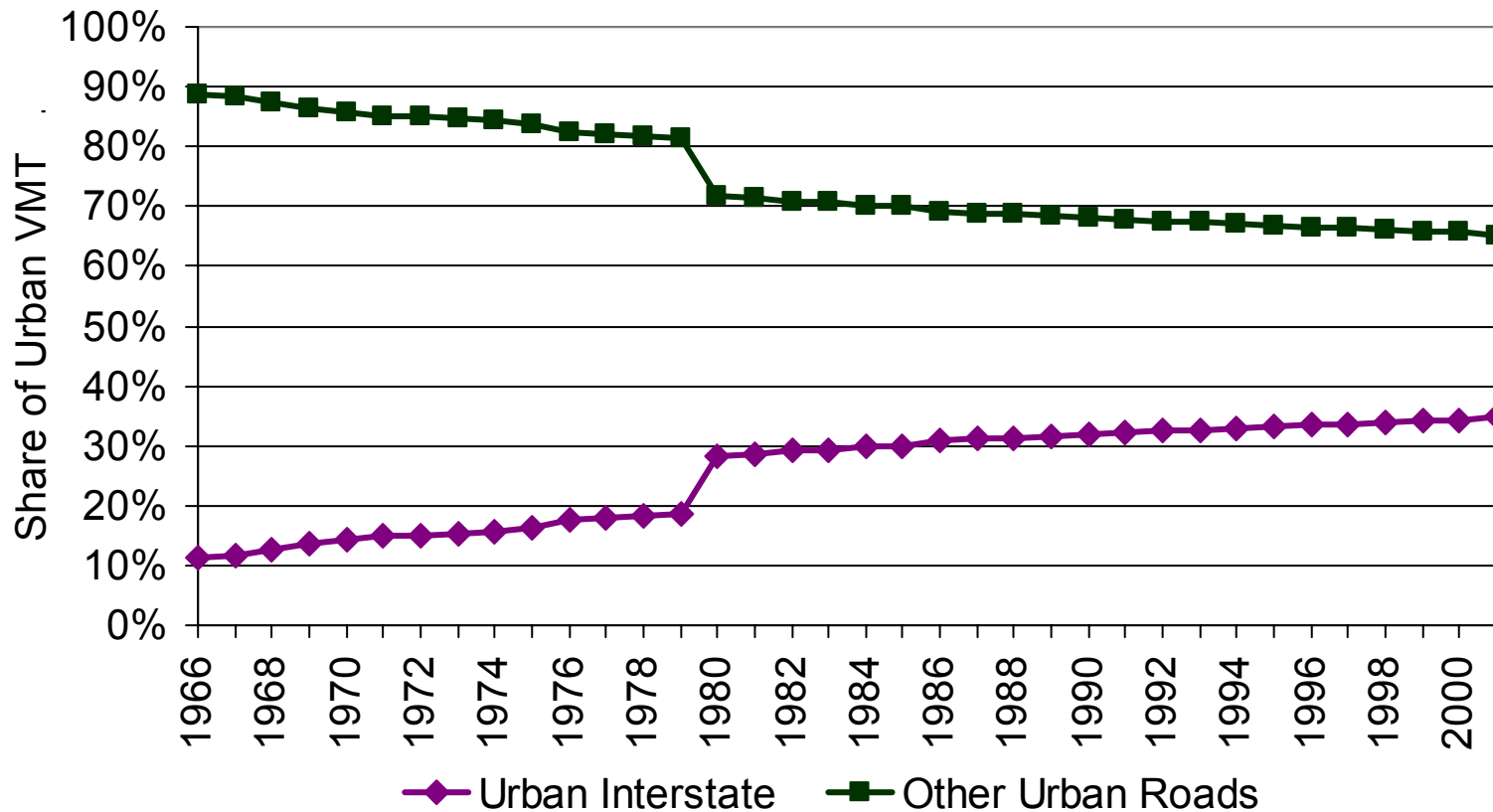
## Impact on VMT



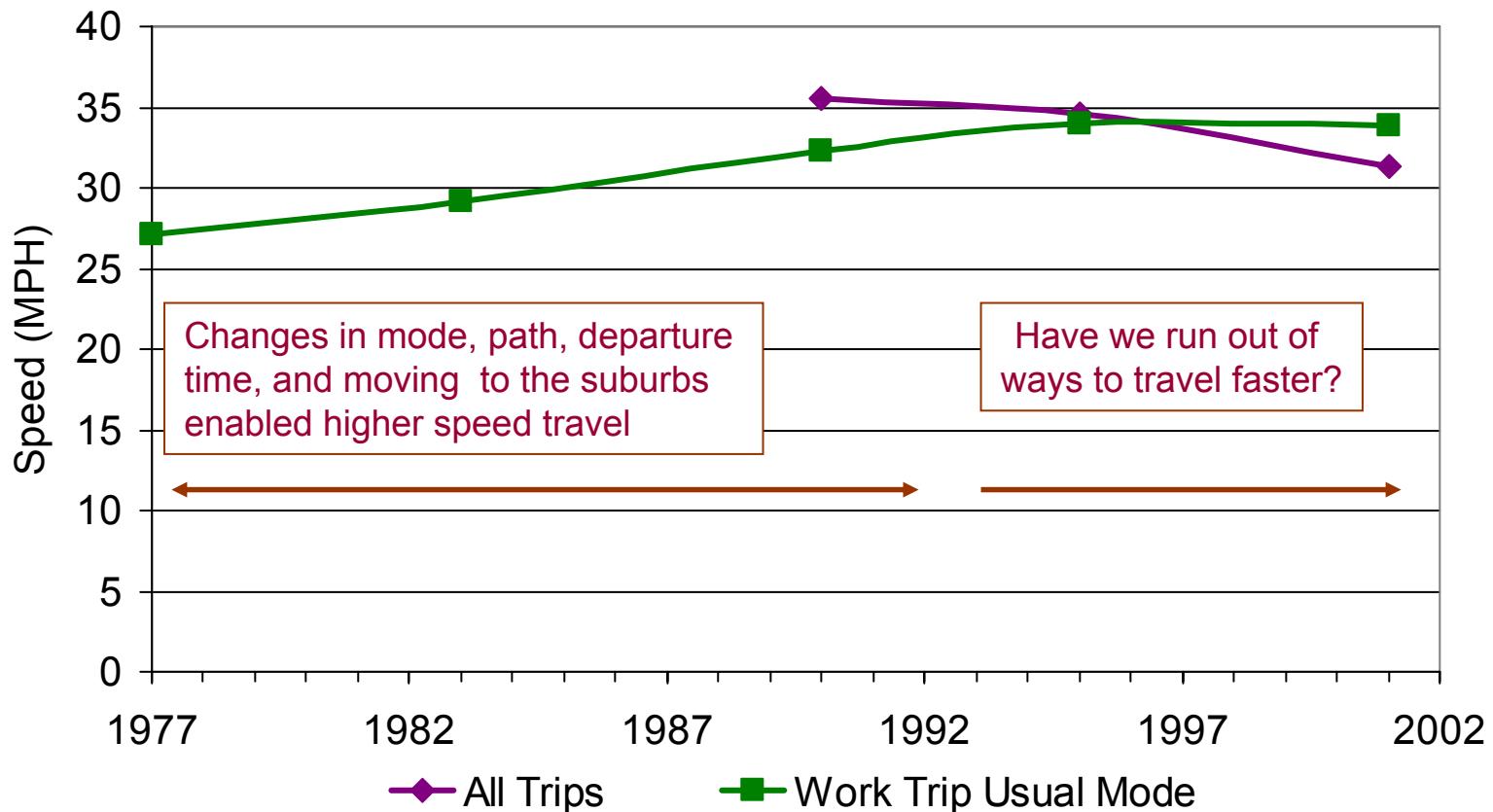
# Conceptual Model of VMT Growth Drivers



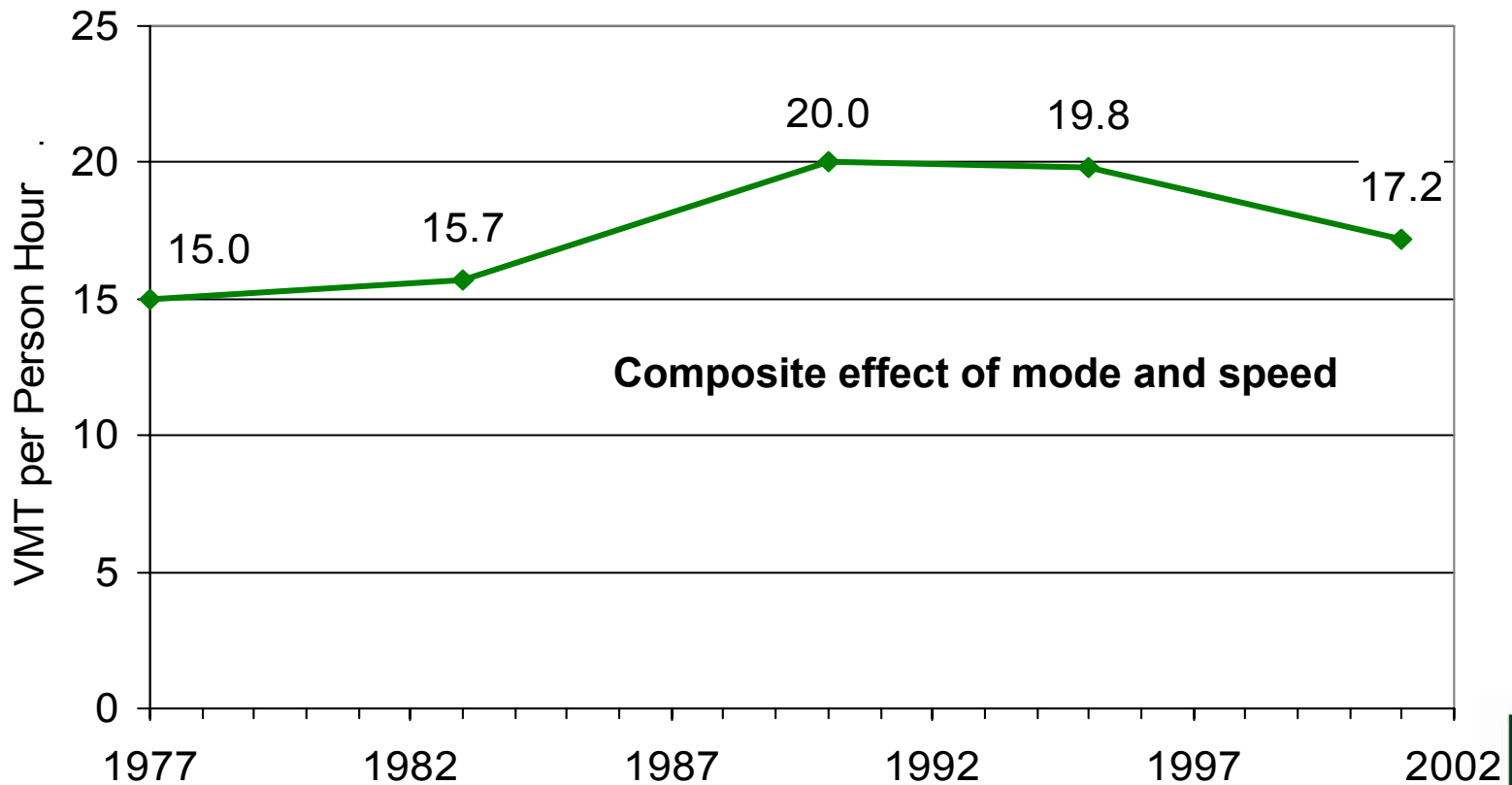
# Share of Urban VMT by Road Type, 1966-2001



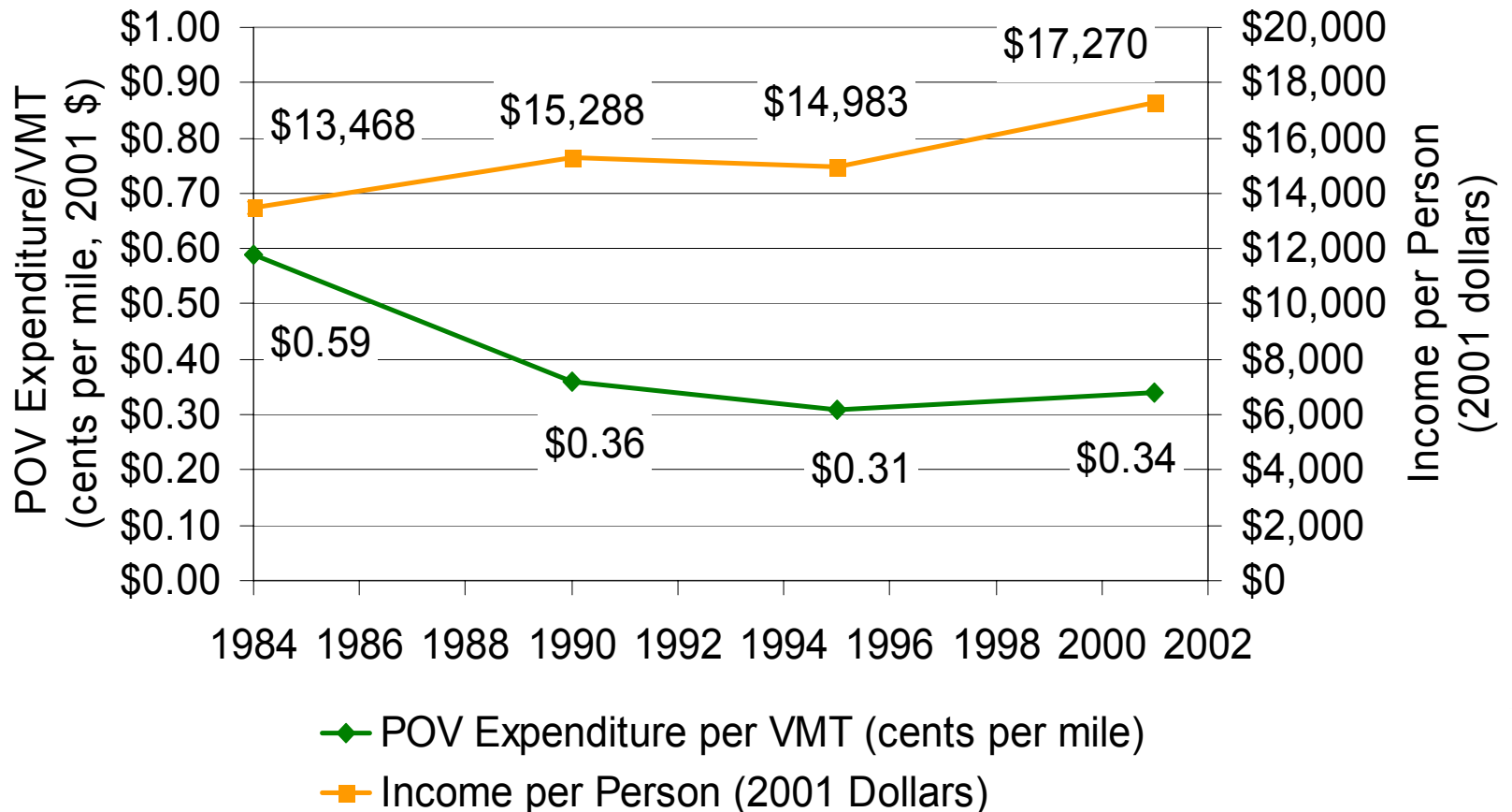
# NHTS/NPTS Data Suggest Travel Speeds are Now Slowing



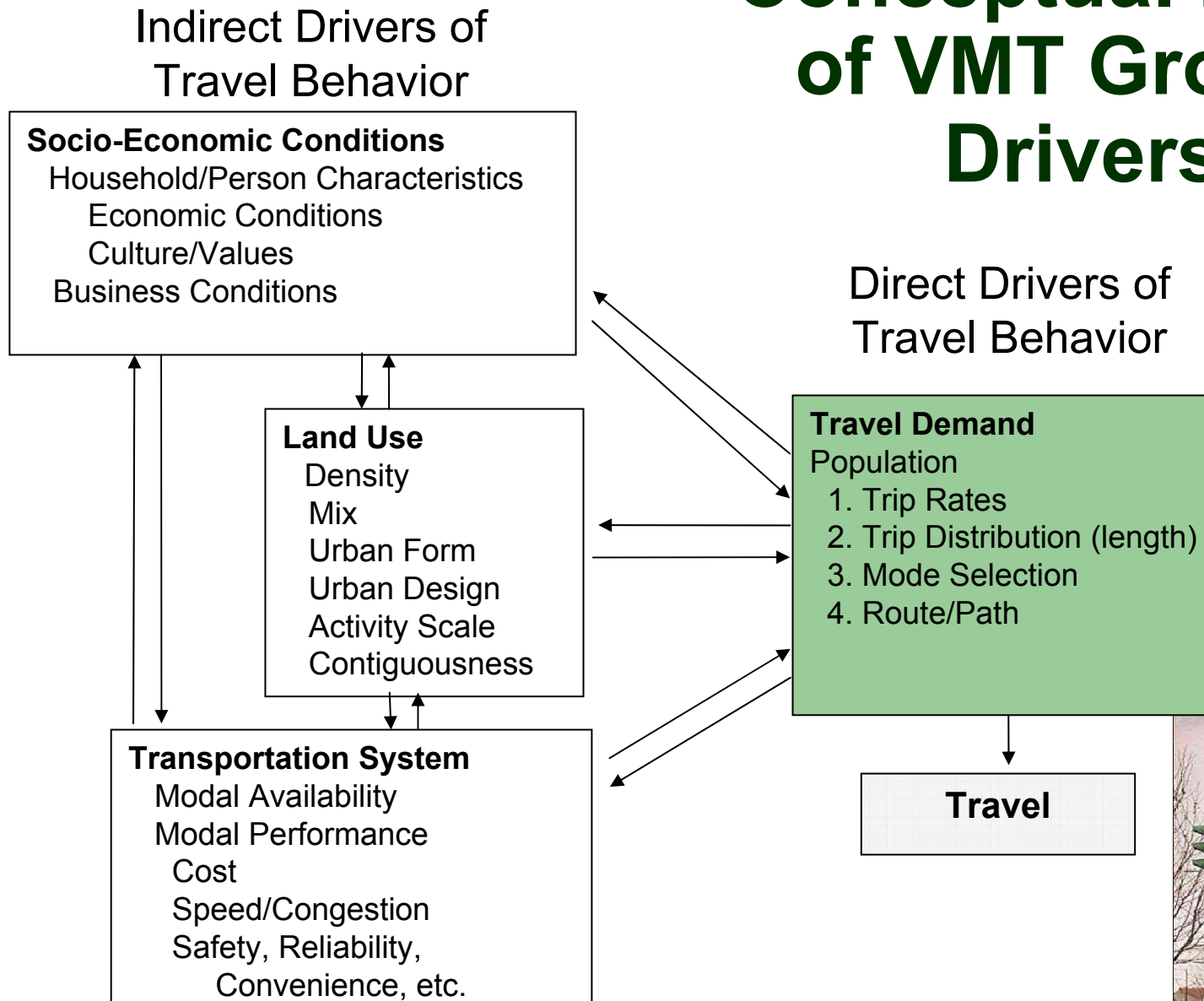
# VMT per Person Hour Spent in Travel is Declining



# Are Income and Travel Cost Driving VMT Growth?



# Conceptual Model of VMT Growth Drivers



# VMT Growth Estimation Equations

**Trip Generation**

**Trip Length**

**Mode**

$$1. \text{ Population} \times \frac{\text{Person Trips}}{\text{Person}} \times \frac{\text{Person Miles}}{\text{Person Trips}} \times \frac{\text{Vehicle Miles}}{\text{Person Miles}} \equiv \text{Vehicle Miles}$$

**Travel Time Budget**

**Travel Speed**

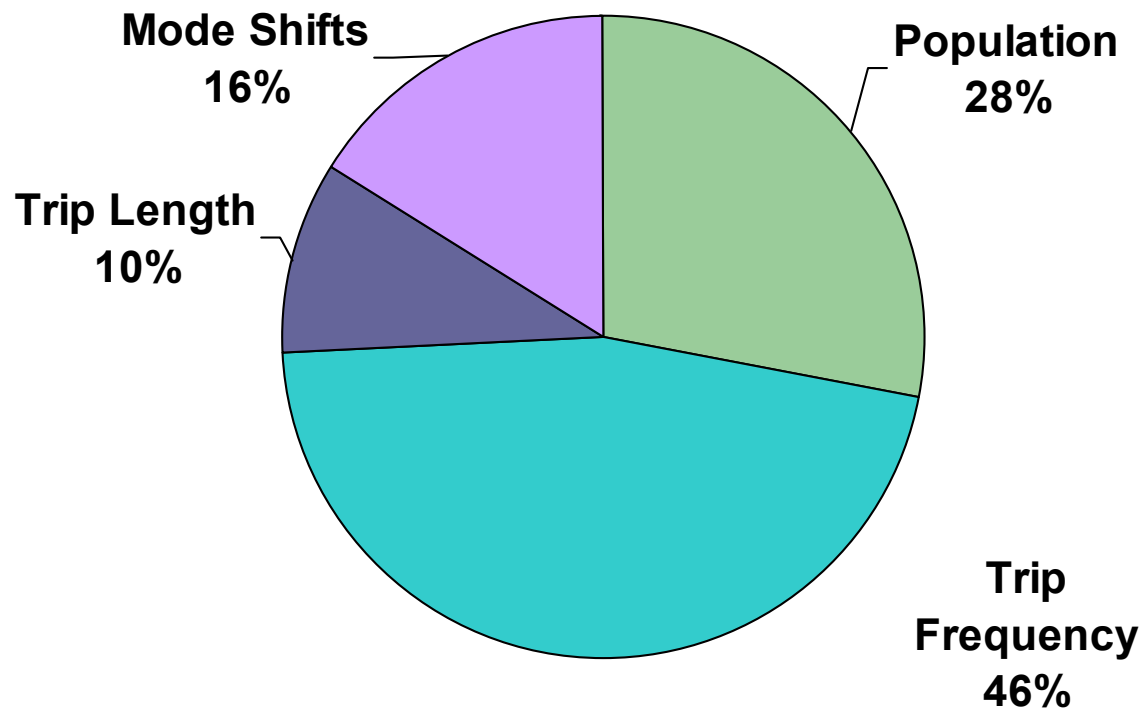
$$2. \text{ Population} \times \frac{\text{Person Hour of Travel}}{\text{Person}} \times \frac{\text{Vehicle Miles}}{\text{Person Hour of Travel}} \equiv \text{Vehicle Miles}$$



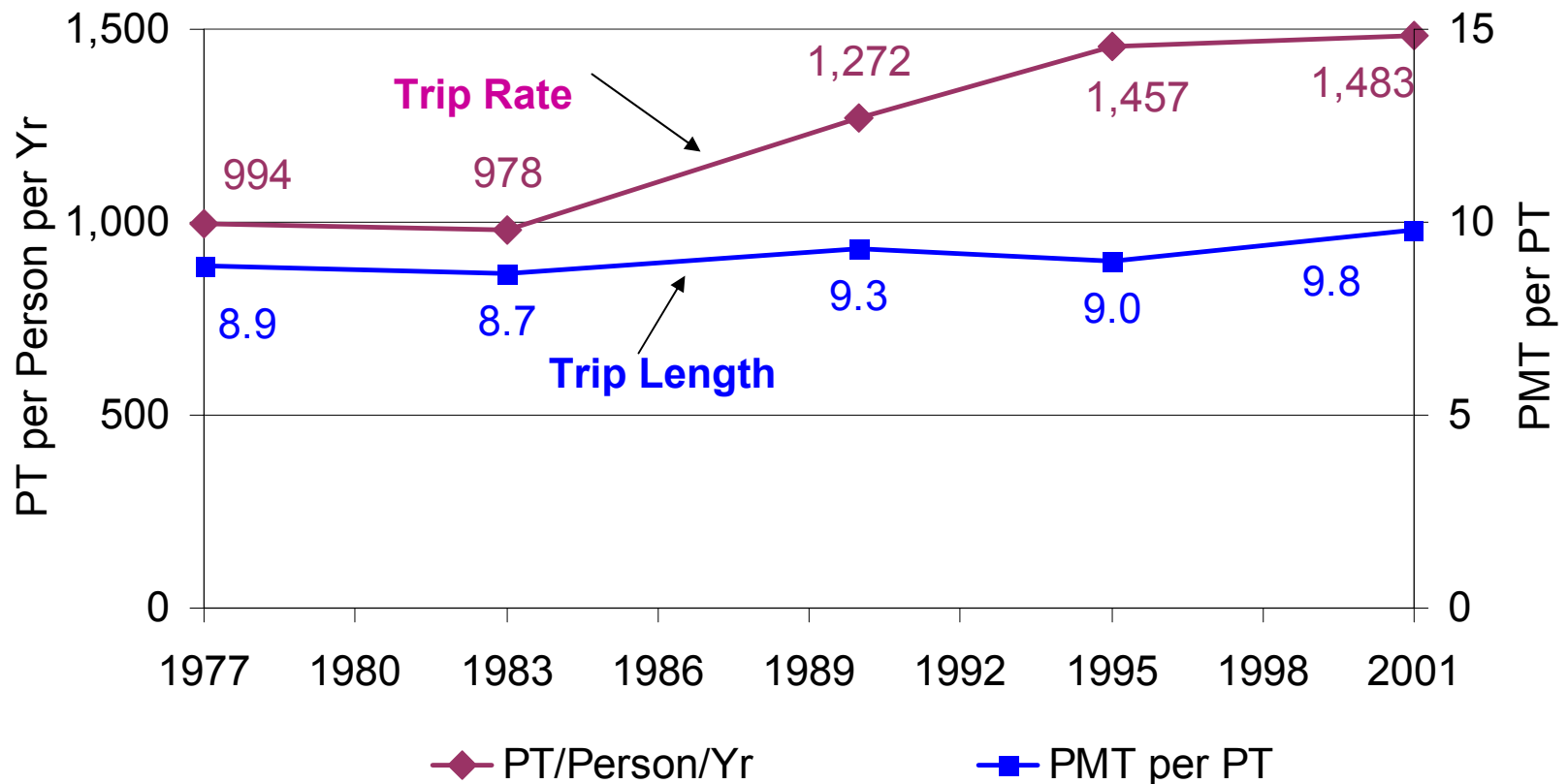
# Key Indicators, 1977 to 2001

	1977	2001	% Change 1977-2001
All Persons (000)	213,141	277,208	+30.1%
HH VT (000,000)	108,826	234,994	+115.9%
HH VMT (000,000)	907,603	2,281,863	+151.4%
Person Trips (000,000)	211,778	410,969	+94.1%
PMT (000,000)	1,879,215	4,026,158	+114.3%
PT/P/Year (trip rate)	994	1,483	+49.2%
PMT/PT (trip length)	8.874	9.797	+10.4%
VMT/PM (mode)	0.483	0.567	+17.4%

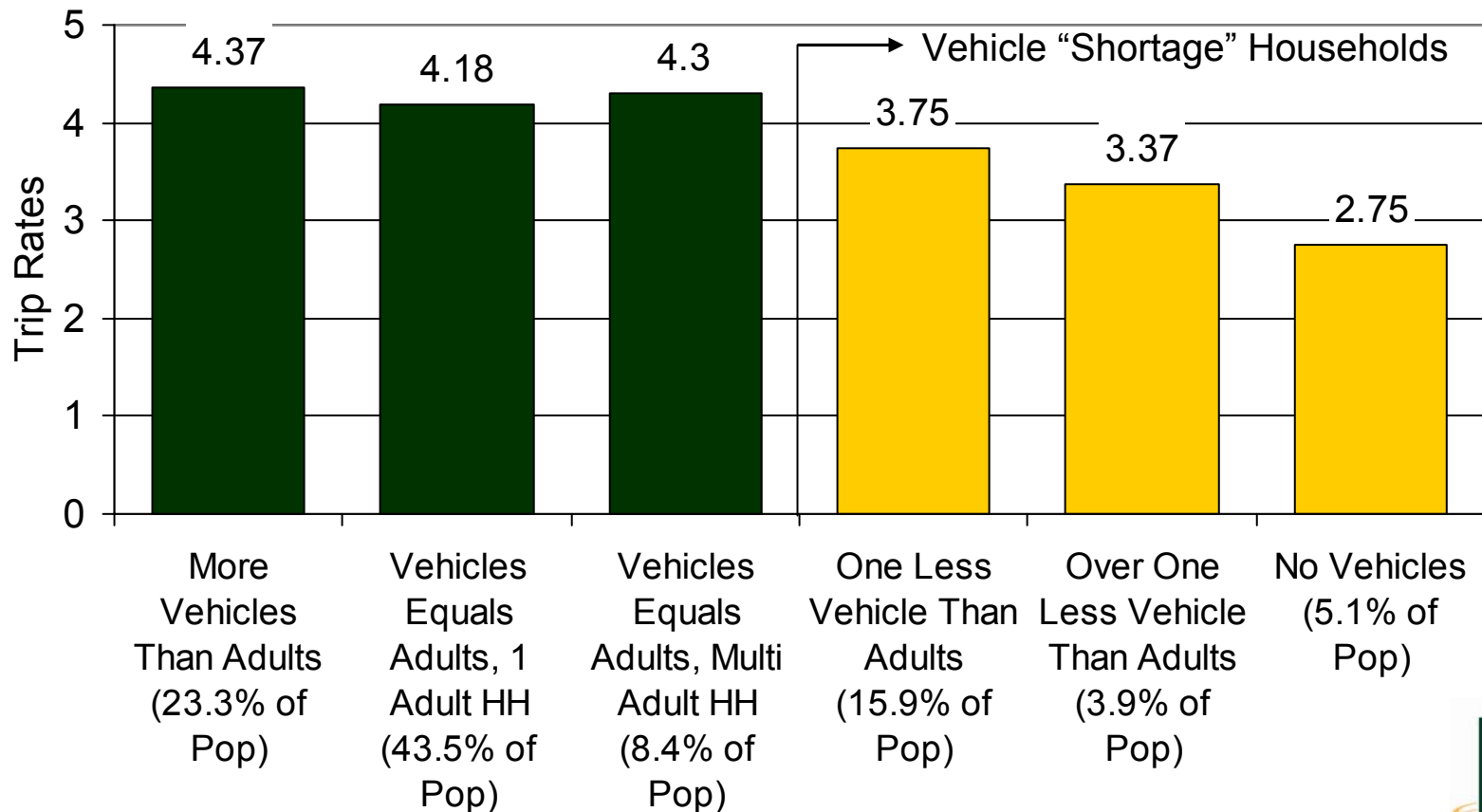
# Factors Contributing to US VMT Growth 1977-2001



# Person Trips per Person per Year and PMT per Person Trip

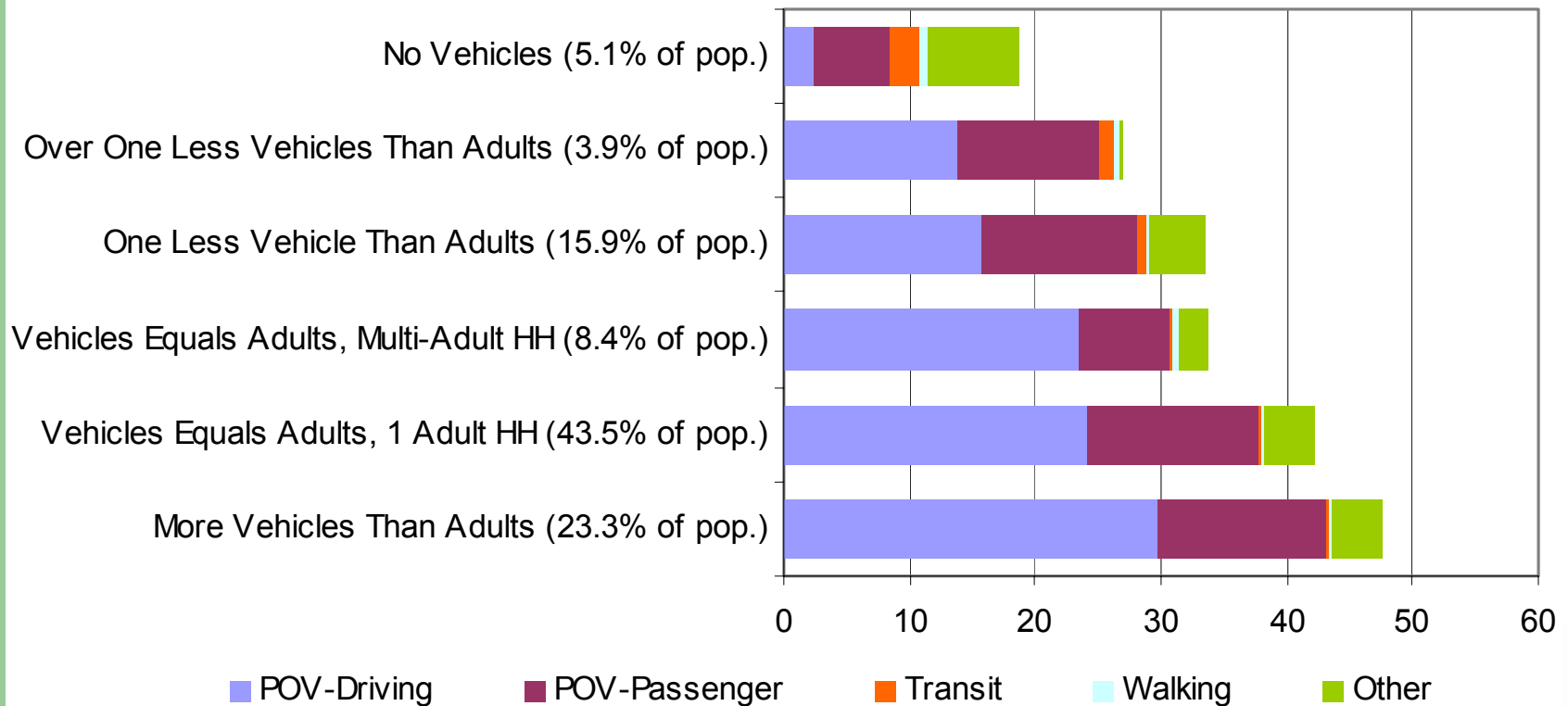


# Daily Person Trip Rates by Vehicle Availability, 2001

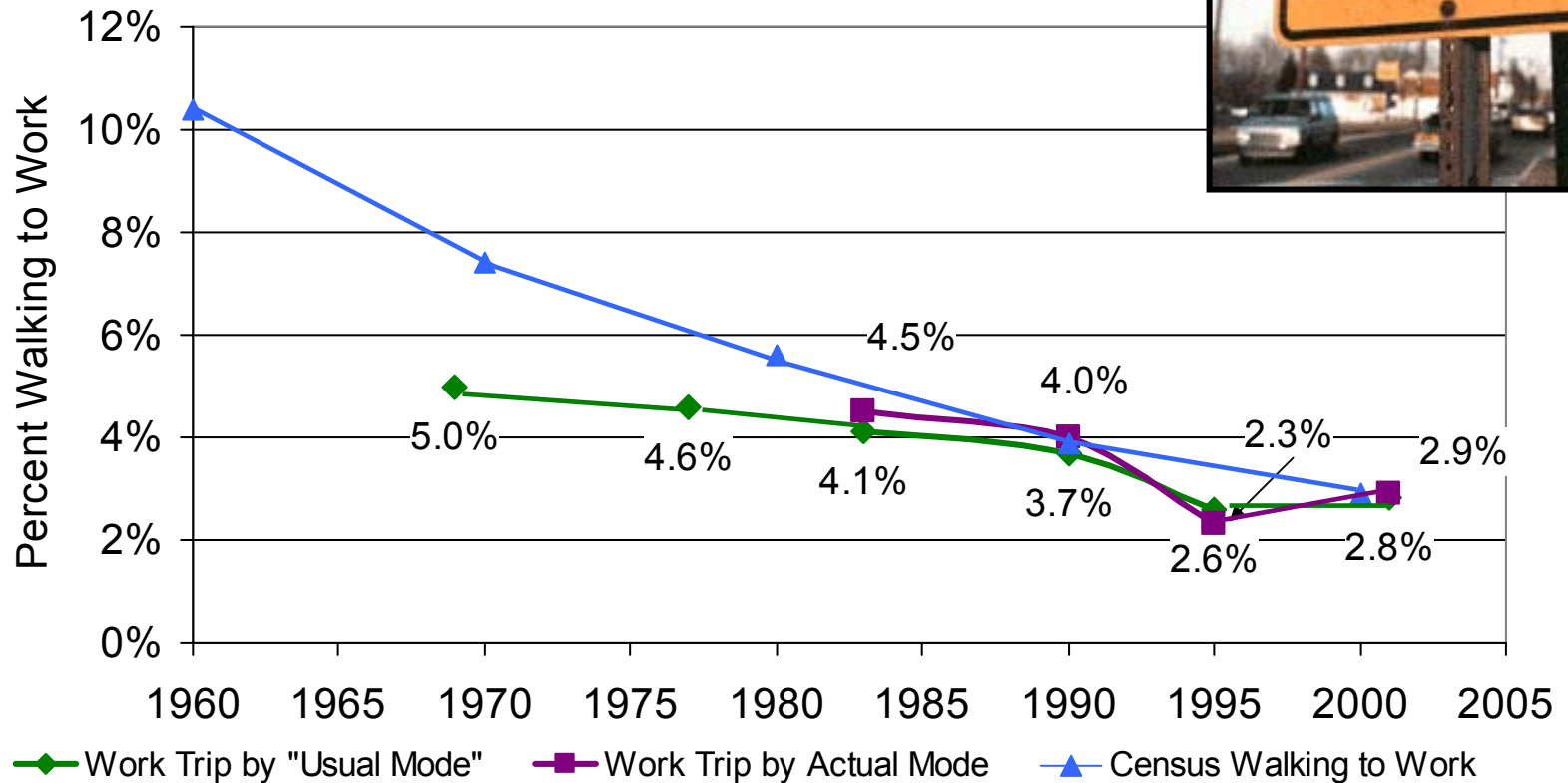


# Daily Mileage by Vehicle Availability and Mode, 2001

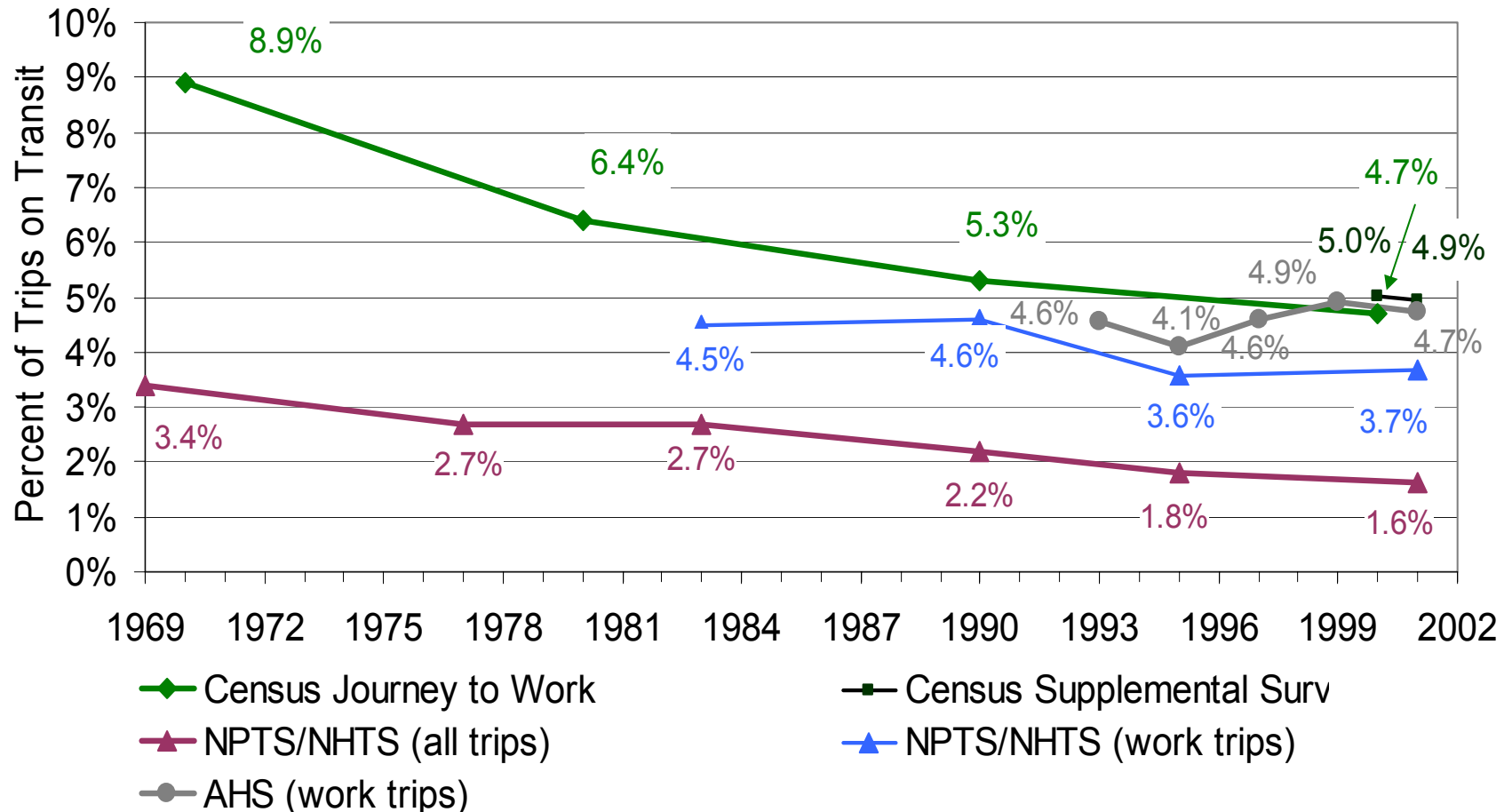
Per Capita Daily Mileage by Mode



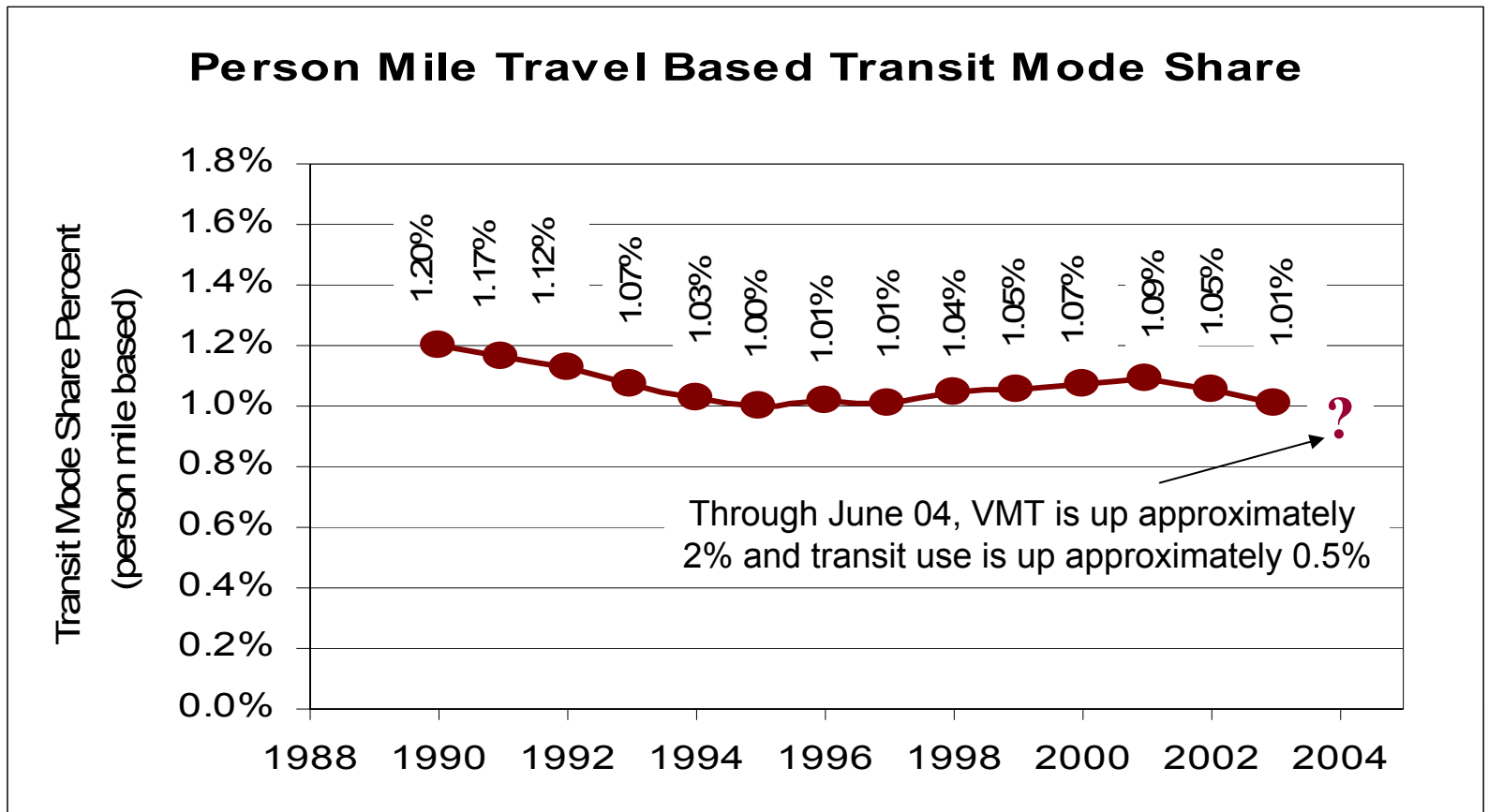
# Declining Walk Shares



# Ending the Decline in Transit Mode Share – Survey Data

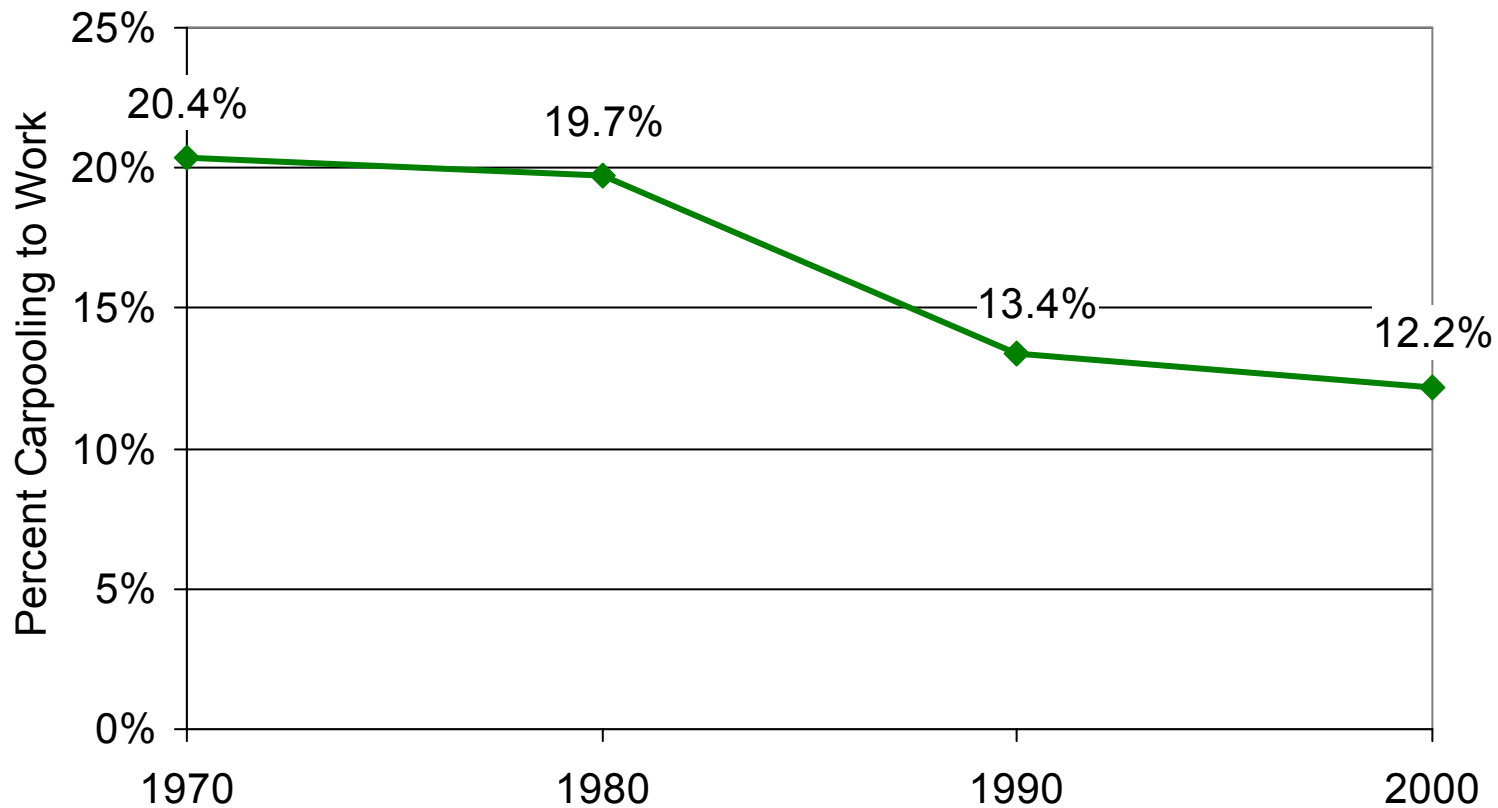


# Transit Share in Person Miles – Empirical Data

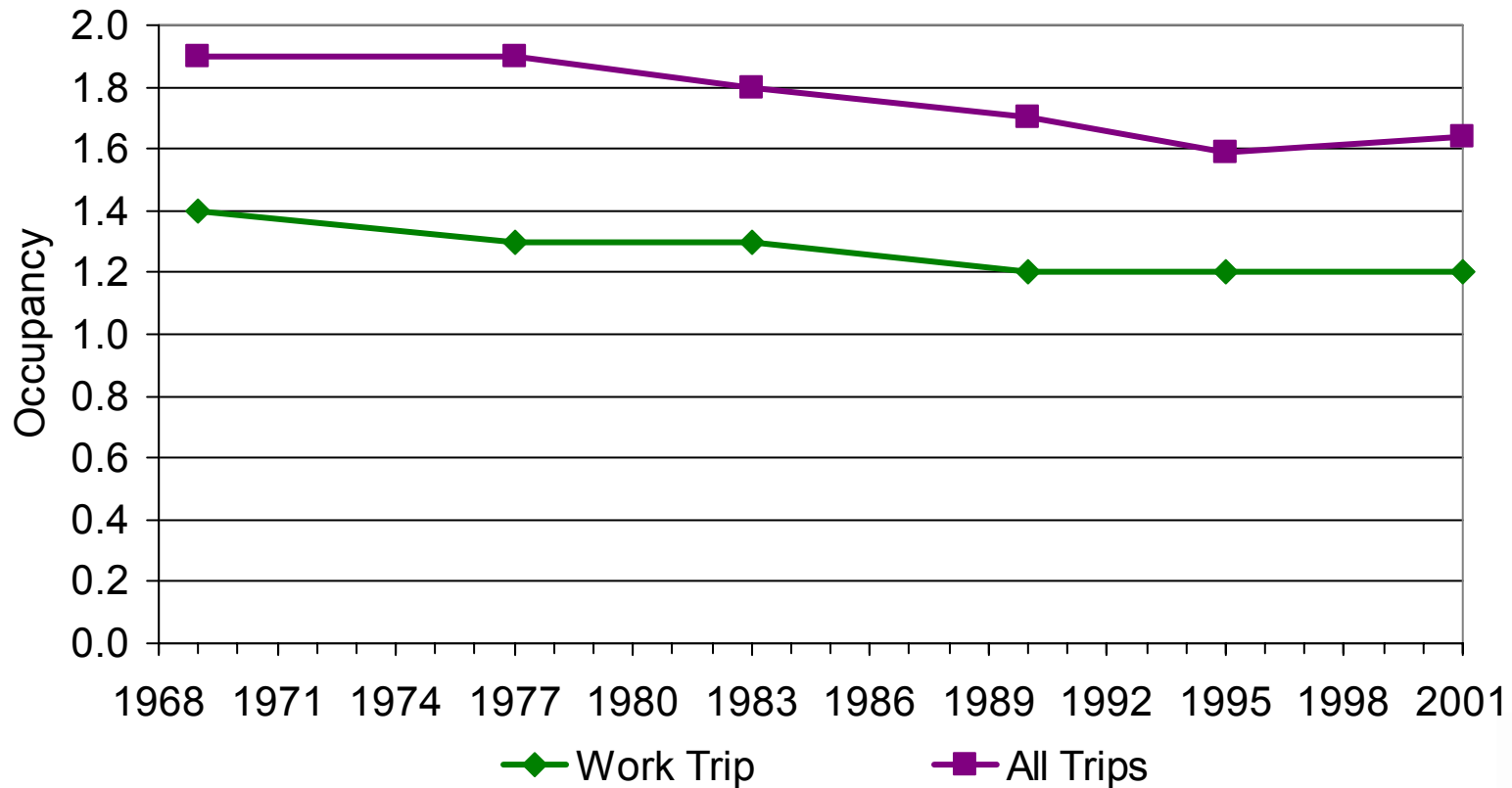




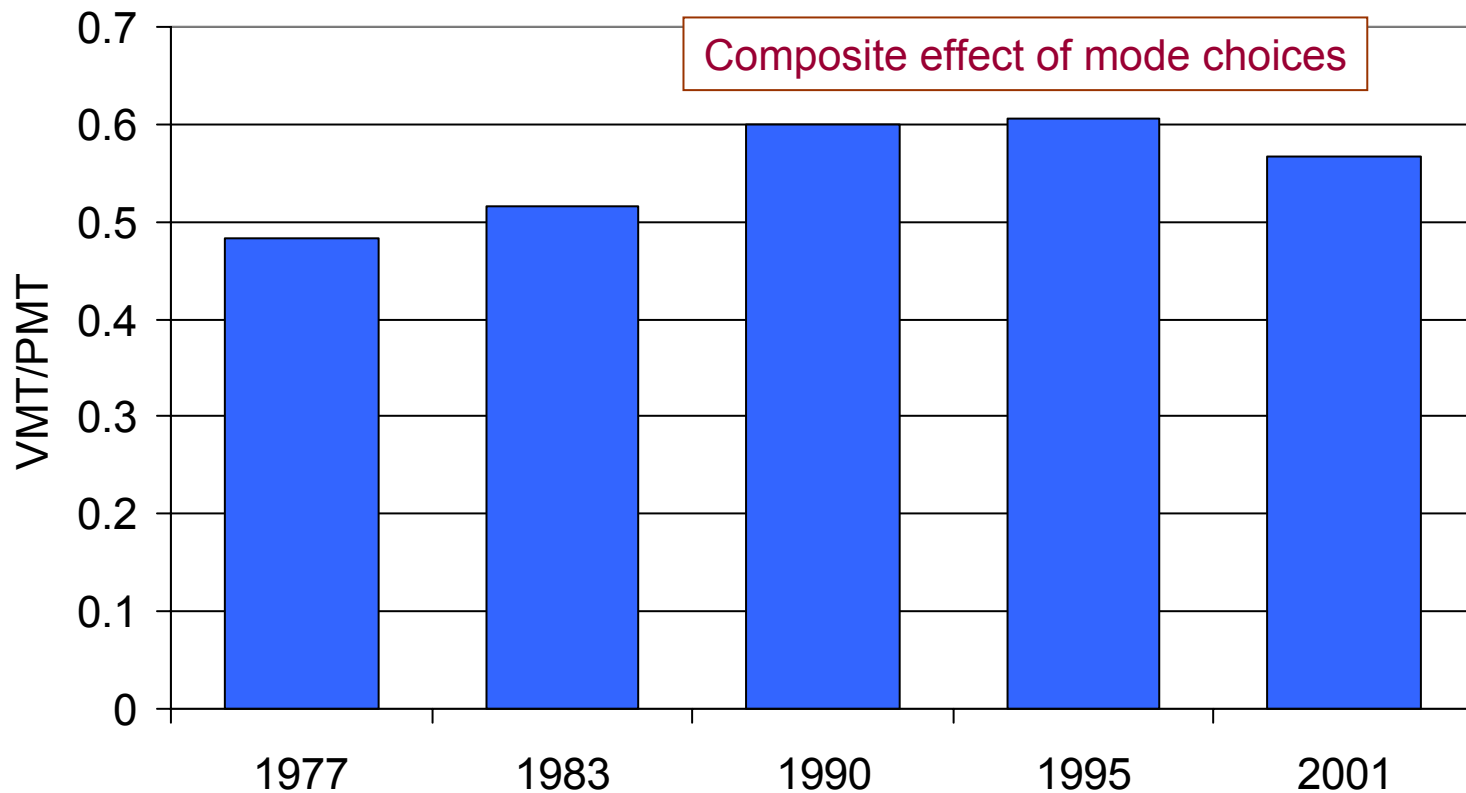
# Census Work Trips Carpooling Mode Share



# Stabilizing Vehicle Occupancies – NHTS and NPTS



# Slowing Vehicle Miles of Travel Per Person Mile of Travel



# So What Does this Mean in Terms of VMT?



# VMT Growth Estimation Equations

**Trip Generation**

**Trip Length**

**Mode**

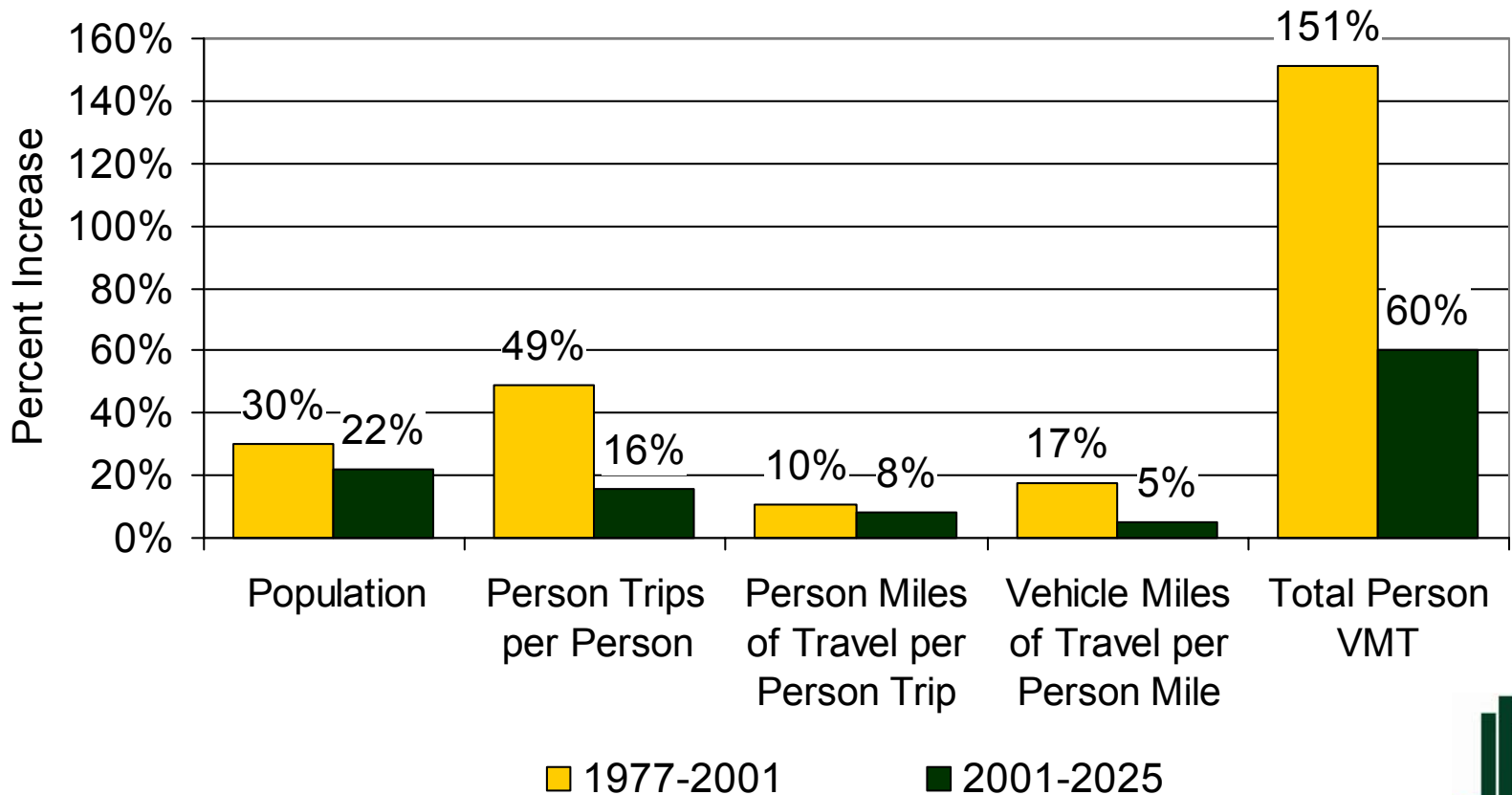
$$1. \text{ Population} \times \frac{\text{Person Trips}}{\text{Person}} \times \frac{\text{Person Miles}}{\text{Person Trips}} \times \frac{\text{Vehicle Miles}}{\text{Person Miles}} \equiv \text{Vehicle Miles}$$

**Travel Time Budget**

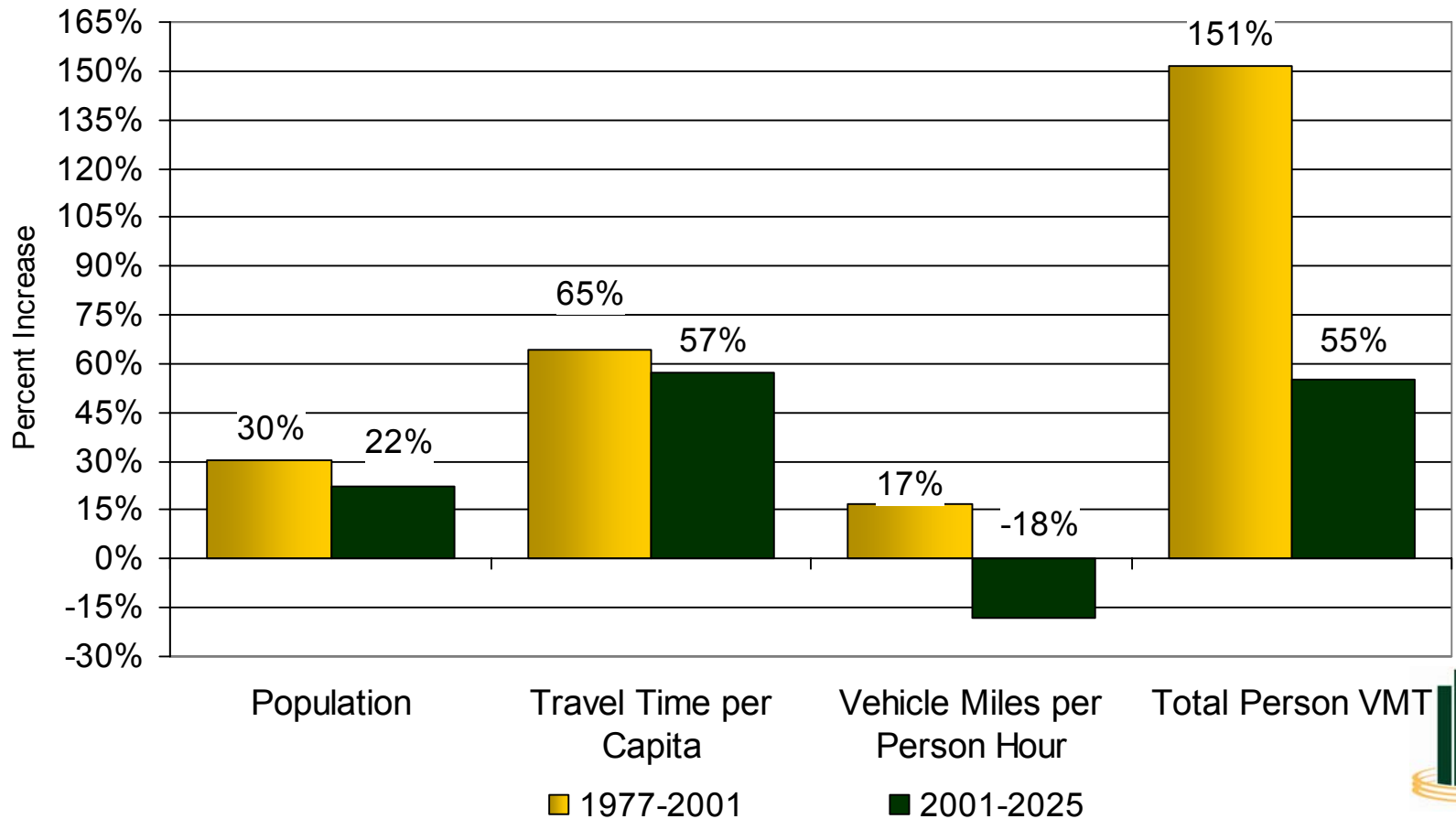
**Travel Speed**

$$2. \text{ Population} \times \frac{\text{Person Hours of Travel}}{\text{Person}} \times \frac{\text{Vehicle Miles}}{\text{Person Hours of Travel}} \equiv \text{Vehicle Miles}$$

# VMT Growth Scenario 1



# VMT Growth Scenario 2



# Future VMT Growth

- *Vehicle Miles Traveled 2001* – 2.08% per year (to 2020)
- Scenario One – 1.98% per year (to 2025)
- Scenario Two – 1.90% per year (to 2025)



# Observations

- The moderation of several historic trends may have significant impacts in terms of future VMT demand as well as on other aspects of travel behavior.

## **Socio-Economic Conditions**

- Average Household Size
- Women Labor Force Participation Rates
- Women Share of Licensed Drivers
- Share of Zero Vehicle Households

## **Transportation System**

- Travel Speed

## **Travel Trends**

- Mode Share of Public Transportation
- Vehicle Occupancies
- Mode Share for Walk, Bike
- Perhaps trip rates

# Observations (Transportation Supply)

Increases in system capacity (supply) compared to demand growth remains uncertain.

- What will federal, state and local willingness to increase spending be?
- Will there be the public will to tolerate the impacts of transportation system expansion?
- What role will toll facilities play?
- What increase in transit supply and use will occur?
- What capacity benefits will be realized by ITS?

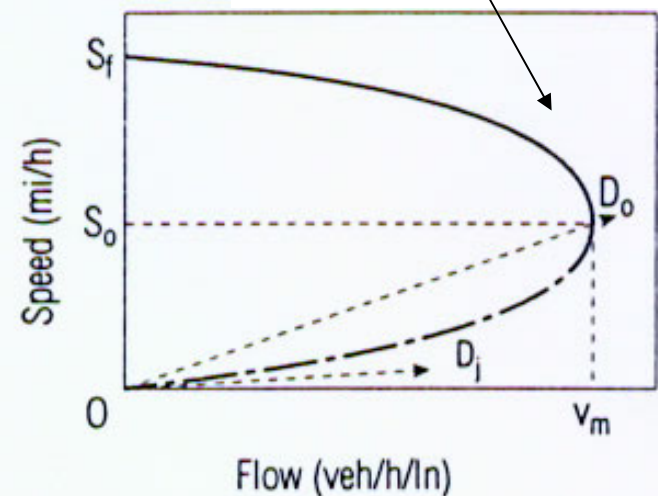
# Observations (travel behaviors)

The dynamic response of our system subject to growing demand is not well understood.

How will people adapt?

- Communications substitution
- Temporal shifts in demand
- Location shifts to avoid congestion
- “Fragileness” of our system

Where are we on this HCM curve?



# Observations & Speculations

The growth in trip making and travel time budgets poses the greatest risk to moderating travel demand.

- Historic causal variables of income, car ownership and worker status are no longer the dominant drivers of trip making (we no longer know how to forecast trip generation growth?)
- Multi-tasking moderates the reluctance to travel:
  - Eating in car
  - Cell phone use
- Activities are shifting from inside to outside of home:
  - Specialization of labor (eating out, hired services)
  - Socialization (for working Americans the social relationships have moved from the front porch or back yard to the workplace break room)
  - Parenting (more organized youth activities and lessons)
  - Specialization of services (GP Dr. > specialist > lab > scanning center)
- Land use changes will not impact the trip making

# Observations



- Uncertainties include:
  - Energy costs and traveler reactions
  - The extent to which development trends change toward smart growth (retrofit versus new town)
  - The extent to which housing affordability encourage housing dispersion
  - Whether activity scale continues to influence travel (mega churches, schools, and stores, create longer trips and different social relationships)
  - What will the VMT trends for truck travel be?
  - What will the VMT trends for long distance travel be?
  - Can/will peak spreading continue?

# Socio Demographic Research Questions

- How are older American travel rates likely to change over time?
- Of zero vehicle households what share are by choice, what share have income constraints, what share have mental or physical health or legal constraints?
- Under what conditions do multi-person households result in some economy of travel?
- What happened to the concept of a travel time budget? Are we multitasking in our cars?

# Transportation System Performance Research Questions

- Has the increase in congestion occurred so fast as to preclude location decision making from naturally adjusting to intolerable travel times?
- Have we really reached the point where average daily travel speeds are declining?
- To what extent is real income and travel cost, versus time a constraint on additional travel?

# Trip Generation, Distribution and Mode Choice Research Questions

- Will trip making levels increase?
- Will trip lengths continue to grow or accelerate?
- Is transit growth inevitable?
- Will walk see a revival as a functional travel mode?
- Will auto occupancies stop declining?





# What Will Happen Next?

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