

# Transport infrastructure, “lock-out”, and urban form

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This paper is about the way that choices about public and private transport infrastructure networks can have long lasting effects on urban form

The main argument:

large scale highway networks create sprawling cities that are unsuited for public transport.

*"Big roads beget little roads, and so to infinitum."*

## Background: city transport systems

### Cross-city transport comparisons

Newman & Kenworthy(1989), Kenworthy & Laube(1999)

46 cities in North America, Asia, Europe, Australia,

detailed data on transport, income, density: 1990

# Car usage patterns by continent



otu

	Cities	Income				
USA	13	\$27000				
Aust	6	\$20000				
Canada	7	\$22500				
Europe	11	\$31500				
Asia \$\$	3	\$21500				
Asia \$	6	\$2500				

# Car usage patterns by continent



otu

	Cities	Income	Cars /1000	(% US)		
USA	13	\$27000	604			
Aust	6	\$20000	491	81%		
Canada	7	\$22500	524	87%		
Europe	11	\$31500	392	65%		
Asia \$\$	3	\$21500	123	20%		
Asia \$	6	\$2500	102	17%		

# Car usage patterns by continent



	Cities	Income	Cars /1000	(% US)	km /capita	(% US)
USA	13	\$27000	604		11100	
Aust	6	\$20000	491	81%	6600	60%
Canada	7	\$22500	524	87%	6600	60%
Europe	11	\$31500	392	65%	4500	40%
Asia \$\$	3	\$21500	123	20%	1500	13%
Asia \$	6	\$2500	102	17%	1900	17%

# Public transport usage by continent



	Cities	trips /capita				
USA	13	63				
Aust	6	92				
Canada	7	161				
Europe	11	318				
Asia \$\$	3	496				
Asia \$	6	334				

# Public transport usage by continent



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	Cities	trips /capita	Density Persons /ha			
USA	13	63	14			
Aust	6	92	12			
Canada	7	161	28			
Europe	11	318	50			
Asia \$\$	3	496	153			
Asia \$	6	334	166			

# Public transport usage by continent



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	Cities	trips /capita	Density Persons /ha	Km service /capita		
USA	13	63	14	28		
Aust	6	92	12	60		
Canada	7	161	28	58		
Europe	11	318	50	92		
Asia \$\$	3	496	153	114		
Asia \$	6	334	166	108		

# Public transport usage by continent



	Cities	trips /capita	Density Persons /ha	Km service /capita	Rail km /ha	
USA	13	63	14	28	153	
Aust	6	92	12	60	287	
Canada	7	161	28	58	390	
Europe	11	318	50	92	3651	
Asia \$\$	3	496	153	114	4914	
Asia \$	6	334	166	108	639	

# Public transport usage by continent



	Cities	trips /capita	Density Persons /ha	Km service /capita	Rail km /ha	% km public
USA	13	63	14	28	153	3%
Aust	6	92	12	60	287	8%
Canada	7	161	28	58	390	10%
Europe	11	318	50	92	3651	23%
Asia \$\$	3	496	153	114	4914	64%
Asia \$	6	334	166	108	639	40%

# Transport usage by continent



	Income	Density Persons /ha		Car km /capita		
USA	\$27000	14		11100		
Aust	\$20000	12		6600		
Canada	\$22500	28		6600		
Europe	\$31500	50		4500		
Asia \$\$	\$21500	153		1500		
Asia \$	\$2500	166		1900		

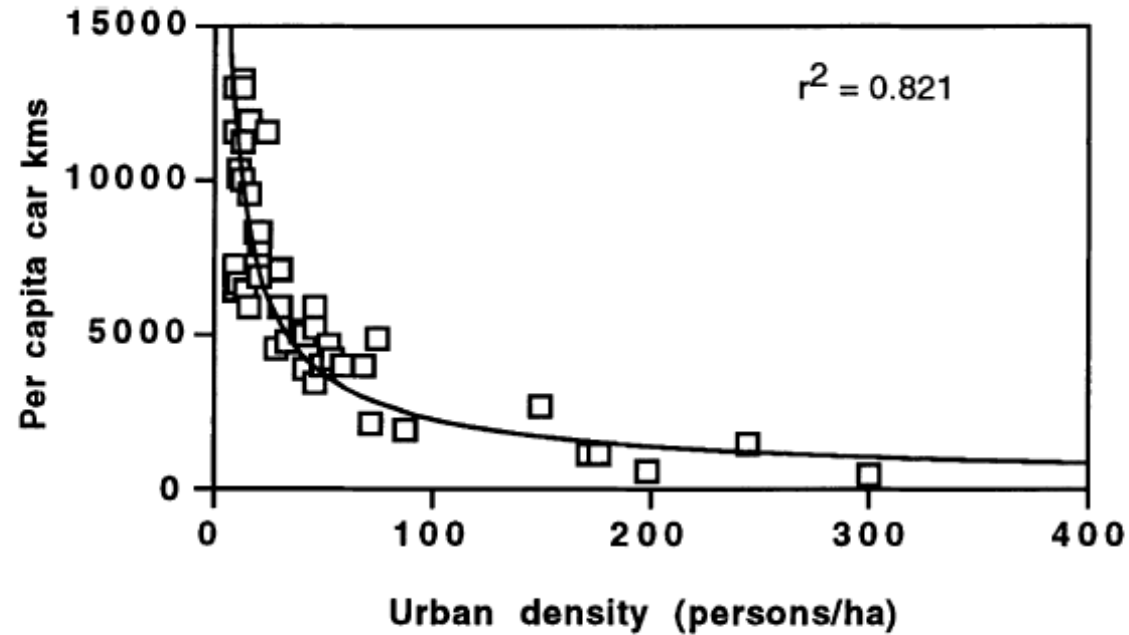


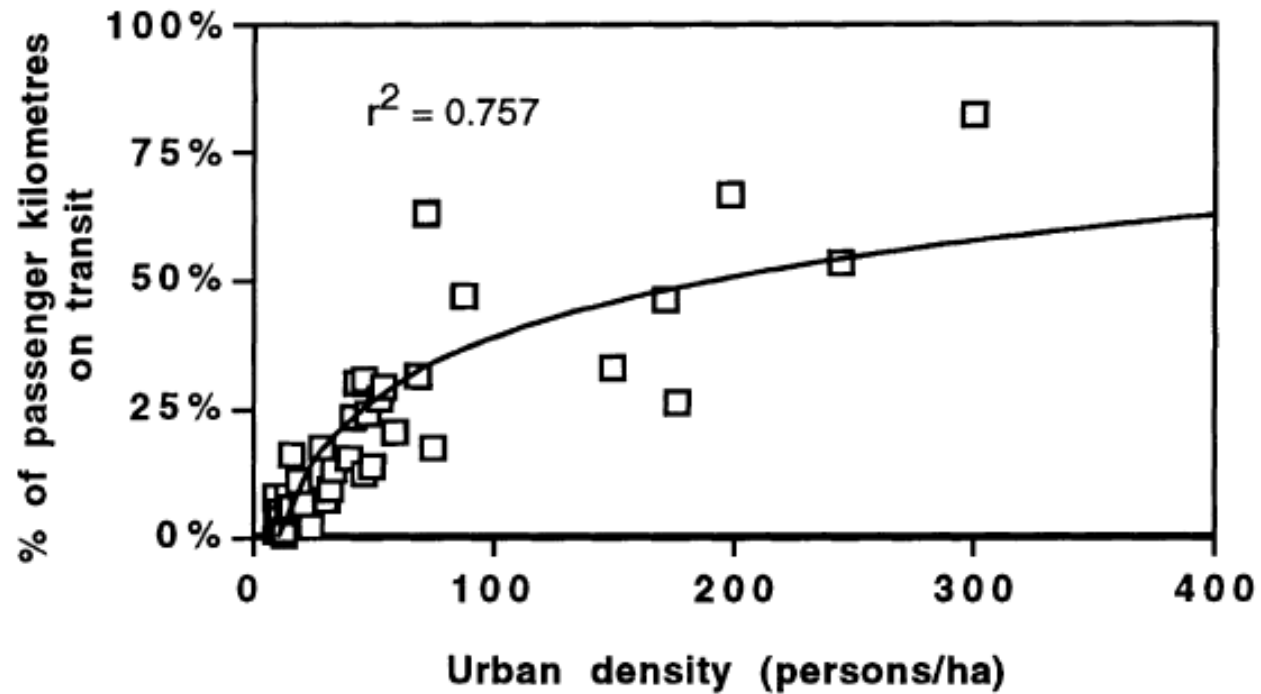
Fig. 5. Urban density versus car use in developed and developing cities, 1990.

**Kenworthy and Laube (1999)**

# Transport usage by continent



	Income	Density Persons /ha		Car km /capita	% km public	
USA	\$27000	14		11100	3%	
Aust	\$20000	12		6600	8%	
Canada	\$22500	28		6600	10%	
Europe	\$31500	50		4500	23%	
Asia \$\$	\$21500	153		1500	64%	
Asia \$	\$2500	166		1900	40%	



Urban density versus the proportion of total motorised transport on transit

**Kenworthy and Laube (1999)**

# Transport usage by continent



	Income	Density Persons /ha		Car km /capita	% km public	% GDP transport
USA	\$27000	14		11100	3%	12%
Aust	\$20000	12		6600	8%	13%
Canada	\$22500	28		6600	10%	7*%
Europe	\$31500	50		4500	23%	8%
Asia \$\$	\$21500	153		1500	64%	5%
Asia \$	\$2500	166		1900	40%	16%

Low density cities have high private car use  
and low public transport use

High density cities have high public transport  
use and low private car use

## Questions of causality: roads and density

Baum-Snow (2007, 2010) analysed location of people and jobs in US cities.

Identification strategy:

US interstate highway system (1940s/50s)

Exogenous variation in the number of highways to city centres

## The main findings

- Building an extra highway *caused* a city to decentralise

### (1) Population moved into the suburb

- Each highway “ray” reduced central city population by 9%
- Highways account for 1/3 relative decline in central city populations since 1960



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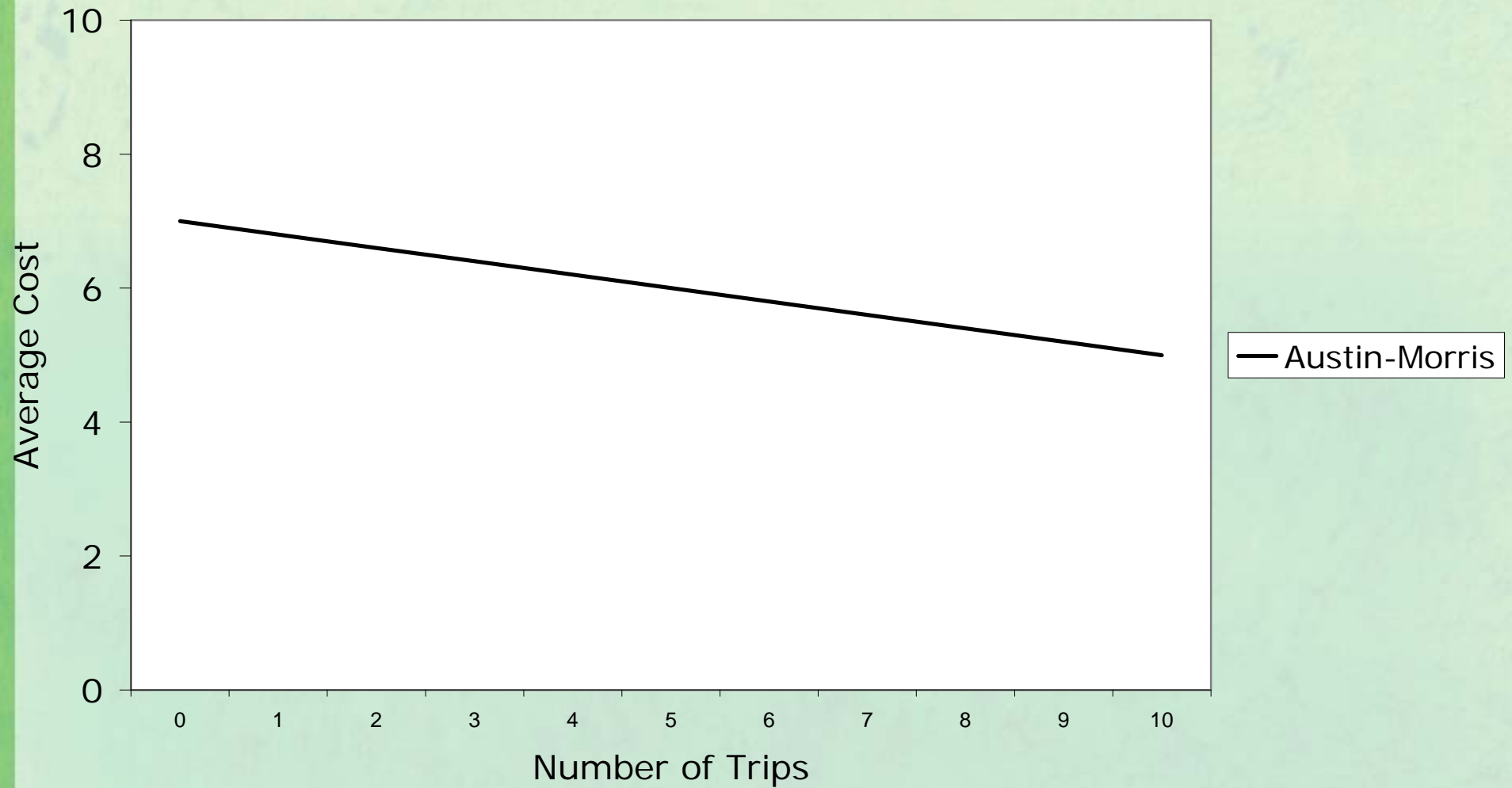
# The main findings

## (2) Jobs moved into the suburbs

- Each highway increased number of people living and working in suburbs by 25%
- Highways account for 1/3 of increase in suburban workers

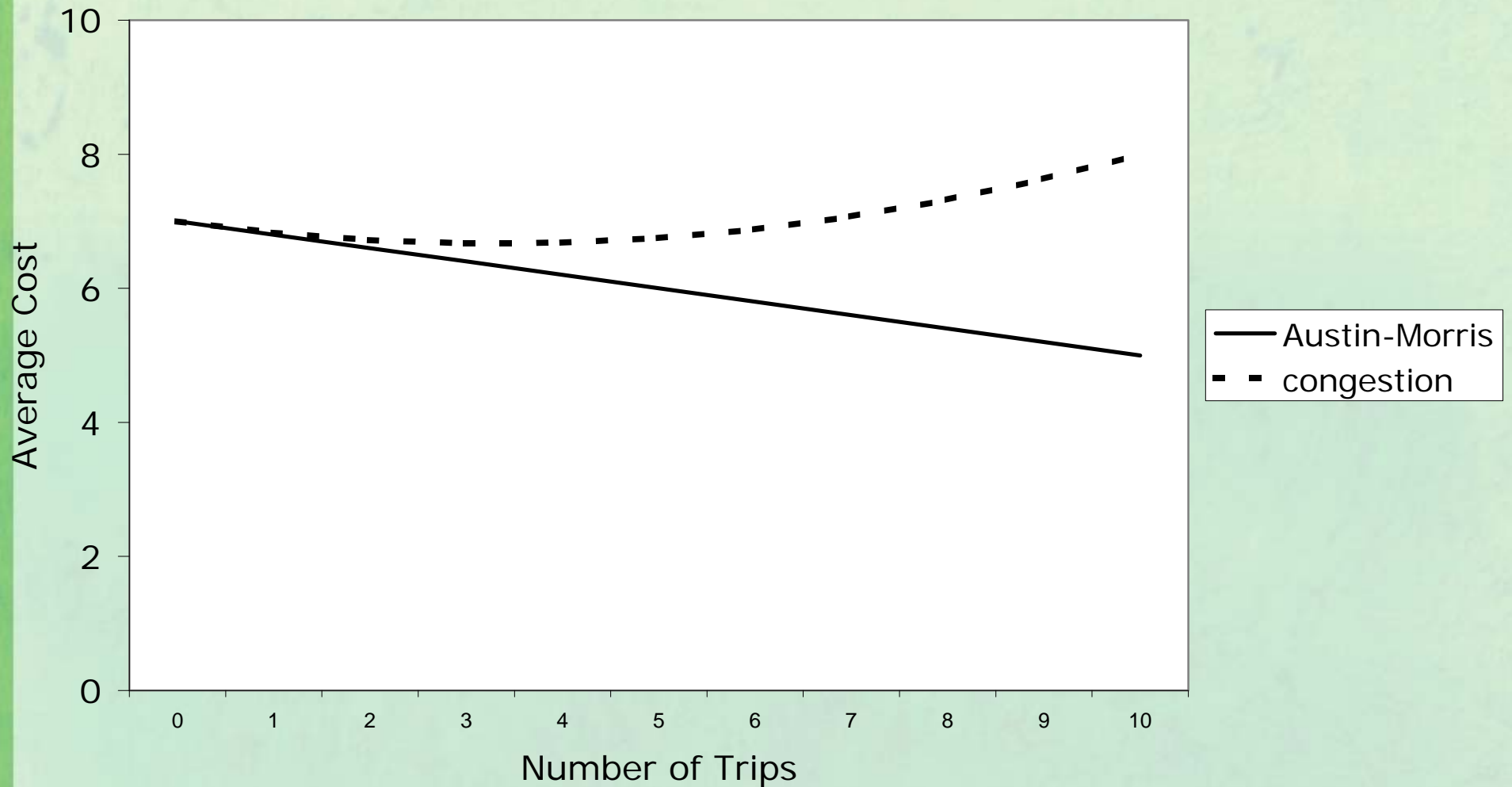
# Technological Lock-out (1)

## Road Transport



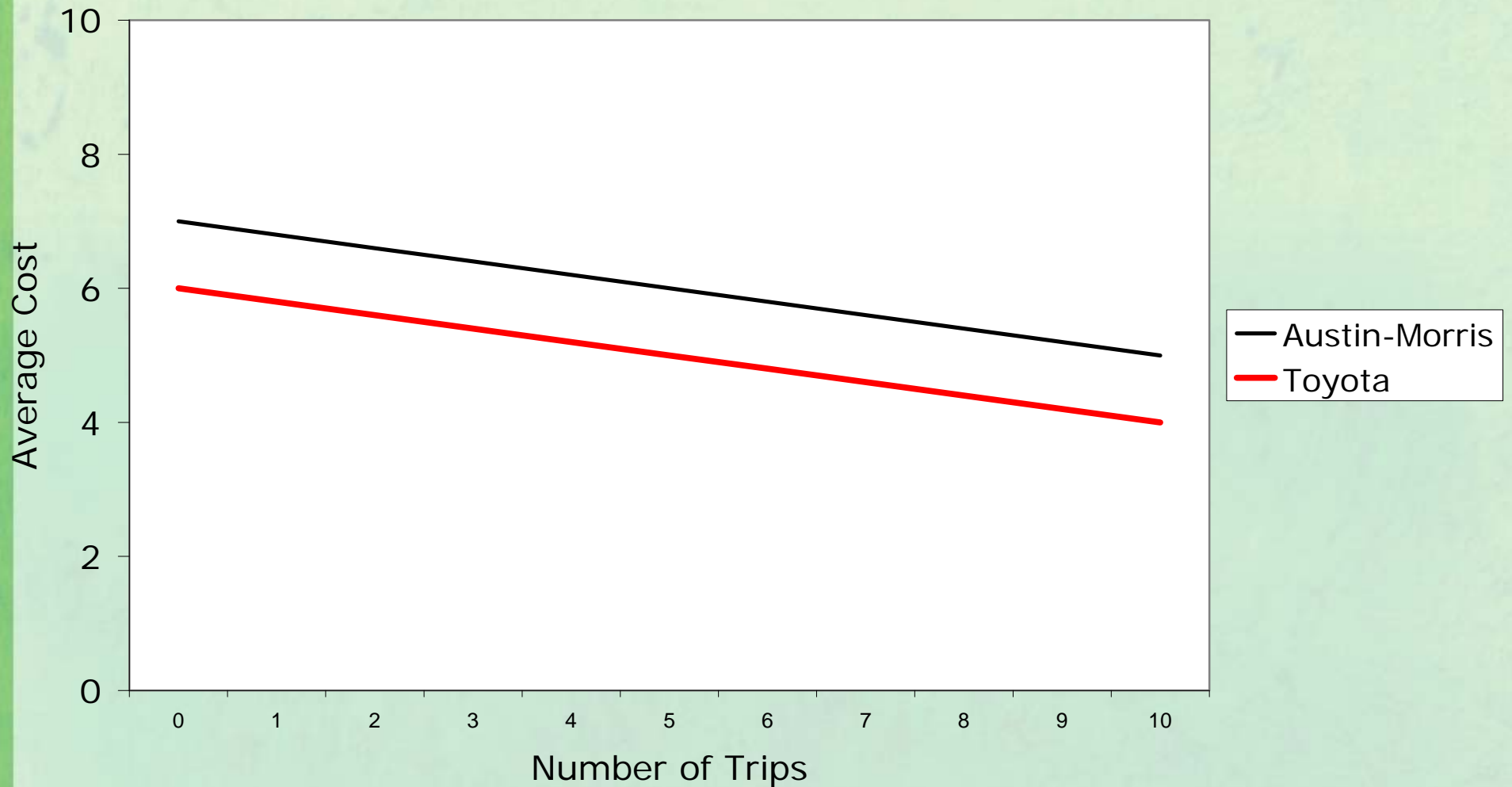
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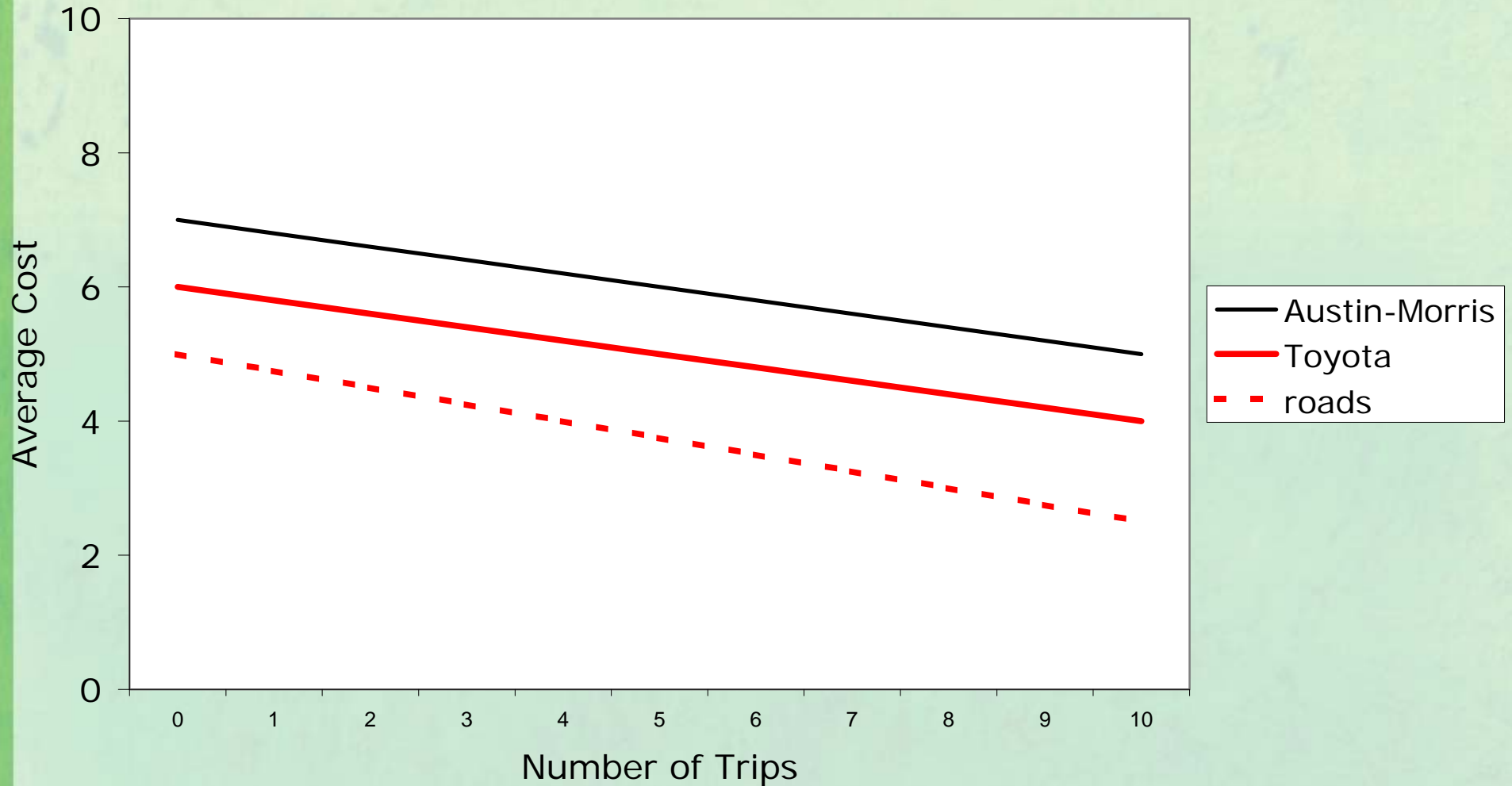
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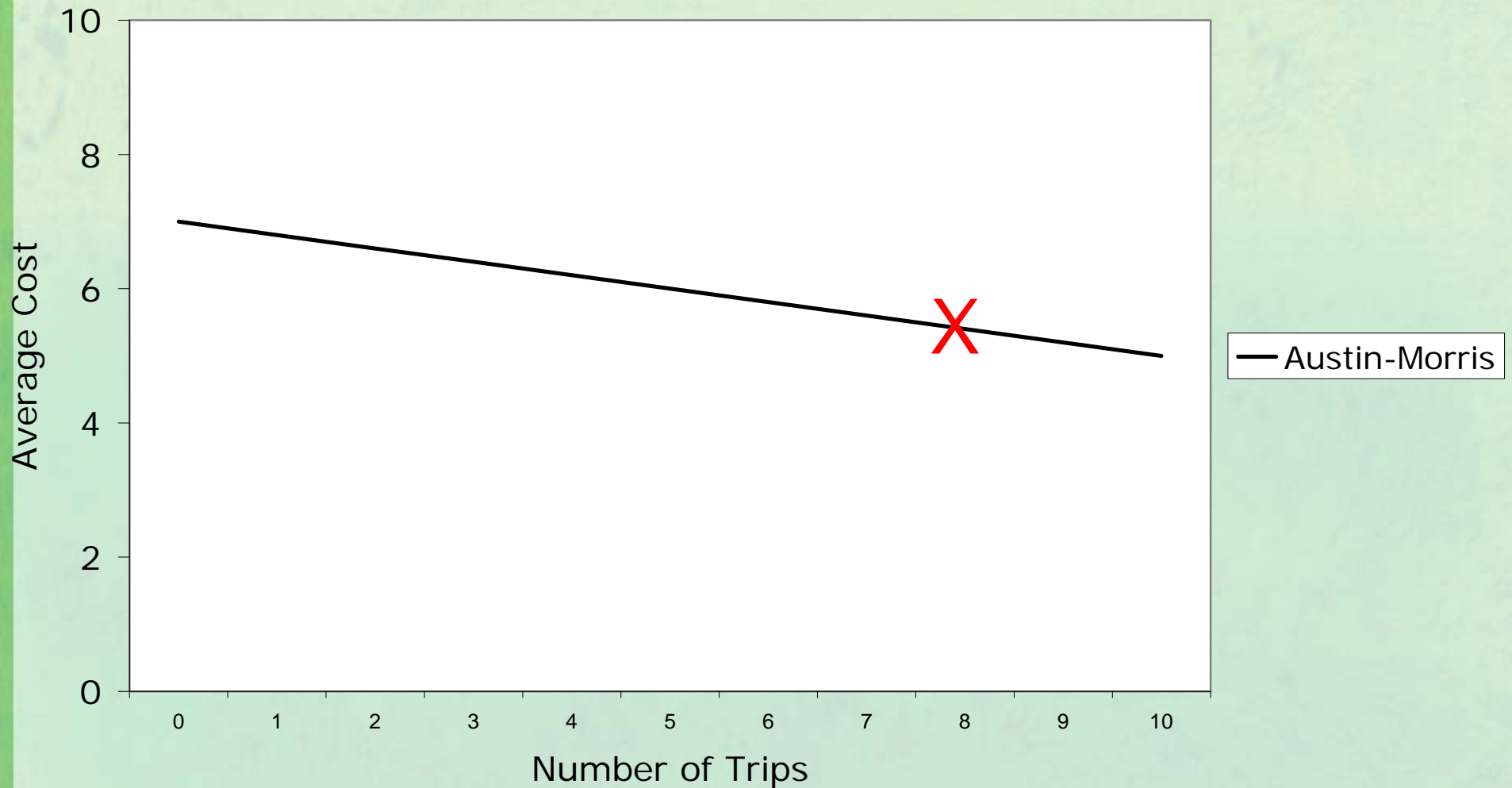
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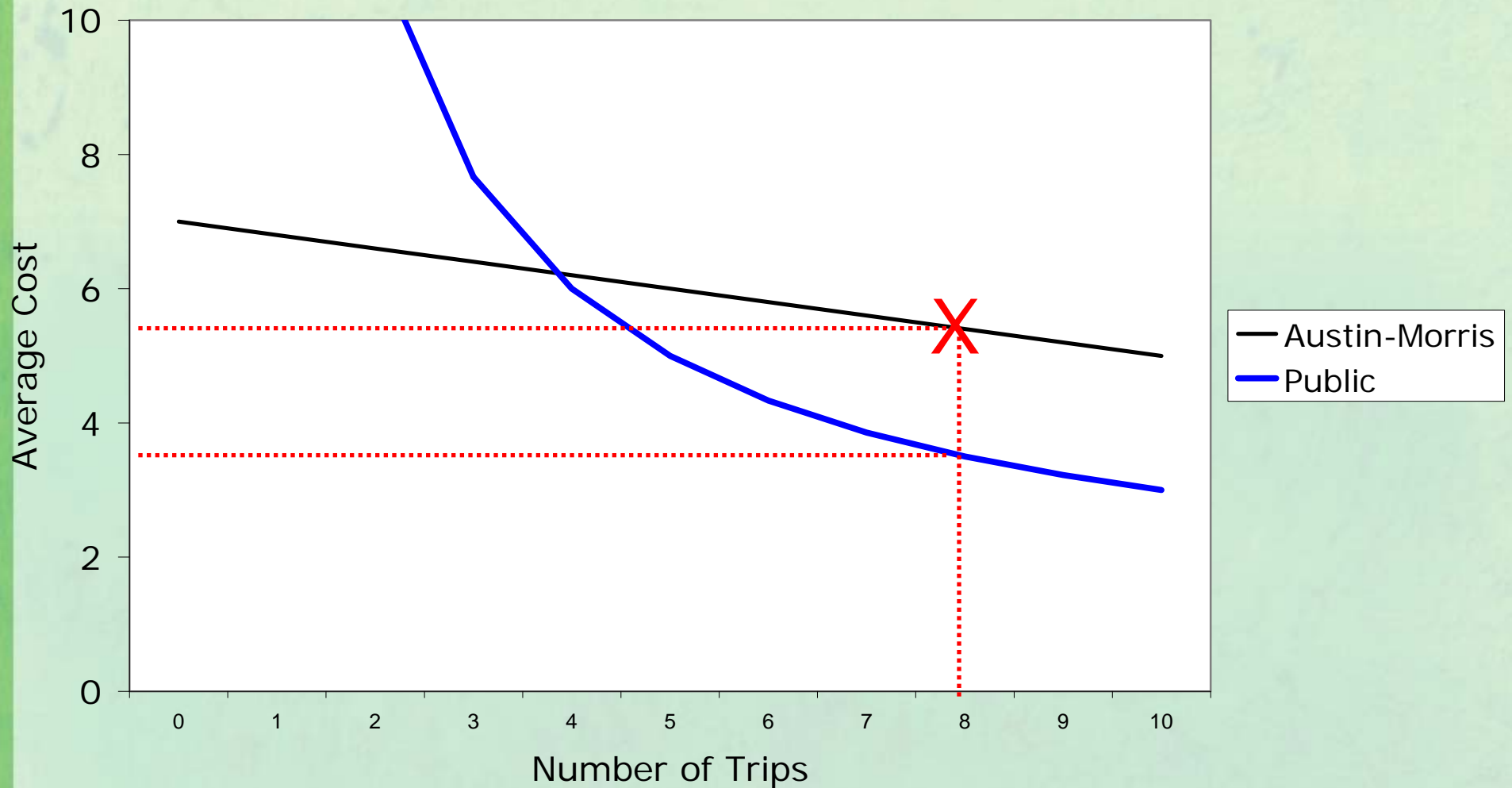
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## Road and Public Transport



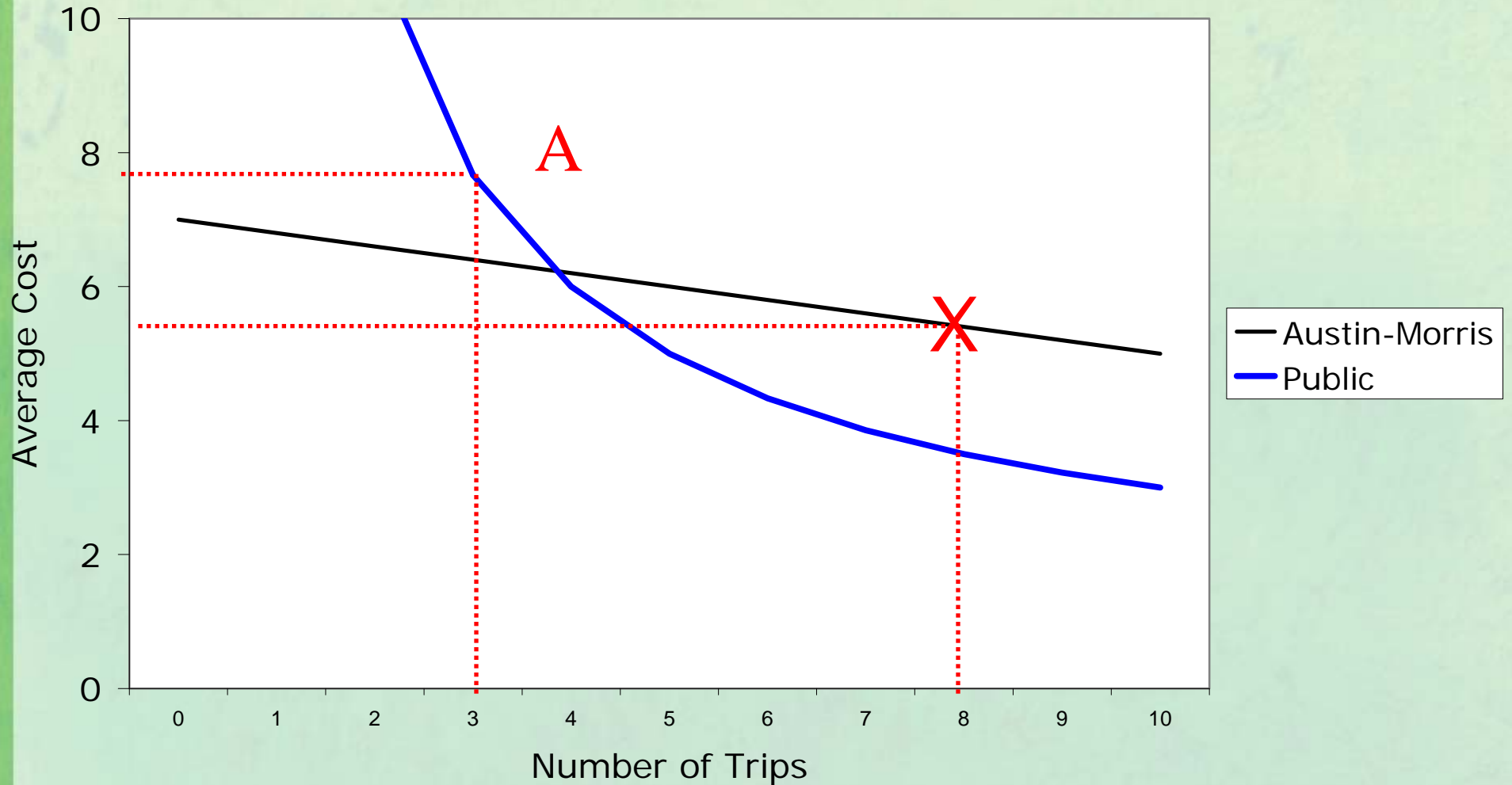
# Technological Lock-out (1): history

## Road and Public Transport



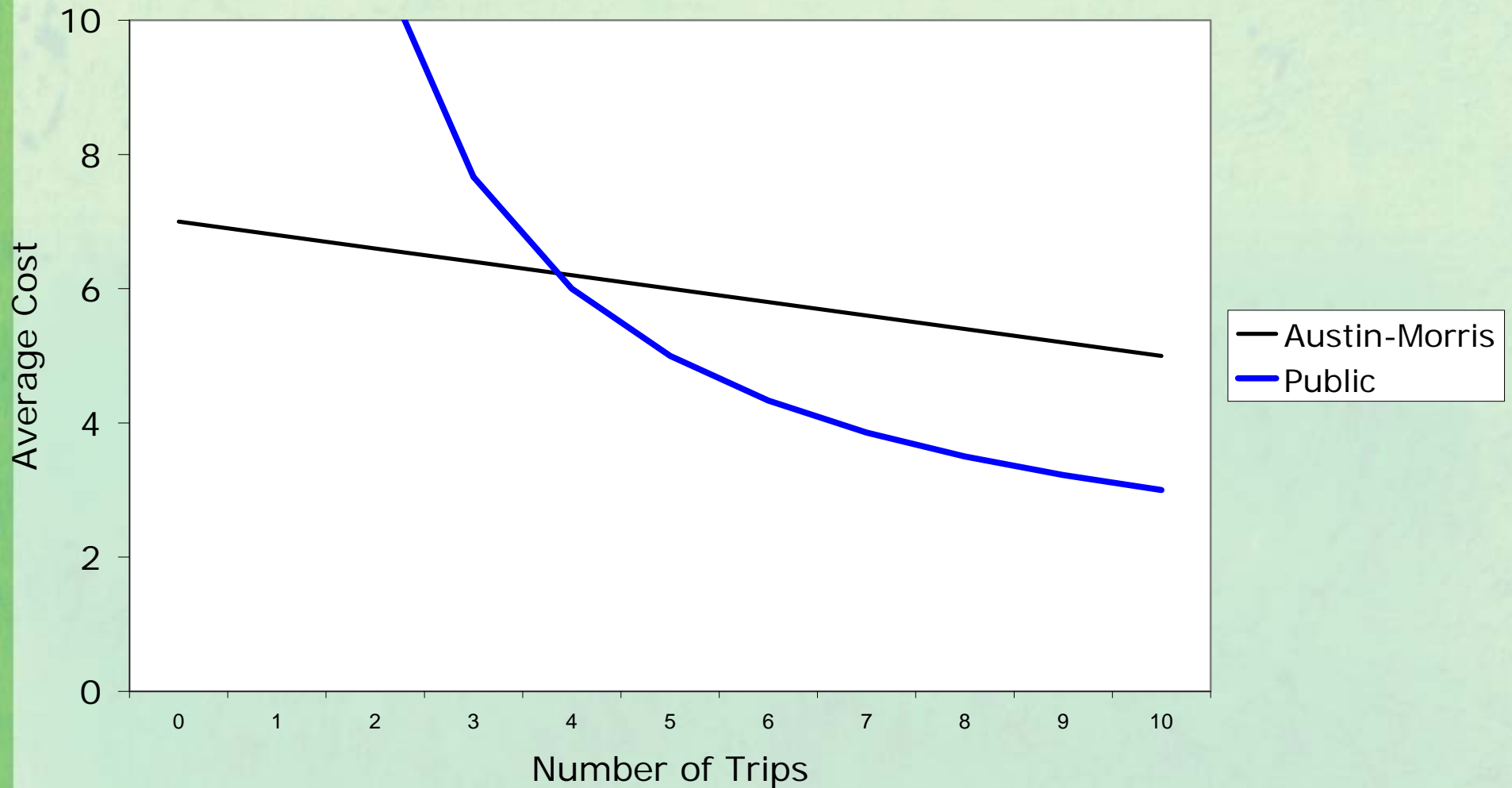
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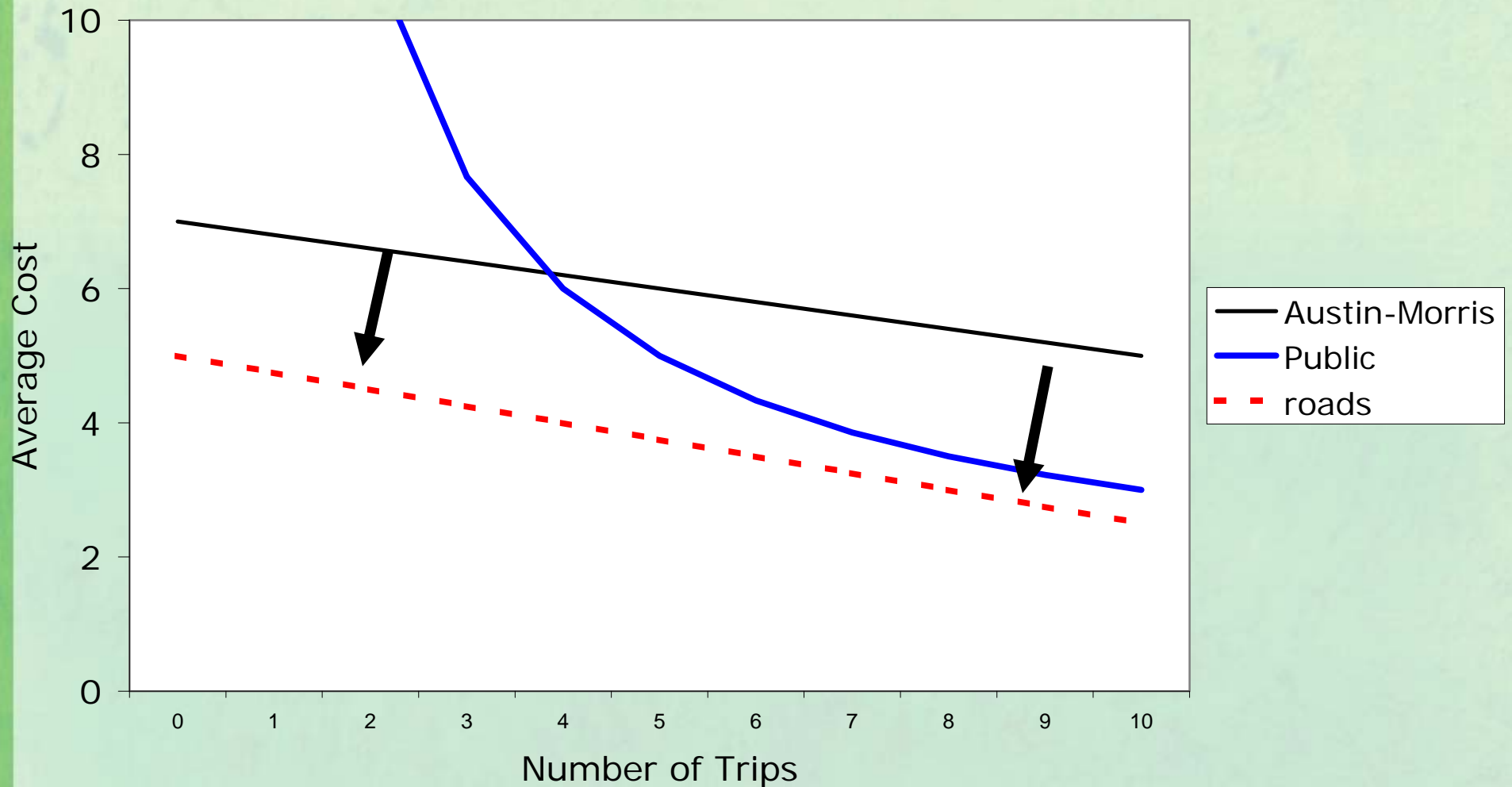
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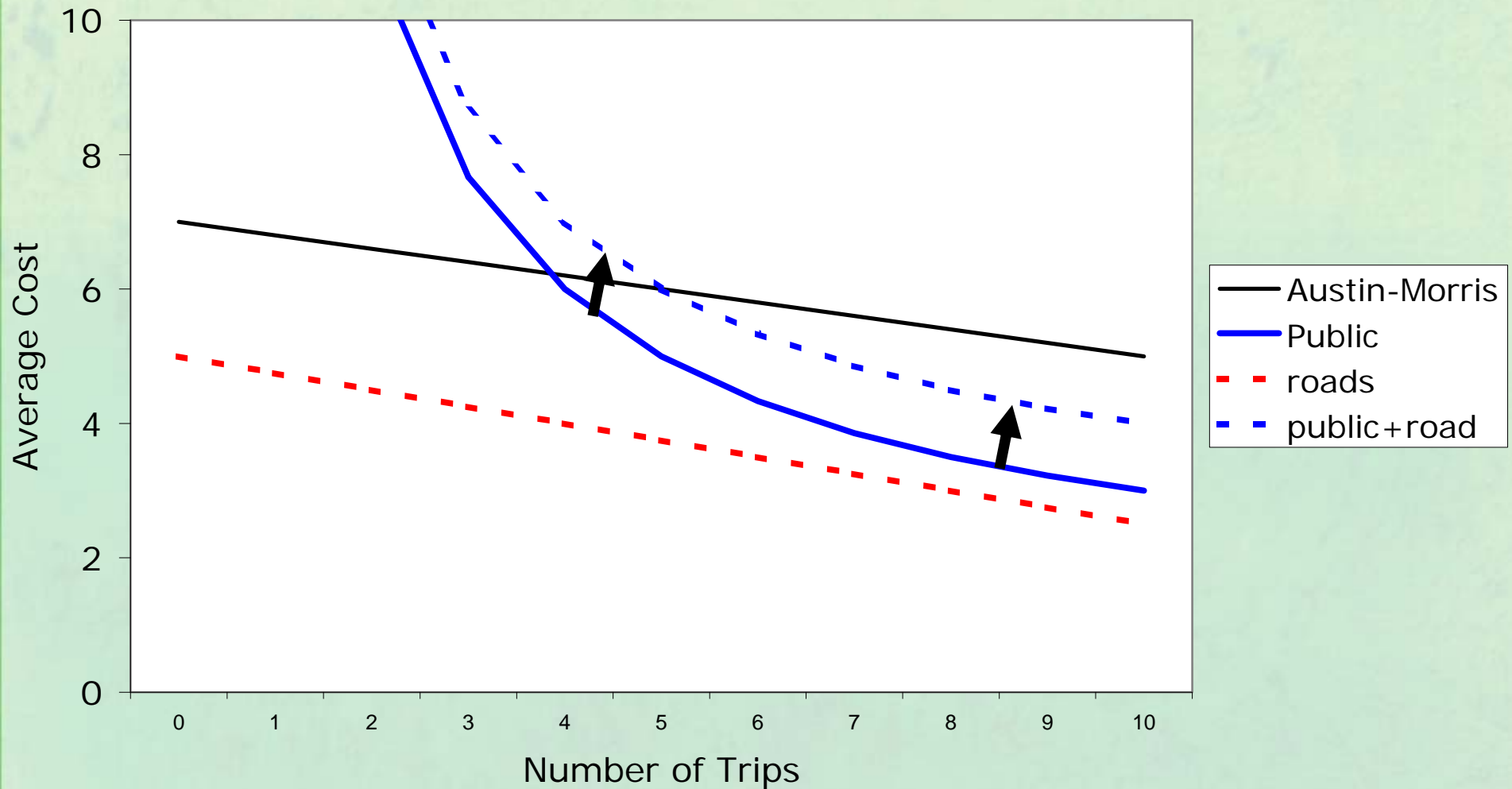
# History, road-building, and Lock-out

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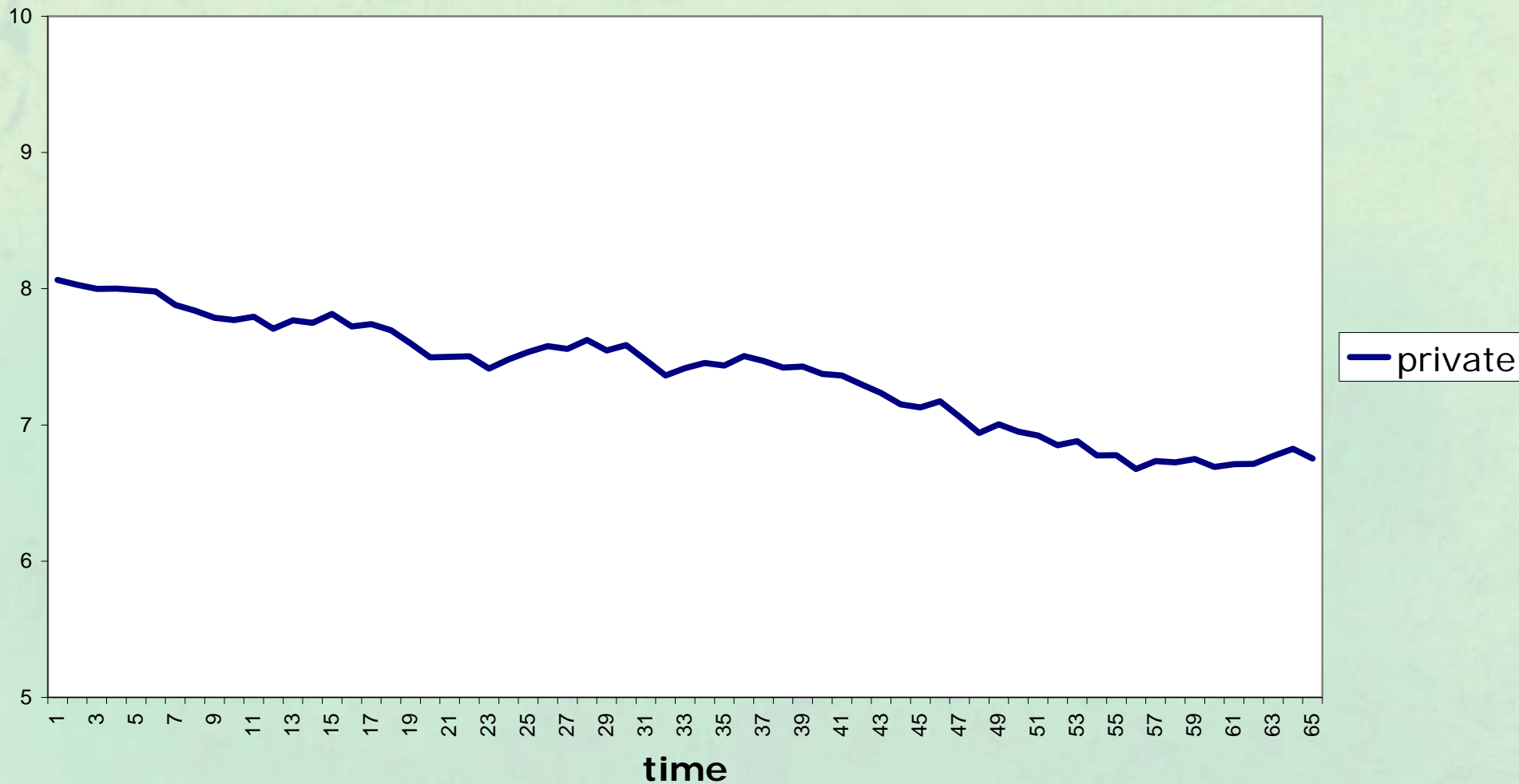
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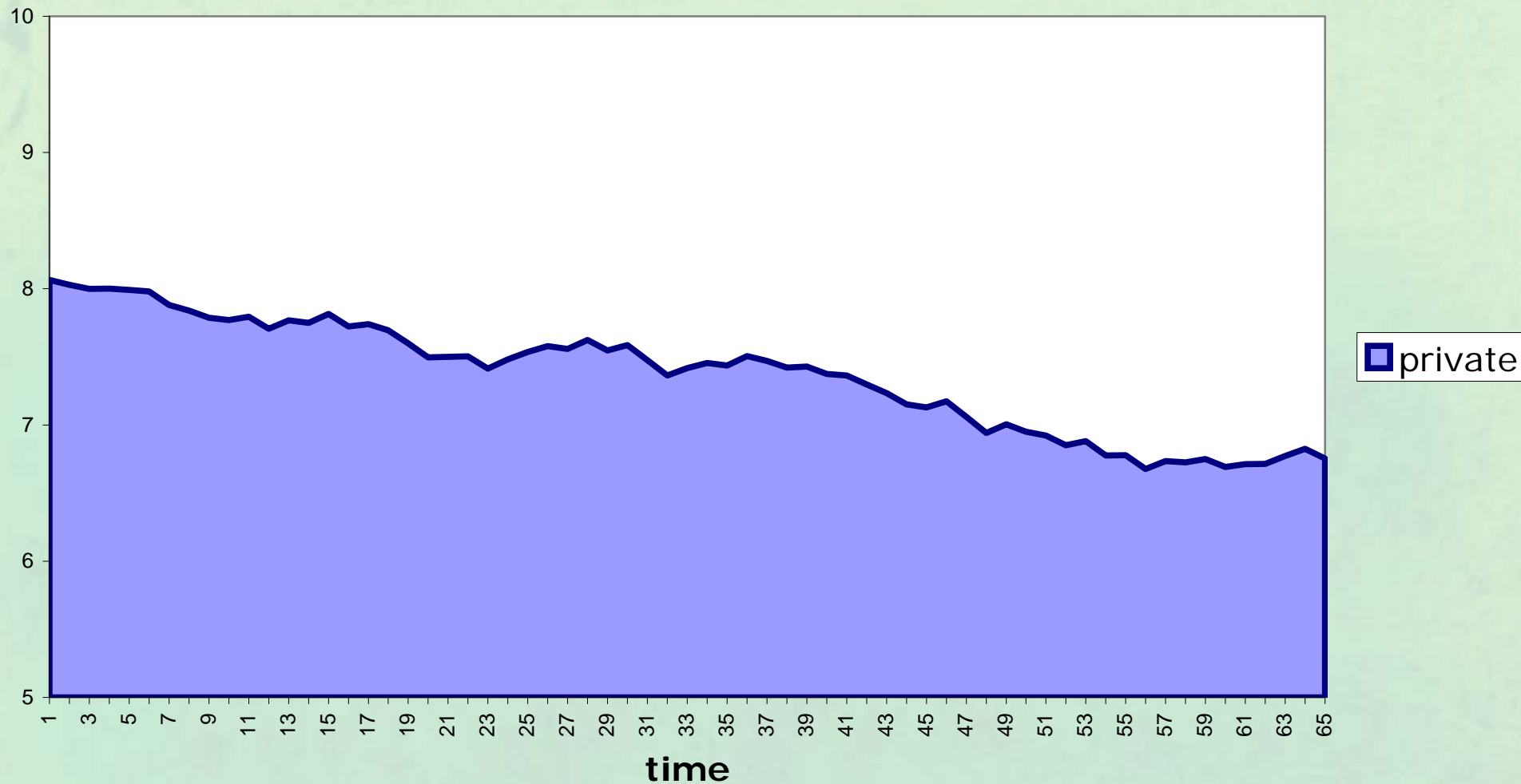
# Technological Lock-out (2): evolution

## Technological progress through time



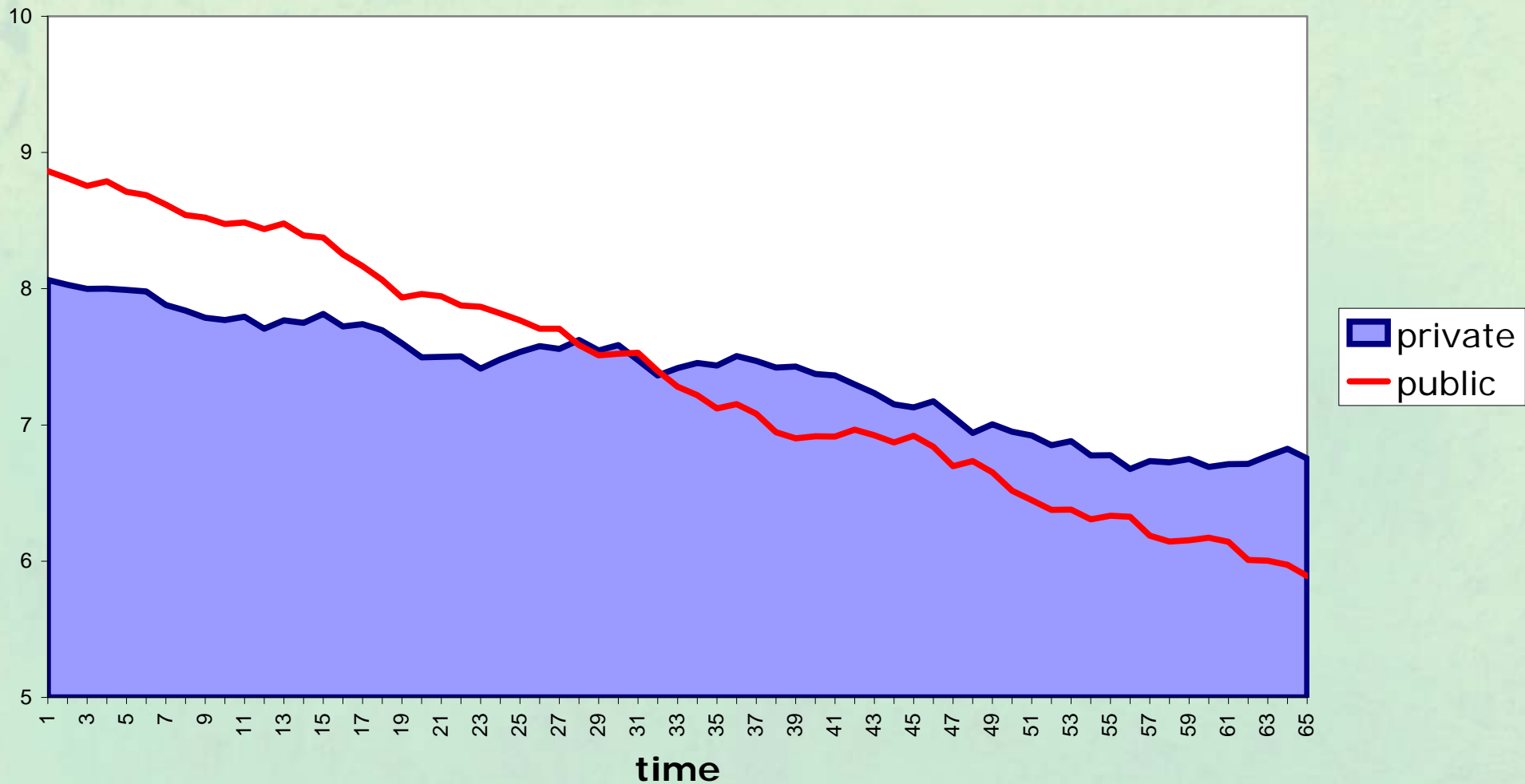
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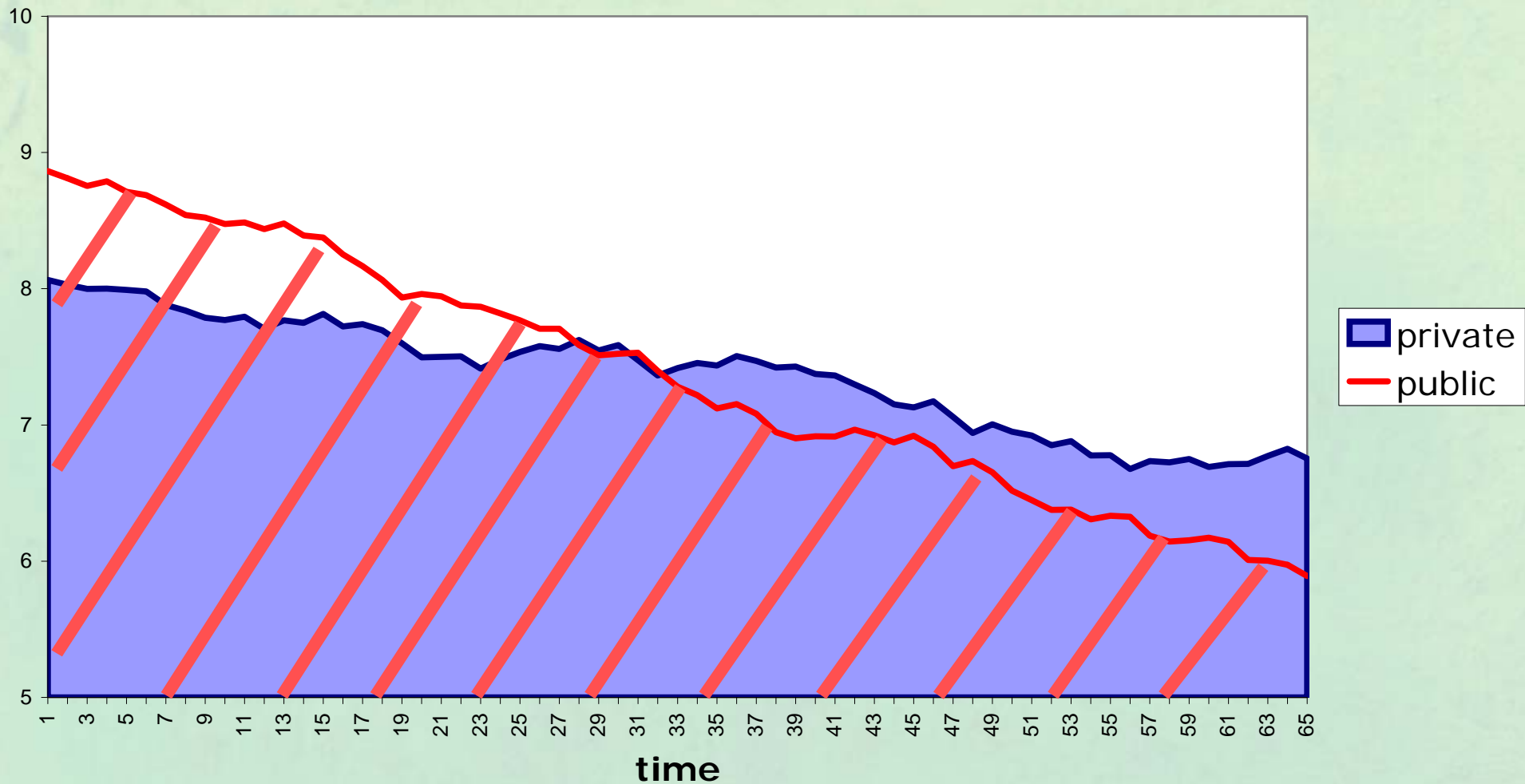
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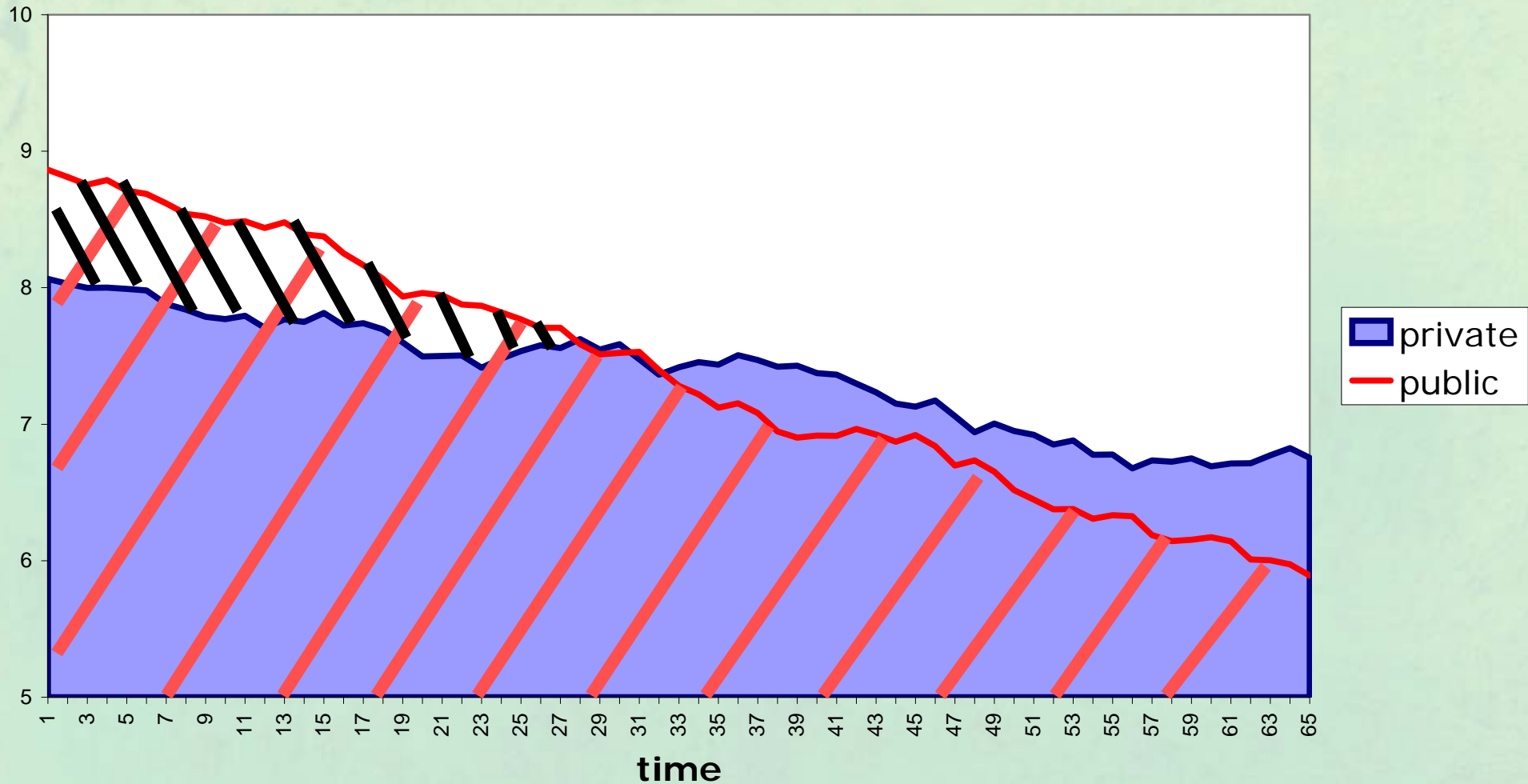
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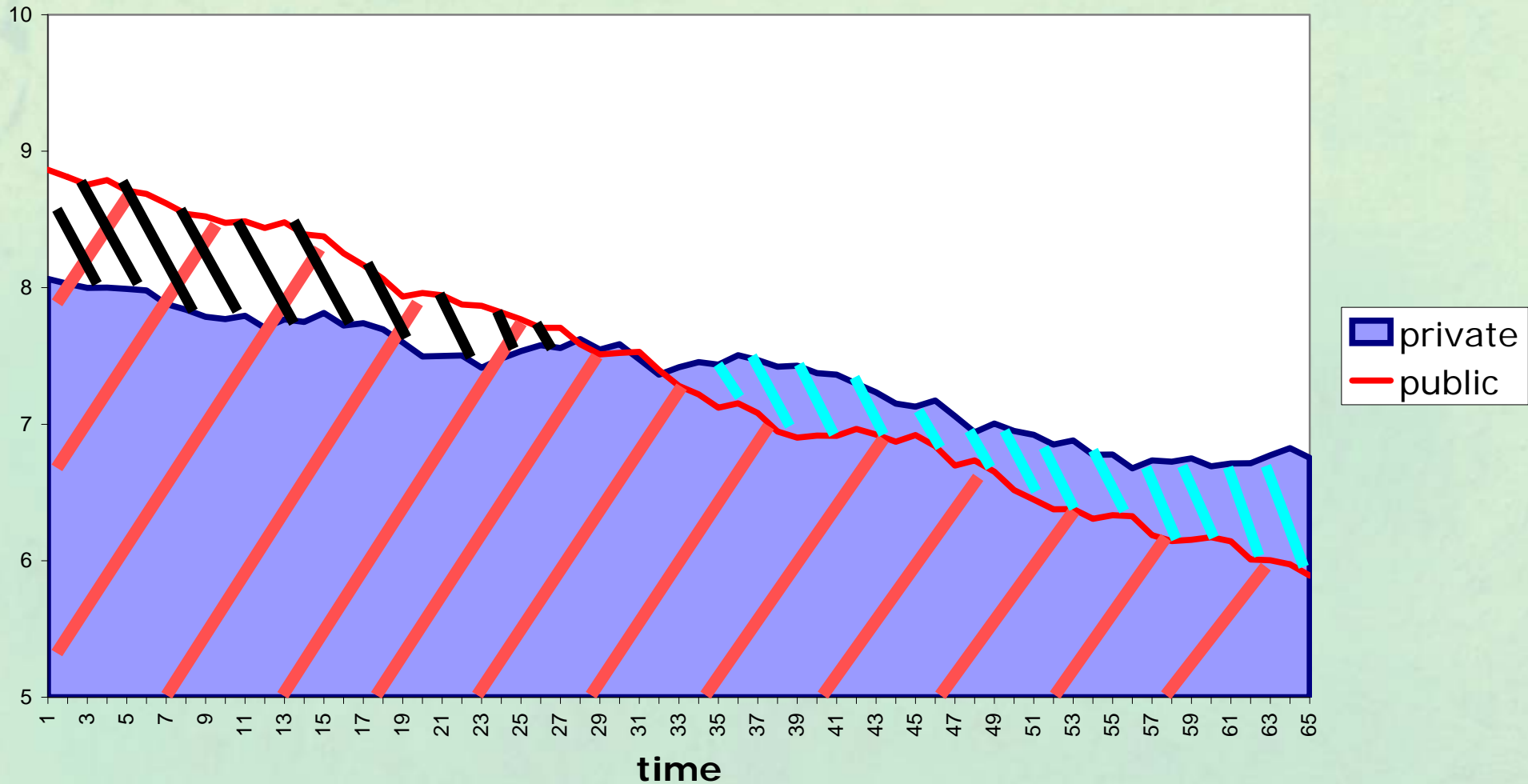
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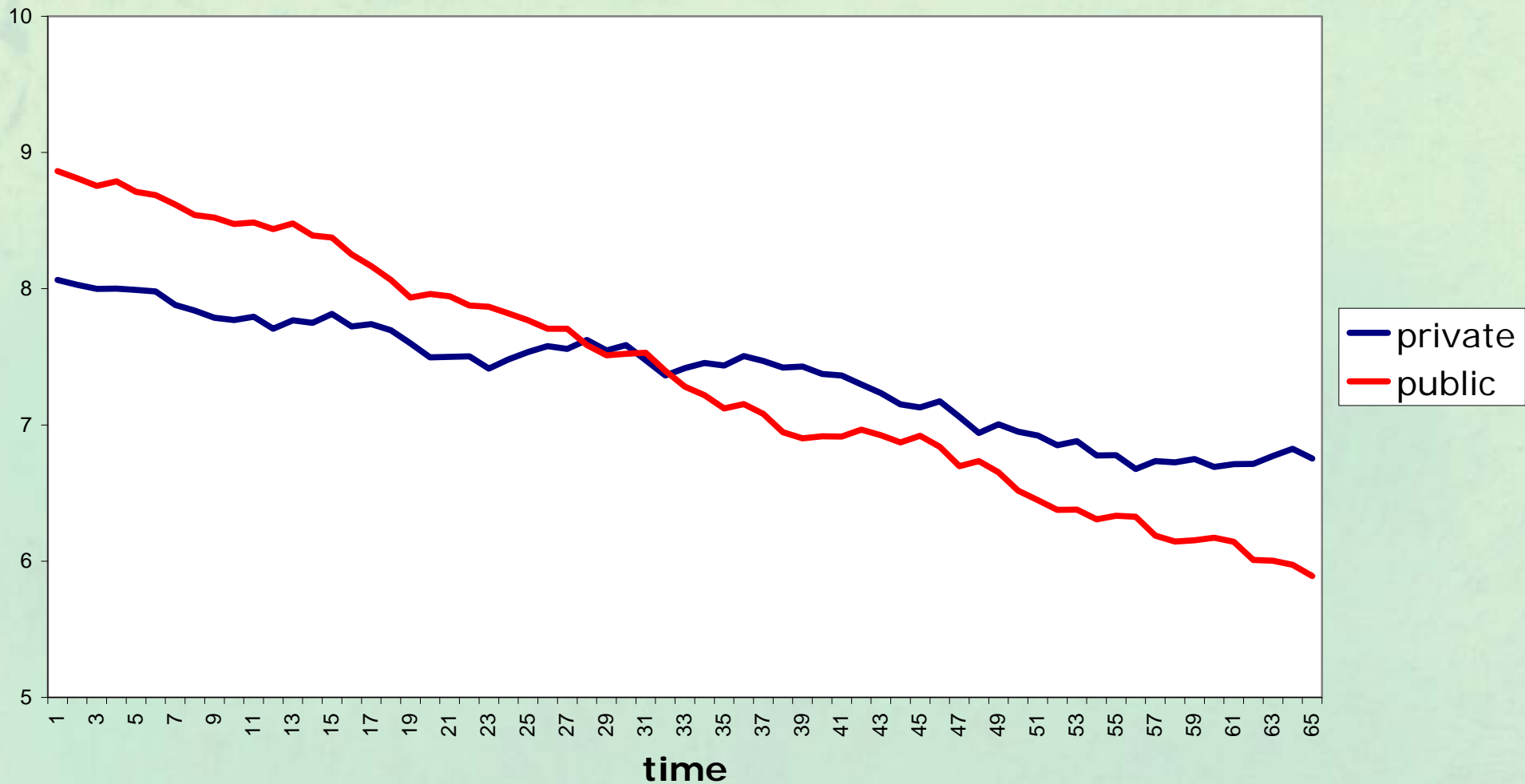
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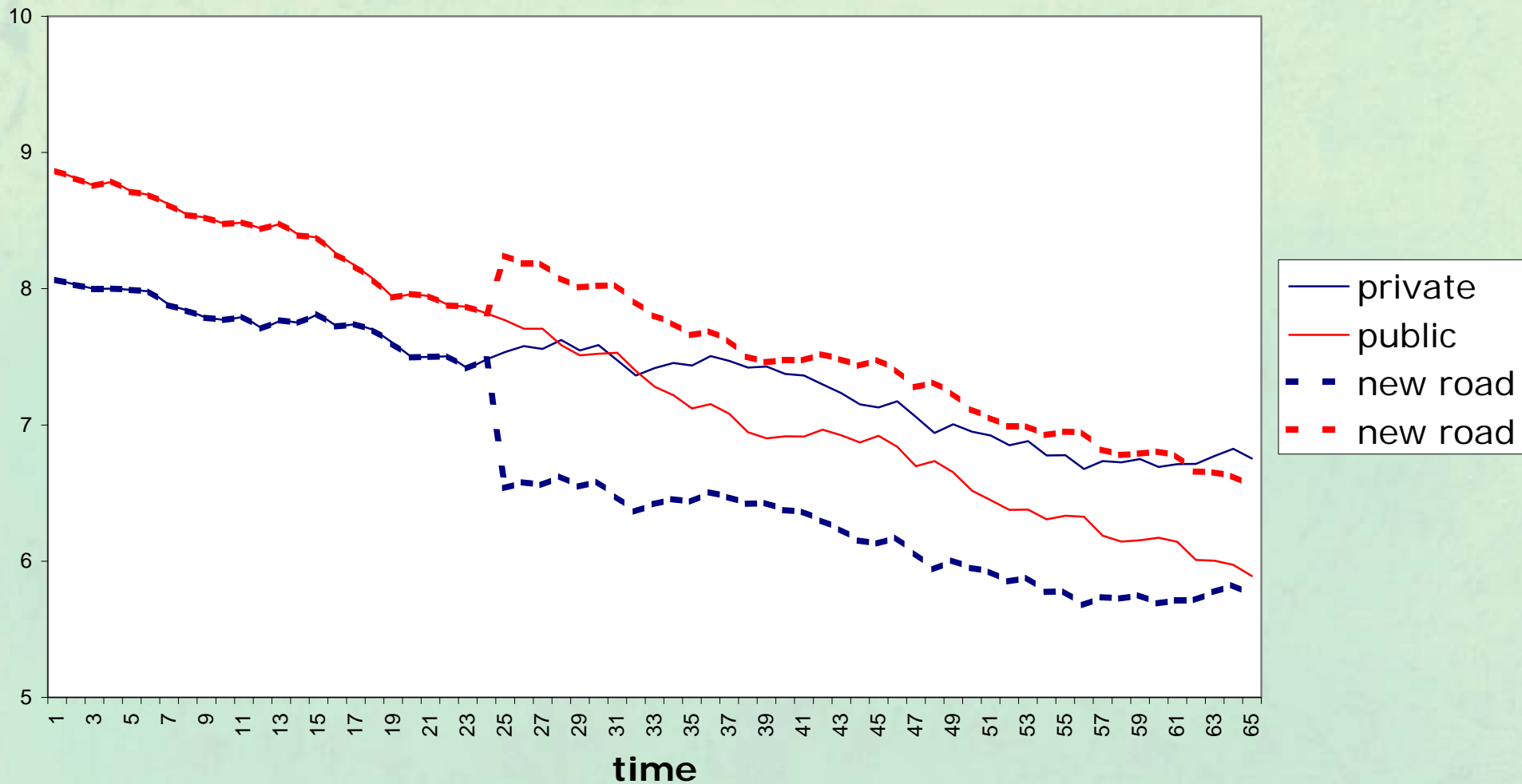
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## Technological progress through time



# Why do some cities sprawl?

Lionel Frost:

1. Transport costs at time of birth?
  - Young cities grown in the car era have more sprawl than old cities
  - But many European cities expanded this century without so much sprawl

## Why do some cities sprawl?

Lionel Frost:

### 2. High incomes at time of birth?

- Workers could afford “big” houses in the suburbs, and streetcar fares, so cities start with sprawl

# Why do some cities sprawl?

Lionel Frost:

## 3. Taste for suburban living?

- Anglo-Saxon peoples have preference for peaceful leafy suburbs, not cosmopolitan living

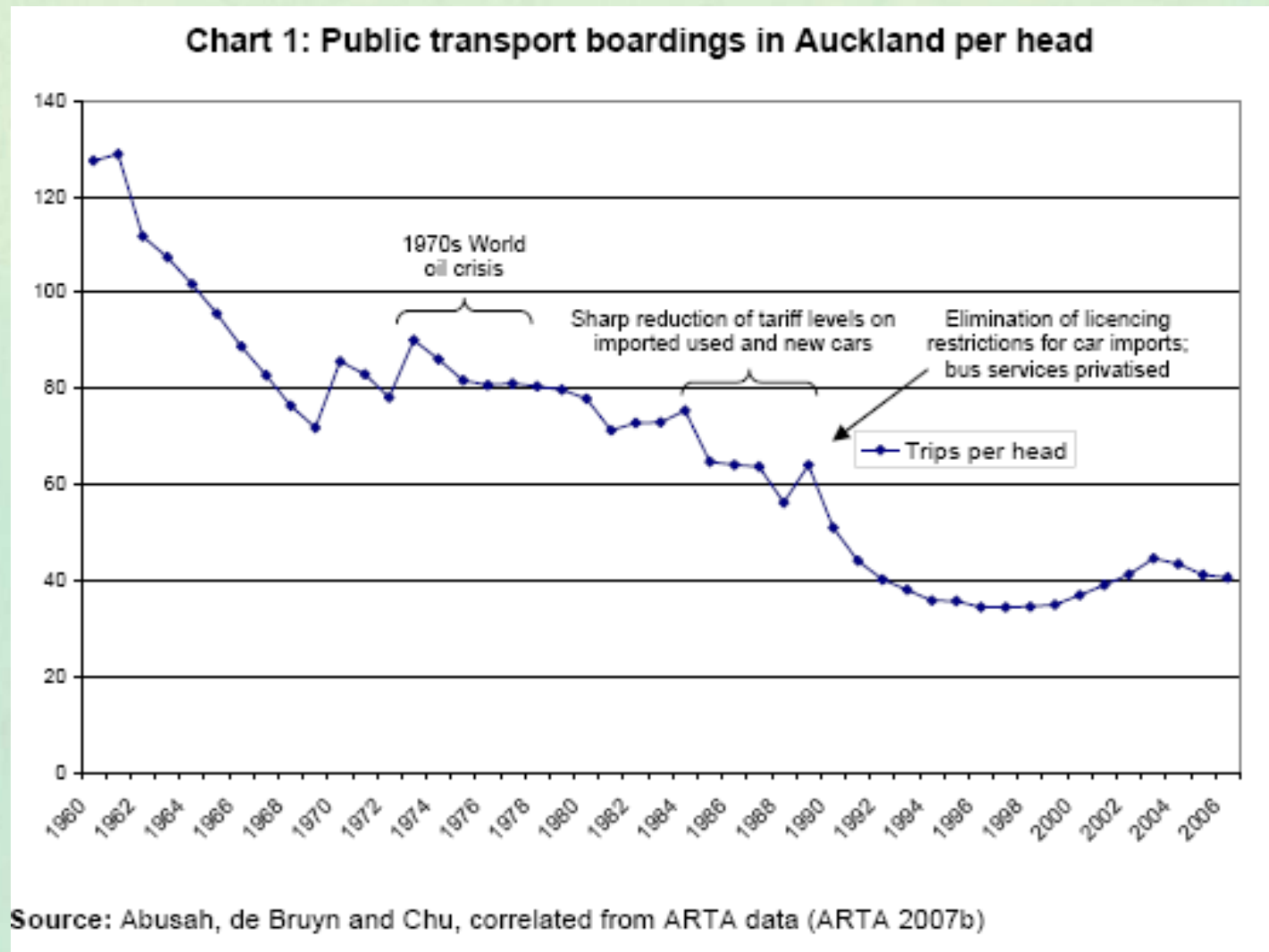


## Why do some cities sprawl?

### 4. Infrastructure choices

- Cities that plan public infrastructure rather than highways have less sprawl
- Auckland used to have 290 public transport trips per annum prior to the rejection of rail and choice of highways in 1950s (Abusah & de Bruyn 2007)

# Abusah and de Bruyn (2007) Getting Auckland on track: public transport and New Zealand: economic transformation



## Conclusion

Infrastructure choices have long term effects on average transport costs because highways induce sprawl.

Cars aren't necessarily bad – Houston – but they are expensive.

A key issue: relative preferences over suburban/ urban living versus cost of suburban/urban living.