Econ 330: Urban Economics

Lecture 17

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03 March, 2020

Lecture 17: Urban Transportation

Schedule

Today

1) **Urban Transit Overview**

2) **Transit Choice Math**

3) **Trains and Busses**

4) **A word on Ridesharing**

Upcoming

- **Book Report Due March 8th**

Overview

One way to combat almost all externalities from driving: **urban transit**

1. Reduces emissions
2. Reduces congestion
3. Reduces collisions
4. Concentrates noise pollution

Great! Must be some bad things, right?

Overview

Question: What do you dislike about public transit? **Typical Answers**:

- Takes too much time
- Too expensive
- Stange sights and smells
- Can't find a seat at busy times

Perfectly reasonable responses. All of these things suck

Overview

So, public transit fixes a ton of external problems we are worried about, but raises a new set of questions:

1. How do we get people to use it?
2. When are busses better than rail?
3. What population density is required to support public transit?
4. Can public transit ever be profitable?

Examples

Everyone has probably experienced cities with public transit they like and dislike

Transit to and from work in the US

TABLE 11–1 Means of Transportation to Work, 2000

Travel Mode	Number of Commuters	Percent
Workers 16 years and over	128,279,228	100
Car, truck, or van	112,736,101	87.9
Drove alone	97,102,050	75.7
Carpooled	15,634,051	12.2
Public transportation	6,067,703	4.7
Bus or trolley bus	3,206,682	2.5
Streetcar or trolley car	72,713	0.1
Subway or elevated train	1,885,961	1.5
Railroad	658,097	0.5
Ferryboat	44,106	
Taxicab	200,144	0.2
Motorcycle	142,424	0.1
Bicycle	488,497	0.4
Walked	3,758,982	2.9
Other means	901,298	0.7
Worked at home	4,184,223	3.3

Source: U.S. Bureau of the Census. *Journey to Work 2000*. Washington DC: U.S. Government Printing Office, 2004.

US Public Ridership over time

TABLE 11–2 Public Transit Ridership, 1940–2000 (in millions)

Year	Heavy Rail	Light Rail	Trolley Coach	Motor Bus	Total
1940	2,382	5,943	534	4,239	13,098
1950	2,264	3,904	1,658	9,420	17,246
1960	1,850	463	657	6,425	9,395
1970	1,881	235	182	5,034	7,332
1980	2,388	133	142	5,837	8,500
1990	2,346	176	126	5,677	8,325
2000	2,632	320	122	5,678	8,752

Source: American Public Transit Association. *Transit Fact Book 1991; Transit Fact Book 2005*. Washington, DC, 1994, 2005.

Checklist

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Modeling Trip Cost

We can model trip costs as:

$$Cost = m + T_a \cdot d_a + T_v \cdot d_v$$

where

- m: monetary cost
- T_a: access time (getting to or waiting for transit)
- d_a: marginal disutility of access time
- T_v: Travel time
- d_v: Marginal disutility of travel time

Modeling Trip Cost

In general, $d_a > d_v$. What does this mean? **Discuss**

- Marginal disutility of waiting for a bus (or train) exceeds riding in one

Can you use this model to explain why most people commute via car? (in the US)

- For cars, $T_a \cdot d_a$ is very small
- Aditionally, for many: $d_v^{car} > d_v^{transit}$, even when $T_v^{car} = T_v^{transit}$

Is $T_v^{car} = T_v^{transit}$ (usually)? **No!**

An Example

Using the table, figure out which mode of transit the individual will take

	Walking	Biking	Car	Bus
Monetary Cost	0.1	0.2	0.5	2
Access Time	0	1	2	5
Marginal disutility per min for access (in dollars)	1	1	1	1
In-vehicle time	12	6	3	4
Marginal disutility per in vehicle min (in dollars)	0.5	1	0.5	0.25
Trip Cost	6.1	7.2	4	8

- They drive!

Data

	Small Cities (Population of 20,000–99,999)					
	Walk			Bicycle		
Rank	City	Percent	Margin of error (±)[1]	City	Percent	Margin of error (±)[1]
1	Ithaca, NY	42.4	3.8	Davis, CA	18.6	1.8
2	Athens, OH	36.8	5.4	Key West, FL	17.4	2.9
3	State College, PA	36.2	3.2	Corvallis, OR	11.2	1.5
4	North Chicago, IL	32.2	4.2	Santa Cruz, CA	9.2	1.7
5	Kiryas Joel, NY	31.6	4.2	Palo Alto, CA	8.5	1.1
6	Oxford, OH	29.7	3.8	Menlo Park, CA	7.6	1.6
7	Pullman, WA	23.5	3.2	East Lansing, MI	6.8	1.2
8	East Lansing, MI	23.3	2.2	Laramie, WY	6.8	1.8
9	College Park, MD	21.5	3.2	San Luis Obispo, CA	6.6	1.3
10	Burlington, VT	20.3	1.9	Ashland, OR	6.2	1.9
11	Moscow, ID	20.2	3.6	Missoula, MT	6.2	0.9
12	Morgantown, WV	18.2	2.9	Chico, CA	5.8	1.0
13	Rexburg, ID	18.0	3.7	Santa Barbara, CA	5.8	1.1
14	Atlantic City, NJ	17.8	2.7	Bozeman, MT	5.8	1.2
15	Urbana, IL	16.6	2.3	Urbana, IL	5.8	1.2

Data

	Medium-Sized Cities (Population of 100,000–199,999)					
	Walk			Bicycle		
Rank	City	Percent	Margin of error (±)[1]	City	Percent	Margin of error (±)[1]
1	Cambridge, MA	24.0	1.2	Boulder, CO	10.5	1.0
2	Berkeley, CA	17.0	1.1	Eugene, OR	8.7	0.9
3	Ann Arbor, MI	15.6	1.3	Berkeley, CA	8.1	1.0
4	Provo, UT	14.5	1.2	Cambridge, MA	7.2	0.8
5	New Haven, CT	12.4	1.0	Fort Collins, CO	6.8	0.6
6	Columbia, SC	11.3	1.3	Gainesville, FL	6.5	1.0
7	Providence, RI	10.6	0.8	Tempe, AZ	4.2	0.6
8	Syracuse, NY	10.4	0.9	Ann Arbor, MI	3.7	0.5
9	Boulder, CO	9.2	0.8	Provo, UT	3.1	0.5
10	Hartford, CT	8.2	0.8	New Haven, CT	2.7	0.5
11	Dayton, OH	7.9	0.8	Salt Lake City, UT	2.5	0.3
12	Eugene, OR	6.8	0.8	Charleston, SC	2.2	0.4
13	Elizabeth, NJ	6.8	1.0	Costa Mesa, CA	2.2	0.6
14	Columbia, MO	6.7	0.8	Pasadena, CA	2.1	0.6
15	Wichita Falls, TX	6.3	1.3	Athens-Clarke County, GA	1.7	0.5

Data

Larger Cities (Population of 200,000 or Greater)						
	Walk			Bicycle		
Rank	City	Percent	Margin of error (±)[1]	City	Percent	Margin of error (±)[1]
1	Boston, MA	15.1	0.5	Portland, OR	6.1	0.3
2	Washington, DC	12.1	0.5	Madison, WI	5.1	0.5
3	Pittsburgh, PA	11.3	0.6	Minneapolis, MN	4.1	0.3
4	New York, NY	10.3	0.1	Boise, ID	3.7	0.4
5	San Francisco, CA	9.9	0.4	Seattle, WA	3.4	0.2
6	Madison, WI	9.1	0.7	San Francisco, CA	3.4	0.2
7	Seattle, WA	9.1	0.3	Washington, DC	3.1	0.2
8	Urban Honolulu CDP, HI	9.0	0.6	Sacramento, CA	2.5	0.3
9	Philadelphia, PA	8.6	0.3	Tucson, AZ	2.4	0.2
10	Jersey City, NJ	8.5	0.6	Oakland, CA	2.4	0.3
11	Newark, NJ	8.0	0.8	Denver, CO	2.3	0.2
12	Baltimore, MD	6.5	0.4	New Orleans, LA	2.1	0.2
13	Minneapolis, MN	6.4	0.3	Richmond, VA	2.1	0.3
14	Chicago, IL	6.4	0.2	Philadelphia, PA	2.0	0.2
15	Rochester, NY	6.2	0.7	Urban Honolulu CDP, HI	1.8	0.2

Back to the Model

Using our simple model, what ways can we incentivize people to drive less?

- Price mechanisms (change m)
- More access points (change T_a)
- More efficient public transit (change T_v)
- More clean public transit (change d_v)

Probably hard to do much to d_a (why?)

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Trains and Busses

Now let's discuss some costs and benefits to:

1. Busses

2. Trains

Can you think of any?

Busses

Advantages

- Integrated: commuters can make the entire trip on one vehicle without switching
- Time between busses can be shorter
- Space between stops can be shorter
- *Relatively* cheap to build and operate

Disadvantages

- Subject to same problems of congestion with automobiles
- Bunching (get off schedule with long stretches with no busses, then many at once)

Trains

Advantages

- Seperate right of way: not sensitive to automobile congestion
- Can keep schedules relatively assiduously
- Easier to board for young, elderly, and disabled

Disadvantages

- Not integrated: many riders must switch modes
- Widely spaced stations $\implies$ longer access time
- Sometimes (BART): very costly to ride!
- Super expensive to build (hundreds of millions per mile) and operate

Cost Curves

Public transportation is subject to **economies of scale**. Why?

- Indivisible inputs: cannot efficiently scale down building of trains
  - Is it more or less costly to operate 1 inch or 1 mile of train?
- **Mohring Economies**: More riders $\implies$ more buses/trains added to same route $\implies$ shorter wait times per rider

What does this imply for the shape of the average and marginal cost curves?

- They are decreasing

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Ridesharing: Benefits

Benefits:

- Cheaper than alternative (cabs) by a huge margin
  - Estimated average consumer surplus of $1.60 per ride
- "Easy" employment for individuals having trouble finding work
- Possible: reduce car ownership and carbon emissions

Ridesharing: Costs

Costs:

- Over half of uber trips would have been made by bike or foot (estimated)
- Associated with increase in VMT (damn, nope on carbon emissions), petrol consumption, *and* car ownership
- Roughly 1000 additional fatal accidents per year

Is it a good thing? Maybe, this is normative.

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