Temple City station of Pacific Electric Railway Company in 1924. Pacific Electric owned by Henry Hunington connected San Gabriel valley and other parts of Los Angeles to downtown LA.

Today, we want to include the mode of commuting in our analysis of where people of different income groups lived.

Also, at end, I will explain race and ethnicity categories in the Census and how you can use those for your papers if you want.

Before we get started, looked at results of my survey of Berkus lecture. 78% said very interesting. 12% said interesting. No one gave it a lower rank. In terms of what interested you, about half found his ideas of mixing people of different incomes and ages to be the most interesting. In terms of what you wanted to hear more about, all over the map. Many really interesting questions. Why didn’t you ask them? I asked a question about careers to give you some time to think of a question. Trevor asked about how would housing work on top of La Cumbre plaza. Good question. Then there was an awkward pause. Barry asked me to ask him a question. I asked about downtown LA. What were you thinking then?
Review

- Can simple model explain where rich and poor live within a city?

- Two forces
  - Value of time in commuting -> rich live closer
  - Housing demand -> rich live further
  - Value of time proportional to wage
  - Housing demand is also proportional
  - Two forces offset each other

Last time, simple model. Everyone commutes to center.
Two modes of commuting
- One faster, but more expensive
- Bus versus car (20th century)
- Walking versus trolley (19th century)

Rich choose faster mode
- Gives them comparative advantage living farther out

Depends on cost of faster mode
- Historical periods
Reviewing Housing Price Function

- Workers commute to CBD
- Housing price function offsets commuting costs
Housing prices function express rent that offsets distance. Provides same utility. Two groups of people. Different among groups.
Poor Live Closer

$/sf

\( P'_h^{\text{poor}}(u) \)

\( P'_h^{\text{rich}}(u) \)

poor area

rich area

u
The Issue

- At intersection, which is steepest?
- If housing price function of rich is steepest, rich live closest
- If housing price function of poor is steepest, poor live closest
Slope of Housing Price Function

\[ P'_h(u) = -\frac{t_h}{H} \]

Both \( t_h \) and \( H \) are proportional to income

Slope does not change with income

t is cost per mile of commuting. \( H \) is housing consumption

PH must decline by amount of cost of extra commuting
Based on that model, we shouldn’t see much segregation. Other things may be at work.
Two Modes of Commuting

- Assumed one mode of commuting
- $t_h$ varies because value of time varies
- Suppose two mode
- Trolley versus walking in 19th century
- Automobile versus bus in 20th century

How might that affect things
Some Notation

- Two modes: a (auto) and b (bus)
- Material costs:
  - fixed cost per trip
  - $m_a$ and $m_b$
  - $m_b < m_a$
- Speed:
  - minutes per mile
  - $s_a$ and $s_b$
  - $s_a < s_b$
Mode Choice

- Value of time: $v$
- Cost if by auto
  $m_a + vs_a u$
- Cost if by bus
  $m_b + vs_b u$
- Auto cheaper if
  $m_a + vs_a u < m_b + vs_b u$
Mode Choice Continued

Auto cheaper if
\[ m_a + vs_a u < m_b + vs_b u \]

Auto cheaper if
\[ u > \frac{m_a - m_b}{v(s_b - s_a)} \quad (=\text{breakeven distance}) \]
Implications for housing price function

\[
\text{breakeven distance} = \frac{m_a - m_b}{\nu(s_b - s_a)}
\]

Don’t commute by auto for short distances

If do commute by auto, cost of additional mile is lower than if by bus
I have drawn this with straight lines instead of convex. Make it easier to see. Why convex?
Breakeven Distance and Income

breakeven distance = \frac{m_a - m_b}{v(s_b - s_a)}

Breakeven distance less for rich than for poor
Here I have represented a situation where rich live farther from center than poor.

Note that their bid-rent function has the same slope when both are commuting by the same mode.

However, there is an area where the rich would be commuting by auto and the poor by bus. If housing price functions cross in this area, rich will have flatter function.

A possibility. Doesn’t have to be that way.
Thinking Historically

- Before 1850
  - Almost everyone walks to work
  - A very few can afford a carriage

- 1850-1900
  - Street railroad
  - First horse drawn
Seattle Street Railway-1884
Economics of Horse Drawn Street Railway

- Fare $0.05, $0.10 per day
- Working person’s wage, $1 per day
- A little faster than walking
- Economical for only affluent commuters
Electrification

- Horses replaced by electricity and cable in 1880s
Electric Trolley, Central and 56th, Los Angeles 1893
Electric Trolleys
Second Street
Seattle, 1906
Cable Car, California at Powell, San Francisco
Cable Car, Washington St, San Francisco
Boston Streetcar
1951
Replica of 1929 Trolley in Melbourne (Market Street Line in San Francisco)

Replicas of old street cars run along Market Street and Embarcadero in San Francisco. Largely a tourist thing, but it is a handy commuting for short distances down town.
Another Commuting Innovation

Ford Model T, 1913
Modern Day Model T

Ford
Explorer,
2003
Intersection of I10 and I110 south of downtown LA
A Stylized History

- Every so often, new mode of commuting introduced
- Faster, but more expensive than prevailing mode
- At first, only higher income commuters use it
- As mode becomes more efficient and wages rise, more people use it
Implications for Where People Live

- First period
- Everyone commuting by same mode
- No strong comparative advantage for rich to live close or to live far away
No Strong Comparative Advantage

$/sf

Poor

Rich
Second Period

- New mode first introduced
- Faster but expensive
- Only rich use the mode
- Rich have comparative advantage living far away
- “Flight to the suburbs”
Rich Live Farther Away

$/sf

Poor

Rich

u
Third Period

- Cost of new mode has fallen relative to wages
- Everyone uses it
  - Trolleys in early 20th century
  - Autos now
- Rich no longer have comparative advantage living further away
- Regentrification of central city
No Strong Comparative Advantage

$/sf

Rich

Poor

u
Implications for the third period

☐ Other things matter—schools, amenities, terrain, fads

This is what we are seeing now. Everyone has access to a car. No strong forces causing separation. Other less powerful forces matter. A taste for old buildings?
Conclusion

- A simple model
- Asking whether it can explain important phenomenon
- Highlights the important role of innovations in commuting
In discussing cities, we have been assuming that all work is in the center. Clearly not the case. Scattered throughout the area. How scattered is it, and how should this alter the way we think about the area. Next time talk about location of employment in one of the world’s most decentralized cities, Los Angeles.
P7. Hispanic or Latino by Race

<table>
<thead>
<tr>
<th>Race</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Hispanic or Latino</td>
<td>4,285</td>
</tr>
<tr>
<td>White alone</td>
<td>3,754</td>
</tr>
<tr>
<td>Black or African American alone</td>
<td>67</td>
</tr>
<tr>
<td>American Indian and Alaska Native alone</td>
<td>23</td>
</tr>
<tr>
<td>Asian alone</td>
<td>297</td>
</tr>
<tr>
<td>Native Hawaiian and Other Pacific Islander</td>
<td>0</td>
</tr>
<tr>
<td>Some other race alone</td>
<td>20</td>
</tr>
<tr>
<td>Two or more races</td>
<td>124</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>1,030</td>
</tr>
<tr>
<td>White alone</td>
<td>490</td>
</tr>
<tr>
<td>Black or African American alone</td>
<td>28</td>
</tr>
<tr>
<td>American Indian and Alaska Native alone</td>
<td>0</td>
</tr>
<tr>
<td>Asian alone</td>
<td>39</td>
</tr>
<tr>
<td>Native Hawaiian and Other Pacific Islander</td>
<td>0</td>
</tr>
<tr>
<td>Some other race alone</td>
<td>364</td>
</tr>
<tr>
<td>Two or more races</td>
<td>109</td>
</tr>
</tbody>
</table>

A number of you have asked about the race breakdown. Particularly, why hispanic or latino is not broken down.

Hispanic/latiino is not a race. But, you can get Hispanic by race which will allow you to do the breakdown you want.

First go to Table P7 in list of all tables. This is my census tract

You will see races broken down by latino and non-latino

Note that most Latinos list their race as white. About a third say some other race
# Combining Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>4,285</td>
<td>80.6%</td>
</tr>
<tr>
<td>Latino</td>
<td>1,030</td>
<td>19.4%</td>
</tr>
<tr>
<td>Asian</td>
<td>297</td>
<td>5.6%</td>
</tr>
<tr>
<td>Black</td>
<td>67</td>
<td>1.2%</td>
</tr>
<tr>
<td>Other</td>
<td>364</td>
<td>6.8%</td>
</tr>
</tbody>
</table>

To combine, take whites as all non-hispanic whites.
Take Latinos as Latinos of all races.
Take Asian as non-Latino Asian.
Take Blacks as non-Latino Blacks
Take Other as non-hispanic of all other races.