The Effects of Rising Gas Prices on Transit Ridership

Skyler Martin
NEXTRANS 2010 Summer Undergraduate Internship Program
July 23, 2010
U.S. Gas Prices, 1998-2008

- **Gasoline**
- **No. 2 Diesel**
Effects of Rising Gas Prices on Transit Ridership

- The relationship between rising fuel prices and transit ridership is complex.

- A solid relationship between gas prices and transit ridership is difficult to assess due to the many factors that contribute to trends in ridership
  - Factors
    - Internal Factors
    - External Factors
Factors Affecting Ridership

- **Internal Factors**
  - Factors controlled by transit system
    - Route Structuring
    - Transit Fair
    - Overall Serviceability

- **External Factors**
  - Factors beyond the control of the transit system
    - Residential and Employment Densities
    - Income Level
    - Auto Ownership
    - Gas Prices
Response to Increasing Fuel Prices

- After 2007 Annual Passenger Miles Traveled decreased
  - 4.7% decrease (12.2 billion miles) in miles traveled in the U.S. from 2007 to 2008

- Public transportation ridership was the highest in 50 years in 2007

- Almost every mode of transportation saw an increase in ridership after 2005
Annual Passenger Miles Traveled

<table>
<thead>
<tr>
<th>Year</th>
<th>Miles (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>5.182</td>
</tr>
<tr>
<td>2003</td>
<td>5.259</td>
</tr>
<tr>
<td>2004</td>
<td>5.435</td>
</tr>
<tr>
<td>2005</td>
<td>5.505</td>
</tr>
<tr>
<td>2006</td>
<td>5.552</td>
</tr>
<tr>
<td>2007</td>
<td>5.608</td>
</tr>
<tr>
<td>2008</td>
<td>5.494</td>
</tr>
</tbody>
</table>
How Has Ridership Been Affected?

- Past research has shown responses to increase in fuel price differ from city to city
  - Large cities
    - Less responsive to increase in fare
    - Quick to respond to increase in gas prices
  - Small Urban Areas
    - Less transit dependent
    - Lack of service and familiarity
  - Over time responses from communities of both high and low population densities are similar
How Has Ridership Been Affected?

- Riders are now willing to travel further distances using public transit
  - Passenger Miles
  - Unlinked Passenger Trips
Passenger Miles by Mode

<table>
<thead>
<tr>
<th>Year</th>
<th>Bus</th>
<th>Heavy Rail</th>
<th>Commuter Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>21,841</td>
<td>13,663</td>
<td>9,504</td>
</tr>
<tr>
<td>2003</td>
<td>21,262</td>
<td>13,606</td>
<td>9,559</td>
</tr>
<tr>
<td>2004</td>
<td>21,377</td>
<td>14,354</td>
<td>9,719</td>
</tr>
<tr>
<td>2005</td>
<td>21,825</td>
<td>14,418</td>
<td>9,473</td>
</tr>
<tr>
<td>2006</td>
<td>22,821</td>
<td>14,721</td>
<td>10,361</td>
</tr>
<tr>
<td>2007</td>
<td>20,976</td>
<td>16,138</td>
<td>11,153</td>
</tr>
<tr>
<td>2008</td>
<td>21,757</td>
<td>16,848</td>
<td>11,049</td>
</tr>
</tbody>
</table>
Unlinked Passenger Trips by Mode

- **2002**: 5,868 million (Bus: 2,688, Heavy Rail: 5,692, Commuter Rail: 414)
- **2003**: 5,692 million (Bus: 2,667, Heavy Rail: 5,413, Commuter Rail: 410)
- **2004**: 5,731 million (Bus: 2,748, Heavy Rail: 5,573, Commuter Rail: 414)
- **2005**: 5,855 million (Bus: 2,808, Heavy Rail: 5,573, Commuter Rail: 423)
- **2006**: 5,894 million (Bus: 2,927, Heavy Rail: 5,573, Commuter Rail: 441)
- **2007**: 5,413 million (Bus: 3,460, Heavy Rail: 5,413, Commuter Rail: 459)
- **2008**: 5,573 million (Bus: 3,547, Heavy Rail: 5,573, Commuter Rail: 472)
Transit Agencies

- American Public Transportation Association 2008 survey
  - 91% of transit agencies are having difficulties adapting to the increase in ridership

- It is important to know how riders will respond to changes in internal factors
  - Transit fare
    - Elasticity with respect to transit fare of -0.38 (Holmgren, 2007)
  - Transit service
    - Elasticity with respect to transit service of 0.78 (Holmgren, 2007)
Level of Service

- Measured in Vehicle Revenue Miles

  Represents the distance traveled by the transit vehicle while in service

<table>
<thead>
<tr>
<th>Year</th>
<th>Bus</th>
<th>Heavy Rail</th>
<th>Commuter Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>2,091.9</td>
<td>603.5</td>
<td>259.3</td>
</tr>
<tr>
<td>2003</td>
<td>2,092.9</td>
<td>611.9</td>
<td>262.1</td>
</tr>
<tr>
<td>2004</td>
<td>2,150.5</td>
<td>624.6</td>
<td>268.9</td>
</tr>
<tr>
<td>2005</td>
<td>2,141.0</td>
<td>628.5</td>
<td>277.4</td>
</tr>
<tr>
<td>2006</td>
<td>2,154.8</td>
<td>633.8</td>
<td>287.1</td>
</tr>
<tr>
<td>2007</td>
<td>1,987.0</td>
<td>638.5</td>
<td>297.4</td>
</tr>
<tr>
<td>2008</td>
<td>2,052.2</td>
<td>655.4</td>
<td>310.2</td>
</tr>
</tbody>
</table>
Affects on the Community

- Commuters are switching to more fuel efficient modes of transportation
  - Walking, Biking, Motorcycles

- Crashes involving pedestrians, bicyclists, and motorcyclists have increased

- Automobile crashes have decreased

- SUV sales have decreased

- Electric/Fuel Efficient cars are more popular

- Affects on National Unemployment Rate
Motor Vehicle & Motorcycle Crashes

Motor Vehicle Crashes

Year

Motorcycle Crashes

Year

Fatal Motor Vehicle Traffic Crashes

Motorcycle Crashes
Pedestrian & Bicycle Crashes

Pedestrian Crashes

Crashes Involving Pedestrians

Year

2002 2003 2004 2005 2006 2007 2008

Crashes Involving Pedestrians

2002 2003 2004 2005 2006 2007 2008

Pedal Cyclist Crashes

Crashes Involving Pedal Cyclists

Year

2002 2003 2004 2005 2006 2007 2008
Transit Operating Employees by Mode

Transit Operating Employees by Mode

Number of Employees

Year

Bus
Heavy Rail
Commuter Rail

Unemployment Rate

Year

U.S. Unemployment Rate
Future Studies

- Several aspects contribute to trends in ridership and must be analyzed for future study to better understand trends in ridership.
  - **Transit Agencies**
    - Alterations of Internal Factors
      - Increase in transit fare
      - Increase in service
  - **Economy**
    - Demographics
    - Unemployment rate
    - Level of income
      - Disposable
      - Auto sales
Future Studies

- Community & Sustainability
  - More fuel efficient modes of transportation
  - Rider’s perception of public transportation
  - Population density
  - Transit serviceability

- Questions to be addressed
  - How will ridership be affected by gas prices in the long-run?
  - Will riders remain loyal to public transportation regardless of gas prices?
  - Will ridership continue to increase?
  - How will transit agencies respond to the increase in transit ridership?
Conclusion

- Almost every mode of public transit has seen an increase in ridership in the past several years.

- It will be difficult for transit agencies to meet the demand of transit ridership:
  - Increase serviceability
  - Increase employment
  - Budget pressure caused by increasing fuel costs

- Population densities play a large roll in how riders respond:
  - Transit dependency
  - Familiarity
  - Overall serviceability
Conclusion

- Commuters are turning towards more fuel efficient modes of transportation
  - Walking, Biking

- Vehicle accidents
  - Increase in Pedestrian, Bicycle, and Motorcycle crashes
  - Decrease in Automobile crashes

- Gas prices have an affect on transit ridership, but it is the many other factors that create a complex web of connections, making it difficult to establish solid relationships
THANK YOU