How are Highways financed?

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Background

- Highways
  - Interstate- America's most valuable set of highways
    - Only 2.52% of total lane-mile roads
  - Urban + Rural Interstates
    - 24.4% of all vehicle miles of travel
  - Both interstates are not adequate for the 21st Century
    - Built mostly between 1960-1970's, life span of 50 years
    - Expiration dates between 2010-2030!

Goals

- Estimate whether reconstruction and selective widening of interstates could be financed via per mile toll revenue
  - Is so, what how much would the highways cost?
  - How much would the tolls cost us?

Previous Research

- National Cooperative Highway Research Program conducted a study of future options for the interstate system
  - Study not only foresaw a slowdown in the growth rate of Vehicle per Miles Travelled (VMT) but also predicted a possible topping out of VMT per capita
    - 2% annual growth rate in the first 20 years
    - 1.5% annual growth rate for the next 10 after that

Predictions

- Revamped interstate would widen by 88,600 lane-miles on the existing 46,800 lane-miles
- In 2003 Dollars, revamp would cost $3.14 Trillion dollars over 30 years
  - $1.4 trillion for widening
  - $1.74 trillion for new routes
  - * Reconstruction of worn out pavement and bridges not part of estimate

- In 2011 the former vice chairman of the National Surface Transportation Policy & Revenue Study Commission co-authored a paper calling for a national inflation-adjusted toll on all Interstate system users to pay for restoration, expansion, and modernization of the system.
  - Electronically collected toll revenue, moved to Modernization account, project would be cash basis
  - New estimate of 1.3-2.5 Trillion for modernization
- 2012- Graells predicts that a 10,000 mile route of rural, inter-city interstates with heavy truck traffic could be paid with just toll money
  - Formula= avg. toll (car +truck) rate of 0.15 per mile = $22 Billion per year

Reconstruction

- Rural Interstate- rural cost estimates are given separately for flat, rolling, and mountainous terrain
  - Rural Interstate route-miles where divided amongst the terrain to help create a weighted average reconstruction cost per lane-mile.
  - Unit cost was multiplied by the number of lane-miles to provide the estimated total rural Interstate reconstruction cost, in 2010 dollars
    - Rhode Island: $ 101 Million
    - California: 7.84 Billion
  - All-Electronic-Tolling- $250,000/ mile
  - Total Reconstruction: $148 Billion
    - 5.4% more than reconstruction alone

Reconstruction

- Urban Interstate- Reconstruction unit cost depends on Urban size: Small Urban, Small Urbanized, Large Urbanized, Major Urbanized
  - Separation helped produce the weighted average urban reconstruction unit cost for each state.
  - Then multiplied by the urban Interstate lane-mile total
  - Reconstruction cost ranged from a low of $315 million in Vermont to a high of $59.2 billion in California.
  - All-Electronic-Tolling- $2.5 million per mile
    - urban Interstates more tolling gantries are needed than for rural Interstates, because the former have far more on-ramps and off-ramps.
- Total Reconstruction for Urban Interstate : $441 Billion
  - 10.4 % higher than just reconstruction

Initial Construction Cost

- Rural Interstate- The estimated cost of reconstructing this system is $148 billion (2010 dollars), or $1.20 million per lane-mile
  - Cost is modest due to small amount of rural interstate in mountainous terrain and lack of need to obtain "New Right of Way for Construction" permissions
- Urban Interstate- The estimated cost of reconstructing this system is $441 Billion (2010 dollars), or $4.78 million per lane-mile
  - Cost also are modest compared to high cost of new expressway lanes in urban areas
  - Small/Medium Urban Cost: $2 million per lane-mile
  - Large/XL Urban Cost: 4-7 million per lane-mile
- Baseline cost only for reconstruction of existing lane-mile, does not include new lanes or right of ways

Cost

- The cost of reconstructing the entire existing Interstate Highway without adding new lanes/routes is $580 billion (2010 Dollars).
  - Half of this cost is going to only 8 states
    - California
    - Texas
    - New York
    - Illinois
    - Georgia
    - Pennsylvania
    - Michigan
    - Florida

Estimated Traffic Revenue

- Rural Interstate- In 2010, a study was done to see how much traffic would decrease once tolls were placed.
  - 10% of small cars stopped using the interstate
    - 3.5 cent/mile toll charged
  - 20% of trucks stopped using the interstate
    - 14 cent/mile toll charged
  - "The baseline toll rates initially selected for this study 3.5¢/mile for light vehicles and 14.0¢/mile for trucks, (both in 2010 dollars) were chosen as potentially being in the right ballpark to pay for reconstruction. "
  - As of 2010, those prices are below national average
    - toll rates of 4.9¢/mile for cars and 19.9¢/mile for trucks

Toll Rates

- Both toll rates are adjusted annually by an assumed consumer priced index (CPI) increase of approx. 2.5 % per year
  - Light Vehicles: Annual growth rate are driven by population growth
    - Low: .3% (CT) High: 2.2 (AZ)
  - Trucks: Annual growth rate are driven by the state's economic growth
    - Low: 1.8 (WI) High: 3.4 (AZ)

2010 Urban per-mile toll rates

Table 1
2010 Urban per-mile toll rates, by urban area size.

	Peak rate	% of VMT	Off-peak rate	% of VMT
Cars				
Small urban areas	$.05	30%	$.035	70%
Medium urban areas	$.06	40%	$.045	60%
Large urban areas	$.075	50%	$.055	50%
Very large urban areas	$.10	60%	$.070	40%
Trucks				
Small urban areas	$.20	35%	$.14	65%
Medium urban areas	$.24	40%	$.16	60%
Large urban areas	$.30	40%	$.18	60%
Very large urban areas	$.40	35%	$.20	65%

Table shows the toll rates used for this exercise and the fraction of the Vehicle per Miles Travelled (VMT) charged the peak and off-peak rates.

Toll Revenue

- Gross Revenue: Calculated by multiplying CPI-adjusted for that year x adjusted Vehicle per Miles Travelled (VMT) for that year= Net toll revenue for that year
- The net toll revenue for that year was then defined as 85% of the gross toll revenue.
  - 10%-: gross revenue devoted to highway maintenance
    - (Approx. $14,000/mile-lane)
  - 5%: gross revenue was assumed for the cost of toll collection based on all-electronic tolling

Urban Interstates

- America's urban congestion problem suggests that if urban Interstates are to be tolled (for reconstruction), the toll rates should be higher during peak periods than at other times of day.
- Since these Tolling booths will be more expensive to install, the hike during peak hours helps pay the booths off quicker
- Peak hours and Peak price- Longer duration of price hike depending on the size of urban area

Widening Cost

- 96 Major Interstates
- 97 Urban Interstates
- Rural Lane Addition: (2010 dollars)
  - Flat terrain: $2.251 million/ lane-mile
  - Rolling terrain: $2.462 million/ lane-mile
  - Mountainous terrain: $7.597 million / lane-mile
- Urban Lane Addition: (2010 dollars)
  - Small: $4.448 million / lane-mile
  - Medium: $5.725 million / lane-mile
  - Large: $11.178 million / lane-mile
  - X-Large: $29.717 million / lane-mile

Urban Interstates

- How many lanes do we need to add to our interstates to reduce year 2040's Daily Vehicles per Miles Travelled to 18,000 or below?
  - 48 Interstates need 2 lanes
  - 23 Interstates need 4 lanes
  - 10 Interstates need 6 lanes
  - 16 Interstates need 8+ laned
    - California and Texas need most of the 6-8+ lanes
    - California's I-405 and I-605 would need more than 8 lanes, but the way the infrastructure was built, only 4 more could be added. Too large of a project for such an Urban location

Conclusion

- Is there a way we can collectively pay for a new and lasting Interstate Highway?

- Yes, buy building both Interstate and Urban toll booths, although it would take 10 years to build and 30 years to pay off it can be done.

Questions?