MTI Research Snaps:

Congestion-Clearing Payments to Passengers
By: Paul Minett (PI)
John S Niles
Richard Lee
Brittany Bogue

Presented by Paul Minett

7 October 2020
Rewarding Passenger Travel

Frequent Flyer Program For Ground Transportation
Earn miles for all of your commute and travel. Redeem miles for exclusive rewards.

Source: A Commercial App Provider Website (Screenshot captured March 2020)

Incentive Solution Evaluation Methodology

Survey: Would they travel as passengers? At what price?

Understand Current Traffic
Understand Nature of People on Route
Understand Growth Trends
Estimate 20-year benefits
Estimate 20-year costs
Calculate NPV and BCR

Case study route in California

From Half Moon Bay to Silicon Valley
A single bottleneck at the beginning of the route and capacity of about 1,400 vehicles per hour, with no plan for expansion, and chronic daily congestion at the bottleneck.

Current Traffic

Survey: Amended Known Traffic, Reducing Queues, and People Departing Status
(Cartoon pattern Half Moon Bay bottleneck)

If Congestion Went Away

Existing Commuters would...
- Shift to earlier departure (1,735 more hours at home)
- Shift to later departure (1,735 more hours at home)
- No change to departure time

Reward Sought for Being a Passenger

Reward Curve for Half Moon Bay to San Jose

...if it is easy to travel as a passenger*

Revised Traffic within a year

20-Year Benefits and Costs: Case Study Route
Millions of 2019 Dollars, Discount Rate: 3%

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<td>Benefit/Cost Ratio</td>
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* If it is easy to travel as a passenger
Congestion-Clearing Payments to Passengers

Paul Minett  
John S. Niles  
Richard W. Lee, PhD  
Brittany Bogue

Published Report


Or


Field work completed pre-Covid-19

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Congestion-Clearing Payments to Passengers

Instead of building infrastructure or pricing congestion:

- “Might authorities be able to manage the volume of peak traffic by paying monetary incentives to reduce congestion?”
- Would enough people travel as passengers in carpools, vanpools or buses, to eliminate congestion?
- “If so, at what cost, and with what benefits?”
- “Would the benefits exceed the costs?”
The Incentive Concept

- Reward all people who are traveling as passengers when they cross the bottleneck line
- It does not matter what mode they used previously
- To get more people to travel as passengers, increase the reward
- Put in place as an ongoing solution to manage congestion
- Critical is passenger verification app

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Rewarding Passenger Travel

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Incentive Solution Evaluation Methodology

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Survey: Would they travel as passengers? At what price?

Understand Growth Trends

Estimate 20-year benefits

Estimate 20-year costs

Calculate NPV and BCR

- Literature review
- Thinking
- Focus groups
- Survey
- Analysis
- Report

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Case study route in California

From Half Moon Bay to Silicon Valley

A single bottleneck at the beginning of the route and capacity of about 1,400 vehicles per hour, with no plan for expansion, and chronic daily congestion at the bottleneck.
Survey-Based Excess Traffic, Resulting Queue, and People Departing Queue.
(Current pattern Half Moon Bay bottleneck)

Vehicle-hours of delay, 7 am to 9 am: 220
Total people departures from queue, 7 am to 9 am: 2,783
Total vehicles delayed, 7 am to 9 am: 2,807

Arriving traffic within capacity
Arriving Excess traffic
Ending Queue - RHS
People departing bottleneck - RHS

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Survey Questions (1 of 2)

- Place of residence, travel in congestion or not, mode of travel, departure time, impact of congestion on you?
- If congestion went away, would any of those change? i.e. start to travel, change departure time, change mode?
- Waiting for congestion to go away, would you help by traveling as a passenger some of the time?
  - Are you the sort of person who would travel as a passenger?
  - If no, would you do it for money?
Survey Questions (2 of 2)

• If yes, how much money, if it was easy to do, to travel as a passenger
  • On a bus?
  • In a vanpool?
  • In a carpool?
  • In a shared Uber-style of service?
• If not a passenger person even for money, are you the sort of person who would provide a ride?
• If no, would the answer be different if you were paid by the passenger?
  • If yes, how much money to give a passenger a ride?
If Congestion Went Away

Existing Commuters would...

- 71% No change to departure time
- 17% Shift to earlier departure (490 hours earlier at destination)
- 12% Shift to later departure, (1,735 more hours at home)

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Survey Response: Willingness to Share the Ride

If the deal was right!

- Potential Passengers: 50%
- Drivers, Alone: 27%
- Drivers of Passengers: 23%
Reward Sought for Being a Passenger

Reward Curve for Half Moon Bay to San Mateo

$\text{y} = -0.0011x^2 + 0.0398x + 0.1101$

$R^2 = 0.9825$

"...if it is easy to travel as a passenger."

Daily Payment to Passengers

Percent of Commuters

- Reward Curve Initial
- Poly. (Reward Curve Initial)

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Rewards sought for providing rides

Drivers Taking Passengers for $, morning only

\[ y = -0.0004x^2 + 0.0187x + 0.0654 \]

\[ R^2 = 0.9661 \]

Percent of Commuters Providing Rides

Daily Price for Driver to take Passengers

Drivers taking Passengers for $

Poly. (Drivers taking Passengers for $)

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Revised Traffic within a year

Vehicle-hours of delay, 7 am to 9 am  79
Total people departures from queue, 7 am to 9 am  4,307

Vehicles Arriving Each Minute

Paul Minett

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20-year demand growth

### Passengers per 15-Minute Period at End of Each Year

Note 0 Passengers Means 100% SOV Demand in Period.
Note Assumption is that All Passengers are Incentivised, Those Traveling Before 8 am Receive Going-Early Bonus

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<tr>
<th>Year</th>
<th>From</th>
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<th>1</th>
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5:00 AM 9:00 AM 2157 2228 2303 2378 2457 2538 2621 2708 2797 2890 2985 3084 3185 3290 3397 3510 3625 3744 3867 3992

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Need to limit SOV travel at peak of peak (eventually)

• Options
  • Charge a price for SOV travel at peak
  • Physically constrain SOV travel at peak
  • Provide an HOV bypass so all HOV have preference over SOVs at peak
Benefit Cost Analysis

• Modelled
  • the change in the traffic as congestion is reduced
  • the further change to the traffic as intra-peak demand shift occurs, or the cost of preventing it
  • population and economic growth for 20-years

• Model
  • benefits for 20 years and discount to present
  • costs for 20 years and discount to present

• Calculate Net Present Value and Benefit Cost Ratio
## Congestion-Clearing Payments to Passengers
### 20-Year Benefits and Costs: Case Study Route

**Millions of 2019 Dollars, Discount Rate: 3%**

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**Benefit Cost Ratio**

|                | 4.5 | 1   |

**Value Created**

$ 498.7

181,000 metric tons of CO2 emissions avoided, co-benefit of $2,762 per tonne.
Questions and Extensions

- Where will the money come from?
- Integration with variable congestion pricing
- Solution solves equity issues that congestion pricing usually raise
- Land-use ‘development charges’: Present Value of future impact on incentives
- Over 20-years reduces CO₂ emissions by 181,000 tonnes. As a carbon emissions reduction approach it would produce co-benefits of $2,762 per tonne of carbon reduced.

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Next steps

• Looking for locations to further test methodology
• Looking for funding for pilot project
Thank you for joining us for:
Congestion-Clearing Payments to Passengers

View the full report at: https://transweb.sjsu.edu/sites/default/files/1817-Minett-Congestion-Clearing-Payments.pdf

Tune in for our next webinar in partnership with WTS “Make the Connection: Next Stop Your Career” on November 4, 2020 at 5:30 p.m.!
Visit https://transweb.sjsu.edu/events for details and registration.

Have a suggestion for a webinar topic you’d like to see featured? Email irma.garcia@sjsu.edu

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