THE IMPACT OF U.S. HOV AND HOT LANES ON CONGESTION

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Overview

• Part 1: The evolution of HOV and HOT lanes in the United States
• Part 2: HOT lane performance
• Part 3: HOT lanes’ implications for freeway pricing
Part 1: Evolution

From busways to HOV lanes

• Busway rationale was reducing oil imports.
• Excess capacity on bus lanes led to allowing vanpools and 4-person carpools.
• Excess capacity then led to HOV-3, and ultimately HOV-2.
• Rationale became reduced emissions.
• New federal policy: only lane additions allowed were HOV, not GP.
Second thoughts on HOV lanes

- Most HOV lanes either too full or too empty.
- HOV lane “revolts” urged conversion to GP lanes.
- Fam-pooling recognized as a problem.
- No workable way to verify occupancy or enforce it.
- Long-term decline in carpooling as more lanes added (from 19.7% of commuters in 1980 to 9% in 2018).
Origin of HOT lanes

1991 federal law changes:
• Allowing addition of toll lanes to federal-aid highways.
• Creation of FHWA Congestion Pricing Pilot Program.

Independent of these, California law allowed:
• SR 91 (Orange County) to add privately financed variable toll lanes.
• I-15 (San Diego) to convert HOV-2 lanes to HOT-2.
Growth of HOT lanes

- Federal program renamed Value Pricing Pilot Program.
- Early projects converted HOV-2 to HOT-2
- Next privately financed lane additions: HOT-3 on Beltway outside Washington, DC
- Both kinds proliferated since mid-2000s.
- TRB created Managed Lanes Committee and projects database.
- 53 ML projects in operation by mid-2020
Changing HOT lanes trends

- HOT networks added to metro-area long-range transportation plans.

- Newer projects increased requirement for HOT-3 or gave no exemptions to carpools.

- Increasing fraction developed as lane additions, financed by toll revenue bonds:
  - Some carried out under long-term P3 agreements
  - Others carried out by state or local transportation agencies

Most of these have investment-grade bond ratings.
Part 2: HOT lanes performance

Findings on customers

- Increased understanding of values of time and values of reliability (Small, et al.)
- Newest concept: value of urgency (Bento, et al.)
- Demographic and vehicle data counter the idea of “Lexus Lanes”
- Most motorists use HOT lanes only occasionally, for specific trips of high value (informal 90/10 rule)
**Impact on transit use**

- Less-congested corridor as preferred guideway for express bus service.
- Transit agencies increasingly taking advantage of HOT lanes.
- Some data show significant increases in bus ridership, compared with bus in HOV lane.
- Nearly all planned HOT lanes plan to host express bus service.
Impact on carpooling

- I-15 had carpool increase after HOV to HOT conversion.
- HOT-2 often led to carpool increase.
- HOT-3 usually leads to carpool decrease, at least in the lanes themselves.
- Atlanta (I-85) and Miami (I-95) permit registered carpools only, to exclude fam-pools.
Equity findings, (1)

Detailed I-405 study (Hallenbeck, et al.)

• Regular users (8% of total) account for 76.5% of daily use.
• Lowest-income users are 20% of AM peak, 12% of PM peak.
• Net benefit findings (VOT saving minus toll cost)
  • $2.50/trip for lowest-income group
  • $1.70/trip for middle-income group
  • $1.45/trip for high-income group.
Equity findings (2)

Social welfare modeling, DFW area, (Do, et al)

Four alternative freeway projects:

- Add GP lane
- Add HOV lane
- Add HOT lane (“priced ML”)
- Price all lanes.

“Priced ML” showed the greatest increase in social welfare.
HOV/HOT enforcement

• Original method (still used) is highway patrol officers’ eyeballs.
• Various roadside camera systems (none is accurate or reliable enough)
• Switchable transponder (honor system)
• Smartphone is newest approach.
• Registered carpool with regular certification
Part 3: HOT lanes and freeway pricing

• The congestion reduction and equity benefits of HOT lanes offer some degree of hope for eventual freeway pricing.

• However, the political difficulties must be thought through and overcome, for this to happen
Political difficulties

World Bank analyst’s three groups (Hau):

• The tolled—winners
• The tolled-off—losers
• The un-tolled—losers

Dealing with the losers:

• Compensate them using toll revenue (Small, King)---
or
• Create a value-based approach
Support for HOT lanes increased when focus shifted:

*Congestion Pricing* Pilot Program suggested forcing people to pay for driving during peaks (punitive).

*Value Pricing* Pilot Program offered valued time savings for those who choose to pay (opportunity).

How can we apply this lesson to freeways?
A proposed evolution toward freeway pricing

- Emerging HOT networks will increase familiarity with motorist and transit benefits of variable pricing.
- As fuel tax revenue continues to decline, stress the need to replace it with per-mile charges, starting with limited-access highways/freeways.
- Urge modest peak/off-peak charge for regular (GP) lanes with continued variable (market) pricing in premium (HOT) lanes.
- The rationale here is to extend the value pricing benefits to regular lanes, to ensure they are properly funded and work better long-term.
- This approach would avoid rhetoric about shifting motorists out of freeways (punitive) and seek to attract them to pricing’s proven benefits.