



Axle Weight Regulation of Transit Buses and Motorcoaches

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Outline

- Motivation
- Current trends in bus axle weight
- Pavement damage caused by buses
- Methods to reduce axle weight
- Evaluation of selected policies



Motivation

Federal axle weight limit of 20,000 lb single axle / 34,000 lb tandem axle, with some exceptions

- Grandfather rights**
- Intrastate transit buses**
- Motorcoaches (as of 2/2003)**

Issues

- Both transit buses and motorcoaches exceed weight limits when they have a full passenger load**
- Transit and motorcoach exceptions were due to expire in 10/2003**

Current Trends

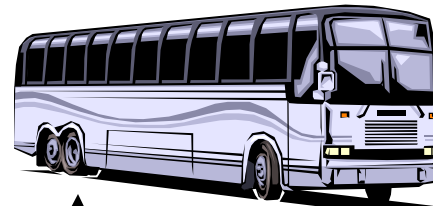
Increase of several thousand pounds since late 1970's:

- Larger vehicles and passenger amenities (motorcoaches)
- Alternative fuels
- ADA accommodation



28 Klb empty
36 Klb gross

↑ 66% rear axle



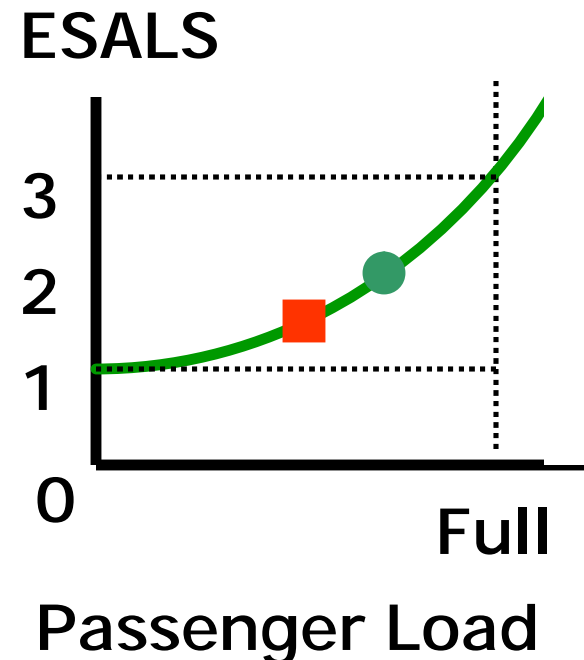
36 Klb empty
47 Klb gross

↑ 48% drive axle



Pavement Damage

- Weighted average passenger load -> ESALS
 - Transit: 1.4 – 1.6 ESALS
 - Motorcoach: 1.7 – 1.9 ESALS
- Annual VMT by road type
- Pavement damage cost by road type
- Annual pavement damage cost
 - Interstate: \$12M transit; \$53M motorcoach
 - Other roads: \$1,633M transit; \$804M motorcoach





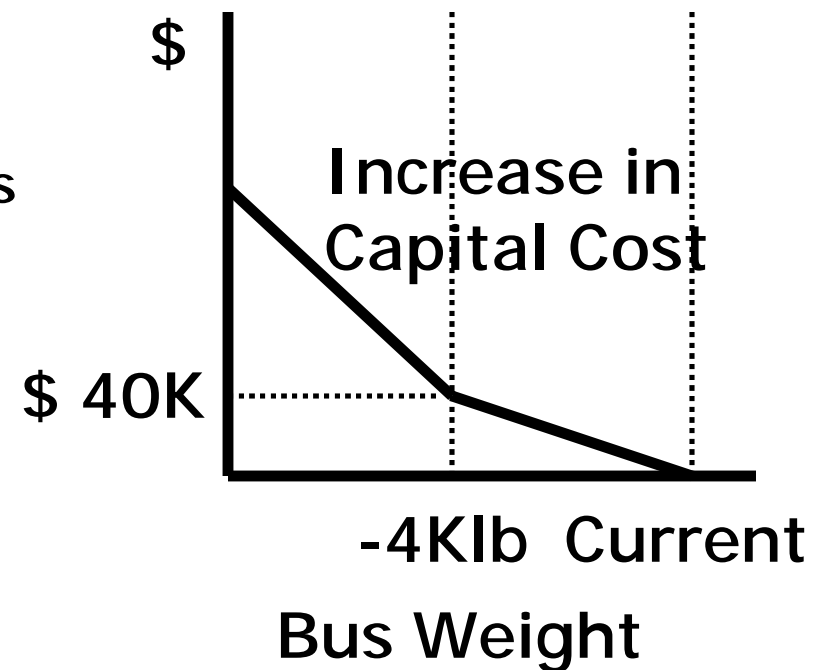
Reducing Axle Weight

Incremental

- Replace non-structural components
- Save up to 3K - 5Klb for the bus

Revolutionary

- Major changes to bus structure
- Save 10Klb for the bus

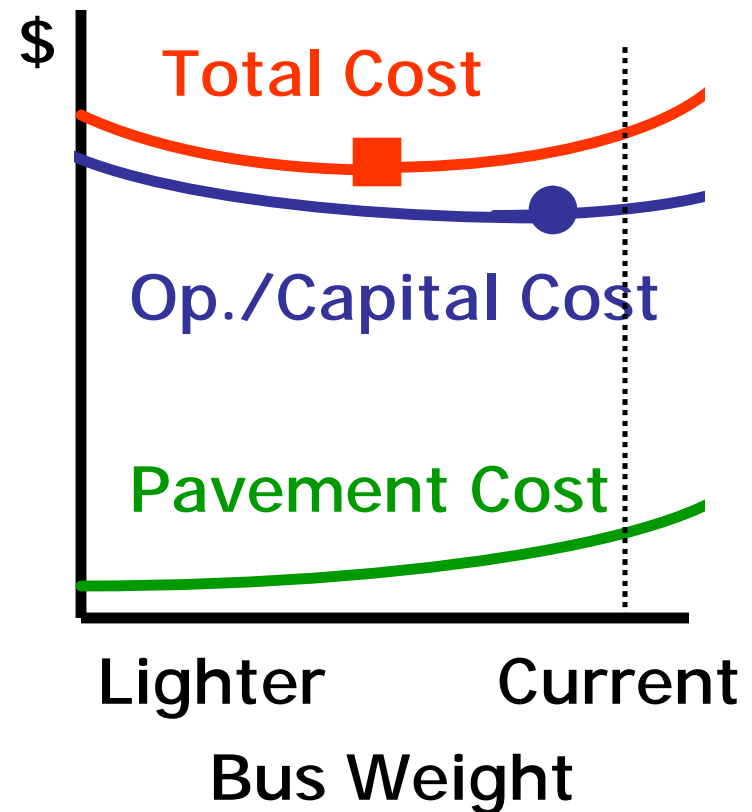


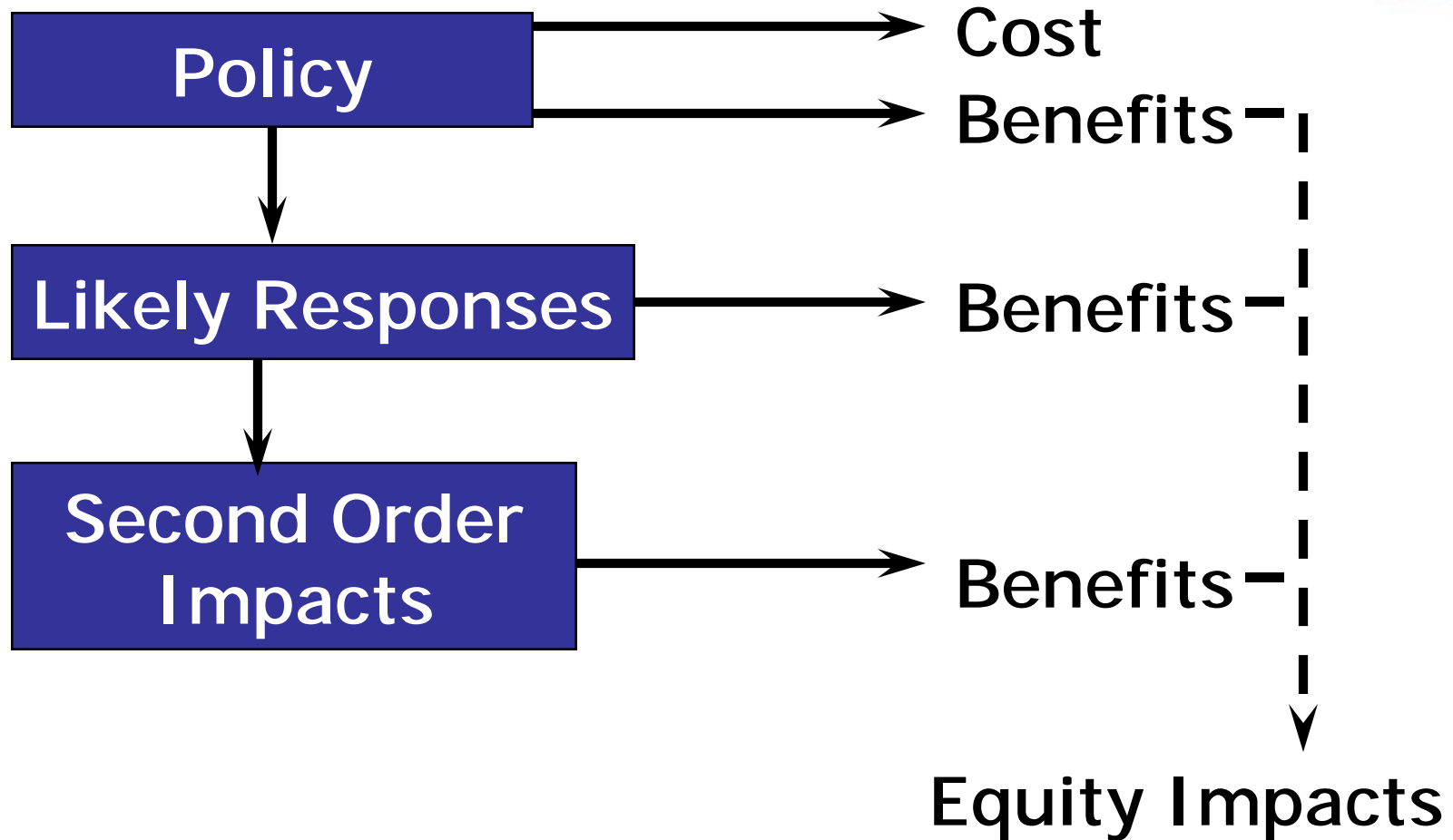
Market Penetration

Lighter weight buses

- Some operating cost savings (e.g. fuel)
- Not enough to offset increased capital cost

But, the reduction in pavement damage is enough to offset the increased capital cost





Example

Impose Lower
Axle Weight Limit

Cost

Use roads w/o enforcement
Lower passenger loads
Lighter-weight buses
Smaller buses
More axles

Pavement damage
Capital and operating cost

Higher cost per seat mile, leading to higher fares

Less bus service
Mode shift

Air pollution
Safety
Congestion



Policies Evaluated

- Enforce axle weight limits
- Provide financial incentives to use lighter-weight buses



Enforce limits: Transit

Response	Annual Benefit (M)	Fraction Adopting
Smaller buses	\$ (979)	0
Tag axles	\$ (120)	0.2
Reduce 4Klb at \$10/lb	\$ 522	0.5
Reduce 8Klb at \$20/lb	\$ 103	0.3

\$268 M annual benefit, provided that lighter weight buses are available



Enforce limits: Motorcoach

Response	Annual Benefit (M)	Fraction Adopting
Do nothing	0	0.33
Smaller buses	\$ (336)	0.0
Reduce 4Klb at \$10/lb	\$ 185	0.67

\$123 M annual benefit, provided that lighter weight buses are available



Financial Incentives

- Make the pavement damage cost from heavy buses visible to the bus purchaser
- Response: use lighter weight buses
 - 4 Klb savings given our assumed cost structure
- Benefit:
 - \$522 M transit
 - \$185 M motorcoach
 - Exceeds benefit from re-imposing weight limits



Conclusions

- Highest benefit from use of financial incentives
- Success of any policy depends on lighter weight buses being available at reasonable cost
 - Other responses to re-imposed weight limits produce a negative benefit
 - However, continuing the current exemptions indefinitely mean there is little incentive to invest in lighter weight buses