A Political Economy of Access

Infrastructure, Networks, Cities, and Institutions

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4

Subsidy

Should government subsidize transport? If government subsidizes transport, should it subsidize producers or consumers? If a government gave money to consumers, they could spend it on what they want, paying for a service, which if it covers operating costs, could lead to more investment. If it gave money directly to producers, they spend it on more supply. Which leads to a better outcome?

Let’s think about the word ‘subsidy’ for a moment. Below are a few examples.

1. If I buy a ticket on a train, and it pays my share of both the fixed and variable elements of the full cost of the trip, am I subsidizing the train? [No]
2. If my mom buys the ticket for me, is she subsidizing the train or subsidizing me? [me]

3. If my employer buys the ticket for me, is it subsidizing the train or subsidizing me? [me]

4. If a store buys the ticket for me, is it subsidizing the train or subsidizing me? [me]

5. If I buy a ticket which pays the marginal cost of my trip, but not the fixed cost, and my mom pays the difference, is she subsidizing me or the train? [the train]

6. If I buy a ticket which pays the marginal cost of my trip, and my city pays the fixed cost, is the city subsidizing me or the train? [the train]

7. If I buy a ticket which pays the marginal cost of my trip and the state pays the fixed cost, is the state subsidizing me or the train? [the train]

8. If I buy a ticket which pays the marginal cost of my trip, and the federal government pays the fixed cost, is the federal government subsidizing me or the train? [the train]

9. If the state gives me money and I buy a ticket which pays for the full cost of the train, is the state subsidizing me or the train? [me]

American Heritage dictionary says:

sub-sid-y n.

- Monetary assistance granted by a government to a person or group in support of an enterprise regarded as being in the public interest.¹

Dictionaries imply that subsidy is primarily from a government. You can then decide what is government: Family? Homeowners association? City, state, and federal certainly apply.

This is relevant in transport accounting. For instance Amtrak, a publicly-owned corporation, gets a subsidy (which it calls ‘funding’) from the federal government.² If it were to declare that subsidy to be revenue, it would earn a ‘profit.’ (Apparently it once did, but does so no longer). Amtrak also gets subsidies from state governments. It does declare those subsidies to be revenues. If you think about it as providing a service to the states, this makes sense. Any contractor to the state which charges in exchange for a service books that revenue as income. So in Amtrak-accounting, state-supported services are ‘passenger-related’ revenue, but federal support is not.

We advocate reframing³ current US practice in transit subsidies

¹ The etymology comes from the Latin word subsidere meaning “to settle down, stay, remain.”

² (Amtrak 2014).

³ §19
away from thinking of transit agencies as money-losing, and instead towards an organization providing services for users. Hopefully most of those users are passengers. It also would provide service for governments that want a particular service that users cannot pay for directly. The government would not be subsidizing the transit agency, it would be subsidizing users of the service by paying someone to provide the service. The difference in thinking is subtle, but important.

4.1 Car subsidies

In the United States (similar to many other nations), drivers do not pay enough for transport. As a result, drivers use too much and have misleading anchors about what prices ‘should’ be. When drivers are shown and charged the actual cost of things, they are surprised, and not a little bit disgruntled. They also often change their behavior.

Car2go is a carsharing company that has a presence in some US cities. We illustrate comparing their charges with costs of ownership.

car2go vs. private costs of auto ownership. Why should a car2go ride be $0.38/min?4 We don’t pay $0.38/min to ride our own cars, or transit, do we?

When driving our cars, we pay out-of-pocket for gasoline.5 At 48km/h,6 we pay $0.05/min (assuming no variation in fuel economy).

Much of the other $0.33/min is paying for what we perceive to be the fixed costs of vehicle ownership: the cost of the vehicle itself, insurance, maintenance, and repairs.

• The cost of the vehicle, say $15,000 for a vehicle that runs 100,000 miles before depreciating to $0, is $0.075/min.7
• Insurance might run $1,000/year or $0.05/min.8,9
• Vehicle taxes are about a quarter to half that, depending on where you are, so let’s say $0.01/min. In some states these are dedicated to infrastructure, so we need to be careful to avoid double counting.
• Repairs, oil, and maintenance probably have a similar running cost to insurance, less in the early years, more in the later year ($0.05/min).

Adding that together is $0.185/min.

That leaves $0.165/min in ‘out-of-pocket’ costs car2go charges above what you would pay for an equivalent vehicle. Some of this is

Figure 4.2: car2go in Minnesota. Photo by D. Levinson.

4 Note, rates vary by city, rates have changed since this was first written.
5 At prices of about $0.92/L (inclusive of taxes), ($3.50/gal) and 6.72 L/100km, (35 mpg) we pay just $0.061/km ($0.10 mi) out-of-pocket.
6 30 mph
7 $0.094/km ($0.15/mi).
8 $0.061/km ($0.10/mi).
9 Pay as you drive (or pay at the pump) insurance is a long discussed policy that has yet to be mainstream in the US. A version exists in Australia and some other places, including some US opt-ins.
Car2go operating expenses – load balancing or moving cars around so they will be near you, paying the cities for ‘free’ on-street parking, having a nice app and GPS. Some of this might be because car2go vehicles are actually used less than many private cars, so the fixed costs have to be spread over fewer minutes. Some of this might be higher insurance than you would pay. Some of this is on-road assistance as needed. Some of this is operating profit, a private company has to break-even as a business or it will cease to exist.  

One point is the average user of car2go drives less than the average owner of an equivalent car, thereby saving the outlay of $15,000 for ownership, $1000/year for maintenance, $1000/year for fuel, $1000/year for insurance, and $250/year for vehicle tabs. Thus when they are willing to drive, they pay more per minute than the per minute basis for an owned car because they are paying for the option value of having a car when they want, but not when they don’t.

The second point is if the average owner of a car paid an additional $0.185/min on top of $0.05/min, they would drive less. For a ten-minute trip, they would be out-of-pocket an extra $1.85. For a thirty-minute trip, they would pay an extra $5.55, which is about the out-of-pocket price of an express bus.

The costs so far only describe the private costs of driving. Since most of these costs are fixed, there is little reason not to drive once these costs have been paid. People would drive less, and potentially travel less overall, if they paid higher marginal costs of travel. This is one reason we don’t expect that car sharing will result in the same amount of vehicular travel as private vehicles.

Non-private costs

Infrastructure. The full cost of travel includes non-private costs, including infrastructure. Nationally, direct user fees (gas tax and tolls) pay for about one-third the cost of all roads, 11 the other two-thirds comes from general revenue (particularly property taxes at local jurisdictions, but also pseudo-user fees like motor vehicle taxes). Since fuel taxes (the bulk of highway user fees) are $0.0486/L12 at the national level and $0.0753/L13 in Minnesota, $0.47 in total, we would need to about triple it for user fees to pay for all of infrastructure costs or $0.02/min,14 of which $0.0067/min is already covered by existing gas taxes, meaning a new tax of $0.0133/min should be levied to convert road infrastructure costs into a user charge.

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10 Actually, car2go doesn’t have to break even, as it, like Smart, is a Daimler-Benz subsidiary, and car2go purchases Smart ForTwo, which offset less fuel efficient Mercedes cars under US Corporate Average Fuel Economy (CAFE) standards.

11 (Henchman 2013).

12 $0.184/gal.

13 $0.285/gal.

14 $0.372/L ($1.41/gal) or $0.025/km ($0.04/mi).
This assumes infrastructure spending is the right amount in total, about which there is considerable argument. Clearly much infrastructure is in poor condition or insufficient, which increases vehicle repairs, crash rates, congestion, and future infrastructure costs.

**Parking.** Parking is usually ‘free’ where most Americans live and work and shop, so this is not an out-of-pocket cost until we start charging for parking.\(^{15}\) Obviously there is a cost that is bundled into other real estate transactions, or is subsidized by the infrastructure provider in the case of free on-street parking. The value of this land in alternate uses depends on location,\(^{16}\) and in most, but not all, US places approaches zero, though obviously this is not the case in active centers.

**Externalities.** Like parking, this also does not include externalities, which are also ‘free.’ Crashes are mostly internalized in insurance, but congestion and pollution and \(\text{CO}_2\) emissions and noise are not internalized. These estimates vary widely.\(^{17}\) This might be on the order of magnitude of \$0.10/min,\(^ {18}\) though again varies hugely based on location and assumptions.

We have not also included user time. Presumably drivers consider their own time already (though undoubtedly over-estimate the time spent driving). At an average wage of \$20/hour (it is probably a bit higher) this would be \$0.33/min of labor foregone. Note this is roughly the same level as the full monetary costs of travel. In benefit/cost analysis, transport economists typically use half the wage rate, though this is at best a rule of thumb.\(^ {19}\)

Table 4.1 summarizes our ballpark out-of-pocket monetary costs per minute. Table 4.2 presents an estimate from extensive modeling by (Cui and Levinson 2019). Time is a dominant cost of travel, though we neglected it in the comparison above, as it applies to both car2go and a private vehicle. Access time (the time to reach the vehicle) is higher in a carsharing example than private ownership.

**Reduction in travel**

How much less travel would there be if the costs of driving paid out-of-pocket on a per use basis? Economists use the elasticity of demand with respect to price to estimate this. This tells us how much demand drops as prices increase. The short run elasticity of

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\(^{15}\) (Shoup 2017).

\(^{16}\) §4.1.

Table 4.1: Summary Costs of Monetary Costs of Car Ownership ($/min).

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>$0.050</td>
</tr>
<tr>
<td>Vehicle ownership</td>
<td>$0.075</td>
</tr>
<tr>
<td>Repairs, oil, &amp; maintenance</td>
<td>$0.050</td>
</tr>
<tr>
<td>Insurance</td>
<td>$0.050</td>
</tr>
<tr>
<td>Infrastructure (ex. gas tax)</td>
<td>$0.013</td>
</tr>
<tr>
<td>Externalities</td>
<td>$0.100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$0.34</strong></td>
</tr>
</tbody>
</table>

\(^{17}\) (Levinson and Gillen 1998; Parry et al. 2007).

\(^{18}\) $0.12/km ($0.20/mi).

\(^{19}\) (Hensher 2019).
Table 4.2: Average Cost Estimates for Each Cost Component Among All the Links on the Twin Cities Road Network ($/veh – km). Source: (Cui and Levinson 2019).

<table>
<thead>
<tr>
<th>Single Cost Components</th>
<th>Full Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time</td>
</tr>
<tr>
<td>Internal</td>
<td>0.3819</td>
</tr>
<tr>
<td>External</td>
<td>-</td>
</tr>
</tbody>
</table>

Demand for driving (measured in vehicle miles traveled) with respect to the price of gas is about \(-0.05\), meaning for every 100% increase in the price of gas, there is a 5% decrease in gasoline consumption (which correlates to driving in the short run, in the long run there is also a shift in vehicle fuel economy).\(^\text{20}\) So if we hold that to be true for all costs, going from $0.05/min to $0.34/min is 676% higher cost (a 576% increase), leads to about a 29% reduction in fuel use (distance traveled) in the short run if people paid their roughly fixed costs plus infrastructure plus externalities of vehicle ownership as variable costs instead. Of course at the magnitude of shift, the elasticity values may no longer hold. In any case, this is no small matter. Certainly the direction is right, countries with much higher fuel taxes see much less driving in general.

**Economic responses**

**Income effects.** There would be a countervailing income effect, as people now had an income that was higher by the cost of the car-payment (say $1,500 per year over 10 years), and $2,250 in other vehicle costs. That additional income effect would be expended consuming many different goods, not just travel by automobile. A fraction of it (maybe 20-30%) would go back to pay for additional transport, though not necessarily more travel, perhaps just nicer travel in a better car (a Smart ForFour instead of a Smart ForTwo). Since wealthier people travel a bit more than less wealthy, there would be a small bit more travel, but probably a relatively *de minimis* amount.

**Induced demand.** Further, if we did reduce congestion, we would expect at least some people to take advantage of that change and start traveling more than they otherwise would have. There would be **induced demand**\(^\text{21}\) due to the lower travel times.

\(^\text{14}\)§.
**Time is money.** As the adage goes, ‘time is money,’ and if we were more directly aware of the cost of our travel, we would spend far less on it. This implies we over-consume travel compared to a system that charged users directly for their full costs. As we move towards more efficient and equitable transport funding, using road pricing, and an economy with shared vehicles and Mobility-as-a-Service (MaaS) we should expect significantly less passenger travel demand.

Consequently, infrastructure providers should supply less transport capacity in this policy environment than one where people could free ride and over-consume. Since infrastructure is long-lived, planning for a smaller network should begin now, with the aim to avoid irreversible investments made today that will later be seen as unnecessary.

One area that has received some attention for adaptable infrastructure is parking structures. Parking is required as part of new development in most of the US, yet demand for parking will decline if on-demand services (including automated vehicles) increase. Some architects and developers are already designing parking structures for potential future transition to some other use.

### Hidden subsidies

Highway users pay a fee for the cost of highways. Federal gas taxes are dedicated to the federal Highway Trust Fund (HTF), and many states have similar rules at the state level. The HTF has in recent years fallen short of the amount that politicians want to spend on roads, but that is in principle easily corrected with an increase in the user fee or a decrease in spending. Most local roads (municipal and county) are paid for via local general revenue. This is also well known in the transport community, if not the general public.

The hidden subsidy is in states which have general sales taxes, but don’t apply them to gasoline. In Minnesota, for instance, purchasers pay a sales tax on prepared food, but not gasoline (or clothing, or a few other random things). Thus relatively, spending is encouraged in those untaxed areas, which are 6.875% less taxed than other goods. This lack of a tax is not a subsidy in a state which doesn’t tax sales, and instead taxes income or property. But where sales are taxed, but gasoline is exempted, other goods are implicitly taxed more so gasoline can be explicitly taxed less. Note this is not universal across the US.

In California, there has long been both a sales and use tax. However the value of the sales tax on gasoline is now lower than the sales tax on general goods, though for many years it was close...
There is argument about the fact that the sales tax is levied on both the gasoline and the user fee associated with the gasoline. In short, the general principal is that gasoline cannot simultaneously be taxed with the funds dedicated to highways (thus acting as a user fee) and exempted from sales taxes without there being a subsidy that at least partially offsets the user fee. At a $0.66/L price of gas, a 6.875% tax raises $0.0458/L. To compare, the state gas tax is $0.0635/L. Thus, in Minnesota the net state user fee is only about $0.0178/L, not the $0.06356/L widely advertised. The federal gas tax is $0.041/L. This is more truly a user fee. Also since there is no federal sales tax, gasoline is not disproportionately favored. The tax in Minnesota is higher in some localities to pay for other things. We could similarly look at the motor vehicle sales tax (MVST), which is dedicated to transport in Minnesota. It is 6.5%. There is nothing wrong with dedicating the funds, but as a result, they cannot be counted as user fees, since sales tax revenue would otherwise go to general revenue. Since 2011, 60% of the MVST goes to the Highway User Tax Distribution Fund, and 40% goes to the Transit Fund.

To minimize distortions, the general sales tax should apply to all goods equally. For equity concerns, sales taxes can be refunded, or at sale can be avoided with specialized payment cards. Better, a value added tax should be used. Special taxes on beneficiaries should be used where they can be, but not in lieu of general taxes. There is sufficient economic capacity in the highway system for users to pay for the whole thing (the evidence being how much people have paid for gasoline per gallon in the past in the US, and how much they pay in other countries), it’s a shame we don’t take advantage of that.

After paying for roads, and their externalities, and their share of the general tax burden, road users will be paying about their fair share. Taxes are needlessly complicated by special interests. This allows all sorts of hidden subsidies. Let’s expose them to the sunlight, and then make objective decisions about whether we should lower the general sales tax on all other goods, and impose that tax rate on fuel.

Road rent

There are a number of ways to view the cost of automobile travel. For instance in this book we examine the congestion costs imposed, we allocate infrastructure costs, and assess full costs to consider internal costs, subsidies, and externalities. This section examines the idea of road rent, which considers the opportunity cost of land used for
roads. At the margins, what is the value of road space for parked and moving cars, and how might that cost look on a per vehicle-km traveled basis?

**Land has value.** Land used as roads has value both as a road and potentially for other uses. What if the value for other uses was higher than that for use as a road?

In Greater Sydney land values range from to $AU210,000/m² in Barangaroo on Darling Harbour to under $AU1000/m² in Western Sydney. In Minneapolis, we estimated a few years ago that average assessed land value as $144/m² for streets and $30/m² for highways. It seems that assessed value is about 2/3 of market value in Minneapolis.

In some places it is much higher, in some places much lower, the examples used herein are simply an illustration.

The idea is that there is a land holder (such as a government land agency) that has to decide whether to allocate land to road uses or for other purposes.

**Charge rent for on-street parking.** Consider a typical suburban residential neighborhood with ‘free’ parking in front of houses. The land is valued at $1,000/m². Each house requires one parking space out front, and parking is permitted 24 h/day. Conservatively, a car takes 10 m² when parked (the road is the access lane, we consider that separately). It would cost $10,000 for the land owner to purchase the land equivalent of the parked car. The annual rent on that would be $400 (at 4% interest).

In this example $400 is how much the car owner should pay annually to their municipality for a permit to park their car to cover the cost of land (not the cost of infrastructure, or any other costs of roads and mobility, just the cost of land). This is a bit more than $1/day. In more expensive neighborhoods, this would be higher, in less expensive neighborhoods, lower. For Minneapolis, we have previously estimated about 220,000 on-street spaces. At $400/space/year, this would raise $88,000,000/year, a not inconsiderable share of the city’s $1.3 billion annual budget. Instead it is mostly given away free.

Consider the implications if property taxes were reduced by up to $88 million in total, and parking permits sold at $400/year (payable monthly with the water and trash bill). People would realize the cost of on-street parking, and there would be less demand for it, and less vehicle ownership at the margins, and fewer trips by car. Space freed up could be re-allocated.
Alternatively, $400/year is the value of public subsidy from publicly-owned land to private car owners who get ‘free’ on-street parking. In short from the car-less to the car owners.

**Road space has alternative uses.** The economic idea of opportunity cost is important here. Opportunity cost is the value of the next best alternative. The next best alternative to road space might be renting it out. For instance, an urban US freeway that destroyed blocks of extant development when it was built has an opportunity cost associated with the value of that real estate.

So the question arises as to what other uses could be made of the road; for if there were no other uses, you might as well store cars for free. Here are several other uses that could be considered to replacing a parking lane:

- Park or parklet,
- Bike lane,
- Bus lane,
- Paid parking, via meters,
- Shared car parking (rented to the car sharing company),
- Shared bike parking (rented to the station-based or dockless bike sharing company),
- Taxi or ride-hailing stand,
- Bus stop,
- Shared scooter parking (rented to dockless scooter sharing company),
- Food truck or ice cream vendor,
- Road for moving motor vehicles (a parking lane could be another moving lane),
- Sold off for development.

The last item deserves some discussion. Consider that our road with two parking lanes (one on each side) is maybe 10 or 12m wide.\(^{37}\) This is wider than some houses are long. The city could in principle retain the sidewalks and sell off the roadbed for townhouses or single family homes. Given the houses are already serviced by alleys, and so long as not all roads were sold off, some roads could be. An illustration of this is the Milwaukee Avenue in Seward in Minneapolis, as shown in Figure 4.4. You will see there is no paved street in front of the houses. This could be tightened up further or realigned should there be demand.

This is not appropriate for every street. However, (1) there are places this can be done, where roads are in excess and housing scarce, and (2) this illustrates that land currently used as asphalt to store and move cars has value, and that houses have value even in the absence of streets for cars in the front.

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\(^{37}\) About 32 to 40 ft.
Figure 4.4: Milwaukee Avenue, Seward. Source: (Milwaukee Avenue Historical Association 2014).

There are always excuses – utilities may need to be relocated, fire trucks would need to go slower down narrower sidewalks. But these excuses can be overcome, there are numerous examples of narrow paths that function as roads.

Charge rent for moving cars. Typically each car is in use 1 - 1.5 hours per day, and parked for the remainder. Above, we considered parking, the ‘remainder,’ here we look at the time in motion.

When in use, the car is occupying not simply its area, but also is preventing the use of other space around it. On a freeway with a capacity of 1,800 vehicles/hour traveling at a freeflow speed of 100 km/h, (i.e. just before the speed and flow drop due to congestion sets in) there is a critical density of 18 vehicles/km.

It is the density that is the relevant number here, since vehicles are occupying space that we are charging rent for in this thought experiment. Though they are moving, and so the space they are occupying moves with them, there is always some space being occupied for the duration of their travel. Each of those vehicles per hour is occupying a moving window of space.

Roads are a timeshare. When roads are less congested, cars are consuming more space per vehicle. So uncongested urban roads are much more expensive per traveler than congested rural roads. When traffic breaks down, they are consuming less space, but presumably are occupying that space for more time, since they are going slower. Induced demand, and travel time budgets negate that to a significant extent.

In this example, the hourly rent on 200 m² is what we are interested in. Though cars move, over the course of 1 hour of travel in these conditions, they are claiming that much space. The specific space they are claiming moves with the vehicles, but this all balances out as other cars claim the space they vacated.

\[1 \text{ are} = 100 \text{ m}^2 \quad \text{and} \quad 1 \text{hectare (ha)} = 100 \text{are} = 10,000 \text{m}^2.\] The \(m^2 \cdot \text{sec}\) (or the larger \(\text{hectare} \cdot \text{second}\)) is a new unit of measurement (a time-volume) that needs a catchier name.

\(^{39}\) The 10 m² = 2 m · 5 m.

\(^{38}\) 18 vehicles/km is 55.5 m/vehicle. Lane width is 3.65 m, so the area occupied is 202 m². Let’s round to 200 m². Each moment a car is in use, it is using 200 m², on which it should pay rent. So for an hour a day, this is 720,000 m²·s. Or 72 hectare · s. Note: 1 are = 100 m² and 1 hectare (ha) = 100 are = 10,000 m². The m²·cdotsec (or the larger hectare·second) is a new unit of measurement (a time-volume) that needs a catchier name.

\(^{40}\) §14.

\(^{41}\) (Levinson et al. 2018).
Empty roads still have to be paid for, and paid for by actual road users. Even when a road is not being used, it is available to be used. Travelers have the option of traveling. Pavements cannot be easily be rolled up and allocated to other purposes on the fly, particularly purposes like buildings. (Roads can occasionally be closed for special events, but this is rare during business hours.)

Example. Consider a car trip that uses three roads:

- Road section 1 (suburban residential):
  \[ l = 5 \text{ km}, w = 3.65 \text{ m}, v = 30 \text{ km/h}, q = 1000 \text{ veh/h}, k = 33.33 \text{ veh/km}, AADT = 10,000 \text{ vehicles/day/ lane}, p = $1,000/\text{m}^2. \]

- Road section 2 (motorway):
  \[ l = 10 \text{ km}, w = 3.65 \text{ m}, v = 100 \text{ km/h}, q = 2000 \text{ veh/h}, k = 20 \text{ veh/km}, AADT = 20,000 \text{ vehicles/day/ lane}, p = $5,000/\text{m}^2. \]

- Road section 3 (downtown):
  \[ l = 1 \text{ km}, w = 3.65 \text{ m}, v = 40 \text{ km/h}, q = 1600 \text{ veh/h}, k = 40 \text{ veh/km}, AADT = 16,000 \text{ vehicles/day/ lane}, p = $10,000/\text{m}^2. \]

Consider each road section to be a homogenous pipeline. The annual rent \((R)\) for each road section is the \(R = p \cdot i \cdot l \cdot w\)

- Road 1: \(R = 1,000/\text{m}^2 \cdot 0.04 \cdot 5,000m \cdot 3.65m = $730,000/\text{y}\)
- Road 2: \(R = 5,000/\text{m}^2 \cdot 0.04 \cdot 10,000m \cdot 3.65m = $730,000/\text{y}\)
- Road 3: \(R = 10,000/\text{m}^2 \cdot 0.04 \cdot 1,000m \cdot 3.65m = $1,460,000/\text{y}\)

This annual rent is paid by the road agency to the land owner for the use of land as a road. The road agency then wants to recover this cost from its customers, the travelers.

The question of how to allocate always has some subjectiveness to it. Another way of thinking about it is based on elasticity of demand. Peak hour work trips are perhaps the least elastic (least sensitive to price), and so from an economic efficiency perspective should bear the greatest cost.

In this example, we take a simpler tack.

The allocation is \(R/AADT\) to get cost per year per daily tripmaker, and divide by 365 to get cost per trip, and by section length to get cost per km. In this example:

- Road 1: \($730,000/10,000 = 73/\text{y} = $0.20/\text{trip} = $0.04/\text{km}\)
- Road 2: \($7,300,000/20,000 = 365/\text{y} = $1/\text{trip} = $0.10/\text{km}\)

\(^{41}\) \(l = \text{ length (km)}, w = \text{ lane width (m)}, v = \text{ velocity (km/h)}, q = \text{ flow (veh/h)}, k = \text{ density (veh/km)}, AADT = \text{ Average Annual Daily Traffic}, p = \text{ land value ($/m^2)}, i = \text{ interest rate = 0.04, y = year, r = land rent ($/y/m^2)}, d = \text{ days/year}\)

\(^{42}\) With heterogenous traffic, this is obviously far more complicated, and we would make use of the \(q, k, \text{ and } v\) variables to compute an area-time.

\(^{43}\) This is formally called Ramsey Pricing, see (Oum and Tretheway 1988).
Road 3: $1,460,000 / 16,000 = $91.25 / y = $0.25 / trip = $0.25 / km

The total is thus $529.25 per year or $1.45 per trip to cover land rent.

The implications of road rent are several

• At an additional $1.45 per trip, travel by car (and congestion) will diminish.

• Road rent is essentially additive with annualized infrastructure costs. Infrastructure budgeting generally does not consider the cost of land, rather, land is often implicitly considered ‘free’ or a sunk cost.

• If travel by car diminishes sufficiently, road space can be clawed back and redeployed for other public purposes.

• Narrower lanes impose less road rent. But not necessarily proportionately so, as the throughput on narrower lanes (with human drivers) may be lower as drivers are less keen to be immediately adjacent to nearby high-speed vehicles.

• Slower moving vehicles take up less space, but take that space for longer.

• While pedestrians and bicyclists use space as well, they use much less space. Sidewalks (footpaths) are often considered part of the adjacent private property, and are thus already paid for with property tax.

• Land used for roads instead of development is not on the books for property taxes.

• The revenue raised can be used for many transport purposes or redistributed back to taxpayers through some other means.

• The additional road rent reduces the effective land rent that landowners can charge. If people have to pay more for travel, they will pay less for real estate.

• Rural areas have much lower, perhaps negligible, road rent. Though the number of users drops significantly (so there are fewer travelers who must pay the burden of road rent), the cost of land drops even more significantly.

• Were there no (fewer) roads, land would also have very little (less) value, since it would be difficult to access and egress.

\(^{45}\) See discussion of flux in (Levinson et al. 2018).
Table 4.3: Mode Share in the US, Weighted by Person Distance Traveled. Source: 2017 National Household Travel Survey.

<table>
<thead>
<tr>
<th>Mode</th>
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<td>Rental car, Car sharing</td>
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<tr>
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</table>

- If roads were fully built on, views would be terrible and the existing buildings would diminish in value. But none of that is to say we have the correct amount of roads now. Clearly urban roads are undercharged in a real estate sense.

4.2 Bicycle subsidies

This book largely focuses on two transport modes: the automobile/truck/highway system and public transport, and pays short shrift to walking and bicycles, which tend not to have large funding demands, nor in the case of bikes, large usage in the US, as shown in Table 4.3. Bicycles also don’t have user fees. Concomitantly bikes don’t have much infrastructure to show for it.

Certainly, as shown elsewhere, car owners don’t pay for 100% of the cost of road infrastructure (more like 50% of operating and capital costs, but depends how you count), but they pay more than non-car owners due to gas taxes and vehicle registration fees. For better or worse, this allows a lot of car-oriented infrastructure to get built.

Transit users don’t pay for 100% of the cost of riding transit (farebox recovery is nearer 33% of operating costs and 0% of capital costs), but they pay more than non-transit users due to fares. This allows transit routes to be somewhat more widespread than otherwise.

There is a perception widely held among non-bike riders that bicyclists are free riders. Bike riders do not pay more for the available bike infrastructure than non-bike riders. Is this perception wrong? Bicyclists could step-up (or pedal-up) and claim some rights and funds in exchange for some responsibilities and paying user fees.

Bicycling would get more respect at the table, and more resources, if bicycle owners and/or users paid some amount of money to support bicycle infrastructure.
For instance, a $10/year fee for registering a bike would raise more than a million dollars a year in Minneapolis, which would go a long way toward bike infrastructure. Bike advocates should reframe and embrace. A Bicycle Trust Fund could be very powerful.

Some suggest the funds for bicycle infrastructure should be provided by the public out of general revenue. Our first thought is, how is that working for you so far? If you are happy with the level of bike infrastructure in America’s number one bike city, Minneapolis, much less everywhere else, carry on. If you think it should be better, you can rally and exhort, but you can also bring some money to the table.

In contrast to sidewalks, which are largely maintained (or not) by adjacent property owners, and paid for from special assessments, bike paths are treated more like roads. Also, keep in mind, everyone walks, not everyone bikes.

Tax collection bureaucracies have high overhead, but there should be ways to do this and get a pot of money together. If you think a $10 annual fee is too administratively complex, make a $30 fee at the point of sale and/or at bike registration. Exclude bikes older than 3 years.

If you think the bike-tax cops will harass poor or minority bicyclists, a very real concern, make it a secondary rather than primary offense, so riders can’t get pulled over for it.

If you are worried about kids, set it up so parents pay for kids, or make it only for bikes with a greater than 20 inch wheel – there are many possible strategies.

We need to think creatively.

4.3 Transit subsidies

The words ‘transit’ and ‘crisis’ have been associated in the American lexicon for nearly 60 years. It is time to recognize this as a chronic condition rather than a temporary event. Current strategies have not placed transit on a financially sustainable path.

In most of the United States and much of the world, public transport is publicly subsidized. Everyone in an area pays for transit whether or not they use it. This was not always the case, and need not everywhere be the case. Once mass transport was privately provided to the public for profit (in most US cities) from the late 1800s through the first half of the 1900s. While rights-of-way were often publicly provided, the companies operating transit paid for the maintenance of those rights-of-way above and beyond what was required for transit. This model was hugely profitable for decades.

\[48 (\text{Wisniewski 2017}).\]

\[49 \text{The terms ‘mass transit’, ‘public transit’, and ‘public transport’ are used interchangeably and refer to services that carry multiple parties from multiple origins to multiple destinations.}\]

\[50 \text{See (King 2013).}\]
until it wasn’t. In fact, as late as the 1960s over 80% of mass transit in the United States was privately owned and operated.\textsuperscript{51}

The causes for transit’s decline are many, but rising incomes, suburbanization, and of course a much faster competitor in the automobile/highway system are among them. Operational reasons include limits to raising the nickel fares starved the operators of money to invest in the systems and diminished performance due to travel in mixed-traffic. Between the 1930s to the 1960s, depending on where you were in the United States, the private sector abandoned mass transit and the public sector took over.

Over the past half century, US transit under public ownership has seen an enormous and growing per passenger subsidy. The debate over the merits of subsidy has become partisan.

Transit is essential to those who use it on a daily basis. But so are many other goods and services that have much lighter public involvement, ranging from food production and distribution to electricity and natural gas. Aside from the inability of transit operators to make money under the regulatory regime of 60 years ago, is there anything about transit that warrants public ownership? Let’s consider who benefits from transit:

- Riders, who on average directly pay about one-third of the operating costs through fares, and none of the capital costs
- Employers of subsidized riders, who can pay lower salaries since those employees have some of their transport costs covered. In some places, employers subsidize transit passes or local transit services for employees.
- Highway travelers who face less congestion the more other people use transit. The federal Highway Trust Fund, most of which comes from motor fuel taxes, dedicates 2.86 cents of the 18.3 cent federal gas tax (or 16%) to transit capital costs. Many states have similar transfers from highway users to transit systems. To be clear, the purpose of transit is transport for people who use transit, not less congestion for people who don’t.
- Land-owners whose value appreciates due to the option value provided by transit, even when they themselves, or their tenants, don’t use it.
- Society as a whole, which has fewer pollution externalities if more people ride transit instead of driving alone in gasoline powered automobiles.

All of these beneficiaries pay something, but they do not pay in proportion to the benefit, because of the misperception that mass
transit is a public good, like police or fire protection. In principle, a public good is something that people cannot be prevented from using, and that does not get worse the more people it serves. In reality, transit is more like a club since we charge users all the time. In fact, it would be technically fairly easy to charge users more.

The fear is that if users paid more, they would ride transit less. Undoubtedly in the short run, if nothing else changed, a fare hike would lead to a decrease in ridership. Yet many countries (including Canada) have higher transit fares (and higher costs for competing modes) along with higher transit ridership (and better service). With exchange rates and complicated fare structures, however, there is no perfectly fair comparison.

There is also the concern that transit is a merit good, so it is aimed at serving poor passengers who cannot pay the average cost of transit service. Overall, transit riders have lower than average incomes. Yet many routes (think commuter rail and heavy rail systems) have passengers with higher than average incomes. As we discuss below, if you want to help poor people, give them money; or, failing that, give or subsidize transport vouchers or transit passes, rather than subsidizing the wealthy under guise of aiding the poor.

But the primary problem with funding transit operations is not that poor people are subsidized. Since the routes serving low-income travelers are often profitable (fares cover operating costs), it is that long-distance, inefficient suburban routes are very heavily subsidized by profitable or near-profitable urban routes. If the average farebox recovery in the US is one-third (as shown in Table 4.4), many routes are much higher and other routes are much lower. The lowest performing routes are typically in suburban districts, where transit dollars are spent as part of a political bargain to obtain some form of general revenue funding from suburban jurisdictions.

An independent transit utility can raise fares, with the approval of a public utilities commission. For a private firm, we would expect that total revenues exceed total operating costs. The ratio of revenues to operating costs is called ‘farebox recovery’.

Playing with this idea more deeply, we engage in two thought experiments. The first considers this idea of full farebox recovery, and what does it mean, and the second looks at a radically different alternative: free transit.

**Thought experiment: full farebox recovery**

Public transport in the US is heavily subsidized. Regardless of whether this is a good thing, is 100% transit farebox recovery even possible, or will a death spiral result in no users? This section engages in a thought experiment to test what kinds of fares and user subsidies would be needed to achieve 100% farebox recovery.

If 3 million people in the Twin Cities metro each purchased a Metropass at $76 per month, that would be $2.736 billion per year (about 9 times the current annual budget). This is highly unlikely on a voluntary basis, the evidence for which is that we have not yet seen it.

According to the Minnesota Department of Transportation total budgets are $301 million per year on Metropolitan Council systems for bus and LRT (excluding other services), so really only 330,000 pass-holders would be required to cover existing costs. This is just an order of magnitude estimate, and certainly high since while a large (but unknown) fraction of existing riders are essentially daily riders, others are more infrequent riders and would still pay fares rather than get a pass. The problem is that there are not 330,000 daily or near daily users of the system, instead there are 267,700 daily trips for Metro Transit, and a few more for suburban transit...
systems. Presumably about half that many persons ride daily, assuming mostly round trips, and one round trip per day. This is further complicated by transfers.

Working this problem in reverse to cover $301 million dollars in expenditures from 267,700 trips (or 133,850 riders, assuming round trips and no transfers) requires $2,250 per person per year. But if fares increased to the equivalent of about $3.10 per trip (at 60 trips per month), there would be fewer users.

How many fewer users?

**Scenario 1.** If users were now paying $2.25 per trip in fares (two-way peak) and it increased to $3.10, that is a 39% increase in effective user prices (though this is complicated by switching from an out-of-pocket fare payment to a monthly pass). At an average fare elasticity of -0.4, we would expect a decrease in ridership from 133,850 travelers each day to 114,000.

Total revenue drops to about $255 million per year.

Nevertheless, if Metro Transit could reduce costs by $46 million without reducing service, good on them! That is however unlikely, and we see aspects of the transit death spiral in place: Fewer riders -> Less revenue -> Reduced Service -> Fewer Riders. This might be self-limiting, as the weakest services affect the fewest number of riders.

Alternatively, we could just keep raising prices until we reached equilibrium. This reduces revenue and thus requires a rate increase, which further reduces riders. This is also self-limiting, and in this scenario the system ridership drops to just over 100,000 persons per day (200,000 trips per day) at an annual Metropass rate of $2,988.

**Scenario 2.** A current farebox recovery ratio of 0.31 suggests riders are not in fact paying an average of $2.25 per trip. Instead, it is about $1.91/day or $0.95 per trip equivalent. Certainly some riders pay ‘full freight.’ Other have passes and use more than the average number of trips than a pass is equivalent to, ride in the off-peak, or otherwise have discounts. Thus increasing to $3.10 for everyone would be more than a 40% increase for some. In this case, we would need to increase fares from $1.91/day to $6.17/day, a 223% increase. If riders actually were expected to pay this, ridership would drop about 90%. Then to continue full service (though why would we?), we would need to increase daily rates to $56.22. This would reduce ridership to about 0. This is the full transit death spiral in action.

53 These suburban systems are referred to in the Twin Cities as ‘opt-outs’ since they opted out of Metro Transit service.

54 $187 from each person who rides per month.

55 (McCollom and Pratt 2004).
There is a middle ground, retrenching service to that which is profitable, which would lose riders and service, but hopefully lose more costs than revenues.

Clearly we cannot uniformly more than triple real transit fares as paid by patrons, in the absence of changing other costs in the transport system, and expect the current set of riders to pay that.

A plausible policy would argue for ‘equity subsidies’ to cover the difference for groups that society wants to provide aid to rather than discounting fares for everyone alike.

**Thought experiment: free transit**

The foremost response to the thought experiment on farebox recovery is that transit should be free. So why don’t we treat transit like we treat elevators? Functionally they appear very similar, though one operates on the horizontal and the other the vertical.

There are several answers.

- Sometimes we do charge for elevators, and while this is admittedly rare, the cases are informative. The Empire State Building charges users going to the observation deck, because the users of the elevators are not paying rent in the building the elevator serves and are not doing business with those who are. Whether we are charging for the elevator or the view is not always obvious. There is also an unpopular charge for some elevators in China. The custom is of course that elevators (like parking in most places in the US) is bundled into the rent. The custom is not without reason, charging for elevator riders, like charging tolls on drivers, or fares to riders, is an annoyance. The mechanics are perhaps trickier, if you don’t have anyone collecting the fare, do you have to have a turnstile at the elevator, or just the first person who boards has to pay and everyone else free-rides. Staffing the elevator is unnecessary. The honor system would likely break-down, and proof-of-payment engenders an enforcement problem. Also the marginal costs of elevators are approximately zero.

- Sometimes we do give away transit, though this is rare as well, and the cases are also informative. For instance, we give away transit when there is a patron who views most of the riders as ‘us’ rather than ‘them.’ That is, for instance, the case at the University of Minnesota, where every student pays (implicitly) a tax to ride on the campus transitway, and the University subsidizes the rest of the costs from other fees. The only people using the transitway
are students, faculty, staff, and others doing business or research at the University.

- Sometimes we give away transit in a business park. The punningly named Emery-Go-Round in Emeryville, California, functionally a business park with a few residents, is a circulator bus connecting to the MacArthur BART station. This is an amenity for tenants, and is paid for by a local Transport Management Association.

- Sometimes we give away transit in small cities. One of the largest US cities with free transit is Vero Beach, Florida, with a metropolitan population of 130,000 (though municipal population of only 15,000) which is largely a tourist town. In Tempe, Arizona, the city augments regional transit service with a fare free circulator bus that is paid through a sales tax. The largest city in the world offering free transit is Tallinn, Estonia, at 420,000 people (the metro area is only slightly larger at 543,000 people), which has only done so following a 2012 referendum. Yet Tallinn charges for tickets for non-residents. In short, Tallinn residents are part of a largish club. The community (Tallinn) identifies the riders as ‘us’ rather than ‘them.’

We could get into the causality of divisions into ‘us’ and ‘them,’ but we believe this is inherent in human nature:

When individuals having no established relationships are brought together to interact in group activities with common goals, they produce a group structure with hierarchical statuses and roles within it.

If two in-groups thus formed are brought into a functional relationship under conditions of competition and group frustration, attitudes and appropriate hostile actions in relation to the out-group and its members will arise and will be standardized and shared in varying degrees by group members.

So can buses (or if need be, trains) be the source of uniting the community rather than a reflection of its divisions? The evidence of casual empiricism suggests large communities inherently fracture (red states vs. blue states) unless brought together under crisis (war, tornado, etc.). The problems solved by transit (road congestion, transport for the carless, emissions, the high cost of downtown and University parking) do not seem a strong enough glue to overcome this.

What would be the effect on a transit agency if fares went to zero? Elasticities don’t necessarily hold constant over large ranges, but a 100% reduction in fares at a -0.4 elasticity implies a 40% increase in riders. In most US markets, this is too high. However, and while the evidence is mixed, Baum estimated -0.1 elasticity. (Baum 1973).

(Cats et al. 2014; 2017).

See the example from Muzafer Sherif’s 1954 Robbers Cave study of fifth grade boys in Oklahoma (Sherif 2010).

(Cats et al. 2014; 2017).
with about a 5% work mode share for transit in the Twin Cities now, this would increase transit work mode share to 7%. Assuming these new transit riders were drawn proportionally from the other existing modes this would reduce peak commuting auto mode share in the Twin Cities from something like 78.3% to about 77%. An improvement, but barely noticeable in terms of peak congestion, since some of that gain will be contracted due to peak spreading and induced demand.60

The transit agency would need to make up the lost revenue or cut-back service (reducing costs to cover that lost farebox revenue) since its current 31% farebox recovery would go to 0%. Cutting service by 31% while raising ridership by 40% would about double average load factors (if done uniformly). When the bus is half empty, this is not a problem. In peak times this would lead to crushing loads. (Both the service cutbacks and the higher load factor would result in ridership rising by well less than 40% – induced demand works in reverse as well.)

Raising taxes for free transit seems politically difficult, though technically it would be quite simple to raise a tax on something else. For instance, a regressive sales tax on mostly non-transit users has been mooted by the business and transit advocacy community to subsidize transit.

Farelessness would make transit in the US more vulnerable to cutbacks, as it would not have its own revenue source and unless it were to gain massive ridership (and 7% work mode share does not count as massive) it would still not have the political buy-in for most people to see transit as serving ‘us’ rather than ‘them.’ The reason we have ‘free’ rather than tolled roads is that almost everyone identifies as a road user. To get the American driving public to see mass transit in the same light requires a major perception change.

Were transit free, very low value trips would get induced, for instance, teenage joy-riding, which would impose a negative externality on more serious riders.

When transit is on the left side of the U-shaped average cost curve,61 with declining marginal costs, free can be argued as welfare improving. When transit has rising marginal costs (as in the peak, or full commuter buses perhaps), free is a less appropriate option.

Transit is a private good,62 it is rivalrous in principle, and in practice during peak times, it is excludable. Further it can in many markets be competitive, at least in terms of competitive tendering for franchises, if not the full chaos of the market without property rights in stops, which even libertarians have identified as
Comparison of fares around the world. Table 4.5 compares fares globally. The US has lower fares than elsewhere.

If poor riders were subsidized for some large fraction of the difference between current fares and the new fares, it could produce a farebox recovery rate of about 100% (depending on actual fare elasticities), compared to the 30-40% typical in US cities.

A perhaps more important point is that Canada has higher fares than the US, a higher farebox recovery rate than the US, better transit, and higher transit mode shares. What are they doing more right than the United States? We discuss this with the question of federalism.\footnote{\text{§17.3.}}

The competitive environment for transit limits how high rates can go. In cities with a greater dependence on transit (and greater inconvenience for driving), transit agencies have more latitude to raise fares. The political environment also matters, and it may be simpler politically to subsidize rides for everyone, not just those who need it.

Lowering costs can also increase farebox recovery ratios, by lowering the denominator (expenses) instead of raising the numerator (revenue). As discussed elsewhere, transport costs too

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<tr>
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Table 4.5: Global transit fares. Single price ticket in central zone. Source: (MVA Consultancy 2013).
much, so there are probably a number of possibilities for reducing expenses.

There are many policy alternatives for fares between $4.50 and $8.00 day, there is no magic number. Until transit is again privatized without subsidy there is no requirement for 100% fare recovery. It would almost certainly be a bad idea to do this kind of change overnight, large systems need transitions. Still, raising base fares should be on the table to give transit agencies more operational independence and to reframe their status from [whatever it is now] to what it once was and will eventually be again, a public utility providing a service in exchange for consideration.66

Great cities have great transit and their users pay more for it.

4.4 Subsidize users not systems

Even though there is broad agreement that transit should be subsidized, there is no agreement on how to subsidize or how much to subsidize. Consider capital and operating subsidy. These are related, but different enough that they should be addressed separately.

Capital subsidy can be direct or indirect (such as assistance with land acquisition), and these monies come from federal, state, metropolitan, local and sub-local sources. Traditionally capital subsidy has largely come from federal and state sources, though recently local sources have used sponsorship and value capture.68 Capital subsidy for transit expansion rarely, if ever, considers the effects capacity and network expansion have on operating subsidy, however. Since every transit system in the United States requires an operating subsidy, every service expansion increases the required operating subsidy and makes the financial position of transit agencies worse over the medium and long term. In the US, unlike many European countries, there is not even a requirement that benefit/cost analyses, projections, or planning consider what system expansion will do to operating budgets.

Operating subsidies are from local, regional and state sources. The federal government placed severe limits on using federal money for operations in the 1970s, in part because most of the increases in subsidy went to total wages without any increase in productivity.69 The primary reason for operating subsidy for US systems now seems to be “that’s the way we do it here,” which is not a proper justification. Many of the cities around the world have much higher farebox recovery, fewer operating subsidies and much higher ridership than transit in the United States. Maryland for

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65 §9.1.

66 To be clear, as long as driving remains cheap there is little that can be done via subsidy to make transit more competitive. Drivers should pay the full cost of driving.

67 See the Emirates Airways gondola in London, for instance.

68 See the 7 train extension to the West Side of Manhattan. The topic is discussed more in §16.

69 (Pucher et al. 1983).
instance considered a 35% cost recovery requirement for transit.\textsuperscript{70} This suggests a justification for less subsidy and higher fares: *planning without prices leads to bad planning.*

**THE CASE FOR SUBSIDY.** For some public goods the case is obvious. In the absence of excludability and rivalry, one needs to get revenue from somewhere to operate a service that provides public benefits.

- Transit often operates on the left-hand side of the U-shaped cost curve.\textsuperscript{71} Fixed costs are spread over more and more users as the quantity demanded increases, while marginal costs remain small if not zero. If we charge riders an average cost for a service with near zero marginal cost (which is an approximation of the situation in transit in the absence of crowding, certainly in terms of the short run marginal cost, ignoring a few things like the delays which boarding imposes on other passengers), we get under-consumption and under-supply compared to the social optimum. That means if we charge more than the marginal cost of the ride, we get a less than socially optimal number of passengers (there is a deadweight loss). Somebody who would ride at a lower price that was still at least as high as their marginal cost cannot. The social benefit (consumer’s surplus) of that unmade trip is foregone. Unfortunately because of high fixed costs, this implies that fares at marginal cost will not recover total costs. Thus the natural monopoly / economies of scale or density / declining fixed cost is one aspect that might warrant subsidy.

- There are network externalities associated with public transit. The more users of transit there are on a system, the more useful the system is for everyone.\textsuperscript{72}

- Transit helps the transport disadvantaged.\textsuperscript{73} This is part of the argument used for the creation of the Urban Mass Transport Act in 1964, the first federal program to provide assistance to public transport. Equity or welfare has often been an argument in favor of subsidy, that we do it to provide benefits for people unable to afford otherwise, or transport for the disadvantaged. This gets more into values than economics, but there are some people who would be employed but for their ability to access jobs, so some subsidy on the transport front is at least partially repaid by more economic productivity.

- Transit subsidy helps poor jurisdictions. Spatial cross-subsidies help poor jurisdictions rather than poor people.

- Transit arguably reduces congestion\textsuperscript{74} on other modes, by taking

\textsuperscript{70} (Shaver 2017).

\textsuperscript{71} §B.

\textsuperscript{72} §A.4.

\textsuperscript{73} §21.

\textsuperscript{74} §5.
cars off the road, and therefore benefits drivers (who should thus pay for it).

- Transit stimulates economic development.\(^{75}\)

- Cars are subsidized, therefore transit should be subsidized.

These aspects argue in favor of subsidy. But then the questions arise: Subsidy from whom? Subsidy for what? What is the appropriate base for providing subsidy?

Here we argue in favor of a club good\(^ {76}\) model. People in the Club should help subsidize the service.

The beneficiaries of transit are relatively local. If we live in Phoenix, the option of riding transit in Las Vegas or Curitiba is of essentially zero value. The option of riding transit within the greater metro area is of some value, and the option of riding transit in downtown is of high value. The option of riding transit that runs directly from home to the desired destination is the highest value. Benefits diminish with distance from the system.

We can define the Club more narrowly as anyone who might want to use transit and is willing to pay (or whose employer or university is willing to pay or help pay) for a season pass. One example of this is apartment building managers who supply their tenants with shuttle vans.\(^ {77}\) An advantage of using a season pass model (rather than pay per trip) is the ability that it presents in providing services without excessively under-pricing the transit service. Whoever wants to provide transport benefits for the transport disadvantaged can subsidize those whom they want without subsidizing everyone.

We can define the Club a bit more broadly as landowners whose property value is increased by the presence of transit. The option of riding transit sometimes is public good (i.e. the option is neither rivalrous nor excludable), and its value is embedded in locations near transit stations. This appears to justify some form of value capture approach (of which property tax is the most widely used, but certainly not the most direct or efficient mechanism).

Both of these clubs are smaller than the municipalities in which transit operates, and much smaller than higher levels of government, like county, state, or nation.

The case against subsidy. Though there are clearly some arguments in favor, we promised arguments against transit subsidy as well.

- Transit is basically a private good. Private goods can be privately provided, which aligns incentives of the producer with their

\(^{75}\)§11.20.

\(^{76}\)§A.

\(^{77}\)For an example from Pittsburgh, see (Walnut Capital 2018).
revenue model directly, better performance is rewarded, worse performance is punished. When all transit lines – and road networks for that matter – are planned and operated below cost we simply don’t have any idea what the true value of any service is. This is true whether publicly or privately supplied. As we write this, large amounts of venture capital are subsidizing travel through Uber, Lyft, Didi, Bridj, Chariot and others – and we simply don’t know what actual demand is where the firms can be profitable. We suspect they do not either. If fares increase to cover costs, or at least come closer to covering costs, service can adapt to revealed demand and firms and households can adapt accordingly. Without proper prices we don’t know where to increase capacity or improve service. We can’t identify actual bottlenecks or spread peak demand across more hours in the day by using dynamic pricing. By planning service while blind to the value of the service, everybody is a bit worse off and many actual transit riders are substantially worse off.

• The network effects might be relatively small either because they are already played out (high frequency service in a high density city), or because they never will be (low frequency service in a low density city). The best opportunity is thus low frequency service in a high density city, in which service can be increased. Downscaling may need to occur in places with high frequency and low density. Many technologies have network effects but don’t require public subsidy. From Facebook to your ATM networks the amount of public subsidy is zero, or small. What is usually required is a monopoly (AT&T of yore, airline hubs), some type of lock-in (social networks), collusion (credit cards), or cooperation (the English Language), which readers of this book all use without the government subsidizing.

• Though there are always returns to density (more riders on the bus always lowers the cost per passenger on the bus), bus systems have approximately constant returns to scale (more buses are not less expensive per bus than fewer buses). Many places have figured out an economic model which does work from a profitability stance. There is little reason economically to run a service with many buses under the auspices of a single monopolistic organization. Constant returns industries don’t warrant the same subsidy as increasing returns industries.

• While it is claimed transit should be subsidized to stimulate economic development, it is also claimed that economic
development should be subsidized because it stimulates transit. It is not clear which, if either, or both, are driving this cart.\footnote{11.20} 

- Fixed route transit may be made obsolete by new technologies, especially outside of cities and in off-peak periods.

- One bad subsidy does not deserve another. Just because cars are subsidized is not a reason to subsidize transit. It is an argument to remove the subsidies that exist. Technically (if not politically) it would be relatively easy to charge cars for their full cost (i.e. eliminate their subsidy) via higher fuel taxes (or mileage fees) but the amount of the incremental charge would have a very small effect on total automobile use.

- As for the Mohring effect,\footnote{A.4} how much should a transit rider pay for the bus or train not taken (subsidy for options)? Consider a downtown worker who prefers to take transit to work, but sometimes has to work late into the evening. There is lots of service for typical 9-5 employment, but a major reason workers are comfortable on transit is that they know there is adequate service for occasional trips such as when they work late. Let’s say that an optimal fare that covers direct costs for a rush hour bus is $2, but every other week a worker has to stay until 9:00 pm when service is infrequent. Should the regular fare be $2.20 to reflect the required subsidy for the not-full 9:00 pm bus? Or should occasional trips be shifted to taxis or made the employers’ problem? In Manhattan most corporate employers will pay for a taxicab home for employees who work past 9:00 pm, and San Francisco employees are more likely to ride transit to work if they know that they can take a cab for their return trip.\footnote{See (Freemark 2011) making the case for spatial subsidies.} As this is off-peak time for taxicabs perhaps this is a more optimal solution than subsidizing increased fixed-route services.

- Finally there are many reasons not to trust the recent experience in transport with investment. The costs are too high and the benefits are too low. Giving more funds to existing institutions to build more capital-intensive infrastructure while existing infrastructure deteriorates may not produce the hoped for results.

4.5 Refactoring subsidies

There are poor people, and society won’t give them enough money directly, (demand-side subsidies). Should society then subsidize services for them (i.e. provide supply-side subsidies to the public sector)?\footnote{Spatial subsidies.} Clearly that is what the US does. But what should the US do for the poor?
The public should subsidize transport for the disadvantaged from non-transport specific revenue sources. Perhaps the biggest problem with current subsidies is that they are place-based and not people-based. Why should the entire system be subsidized? Also, why should a professor pay the same fare as students? Or in New York, why should former Mayor Bloomberg, the richest guy in the city, pay the same fare as the cleaning staff of Bloomberg, Inc.?

**Demand-side solution: Give them money.** The greatest consequence of an effective fare increase to cover 100% of operating costs would be on the poor. One strategy (which appeals to libertarian and rationalist sensibilities) for dealing with this problem is the negative income tax (endorsed by both Milton Friedman and the US Green Party), i.e. give the poor money to spend as they choose.\(^\text{82}\) There are some public policies which do this (Earned Income Tax Credit), and others which have been proposed (Universal Basic Income) but nothing so blatant as systematic cash handouts. It is a clean elegant solution that avoids distortions. Hence politicians don’t like it.

One of the concerns is with incentives. If we just gave people money for being poor, wouldn’t we get more poor people? The other concern often raised is one of financial responsibility. Some people are poor temporarily due to bad luck or circumstance. Others have trouble with financial management – just giving money would not help.

**Demand-side solution: Transport choice - give them transport vouchers.** If policy-makers don’t trust the poor with money, and this seems to be the attitude of American society, which does not actually give much money directly to poor people, give transport vouchers to the poor to spend on transport as they choose.

Policymakers should transform today’s system of mass-transit subsidies into an individual transport-choice program directed to meeting the needs of consumers rather than producers, by providing transport vouchers to America’s neediest. Low-income people would be issued accounts and smartcards giving them access to a set benefit that could be used for any eligible public or private transport service (including transit fares and passes, taxi rides, gasoline, tolls, car purchases, and car repairs).

We propose that this replace the bulk of the Federal Transit Administration’s program grants for specific capital investments, which would be defunded. States, metro areas, and localities that wanted to invest in new transit infrastructure could still do so, but
would make choices that were locally worthwhile given their own situations, rather than decisions based on the premise that someone else will pick up half the bill. Existing mechanisms like user fees, land value capture, taxes, bonds, or non-forgivable loans from state (or perhaps federal) infrastructure banks remain as ways to fund and finance such investments.

This proposal would provide help to a broader base of low-income families, not just those fortunate enough to live along new transit lines. Instead of assuming what types of transport people should use, it would give people a choice of how to spend transport dollars in a way that best suits their own lives. Many travelers will choose transit, paying for the services they use. But transit is not the best choice for all (or even most) low-income workers, so why should transit infrastructure be subsidized on equity grounds?

Rather than subsidizing all travelers with low fares, transit operators could be permitted to raise fares as necessary with fewer concerns about equity, since low-income travelers would have vouchers specifically for that purpose. The share of operating costs paid by fares should increase from the current average of 33%. Because the stream of revenue would be higher, cost-effective projects would be more likely to break-even operationally and repay capital costs over time, and thus could be justified as investments.

The risk is that the poor with the transport voucher might find buying a car or gasoline is a better decision than riding transit, especially if their jobs and homes don’t align with the network. While this is presumably better for the individual traveler (why would they allocate their resources that way if it weren’t), it doesn’t help the transit agency or other travelers, as it weakens transit service by removing the positive externality they would otherwise generate, and adds to congestion on roads in the short run.

Demand-side solution: Give them public transit vouchers. And if transport vouchers are unacceptable, public transit-only vouchers are also straight-forward, and better for the transit agency itself. This could be administered by topping up a recipient’s per use transit pass with $X per week, or giving a monthly pass, or some other mechanism. Recipients of top-ups would use the same smartcard as everyone else, so no public stigma is attached to using the card. Moving towards smartcard systems is efficient all around, saving boarding times and reducing transit run times. It could also be administered when anyone qualifies for other social services, such as unemployment insurance or food assistance. If people have trouble eating they probably have trouble with the
expense of travel. For instance, the city of Seattle pays the transit agency $3.8 million per year in order to provide free transit passes for all public high school students.\textsuperscript{84} It accomplishes the appropriate ends, without burdening the transit system with this welfare function. It also allows freedom for funds to be spent on taxi or rental car as needed (if in cash-equivalent form), rather than just fixed-route transit.\textsuperscript{85} Just because some people are poor does not mean they don’t have other transport needs.

Presently, the ‘budget’ for subsidies for the poor comes from the transit agency. Instead the budget for negative income tax, transport vouchers, or transit vouchers should come from general revenue, as the primary objective is to help individual people, not transit systems. These funds would be billed to a separate government agency (let’s call it the ‘Transport Opportunities Office’) which is completely separate from the transit organization.

Who should pay for social fares? King County Metro, in Washington, announced a low-income fare policy in 2015. This is from the King County press release:\textsuperscript{86}

“Rising housing costs are leading many families to locate in lower-cost locations that may be farther away from where they work,” said Mike Heinisch, executive director of South King Council of Human Services. “Providing a low-income fare is one way we can help keep the region more affordable for working families and ensure equal access to economic opportunity.”

“As a social service agency, we work with people who are in dire need of affordable public transport to get to training classes, meet with case managers, find and get to jobs and health care appointments, as well as other important appointments,” said Mahnaz Kourourian Eshetu, executive director of Refugee Women’s Alliance. “The efforts of our County Executive and County staff to make the discounted transit fare widely available to people who need it the most is admirable and will have a positive effect on the County’s economy while creating stronger communities. It was an honor to serve on this task force.”

“King County is one of the first regions in the nation to put a low-income fare in place, helping to make sure that our bus service really is serving the whole community,” said Alison Eisinger, director of Seattle-King County Coalition on Homelessness. “We can be very proud that we are putting our values into practice in this way, by taking a big step that will help advance greater equity and access to opportunity. Thousands of people, and our community as a whole, will benefit from this progressive policy.”

While laudable, why is it the transit agency’s responsibility to pay the $8 million or so annually? So Human Services, the Refugee Women’s Alliance, and the Coalition on Homelessness are all part...
of a coalition supporting low fares for certain groups. While we agree that all of these groups deserve affordable travel, we don’t see why these benefits should be paid directly from the transit budget. Expecting the transit provider to also provide social services is not sustainable unless someone directly pays for those social services. The public has a social obligation to provide access to opportunities, but this doesn’t mean the mass transit operators should pay for social programs.

**Don’t subsidize everybody.** Only as a last resort should we distort an entire transport mode and drive it into perpetual ‘crisis’ mode for the sake of subsidizing a subset of users. This worst solution is to subsidize transit for all riders. This needlessly reduces the resources available to operate the transit system, and keeps transit agencies in the subservient position of having to beg for money on a regular basis rather than being fully funded by their users.

**Supply-side solutions: Build them stuff, Run them lines.** If politically it is too hard to actually help the poor directly with demand side subsidies, which might pull through new investments, we can push service and subsidize that spatially. Clearly it is less efficient, and likely winds up benefitting the wealthy at least as much as the poor. To use this last resort is basically the problem of the first best and second best.¹⁸⁷ In the first best world, we act as if everything else is also optimized, in the second best, we optimize given the suboptimality of the rest of the world. But by doing so, we consign the rest of the world to suboptimality as well.

Just as roads are underfunded and we see congestion, because they are not priced properly and spending is too focused on expansion rather than preservation, a point that is made elsewhere in this book, transit is underfunded and we see both crowding in some places and literally, (yes literally) empty buses in others, both of which are the consequence of severe misallocation of resources to achieve the what Jarrett Walker calls ‘coverage’ aims.¹⁸⁸

Places that would see service dropped once you went to an appropriate funding model are not the poor inner-city areas, which are (or ought to be with appropriate management, regulation, etc.) profitable given their relatively high densities, but instead the low density suburban routes. (Recognizing that the poor are suburbanizing in many metropolitan areas). The current model is largely a cross-subsidy from the poorer areas to the middle-class areas.

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¹⁸⁷ See: (Lipsey and Lancaster 1956).

¹⁸⁸ (Walker 2012).
UCLA transport planning professor Brian Taylor writes:89 Federal subsidies of public transit, particularly transit operations, are declining and the responsibility for supporting transit is falling increasingly on states and localities. In California, the Transport Development Act (TDA) has become the state’s principal source of transit operating subsidies. It is found that the strict per capita allocation formulas of the TDA strongly favor lightly patronized suburban transit service over more heavily patronized service in the central cities. Transit riders in San Francisco, for example, receive a TDA subsidy of $0.13 per trip, whereas the TDA subsidy to transit patrons in suburban Livermore is over $5.00 per trip. The built-in suburban bias of the TDA is the result of partisan compromises made to secure passage of the Act in 1971 – compromises to assuage a Republican governor opposed to new taxes – and to include the interests of rural and suburban counties. The result has been a proliferation in California of new, well-funded, and expanding suburban transit operators that attract few riders whereas older, heavily patronized central city transit operators are forced to cut service because of funding shortfalls.

While the numbers have changed since he wrote that, the basic observation stands.