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Heavenly Highway

If you've ever been caught in a rush-hour traffic jam you understand what happens when a scarce good has a price of zero. In this case, the scarce good is highway travel, and when the money price of travel is zero, something else must be used to ration the quantity of the good demanded. During rush hour (and much of the rest of the day in places such as Los Angeles, New York, Seattle, and Atlanta) the "something" that rations travel demand is time—the time of the motorists caught in traffic.

Whenever a person drives a car, he or she generates a variety of costs. First are the **private costs** of driving: fuel, oil, vehicular wear and tear, and the value of the driver's time.[1] These are all borne by the driver, so when deciding whether and how much highway travel to consume, the driver weighs these costs against the benefits of that travel. If these were the only costs of driving—and on some roads at some times they are—this discussion would end here. Drivers would bear the full cost of their activities, just as the consumers of pizza do, and there would be no further issues to consider. But in most places of the world, during parts of most days, driving generates another cost—congestion—which is not borne by the individuals responsible for it.

On any road, after traffic volume reaches some level, additional cars entering the road slow the flow of traffic. Once this process of congestion occurs, every additional car slows traffic

[1] Ideally, the excise taxes on fuel, as well as automobile licensing fees, are set to accurately reflect the costs of maintaining and policing the road system. Hence drivers pay not only for their vehicles and their time but also for roads and the police necessary to keep them safe.

even more. Eventually, traffic may even come to a complete halt. Under these circumstances, each driver is implicitly using, without paying for it, a valuable resource that belongs to other people—the time of other drivers. Unless drivers are made to bear the **congestion costs** they create, we know two things must be true: first, the money price of traveling on the road is too low, and second, the value of motorists' time spent in traffic must be rationing the quantity of travel demanded.

Why do economists worry about congestion? Because its existence raises the possibility that the people using the road could actually be made *better off* if they were somehow charged a money price for using the road. This money price would induce fewer motorists to drive, because some would carpool, others would use public transit, and still others might telecommute rather than come into the office at all. The reduced driving would reduce congestion, and so conserve the valuable time of those people who continued to drive. In fact, it is even possible that by charging drivers a monetary fee or "toll" to drive on a road, *more* people would succeed in reaching their destination in any given time period. It is easiest to see this when traffic is so bad it comes to a grinding halt. The toll would discourage some people from entering the road, and so permit the remaining traffic to move, and thus reach its destination. But the general principle holds true even when traffic is just greatly slowed down by the congestion: road tolls can both improve traffic flow and make drivers better off—surely a heavenly combination for those sick of being stuck in traffic.

Why, then, do we not see more widespread use of tolls on highways? There are three reasons. First, toll collection is not free, and until recently the costs were often large enough to offset many of the benefits. If you've ever traveled on a toll road such as the Pennsylvania or New Jersey turnpikes, you have some notion of these costs. The toll booths there must be constructed and then manned 24 hours a day, and traffic must come to a halt to pay the toll. The result is that the tolls are *creating* some of the congestion they are supposed to relieve.

But over the last 15 years, electronic toll collection systems have been developed that reduce these costs substantially. Small, inexpensive electronic devices called transponders can be

installed in cars that will be using the toll road. The transponders transmit identifying information to receivers at the toll stations, which are suspended above the roadway. (The toll stations are also equipped with cameras to record the license plate number of anyone passing through with a missing or malfunctioning transponder.) Cars need not even slow down from cruising speeds to have their identification recorded as they pass through. At the end of the month each motorist receives a bill in the mail for his toll charges (or a ticket if he's tried to avoid the toll). Clearly, such a system is designed for roads or bridges heavily trafficked by regular commuters, but in these circumstances, such as on the bridges in the New York City area, electronic toll collection has drastically lowered the costs of using monetary prices to ration roadway usage. The result has been reduced congestion and improved economic efficiency. Drivers are better off, and local governments have extra revenue to spend on other services.

The second impediment to pricing highway travel is the often radical and unpredictable consequences of changes in the cost of travel. Unlike a typical privately provided good, each road is part of a network of roads; a change in costs on one segment of the system can sometimes have striking and substantial consequences elsewhere—consequences that can largely or completely offset the benefits of the tolls.

The island nation of Singapore, for example, has some of the worst traffic in the world. As a result, its government has been experimenting with pricing roads since 1975, charging a special fee for vehicles entering the central business district during peak traffic periods. When combined with other traffic-control measures, the fee helped cut traffic in central Singapore by 45 percent during peak hours, enabling traffic speed to almost double, to about 22 miles per hour. But these positive effects in the central city between 7:30 AM and 9:30 AM were accompanied by deleterious effects elsewhere. For example, just outside the central city, traffic jams got worse as drivers sought routes they could use without paying. Moreover, on the roads leading into the central city, the drop in rush-hour traffic was nearly matched by a sharp increase in traffic just before 7:30 and after 9:30.

Tolls don't always have to have such adverse side effects, however, as illustrated by the success of London, England, in

implementing them. Beginning in 2003 drivers entering the central area of London were charged a fee of £5 (about $9 at recent exchange rates), with fines ranging in excess of £200 if they failed to pay. The result has been a 20 percent reduction in traffic and about a 5 percent increase in average speeds—which doesn't sound like much, until you realize that average traffic speeds in London actually *fell* during the twentieth century, as cars first replaced horses and then simply got in each other's way. The big difference between Singapore and London seems to be the magnitude of the charge: London got it roughly right, but Singapore has tried to charge too much—a point to which we shall return.

Perhaps the biggest impediment to efficient pricing of roads is the fact that roads typically are operated by governments rather than by private-sector firms. Decisions to price roads must pass through the political process, which necessarily means that the efficiency concerns of the economist are likely to be outweighed by political concerns over who shall pay how much for what. Public-opinion polls from densely populated and heavily congested Hong Kong help us understand the consequences.

Although motorists and non-motorists in Hong Kong are almost identical in agreeing that traffic congestion is serious (84.5 percent and 82.0 percent, respectively), they differ sharply in what they think should be done about it. Motorists favor new road construction, presumably because this would shift to taxpaying non-motorists part of the cost of relieving congestion. In contrast, non-motorists believe that financial disincentives to driving (such as tolls and licensing fees) should be given the top priority, presumably because this would shift more of the burden to drivers. These divergences of public opinion have slowed the use of private-sector remedies for the congestion on publicly owned roads, just as they have elsewhere in the world. The result is too many roads on which monetary prices are too low (or nonexistent), and thus congestion is too high.

The nation of Japan offers us an illustration from the other end of the spectrum on the hazards of having politicians set prices. Unlike in the United States, where "freeways" are commonplace, all 4350 miles of expressways in Japan's national highway system are toll roads. The nation began building the expressways in 1956 with loans from the World Bank, imposing tolls to pay off the loans.

The loans are long-since paid off, but the tolls remain—generating $15 billion per year to help the national government pay off its $360 billion debt for other public-works projects. Yet the government is so addicted to tolls as a revenue source that many of its citizens think it has gone off the deep end. Tolls are so high that if you were to drive the length of Japan (a nation smaller than California), you would rack up $330 in tolls. Just making the 10-minute trip across Tokyo Bay from the airport will set you back $25, which is actually an *improvement* over the $42 that drivers used to pay. With fees like this, you can imagine the response: people buy airline tickets rather than drive when making trips of 200 miles, and trucking companies devise elaborate routing schemes for their trucks to keep toll costs down. And how's traffic? Well, along many of the pricier portions of the Japanese highway system, you may find yourself alone on the road.

The message of our story is quite simple. For a variety of reasons, highways, unlike hamburgers, are tricky things to price correctly. More often than not, the price is too low, but sometimes it is too high. So if you are out there looking for that heavenly combination of speedy travel and low money prices, you may be on the road quite a while.

DISCUSSION QUESTIONS

1. Rather than use tolls, some localities use other means to reduce congestion on major routes—for example, access-limiting traffic lights at freeway on-ramps. From an economist's perspective, what are the disadvantages of such a system?
2. If the purpose of a toll is to bring the private costs of a driver's actions into equality with the social costs, should the size of the toll depend on how many passengers are in the car? Should it depend on the size of the car (or differ between cars, trucks, and buses)? Should it depend on the time of day that it is collected?
3. Suppose that when you ate a pizza you had to pay only for the crust, not the toppings. What would happen to (i) the number of pizzas you ate, and (ii) the amount and quality of the top-