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### **Incentives for Drivers Who Avoid Traffic Jams**

PALO ALTO, Calif. — London, Singapore, Stockholm and a few other cities around the world battle heavy traffic with a “congestion charge,” a stiff fee for driving in crowded areas at peak hours. But drivers generally hate the idea, and efforts to impose it in this country have failed.

[Balaji Prabhakar](#), a professor of computer science at [Stanford University](#), thinks he has a better way.

A few years ago, trapped in an unending traffic jam in Bangalore, India, he reflected that there was more than one way to get drivers to change their behavior. Congestion charges are sticks; why not try a carrot?

So this spring, with a \$3 million research grant from the federal Department of Transportation, Stanford deployed a new system designed by Dr. Prabhakar’s group. Called Capri, for [Congestion and Parking Relief Incentives](#), it allows people driving to the notoriously traffic-clogged campus to enter a daily lottery, with a chance to win up to an extra \$50 in their paycheck, just by shifting their commute to off-peak times.

The program has proved so popular that it is to be expanded soon to also cover parking.

Amaya Odiaga, the director of business operations for Stanford’s physical education department, now drives to campus a few minutes earlier and says she has won just \$15. But a co-worker got \$50 — creating a competitive atmosphere that makes the program fun, Ms. Odiaga said.

Better yet, Ms. Odiaga’s commute now takes as little as 7 minutes, down from 25 minutes at peak hours.

Dr. Prabhakar is a specialist in designing computer networks and has [conducted a variety of experiments](#) in using incentives to get people to change their behavior in driving, taking public transit, parking and even adopting a more active lifestyle. Unlike [congestion pricing](#), which is mandatory for everyone and usually requires legislation, “incentives can be started incrementally and are voluntary,” he said.

Moreover, systems based on incentives can offer a huge advantage in simplicity. Until recently, the Stanford system required sensors around campus to detect signals from radio-frequency identification tags that participants carried in their cars. But the need for such an infrastructure has vanished now that so many drivers carry smartphones with GPS chips or other locaters.

Administrators can use the network to set up a centralized Web-based service to manage any number of incentive campaigns.

“Through smartphones we’re getting more at ease about fine-grained information about space and time,” said [Frank Kelly](#), a mathematician at the University of Cambridge in England who specializes in traffic networks. “This is possible because information and communications systems are becoming cheaper and cheaper.”

[Samuel I. Schwartz](#), a transportation consultant and former New York City traffic commissioner, says a smartphone-based system is inevitable, though he predicts it will be used for congestion pricing as well as incentives.

“Ultimately we will be charged, or money will be added to our accounts, by using the cloud infrastructure,” he said. “It’s so precise that you will be able to charge people for how much of Fifth Avenue they use and for how long a period. In Christmas season you may decide to charge them \$10 to use Fifth Avenue for each block.”

In New York City, Mayor Michael R. Bloomberg’s [plan for congestion pricing](#) died in 2008 for lack of support from the state Legislature. [Pravin Varaiya](#), an expert on transportation systems at the University of California, Berkeley, said enforcement costs would have been “huge,” adding that “carrots, as opposed to sticks, frequently work very well.”

Still, [Charles Komanoff](#), a transportation expert who has designed a computer model of New York traffic, said he had reservations about such a system as an alternative to congestion pricing.

“The incentives will be far too small,” he wrote in an e-mail, adding: “You really do need big disincentives (big sticks). Little carrots won’t do the job of changing drivers’ decisions” in New York or in San Francisco.

Dr. Prabhakar said congestion pricing and his incentive system need not be mutually exclusive, and he noted that highway congestion was an example of “nonlinear” behavior, in which even a small reduction in vehicles at a given time — 10 percent or less — can have a big effect on traffic flow.

And conversely, added Dr. Kelly, the mathematician, “when the system is close to critical levels, very small increases in traffic can create time delays for everyone.”

Dr. Prabhakar’s experiments have offered different kinds of incentives, from airline-style reward points to lottery cash prizes. Now his system is poised to reach a much larger audience.

Singapore is considering a system he and his students designed that offers lottery participation or a fare discount to public transit riders who travel at off-peak times. A trial run begun in January lowered rush-hour ridership by more than 10 percent. (Given a choice between discounts and lottery, riders overwhelmingly chose the lottery.)

Bill Reinert, an advanced technology manager at Toyota, says incentives are no panacea. “Incentives the government gives you” to buy hybrid vehicles “are a good way not to establish markets,” he said. But he added: “Do incentives work? Yes. I fly 300,000 miles a year on United.”

The Stanford experiment adds a social network component to the lottery, in effect making it a game where friends can observe one another’s “good” behavior. The researchers say this tends to reinforce changes in behavior and individual commitment. Next fall, the university plans to expand the system to encourage people to park farther from the busiest parking structures.

The idea of using incentives to change social and personal behavior has grown increasingly popular. In their 2008 book "[Nudge: Improving Decisions About Health, Wealth and Happiness](#)," the economist Richard H. Thaler and the legal scholar Cass R. Sunstein argued that organizational structures could be created that guide people toward better behavior.

Dr. Thaler noted that variable tolls, like those used on the Hudson River crossings in New York at different times of day, "are clearly an attempt to shift people's incentives." Of traffic systems like Stanford's, he said, "this is just as efficient."

Dr. Prabhakar's first experiment was in Bangalore in 2008, when he created a system to encourage employees at the software company Infosys to choose different travel times to its suburban campus. The system significantly lowered congestion.

More recently, he worked with Accenture, a business services company, to set up a system that used pedometers to measure the number of footsteps more than 3,000 employees took each day, encouraging them to walk more for better health. The campaign, called "[Steptacular](#)," included a social network component and a Web-based game to add a random element to the incentives; it handed out \$238,000 in rewards.

Dr. Prabhakar said the power of his method was that only a small change could have a drastic effect.

"This is one of the nicer problems," he said. "You don't have to change everyone's behavior; in fact, it's better if you don't."