



MAPS

How Americans Really React to High Gas Prices

ERIC JAFFE DEC 01, 2011 22 COMMENTS



Americans love to gripe about high gas prices, but they actually pay some of the [lowest fuel costs in the world](#) [PDF]. Part of the reason for this hidden discount is that lawmakers have refused to raise the federal gasoline tax since 1993. In fact the tax has lost value over time, since it's not even indexed to inflation; it sits at a flat 18.4 cents per gallon. That's to say nothing of the unaccounted social costs of traffic or the environmental costs of pollution. If gasoline were priced fairly in the United States, one has to wonder whether or not America's love for driving would remain so bold.

That question is at the heart of a recent analysis conducted by Bradley Lane of the University of Texas at El Paso. Lane examined fluctuations in gas prices in 33 U.S. cities during a period stretching from January 2002 to March 2009. He then compared these changes to transit ridership patterns in the same cities over the same time. In all cities he looked at bus ridership, while in 21 places, including Los Angeles and Chicago and Washington, he considered rail travel as well.

All told, Lane found a pretty strong link between changes in gas prices and shifts in transit ridership. Every 10 percent increase in fuel costs led to an increase in bus ridership of up to 4 percent, and a spike in rail travel of up to 8 percent. These results suggest a "significant untapped potential" for transit ridership, Lane reports in an [upcoming issue of the *Journal of Transport Geography*](#). In other words, a significant part of America's love for the automobile may only be its desire for inexpensive transportation.

"Despite this being one of the most driving-oriented societies in the world, despite the fact that we have a lower national priority for transit than just about every developed society in the world, despite the fact driving is essentially free in our minds compared to any other mode, in some cities you still see some pretty large responses to gasoline prices," says Lane. "So despite the game being tilted totally in favor of auto use, gasoline price fluctuation in the past 7 or 8 years actually appears to have a pretty significant, consistent effect on limiting how much people drive."

Lane's analysis revealed two key relationships between gas prices and transit ridership. The first is what he calls an elasticity, which is essentially a behavioral response to an event. In this case the event is a change in gas prices, and the response is a shift in transit ridership. The second is what he calls a "lagged effect." That means that some elasticities — such as switching your commute from car to train — don't appear until several months after the initial change in fuel cost.

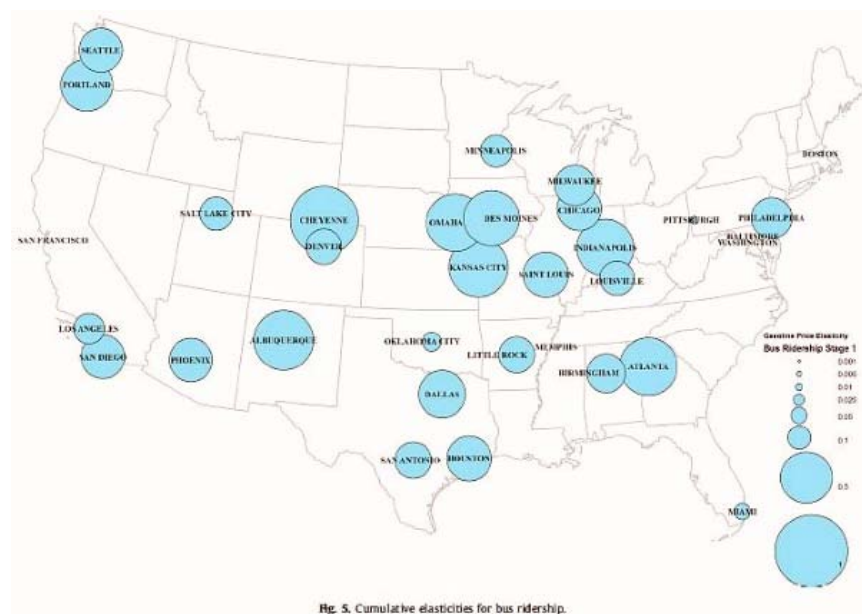
Take, for instance, the case of bus ridership in Atlanta. There Lane discovered three significant

behavioral elasticities at three distinct temporal lags. The first, which occurred at 0 months (or roughly the same time as the fuel hike), saw a roughly 20 percent jump in bus ridership. The second, coming at 6 months, saw a 32 percent transit rise, and the third, at 11 months, a 12 percent spike. Over the course of about a year, then, one major rise in fuel cost in Atlanta led to about a 64 percent rise in bus ridership.

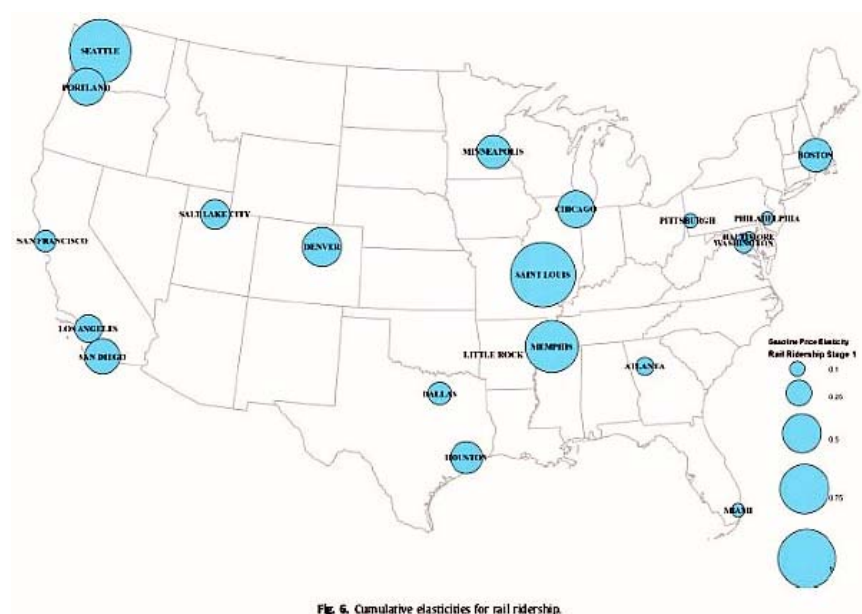
(Technical sidenote: Elasticity works both ways — so a drop in fuel costs would lead to a change the other direction, away from transit — but the important thing here is the direct connection between gas price and transit ridership. Lane did discover some negative elasticities, meaning an inverse relationship between fuel cost and ridership, but those were rare and possibly a limitation of the mathematical model.)

When Lane mapped the cumulative elasticities for each city in his study, he found some interesting patterns. Most notably, he found big behavioral responses to gas prices in places like Omaha, Des Moines, Kansas City, and Indianapolis — cities one typically thinks of as car-centric. "What that tells me is that there is actually a greater sensitivity to fluctuation of gasoline costs in cities that tend to be more auto-dependent," says Lane. "That to me is very interesting. People will go to transit even when there really isn't much transit to go to."

Here's the map for cumulative change in bus ridership in response to fluctuations in gas prices (the larger the circle, the greater the response to fuel costs):



And here's the map for shifts in rail transit:



The upshot of this analysis is a recognition that automobile use does not occur in isolation. It's strongly tied to both gasoline prices and the quality of the public transit system. Increase the first and improve the second, says Lane, and you may well find that America's love for the road is founded less on hard concrete than on an artificially soft market.

"We typically associate high automobile use in the U.S. with Americans' need to drive and love to drive. But ultimately there's a pricing and policy structure that enforces that," says Lane. "If we fully costed out some of the impacts on driving and had any inhibitions on car use — not to the level of inhibitions on public transit now; I'd never wish that on anybody — but simply had some way to make automobile travel more difficult and more expensive, and gave an alternative in the form of public transit or denser neighborhoods or shorter multimodal trips, then you could really see a pretty large change."

Photo credit: Reuters/Joshua Lott

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tominoakland

Professor Lane has demonstrated what most intuitively know. When there are decent transit options available, an increase in gasoline prices causes a decrease in driving. In CA when gas went over \$4 in 2008, the State reported an 8% decline in sales tax revenues from gasoline sales. However part of this was estimated to be from people driving their more economical vehicle rather than their gas hog.

Those commenters who deride the high cost of transit, ignore the massive subsidies given to highways. Some of these subsidies are hidden: the ability to write-off business auto use costs from state and local income taxes, or the mandatory off-street parking requirements of cities where 4 or 5 free parking spaces are required for each 1000 sq. ft. of new business. There is

no such countervailing transit pass requirement for bus riders. A parking space in a structure typically costs about \$30,000, and about half that for a space at grade, if space allows. What logical role do cities have in encouraging people to drive and park freely?



Westwoodnc westwoodnc

"That question is at the heart of a recent analysis conducted by Bradley Lane of the University of Texas at El Paso. Lane examined fluctuations in gas prices in 33 U.S. cities during a period stretching from January 2002 to March 2009."

I don't know why Lane decided to settle on these seemingly random dates for the study, since the Census keeps tabs of mode of transportation decennially. Between 2000-2010, when the decade saw a sustained double-digit percentage rise in oil prices, the share of single-occupancy vehicles commutes went up from 73.2% to 73.7% for the largest US metros. <http://www.newgeography.com/co...>



eric jaffe

Generally speaking studies of gas prices and transit ridership fall into two categories: brief case studies that look at a single city over a long period of time, or wide-ranging studies that look at many cities in a narrow time window. Lane had the chance to do both with this study of the 2000s for these 33 cities. How exactly that seems random, I'm afraid I don't follow.



Westwoodnc westwoodnc

They're random because he doesn't explain why he chose between January 2002 and March 2009. Is that hard to understand? You're not worried at all that he's cherry-picking dates that serves only to bolster his narrative? The census data is far broader than his case study and I'd defer to its findings than some professor from El Paso.



Geoff Green

Westwoodnc:

The ridership data which Lane uses comes from the FTA's National Transit Database, which requires all transit agencies which receive federal funding (basically, all of them) to provide monthly ridership data. NTD aggregates and distributes the data (it's available on its web site). However, the NTD data only goes back to January 2002 which is why I assume Lane's study begins at that point.

In any event, my memory is that gas prices did not fluctuate much in the ten years prior to 2002 (after the end of the first Iraq War). It's hard to find much of a correlation when the data doesn't show variation.



calwatch

It's meaningless because the Census data uses sampling, and the 2010 data is from the American Community Survey, a sampling taken over many months in time (rather than the 2000 long form). The point is to graph short and medium term increases in transit ridership, not long term changes in mode share - although VMT as calculated by FHWA

has also flattened and dropped over the past few years.



Westwoodnc westwoodnc

"Part of the reason for this hidden discount is that lawmakers have refused to raise the federal gasoline tax since 1993. "

I love this brain dead formulation. Let's not call it a Bush tax cut, it's the Bush hidden discount.



billwald

Keep in mind that most public transportation is 80% subsidized. If bus riders had to pay the true cost of their ride . . . I don't think city transit systems (in WA State) even pay the state sales tax.



billwald

Gas is subsidized in some OPEC and some 3rd world nations. How is gasoline subsidized in the USA?



Ben Mummert

Keep in mind that automobiles are heavily subsidized--gasoline is subsidized and highways are provided free by federal government. The consequences of auto dependence are externalized.



billwald

How is gas subsidized in the US?



calwatch

How much of our national defense is as a result of our use of oil? If you did what Ron Paul wants, and had us withdraw from Afghanistan, Iraq, and the Middle East immediately, we could save hundreds of billions of dollars. Were it not for the dependence on oil, we could just let the Europeans and Japanese deal with it, but instead the US takes the lead.



billwald

OK, agree. I was thinking of a more direct subsidy. There should be at a \$1/gal war tax on gasoline and diesel fuel.



sanchezjb

What about urban population increases? That doesn't appear to be addressed in this study. As an example, the city of Atlanta, cited in this article, had a 29% population increase from 2000 - 2010. See <http://www.city-data.com/forum....> Such an increase would likely also provide an increase in the use of public transportation. Yet, the only relationships discussed in this article (and the study?) are the relationships between gas prices and transit ridership. Another variable, amongst others, that should be addressed is population growth.



TheAnonymouse

The fact that the US taxes gasoline at a rate that isn't as high as some other countries is not a "discount." This is a rhetorical trick on par with claiming that you're "cutting" spending when what you're actually doing is slowing the rate of increase in spending. (As a Californian, I get to hear these little verbal ploys every day.)

The quote at the end really says it all: if we "had some way to make automobile travel more difficult and more expensive [...] then you could really see a pretty large change." If we can't come up with ways to promote public transit _on its own merits_, that's very telling. The just solution is to find a way to make public transit alluring, not by punishing drivers out of their cars.



eric jaffe

Strange that you would interpret this report as an attempt to "punish" drivers out of their cars. On the contrary, it argues that many drivers will gladly make the exchange when circumstances are right.



TheAnonymouse

This driver certainly would make the exchange, when the circumstances are right.

I don't think we disagree as much as my earlier (grumpier) post might make it sound. From what I see, there are two separate issues being discussed: (1) is increased public transit a good thing? and (2) if it is, how do we go about creating it?

As to the former issue, I would probably agree with you: it can be a good thing. For the obvious environmental reasons, for political reasons (namely, reducing dependence on a substance largely controlled by regimes hostile to the US), and maybe for quality of life reasons. (I suspect we would disagree on this last bit, as I prefer a rural lifestyle over a dense cosmopolitan one, but it's a fair disagreement.)

As to the latter issue, well, isn't that the perpetual sticking point? I would like to see local government out of the public transit arena altogether; since the for-profit MegaBus line came to my city, I have purchased tickets on several occasions for trips to a different metro area in a different county for prices less than a one-way ticket across downtown on my public bus! I recognize that in cities that aren't New York or San Francisco public transport faces a tough dilemma: lower prices, increase ridership, and realize that the well-off are going to stay in their cars; or raise prices, raise the quality of service, and realize that the lowest-end customers are going to be priced out of the market. However, historically this is the sort of problem that the market loves to fix, and that central planners usually get wrong.

I do not claim that you wish to punish drivers out of their cars, but Mr. Lane's comments ("some way to make automobile travel more difficult and more expensive") make it hard to read his intention any other way. Mr. Lane and

yourself make a giant leap in moving from the descriptive "higher gas prices tend to increase ridership" to the prescriptive "let's raise taxes on gasoline." The latter policy choice follows from the former observation if and only if one already has an agenda that demonizes cars and lionizes public transit. I admit that artificially raising the cost and difficulty of driving is a valid public policy choice; however, I do not agree with that choice.

I'm not a policy planner, nor do I wish to be. I'm a working stiff who pays his taxes and desires transportation that is relatively cheap, maximizes my productive day, is flexible as to multiple destinations, and minimizes taxation. I know that we cannot achieve perfection on all these counts. However, at the present time, driving my own car best fits those desires. I am not against public transit, but I'm not going to go back to using it unless a) I have to, or b) it becomes a more attractive choice than my car, based on those criteria. What I do resent is people (not necessarily you, Mr. Jaffe) who are all stick and no carrot: lure me onto the bus, don't force me with more taxes.



Racaille

"In other words, a significant part of America's love for the automobile may only be its desire for inexpensive transportation."

This maybe true based on the fact that Americans are not, for the most part, financial oracles. But the forcing-function for most people who refuse to ride the bus, subway or rail is the idea that public transit is for poor people.

Mr Barnett says:

"Newer suburban and exurban employment centers are not typically well- served by transit, even in "good transit" cities like Chicago and Philadelphia."

And that's why suburban business campuses are dead money.



Chris Barnett

All "sunk costs" are "dead money": the buildings, roads, and jobs are already there. There are a lot of them. Brookings has documented well the increasing "job share" of non-downtown business centers.

There is no cost to an enterprise to stay put once it moves to a suburban location. There may not be a lot of NEW demand, but increasing energy costs won't drive any businesses out of those locations back to downtowns. So existing office parks aren't likely to dry up and blow away like suburban malls.

Consider also that office-park location decisions are often made by suburbanites who want the office closer to home, shortening the commute, with "free" parking that saves the company money at the end of the trip. In some metros, moving out of the core county also saves wage tax. Such decisions can even be rationalized (some might say greenwashed): "We're moving our offices closer to where the majority of our employees live...it will reduce commuting cost, VMT and expressway congestion."

So there is still some apparent incentive at the level of the firm, even with higher gasoline prices. And I won't even get into "economic development strategy" (tax giveaways) that are yet another thumb on the scale in weighing location decisions.

I don't see these other factors changing soon, so I am not nearly as convinced as Racaille seems to be that suburban business campuses are dead in any time frame shorter than 30-50 years, which is longer than most real-estate investors' time horizon.



Wendy Waters

Enjoyed this article and I'm glad to see some evidence that transit might be more used if driving were not so cheap.

But this evidence is likely very worrying to the US automotive sector, and I wonder if more lobbying will happen in Washington DC related to this.

Here's what I mean. They will say that what's good for General Motors and American car manufacturers has been good for America. Government-funded roads and cheap gasoline fueled an automobile industry that created a lot of jobs. You could even argue that along with the military spending, this was a backbone of the US economy.

This evidence suggests that if gasoline prices continue to rise, fewer people will drive which means a lower demand for cars. This will exacerbate US economic woes.

While some (including me) might argue that it is a sign that the US needs to focus on creating a fertile environment for new, post-industrial economic growth--others will say the opposite, and gas prices need to come down to give the US economy a boost.



Chris Barnett

Several key points in response regarding "auto-dependent cities": 1) In the case of such cities, the numerical transit ridership base is so low that a relatively small numerical change in ridership presents as a large percentage change. But such a change barely moves the needle on trip share. This is a serious problem with basing the mathematical elasticity relationship on percentage change in ridership. A better measurement of behavior change would be the change in trip-share from auto to transit with each \$X.xx change in gasoline price, which would allow policy-makers to understand how much gasoline prices would have to rise to achieve a target transit share.

2) Ridership in auto-dependent cities tends to be people with no other choice, i.e. those unable to afford to buy and run an automobile. As time passes after gas prices rise, more people driving clunkers will fall into that "no other choice" group as the increased cost of gasoline prevents them from fixing/maintaining the car properly. This probably accounts for a chunk of the observed time-lag effect.

3) Any program of "forcing people out of cars" would have to face the structural issue of employment location. Newer suburban and exurban employment centers are not typically well-served by transit, even in "good transit" cities like Chicago and Philadelphia. In car-dependent cities, the problem is worse. Transit systems in such cities have only so much existing "slack" capacity and won't achieve growth past a certain point without adding routes (which means capital equipment and operators). This isn't free.



Geoff Green

Chris: On first thought, I agree that switch in mode share would be a better metric, because that would, in a sense, automatically correct for confounders such as increase in population. However, each transit agency provides detailed, and reasonably accurate, data regarding ridership on a monthly basis. There is no such data for automobiles or for general mode share. So it would be challenging to do.

