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Political Incentives and Transportation Funding

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Abstract

This paper examines the incentives politicians face when deciding on the level and allocation of government transportation infrastructure spending. I conclude that transportation infrastructure spending is highly inefficient and often driven by political rather than economic forces.

Research shows that transportation project costs are significantly underestimated and traffic flows tend to be overestimated. These errors are large and are not random, suggesting they are deliberate in order to get projects started. Furthermore, federal highway funding is excessive and misallocated across states. Project benefits are concentrated in a state or district whereas tax costs are spread out nationwide. As a result, legislators embrace inefficient transportation projects because district or state voters do not pay the full project cost. Projects move forward even when the total cost of the project exceeds total benefits. Also, funding committee membership and vote trading distorts decisions. Finally, government barriers slow the adoption of new technologies. This is less likely to occur when the performance advantage of the new technology is large and the costs of lobbying are high. When jitneys threatened city railroads in the early part of the 20th century, incumbents with a financial stake successfully lobbied city officials to stop the new transportation option. These same forces are at work today as local ride-sharing options and driverless cars threaten the financial interests of incumbent firms.

Possible reforms include comparing potential project costs and benefits to completed similar projects to assess the accuracy of predictions of cost and demand, shifting highway financing to state and local governments, deregulating highway pricing to allow for variable pricing to reduce congestion, and expanding the private sector's role in the transportation system. The federal government should resist the temptation to dictate which new transportation project will succeed.

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1. Introduction

The transportation sector represents a large part of the U.S. economy. Its share of the economy equals approximately 17 percent of gross domestic product.[1] An efficient transportation system is a precondition for a strong economy.[2] The transportation system plays two important roles. First, it provides mobility, improving employment opportunities and leisure activities. Second, it plays a central role in facilitating domestic and international commerce.

Unfortunately, the U.S. transportation system underperforms. Serious congestion problems face most major cities. This results in longer travel times and higher emissions. One estimate is that time wasted sitting in traffic, additional air pollution, and politically driven transportation spending reduce welfare by about $100 billion annually.[3] Much of the nation's highway infrastructure is past its design life. There is insufficient capacity to serve growing areas.[4] Reducing highway congestion, providing adequate road capacity, and maintaining existing roads should be the top priories for government infrastructure spending. However, congestion and maintenance problems persist despite massive infrastructure expenditures by federal and state governments. Policy decisions are driven by politics rather than by efforts to actually improve the country's transportation infrastructure.

This paper examines the political economy of U.S. transportation infrastructure decision making. Emphasis is placed on the incentives that influence elected officials when they decide on the level and allocation of government infrastructure spending. First up is a discussion of the biases in project cost-

[1] Winston, Clifford. 2013. "On the Performance of the U.S. Transportation System: Caution Ahead." *Journal of Economic Literature* 51, no. 3, 773-824.
[2] There is a large literature evaluating the economic impact of infrastructure spending. See Robert Krol. 2014. "Infrastructure and Economic Development." *Encyclopedia of Public Administration and Public Policy*. Melvin Dunick and Domonic Bearfield eds. Taylor & Francis Group, NY, NY 10017 or Alfredo M. Pereira and Jorge M. Andraz. 2013. "On the Effects of Infrastructure Investment." *Journal of Economic Development*. 38 no. 4, 1-37.
[3] See Winston (2013) footnote 1.
[4] Poole, Robert W. Jr. 2013. "Interstate 2.0: Modernizing the Interstate Highway System Via Toll Finance." Reason Foundation Policy Study, no. 425.

benefit analysis. The next section explains how legislative voting and institutional problems result in a misallocation of transportation funds. The last section focuses on government actions that block new technologies that could improve the transportation system.

2. Can we Trust Project Cost-benefit Projections?

Politicians have limited funds to finance a long list of potential transportation infrastructure projects. Priority should go to high-return projects. In principle, analysts are expected to apply an objective cost-benefit analysis to each project in order to determine its net economic impact. Once this analysis is complete, projects can be ranked and only projects with the highest positive net benefits should be selected. For this approach to work, decision makers must have objective and unbiased estimates of all project costs and benefits.[5]

How confident can we be that projects are evaluated in an objective fashion? The following quote should worry any taxpayer. In response to the $300 million cost overrun for the Transbay Terminal in San Francisco, Willie Brown, a former Speaker of the California Assembly and former Mayor of San Francisco wrote,

> "We always knew the initial estimate was way under the real cost. Just like we never had a real cost for the Central Subway or the Bay Bridge or any other massive construction project. So get off it. In the world of civic projects, the first budget is really just a down payment. If people knew the real cost from the start, nothing would ever be approved. The idea is to get going. Start digging a hole and make it so big, there's no alternative to coming up with the money to fill it in."[6]

Is San Francisco an outlier, or is it common practice to systematically under-estimated project cost and, perhaps, over-estimate project benefits? We do not need to rely on quotes from politicians.

[5] Small, Kenneth A. 1999. "Project Evaluation." In *Essays in Transportation Economics and Policy*. Jose Gomez-Ibanez, William B. Tye, and Clifford Winston eds. The Brookings Institution, Washington, D.C.
[6] Brown, Willie, SFGATE, *San Francisco Chronicle*, July 27, 2013.

Researchers have examined transportation projects across many countries and time periods. The results are disturbing.

Flybjerg, Skamris Holm, and Buhl compare the actual cost of a transportation project at the time of completion with the estimated cost at the time the decision to build was being made. They examined 258 transport projects worth $90 billion built in North America, Europe, and other regions of the world over the last 80 years. They found significant cost overruns suggesting cost estimates produced large cost errors.[7] Average figures are reported in Table 1.

Table 1 – Transportation Project Cost Overruns

Project Type	Number of Projects	Average Cost Overrun (%)
Rail	58	44.7
Fixed-link	33	33.8
Road	167	20.4
All Projects	258	27.6

Source: Flyvbjerg et. al. (2002) page 283.

The results reported in Table 1 show the average cost overrun was nearly 28 percent. Rail, especially high-speed, had the largest cost overrun of almost 45 percent and roads had the lowest overrun of around 20 percent. There appeared to be little difference between the U.S. and European errors. Given that the sample included cost estimates for projects built before World War II, we would expect the development of computers to have improved cost estimates. However, there is no improvement in the more recent cost estimates. The authors conclude that these large and systematic errors were made intentionally to mislead voters.

[7] Flyvjerg, Bent, Mette Skamris Holm, and Søren Buhl. 2002. "Underestimation Costs in Public Works Projects." *Journal of the American Planning Asociation*. 68 no. 3, 279-295.

The same authors also examined the accuracy of traffic flow forecasts. They examined 210 rail and road projects, in 14 nations worth a total of $58 billion built from 1969 to 1998.[8] They compare the actual traffic in the first year of operation with the original forecast. Table 2 reports their results on the size and distribution of the traffic forecast errors. The forecast error is calculated as the percentage difference between actual and estimated traffic flow. A negative error indicates the forecast exceeded the actual traffic flow and was overly optimistic.

Table 2 – Transportation Traffic Forecast Error Size and Distribution

	Rail	Roads
Average Error (%)	-51.4	9.5
Percentage of projects with inaccuracies > ± 20%	84	50
Percentage of projects with inaccuracies > ± 40%	72	25
Percentage of projects with inaccuracies > ± 60%	40	13

Source: Flyvbjerg et. al. (2006) page 11.

The average project forecast error reported in the first row indicates rail traffic was overestimated by 51.4 percent. Road forecasts underestimated traffic flows by about 9.5 percent. The underestimate of road traffic may have been intentional. Forecasting lower road traffic flows would make the construction of roads less attractive (lower benefits). If politicians prefer, for environmental reasons, to get commuters out of their cars and into rail systems, then underestimating road benefits might serve their purpose.

[8] Flyvberg, Bent, Mette K. Skamris Holm, and Søren L. Buhl. 2006. "Inaccuracy in Traffic Forecasts." *Transport Reviews*. 26 no. 1, 1-24

The remaining table entries illustrate the distribution in traffic flow forecast errors. The entry in Row 2, Column 2 indicates that 84 percent of the rail traffic forecast errors were greater than 20 percent. Notice that 40 percent of the rail projects had forecast errors greater than 60 percent.

Button and Chen compare traffic forecasts for 26 U.S. highway projects for the period from 1986 to 2004.[9] Because four of these projects were public-private partnerships, they ask whether having a greater private sector role in the evaluation stage of a highway project reduces traffic forecast errors. They found both types of ownership overestimated actual traffic flows five years into the future. However, public-private partnership errors were about half the size of the public forecast errors. This suggests expanding the role of the private sector could potentially reduce the size of the forecast errors, since private investors are risking their own funds. However, since the number of public-private partnerships in the sample is small, it would be a mistake to draw a strong a conclusion.

Bain looked at traffic flow errors in private forecasts. He examined traffic flow forecasts of 100 privately financed toll roads, tunnels, and bridges built between 2002 and 2005.[10] He found the forecasts overestimated traffic flows by an average of 23 percent. This suggests, in addition to the political forces that bias forecasts, making these projections are difficult even when undertaken by private individuals risking their own resources. A healthy dose of skepticism concerning the accuracy of these forecasts is needed for both taxpayers and financiers.

Forecasting the cost of building and the demand for large transportation projects is difficult. In order to accurately estimate future costs, ridership, and traffic flows, analysts must correctly project economic growth, demographic trends, and inflation. Clearly, forecasting costs and traffic flows result in large errors. There is a strong tendency to underestimate project costs for most transportation projects.

[9] Button, Kenneth and Zhenhua Chen. 2014. "Demand Forecasting Errors and the Ownership of Infrastructure." *Applied Economic Letters*. 21 no. 7, 494-496.
[10] Bain, Robert. 2009. "Error and Optimism Bias in Tollroad Traffic Forecasts." *Transportation*. 36 no. 5, 469-482.

Most traffic flow forecasts are overly optimistic. If the forecast errors were random and did not persistent over time, we could conclude that the errors are the result of technical issues and the general uncertainty associated with trying to project the future. The fact that these errors persist over time suggests errors are deliberate. Politicians and special interest groups (construction unions and companies, engineering firms, and bureaucrats) have effectively captured the process. Consistent with the earlier quote from Willie Brown, it appears that politicians want to get the project started and think funding will somehow follow. While politicians pretend that the estimates have been done in a scientific way, in reality, they are a "strategic misrepresentation."[11] Transportation expert Martin Wachs drew a similar conclusion. He argued the estimates are presented to the public as scientific and unbiased, but are actually intended to get the project started for political gain.[12]

Many government agencies have forecasting responsibilities. When we evaluate a forecast, we look for unbiased forecasts or biases that do not persist over time. In a political setting, whether it is forecasting the growth rate of the economy as part of a revenue projection or estimating project costs and benefits, the analyst's projections are likely to be influenced by politicians and their appointed administrators. They are going to face pressure to bias the forecast in a direction that favors the objectives of the elected officials they serve. An analyst's pay and possible future job opportunities may depend on how closely they play along. While the analyst's professional reputation serves as a check on this process, it appears that political pressures dominate the process. The strength of the political

[11] See Flyvbjerg et. al. (2002) page 229, footnote 7.
[12] Wachs, Martin. 1990. "Ethics and Advocacy in Forecasting for Public Policy." *Business and Professional Ethics Journal*. 9 no. 1-2, 141-157.

pressure depends on how politically insulated analysts are from elected officials. The greater the insulation, the less the political pressure to bias projections.[13]

It is likely that we cannot completely eliminate the political pressure to bias projections in the direction preferred by interest groups and politicians. The payoffs to politicians and interest groups is simply too high to ignore. However, there are some reforms that could improve cost-benefit estimates for transportation infrastructure projects. First, any cost-benefit calculation should be subject to outside peer review.[14] A group of specialists at universities not directly involved with the project can review the analysis. This appears to have improved the revenue forecasts of the Congressional Budget Office and budget agencies outside the U.S.[15] Second, Flyvberg suggests it would make sense, where possible, to compare estimates of costs and traffic flows with actual outcomes of completed projects of comparable size under similar economic and demographic conditions.[16] If there is a sample of comparable projects, a distribution of outcomes can be constructed. Then, the estimates for the new project can be compared with previous outcomes of similar projects. This process could help establish the degree of confidence we should have in the estimates. Making this public would provide the taxpayer with a basis to decide whether or not the projections seem reasonable. Third, each cost and benefit estimate should be calculated using a range of possible assumptions. For example, what happens to the benefit-cost ratio when you use an alternative discount rate? How sensitive are your estimates to variations in key assumptions, such as economic growth rates? Are the estimates robust?[17] Finally, to generate the

[13] Krol, Robert. 2013. "Evaluating State Revenue Forecasting under a Flexible Loss Function." *International Journal of* Forecasting. 29 no. 2, 282-289. and Robert Krol. 2014. "Forecast Bias of Government Agencies." *Cato Journal*. 34 no. 1, pages 99-112.
[14] See Small (1999) footnote 5.
[15] See Krol (2014) footnote 13.
[16] Flyvbjerg, Bent. 2009. "Survival of the Unfittest: Why the Worst Infrastructure gets Built-and What we can do About It." *Oxford Review of Economic Policy*. 25 no. 1, 344-367.
[17] See Small (1999) footnote 5.

right incentives, tie an analyst's salary or bonuses to the accuracy of his or her cost and benefits projections.

3. Legislative Voting Practices and Institutions

Voting Practices

Transportation infrastructure in the U.S. is financed using federal, state, and local funds. The largest source of funding is the Federal Highway Trust Fund. For every dollar spent by a state on transportation infrastructure construction and maintenance, depending on the time period, between $.80 to $.90 is federally funded. These funds come with regulations and constraints dictated by Congress. Congress reauthorizes funding and spending priorities of the Trust Fund every five years although political wrangling can delay the reauthorization. The allocation of funding across states is set by a congressionally-determined formula that depends on state characteristics. That does not imply a lack of discretionary power for the members of Congress. In addition to devising the formula, approximately one-third of recent appropriations from the Highway Trust Fund have been allocated for earmarks and non-road expenditures by Congress.[18] Ultimately, it is Congress that determines the amount and allocation of funds included in the reauthorization bill.

A justification for giving the federal government a large role in the provision of local public goods, like transportation projects, is the presence spillover benefits. This means that some of the benefits from a particular project, such as a road, are captured by individuals who live outside a particular political jurisdiction. If all transportation spending were to be financed by local taxes, some individuals would benefit from a road without paying. The total cost of the road may equal the total benefits including those that accrue to non-tax-paying users, but because the community where the

[18] Utt, Ronald D. 2011. "Next Highway Reauthorization Bill Should Terminate the Transportation Enhancement Program." Heritage Foundation WebMemo no. 3407.

road is located doesn't capture all of the benefits, it may not build some economically worthwhile roads. Because of these benefit spillovers, all communities would spend less on transportation and the nation would not have a road system that would maximize economic welfare. Using federal revenues to finance the bulk of road construction solves the problems created by benefit spillovers.

An alternative solution to the benefit spillover problem is to charge a toll to use a major highway. Then all users contribute to financing the road and the federal role in financing roads could be eliminated. Local streets can be financed by general taxes imposed by the town or city. Of course, politicians in Washington prefer to dole out pork barrel transportation projects to garner campaign contributions.

A relevant question is whether benefit spillovers are very large. Gramlich argued that the size of the benefit spillovers are estimated to equal around 30 percent, suggesting a smaller role for the federal government in financing highways.[19] As we will see, allowing Congress to vote on transportation spending to solve the benefit spillover problem creates other inefficiencies in the process that significantly outweigh any likely spillover problems.

Legislative voting on federal highway spending is problematic because funds for local projects come from a common pool of funds. The benefits from a transportation project are concentrated in the area that receives the funds, while the costs are spread out over the entire nation. This creates an incentive to overspend as recipients do not bear all the costs.

Unfortunately, having the federal government play such a major role in financing the transportation system results in the construction of many non-economic transportation projects. Voters in a community and their political representatives will want to build any project for which the benefits

[19] Gramlich, Edward. 1994. "Infrastructure Investment: A Review Essay." *Journal of Economic Literature*. 79 no. 3, 1176-1213.

exceed the community's ***share*** of the cost. This bias can result in projects where the total cost of the project exceeds the community's total benefit, implying the project is a net loss to society. Projects like this get built because the community only pays a part of the cost, rather than the full cost. If the town was footing the project's entire cost, it would be less inclined to build the project. This kind of thinking drives the voting of the representatives in Congress. As a result, the level and distribution of transportation spending does not maximize economic welfare and is inefficient.

Knight examined transportation project voting in Congress.[20] Knight argues that a legislator is more likely to support transportation project spending as the number of projects in the district increases. This is balanced against a desire to limit the total tax burden ultimately paid by voters. In other words, as the number of own-district projects increase and the number of projects elsewhere declines, the legislator is more likely to vote for the bill.

Between 1998 and 2003, the U.S. House of Representatives voted on 1653 transportation projects worth $9.5 billion. Knight found, and this should come as no surprise, that higher district spending had a positive impact on voting "yes" while higher total spending negatively impacted support for a bill. He found no evidence of spillover effects; projects in districts with a common border did not get more support. This is additional evidence that spillover benefits tend to be small and the federal government should play a smaller role in financing highways. He also found that districts with members on the Transportation Authorization Committee received three times more funding than other districts.

Knight tried to determine whether the total level of transportation spending maximizes economic welfare. Consumer welfare is greatest when funds are allocated across projects so that for the last dollar spent, the benefits (the social marginal benefit of a project) equal the tax cost (the social

[20] Knight, Brian. 2004. "Parochial Interests and the Centralized Provision of Local Public Goods: Evidence from Congressional Voting on Transportation Projects." *Journal of Public Economics*. 88 no. 3, 845-866.

marginal cost). Knight found national marginal costs exceeded national marginal benefits, so national economic welfare would increase if the U.S. were to spend spent less on transportation. He estimates the welfare loss of the excess spending at $7.2 billion annually. While most politicians and commentators argue we need to spend more on transportation infrastructure, these results suggests we should not and that we should rethink the allocation of funds among the states.

Logrolling can also distort transportation spending decisions in Congress. In order for committee leaders to pass a transportation bill, they must garner support from 50 percent of the legislature. Diana Evans examines this issue by looking at how highway demonstration projects influenced the vote on the 1987 transportation bill.[21] At the time, due to the recent completion of the Interstate Highway System, there was opposition to additional transportation funding. To insure passage of the bill, committee leaders allocated demonstration projects to increase support. House leaders provided 100 of these projects to 76 House members and the bill passed. In her statistical work, Evans found that members who received a demonstration project in their district were more likely to support the transportation bill. The process of logrolling can result in higher levels of spending, in this case as part of a transportation bill, to insure passage of a bill facing legitimate opposition. In addition, the demonstration projects were allocated to buy votes, and not because the projects made any economic sense.

The complications brought on by the democratic process to determine transportation infrastructure spending is not unique to the U.S. Research shows similar political forces plague spending decisions in other developed countries, including France, Spain, Canada, and Norway. Researchers have found lobbying efforts by interest groups and re-election incentives cause politicians to allocate transportation and other infrastructure spending for political reasons, rather than based on the return

[21] Evans, Diana, 1994. "Policy and Pork: The Use of Pork Barrel Projects to Build Policy Coalitions in the House of Representatives." *American Journal of Political Science*. 38 no. 4, 894-917.

from the project.[22] A study by Keefer and Knack examined a large cross section of developing countries for the period from 1974 to 1998.[23] They find government corruption and non-competitive elections result in higher levels of infrastructure spending on generally low return projects. They conclude that much of this spending is not productive. Instead, the spending steers benefits to government officials or their cronies. They point out that infrastructure spending is not likely to be a driver of economic development in countries with low quality political environments.

Institutions

Political Institutions, such as election rules or term limits, also influence infrastructure spending. Dalenberg and Duffy-Deno investigate the impact of election rules on infrastructure spending using U.S. city level data.[24] They argue that outcomes will differ if local officials are elected city-wide rather than by voters in smaller communities (as in a ward system). As with federal funding, in a ward or council district system, infrastructure funding comes from a common pool of tax revenues. In this situation, a portion of the higher taxes associated with infrastructure spending in one ward comes from voters in other wards. Local politicians weigh the increase in support associated with an infrastructure project against the lost votes associated with higher taxes. In a ward system, because part of the cost of a ward-specific infrastructure project is spread out over the entire city, city council members are more likely to support local infrastructure spending. The result should be a higher overall infrastructure stock in the city because of the election structure. Dallenberg and Duffy-Deno look at a sample of 30 cities

[22] See Cadot, Olivier, Lars-Hendrick Röller, and Andreas Stephan. 2006. "Contribution to Productivity or Pork Barrel? The Two Faces of Infrastructure Investment." *Public* Choice. 90 no. 6-7, 133-1153, Solé-Ollé, Albert. 2013. "Inter-regional Redistribution Through Infrastructure Investment: Tactical or Programmatic?" *Public Choice*. *156* no. 1-2, 229-252, Joanis, Marcelin. 2011. *Public Choice*. 146 no. 1-2, 117-143, and Fiva, Jon H. and Gisle James Natvik. 2013. *Public Choice*. 157 no. 1-2, 305-331.

[23] Keefer, Philip and Stephen Knack. 2007. "Boondoggles, Rent Seeking, and Political Checks and Balances: Public Investment under Unaccountable Governments." *Review of Economics and Statistics*. 89 no. 3, 566-572.

[24] Dalenberg, Douglas R. and Kevin T. Duffy–Deno. 1991. "At–Large Versus Ward Elections: Implications for Public Infrastructure." *Public Choice*. 70 no. 3, 335 – 342.

during the period from 1960 to 1981. They found cities with ward elections had a higher infrastructure stock than cities with city-wide elections. In this case, the political structure of the city, may override the economic merits of infrastructure spending.

Political institutions, such as term limits, leave current policies open to change because the next government might have different priories. To constrain the next administration, current politicians may choose durable infrastructure projects that lock in place their own spending priorities. High tax and debt levels used to fund infrastructure projects limit a future government's ability to expand in other policy areas. Crain and Oakley test this hypothesis using state level data for the period from 1978 to 1988.[25] They found the absence of term limits, a stable majority political party, and a biennial budget all increase political durability and significantly lower the public capital stock of U.S. states. They also found higher public capital stock in states where voters had access to an initiative system and where the capital budget is separate from the general fund. These results show that institutional factors outside of project costs and benefits influence infrastructure spending in the U.S.

Transportation infrastructure spending decisions are made in a political environment. Reforming government to more effectively allocate transportation spending remains a daunting challenge. Since transportation spillover benefits are modest, the ideal reform would be to end the federal gasoline tax used to fund the Highway Trust Fund.[26] Each state could then decide on an appropriate funding approach given its transportation system goals. The state would make better decisions because it would bear the costs and capture most of the benefits from any transportation

[25] Crain, W. Mark and Lisa K. Oakley. 1995. "The Politics of Infrastructure." *Journal of Law and Economics*. 38 no. 1, 1-17.

[26] Ending the federal gasoline tax introduces another problem. Using fossil fuels produces air pollution. One argument for taxing gasoline consumption, independent of financing highways, is to internalize the negative externality from consuming gasoline. See Parry, Ian W. H. and Kenneth A Small. 2005. "Does Britain or the United States have the Right Gasoline Tax?" *American Economic Review*. 95 no. 4, 1276-1289, for a discussion of this issue and provides an estimate of the optimal gasoline tax.

project. Better decisions will be made when the political entity bears the full cost of a project. California's plans for a bullet train would fold without federal funding as the benefits do not outweigh the cost.

Alternatively, if elimination of the Highway Trust Fund is not possible, funds should be transferred to states as a fixed block grant. While there are political problems with allocating funds at the state level as well, there is a greater chance that the funds would be better allocated. It is also important to end regulations that dictate how funds are used. For example, states should not be forced to build new capacity if maintenance spending provides a higher return. States should be free to use congestion tolls on interstate highways to improve the efficient use of existing roads. The increase in efficiency would be significant.

Congestion pricing would give states and cities better information about their highway needs. In some cases, the reduction in congestion would eliminate the need to add lanes to highways. The current funding system takes a build-your-way-out-of-congestion approach. That is, the solution to congestion problems is to build more highways. Adding highway lanes increases traffic volume, but fails to solve the congestion problem.[27] Furthermore, it is impossible to determine the efficient level of highway spending when the price for driving is zero. Observing consumption at prices that reflect the cost of additional construction allows policy makers to assess whether additional roads make economic sense. Another option is to expand the role of the private sector in funding, building, and managing transportation infrastructure. This would generate experimentation that could improve the efficiency of the system.

4. Innovation in Transportation

[27] Duranton, Gilles and Matthew A. Turner. 2011. "The Fundamental Law of Road Congestion: Evidence From US Cities." *American Economic Review*. 101 no. 6, 6-56.

Do Governments Impede Innovation?

Transportation innovation has been driven by new technologies. Wireless communication has allowed Uber and Lyft to directly compete with traditional taxicab companies, providing more flexible, cheaper, and higher quality local transportation. GPS and other complementary technologies have led Google and automobile manufacturers to develop driverless cars. Driverless cars can be expected to increase mobility for the young and old and change the way products are shipped. Infrastructure investments must take this into account to avoid expensive construction that will result in excess capacity.

Despite these welfare-improving transportation developments, companies that make use of existing technologies are likely to resist change. They may lobby government officials to limit or at least slow the adoption of these new transportation modes. Governments will face strong political pressures. The best course for government is to step aside to allow the entrepreneurial, competitive process to play itself out. Expect a dramatically different and more efficient transportation system in the 21st century.[28]

Technological change is an important driver of economic progress. Across countries there are wide differences in standards of living. We now know that differences in property rights, the rule of law, and the general quality of a country's government plays a key role in explaining differences in living standards. Government institutions and policies can either facilitate or hinder the creation of an

[28] See Thierer, Adam and Ryan Hagemann. 2014. "Removing Roadblocks to Intelligent Vehicles and Driverless Cars." Mercatus Working Paper, Anderson, James M. et al. 2014. "Autonomous Vehicle Technology: How to Best Realize its Social Benefits." Rand Corporation *Brief*, and Fagnant, Daniel J. and Kara M. Kockelman. 2013. "Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers, and Policy Recommendations." Eno Center for Transportation.

environment that is conducive to innovation and economic progress for the overall economy or a particular sector like transportation.[29]

Historical experience and empirical studies show that governments pick winners and losers based on the potential political gains. The usual justification for government regulatory action is that the market fails to allocate resources appropriately. Some governments have chosen to restrict entry ostensibly to assure product quality and environmentally friendly production processes. However, a study by La Porta, Lopez-de-Silanes, and Sheifer of 85 countries finds entry restrictions to be associated with greater corruption, a larger underground economy, lower product quality, and higher levels of pollution. Consumers do not gain. Instead, the entry regulations benefit politicians, bureacrats, and existing firms.[30]

In a similar vein, Cole, Ohanian, Riascos, and Schmitz try to determine why Latin America's standard of living is so much lower than that of the U.S. They test whether the income gap is the result of differences in human capital or inefficient production. They find the income gap is not explained by human capital differences but is caused by international and domestic entry barriers that result in inefficient production and slow productivity growth. They estimate entry costs in Latin America to be equal to 80 percent of per capita GDP compared to only 1.7 percent per capita GDP in the U.S.[31]

It is common for governments to impose policies that restrict entry slowing innovation and productivity growth, important engines of economic progress. Owners of incumbent businesses

[29] Boettke, Peter J. and Christopher J. Coyne. 2003. "Entrepreneurship and Development: Cause or Consequence?" *Advances in Austrian Economics*, Volume 6, 67-88.
[30] La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2002. "The Regulation of Entry." *Quarterly Journal of Economics*. 117 no. 1, 1-37.
[31] Cole, Harold A., Lee E. Ohanian, Alvaro Riascos, and James A. Schmitz. 2005. "Latin America in the Rear View Mirror." *Journal of Monetary Economics*. 52 no. 1, 69-107.

establish relationships with key elected officials and have been successful in slowing the adoption of new technologies.[32]

Comin and Hobijn have investigated the factors that influence a government's ability and willingness to slow the adoption of new technologies.[33] They examined the speed of adoption of 20 technologies for 23 OECD countries over the last 200 years. They point to two factors that determine the speed at which a new technology is adopted. The first is the size of the benefit or performance advantage of the new technology compared to the old technology. The larger the performance advantage of the new technology, the greater are the political costs of slowing adoption. The second is the cost of lobbying. Where lobbying costs are low, it is easier for owners of incumbent technologies to slow the adoption of new technologies.

In some cases the performance differences between technologies are large. Railroads were ten time faster than the horse and wagon. Steam ships were considerably faster than sailing ships. In contrast, trucks were not that much faster than trains. However, the flexibility of trucks became an advantage after the road system was improved.

The cost of lobbying legislators is higher if the executive branch and judiciary are strong because they are likely to push back in response to any action taken by legislators. This kind of a response raises the costs of legislative action. A greater lobbying effort is required in order to slow adoption. An effective judiciary is also able to detect bribes, further raising lobbying costs. Finally, a more

[32] Stigler, George J. 1971. "The Theory of Economic Regulation." *Bell Journal of Economics and Management* Science. 2, 3-21, Peltzman, Sam. 1976. " Toward a More General Theory of Regulation." *Journal of Law and Economics*. 19, 211-240, Becker, Gary. 1983. "A Theory of Competition Among Pressure Groups for Political Influence." *Quarterly Journal of Economics*. 98, 371-400, and Buchanan, James M., Robert D. Tollison, and Gordon Tullock. 1980. *Toward a Theory of the Rent-Seeking* Society. Texas A & M University Press, College Station, TX.
[33] Comin, Diego and Bart Hobijn. 2009. "Lobbies and Technological Diffusion." *Review of Economics and Statistics*. 91 no. 2, 229-244.

competitive election process makes elected officials more accountable to voters. In this case, supporting policies that slow adoption is politically costly.

This suggests that small technology performance differences and low lobbying costs slow the adoption of new technology. The reverse would also be true. A combination of a large technology performance gap and high lobbying costs would tend to speed up the adoption of new technology. So, for example, when the gains to consumers from adopting a new technology are large, the political cost (measured in terms of lost votes) of blocking the new technology is also high and will outweigh the political gains (votes and campaign contributions from special interests) associated with blocking the technology. In this case, elected officials are less likely to pass laws that significantly slow the adoption of new technology. Lobbying costs would need to be very low to get this outcome. Comin and Hobijn find empirical support for this model of government decision making.

This suggests that if the advantages of a new technology (new transportation mode or service) are low, and given the effectiveness of lobbying groups in the U.S., the political process is more likely to try to slow the adoption of new (transportation) technologies. This is especially true in the earlier stages of a new technology. Changing the way you travel can have significant initial transaction costs, reducing the net gain to the consumer. Once people become familiar with the new technology and the purchase price declines, the net benefit gain from adoption should increase, reducing the incentive for elected officials to slow the adoption. The political technology blocking process is more likely to be effective in the earlier stages of adoption.

Transportation Examples

At the start of the 20th century, electric street railways were the primary mode of urban transportation.[34] By 1906, approximately 90 percent of city trips were on these railways. City franchises for the rail systems resulted in a monopoly provider. In return for the monopoly franchise, state and local officials regulated the fares the railroads could charge. Fares were set at five cents per trip with free transfers. Under this pricing system, passengers who took short trips subsidized long-distance passengers.

The development of a more affordable automobile, the Model-T, provided a possible alternative transportation mode in cities. In 1914, some car owners began competing with the railroads for short distance customers. The cars providing this transportation service were called jitneys. They charged the same five cent fare. After starting in Los Angeles, jitney service quickly expanded to other cities.

Jitneys travelled faster and provided a higher quality service by using more flexible routes. They responded to demand conditions. Their customers were generally younger and they often served businessmen, whose time was valuable. The jitneys often delivered packages in off-peak hours. Within the first year of competition, railroad revenues declined, resulting in layoffs and the elimination of certain routes.

By 1915, the railroads sought protection from city governments. City governments were willing to go along because each monopoly railroad provided road maintenance services, funded street lighting, and paid taxes to the city. Cities thought it would be difficult to extract these subsidies from jitneys. In addition, high entry and exit in the Jitney service made it difficult for jitney drivers to organize to exert political pressure to offset the railroad's influence over elected officials.

[34] The information on the jitney story comes from Eckert, Ross D. and George W. Hilton. 1972. "The Jitneys." *Journal of Law and Economics*. 15 no. 2, 293-325.

A concerted effort was initiated by the railroads, unions, and government officials to discredit jitneys. They claimed jitneys increased accidents and crime. Ultimately, this effort resulted in anti-jitney legislation. By the end of 1915, 125 of 175 cities had passed laws that protected city railroads from competition.

The new legislation required jitneys to be licensed and to provide the same services as railroads. This regulation was designed to reduce the jitneys' comparative advantage in providing flexible, fast, and specialized services. City governments required owners to purchase liability bonds and to pay taxes greater than those paid by the railroads. They regulated routes and schedules, reducing the flexibility of jitneys. They excluded jitneys from the most profitable, densely populated, downtown areas of the cities. By 1917, the jitney industry was effectively gone.

Rather than allowing the jitneys to provide a superior service for short city trips and adjust the railroad rate fare to more accurately reflect the cost of long trips, cities imposed regulations that eliminated the advantages of jitneys. Fees could have been imposed to reflect the social costs associated with the alternative transportation modes. As a result, cities ended up with inflexible linear railroad transportation systems that became unprofitable over time because of their inability to ultimately compete with cheaper and more flexible cars. Railroad unprofitability eventually led cities to lobby for federal aid in order to keep these systems operating.

In the case of jitneys, their superior performance benefited only a subset of residents--businessmen and younger people living downtown. People living outside the central city did not benefit as much. Given the monopoly position of the railroads and the subsidies they provided the cities, effective lobbying was low cost. As a result, elected city officials decided to block the jitneys rather than allow them to compete with the railroads.

We see a similar story starting to play out in cities today. Using wireless communication technologies, new companies like Uber, Lyft, and Sidecar are able to provide cheaper, better quality, and more convenient local transportation services. Uber has grown rapidly over the last four years providing local transportation services in 230 cities in 50 countries.[35] This growth includes Saudi Arabia, Where the prime beneficiaries of this new local transportation service are women, who are banned from driving in the country.[36] Uber is now worth more than $40 billion and is the most valuable technology based start-up in the U.S.[37]

These new companies compete directly with city taxicab companies. Taxicab companies in Los Angeles and San Francisco have complained about the dramatic drop in their business over the last few years. While stories of bad experiences with these companies have been the source of newspaper headlines, the dramatic growth in these companies in the U.S. and abroad suggest they provide quality service at a competitive price.[38]

Much like the jitney case, taxicab companies are using the regulatory process to block or handicap this new competition. Virginia has already banned these services. [39] The California Public Utilities Commission has passed rules that allow these companies to operate legally, but they are subject to new regulations.[40] Taxicab companies have a strong incentive to protect the profits they earn from

[35] Mims, Christopher. 11.25.14. 'Uber and a Fraught New Era for Tech." *Wall Street Journal* page B1.
[36] Jones, Rory and Ahmed Al Omran. 10.18-19.14. "Uber's Most Avid Users: Saudi Women." *Wall Street Journal*. Page B1.
[37] MacMillan, Douglas, Sam Schechner, and Lisa Fleisher. 12.5.14. "Investor's Push Uber's Valuation Past $40 billion." *Wall Street Journal*. A1.
[38] Dave, Paresh. November 20, 2014. "Complaints Mount Against Ride-Hailing Service Uber." *Los Angeles Times*. B5.
[39] Domps, Steward and Adam C. Smith. 2014. "Regulation of Patform Markets in Transportation." Mecatus on Policy.
[40] Dolan, Maura and Laura J. Nelson. 9.27.14. "Uber, Others May Face Action." *Los Angeles Times*. Page AA1.

government regulation of entry. For example, in New York City, where entry is severely restricted, licenses are worth more than $1,000,000.[41]

The argument for taxi regulation is the need to protect consumers, especially out-of-town customers, from being overcharged for a ride. A visitor new to the city is unlikely to know fares and the best route to get to a particular destination. Uber has figured out a way around this problem. Customers rate drivers and these ratings are available to potential customers. Wireless communication technology allows the out-of-town customer to ascertain driver quality. Drivers with low quality ratings are dropped from the pool. Companies that provide higher quality services will grow at the expense of low quality companies, including traditional taxi companies. Entrepreneurial competition will force surviving taxi companies and new companies to provide higher quality service in order to prosper. Consumers of local transportation services will experience an improvement in economic welfare as a result of this transportation innovation unless it is blocked by government.[42]

The effectiveness of efforts to block local transportation innovation depends on the performance advantage of the new companies compared to traditional taxis. Once customers become familiar with the new companies and if these new companies demonstrate superior service, it will be harder to block the innovation. Unfortunately, taxi companies have a long established relationship with elected city officials; lobbying costs are likely to be low. This increases the chances that taxi companies, with significant profits at stake, will be able to slow this transportation innovation.

The development of driverless cars or intelligent vehicles represents a second transportation innovation that will significantly change how people and goods move through the economy. While many of today's cars have already incorporated some of this technology, such as lane-change warnings

[41] See footnote 40.
[42] See Mims (2014) footnote 36.

and automatic stopping features, fully automated vehicles may become commercially available in the next 10 to 15 years. The widespread adoption of these vehicles will take time. Once these vehicles become a significant share of the automobile stock, they will generate large benefits because they will reduce crashes, potentially reduce congestion, and alter travel behavior.[43]

The benefits from improved safely can be quite significant.[44] Approximately 93 percent of traffic accidents are the result of human error. The economic cost is $300 billion annually. Driverless cars can reduce the number of accidents by eliminating the human error component of crashes. Driverless intelligent cars can improve lane usage, choose optimal routes to avoid traffic problems, and anticipate braking and speeding up on highways. This can improve fuel economy, reduce air pollution, and decrease congestion. The congestion effect would depend on whether these new vehicles significantly increase travel by the young and elderly, groups previously unable to travel independently using a traditional vehicle. If this new technology allows trucks to drive in tight convoys, highway usage can improve, effectively increasing the capacity of the existing highway stock. The driverless smart vehicle has the potential to significantly improve the efficiency of the highway system and improve consumer welfare.

This technology can be disruptive to existing industries. Some mining and farming operations are already using this new technology.[45] The result would be a dramatic reduction in the demand for drivers and farm workers. In the case of long-haul trucking, unions and railroads are likely to lobby against such changes. Fewer accidents will lower insurance premiums, potentially reducing the profitability of insurance companies. The decline in accidents (and traffic violations in general) suggests we would need fewer police officers on the road and fewer automobile body repair specialists. These changes

[43] See Thierer and Hagemann (2014) footnote 29.
[44] See Fagnant, Daniel J. and Kara M. Kockelman. 2013. "Preparing the Nation for Autonomous Vehicles: Opportunities, Barriers, and Policy Recommendations." Eno Center for Transportation.
[45] See Fagnant and Kockelman (2013) footnote 45.

suggest additional opposition to driverless cars may come from insurance companies, police unions, and the auto-body industry.

The speed at which the price of these new vehicles or the cost of modifying existing automobiles and trucks declines will ultimately determine how quickly driverless cars can penetrate the market. Manufacturers will have to show that the new vehicles can operate safely (better than human-operated vehicles). Lastly, given the disruptive nature of this new technology, groups that expect to be harmed economically will likely lobby government to impose entry restrictions to slow adoption. As with other innovations, the effectiveness of lobbying efforts will be depend on the size of the performance advantage of driverless cars and the cost of lobbying.

Transportation innovation is occurring rapidly. Ride sharing and driverless smart cars are a reality. Governments can be a threat to these new technologies. Given the uncertainty surrounding any new technology, the government should, as much as possible, let the competitive entrepreneurial process move forward.[46] In the case of driverless cars, the Federal Highway Safety Administration could provide guidelines so that state regulations would be more comparable, facilitating adoption. All levels of government should rethink, and perhaps freeze construction of fixed-rail transit systems.[47] Fixed rail has not been cost-effective to date, the driverless car with its many advantages may overtake fixed rail.[48]

5. Summary and Policy Conclusions

All governments face competing demand for tax revenues. Faced with this constraint, ideally, government officials should determine spending priorities to fund transportation projects that have the

[46] See Thierer and Hageman (2014) footnote 28.
[47] O'Toole, Randal. 2014. "Policy Implications of Autonomous Vehicles." Cato Institute *Policy Analysis*. No. 758.
[48] Baum-Snow and Matthew E. Kahn. 2005. "Effects of Urban Rail Transit Expansions: Evidence from Sixteen Cities, 1970-2000." *Brookings-Wharton Conference on Urban Affairs*. 1-60.

highest value to society determined by objective cost-benefit analysis. However, in the political world, elected officials face and respond to pressures from special interest groups. These lobbying pressures, combined with politicians' interests in being re-elected, greatly politicize the process, moving the actual outcome away from the ideal. Cost-benefit analysis is biased by political motives. Project costs are systematically underestimated. Ridership flows are often overestimated. These errors are deliberate and motivated by politicians' desire to get transportation projects started in order to benefit special interests.

Voting practices and political institutions, such as term limits, also favor political forces over economic forces in transportation funding decisions. Legislators try to steer funding to their states or districts while, at the same time, they try to limit funding of projects to other areas to constrain the overall tax burden. Vote trading and transportation committee membership result in projects being funded for their political rather than economic impact.

The political institutional structure also influences the level of infrastructure spending. For example, when a city council member faces only district voters rather than citywide voters, the higher taxes used to fund infrastructure spending are spread out over the entire city, yet the benefits from the project tend to be concentrated in their district. This creates an incentive to spend more on infrastructure. Once again, political rather than economic factors drive at least some of the infrastructure spending in cities.

Innovation brought on by technological change raises productivity and an economy's standard of living. Governments can implement policies that either facilitate or hinder innovation. Governments often do the latter. The willingness of elected officials to block a new technology depends on the performance advantage of the new technology compared to the old technology, and the cost of lobbying.

Given the incentives that cause the political decision-making process to allocate resources in an inefficient manner, how likely is it that transportation policy reforms can occur? Federal elected officials have been unwilling to cede control over transportation infrastructure spending even though the interstate highway system was completed in the early 1980s. The most likely development to force policy reform is the financial pressure facing governments from growing entitlements expenditures. As entitlement spending, public pensions, and healthcare become a larger share of the federal budget, there may be pressure to shift transportation spending responsibilities to state and local governments where spending from a common pool of tax dollars is less of a problem. The shift in financing responsibility to state and local authorities would more closely match project benefits to costs.