RESEARCH BRIEF

The Environment for Development initiative is a capacity building program in environmental economics focused on international research collaboration, policy advice, and academic training. It consists of centers in Central America, Chile, China, Ethiopia, Kenya, South Africa, Sweden (Environmental Economics Unit, University of Gothenburg), Tanzania, and the US (Resources for the Future). Financial support is provided by the Swedish International Development Cooperation Agency (Sida). www.efdinitiative.org.

Will a Driving Restriction Policy Reduce Car Trips?

A Case Study of Beijing, China Suggests That Driving Restrictions Are Not Too Effective

BY DR. PING QIN, EFD CHINA
DRB 13-11, JULY 19, 2015

A driving restriction policy is a politically acceptable policy tool to address traffic congestion and air pollution in some countries and cities, but evidence from Beijing suggests that it is not as effective as hoped. This type of policy, called a command-and-control measure, is more acceptable than a market-based pricing instrument, because it states a rule that applies to everyone, rather than imposing a tax or fee that might be felt more heavily by poorer people.

Beijing was the first city in China to implement a driving restriction. Encouraged by Beijing's experience, several Chinese cities in recent years, including Changchun, Lanzhou, Hangzhou, Guiyang, and Chengdu, began to rely on driving restrictions to alleviate traffic congestion.

In Beijing, the driving policy was first introduced on August 17, 2007. It lasted four days as a trial run for the 2008 Olympic Games. After the Olympics, evidence of reductions in congestion and pollution from cars encouraged the municipal government to continue with a similar but less restrictive program. From August 28 to September 20, 2008, the driving restriction boundary area was redefined as the 5th ring road. (Beijing has a system of ring roads; the 2nd ring road is nearest to the city center and the 6th ring road is farthest away.) In 2010, 2011 and 2012, the Beijing municipal government continued these measures to restrict all automobiles from driving one day per week based on the license plate number. After January 9, 2011, the government revised the restriction to charge a 100 RMB fine (about US $16) each time if two consecutive violations were committed more than three hours apart by the same person. With this measure, supported by more than 2,000 surveillance cameras all over the city and frequent patrols, the

Key Points

- A driving restriction policy is more politically acceptable than taxes or fees as a policy to address traffic congestion and air pollution, but evidence from Beijing suggests it is not effective in the long run.
- Short-term driving restrictions introduced in Beijing for the 2008 Olympics produced a short-term reduction in congestion and pollution. Longer-term restrictions directed cars to stay out of the central city area one day a week based on license plate number, but the positive effects lasted only about a year.
- In Beijing, as in other countries, the policy produced unintended consequences, as people figured out ways to get around the rules or simply ignored the rules.
- Rule-breakers were more likely to be car owners who traveled during peak hours or for work trips, and those whose destinations were farther away from the city center or subway stations.

driving restriction policy in Beijing was expected to take one-fifth of the city's 4.2 million cars off the road each weekday.

However, as has been observed by researchers in other developing countries which introduced a similar mechanism, this type of control-and-command policy produces unintended consequences, and, therefore, it is ineffective to control car trips and traffic congestion, at least in the long run. Beijing is not an exception to this phenomenon.

Beijing traffic authorities use a congestion index to measure traffic problems. For instance, when the congestion index is between 4 and 6, some of the ring roads or major arterials are jammed, and travelers need 1.5 to 1.8 times the average travel time to finish their trips. When the congestion index is between 8 and 10, most of the roads in the city are severely congested, and travelers need to spend more than 2 times the average travel time to complete their trips.

Based on these measures, there was an unacceptable amount of congestion in major commercial districts and on major arterial roads in Beijing in 2007. With the driving restriction policy, the congestion index was reduced substantially after two years, reaching a low level of 5.93 in September 2009, even though the vehicle population increased by 26% over 2007. However, the effect did not last very long. Only one year later, in 2010, the congestion index jumped back to 7.80, with total vehicle population reaching 4.5 million.

In this study, we used Beijing Household Travel Survey Data to answer two important questions: the first is to understand whether the driving restriction policy is effective enough in the short run to justify its implementation; and the second is to identify who would be more likely to be the “bad guys” or rule breakers. The total sample contains 46,900 households, with a total of 116,142 respondents, all in the Beijing Municipal Area. About 24.7% of total households in Beijing owned automobiles; 65.3% owned bicycles; 14.9% owned electric bicycles; and only 2.8%% of households owned motorcycles. We look at choice of transportation mode in simple round trips in which a person starts from home, visits another place with a single purpose, and comes home at the end of the day. Of these, 31.7% were made by bus, 17.1% by car, 15.5% by walking, and 12.2% by subway. The rest (about 23.5%) were shared by bicycle, powered two-wheelers and other modes. In the statistical analysis, the driving restriction policy reduced the likelihood that a trip would be made by car relative to the likelihood of using public transit, but the result was not statistically significant – in other words, we can’t be confident that the same result will appear in another sample. While residents in Beijing are less likely to drive when a restriction policy is in place, the weak statistical result might indicate that the driving restriction policy is not effective enough to stimulate automobile owners to give up car trips.

To identify the rule breakers, we used the information of the last digit of the license plate numbers collected in the survey, and the location of the origination or destination places (inside the 5th ring road). In total, we identified 730 cars that were subject to the restriction rules. We found that 349 car trips, or about 47.8% of the regulated car users, broke the driving restriction rules. In addition, we found that 92 car owners (about 12.6% of regulated car owners) who were subject to driving restrictions on the dates left home between 6:00 a.m. and 7:00 a.m. We suspect some of these “early birds” chose to leave early in order to avoid the driving restrictions. The results also show that car owners who traveled during peak hours or for work trips, and those whose destinations were farther away from the city center or subway stations, were more likely to break the rules.

Conclusions

Driving restrictions have been regarded by the governments in a dozen countries and regions as a silver bullet to mitigate congestion problems. Beijing is one of those places. This study shows that, even for the short-run perspective, the driving restriction policy is not as effective as was

intended in controlling car trips. The rule-breaking behavior is constant and pervasive, as has been observed in other countries. In our view, these command-and-control policies can only alleviate the symptoms of the negative effects of cars for a very short period of time, but they are unable to attack the root causes. In the long run, neither the driving restriction policy nor a related policy -- a license plate lottery that restricted the ability of Beijing residents to register new cars -- can constitute the silver bullet necessary to reduce traffic congestion or air pollution. Therefore, Beijing is in need of more comprehensive and palatable policy instruments (e.g., a combination of congestion tolls, parking fees, fuel taxes, and high-speed transit facilities) to effectively alleviate traffic congestion and air pollution.

ABOUT THIS BRIEF

This brief is based on "Will a Driving Restriction Policy Reduce Car Trips? A Case Study of Beijing" (2013) by Lanlan Wang, Jintao Xu, Xinye Zheng, and Ping Qin. EfD Discussion Paper 13-11, published by Environment for Development, University of Gothenburg, Sweden, and Resources for the Future, Washington, DC.

FURTHER READING

"A Review of Beijing's Vehicle Lottery: Short Term Effects on Vehicle Growth, Congestion, and Fuel Consumption" (2014) by Jun Yang, Ying Liu, Ping Qin, and Antung A. Liu. EfD Discussion Paper 14-01, published by Environment for Development and Resources for the Future, Washington, DC.

CONTACT

Dr. Ping Qin, EfD-China, pinggin2009@gmail.com

EfD in China, www.efdinitiative.org/centers/china
eepc@pku.edu.cn , Phone +86-10-62767657, Fax +86-10-62767657
Environmental Economics Program in China (EEPC), College of Environmental Sciences and Engineering, Room 322, Old Earth Science Building, Peking University, 100871 Beijing, China

EfD, Environment for Development initiative, www.environmentfordevelopment.org
EfD Secretariat: info@efdinitiative.org, Phone: +46-31-786 2595, Fax +46-31-786 10 43, www.efdinitiative.org./efd-initiative/organisation/secretariat, Department of Economics, University of Gothenburg , PO Box 640, SE 405 30 Gothenburg, Sweden