Environmental Politics

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/fenp20

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ENVIRONMENTAL POLITICS
https://doi.org/10.1080/09644016.2022.2113608

Routledge
Taylor & Francis Group

Command and control or market-based instruments? Public support for policies to address vehicular pollution in Beijing and New Delhi

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ABSTRACT
Environmental protection efforts commonly make use of two types of government interventions: command and control policies (C&C) and market-based instruments (MBIs). While MBIs are favored for their economic efficiency, visible prices on pollution may generate political backlash. We examine whether citizens are more likely to support policies that tend to obfuscate policy costs (C&C), as opposed to MBIs, which impose visible costs. Using conjoint experiments in Beijing and New Delhi, we examine support for 'policy bundles', including both C&C policies and MBIs, aimed at limiting air pollution from vehicles. In both cities, increasing fuel taxes (a MBI) reduces policy support. However, pledging revenue usage from fuel taxes to subsidize electric cars or public transport eliminates this negative effect. Furthermore, individuals with a lower evaluation of their government respond more negatively to MBIs. MBIs may be economically efficient, but are politically difficult unless policy-makers can offset visible costs through additional measures.

KEYWORDS market-based instruments; command and control; regulation; air pollution; urban pollution; vehicles; China; India

Introduction

Air pollution is a major global health problem, killing millions of people every year. Worldwide, nine out of ten people breathe air that the World Health Organization deems unhealthy.[1] Air pollution is a particularly important policy challenge in urban areas of emerging economies. We focus on India and China where this problem is severe: many cities with the highest ambient air pollution globally (PM 2.5) are located in India (Mahato and Ghosh 2020) and China (Shi *et al.* 2019). Researchers have also noted the role of automobiles in this regard, which account for less than one-third of travel distance but contribute 73% to urban air pollution.[2]

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Facing such challenges, governments usually struggle to identify, adopt, and implement policy instruments that reduce pollution and are also politically acceptable to the mass public. Urban air pollution poses a major challenge in this regard because much of the pollution originates from the transportation sector. In contrast to reducing pollution from large point sources, such as electric power plants and factories, reducing pollution from diffused sources is more challenging both administratively and politically. In particular, motorized vehicles or nonpoint sources, which account for a large share of urban air pollution (Karagulian *et al.* 2015), pose a serious political challenge because policy interventions targeting vehicular pollution impose direct costs on car owners to produce the public good of cleaner air.

Political economists have long noted political challenges in enacting policies that impose concentrated costs on a few to produce diffused benefits for many (Lowi 1964, Wilson 1980). One key lesson is that policies imposing concentrated costs might pass the muster of economic efficiency, but often fail the test of political rationality. Alongside the distributional dimension, policy support might depend on the visibility of costs and benefits (Mani and Mukand 2007, Prakash and Potoski 2014). Politicians might favor economically inefficient policies, such as flood relief, as opposed to more efficient policies of flood control. The reason is that the public rewards them for solving problems (a visible benefit) and not for preventing problems that did not happen (Healy and Malhotra 2009). Similarly, politicians have incentives to invest in visible, new infrastructure projects as opposed to maintaining less visible, existing ones. Even companies invest more in reducing visible air pollution in contrast to less visible water pollution (Prakash and Potoski 2014).

In this paper, we examine how different policy instruments affect public support for environmental policy. We distinguish between Command and Control (C&C) and Market Based Instruments (MBIs) in assessing how policy design affects political feasibility. Following a visibility-based logic of political support, we expect that a policy with hidden costs faces less public opposition than one that imposes visible costs. Therefore, MBIs which make clear their costs to the public are expected to be less popular than C&C instruments, and thus less *stringent* in the cost burdens citizens are willing to accept. We also expect these differences in public support to depend upon whether individuals are targeted by the policy in question and their general level of political trust.

To assess public support for MBI and C&C instruments for limiting vehicular urban air pollution, we employ a conjoint experiment embedded in surveys fielded in Beijing and New Delhi. Beijing and New Delhi are the capital cities of the most populous economies, that struggle with severe urban air pollution problems. A key novelty of the paper is that instead of examining one policy instrument in isolation, we assess public support for policy bundles that include four policies each: (1) a tax on petrol and diesel (MBI), (2) Vehicle Ownership Permits (VOP) (MBIs), (3) prohibition of motor vehicles older than 10 years (C&C), (4) odd-even rule imposing driving restrictions (road space rationing) based on license plate number (C&C). These policies, and each policy instrument thereof, can have different levels of *stringency*, which we randomly vary across policy bundles. We define *policy stringency* to mean the level of direct (e.g. monetary) or indirect (e.g. requirements and regulations) costs imposed by a particular instrument design. This 4 × 4 research design allows us to understand how individuals view the four policy instruments and the extent to which individuals may trade-off policy instruments.

We find that using MBIs either causes a significant decrease in support for a policy bundle or has no significant effect. In both Beijing and New Delhi, increasing fuel taxes leads to a significant decline in overall policy support. However, pledging revenue usage from fuel taxes to subsidize electric cars or public transport eliminates this negative effect. The results are robust to car ownership. Individuals with a lower evaluation of their government respond more negatively to MBIs. The main implication is that MBIs may be economically efficient, but politically difficult unless policymakers can overcome their political limitations through additional measures, such as fuel tax revenue recycling (Parry 1995, Beck *et al.* 2015, Beiser-McGrath and Bernauer 2019, Dolšak *et al.* 2020).

Theoretical approach

Scholars commonly differentiate between two major types of policy instruments that can be used to address collective action challenges and produce public environmental goods: Command and Control (C&C) and Market-Based Instruments (MBI) (Blackman *et al.* 2018). C&C policies seek to limit pollution through explicit mandates or restrictions on polluting activity. In contrast, MBIs seek to incentivize individuals and/or firms to pollute less by imposing direct economic costs, usually in the form of taxes or permits.[3]

While this body of research clearly demonstrates the differences between these policy types and their effectiveness (He *et al.* 2016; Zhang et al. 2016, Bonilla 2019), the focus of this paper is on comparisons between these instruments in terms of policy support (e.g. Keohane *et al.* 1998, Campbell 2011, Stokes and Warshaw 2017, Huber *et al.* 2020, Wicki *et al.* 2020, Huber and Wicki 2021), and thus their political feasibility (Drews and van den Bergh 2016, Ejelöv and Nilsson 2020). In the next section, we discuss theoretical mechanisms and review existing literature that explains differences in public support between these two policy types.

Public support for different policy instruments

To understand how the choice of policy instruments affects public support, in terms of policy feedback (e.g. Campbell 2011, Busemeyer *et al.* 2021, Beiser-McGrath *et al.* 2022), we first develop our theoretical argumentation around differences in the understanding of the cost implications of instruments. Based on a visibility-based logic of political support, we expect that a policy with hidden costs faces less public opposition compared to one that imposes visible costs. While transparency in public policy is often considered a virtue (Stiglitz 1999, French 2011), sometimes 'too much' transparency can trigger reactions that undermine policies that create public benefits. The reason is that policy transparency might focus the spotlight on private costs, and their differential incidence across individuals (e.g. Ellermann 2006). Thus, individuals might feel that they are bearing an unfair (private) burden to provide a public good.

In this light, MBIs such as fuel taxes that put a price on pollution (a visible cost for consumers) likely receive less public support than C&C instruments (such as emission standards) with hidden costs (Stadelmann-Steffen 2011). As the costs of MBIs are clearer and more easily understandable to the public they generate more political opposition (Stadelmann-Steffen and Dermont 2018, Kallbekken *et al.* 2013), possibly due to individuals anchoring their policy support based upon the costs stipulated. In contrast, the opacity of how exactly command and control policies translate into immediate monetary costs, could make them politically more acceptable compared to MBIs whose costs are immediate, their structure is clear and understandable. Nevertheless, it may be the case that C&Cs reduce support by limiting consumers' freedom of choice, especially if their leads to individuals perceiving their design as unfair.

Additionally, the differences in the visibility of costs for C&Cs and MBIs is compounded by potential differences in the benefits they provide. MBIs do not guarantee that the benefit of lower air pollution is realized, which is often necessary for environmental policy support (Krosnick *et al.* 2006). Rather, they are expected to result in this benefit indirectly, by incentivizing individuals to pollute less. In contrast, the goal of reduced air pollution is more directly realized and visible through the restrictions imposed by C&C instruments. While MBIs are considered to be economically efficient, this does not necessarily translate into substantial improvements in air pollution if the details of the MBI, in terms of tax rates for instance, are not optimal. Nevertheless, additions to MBIs, such as revenue recycling that precommits governments to use environmental tax revenues in a certain manner (e.g. Carattini *et al.* 2018, Beiser-McGrath and Bernauer 2019, Jagers *et al.* 2019, Dolšak *et al.* 2020), may generate sufficient ancillary benefits to overcome these issues.

H1: Policy bundles with C&C instruments receive higher levels of support than those with MBIs.

One feature of MBIs, however, offers a potential route to political feasibility. As MBIs can generate revenue, the usage of said revenue can be used in a manner to overcome MBIs inherent political limitations (Raymond 2016, Rabe 2018). For example, by pledging the use of revenues generated from a carbon tax to specific goals, 'revenue recycling' has been shown to increase political support for costly climate policies (e.g. Carattini *et al.* 2018, Beiser-McGrath and Bernauer 2019, Jagers *et al.* 2019, Dolšak *et al.* 2020). This is coupled with research that finds green policy support increases when compensation for different coalitions of climate-vulnerables citizens is included (Gaikwad *et al.* 2022). Taken broadly, we, therefore, expect that MBIs with revenue recycling will be more popular than those without.

H2:MBIs with revenue recycling receive higher levels of support than those without.

Moderating factors

While these features of policy instruments have an aggregate impact on public support, we also expect specific characteristics of individuals to moderate these effects. In particular, we focus on whether individuals are directly affected by the policy in question and individuals' levels of trust in government.

Policy exposure

The first moderating factor distinguishes between those who incur direct costs (car owners only) and those who benefit from the policy (both car owners and non-car owners). Following a logic somewhat reminiscent of NIMBYism (Devine-Wright 2005), we expect the cost implications outlined previously to be more salient for those directly impacted by the policy instruments. Therefore, we expect the differences in policy support when comparing C&Cs and MBIs to be largest for this group. Additionally, we expect the impact of revenue recycling to be less salient for this group, as any potential benefits are offset by their higher contributions to the cost. In contrast, non-car owners will be most supportive of policies that generate the largest immediate benefits, as they are not required to pay the cost that finances them. In this regard, they should be most supportive of C&C policies and MBIs that provide direct benefits through the use of revenue recycling.

H3:The level of public support for C&Cs compared to MBIs is higher for car-owners than for non-car-owners.

Governmental evaluations

An additional moderating factor we are interested in here is the role political trust, in the form of positive government evaluations, plays in support for environmental policy. Prior research on the importance of political trust for policy support more broadly finds that it plays a key role when examining individuals' support for policies necessitating shared effort in uncertain circumstances (Hetherington 2004, Rudolph and Evans 2005, Citrin and Stoker 2018), for the form of regulatory policy (Harring 2016), and specifically for climate policy (Davidovic and Harring 2020). In such cases, the potential benefits derived from policy targeting air pollution reduction may be further discounted by those in the population who have a low opinion of the present government.[4]

This mechanism further compounds differences in support between C&Cs and MBIs, as they may also differ in their corruption potential which subsequently affects public support. MBIs, through the money they levy, directly provide fungible revenue to governments. As a result, individuals who are concerned that governments will not appropriately use revenue obtained through an MBI will be reticent to support its implementation. In contrast, C&C instruments often do not generate additional revenue for governments, as they are focused on constraining vehicle usage through prohibition or restriction. Thus, there is a lower potential for individuals to directly attribute the indirect costs they face from the policy to misuse by the government, in comparison to the collection of revenues through MBIs. This is to some extent corroborated by previous research, which finds political trust to be more important for climate taxes than for subsidies and bans (Davidovic and Harring 2020). As a result, individuals who have a low evaluation of the present government may be more willing to accept C&C instruments, as they are less subject to rent-seeking and corruption from governmental actors.

H4: The level of support for C&Cs compared to MBIs is higher for those who have low governmental support than those with high governmental support.

As discussed previously, revenue recycling can overcome the fungibility problem, and thus potentially mitigate these concerns. By pledging revenues to specific uses, the government clearly signals that the revenues raised from MBIs will meet the policy goal rather than be used for other purposes. However, research on carbon taxation has shown that political distrust can nevertheless still reduce the political feasibility of MBIs, as individuals may simply not believe that the government will follow through in using tax revenues as pledged (Harrison 2012, Fairbrother 2016, 2019). Therefore, while we clearly expect low political trust to reduce support for MBIs it is plausible that this still holds when revenue recycling is applied.

Research design and methods

Case selection

Automobiles are crucial means of transportation. While they account globally for less than one-third of travel distance, they contribute 73% to urban air pollution.[5] Of course, as the world transitions to electric vehicles, urban air pollution will decline. However, since this transition will take place over two or maybe even three decades, urban air pollution due to vehicular pollution will remain a critical problem, particularly in lower income countries. Air pollution problems in New Delhi are legendary. While air pollution from stubble burning in the months of October and November often gets strong media attention, New Delhi tends to have poor air quality all year round. In addition to inviting judicial intervention (Iyengar *et al.* 2019), air pollution is an electorally important issue, especially because New Delhi's ruling party, the Aam Aadmi Party, has tried various policy innovations (Bernauer *et al.* 2020). Local air pollution has emerged as an important concern in China as well (Steinhardt and Wu 2016). Some suggest that China's quest for renewable energy is driven, in part, by the desire to reduce local air pollution (Zhu *et al.* 2020). Moreover, in recent years, China has faced local unrest on environmental issues. As a result, under the dual administrative system, while previously the cadre evaluation was focused essentially on delivering economic growth, in recent years, the party has also started to emphasize environmental goals (Wu and Cao 2021). Thus, while public opinion might not directly affect the choices of policymakers in China, it certainly informs the political calculations of local party leaders who are tasked with formulating public policy.

At various points in time, both cities have used policies aimed at restricting vehicle usage to limit air pollution. The most notable of these has been the odd-even rule, where private cars with odd and even registration numbers are allowed on roads only on alternate days (Goyal and Gandhi, 2016; Mohan et al., 2017). The odd-even rule, in the form just described, was used in Delhi during January 1–15, 2016, and again during April 1–15, 2016. The Beijing Traffic Management Bureau first implemented the policy during the 2008 Olympics. Since then, the policy has been used whenever a red alert is issued about air pollution, which occurs when the air quality index is expected to be over 200 for 72 hours. Therefore, citizens in both cities have similar experiences with a policy directed at vehicles in order to limit air pollution, making them ideal cases to assess the role of policy design upon public support.

Data collection

The surveys were fielded online through Ipsos and took place in two waves.[6] The 1st wave of the survey, with 750 respondents per city, was fielded from 16 to 26 November 2017. We then fielded a second wave with another 750 respondents per city two weeks later, from December 4–10, 2017. We used quota sampling in order for the sample to be broadly representative in terms of gender, occupation, age, and education.[7] This also ensures that there are no imbalances in demographics across waves, which could bias results.

In the conjoint experiment participants were asked to compare and choose between two policy bundles, each including two MBIs and two C&C policy instruments. The C&C policy instruments are: (1) the odd-even rule and (2) a prohibition of vehicles older than ten years. Both of these policies seek to manage vehicle numbers and usage and limit air pollution by restricting the number and emissions of vehicles plying on roads. The odd-even rule seeks to halve the number of circulating vehicles by granting daily access based upon a digit on the number plate.[8] The ban on vehicles older than 10 years is based on the fact that older vehicles are more polluting.[9] The two MBIs are: (1) fuel taxes and (2) vehicle ownership permits (VOPs). Both of these policy instruments seek to manage vehicle numbers and usage and limit air pollution by making it more costly to own and use a vehicle. Fuel taxes increase the marginal costs of vehicle usage, incentivizing individuals to use their vehicles less frequently and/or switch to vehicles with lower fuel consumption.[10] A vehicle permit imposes an additional fixed cost on vehicle ownership and usage.[11]

Table 1 displays policy instruments and their levels of stringency (costs). We define *policy stringency* to mean the level of direct (e.g. monetary) or indirect (e.g. requirements and regulations) costs imposed by a particular instrument design. Every policy bundle includes all four policy instruments, but each instrument is randomly assigned a specific level of stringency. Each respondent was presented with an initial text explaining each of the policy instruments (see Appendix A1). Respondents were then presented a table with two policy bundles, labeled A and B, with the stringency of each policy instrument within a bundle randomly assigned (Bansak *et al.* 2021). Every respondent was then asked to make a forced choice as to which policy should be adopted, between A and B. Respondents were additionally asked to rate each policy bundle on a scale from 1 (strongly opposed) to 7 (strongly support). The respondents then repeated this task with another set of randomly assigned policy bundles a further four times, making a total of five choice tasks per respondents.

Table 1. Conjoint Table: Design features of policy bundles (wording for experiment in Delhi).

	Different levels/stringency of the policy
1. Tax on petrol and diesel (MBI)	[RANDOMISE ATTRIBUTE] (1) No additional tax (2) 30 Rs. additional tax per litre (3) 30 Rs. additional tax per litre, tax income used to make metro and bus services cheaper (4) 30 Rs. additional tax per litre, tax income used to make hybrid and electric vehicles cheaper
2. Vehicle Ownership Permit (MBI	[RANDOMISE ATTRIBUTE] (1) No permit required (2) Permit required, costing 200,000Rs for cars and 50,000Rs motorcycles/scooters (3) Permit costing 200,00Rs for cars required, but no permit required for motorcycles/scooters (4) Permit costing 50,000Rs for motorcycles/scooters required, but no permit required for cars
3. Prohibition of motor vehicles older than 10 years (C&C)	[RANDOMISE ATTRIBUTE] (1) No such prohibition/motor vehicles older than 10 years allowed (2) Prohibition of cars and motorcycles/scooters older than 10 years (3) Prohibition of cars older than 10 years, but no such prohibition of cycles/scooters (4) Prohibition of motorcycles/scooters older than 10 years, but no such prohibition of cars
4. Restrictions based on license plate number (odd-even rule) (C&C)	[RANDOMISE ATTRIBUTE] (1) No such restrictions/no odd-even rule (2) Restrictions (odd-even rule) applied permanently (all year) (3) Restrictions (odd-even rule) applied from November to February (4) Restrictions (odd-even rule) applied whenever the local forecast predicts at least three consecutive days of high air pollution

Estimation

We focus on two empirical quantities when estimating the effect of an individual policy instrument upon support for the policy bundle: Average Marginal Component Effects (AMCE) and Marginal Means. AMCEs capture the change in support for the policy bundle caused by a specific stringency level of the respective policy instrument, relative to a baseline value (Hainmueller *et al*. 2014). Marginal Means, in contrast, indicate the overall proportion, or probability, of support for a given value of a policy instrument, averaging overall values of the other policy instruments (Leeper *et al.* 2019). It thus indicates average support for a policy bundle containing the specific attribute value of a policy instrument within the bundle. The AMCE for a given value of the policy instrument is thus the difference between the Marginal Mean for this value and the Marginal Mean for the baseline value of a policy instrument. Thus, AMCEs can be considered to capture *differences* in support, while Marginal Means measure *levels* of support for policy bundles.

Results

In this section we present the results of our conjoint experiments. First, we examine how the stringency of C&C and MBIs affect overall support for policy bundles. We then move on to looking at particular combinations of C&C and MBIs, to assess the extent to which they act as complements or substitutes to one another. Finally, we repeat these analyses based on individuals' exposure to the policy, in terms of car ownership, and their prior evaluations of the city government's policy efficacy (our measure of trust in government).

Figure 1 displays the effect of each policy instrument's stringency level upon the probability of choosing a policy bundle including this feature.[12] When comparing the top two rows of policies (MBI: fuel tax and VOP) to the bottom two rows (C&C: odd-even and vehicle ban), we can see that including C&C measures in a policy bundle increases support for the policy bundle. In contrast, including MBIs either decreases support or does not significantly affect support, with the exception of Beijing if a fuel tax is used to subsidize public transport.[13]

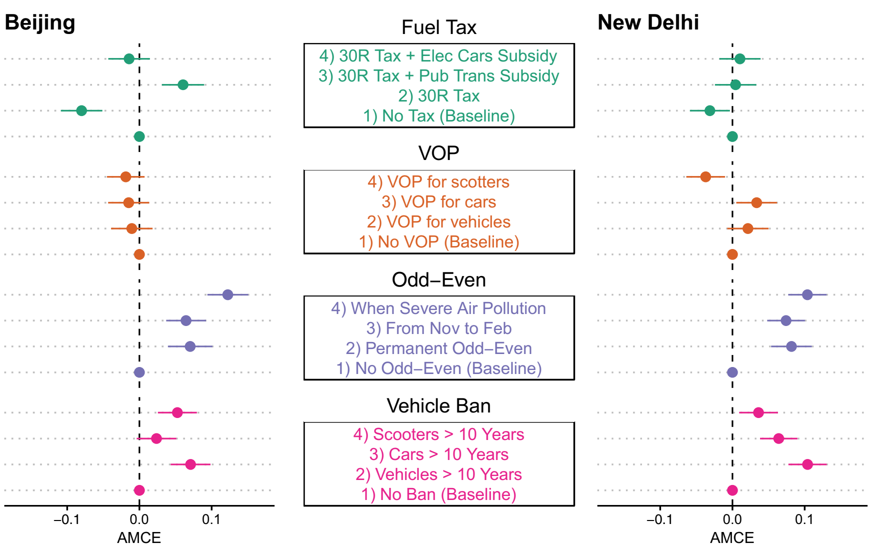

Figure 1. The effect of policy instruments upon the probability of a policy bundle being chosen. Points indicate Average Marginal Component Effects (AMCE), with lines displaying 95% confidence intervals.

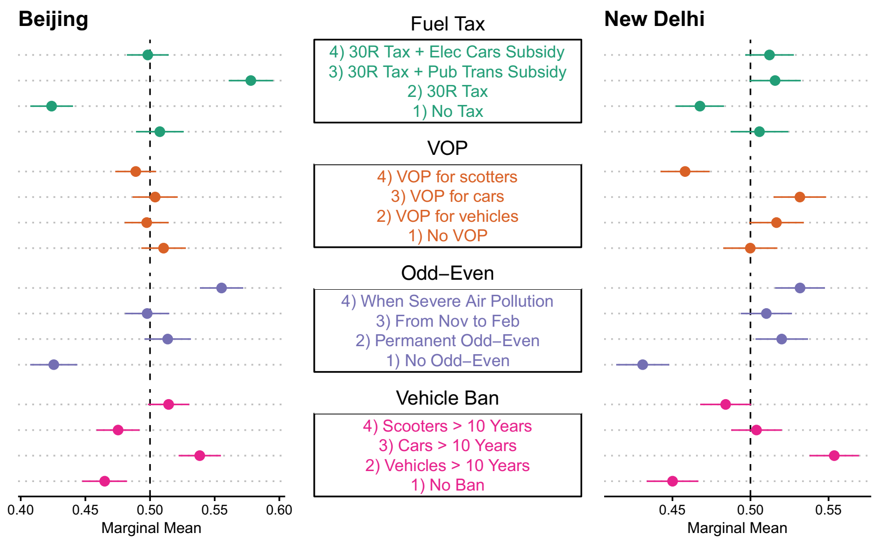

Figure 2. Points display the expected probability of choosing a policy bundle (marginal mean) for a given value (stringency level) of the respective policy instrument, averaging over the values of the other policy instruments. 95% confidence intervals in parentheses.

In Figure 2 we display marginal means.[14] We can see that MBIs either significantly decrease support for the policy bundle or have no significant effect. In both Beijing and New Delhi, increasing fuel taxes leads to a significant decline in policy support. However, pledging revenue usage from this fuel tax to subsidize electric cars or public transport eliminates this negative effect. That is, a visible cost gets balanced by a visible benefit in this case. This echoes findings from research on carbon pricing, and carbon taxation in particular, which shows that committing revenues raised to the funding of infrastructure and renewables increase policy support (Beiser-McGrath and Bernauer 2019, Dolšak *et al.* 2020). As discussed previously, this could be a result of the benefit provided to individuals, as well as its constraining effect upon corruption and potential fairness gain through the financing of public transportation.

Vehicle Ownership Permits (VOPs) generally do not have a major effect on public support levels in both cities. In New Delhi, the inclusion of a VOP for scooters significantly decreases support, although a VOP for cars does cause a small but statistically significant increase in policy support.[15] Yet, C&C policies generally lead to significant increases in policy support. Failure to include an odd-even rule or a vehicle ban in a policy bundle results in significant declines in support. The odd-even instrument in all its forms has a uniformly positive effect on policy support, with the most preferred form being one that is enacted whenever air pollution hits a critical level. In fact, the use of the odd-even rule when there is severe air pollution is the second most supported policy option across both cities. One explanation for this may be respondents' familiarity with this policy option (Whan and Parker 1981), as both the Beijing and Delhi governments have used this policy option in recent years. The banning of vehicles older than ten years also significantly increases policy support in all its forms, the one exception being limiting the policy to only cars in Beijing.

To further explore how combinations of policy instruments affect support, we calculate the probability of a policy bundle being chosen for four specific 'policy combinations' outlined in Table 2. These capture the full range from the least stringent, *i) No Instruments*, to the most stringent, *iv) All Instruments* in their most stringent form. They also include a policy bundle that has the most stringent MBI instruments and the least stringent C&C instruments, *ii) Only MBI*, as well as the opposite, *iii) Only Regulation (C&C)*. Examining the effects of these combinations allows for comparison regarding the popularity of the most extreme versions of a policy bundle. These probabilities are estimated using the parameters of the regression models used to estimate the AMCEs.

Figure 3 displays the choice probabilities for the four policy combinations shown in Table 2. Taking no action, i.e. not adopting any new policy instruments, is unpopular in both Beijing and New Delhi. Interestingly, a policy combination that consists of only MBI is as unpopular as doing nothing in New Delhi and is in fact less popular than doing nothing in Beijing. The larger negative impact of MBIs in Beijing may be due to residents having less familiarity with MBI policies when compared to C&C policies. Only policy combinations that include C&C lead to a better than 50/50 chance of being preferred by individuals. In New Delhi (but not in Beijing) this is the case regardless of whether MBIs are included or not. This suggests the negative sentiment toward MBIs is offset in Delhi, but not in Beijing, when coupled with C&Cs.

In summary, the *absence* of C&C instruments in policy bundles to deal with the negative effects of vehicle usage causes a significant decline in public support. Moreover, the *inclusion* of MBIs, absent benefits pledged through revenue recycling, can lead to a significant decline in public support.

Table 2. Stringency levels of particular policy instrument combinations.

Policy Mix	Fuel Tax	VOP	Odd-Even	Vehicle Ban
i) No Instruments	No Tax	No VOP	No Odd-Even	No Ban
ii) Only MBI	30 R Tax	VOP for vehicles	No Odd-Even	No Ban
iii) Only Regulation	No Tax	No VOP	Permanent Odd-Even	Vehicles > 10 Years
iv) All Instruments	30 R Tax	VOP for vehicles	Permanent Odd-Even	Vehicles > 10 Years

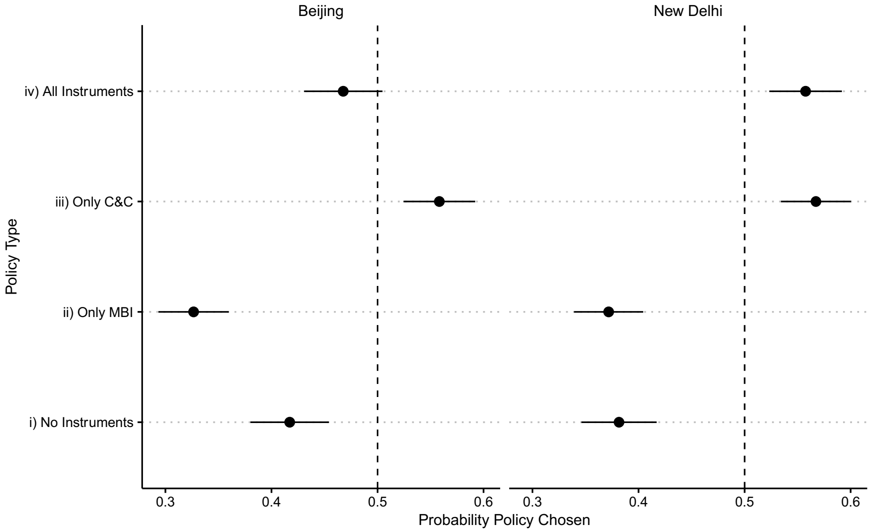

Figure 3. Probability of being chosen for four policy combinations.

Heterogeneous effects

Next, we examine whether the importance of C&C policies for overall policy support is driven by any particular subgroup. We identify two theoretically relevant subgroups in our samples: car owners and individuals' evaluation of the government.

Car ownership might be critical because this group bears the policy cost directly. Figure 4 displays how the effect of policy instruments upon support for policy bundles varies by car ownership, in terms of marginal means.[16] While individuals generally respond similarly regardless of car ownership, there are some important differences. First, car ownership is important when considering how a fuel tax impacts policy bundle support in Beijing.[17] It is car owners who respond more negatively to a tax increase without revenue usage pledge, while those without a car do not significantly decrease policy bundle support. However, those without a car largely drive the positive effect of the public transport subsidy from fuel tax income upon support for policy bundles.

Second, in both Beijing and New Delhi, individuals without cars significantly decrease policy support when a VOP for scooters is required. Third, non-owners are more supportive of policy bundles including odd-even policies in both cities, which does not impose any costs on them. However, car owners still remain more supportive of policy bundles that include the odd-even instrument when compared to bundles that do not. Finally, there is little meaningful difference in support for policy bundles including vehicle bans by car ownership, apart from the case of scooters and non-car owners.

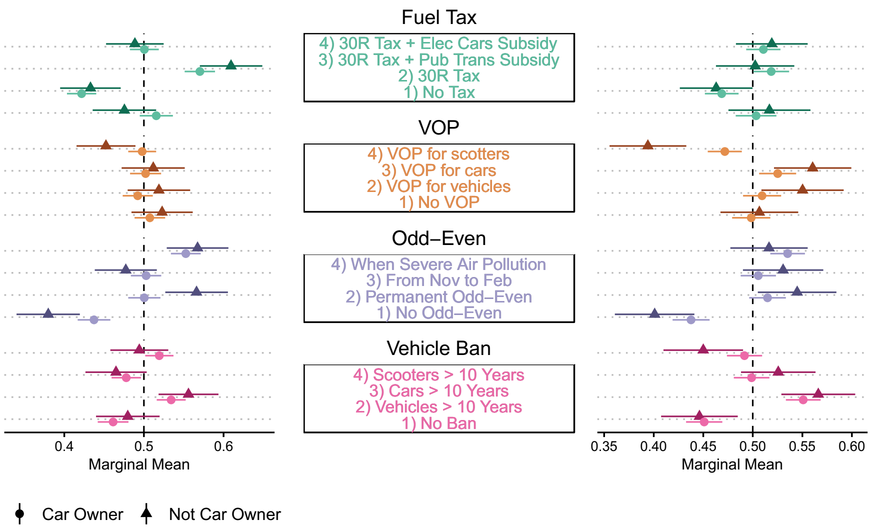

Figure 4. The effect of policy instruments upon policy bundle support, conditional upon car ownership. Lighter circular points indicate car owners, while darker triangular points indicate non-car owners.

Returning to the policy combinations we considered earlier in Table 2 and Figure 3, we conduct the same analysis by car ownership status in Beijing and New Delhi. The results, displayed in Figure 5, show that car ownership has a stronger impact on policy preferences in Beijing than in New Delhi. In

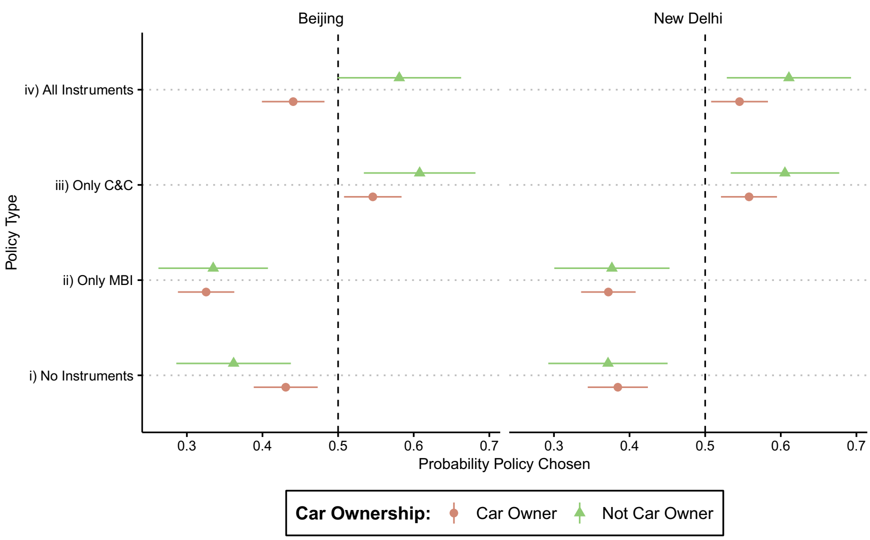

Figure 5. Probability of choosing a specific policy bundle, by car ownership.

Beijing, the non-MBI only policy bundle is the sole bundle that achieves majority support, suggesting the negative effect of MBIs amongst car owners cannot be offset by including C&C instruments. This, however, is not the case in New Delhi where a policy bundle including MBIs in combination with C&C instruments still achieves majority support amongst car owners.

Taken together, accounting for car ownership further suggests that MBIs generate hurdles in the implementation of policies to limit vehicle pollution, significantly decreasing support for policy bundles in a variety of circumstances. In contrast, C&C generally increase support for policy bundles across both car owners and non-car owners, although this increase can weaken in line with the distribution of costs.

Finally, we look into whether individuals' evaluation of the city government's performance[18] may condition the effect of C&C vs. MBIs upon policy support. Individuals who hold low evaluations of the government, believing that it does not perform well on policy issues generally, may be less likely to support C&C measures that rely on governmental oversight and implementation. On the other hand, while MBIs may stop governments from micro-managing vehicle ownership and usage, the government is still ultimately involved. In fact, actively raising revenue through MBI may foster further distrust and dislike of the government, as it is seen as 'profiting' from the policy.

Figure 6 displays the effects of policy instruments on support when allowing the effect to vary by individuals' evaluation of their city government,

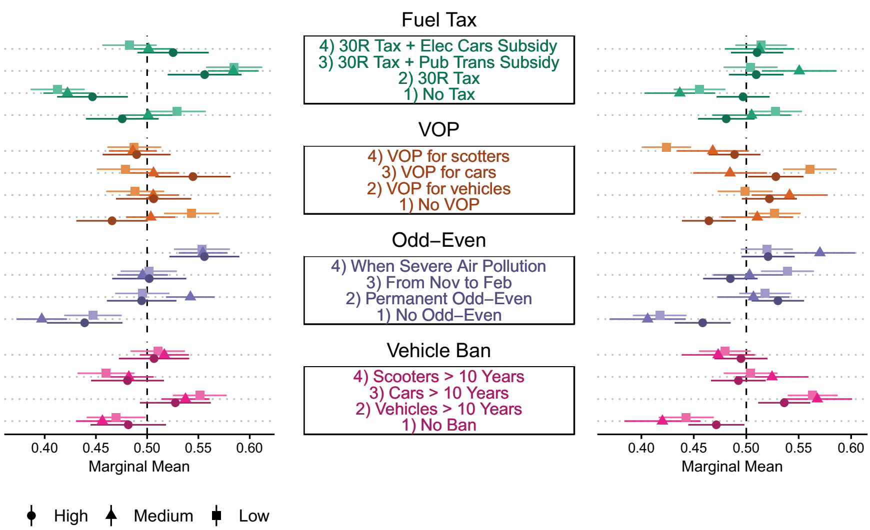

Figure 6. The effect of policy instruments upon policy support, conditional upon individuals' governmental evaluations. Darker points indicate higher evaluations of the city government, with the shape of points explicitly defining the categories: high (circular), medium (triangular), low (square).

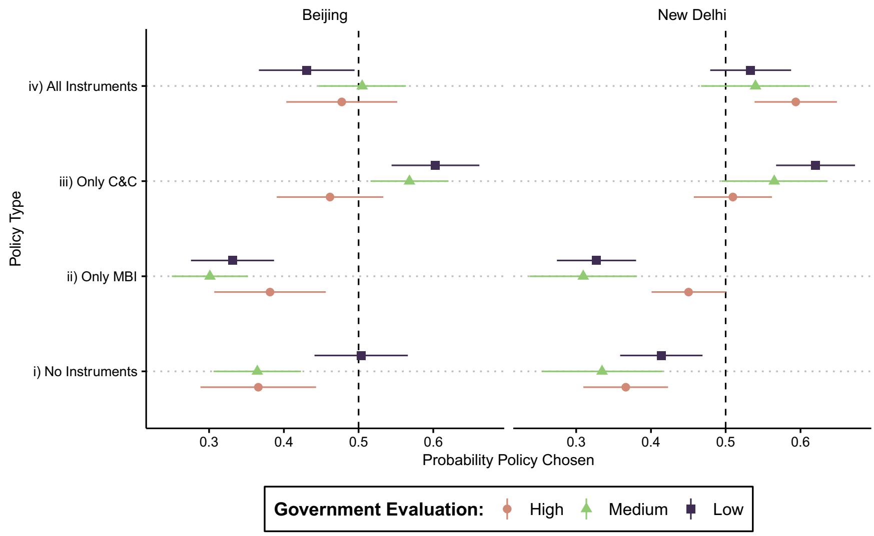

Figure 7. Probability of choosing specific policy instrument combinations, by government evaluation.

in terms of marginal means.[19] Our results suggest that individuals with a low evaluation in the government are responding *more* negatively to MBIs. In the case of fuel taxes, we find that individuals with low or middle governmental evaluations are significantly more negative about the imposition of fuel taxes, without specifying the subsequent revenue usage. For all forms of VOPs, we see a decline in support amongst respondents with low government evaluations in Beijing.[20] This same effect only holds for scooters in New Delhi. In contrast, we observe no negative effects for C&C instruments at any level of governmental evaluation.

Turning to support for the four specific policy combinations, as displayed in Figure 7, we can see that individuals' evaluation of their governments can often make the difference between achieving majority support or not for a given policy bundle. Across both Beijing and New Delhi, MBIs tend to be highly unpopular, but less so amongst those with a more positive evaluation of the government. Those with more negative evaluations of their government tend to instead prefer the C&C only policy mix. While initially surprising, one explanation for this pattern could be that C&C policies do not involve revenue collection, which respondents may be skeptical of being used effectively.

Conclusion

Many if not most urban areas in developing countries and emerging economies are experiencing high levels of air pollution, and policy-makers there are struggling to find solutions that are both effective in environmental and public health terms, and politically feasible in terms of being acceptable to the mass public. In this paper we study this challenge from a public opinion and thus political feasibility perspective (e.g. Keohane *et al.* 1998), focusing on a set of four potentially effective policy instruments, and how combinations of these instruments could be designed in order to be acceptable to the mass public and critical subgroups thereof.

Our theoretical entry point is the distinction between C&C and MBIs. MBIs have a compelling economic logic, but C&C instruments might garner more public support. Reasons for this include the more direct and visible costs associated with MBIs, relative to C&C, but also various other reasons, for example, pertaining to fairness concerns arising from distributional implications of particular policy instruments.

Our empirical findings do in fact suggest that MBIs are particularly unpopular, both in Beijing and New Delhi. Yet, including C&C policy instruments results in policy bundles that a majority of respondents support, and can even mitigate the support decreasing effects of including MBIs. These negative effects of MBIs are often concentrated amongst those individuals most exposed to the policy costs associated with MBI, in our case vehicle owners. However, opposition to MBIs also arises from individuals with more negative pre-existing evaluations of the government and is likely a result of distrust that revenue being generated by such policies will be used effectively.

While our study focuses on policies to limit urban air pollution in two major cities (Beijing and China), the findings speak broadly to the global issue of mortality caused by outdoor particulate pollution generated by fossil fuel consumption (Karn *et al.* 2021). While this issue is most often referred to in other cities within the Global South it is also a major concern in cities within the Global North.[21] As policies to address vehicular pollution are often the first tool local governments use in response to this issue, understanding the political feasibility of different policy instruments is crucial to assess the potential for policy-makers to take meaningful action to limit air pollution. Future research could assess the extent to which our findings generalize across these different contexts.

One ‘ray of light’ for proponents of MBIs is that pairing taxes with explicit revenue use pledges can mitigate their negative effects on policy support. This echoes findings on carbon taxation policy (Beiser-McGrath and Bernauer 2019, Dolšak *et al.* 2020). Further research could examine whether specific forms of revenue usage are as important in the case of vehicle usage/ownership and air pollution as they appear to be in the case of limiting carbon emissions in general (from any source) through a carbon tax. Future research could also use experimental study designs to identify what causal mechanisms tend to make particular policy instruments, and combinations of policy instruments, induce variation in political support levels. For instance, such research could explore whether C&C instruments tend to garner more public support because they obfuscate costs more than MBIs, or whether lower support levels for MBIs are driven primarily by concerns over corruption, distributional fairness, or other factors.

Notes

1. https://www.who.int/news/item/02-05-2018-9-out-of-10-people-worldwide-breathe-polluted-air-but-more-countries-are-taking-action.
2. https://www.c40.org/blog_posts/CAM2.
3. Subsidies could also be viewed as MBIs and could create conflicts on who should get subsidies or should subsidies be rolled back (Lim *et al.* 2022). We also recognize that historically both India and China have subsidized fossil fuels and electricity consumers and producers. Yet in India, for example, producer subsidies go to the coal industry and household subsidies to LPG and kerosene. Petrol and diesel are not subsidized. Hence, our paper tends to closely follow the policy landscape in these countries.
4. We recognize that citizens might have different levels of trust in national and local government, and this could impact their support for MBIs. For example, in India, the excise tax is collected by the national government, but the sales tax is collected by the local government. In China, given its one-party system, the local-federal distinction may be less important. Thus, future studies could investigate which level of government collects the tax, the trust citizens have in that branch of government, and how this might influence support for MBIs.
5. https://www.c40.org/blog_posts/CAM2.
6. Fielding in waves was chosen to examine how public support for a specific policy changes over time, as published in Beiser-McGrath *et al.* (2022).
7. Appendix A2 displays how the distribution of these demographics in the sample compare to census data. We find that even after using a soft quota, our sample is more educated and likely to be employed than the national average.
8. This policy has previously been used in Beijing and Delhi, as well as other cities such as Athens and Jakarta.
9. A version of this policy has been introduced in Delhi, starting in April 2022 (https://indianexpress.com/article/cities/delhi/rule-banning-old-vehicles-to-be-enforced-from-april-1-khattar-7782942/).
10. Fuel taxes are a common policy tool in many countries, and China is currently planning to impose consumption taxes on gasoline and diesel (https://www.argusmedia.com/en/news/2205974-china-eyes-reforms-to-road-fuel-consumption-tax).
11. This policy instrument has been adopted in Singapore (https://www.bbc.co.uk/news/business-41730778).
12. Table A1 in section A3 of the appendix displays the statistical output with p-values.
13. Explicit calculation of differences between AMCEs by city is displayed in Table A5, section A3 of the appendix.

14. Table A2 in section A3 of the appendix displays the statistical output with p-values.
15. Explicit calculation of differences between MMs by city is displayed in Table A6, section A3 of the appendix.
16. Table A3 in section A3 of the appendix displays the statistical output with p-values.
17. Explicit calculations of differences in MMs by car ownership are displayed in Tables A7 and A8, section A3 of the appendix.
18. The survey item is: 'In your opinion, how well has the government of Beijing/ New Delhi performed in recent years in dealing with the challenges the city is facing.'
19. Table A4 in section A3 of the appendix displays the statistical output with p-values.
20. Explicit calculations of differences in MMs by government performance assessment are displayed in Tables A9 and A10, section A3 of the appendix.
21. https://survey item is: "In your -asks-residents-to-leave-car-at-home-amid-high-air-pollution/a-18986437.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research was financially supported by European Research Council (ERC) Advanced Grant No. 295456 (Sources of Legitimacy in Global Environmental Governance) and ETH Zürich.

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Data availability statement

Upon publication replication data will be available at: https://doi.org/10.7910/DVN/JVDNTD

Ethics

The surveys that generated the data for this study were a part of ERC Advanced Grant project no. 295456 (Sources of Legitimacy in Global Environmental Governance). Ethical approval for the project as a whole was obtained at the beginning of the project (ETH Ethics Committee approval, 28 September 2012, EK-2012-N-41, extended to March 2018). The Ethics Committee of ETH Zürich and the ERC Ethics Monitoring Unit regularly monitored the project, with the final survey items provided on a continuous basis. The surveys for this study were fielded by Ipsos, and respondents were first informed about the nature of the study before being asked to consent. The study also followed the no-deception principle, whereby only factual information was provided to respondents.

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Appendix

A1. Conjoint Text

Please read the following text very carefully.

Pollution from motor vehicles, such as cars, trucks, buses, and motorcycles/scooters, accounts for a large part of the total air pollution in New Delhi. Besides air pollution, motor vehicle traffic contributes to congestion, noise, and accidents. The government is currently considering measures (policies) to limit motor vehicles in New Delhi. Such measures include:

(1) **An additional tax on petrol/diesel of 30 Rs per litre**. This would raise the price per litre from around 70 Rs to around 100 Rs.

(2) **Introducing an odd-even rule**. This rule would allow motor vehicles with an odd or even license plate number to circulate in the city only every other day. Vehicles with an odd license plate number at the end (1,3,5,7,9) would, for

instance, be allowed to drive on Mondays, Wednesdays, and Fridays and would be banned from circulating in New Delhi on Tuesdays, Thursdays, and Saturdays. Vehicles with an even license plate number at the end (2,4,6,8) would then be allowed to drive on Tuesdays, Thursdays, and Saturdays, but banned from circulating on Mondays, Wednesdays, and Fridays.

(3) **Banning motor vehicles older than ten years**, which are usually more polluting than newer vehicles, from circulating in New Delhi.

(4) **A Vehicle Ownership Permit**. Anyone who acquires a new or used motor vehicle in New Delhi must from now on first obtain a Vehicle Ownership Permit for the appropriate vehicle category before the vehicle can be bought, registered, and used. In contrast to taxes on petrol/diesel, which continuously result from using a vehicle and depend on how much the vehicle is used, the Vehicle Ownership Permit requires a one-off payment before a car is bought and used. The Permit would allow its owner to have a car and use it on the road space of New Delhi for 10 years. The Permit would cost 400′000 Rs. for a truck, 200′000 Rs. for a car, and 50′000 Rs. for a motorcycle/scooter.

In the following, we will ask you to look at sets of two policy proposals, shown side-by-side. Each policy proposal consists of a combination of the policy measures shown a moment ago. Please look at each of the policies very carefully, compare them, and tell us which of the two policy proposals you would like the government to adopt and implement. In some cases, the two proposals may look quite similar, but will in fact differ in at least one or more aspects.

SECTION ORDER [RANDOMIZED ONCE BETWEEN RESPONDENTS AND KEEP IT FIXED 5 TIMES]	POLICY A [RANDOMISE ATTRIBUTE]	POLICY B [RANDOMISE ATTRIBUTE]
(1) Additional tax on petrol and diesel	[RANDOMISE ATTRIBUTE] (1) No additional tax (2) 30 Rs. additional tax per litre (3) 30 Rs. additional tax per litre, tax income used to make metro and bus services cheaper (4) 30 Rs. additional tax per litre, tax income used to make hybrid and electric vehicles cheaper	[RANDOMISE ATTRIBUTE] (1) No additional tax (2) 30 Rs. additional tax per litre (3) 30 Rs. additional tax per litre, tax income used to make metro and bus services cheaper (4) 30 Rs. additional tax per litre, tax income used to make hybrid and electric vehicles cheaper
(2) Restrictions based on license plate number (odd-even rule)	[RANDOMISE ATTRIBUTE] (1) No such restrictions/no odd-even rule (2) Restrictions (odd-even rule) applied permanently (all year) (3) Restrictions (odd-even rule) applied from November to February (4) Restrictions (odd-even rule) applied whenever the local forecast predicts at least three consecutive days of high air pollution	[RANDOMISE ATTRIBUTE] (1) No such restrictions/no odd-even rule (2) Restrictions (odd-even rule) applied permanently (all year) (3) Restrictions (odd-even rule) applied from November to February (4) Restrictions (odd-even rule) applied whenever the local forecast predicts at least three consecutive days of high air pollution

(*Continued*)

SECTION ORDER [RANDOMIZED ONCE BETWEEN RESPONDENTS AND KEEP IT FIXED 5 TIMES]	POLICY A [RANDOMISE ATTRIBUTE]	POLICY B [RANDOMISE ATTRIBUTE]
(3) Prohibition of motor vehicles older than 10 years	[RANDOMISE ATTRIBUTE] (1) No such prohibition/motor vehicles older than 10 years allowed (2) Prohibition of cars and motorcycles/scooters older than 10 years (3) Prohibition of cars older than 10 years, but no such prohibition of cycles/scooters (4) Prohibition of motorcycles/ scooters older than 10 years, but no such prohibition of cars	RANDOMISE ATTRIBUTE] (1) No such prohibition prohibition/motor vehicles older than 10 years allowed (2) Prohibition of cars and motorcycles/scooters older than 10 years (3) Prohibition of cars older than 10 years, but no such prohibition of cycles/scooters (4) Prohibition of motorcycles/ scooters older than 10 years, but no such prohibition of cars
(4) Vehicle Ownership Permit (VOP)	[RANDOMISE ATTRIBUTE] (1) No permit required (2) Permit required, costing 200,000Rs for cars and 50,000Rs motorcycles/ scooters (3) Permit costing 200,00Rs for cars required, but no permit required for motorcycles/ scooters (4) Permit costing 50,000Rs for motorcycles/scooters required, but no permit required for cars	[RANDOMISE ATTRIBUTE] (1) No permit required (2) Permit required, costing 200,000Rs for cars and 50,000Rs motorcycles/ scooters (3) Permit costing 200,00Rs for cars required, but no permit required for motorcycles/ scooters (4) Permit costing 50,000Rs for motorcycles/scooters required, but no permit required for cars
(5) Which of the two policies should the government adopt and implement?		

Q: Please rate the two policy measures on a scale from 1 to 7, where 1 indicates that you " strongly oppose " and 7 indicates that you " strongly support " the policy measure.

	Strongly oppose (1)	(2)	(3)	(4)	(5)	(6)	Strongly support (7)
1. Policy A							
2. Policy B							

A2. Distribution of Demographic Characteristics[22]

Source: Census 2010 – n = 500 pilot + 1500 main Beijing	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
Beijing – Wave 1						
GENDER	**Q2**		Hard Quota			
Male	1	51%		382	51%	381
Female	2	49%		368	49%	369
Total		**100%**		750	100%	**750**
AGE	**Q3**	%	Hard Quota			
18–24	1 to 7	30%		225	30%	225
25–34	8 to 17	30%		225	30%	225
35–44	18 to 27	32%		240	32%	240
45+ (including about 12% btw 45–50 yo)	From 28 and over	8%		60	8%	60
Total		**100%**		750	100%	**750**
EDUCATION	**Q4**	%	Soft Quota			
Non-schooling	1	5%		0	0%	40
Primary School	2	25%		0	0%	184
Junior Secondary School	3	44%		5	1%	327
Senior Secondary School	4	15%		31	4%	115
Junior College	5	6%		102	14%	49
University	6	4%		518	69%	32
Post Graduate	7	0%		94	13%	3
Total		**100%**		750	100%	**750**

(*Continued*)

(Continued).

	Source: Census 2010 – n = 500 pilot + 1500 main Beijing	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
	OCCUPATION	**Q5**	%	Soft Quota			
Working	Full-time paid employment	1	58%		636	85%	435
	Part-time paid employment	2	8%		15	2%	60
	Self-employed (own business)	3	6%		18	2%	45
Not working	Unemployed	4	3%		4	1%	23
	Retired	5	3%		8	1%	23
	Homemaker	6	5%		1	0%	38
	Student	7	13%		68	9%	98
	Other	8	4%		0	0%	30
	Total		**100%**		750	100%	**750**
Beijing – Wave 2							
	GENDER	**Q2**		Hard Quota			
	Male	1	51%		382	51%	381
	Female	2	49%		368	49%	369
	Total		**100%**		750	100%	**750**
	AGE	**Q3**	%	Hard Quota			
	18–24	1 to 7	30%		225	30%	225
	25–34	8 to 17	30%		225	30%	225
	35–44	18 to 27	32%		240	32%	240
	45+ (including about 12% btw 45–50 yo)	From 28 and over	8%		60	8%	60
	Total		**100%**		750	100%	**750**
	EDUCATION	**Q4**	%	Soft Quota			
	Non-schooling	1	5%		0	0%	40
	Primary School	2	25%		1	0%	184
	Junior Secondary School	3	44%		0	0%	327
	Senior Secondary School	4	15%		33	4%	115
	Junior College	5	6%		114	15%	49
	University	6	4%		538	72%	32
	Post Graduate	7	0%		64	9%	3
	Total		**100%**		750	100%	**750**

(Continued)

(Continued).

	Source: Census 2010 – n = 500 pilot + 1500 main Beijing	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
	OCCUPATION	**Q5**	%	Soft Quota			
Working	Full-time paid employment	1	58%		659	88%	435
	Part-time paid employment	2	8%		13	2%	60
	Self-employed (own business)	3	6%		11	1%	45
Not working	Unemployed	4	3%		0	0%	23
	Retired	5	3%		6	1%	23
	Homemaker	6	5%		1	0%	38
	Student	7	13%		57	8%	98
	Other	8	4%		3	0%	30
	Total		**100%**		750	100%	**750**

	Source: Census 2011 – n = 500 pilot + 1500 mainNew Delhi	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
New Delhi – Wave 1							
	GENDER	**Q2**		Hard Quota			
	Male	1	51%		384	51%	385
	Female	2	49%		366	49%	365
	Total		**100%**		750	100%	**750**
	AGE	**Q3**	*%*	Hard Quota			
	18–24	1 to 7	21%		158	21%	158
	25–34	8 to 17	25%		187	25%	187
	35+ (with substantial proportion of 35–45 yo)	From 18 and over	54%		405	54%	405
	Total		**100%**		750	100%	**750**

(*Continued*)

(Continued).

	Source: Census 2011 – n = 500 pilot + 1500 mainNew Delhi	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
	EDUCATION	**Q4**	%	Soft Quota			
	Below Primary	1	11%		0	0%	79
	Primary	2	22%		0	0%	167
	Middle	3	19%		2	0%	139
	Matric/Secondary	4	17%		8	1%	125
	Higher secondary/ Intermediate/ Pre-University/Senior secondary	5	16%		52	7%	121
	Non-technical diploma or certificate not equal to degree	6	0%		7	1%	2
	Technical diploma or certificate not equal to degree	7	2%		14	2%	11
	Graduate & above	8	14%		663	88%	106
	Other	9			4	1%	0
	Total		**100%**		750	100%	**750**
	OCCUPATION	**Q5**	%	Soft Quota			
Working	Full-time paid employment	1	44%		540	72%	330
	Part-time paid employment	2	4%		39	5%	30
	Self-employed (own business)	3	8%		71	9%	60
Not working	Unemployed	4	7%		14	2%	53
	Retired	5	3%		7	1%	23
	Homemaker	6	7%		16	2%	53
	Student	7	23%		63	8%	173
	Other	8	4%		0	0%	30
	Total		**100%**		750	100%	**750**
New Delhi – Wave 2							
	GENDER	**Q2**		Hard Quota			
	Male	1	51%		385	51%	385
	Female	2	49%		365	49%	365
	Total		**100%**		750	100%	**750**
	AGE	**Q3**	%	Hard Quota			
	18–24	1 to 7	21%		158	21%	158
	25–34	8 to 17	25%		187	25%	187
	35+ (with substantial proportion of 35–45 yo)	From 18 and over	54%		405	54%	405
	Total		**100%**		750	100%	**750**

(*Continued*)

(Continued).

	Source: Census 2011 – n = 500 pilot + 1500 mainNew Delhi	Questionnaire recode	Nat Rep Offline 18+	750	completes	Soft Quota	
	EDUCATION	**Q4**	%	Soft Quota			
	Below Primary	1	11%		1	0%	79
	Primary	2	22%		4	1%	167
	Middle	3	19%		0	0%	139
	Matric/Secondary	4	17%		5	1%	125
	Higher secondary/ Intermediate/ Pre-University/Senior secondary	5	16%		55	7%	121
	Non-technical diploma or certificate not equal to degree	6	0%		9	1%	2
	Technical diploma or certificate not equal to degree	7	2%		29	4%	11
	Graduate & above	8	14%		647	86%	106
	Other	9			0	0%	0
	Total		**100%**		750	100%	**750**
	OCCUPATION	**Q5**	%	Soft Quota			
Working	Full-time paid employment	1	44%		372	50%	330
	Part-time paid employment	2	4%		20	3%	30
	Self-employed (own business)	3	8%		103	14%	60
Not working	Unemployed	4	7%		12	2%	53
	Retired	5	3%		0	0%	23
	Homemaker	6	7%		159	21%	53
	Student	7	23%		82	11%	173
	Other	8	4%		2	0%	30
	Total		**100%**		750	100%	**750**

1. Nat Rep Offline 18+: percentage of adults with this characteristic in stated country, based upon Census data. Hard Quota: indicates percentage of responses must exactly match the nationally representative percentage. Soft Quota: indicates sample recruitment was focused on increasing representativeness of this characteristic, without imposing a strict quota. Completes: indicates number of respondents with this characteristic who completed the survey.

A3. Statistical Analysis Tables

Table A1: Probability of choosing policy.

	Beijing	Delhi
(Intercept)	0.417***	0.382***
	(0.019)	(0.018)
fuel_tax2) 30 R Tax	−0.080***	−0.031**
	(0.015)	(0.014)
fuel_tax3) 30 R Tax + Pub Trans Subsidy	0.060***	0.004
	(0.015)	(0.015)
fuel_tax4) 30 R Tax + Elec Cars Subsidy	−0.014	0.010
	(0.015)	(0.015)
vop2) VOP for vehicles	−0.011	0.021
	(0.015)	(0.015)
vop3) VOP for cars	−0.015	0.034**
	(0.014)	(0.014)
vop4) VOP for scooters	−0.019	−0.037***
	(0.013)	(0.014)
odd_even2) Permanent Odd-Even	0.070***	0.082***
	(0.016)	(0.014)
odd_even3) From Nov to Feb	0.065***	0.074***
	(0.014)	(0.013)
odd_even4) When Severe Air Pollution	0.122***	0.104***
	(0.014)	(0.014)
vehicle_ban2) Vehicles > 10 Years	0.071***	0.104***
	(0.014)	(0.014)
vehicle_ban3) Cars > 10 Years	0.024*	0.064***
	(0.014)	(0.013)
vehicle_ban4) Scooters > 10 Years	0.053***	0.036***
	(0.014)	(0.014)
Num.Obs.	15,000	15,010
R2	0.022	0.016
R2 Adj.	0.021	0.015
se_type	CR2	CR2

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Marginal means.

	city	cat_lab	level	estimate	std.error	p	lower	upper
1	New Delhi	Fuel Tax	1) No Tax	0.51	0.0094	5.4e-01	0.49	0.52
2	New Delhi	Fuel Tax	2) 30 R Tax	0.47	0.0079	4.0e-05	0.45	0.48
3	New Delhi	Fuel Tax	3) 30 R Tax + Pub Trans Subsidy	0.52	0.0084	6.0e-02	0.50	0.53
4	New Delhi	Fuel Tax	4) 30 R Tax + Elec Cars Subsidy	0.51	0.0080	1.3e-01	0.50	0.53
5	New Delhi	VOP	1) No VOP	0.50	0.0088	9.9e-01	0.48	0.52
6	New Delhi	VOP	2) VOP for vehicles	0.52	0.0089	6.1e-02	0.50	0.53
7	New Delhi	VOP	3) VOP for cars	0.53	0.0086	2.4e-04	0.51	0.55
8	New Delhi	VOP	4) VOP for scooters	0.46	0.0080	1.9e-07	0.44	0.47
9	New Delhi	Odd-Even	1) No Odd-Even	0.43	0.0086	1.5e-15	0.41	0.45
10	New Delhi	Odd-Even	2) Permanent Odd-Even	0.52	0.0086	2.0e-02	0.50	0.54
11	New Delhi	Odd-Even	3) From Nov to Feb	0.51	0.0083	2.2e-01	0.49	0.53
12	New Delhi	Odd-Even	4) When Severe Air Pollution	0.53	0.0081	9.4e-05	0.52	0.55
13	New Delhi	Vehicle Ban	1) No Ban	0.45	0.0084	3.6e-09	0.43	0.47
14	New Delhi	Vehicle Ban	2) Vehicles > 10 Years	0.55	0.0081	3.4e-11	0.54	0.57
15	New Delhi	Vehicle Ban	3) Cars > 10 Years	0.50	0.0083	6.4e-01	0.49	0.52
16	New Delhi	Vehicle Ban	4) Scooters > 10 Years	0.48	0.0083	5.6e-02	0.47	0.50
17	Beijing	Fuel Tax	1) No Tax	0.51	0.0094	4.2e-01	0.49	0.53
18	Beijing	Fuel Tax	2) 30 R Tax	0.42	0.0084	1.9e-19	0.41	0.44
19	Beijing	Fuel Tax	3) 30 R Tax + Pub Trans Subsidy	0.58	0.0087	4.8e-19	0.56	0.60
20	Beijing	Fuel Tax	4) 30 R Tax + Elec Cars Subsidy	0.50	0.0083	8.3e-01	0.48	0.51
21	Beijing	VOP	1) No VOP	0.51	0.0088	2.3e-01	0.49	0.53
22	Beijing	VOP	2) VOP for vehicles	0.50	0.0087	7.7e-01	0.48	0.51
23	Beijing	VOP	3) VOP for cars	0.50	0.0089	6.5e-01	0.49	0.52
24	Beijing	VOP	4) VOP for scooters	0.49	0.0081	1.7e-01	0.47	0.50

(Continued)

Table A2: (Continued).

	city	cat_lab	level	estimate	std.error	p	lower	upper
25	Beijing	Odd-Even	1) No Odd-Even	0.43	0.0093	1.3e-15	0.41	0.44
26	Beijing	Odd-Even	2) Permanent Odd-Even	0.51	0.0092	1.4e-01	0.50	0.53
27	Beijing	Odd-Even	3) From Nov to Feb	0.50	0.0087	8.0e-01	0.48	0.51
28	Beijing	Odd-Even	4) When Severe Air Pollution	0.56	0.0086	1.2e-10	0.54	0.57
29	Beijing	Vehicle Ban	1) No Ban	0.46	0.0089	7.6e-05	0.45	0.48
30	Beijing	Vehicle Ban	2) Vehicles > 10 Years	0.54	0.0083	4.1e-06	0.52	0.55
31	Beijing	Vehicle Ban	3) Cars > 10 Years	0.48	0.0085	3.6e-03	0.46	0.49
32	Beijing	Vehicle Ban	4) Scooters > 10 Years	0.51	0.0082	7.8e-02	0.50	0.53