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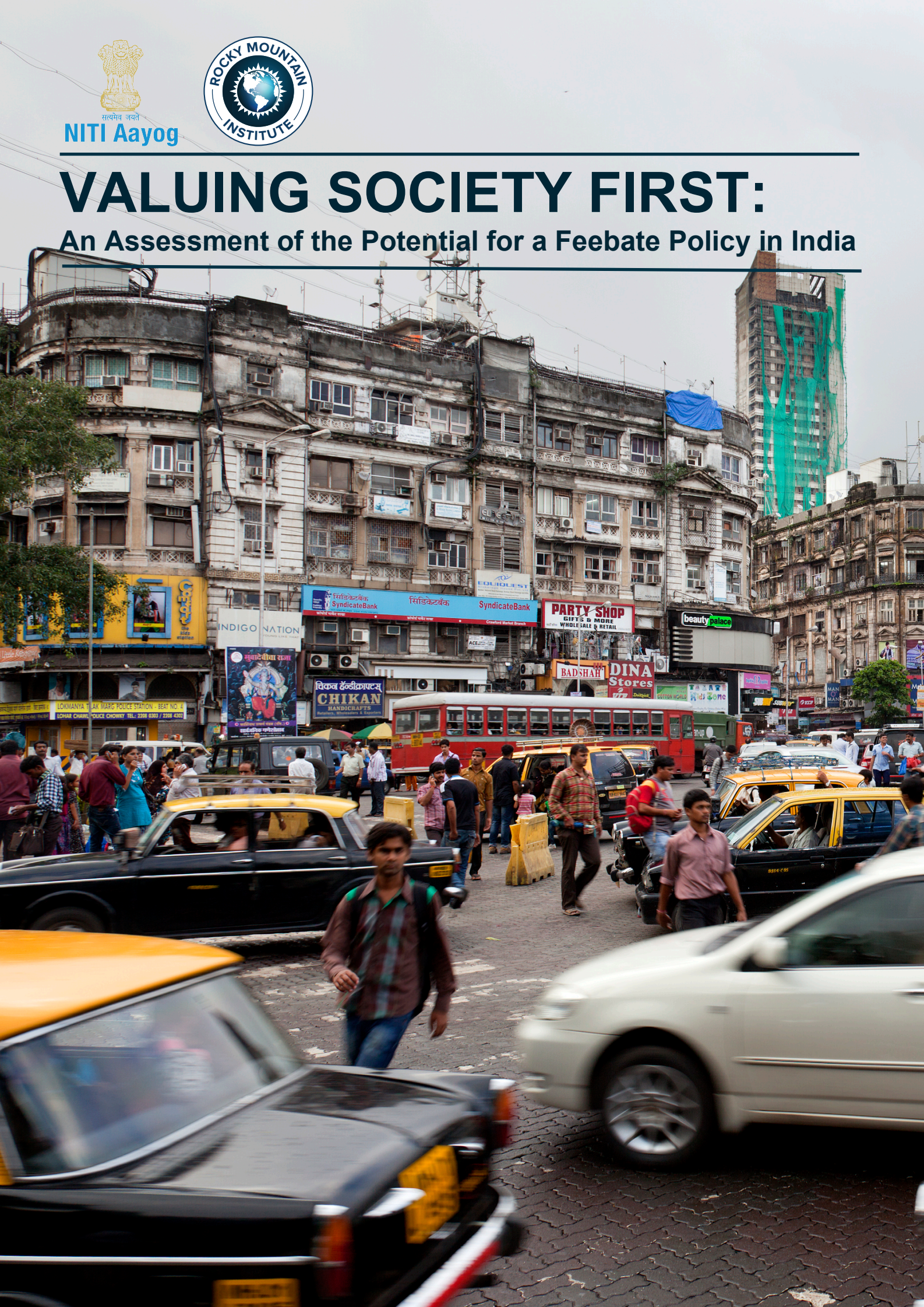
ROCKY MOUNTAIN INSTITUTE

VALUING SOCIETY FIRST:

An Assessment of the Potential for a Feebate Policy in India



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ABOUT ROCKY MOUNTAIN INSTITUTE

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

ABOUT NITI AAYOG

The National Institution for Transforming India, also called NITI Aayog, was formed via a resolution of the Union Cabinet on 1 January 2015. NITI Aayog is the premier policy 'Think Tank' of the Government of India, providing both directional and policy inputs. While designing strategic and long-term policies and programs for the Government of India, NITI Aayog also provides relevant technical advice to the Centre and States. The Government of India, in keeping with its reform agenda, constituted the NITI Aayog to replace the Planning Commission instituted in 1950. This was done in order to better serve the needs and aspirations of the people of India. An important evolutionary change from the past, NITI Aayog acts as the quintessential platform of the Government of India to bring States to act together in national interest, and thereby fosters Cooperative Federalism.

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PREAMBLES FROM NITI AAYOG AND RMI'S LEADERSHIP

Amitabh Kant, Chief Executive Officer, NITI Aayog

The pace of India's mobility transformation is astounding. Every day, India registers over 50,000 new vehicles. While India must strive to avoid pervasive private-vehicle ownership, ensuring that these new vehicles are efficient and clean is the country's collective responsibility. Today India's fleet is among the most fuel-efficient in the world. To maintain this competitive advantage, support a burgeoning auto sector, reduce India's oil-import bill, and improve local air-quality, India should build on lessons learned from countries around the world. Thus, India needs a broad portfolio of measures to encourage and support the production and use of advanced technology vehicles that are capable of more efficiently and cleanly providing mobility services to over a billion people. With its carrot-and-stick approach, a revenue-neutral feebate can draw both consumers and manufacturers forward at a pace commensurate with India's sustainable development—without the use of public funds. It can also guide and accelerate consumers' and suppliers' efforts to understand their role in India's shared, electric, and connected mobility future by jumpstarting a vehicle technology revolution in India that the world and India desperately need. I hope this paper will contribute to productive dialogue around potential policy solutions that support India's rapid pursuit of its ambitions.

Amory Lovins, Cofounder and Chief Scientist, Rocky Mountain Institute

Our societies and economies work best when governments steer and markets row. Thus policies that enable "coopetition"—cooperative competition—are hallmarks of modern policymaking. Structuring fair, actionable, and enticing market rules and incentives isn't an easy undertaking: many governments around the world have tried to steer their electricity and mobility systems in the right direction, but inadvertently rowed and run aground. India has an opportunity to design and implement an elegant policy that can radically transform the mobility and lives of all Indian citizens—simply by letting its agile, entrepreneurial, and technologically advanced private sector do what it does best: innovate. A feebate program, optimized for India's unique conditions, will not only help rapidly deploy efficient and clean vehicles, but also fortify the pillars of India's development strategy. In doing so, it will help uplift the poor, modernize infrastructure, ensure public health, efficiently allocate capital, safeguard the foundations of national security, and enhance and apply the talent of its people and the ambition of its entrepreneurs. We invite leaders across India's government and automotive industry to explore how a feebate can be an effective policy tool for realizing its bold vision.

1. EXECUTIVE SUMMARY

This paper explores the potential for the design and implementation of a national feebate policy to drive vehicle efficiency in India. A feebate is a policy by which inefficient or polluting vehicles incur a surcharge (*fee-*) while efficient ones receive a rebate (*-bate*). Austria, Denmark, France, the Netherlands, Norway, Ontario (Canada), and Singapore have introduced variations of feebates. Its advantages include its market-based design; its potential to be revenue neutral, size neutral, and technology agnostic; and its alignment of private interests with societal interests and incentives. While there are significant challenges in designing and implementing a feebate, the policy can offer an advantageous alternative to fuel economy or greenhouse gas standards, which are static, soon become obsolete, and give no incentive to outperform. On the other hand, feebates drive continuous improvement and innovation. A feebate that is politically attractive and supports both customers' and manufacturers' transitions to more-efficient, cleaner vehicle technologies will require careful attention from and close collaboration among India's public- and private-sector leadership.

As the Government of India sets its sights on 100 percent electric vehicle adoption by 2030, an optimized feebate could effectively incentivize this adoption with little to no use of public funds. Case studies of Norway, France, and Ontario (Canada) offer insights into how India can build on the successes and steer clear of the shortcomings of these programs in designing its own feebate fine-tuned for India's unique conditions. This paper proposes a set of design principles for a potential feebate program in India, without recommending a specific technical design, and suggests a phased approach to its implementation (summarized in Figure 1, below):

- **Phase 1:** Establish an independent professional body to guide the feebate's research and design, and engage stakeholders to collaboratively develop a policy that best supports the transformation of India's passenger mobility system.
- **Phase 2:** Implement a revenue-neutral feebate, probably enacted at the point-of-sale and divided into several size-based categories.
- **Phase 3:** Expand the policy to additional vehicle segments and potentially India's used vehicle market, and introduce trials for feebates that relate fees and rebates to vehicle occupancy as a means of addressing the government's goal to increase sharing.

While many policy options exist, the successful implementation of an optimized feebate could make India a global leader in the policymaking and manufacturing that enable broad adoption of clean, efficient vehicles, and in the accelerating innovation that can continue to widen India's competitive advantage.

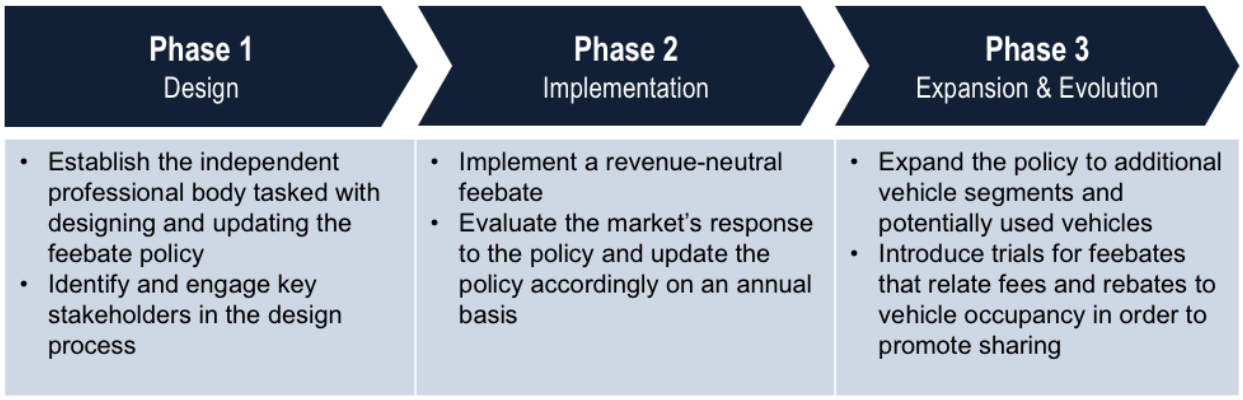

FIGURE 1. THREE PHASES OF DESIGNING, IMPLEMENTING, AND EXPANDING A FEEBATE FOR INDIA.

2. INTRODUCTION

India's passenger transportation sector is at a fork in the road. On the one hand, private vehicle ownership of internal combustion engine vehicles (ICEs) is growing rapidly,[i] producing a host of externalities[ii]—for example, India is home to 10 of the world's 20 most polluted cities,[1] including Delhi, where four out of 10 children suffer from respiratory ailments.[2] On the other hand, the government has declared a vision for a shared, clean, and connected mobility future, as well as targets for 175 GW of renewable energy by 2022 and 100 percent electric vehicles (EVs) by 2030. While vehicles that support this vision, often referred to as low- or zero-emission vehicles (ZEVs), already benefit from lower operating and maintenance costs, Bloomberg New Energy Finance expects these vehicles to reach upfront cost parity with ICEs by 2025. A phased approach to implementing a "feebate"—a policy by which inefficient or polluting vehicles incur a surcharge (*fee*-) while efficient ones receive a rebate (-*bate*)—with the design considerations outlined in section 5 of this report can reduce capital cost premiums of efficient and clean vehicles today while encouraging their manufacturing and rapid adoption.

Incentives designed around India's specific interests and conditions should best stimulate efficient and clean vehicle adoption. A feebate is a promising candidate for driving this transition and helping India reach its ambitious goals for many reasons. Its potential design and implementation presents an opportunity for India to realize a national, revenue-neutral feebate on a scale thus far unmatched globally. Many experts consider this incentive mechanism single-handedly capable of accelerating ZEV adoption through price parity and beyond. Accelerated adoption of efficient and clean vehicles can help rapidly reduce India's harmful air pollution and costly oil imports while creating durable competitive advantage.

What Is a Feebate?

A feebate is a market-based policy combining fees with rebates to reward energy-efficient or environmentally friendly investments or practices and penalize inefficient and environmentally harmful ones. The idea has been discussed since the 1970s, when Rocky Mountain Institute's cofounder and chief scientist Amory Lovins, IBM's chief scientist Richard Garwin, and Berkeley physicist and energy efficiency leader Art Rosenfeld all independently invented the concept. Feebates adhere to the "polluter pays" principle: the idea that polluters should be financially responsible for the externalized costs of the greenhouse gases and local air pollution that they produce, either directly or indirectly. This type of policy has a diverse range of applications, from waste management to electric utilities to vehicles.

In the case of vehicles, a feebate works by levying fees on relatively high-emitting new vehicles while remitting rebates to relatively low-emitting ones. This "bonus-malus" design, as it is known in Europe, simultaneously incentivizes clean vehicles and disincentives polluting ones. While the fees and rebates need not be directly connected for a program to be considered a "feebate," such a connection generally creates a more politically attractive design because it enables self-financing: the fees pay for the rebates, with an annual true-up to ensure that balance.

A feebate differs from a typical tax scheme because it need not entail a net revenue flow to the government's treasury if it is designed to be self-financing; additionally, the fees are entirely avoidable by customers' choice.[iii] Also, a feebate may have other applications in mobility beyond purchase incentives. For example, a part of the feebate or a separate feebate could have a design that promotes vehicle sharing or specific propulsion systems (e.g., battery-electric).

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[i] Personal vehicle ownership grew by roughly 200 percent to nearly 160 million between 2002 and 2013. India currently registers more than 50,000 vehicles per day (over 75% of these registrations are two-wheelers).

[ii] Road accidents exceeded a half-million in 2015, resulting in more than 146,000 fatalities. Congestion is slowing average road speeds in cities to 20 kilometers per hour or less.

[iii] Several non-mandatory goods are taxed, such as a "sin tax" on products like tobacco and alcohol in the U.S.; this alone does not disqualify a feebate from being labeled as a tax.

A feebate typically influences auto-buying decisions at the point of purchase, appearing as a higher or lower purchase price for the vehicle rather than requiring a complex calculation about the potential present value of future fuel savings. In economic terms, a feebate enables a private auto buyer's choices to reflect society's long-term objectives and investment horizon. Typically, the buyer applies a high implicit consumer discount rate,[3] counting only the first year or two of expected fuel savings. A feebate enables the auto buyer to consider the vehicle's entire life-cycle fuel saving, better reflecting such national objectives as public health, national security, and climate stability. Thus, the feebate arbitrages the spread in discount rate between the private buyer and society, harmonizing their timelines by aligning their weighting of short- and long-term goals.

A feebate applied to the purchase of new vehicles in India would help jumpstart both the manufacturing and consumer adoption of efficient vehicles, including EVs. Incentives for India's automotive industry can create additional revenue for manufacturers as they develop a diverse supply of high-quality, domestically manufactured EVs that would attract Indian consumers to shift from ICEs. To ensure this transition occurs across all vehicle segments, the feebate can apply to each segment, including two-wheelers, three-wheelers, and passenger cars. In the future, it could even extend to heavier vehicles, such as medium and heavy trucks.

Challenges and Benefits of a Feebate Policy

There are significant challenges in designing and implementing a feebate. It will take careful attention to detail to create a policy that is politically acceptable and supportive of the automotive industry's transition to advanced vehicle technologies. Several proposed feebate policies in other countries have not been implemented due in part to opposition from the automotive industry. These proposals often failed to take into account automakers' long product cycles and capital-intensive operations. Engaging all potential stakeholders can encourage the design of a feebate that is widely supported in India and capable of delivering benefits to as many parties as possible. While a feebate will probably require automakers to make significant capital investments in vehicle technology development, so would any other policy to achieve the government's objectives of clean and efficient vehicles. A feebate policy would not create additional cost in the long run. Rather, it simply encourages automakers to accelerate the timeline of an inevitable future cost as the market transitions—guided by government policies already announced—to more-efficient vehicles. In select cases, the implementation of a feebate program has even correlated with increased vehicle sales.[4]

Other challenges of designing and implementing a feebate include the perceived complexity of the policy and its interaction with existing policies. The paper addresses these challenges in section 5 and discusses how to mitigate through careful policy design.

A feebate policy provides many benefits that can far outweigh its potential challenges. Compared with other policies, feebates generally offer automakers more control and flexibility. By effectively decreasing the consumer discount rate in the vehicle-buying decision, feebates can align buyers' interests with the national interests that long-term competitiveness and innovation require. Some other key benefits include:

- Feebates are **market-based**: they provide a clear price signal to consumers to buy more-efficient vehicles, harnessing market forces to achieve societal goals without limiting consumer choice. Feebates reward manufacturers for widening their product slates, thus expanding consumer choice.
- A feebate can be **revenue neutral**. Unlike a subsidy program, a feebate need not require the use of public funds. Its adoption thus does not risk disturbing government budgeting.
- An optimized feebate drives **continuous improvement** by creating continuous incentives. By contrast, fuel economy standards only motivate automakers to make marginal improvements to meet the standard. While such standards can remove some of the market's most inefficient vehicles, standards give automakers, dealers, and consumers no incentive to exceed the standards.
- A feebate can be designed to be **size-neutral**, so it rewards efficient choices of the type and size of vehicle one prefers rather than choosing a vehicle one does not prefer.

- Feebates can be **technology agnostic**. They generally promote cleaner, more-efficient vehicles regardless of technology, allowing evaluation of all technologies on a level playing field that rewards or penalizes a technology based on its relative efficiency.
- By **addressing consumers' high discount rates**, feebates reduce the upfront purchase price of an efficient vehicle, incentivizing widespread adoption and making more-efficient, cleaner, cheaper-to-operate vehicles available across a far wider income range.

3. STRUCTURE OF A FEEBATE

This section provides an overview of the components that make up a feebate. For an in-depth analysis of these components and how they influence a feebate's effectiveness, the authors recommend Bunch and Greene (2011).[5]

Feebate Components

Generally, a feebate includes the following components, illustrated graphically in Figure 2:

- An **efficiency criterion** defines how to compare vehicles. Common criteria include emissions, in grams carbon dioxide per kilometer (gCO_2/km), and fuel consumption, in liters/km (L/100 km).
- A **pivot point** (sometimes called a benchmark) defines which vehicles pay fees and which ones receive rebates. This specific value uses the efficiency criterion's units. A feebate can use a single pivot point or multiple, depending on its objectives. For example, different classes of vehicles, such as passenger vehicles and light-duty trucks, could have different pivot points to preserve a higher degree of consumer choice. This principle is discussed in more detail below.
- A **functional form and rate parameter** determines the magnitude of the fee or rebate for each incremental difference from the pivot point. Looking at a schematic of a feebate (see Figure 2), the functional form is the shape of the line (e.g., linear), and the rate parameter is slope. Some options for the functional form include a straight line (linear), a piecewise linear function (multiple line segments with different slopes), and a step function (fixed fees or rebates assigned to specific ranges of the criterion).
- A **point and manner of transaction** defines the party that will levy fees and remit rebates at one or more specific point(s) in the vehicle transaction process. Options include levying the fee or remitting the rebate at the point of sale or later in the vehicle ownership timeline, such as during the vehicle registration process. Fees and rebates can apply directly to the consumer or to another party, such as the dealership or manufacturer. If, for example, the feebates apply at the factory, then they are visible to the retail buyer as a higher or lower price. If they apply at the dealership, they could appear as an additional line on the vehicle price tag, analogous to the goods and services tax (GST) but having a positive or negative value.

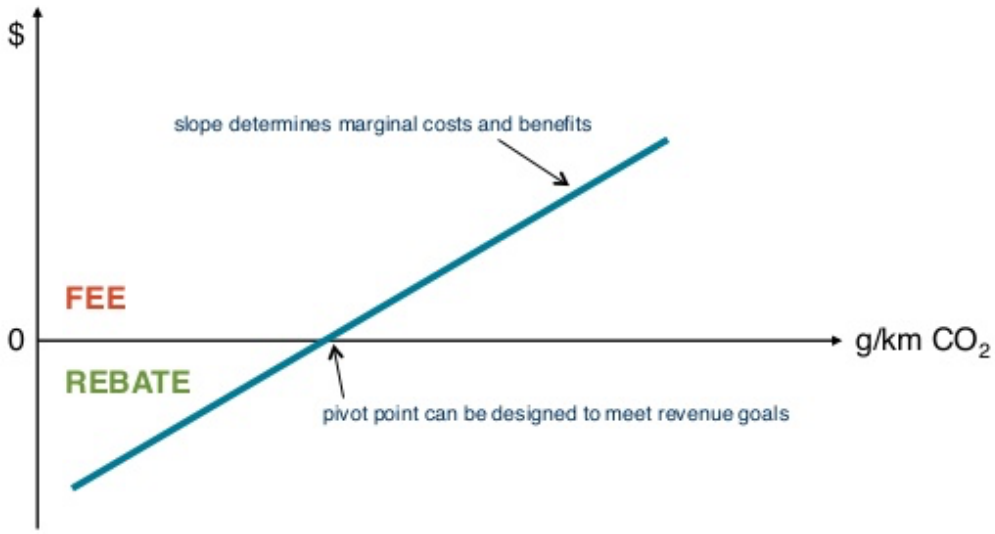

FIGURE 2: EXAMPLE FEEBATE DIAGRAM. IN THIS EXAMPLE, THE EFFICIENCY CRITERION IS GCO_2/KM AND THE FUNCTIONAL FORM IS LINEAR. THE PIVOT POINT IS WHERE THE SINGLE BLUE LINE CROSSES THE X-AXIS. THE RATE PARAMETER IS THE SLOPE OF THE BLUE LINE. SOURCE: ICCT

These technical details are critical to the success of the program, its political acceptance, and its affects on different parties. This paper does not advocate for a particular technical design; rather, it suggests a set of general design principles (described in section 5) that a range of feebate designs can satisfy. Two of these design principles—revenue neutrality and preservation of consumer choice—warrant a bit more technical explanation, and are described in the Appendix.

4. CASE STUDIES

Numerous countries and regions around the world have implemented feebate and feebate-like programs, with a range of stringency and varying success. These policies differ in factors such as efficiency criterion, functional form, and whether they are self-financing, depending on each program's political conditions and goals. Each of these design decisions contributes to the political acceptance and effectiveness of the feebate.

Several European countries—including Denmark, France, the Netherlands, and Norway—have observed clear shifts in car purchasing decisions toward lower emission vehicles since implementing feebate-like policies over the past decade.[6] It is important to note that it is difficult to isolate the effects of a feebate policy in countries with a portfolio of policies favoring alternative-fuel vehicles. What is clear from these examples, however, is that feebates are most successful when their designs complement and reinforce other policies and incentives. Public reaction to feebates has generally been positive.[7] In many cases, the largest source of opposition has come from automakers and car dealerships. This paper suggests that those cases reflect suboptimized feebate design, and that optimized design could make feebates advantageous to those parties.

The following case studies of Norway, France, and Ontario (Canada) offer valuable insights into the successes and shortcomings of feebate design. These examples represent a range of feebate designs and shed light on design considerations for India. Each case study examines the policy's design, political and public reactions to its implementation, and elements that could be improved or redesigned to increase effectiveness and attractiveness. Learning from these examples can help India design a feebate that builds on successful design choices and avoids common mistakes.

(Please see Table 1 on page 12 for a summary of these case studies and two others, Denmark and the Netherlands).

Norway's Vehicle Registration Tax and Rebate Program

Policy description

Nowhere in the world are EVs a higher share of passenger vehicle sales than Norway. Through September 2017, plug-in hybrid electric vehicles (PHEVs) and battery-electric vehicles (BEVs) made up 36 percent of Norway's passenger vehicle sales.[8] A history of supportive policies and a comprehensive suite of fiscal and non-fiscal incentives have enabled Norway's transition to hybrid and electric vehicle technologies by valuing externalities, like climate change caused by CO_2 emissions, and creating a conducive driving environment.[9] In 1991, Norway's fuel tax was designed to include CO_2 emissions.

Norway also has a one-time vehicle registration tax—originally set according to vehicle mass, engine power, and engine size—that underwent two reforms to further address CO_2 emissions. First, in 2007 Norway replaced the engine size parameter with CO_2 intensity, establishing what many economists call a "CO_2 differentiated tax." Second, in 2009 Norway started offering rebates to less emitting vehicles, giving its program a feebate-like form (though technically it is not a feebate because the fee and rebate components do not connect). The CO_2 component's portion of the tax has increased over time, while the other two components (vehicle mass and engine power) have declined, making CO_2 the central focus.[10,11]

Norway's feebate program has a single pivot point of 120 gCO_2/km, equal to the E.U.'s voluntary standard. Its functional form is four line segments, each of which has a different slope. The slope is much higher for less-efficient vehicles, so the fees are greater than the rebates. For example, the initial fee rate is kr277/gCO_2-km (US$34 or INR2,206 per gCO_2-km), and it increases to a maximum rate of kr1,320/gCO_2-km (US$162 or INR10,511 per gCO_2-km). The fee and rebate slopes have been revised over time, illustrated in Figure 3.

As Figure 3 shows, BEVs are not only exempt from Norway's vehicle registration tax; they also receive a rebate worth up to about US$12,000 or ₹775,000, which covers roughly a third of the upfront cost of a Tesla Model 3 at the time of publication. BEVs are not exempt from all taxes, however. For example, BEV owners have to pay an approximately kr3,310 (US$406 or ₹26,343) annual circulation (driving or road) tax. Together, the vehicle registration tax exemption and price difference between ICEs and BEVs created by their respective fees and rebates make BEVs financially attractive in Norway.

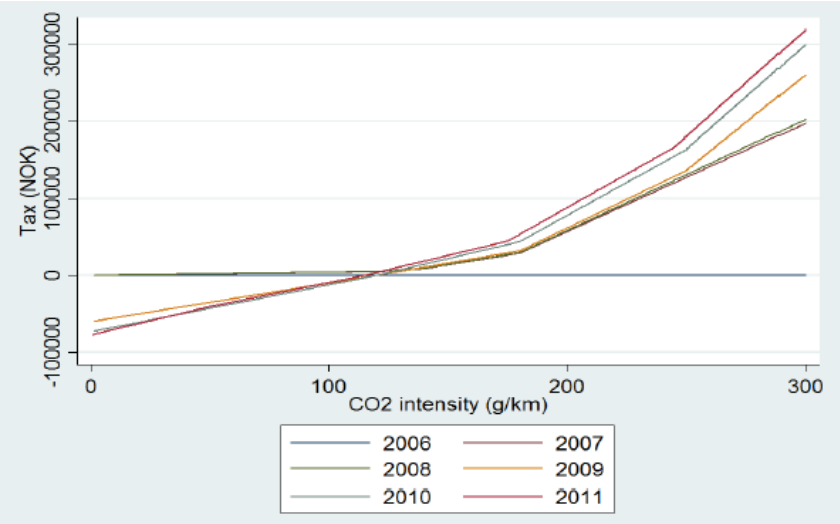

FIGURE 3. CHART SHOWING THE NORWEGIAN FEEBATE-LIKE PROGRAM'S 120 GCO_2/KM PIVOT POINT AND ITS FOUR LINE SEGMENTS WITH VARYING SLOPE PARAMETERS; BORROWED FROM YAN AND ESKELAND (2016).

Outcomes of the policy

Norway's feebate program helped reduce the sales-weighted average of new passenger vehicle emissions by about 15 percent in three years, from over 150 gCO_2/km in 2009 to about 130 gCO_2/km in 2012.[12] Interestingly, this average spiked in late 2006 after the announcement of a January 2007 start date of the CO_2 differentiated registration tax portion of Norway's feebate. Consumers rushed to purchase vehicles with high emissions intensities to avoid paying a higher registration tax.[13] These two findings suggest that feebates can shift consumer behavior in favor of more efficient options. It also suggests that policy announcements can have immediate effects.

	Policy overview	Efficiency criterion	Functional form	Potential improvements
Norway	Norway modified its registration tax in 2007 to include CO_2 intensity. In 2009, Norway started offering rebates to less-emitting vehicles. Together, the fee and rebate create a feebate form.	Emissions intensity: gCO_2/km	Linear, with 4 segments, all with different slopes; the fees have higher slopes than rebates	Could be designed to be revenue neutral and to use a single line and slope, rather than four lines with different slopes.
France	France introduced rebates for lower-emitting vehicles in December 2007. In January 2008, it introduced fees on higher-emitting vehicles, rounding out France's bonus-malus or feebate-style program.	Emissions intensity: gCO_2/km	Step function, with seven steps, including a discontinuity or "doughnut hole"	Could be designed to be revenue neutral. Choosing a linear form and eliminating the discontinuity would create more fairly distributed fees and rebates, and allow for complete coverage.
Ontario	Implemented originally in 1989 as a gas-guzzler tax and updated in 1991 to include a modest rebate, the policy was in effect, with no changes, through 2010. Fees and rebates are applied at the point of vehicle purchase. The program had little impact on consumer behavior.	Fuel efficiency: L/100 km	Step function, with eight steps; in its final form, only one fuel efficiency range out of eight received a rebate	Could be designed to be revenue neutral. A linear form, rather than a step function, with higher slopes and more frequent updates of the fees and reebates would better influence consumers' decisions. A national, not regional, policy would more strongly influence automakers.
Denmark	Denmark introduced its feebate in June 2007. The fee is a form of a registration tax. Denmark's feebate is close to a single-line, revenue-neutral feebate.	Emissions intensity: gCO_2/km	Linear, with two segments (one for fees, another for rebates), both with different slopes; rebates have higher slopes than fees	Could be designed to be revenue neutral and to use a single slope. Also, Denmark is backing off its feebate scheme, "moving to [a] more standard taxation scheme."[14]
Netherlands	The Netherlands introduced its program in July 2006 and revised it in February 2008. It was updated again in January 2010, to a registration tax based on an absolute CO_2 emissions rate. Importers handle transactions and pass on fees or rebates directly to consumers.	Emissions intensity: gCO_2/km	Originally a step function, with seven steps; updated to linear, with three segments	The program had difficulty maintaining revenue neutrality. Research into consumer behavior and market trends can help determine the optimal pivot point. Class-based benchmarks made the program too complex, especially for consumers.

TABLE 1. SUMMARIES OF CASE STUDIES OF FIVE COUNTRIES—NORWAY, FRANCE, ONTARIO (CANADA), DENMARK, AND THE NETHERLANDS—WITH EXPERIENCE DESIGNING AND IMPLEMENTING VARIATIONS OF FEEBATE PROGRAMS.

Reactions to the policy

Norway is a small automotive market, both within the E.U. and globally. Therefore, while its introduction of a feebate program offers a useful case study in policy design, implementation, and effectiveness, its national policies have little to no impact on multinational automakers' vehicle product lines or prices. Norway's government has generally been highly supportive of ZEV adoption, declaring a goal of reaching 100 percent EVs, in terms of new vehicle sales, by 2025.

Shortcomings of the policy

Norway's feebate program could potentially be improved in several ways. It is not revenue neutral by design, which is arguably a more sustainable policy choice. By contrast, it has multiple line segments with higher slopes for the fee lines than the rebate lines. A single line with a constant rate slope most easily achieves a revenue-neutral design, creates proportionate incentives that encourage continuous fuel improvement, and best preserves consumer choice.

France's Bonus-malus Écologique

Policy description

France is one of the European Union's largest passenger vehicle markets, accounting for about 15 percent of the E.U.'s annual sales volume.[15] Plug-in hybrid electric vehicles (PHEVs) and battery-electric vehicles (BEVs) made up more than 1 percent of France's light duty vehicle (LDV) sales in 2015; BEVs accounted for about 80 percent of electric vehicle (EV) sales.[16] The E.U.'s mandatory vehicle emissions standard was the impetus for the policymaking that helped establish France's passenger vehicle market as one of the most efficient in the world. Many transportation experts credit France's "bonus-malus écologique" as a driving force behind its passenger vehicle sector's relatively strong average fuel economy.[17,18,19]

France's bonus-malus scheme developed in two phases. First, France introduced a bonus-only scheme, offering rebates to efficient new vehicles purchased on or after December 5, 2007. Second, the French government introduced a fee on inefficient new vehicles registered after January 1, 2008.[20] Together these bonus and malus components make up France's feebate program. The program's functional form is a step function with nine levels (Table 2). Its pivot point is a range (131–160 gCO_2/km), as opposed to a single value. The literature refers to this range as a "discontinuity" or "doughnut hole" because vehicles falling within it are exempt from both fees and rebates.[21,22]

Table 2 shows the range of fees and rebates, with a maximum fee of US$2,600 and a maximum rebate of US$5,801. While there were no vehicle sales in the ≤60 gCO_2/km step in 2007, today France's top-selling BEV, the Nissan Leaf, would receive a rebate worth about 15 percent of its 2017 upfront price. Table 2 also highlights that a majority (45.4 percent) of France's new passenger vehicle sales fall in the discontinuity's range (131–160 gCO_2/km).

Outcomes of the policy

The bonus-malus scheme helped reduce the sales-weighted average CO_2 emissions per kilometer of France's new vehicles by 6 percent in its first year of implementation, nearly twice the reduction observed in the rest of the E.U. in 2008. Average engine power and vehicle mass also decreased in 2008, with both attributes experiencing their largest reductions in over 25 years.

Efficiency (gCO_2/km)	Rebate		Rebate as Percentage of 2007 Average Vehicle Price (2007) (%)	Market Share (2007) (%)
	(US$)	(INR)		
≤60	5,801	3,76,601	-	-
61–100	1,160	75,307	8.0	0.0
101–120	812	52,715	4.5	18.4
121–130	232	15,061	1.1	10.2
131–160	0	0	-	45.4
161–165	–232	–15,061	0.9	3.2
166–200	–870	–56,480	2.6	15.9
201–250	–1,856	–1,20,492	1.4	5.0
≥251	–3,017	–1,95,864	4.3	1.9

TABLE 2: THE NINE STEPS, INCLUDING THE "DOUGHNUT HOLE" (131–160 GCO_2/KM), OF FRANCE'S FEEBATE PROGRAM, AS WELL AS ITS CORRESPONDING REBATES, BOTH IN ABSOLUTE TERMS AND AS A PERCENTAGE OF AVERAGE VEHICLE PRICE, AND MARKET SHARES. FEES ARE NEGATIVE VALUES. REBATES IN US$ AND INR ASSUME EXCHANGE RATES OF US$1.16 PER € AND INR64.92 PER US$. SOURCE: ICCT (2010), D'HAULTFŒUILLE *ET AL.* (2013)

The 2008 sales of relatively high-emission vehicles (i.e., 120–250 gCO_2/km) declined, whereas low-emission vehicle sales increased dramatically, by about 80 percent.[23] Indeed, market share for the most efficient models nearly doubled, but for the least efficient fell by nearly two-thirds. In the first two years of the program, spanning both high and low gasoline prices, the rate of emissions intensity reduction was three times the previous trend. More recently, BEVs made up about 80 percent of France's 2015 EV sales—probably a product of the roughly US$2,320 BEVs receive over PHEVs under the bonus-malus scheme's rebate structure.

Reactions to the policy

The French feebate program affects both suppliers and consumers. The French government developed its feebate rate parameters in collaboration with automakers.[24] Automakers' acceptance of the program may have been higher in France than in other countries that have introduced feebate-style programs because of this engagement. That said, this collaboration may have weakened the program's price signals, as the auto sector could have contributed to the two most commonly cited shortcomings of the French feebate's design: its nonlinear functional form and its doughnut-hole pivot point. Some consumers expressed concerns around the fairness of France's single pivot point system. For example, large families were worried about incurring fees because they might require larger, less-efficient vehicles to meet their mobility needs. As a result, France created a subsidy to address this concern. Alternatively, the system could have met equity concerns with a design based on size classes.[iv]

Shortcomings of the policy

France's bonus-malus scheme most closely resembles an idealized feebate when compared to other countries' feebate-style programs. However, it deviates from this design in several ways. First, while some studies suggest a doughnut hole may bolster consumer acceptance, it also results in incomplete coverage and disproportionate incentives, leading to lower effectiveness.[25,26] Second, while France considers step functions easier to understand than linear functions and doughnut holes easier to pass, both attributes reduce or even eliminate incentives. For example, vehicles outside the 60 gCO_2/km and 250 gCO_2/km steps, which represent the lower and upper bounds, respectively, have no incentive to reduce their emissions. Finally, the French program has struggled to achieve revenue neutrality.[27]

[iv] It is then vital to use a size metric such as footprint or functional volume, not a mass (weight) metric. Otherwise the metric creates an incentive to make vehicles heavier, hence inefficient. Size has functional value; weight does not.

Ontario's Tax and Credit for Fuel Conservation Program

Policy Description

The feebate policy in Ontario (Canada's largest provincial economy) went through three design iterations. It was first implemented in 1989 as a gas-guzzler tax on inefficient cars, with taxes levied on new vehicles based on their highway fuel consumption rating in liters per hundred kilometers (L/100 km). Vehicles with a fuel consumption under 9.5 L/100 km were exempt from the tax; vehicles with higher fuel consumption were grouped into four ranges and charged a tax based on this step function. In 1990, the tax rates doubled, and the range of vehicles subject to taxation expanded so that only vehicles with fuel consumption below 8.0 L/100 km were exempt.

Ontario updated the policy again in 1991, lowering the taxes on vehicles in the bottom two brackets and extending the policy to apply to more-efficient vehicles by instituting a rebate on vehicles with fuel consumption under 6.0 L/100 km. The policy update also included a wider range of vehicles, such as sport utility vehicles (SUVs), though passenger vans and pick-up trucks were exempt. Under this version of Ontario's feebate, there was only one level of rebate—a very low level, roughly US$100—and the maximum fee levied, for vehicles with a fuel consumption over 18.0 L/100 km, was roughly US$3,200. The fees and rebates applied at the point of vehicle purchase. This version of the tax and credit program did not change until 2010, when Ontario eliminated the feebate program during a large-scale tax reform.[28]

The policy was not revenue neutral; on average the taxes generated about US$30 million per year.[29] The Ontario Government stated three objectives for the policy: environmental protection, energy conservation, and increased revenues.[30]

Outcomes of the Policy

Many experts consider Ontario's feebate program unsuccessful in drastically changing consumer behavior. There were no significant shifts to smaller or more-efficient vehicles as a result of the program; indeed, the market share of large, luxury, and sporty vehicles increased over the lifetime of the program,[31] though arguably they might have increased even more without it. Ford actually redesigned the Mustang during the feebate's active period to have a higher fuel consumption[32]—pushing it into a higher fee level between 2002 and 2009—which suggests that multinational automakers may not have been greatly influenced by the program. However, following the redesign, the Mustang's market share in Ontario fell relative to the rest of Canada. The policy may have resulted in a small reduction in emissions, based on modeling by the University of Ottawa; this same model found that a revenue-neutral design would have more than doubled the emissions reductions relative to the enacted policy.[33]

A paper by Rivers and Schaufele of the University of Ottawa found that Ontario's feebate program did have an economically meaningful and statistically significant effect on the vehicle mix, albeit small and not as large as it could have had it been designed to be revenue neutral. The report also found that there was an asymmetric response from consumers to fees and rebates in the case of the Ontario feebate, and posits a few potential reasons: dealers are more likely to emphasize subsidies during a vehicle test drive or sales pitch, and may attempt to lump fees with other administrative costs of the vehicle so they are less visible to buyers.

Highway fuel efficiency (L/100 km)	Rebates (Nominal CAN$)			
	1989	1990	1991–2010	
	Cars	*Cars*	*Cars*	*SUVs*
<6.0	-	-	–100	-
6.0–7.9	-	-	75	-
8.0–8.9	-	200	75	75
9.0–9.4	-	700	250	200
9.5–12.0	600	1,200	1,200	400
12.1–15.0	1,200	2,400	2,400	800
15.1–18.0	2,200	4,400	4,400	1,600
>18.0	3,500	7,000	7,000	3,200

TABLE 3: EVOLUTION OF ONTARIO'S VEHICLE TAX AND CREDIT PROGRAM OVER THE PROGRAM'S LIFETIME, SHOWING THE SCHEDULE OF FEES AND REBATES FOR NEW VEHICLES. THE EFFICIENCY CLASSES ARE IN L/100 KM. SOURCE: RIVERS AND SCHAUFELE (2017)

Reactions to the Policy

The Canadian car industry reacted negatively to the introduction of a new tax (in its original form, the policy was merely a tax and not a feebate), and argued that the policy was not the most effective way to reduce the environmental impact from vehicles.[34] Canadian and Ontarian environmental groups, such as Friends of the Earth and the Environment and Taxation Working Group of the Fair Tax Commission, argued that the policy needed to be broadened and its rates increased for it to be effective. The 1990 update of the policy was controversial as well,[35] with opposition primarily from manufacturers and the Canadian Auto Workers Union. The Ontario government revisited the policy again in 1991 as a result of lobbying and political pressure.

Shortcomings of the Policy

Ontario's feebate policy had several shortcomings that could be improved upon. First, the step-function design of the policy motivated manufacturers only to make small improvements in order for a car to qualify for a different class (the "edge effect"), rather than motivating continuous improvement. The values of fees and rebates also remained static between 1991 and 2010, limiting the policy's effect on manufacturing habits; once a manufacturer reached whatever tax range seemed feasible for a particular vehicle, the manufacturer had no reason for further improvement so long as the vehicle continued to sell. A better option for the functional form may have been a linear model, adjusted on an annual basis, in order to evolve with technology changes and encourage constant improvement in the auto sector.

Probably the most important factor limiting the Ontario program's success was that the values for the fees and rebates were not large enough to change consumer behavior in the short run, let alone automaker product plans in the longer run. Ontario's monetary incentives and disincentives were low relative to the cost of the car; because of political pressure, 90 percent of the market had a flat fee of about $75 USD.[36] Additionally, few buyers were even aware of the program.

The policy was asymmetric; there were far more fees levied than rebates given, resulting in a large net revenue for the program. Because of the asymmetric response to fees and rebates mentioned above—that is, consumers tended to respond more to rebates than to fees—the policy would have had greater success had it offered larger rebates on more-efficient vehicles. The model by the University of Ottawa found that the program would have been more successful in reducing emissions had it been designed to be revenue neutral.

Finally, the policy may have been more successful in influencing manufacturers' behavior had it been implemented on a national scale, since only a portion of Canada's vehicle market was affected by the policy.

What happened with feebates in California?

Several feebate and feebate-like policies have been proposed in California since 1990, but so far none of these policies has succeeded in making it to the implementation phase. Here are a few examples:

- DRIVE+ (SB 1905): This 1990 legislation laid out a plan for a system of fees on higher-emitting vehicles to be collected by dealerships and sent to the California Department of Motor Vehicles (DMV) and rebates on lower-emitting vehicles to be given directly to the consumer by the DMV, with the goal of revenue neutrality. While the California Legislature approved this program by a seven-to-one margin, the California Governor at the time pocket-vetoed it (leaving it unsigned until it expired) on the grounds that it was essentially a fuel economy requirement and federal law already preempted fuel economy standards[37]—a legal theory that is almost certainly indefensible but offered a plausible excuse. The veto was probably due mainly to a mixed initial reaction from automakers as well:[38] reportedly one major automaker favored the bill, but another hadn't yet studied it or formed a view. This anecdote emphasizes the importance of prior consultation and if possible alignment with industry. California reintroduced the bill in similar forms in 1991, 1992, and 1993, but each of these versions failed to pass the legislature.[39]

- Clean Vehicle Incentive Program (AB 493): State Assemblyman Ira Ruskin introduced this legislation in 2006. The program included fees and rebates on the purchase of new vehicles based on their greenhouse gas emissions. It had a self-financing design, and left out about 25 percent of vehicles in the middle of the emissions spectrum. The proposal lost in the California Legislature by a small margin in its third reading in 2007.[40] The registered support for the bill included the Union of Concerned Scientists, Natural Resources Defense Council, Republicans for Environmental Protection, and numerous other environmental and air-quality organizations. The registered opposition included the Alliance of Automobile Manufacturers, California Motor Car Dealers Association, and the California State Automobile Association.[41]

In both of these policy proposals in California, opposition by automakers and dealerships (which in the U.S. are powerful because they contribute such large sales-tax revenues in their localities) appears to be a key reason for their political failure. This phenomenon suggests the importance for India to collaboratively design a feebate program to better address industry concerns and to create clear net benefits for industry, as well as for customers and the national interest. Encouragingly, a 2009 politically balanced survey of 3,000 California households found 76 percent support for feebates.

5. DESIGNING A PROGRAM FOR INDIA

Supportive Factors in India

India has a unique opportunity to make a global breakthrough in the implementation of a revenue-neutral feebate program at a huge size and scale. With more than 30 lakh passenger vehicles sold from 2016 to 2017, private ownership of cars is booming in India. India is expected to overtake Germany to become the world's fourth largest market, in terms of domestic car sales, by the end of 2017, according to IHS Markit.

Some supportive factors specific to India include:

- The Indian government has stated a goal of making the transition to efficient vehicles with little to no use of public funds,[42] and a feebate can meet this objective more easily than other policy instruments.
- India has more than a billion biometrics on a universal identification platform (Aadhaar) and its Unified Payments Interface, a mobile payments system that mandatorily links bank accounts with biometric information. This system allows for rebates to be easily given directly to consumers, if that is the preferred manner of transaction.
- Private vehicle ownership is growing at a 10 percent compound annual growth rate in India.[43] While procurement of private vehicles will continue in India to a degree, vehicles sold for private and shared applications should be as efficient as possible to meet India's ambitious national goals. India's low rate of private vehicle ownership puts the country in an advantageous position to change the course of the vehicle market.
- The Indian automotive industry is world-class in its agility and ability to adapt to changing market and policy environments. Feebates can reinforce these capabilities and cultural tendencies to advance India's overall global competitiveness and increase the market's ability to move quickly and innovate.
- The Indian consumer base is highly price-sensitive, and will probably respond briskly to feebates' price signal, driving both short- and long-term shifts in the market.
- Compared with some locations that have attempted to implement feebates, such as California, India has a relatively low number of clean vehicle policies that might complicate the implementation of feebates.

A successful feebate system that is able to reduce average emissions and significantly incentivize zero-emission vehicle ownership requires the right combination of practicality and accuracy, which together will bring long-term stability and public support. The evolution and design of such a system should be led by the central government and include all relevant stakeholders such as car manufacturers, car dealerships, and residents affected by air pollution. The feebate should aim to move average emissions downward by a significant percentage over time and to exploit and further enhance Indian automakers' and suppliers' capacity for rapid innovation.

Current Vehicle Policy and Automotive Landscape in India

In 2012, the Department of Heavy Industry (DHI) promulgated a policy to promote electric mobility. The government subsequently approved a mission-mode approach to promote electric mobility and manufacturing of electric and hybrid vehicles (xEVs) in India under the title of "National Mission on Electric Mobility Mission Plan 2020" (NEMMP-2020). NEMMP-2020 launched in 2013 with an aim to achieve 5 to 7 million xEVs on Indian roads by 2020. One of the initiatives under NEMMP-2020 is the Faster Adoption and Manufacturing of Electric (and Hybrid) Vehicles (FAME), which offers direct fiscal subsidies to reduce the purchase price of xEVs. The program has had limited impact, as can be seen by the low number of vehicles that have benefitted from the program—a total of less than 150,000 vehicles from April 1, 2015 through June 30, 2017.[44] A large portion of the number of xEVs on the road is made up of mild hybrids—which were originally subsidized by FAME, and consequently accounted for the majority of the program's subsidies in the initial years—that have had limited impact on reduction in carbon emissions.

In addition to air quality concerns, a major impetus for transitioning to advanced technology vehicles is India's costly reliance on gasoline imports. Currently, more than 80 percent of India's crude oil is imported, and the country spent INR 5 lakh crore (US$80.3 billion) on petroleum imports last financial year.[45] While a large share of all trips (~66 percent in 2007[46]) are still largely served by non-motorized, public and commercial modes of transit, private vehicle ownership is expected to increase significantly,[47] potentially driving up India's already steep oil import bill.

As vehicle ownership cycles in India have been hovering around the four-year mark[48]—and are expected to get shorter—the sales of used cars have burgeoned, and are poised to reach 66 lakh (6.6 million) units annually by 2021.[49,50] Any proposed feebate scheme should consider a mechanism for introducing rebates and fees in the used car market as well. However, given that only 19 percent of the total used car market goes through organized dealers,[51] it will be easiest to start with new car sales and consider expanding to used cars in the future.

Why is a feebate an advantageous addition or alternative to India's Corporate Average Fuel Consumption norms?

In April 2017 India adopted Corporate Average Fuel Consumption (CAFC) norms for light-duty vehicles under 3,500 kg.[52] The CAFC norms require automakers to reduce fuel consumption below 130 gCO_2/km until 2022 and below 113 gCO_2/km thereafter.[53] The Ministry of Power, in collaboration with the Bureau of Energy Efficiency, set these standards after several years of discussions and debate. Despite India's fleet being among the most fuel-efficient in the world, with a sales-weighted average of 136.6 gCO_2/km in fiscal year 2012–2013,[54] its post-2022 CAFC target of 113 gCO_2/km is 8–22 percent lower than proposed targets from Japan, the E.U., the U.S., and Canada. Moreover, the CAFC norms do not offer any incentives for exceeding the standard, unlike feebates, and both government and industry reports suggest that their preparation has a high administrative burden. A revenue-neutral feebate with an annually adjusted pivot point would better support continuous improvement in India's increasingly efficient and growing passenger-car fleet by providing both consumers and manufacturers with incentives that the CAFC norms lack. A feebate policy could be implemented with the CAFC norms still in place, to ensure a baseline level of fuel consumption improvements; ultimately, though, the feebate would likely cause the CAFC norms to become obsolete as the market is incentivized to improve far beyond the efficiency standards set by CAFC.

General Design and Implementation Principles: Learning from Past Examples

With the innumerable decisions that go into designing a feebate, there are countless potential designs possible, each with varying impact and benefit. There is much learning India can build on and improve upon. This section does not advocate for specific technical design decisions; rather, it aims to suggest several principles—based on common concerns and the takeaways from feebate case studies—which a number of different designs can satisfy.

There are many valid concerns and challenges to be considered, and many of them can be addressed and minimized by a close attention to detail in feebate design. Some of the common concerns and opposition arguments include:

- The policy will adversely affect the auto industry by increasing administrative burden and requiring manufacturers to make huge capital investments.
- Automakers have long design cycle times; a feebate policy that is immediately introduced will negatively impact the auto industry for several years while companies rush to update their product offerings.
- The policy will favor particular types of automakers while disadvantaging others based on their primary product offerings.
- Feebates can be misinterpreted or criticized as a new tax.

To address these concerns and the lessons learned from past examples, a feebate design for India should take into account nine principles:

1. **Engage all relevant stakeholders in the design process.** To design a policy that is widely supported and helps strengthen the auto sector, it is necessary to consult the various stakeholders to understand their needs so that the policy can be designed to support them as well as possible. Feebates do not attempt to force a novel change; instead, they aim to support and accelerate, with maximal efficiency and opportunity, the transition to clean vehicles that has already been occurring around the world and in India and that is the clearly declared policy of the Government of India. The ideal outcome of the policy is for the government to help motivate and support both the auto sector and consumers in making this transition.

2. **Design the policy to be revenue neutral.** Making the program self-financing helps to avoid the misconception that it is purely a tax, and increases its level of political acceptance. The Indian government has stated that it aims to make the transition to EVs self-financing,[55] and designing a feebate program to be revenue neutral would align with this goal. Additionally, as seen in the case of Canada, a revenue-positive program is not ideal because of the asymmetric way consumers respond more to rebates than to fees (see the Appendix for a more detailed explanation of the technical design that goes into revenue neutrality).

3. **Design feebates to encourage constant innovation and improvement.** The functional form and slope should be chosen so that manufacturers are encouraged to continuously improve vehicle efficiency, rather than make small improvements to reach the next level of fee or rebate. This means avoiding a step function in favor of a different form such as a continuous linear function, with no “doughnut hole” in the middle that would allow vehicles to be exempt from the policy. The policy should avoid putting a financial cap on the rebates or fees, which would motivate manufacturers only to hit a certain mark. The pivot point should be regularly evaluated based on the changing market, which also ensures that the policy is self-financing. An efficiency criterion should be chosen so that all vehicle technology is included in the policy, to avoid limiting innovation to certain vehicle types. The policy should promote vehicle efficiency, not a particular type of technology, energy, vehicle, or design philosophy.

4. **Preserve consumer choice as much as possible.** By accounting for inherent vehicle type differences through design choices such as defining vehicle classes with different pivot points, consumers are not pushed simply toward smaller cars, and manufacturers are not forced to serve different market segments, than they prefer. Differentiating vehicle classes also incentivizes efficiency across all vehicle types (see the Appendix for a more detailed explanation of the technical design that goes into preserving consumer choice).

5. **Create a level playing field for manufacturers.** The policy should avoid favoring manufacturers who produce a certain type of vehicle. As with preserving consumer choice, this can be done by designing the feebate to take vehicle size or function into account, such as dividing vehicles into classes with different pivot points (e.g., two-wheelers vs. three-wheelers, or four-wheelers of different sizes). By comparing like-size vehicles, the policy would avoid the situation of manufacturers of smaller vehicles immediately having an advantage over manufacturers of larger, inherently less-efficient vehicles.

6. **Make the policy as simple as possible, within reason.** While some intricacies are inherent to feebate design, unnecessary detail and complexity should be minimized as much as possible to keep the policy easy to understand and explain. Designing policies to be simple and understandable makes their value clearer to the consumer and makes implementation and enforcement easier.

7. **Avoid including electricity generation sources in the efficiency criterion.** Because of the varied and rapidly changing Indian electric grid, it would quickly become overly complicated and unfair to take into account electric vehicles' electricity generation sources or their efficiencies. The generation mix varies across states, and consumers often do not have a choice in how their electricity is generated, so it would be unfair to compensate the buyer of an EV in a state with a cleaner grid with a higher rebate than the buyer of the same EV in a state with a dirtier grid. (If the electricity sector transforms in the future to allow for a higher level of consumer choice, this principle may be revisited.) Also, with India's renewable energy goals, rapid market evolution, greater inter-state grid integration, and falling grid losses, the emissions associated with each delivered kWh will probably set to drop markedly in the coming decade; that would require the values for grid emissions to be recalculated frequently to keep the policy up-to-date and accurate. Instead, a national efficiency criterion independent of electricity generation source should be chosen—such as lower heating value for each fuel, using the simple conversion of 1 kWh of electricity equals 3.6 MJ or 3,412 Btu of energy content.

8. **The feebate should be designed with attention to other policies already in place.** It is important to consider how the feebate would interact with existing clean vehicle and emissions policies, and how it can be designed to complement existing policies rather than complicate the regulatory landscape. Consideration could be given to whether the other policies would be necessary with a feebate in place, or if they could be phased out as the feebate phases in, in order to simplify and streamline clean vehicle regulations. This could reduce the administrative burden on both the government and the auto industry, by simplifying both enforcement and compliance.

9. **Include a transition or ramp-up period.** The feebate policy should come into effect over time, so that manufacturers have ample lead-time to adjust their vehicle line-up to optimize the benefit or minimize the losses they will incur because of the policy. Typically, manufacturers need 2–5 years to make substantial changes to a vehicle,[56] and implementing a full-strength feebate with little advance warning would put undue stress on the auto industry. Starting with a lower slope and increasing it over time would also minimize the financial risk of starting a policy without fully understanding how consumers will respond to it. However, subject to these legitimate industry needs, phase-in should proceed with due deliberate speed to capture major benefits as quickly as practical.

Designing a feebate with these principles in mind will create a policy that is strong, flexible, impactful, and adaptable, as well as sensitive to the needs and concerns of the stakeholders involved. It would be a useful and necessary exercise to map out all stakeholders who will be impacted by the policy, in order to engage them in the design process and create a policy that best supports all parties. This task should be undertaken during the policy design process by the professional body described in section 6.

A feebate policy can ideally minimize the negative impacts on the auto industry and aid in and reward the industry's transition to cleaner, more-efficient vehicles. In some cases, the implementation of a feebate has correlated with increased vehicle sales.[57] It is important to stress that a feebate policy does not attempt to force a change that is not already underway; it merely aims to support and accelerate a transition that has already begun. Therefore, while the implementation of a feebate will probably require automakers to make large capital investments, the policy is not adding an additional cost but rather encouraging automakers to accelerate the timeline on an inevitable future cost. Once the policy is developed, it will also be important to effectively educate the auto industry and the public about the program, so that they understand its benefits and avoid common misconceptions, such as equating it with a new tax.

How This Program Might Evolve Over Time

One benefit of a feebate policy is that it is easily adaptable to a changing market. It is a framework, not a cage. The program could also be extended to include more transportation segments, such as

heavy trucks and aviation. It is impossible to anticipate all of the ways that the policy may need to be updated in the years and decades following its implementation, so it will be important to regularly revisit the policy to ensure that it is still having the desired effect.

It is not necessary to plan for the phase-out of feebates at the time of implementation, since the policy is designed to evolve over time. If India reaches the point where it no longer needs feebates to build a clean car industry and discourage backsliding, then the government can consider phasing them out. The value of a feebate program carries an implicit assumption that more-efficient vehicles cost more upfront. This reality will cease to be true in the future, especially as the costs of batteries and other technologies decline. Bloomberg New Energy Finance expects EVs to reach upfront cost parity with ICEs by 2025, and already high-mileage EVs have reached parity with ICEs on a total cost of ownership (TCO) basis.[58] As each vehicle segment reaches TCO parity, the policy should be removed or redesigned to continue to encourage further-increased efficiency and clean technology.

In the future, feebates could potentially be adapted to promote shared vehicles and efficiency in passenger-kilometers, rather than vehicle-kilometers (as the ultimate purpose is to move people, not vehicles; in other words, to provide the best mobility to the most people with the fewest vehicles). In principle, feebates could account for the capacity utilization of vehicles, as large vehicles with many passengers may be more environmentally friendly than smaller vehicles with lower capacity. This approach might even be updated to be transacted on a per-trip or real-time basis, or based on an emissions or energy use per person per kilometer independent of a vehicle. This would require more advanced and complex technology use, and we do not suggest considering it in current policy formation.

6. IMPLEMENTATION CONSIDERATIONS FOR INDIA

Creation of a Professional Body to Design, Implement, and Administer the Program

To ensure a politically feasible and revenue-neutral design, demand forecasting for vehicle sales and analysis of different feebate designs will be important next steps. This paper recommends that a specialized, expert, and independent professional body (a Special Purpose Vehicle of the Government of India) perform these tasks and others, such as determining and regularly updating the pivot point and rate parameter. A small amount of the revenue collected from the fees could fund the professional body's budget and be built into revenue-neutrality policy design. The professional body's staff should include experts in energy, economics, finance, law, and tax administration. In addition to designing, implementing, and updating the feebate, they should also manage the program's annual revenue, including shortfalls or surpluses, to hold the program accountable to its design (e.g., revenue neutrality) and to design and refine its mechanisms for transparency.

The feebate policy should be implemented at the national level to create the most effective program. The main reason for a national program is that the size of the target market directly influences the size of the impact on automakers. Thus, a national-level, not a state-level, feebate program in India would elicit the largest response from the auto industry both domestically and globally. A report by the U.S. Department of Energy[59] models the impact of various feebate designs and concludes that a moderate feebate can induce a meaningful reduction in fuel consumption and CO_2 emissions, largely due to the response by manufacturers. This finding implies that feebates implemented at the national level will probably have the greatest impact because they present the greatest opportunity for manufacturers, thereby encouraging them to make the R&D and capital investments required to produce advanced technology vehicles.

A preliminary set of objectives for the professional body could include:

1. Researching, developing, and proposing the technical design for a feebate program for India, with the input from key stakeholder groups, especially the automotive sector;
2. Supporting the initial implementation and ongoing administration of the feebate; and
3. Updating the feebate's design annually to meet its stated objectives (e.g., revenue neutrality).

To ensure checks and balances, a Committee of Secretaries should be responsible for reviewing and approving any updates to the feebate proposed by the professional body, such as changes to the pivot point or slope and the vehicles and categories covered by the program.

A Phased Approach to Implementing Feebates

Designing and implementing a feebate program in India will take considerable time and effort. Below is an example of a phased approach to developing, introducing, and advancing such a feebate:

Phase 1: Program Design

- Create the professional body to research and design a feebate policy for India.
- Map all stakeholders who will be affected by the policy (e.g., automakers, dealerships, government)
- Engage key stakeholders through workshops and roundtable discussions to understand their perspectives and get their input on policy design and implementation.

Phase 2: Implementation

- Implement a revenue-neutral feebate, probably enacted at the point-of-sale and divided into several size-based categories, as determined by the professional body in phase 1. The efficiency criterion could be in gCO_2/km or energy content (lower heating value) per kilometer if it is desirable to be independent of the means of electricity supply.
- One option for a point and manner of transaction would be rebates transmitted directly to the Aadhaar-enabled bank accounts of consumers purchasing vehicles below the pivot point

upon authentication of sale, and fees levied by the professional body from manufacturers on a monthly basis, based on the number of vehicles they manufacture that fall above the pivot point. The optimal manner of transaction should be researched and finalized by the professional body during phase 1.

Phase 3: Evolution over time

- Expand the policy to additional vehicle segments.
- Consider including the used vehicle market in the policy.
- Introduce trials for feebates that relate fees and rebates to vehicle occupancy as a means of addressing the government's goal to increase sharing (e.g., carpooling).
- Consider long-term opportunities to relate EV rebates to when EVs charge (i.e., time-of-use emissions intensities) to encourage early and wide adoption of smart charging.

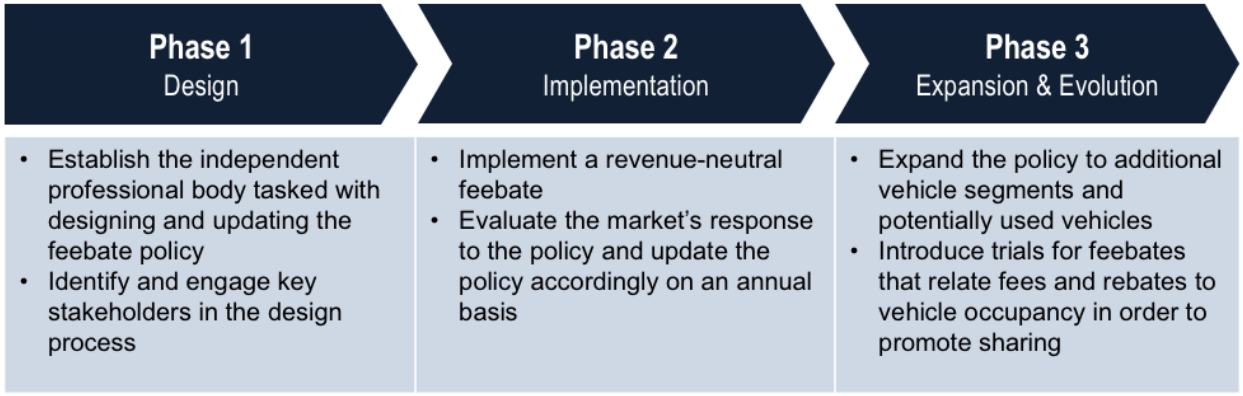

FIGURE 4. THREE PHASES OF DESIGNING, IMPLEMENTING, AND EXPANDING A FEEBATE FOR INDIA.

7. CONCLUSION

The launch of a thoughtfully designed and carefully implemented feebate program in India will help the country reach its goals of clean mobility and a prosperous economy. It will also set an example for the rest of the world. India has a unique opportunity to make a global breakthrough in the implementation of a revenue-neutral feebate at a huge size and scale, supported by the country's growing automotive sector and cutting-edge technology resources. Unlike many policy options, a feebate program delivers societal value and prioritizes individuals' well-being.

India has a unique opportunity to implement the world's first revenue-neutral feebate at a scale that is unmatched globally. This initiative can help the country reach its goal of a shared, electric, and connected mobility future. Doing so will require collaboration among the individuals behind India's ambitious mobility vision and some of the nation's most advanced industries. The first step in creating a national-level feebate program will be the creation of a professional body to research and develop the technical design of the policy. This process must include robust stakeholder engagement to ensure that the policy best addresses the needs of all affected parties.

With many competing priorities, a feebate represents a simple, elegant solution capable of shifting consumers' preferences and manufacturers' offerings in a way that creates value for both parties as well as society. It aims to support the transition to more-efficient vehicles, a shift that has already begun in India and around the world; accelerating the pace of this change can help reduce harmful air pollution and costly oil imports. In addition to revenue neutrality, a carefully designed feebate can be technology agnostic, creates a level playing field for manufacturers, preserves and even enlarges consumer choice, and drives continuous improvement in vehicle efficiency.

India's successful implementation of a feebate can also set an influential example for the rest of the world. Such a market-based mechanism can allow the Government of India to ensure that the auto industry's goals align with the best interests of Indian society—enabling the automotive sector to lead the transition to a safer, healthier, more accessible, and more affordable mobility system.

8. APPENDIX

Two design principles discussed in section 5 warrant more technical explanations.

1. Revenue Neutrality

A specific design feature favored by most feebate analysts and policymakers is revenue neutrality. To achieve this, the pivot point could be set so that the fees levied would balance out the rebates given, with the net fees slightly higher than the net rebates to cover the program's administrative costs. The pivot point would then be adjusted annually based on past market trends and future predictions—the policy administrator would take into account the previous year's sales data and knowledge of how consumers respond to the feebate when calculating the new pivot point—so the feebate would stay revenue neutral as the market evolves. The principle and structure of the feebate can be designed to be consistent, so that consumers and industry can rely on the policy and take it into account in their purchasing and business decisions, while allowing for annual adjustments of pivot points and slopes to keep up with (and anticipate in each firm's strategy) a fast-moving market.

2. Preservation of Consumer Choice

Another feebate design element worth discussing is preservation of consumer choice. A badly designed policy could inadvertently encourage the consumer to purchase smaller or even larger vehicles. For example, if all vehicles were on the same feebate schedule without counting vehicle size, a family would be inherently penalized for needing a larger, more fuel-intensive vehicle than an individual.

One way to preserve consumer choice is by using a mathematical function for the feebate that takes vehicle size into account. Another common method is by dividing vehicles into classes and determining a different pivot point for each class. Although the pivot points are different, the functional form and slope parameter should stay the same, because changing the slope would imply that saving a liter of fuel from one type of vehicle (or the analogy for the chosen efficiency criterion) is more important than saving a liter from another type of vehicle.

Vehicle classes can be based on size or weight; analysts typically advocate size, because this metric better captures the intuitive divisions of vehicle function,[60] encourages lighter rather than heavier weight (important because about four-fifths of a typical Indian car's fuel use is caused by its weight[v]), and best harmonizes Indian rules with the emerging international trend from weight- to size-based efficiency rules. RMI analysis found that the size attribute (interior volume, exterior volume, footprint, rectangular shadow) used to divide vehicle classes does not have a significant impact on manufacturer revenue.[61] These classes could also be divided into 2-wheelers, 3-wheelers, and 4-wheelers, potentially with additional size-based subdivisions. Each size class independently can be designed to be revenue neutral by following the framework laid out above. By taking vehicle size into account, the policy would encourage efficiency improvements across all types of vehicles, rather than just encouraging smaller vehicles.

[v] In the United States where average driving speeds are much higher, about two-thirds of a car's fuel use is caused by its weight; the difference is largely due to aerodynamic drag, which rises as the cube of speed.

9. ENDNOTES

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