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3 **2009 STATEWIDE TELEPHONE SURVEY AND**
4 **FOCUS GROUP RESULTS**
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9 **Elliot Martin, Ph.D. (corresponding author)**

10 Transportation Sustainability Research Center
11 University of California at Berkeley
12 1301 S. 46th St., Bldg. 190, Richmond, CA 94804-4648
13 510-665-3576 (O)
14 elliot@berkeley.edu
15

16 **Susan Shaheen, Ph.D.**

17 Honda Distinguished Scholar in Transportation, University of California, Davis, &
18 Co-Director, Transportation Sustainability Research Center (TSRC)
19 University of California, Berkeley
20 1301 S. 46th Street, Bldg. 190; Richmond, CA 94804-4648
21 510-665-3483 (O); 510-665-2183 (F); sashaheen@tsrc.berkeley.edu; sashaheen@ucdavis.edu
22

23 **Timothy Lipman, Ph.D.**

24 Co-Director, Transportation Sustainability Research Center
25 University of California at Berkeley
26 2150 Allston Way, Suite 280, Berkeley, CA 94704
27 telipman@berkeley.edu
28

29 **Madonna Camel**

30 Transportation Sustainability Research Center
31 University of California at Berkeley
32 1301 S. 46th St., Bldg. 190, Richmond, CA 94804-4648
33 510-665-3467 (O)
34 madonna@tsrc.berkeley.edu
35
36
37
38

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48 **PUBLIC PERCEPTION OF A FEEBATE POLICY IN CALIFORNIA:**
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52 Elliot Martin, Ph.D., Susan Shaheen, Ph.D., Timothy Lipman, Ph.D., and Madonna Camel

53
54 **ABSTRACT**

55 This paper explores the public perception of feebates and climate change within California.
56 Feebates are designed to offer private vehicle buyers a rebate for the purchase of a low-emission
57 vehicle and a fee for those that produce higher emissions. In 2009, the authors conducted a series
58 of 12 focus groups throughout the State, which were followed by a computer-assisted telephone
59 interview (CATI) survey of 3,000 California residents. The survey results were used to gain
60 insights into feebate policy response. Researchers employed the focus groups to gauge
61 participant understanding of the feebate concept and overall response in preparation for the
62 statewide survey. The survey analysis illustrates how opinion is distributed by key demographic
63 variables, including political affiliation. In addition, the survey probed respondents on their
64 relative sentiments towards climate change, foreign oil dependence, and policy fairness. The
65 results suggest that roughly three quarters of the population would support a feebate policy.
66 Approximately one in five participants opposed the policy. The survey data were explored
67 through a cross-tabulation of policy position with demographic and socioeconomic attributes. To
68 evaluate how key factors simultaneously influence policy support/opposition, the authors
69 developed an ordinal regression model, which could correctly predict 89.5% of the sample's
70 policy position. While the focus group and survey results reflect some divergence (i.e., the
71 survey yielded more feebate policy support than the focus groups), the understanding gained
72 from this study can aid California policymakers in assessing the feebate policy as a mechanism
73 to address climate change from the public's perspective.

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75 **KEY WORDS:** Feebates, motor vehicle, climate change, public policy, fuel economy,

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79 **INTRODUCTION**

80 Transportation activity contributes to nearly 30% of annual greenhouse gas (GHG) emissions in
81 the United States (U.S.) (1). Transportation is almost entirely fueled by petroleum in the U.S. and
82 consumed more than 70% of the nation's oil in 2009 (1). Cars and light duty trucks, which
83 comprise two thirds of the sector's consumption, are responsible for about 45% of all U.S. oil
84 combusted (1). To curb these trends, a variety of policies have been proposed and adopted.

85 Since the 1970s, many policies have aimed at reducing oil consumption and harmful air
86 emissions from transportation. The U.S. Corporate Average Fuel Economy (CAFE) standards,
87 enacted in 1975, mandate that automobile manufacturers maintain a specific fuel efficiency
88 standard averaged among all vehicles sold each year (2). The U.S. Clean Air Act (CAA)
89 regulates harmful air emissions from automobiles through a set of standards that auto
90 manufacturers must meet (3). Only California is allowed to set tail-pipe standards more
91 restrictive than the Federal standards because the State has pre-empted Federal law on air quality
92 regulation under authority from the CAA. In addition, the California Zero Emission Vehicle
93 (ZEV) mandate requires an increasing percent of ZEV and other ultra-clean vehicle sales by

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94 automakers in the State (4). Most of these policies are considered supply-side strategies that
 95 regulate technology and production. Alternative strategies are demand-side and focus on
 96 influencing consumer demand through vehicle pricing. In 1978, the gas-guzzler tax was adopted
 97 to discourage the purchase of less efficient passenger cars, but the tax does not apply to light
 98 trucks, such as sport utility vehicles (SUVs), mini-vans, and pick-up trucks (5). Similarly, in
 99 Europe, several countries have incorporated a system of taxation for fuel inefficient and high-
 100 emitting vehicles. Such taxation is prominent in Germany, which incorporates fees for high-
 101 emitting vehicles into annual vehicle registration (6).

102 Among the proposed demand-side policies, and one that has been in effect in other
 103 countries, such as France, Canada, and the Netherlands, is the feebate program. A feebate policy
 104 is comprised of two parts: a rebate for the purchase of a low-emission vehicle and a fee for
 105 vehicles that produce higher emissions. Most feebate programs focus on GHG emissions, but it is
 106 also possible to include other air pollutants and/or target fuel economy. A pivot point captures
 107 the level of vehicle emissions at which the feebate changes from granting a rebate to imposing a
 108 fee (7). A common policy objective is revenue neutrality, as it does not require additional
 109 governmental support above the fees levied. If revenue neutrality is desired, the pivot point will
 110 be at the place where the rebates paid equal the fees collected plus administration costs.

111 As a “carrot and stick” policy, feebates work under the assumption that consumers are
 112 loss averse in wanting to avoid new fees, but they also respond positively to rebates. Thus, when
 113 they are presented with increases in some vehicle purchase prices and decreases in others, they
 114 will give greater consideration to the vehicles that avoid a penalty. By shifting consumer
 115 preferences and demand, feebates can indirectly encourage manufacturers to adopt new
 116 technologies and lower vehicular emissions per mile (8).

117 Previous feebate studies have focused primarily on the impact that feebates would have
 118 on manufacturers and vehicle design, and the subsequent impacts on air quality and/or GHG
 119 emissions. There has been less research on understanding the public’s perception of a feebate
 120 policy. This paper explores the California public’s perception of climate change and feebates.
 121 The authors also examine the role of key variables, such as political affiliation and current and
 122 planned vehicle fuel efficiency, in influencing feebate policy support/opposition. The results are
 123 based on 12 focus groups conducted throughout the State and a computer-assisted telephone
 124 interview (CATI) survey with 3,000 California residents in 2009.

125 The paper is organized into four sections. First, a history and review of past feebate
 126 programs and research is provided, along with a discussion of climate change perception. Next,
 127 the authors explain the study methodology. Third, survey and focus group results are discussed.
 128 Fourth, the paper concludes with a comparative assessment of the focus group and survey results.
 129

130 LITERATURE REVIEW

131 As of 2010, there are no U.S. feebate policies in effect. However, during the early 1990s, several
 132 states attempted to establish such policies. A policy similar to feebates, called “DRIVE+”
 133 (Demand-based Reductions in Vehicle Emissions PLUS Improvements in Fuel Economy) was
 134 proposed in California in 1990. DRIVE+ sought to establish a sales tax surcharge on vehicles
 135 with high carbon dioxide and criteria pollutant emissions and a sales tax reduction for more fuel
 136 efficient and lower emitting vehicles (9). Despite passing through the legislature, the proposal
 137 was vetoed by the Governor. In 1991, the Maryland legislature passed a feebate policy, but it
 138 was challenged by the Bush administration under the premise that it encroached on the federal
 139 jurisdiction over fuel economy standards. As a result, Maryland did not enact the policy, and it

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140 was repealed in 2001 (10). In contrast, feebates have gained greater traction in Europe and
141 Canada where they have become a centerpiece of vehicle emission policies during the last ten
142 years. For example, France, Austria, Denmark, the Wallonia region of Belgium, Norway, and the
143 Netherlands all have some form of a feebate policy. In Canada, Ontario's feebate policy emerged
144 from a 1989 tax on fuel inefficient passenger vehicles after a rebate was introduced in 1991 (11).

145 While most feebate research has focused on policy impacts, some has touched on the
146 public perception of feebate policy. A 2008 survey of California adults revealed strong support
147 for green transport taxes. Sixty-six percent of those surveyed were in support of a feebate policy,
148 with respondents in Northern regions and those affiliated as Democrats more supportive (12). In
149 contrast, a survey conducted by the Consumer Federation of America in 2009 showed that 54%
150 of Americans did not support a feebate. This same survey indicated that 78% of Americans
151 approved of increasing fuel economy requirements from 27 miles per gallon (MPG) to 35 in
152 2016, however (13). A 2009 survey of the National Survey of American Public Opinion on
153 Climate Change showed that 49% did not support a gas tax increase to reduce GHG emissions,
154 while 44% supported an increase in vehicle fuel efficiency even if this resulted in increased
155 vehicle costs (14).

156 While understanding of public reaction to feebates is limited, some proponents emphasize
157 equity as a strategy to gain higher public acceptance. The Connecticut Clean Car Incentive
158 suggests creating a class-based feebate in which vehicles are compared within their class and
159 presented with fees/rebates based on class performance (15). McManus (2007) and Greene and
160 Bunch (2010) also discuss a feebate with a "zero-band" or a section of vehicles that is left
161 unaffected by a feebate, so as not to alienate consumers (16, 17).

162 Public policies influencing vehicle choice and technology are designed to mitigate the
163 externalities (e.g., GHG and air emissions) associated with collective vehicle use. Since these are
164 societal costs, the public's perception of policy need and cost severity are likely to be influenced
165 by perceptions regarding these externalities. Thus, it is logical that the perception of a feebate
166 policy would be impacted by climate change perception. Relative to other countries in the world,
167 the U.S. public has demonstrated less concern about climate change (18). Leiserowitz (2005)
168 suggests that this may be due to the American public's psychological and spatial distance from
169 climate change, which reduces risk perception and lowers possibilities of behavioral change (19).
170 The degree of climate change concern is also related to gender, education, and political
171 affiliation. McCright (2010) and Semenza et al. (2008) have shown that women are more
172 concerned about climate change than men (20, 21). Moreover, Dunlap and McCright (2008)
173 highlight the partisan split between Democrats and Republicans in environmental issues, with
174 three fourths of Democrats believing that climate change is real, in contrast to less than half of
175 Republicans (22).

176 Overall, previous research has suggested that the public has mixed opinions about feebate
177 policies. Much of this work is recent and indicates that public opinion may still be forming.
178 Furthermore, feebate response may evolve over time and be regionally distinct, with certain
179 areas of California and the country more likely to support a feebate policy than others. This
180 suggests that further understanding of the public's response to feebate policies could be useful to
181 future policy formulation.

182

183 **METHODOLOGY**

184 In this study, the authors applied both qualitative and quantitative methods to evaluate the
185 public's perception of a feebate policy in California through a series of focus groups and an

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186 “n=3,000” telephone survey. During August and September 2009, researchers held 12 focus
187 groups across the State in which participants were presented with a variety of feebate policy
188 designs and asked to discuss their reactions and opinions among other participants. The focus
189 groups were held with locally recruited participants in the San Francisco Bay Area, the Central
190 Valley, the Los Angeles area, Sacramento, and San Diego. Two of the focus groups were
191 conducted in Spanish. A total of 165 persons were recruited for the focus groups from which 120
192 were selected to form groups of eight to ten.

193 Researchers developed a detailed protocol to help guide each group discussion, which
194 was pretested at the University of California, Berkeley. Participants provided opinions regarding
195 the feebate concept, as well as three distinct feebate policy designs. This was followed by an in-
196 depth discussion of the perceived benefits and drawbacks of each design and policy option.
197 Finally, participants shared their perceptions of climate change and their opinions regarding
198 feebates overall.

199 The study team employed the initial insights gathered during the focus groups to develop
200 the CATI survey. Researchers conducted a pilot survey with the California public in October
201 2009 to assess instrument clarity, including key policy definitions and question comprehension;
202 one minor change was made to the age question in the instrument. The survey was completed
203 with 3,072 respondents throughout the State between October and December 2009. The sample
204 was drawn using a random digit dialing approach from a total of 31,790 usable numbers. Once a
205 willing household participant was reached, screening criteria included California residency for at
206 least nine months of the year, plans to purchase or lease a vehicle within the next 15 years, and
207 the ability to speak either English or Spanish. The survey was 13 to 16 minutes in length and
208 consisted of 36 questions. Interviewers administered the survey in either English or Spanish, as
209 requested by the participant.

210 Researchers introduced the feebate concept and policy design in the telephone survey.
211 Interviewers asked participants about feebate opinions, as well as impressions of policy
212 effectiveness and fairness. The survey also included demographic information, existing vehicle
213 ownership, future vehicle choice, and general political views including their opinions on
214 environmental issues, such as climate change.

215 The sample was randomly drawn from relevant telephone exchanges in California and
216 consisted of household and mobile telephone numbers. The inclusion of mobile phones in
217 telephone surveys is desirable because this technology has begun to displace household
218 landlines. However, as recently as 2006, a comparison of sample survey results between landline
219 plus mobile and mobile-only users found little distinction, with an average difference of 0.7%
220 (23). A similar 2010 Pew Research Center analysis found that the average percent difference had
221 grown to 2.1%; but this is still considered small (24). That study found mobile-only users to be
222 younger, more male, less Caucasian, and politically more aligned with Democrats relative to the
223 landline sample (24).

224 225 **Study Limitations**

226 For much of the study population in both the survey and focus groups, feebates was a new and
227 unfamiliar concept. This study had to introduce the policy concept and then solicit reactions to it
228 in a 15-minute phone survey. Reactions should be understood in the context of the limited level
229 of initial exposure that respondents had.

230 While the feebate survey data provide insights into the opinions of a large sample of
231 Californians, there are limitations. Self-selection bias can occur in telephone surveys in spite of

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232 random sampling and other efforts to mitigate them, as populations with certain demographics
233 have a higher propensity to respond to telephone surveys than others (particularly, older and
234 more Caucasian cohorts in CATI surveys) (25).

235 Researchers designed the sampling methodology to over-sample certain demographics to
236 compensate when there was a disproportionate share of a particular demographic observed. This
237 helped to increase the response rate and representation from other ethnic/age groups. Because
238 survey demographics are traditionally asked at the end, the authors do not have empirical data on
239 those that responded but stopped part way through. As described in the results section below, the
240 sample was weighted to correct for remaining discrepancies.

241 Finally, while the focus groups provided a rich qualitative setting for group interactions
242 on feebates and identified key trends, they have several limitations. They are limited in size and
243 are not quantitative in nature. Thus, one cannot generalize from the results. Further, the results
244 are highly dependent upon the interactions among the group and the moderator, and dominant
245 personalities can influence other respondents.

246

247 **SURVEY AND FOCUS GROUP ANALYSIS AND RESULTS**

248 The survey and the focus group results produced distinct perspectives on the reactions of
249 Californians to the feebate concept. The focus groups illustrated more in-depth reactions to
250 specific policy designs, whereas the survey provided a more robust sample for evaluating
251 personal opinions. The survey sample did exhibit some departure from the general population
252 along certain demographic attributes. To adjust for this departure, the sample was weighted with
253 post-stratification weights that were derived from the 2006 to 2008 American Community
254 Survey (ACS) Public Use Microdata (PUMS) of California (US Census, 2009). Before applying
255 the weights, non-responses to these questions were imputed using the “hot deck” method, which
256 relies on the sample joint distribution of influential attributes and the random ordering of existing
257 respondents to generate an imputed estimate of missing values. This method imputed values for
258 income, education, and age. The post-stratification weights were then derived from the joint-
259 distribution of these attributes in the PUMS dataset and the survey sample. Table 1 illustrates the
260 demographic profile of the focus groups, the survey sample, and the weighted sample as
261 compared to the California population (18 years or older).

262

263

264 **TABLE 1 Demographic Profile of the Focus Groups, Survey, and California Population**

Demographic Attribute	Focus Groups	Raw Survey	Reweghted Survey	California Population
Gender	N = 97	N = 3072	N = 3072	N = 27,043,417
Male	48.5%	47.2%	47.2%	49.6%
Female	51.5%	52.8%	52.8%	50.4%
Age Category	N = 97	N = 3072	N = 3072	N = 27,043,417
18 - 24	18%	4%	12%	14%
25 - 34	29%	11%	20%	19%
35 - 44	21%	17%	21%	20%
45 - 54	21%	25%	20%	19%
55 - 64	4%	24%	14%	13%
65 - 74	2%	14%	8%	8%
75 or over	5%	6%	6%	7%
Total	100%	100%	100%	100%
Education	N = 97	N = 3072	N = 3072	N = 27,043,417
Did not complete high school	2%	6%	17%	20%
High school graduate	3%	10%	23%	24%
Some college	35%	18%	25%	23%
2-year college degree	15%	12%	7%	7%
4-year college Degree	22%	28%	18%	17%
Graduate Degree	23%	25%	10%	9%
Other	0%	0%	0%	0%
Total	100%	100%	100%	100%
Income (Households, \$ US)	N = 97	N = 3072	N = 3072	N = 12,177,852
Less than \$10,000	4%	4%	6%	5%
\$10,000 to \$25,000	10%	9%	12%	14%
\$25,000 to \$35,000	10%	8%	8%	9%
\$35,000 to \$50,000	15%	11%	13%	13%
\$50,000 to \$75,000	29%	17%	18%	18%
\$75,000 to \$100,000	14%	16%	14%	13%
\$100,000 to \$150,000	16%	18%	16%	15%
More than \$150,000	2%	16%	12%	13%
Total	100%	100%	100%	100%
Race	N = 97	N = 3072	N = 3072	N = 27,043,417
Caucasian or White (alone)	36.1%	55.8%	44.5%	42.6%
Hispanic	30.9%	24.5%	36.9%	36.1%
African American	14.4%	5.2%	5.5%	6.0%
Asian	18.6%	8.2%	6.1%	12.1%
Native American or Alaskan Native	0.0%	2.4%	2.7%	0.5%
Hawaiian or Pacific Islander	0.0%	1.0%	1.3%	0.3%
Other	0.0%	2.7%	3.0%	2.4%
Total	100.0%	100.0%	100.0%	100.0%
Refused	0%	1%	2%	0.0%

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266
267 Table 1 illustrates the distribution of key demographic attributes of the focus groups,
268 survey, and weighted sample against the population for gender, income, age, education, and race.
269 The population distributions are based on the 2006 to 2008 ACS estimates. In comparison to the
270 California population, the focus group participants were younger, more educated, of higher
271 income, and less Caucasian. The focus groups over-represented African-Americans and Asians,
272 while under representing Caucasian and Hispanics. In contrast, the survey respondents were

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273 older relative to the population with an overrepresentation of Caucasians. However, similar to
274 the focus groups, the survey respondents were more educated and had higher incomes than the
275 California population. The weighting of the raw sample reduced the discrepancy in the
276 distribution of age, education, income, as well as race in comparison to the population.

277 The survey sought to understand the public's acceptance of a feebate policy design. To
278 gauge the respondent understanding of the fundamental issues behind the policy, the survey
279 introduced the concept of GHGs and feebates. Each respondent was first read a statement that
280 briefly introduced them to the relationship between GHG emissions and fuel economy. The
281 statement was followed by an initial question that assessed whether they understood the term
282 "greenhouse gases." This was followed by a question that asked them whether they understood
283 the term "climate change." The results showed the 92% of the raw sample were familiar with the
284 term "climate change," while 80% were familiar with "greenhouse gases." The weighting of the
285 sample shifted the response to 87% familiar with "climate change" and 71% familiar with
286 GHGs. Regardless of whether the respondent gave a "yes" or "no" answer to these questions, all
287 were read a definition of GHGs, followed by a definition of a basic feebate policy as it could be
288 applied in California. Researchers designed the definition to be a clear and concise statement of
289 how a feebate policy could be designed and implemented; again, this was pretested for clarity.
290 Interestingly, there was no clear trend regarding knowledge of climate change among the focus
291 group participants. Differences in attitude about climate change based on geographic location
292 were apparent. For example, participants in Fresno and Irvine were less aware of the term
293 "greenhouse gases" and the pollutant contributors to climate change, while participants in
294 Oakland demonstrated a stronger understanding of climate change and tended to believe human
295 activity was a contributing factor.

296 The respondents were then asked a series of questions designed to capture their overall
297 sentiments towards the policy and how they might react to it. These questions were given in the
298 form of statements, and respondents were asked to state whether they agreed or disagreed with
299 the statement using a Likert scale with the options of: "Strongly Agree," "Agree," "Disagree,"
300 and "Strongly Disagree."

301 To adjust the study results to more closely match the geographic distribution of the State
302 population, the survey data were evaluated with regional weights. The regions proportionally
303 under-represented by the sample were urban areas, such as Los Angeles, Orange, and Alameda
304 Counties. The study found that for the raw and weighted samples, a majority stated that they
305 would generally be supportive of the feebate policy. The weighted sample shifted the distribution
306 of opinion slightly towards the center of the four-point scale. In both the raw and weighted
307 samples, roughly 76% (~three in four) said that they would be supportive of the policy.
308 However, this result should be understood within the context that a remaining 22% (~one in five)
309 of the population was opposed to the feebate policy. This population (18 years and older)
310 constitutes roughly six million people versus the estimated 20 million people that would support
311 the policy, if the findings were generalized to the full State. In contrast, reception to the feebate
312 concept varied among the focus groups, although the overall response was negative. Perceptions
313 varied based on the location of the focus group. In Oakland and Sacramento the feebate concept
314 was received more favorably than in Southern California and the Central Valley.

315 Thus, in spite of the fact that the sample weighting produced demographic shifts, such as
316 income, education, race, and age, the resulting opinion shift from the same weights was less
317 pronounced. Overall, regional weighting of the respondents had little additional impact on the
318 balance of feebate support or opposition. Due to this small difference and to simplify further

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319 discussion, the results that follow primarily report on the PUMs weighted sample results. The
320 cross-tabulation of opinions by income, age, race, education, and politics offer a more in-depth
321 perspective on how opinions vary by demographics. Table 2 shows the cross-tabulation of Likert
322 response to the statement: “I would generally be supportive of this kind of program to help slow
323 the rate of climate change,” as classified by education, income, race, age, and politics. Since the
324 raw sample and weighted sample results do not differ significantly, only the weighted sample
325 results are presented.

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330**TABLE 2 Cross-Tabulation of Policy Support by Education, Age, Race, Income, and Politics**

EDUCATION (a)	Did not complete high	High school graduate	Some college	2-year college degree	4-year college Degree	Graduate Degree	Total (Same for all)
Strongly Agree	23%	26%	21%	30%	28%	40%	26%
Agree	62%	49%	51%	43%	45%	40%	50%
Disagree	7%	18%	18%	16%	14%	12%	15%
Strongly Disagree	4%	6%	7%	9%	9%	6%	7%
Don't know	4%	1%	2%	2%	3%	2%	2%
Refused	1%	0%	1%	0%	0%	0%	0%
Total	520	722	754	228	554	294	3072

AGE (b)	18 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 or over
Strongly Agree	17%	24%	27%	33%	30%	23%	20%
Agree	62%	52%	52%	44%	46%	44%	43%
Disagree	18%	15%	9%	13%	13%	20%	29%
Strongly Disagree	2%	6%	8%	9%	7%	6%	4%
Don't know	0%	2%	3%	1%	3%	7%	3%
Refused	0%	0%	1%	1%	0%	0%	1%
Total	362	604	653	601	429	248	176

RACE (c)	Caucasian	Hispanic	African American	Asian	Native American	Hawaiian or Pacific Islander	Other	Refused
Strongly Agree	27%	27%	22%	24%	20%	23%	21%	16%
Agree	41%	58%	64%	54%	64%	55%	38%	43%
Disagree	19%	10%	11%	13%	10%	11%	26%	22%
Strongly Disagree	11%	2%	4%	4%	2%	2%	11%	13%
Don't know	2%	2%	0%	4%	4%	9%	4%	5%
Refused	0%	1%	0%	0%	0%	0%	0%	0%
Total (Respondents)	1342	1114	165	184	81	39	90	56

INCOME (d)	Less than \$10,000	\$10,000 to \$25,000	\$25,000 to \$35,000	\$35,000 to \$50,000	\$50,000 to \$75,000	\$75,000 to \$100,000	\$100,000 to \$150,000	More than \$150,000
Strongly Agree	29%	30%	24%	20%	32%	22%	25%	26%
Agree	60%	56%	59%	54%	49%	50%	42%	40%
Disagree	9%	11%	13%	14%	12%	18%	18%	19%
Strongly Disagree	2%	1%	3%	8%	5%	7%	12%	12%
Don't know	0%	2%	1%	3%	1%	3%	2%	3%
Refused	0%	0%	1%	0%	0%	0%	1%	1%
Total	185	365	260	406	560	426	487	383

POLITICS (e)	Very liberal	Liberal	Moderate	Conservative	Very conservative	Other	Not sure	Refused
Strongly Agree	53%	39%	27%	17%	11%	11%	15%	13%
Agree	35%	51%	52%	49%	31%	74%	57%	49%
Disagree	8%	7%	16%	20%	28%	8%	13%	23%
Strongly Disagree	3%	2%	4%	11%	27%	5%	7%	9%
Don't know	1%	1%	2%	3%	1%	2%	8%	3%
Refused	1%	0%	0%	1%	2%	0%	0%	2%
Total	172	706	926	738	205	112	151	62

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333 Table 2(a) shows that across all education levels, between 70 to 80% of respondents
334 support the feebate policy. The lowest opposition (10%) was found among those that did not
335 complete high school. The trends in education show that feebate opposition first rises with
336 increases in education and then falls. The distribution in Table 2(b) shows that younger
337 populations exhibit a higher level of proportional support: 79% of the 18 to 24 year old cohort
338 supports the policy. The level of feebate policy support then declines gradually with age, with 70
339 to 80% support in the young-adult and middle-age cohorts, and 63% for those 75 and older.
340 However, the regression model presented later suggests that this may be more related to higher
341 income. Table 2(c) shows that 30% of Caucasians opposed feebates. For the remaining ethnic
342 groups, the proportion of the cohort opposing feebates fell within the range of 10 to 20%,
343 without considerable differences across the major ethnic groups in California. Notable
344 differences include somewhat lower support among Caucasians and somewhat higher support
345 among African Americans.

346 Income and age are positively correlated within the sample and hence the distributions
347 with respect to income exhibit similar patterns. Table 2(d) shows that opposition tops out at
348 ~30% at the highest income category, while 66% in the highest income category support the
349 policy. This table also shows that there is no majority among ethnic, education, income, or age
350 cohorts that oppose feebates. The proportion of feebate support and opposition tends to cut
351 across most demographic attributes rather uniformly. However, political philosophy seems to
352 influence respondent feebate position relatively directly.

353 As shown in Table 2(e) the distribution of feebates policy position is somewhat strongly
354 influenced by respondent political alignment. Roughly 90% of those that were liberal or very
355 liberal were supportive of the policy. In the center, 79% of moderates, the largest of all political
356 cohorts, were in support while 20% were opposed. While on the right, 32% of conservatives and
357 58% of those self-described as “very conservative” stated that they would be opposed to
358 feebates.

359 Respondents also were asked questions to understand their views on specific
360 environmental issues related to the feebate policy. They were asked whether they agreed or
361 disagreed with statements related to the existence of climate change, the effect of human activity
362 on climate change, and the seriousness of dependence on foreign oil for the U.S. In addition,
363 respondents were asked to compare the importance of climate change and energy security. Figure
364 1 shows the response distribution from the raw and weighted sample to all of these questions.

365
366

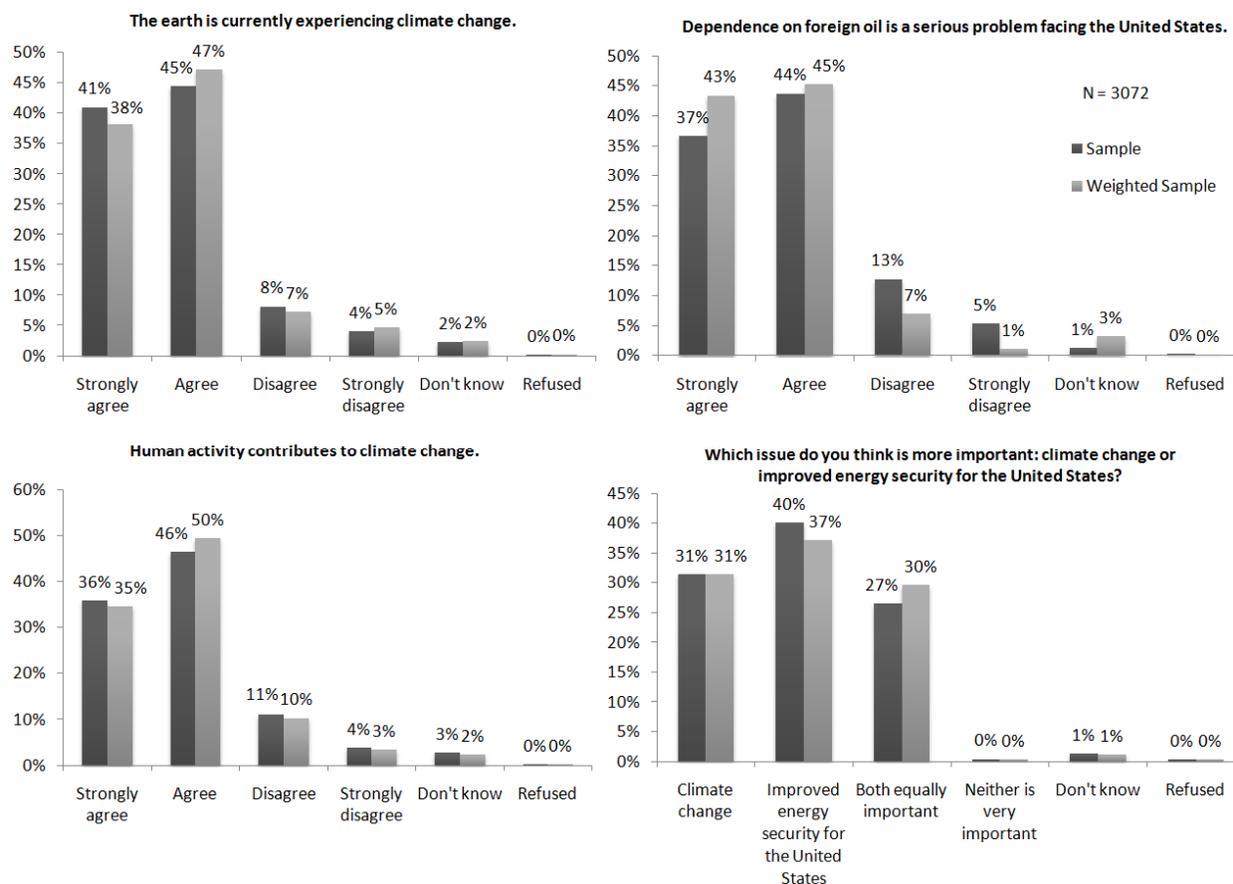


FIGURE 1 Distribution of response to climate change and energy security.

367
 368
 369
 370 The distributions show that the majority of the California population agrees that the earth is
 371 experiencing climate change and that humans are contributing to it. Based on the weighted
 372 sample, the top left graph of Figure 1 suggests that roughly 85% of the population agrees or
 373 strongly agrees that the earth is experiencing climate change. A similar share (85%) also agrees
 374 or strongly agrees that human activity is contributing to climate change.

375 The right side graphs of Figure 1 shows the results of the energy security questions.
 376 Based on the weighted sample, the distribution of the top right graph in Figure 1 suggests that a
 377 vast majority (88%) of the population believe that foreign oil dependence is a serious concern.
 378 The bottom right graph suggests that more people (~40%) in the California population consider
 379 improved energy security for the U.S. to be more important than climate change. In contrast,
 380 31% of respondents consider climate change to be more important. Nearly 30% of the population
 381 considers both climate change and energy security to be equally important.

382 It seems likely that respondent opinions on climate change and energy security will
 383 impact their feeback perception. Figure 2 separates respondents by policy support and climate
 384 change interest. The dark bars in the graph represent the population that is supportive of feebates,
 385 whereas the lighter bars represent the population that opposes feebates as indicated by the
 386 weighted sample.

387

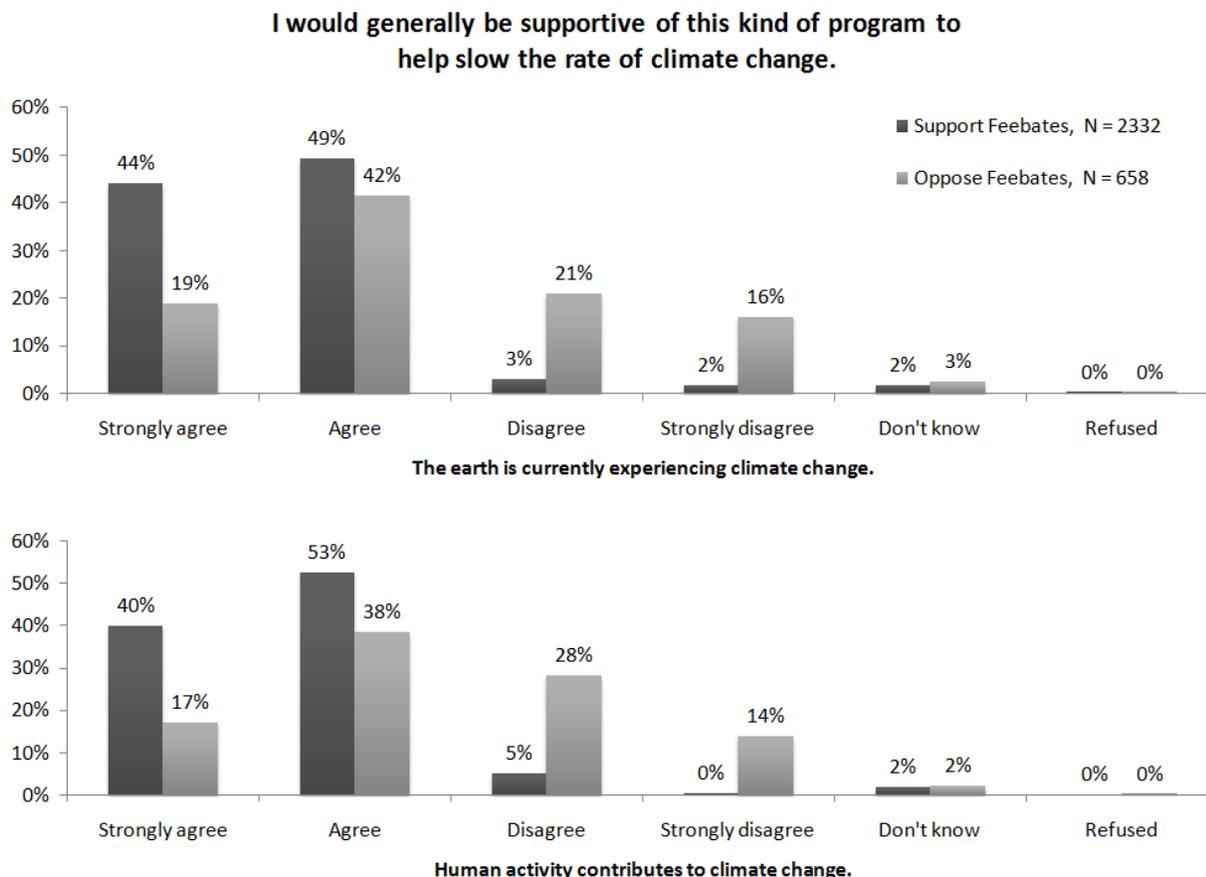


FIGURE 2 Support for feebates crossed with opinions on climate change.

388
 389
 390
 391 The top graph shows that roughly 93% (2,166) of respondents that were supportive of
 392 feebates considered the earth to be experiencing climate change. About 61% (397) of those
 393 opposing feebates also believed that the earth is experiencing climate change. The remaining
 394 37% (260) of those opposing feebates did not believe that the earth is experiencing climate
 395 change. The findings are similar for the bottom graph, which addresses human contribution to
 396 climate change. The results suggest that for the 50 to 60% of the subpopulation that opposes
 397 feebates, the reason is not due to disagreement with the statement that human activity contributes
 398 to climate change.

399 400 **Ordinal Regression Model**

401 The cross-tabulations provide insight as to how policy support is distributed across the weighted
 402 samples and how that support is divided by demographics and attitudes towards climate change.
 403 A more complete perspective on the factors that influence policy can be illustrated with a model
 404 that characterizes policy support as a function of respondent attributes and attitudes. Because the
 405 dependent variable of policy support is ordinal, the authors constructed an ordinal regression
 406 model using the raw sample of the survey data. The ordinal regression model is estimated using
 407 demographic and attitudinal variables. Because the sample was mostly supportive of the feebates
 408 policy, the link function—that characterizes the modeled distribution of the dependent
 409 variable—is of complementary log-log form. Due to the removal of missing responses (2,728),
 410 valid observations were available. The ordinal regression model serves to efficiently explain the

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411 significant factors that drive opinion towards feebates, and in this case the model is found to
 412 perform well. Table 3 presents the estimation results of an ordinal regression model of feebate
 413 policy support.

414
 415

TABLE 3 Ordinal Regression Model Estimation Results

Dependent Variable Threshold (Support of Feebates)		Estimate	Significance
Strongly Disagree		2.950	0.000
Disagree		4.590	0.000
Agree		6.935	0.000
Location Model			
Covariates (Ordinal and Scale Variables)			
Global warming is happening		0.422	0.000
Humans cause global warming		0.362	0.000
Foreign oil dependence is a problem		0.088	0.043
Education		0.031	0.054
Income		-0.061	0.000
Age		0.021	0.296
Highest vehicle fuel economy in household		0.008	0.009
Household size		0.008	0.310
Number of kids under 18		0.038	0.139
The feebate policy is fair		0.929	0.000
Factors (Categorical Variables)			
Which issue do you think is more important?	Global warming more important	0.331	0.118
	Energy security more important	-0.120	0.563
	Both equally important	0.192	0.365
	Neither is important	-2.866	0.000
Race or Ethnicity	Caucasian	0.530	0.002
	Hispanic	0.795	0.000
	African American	0.511	0.012
	Asian	0.591	0.002
	Native American	0.628	0.010
	Pacific Islander	0.669	0.036
Which of the following best describes your usual position on political issues?	Other	0.616	0.008
	Very Liberal	0.456	0.049
	Liberal	0.271	0.185
	Moderate	0.153	0.446
	Conservative	-0.106	0.600
	Very Conservative	-0.468	0.033
	Other	-0.094	0.728
Not Sure	0.259	0.301	

416

*Link function (Complementary Log-log), N = 2728 valid cases

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417
418 The model is presented in terms of three key attributes—threshold coefficients, covariate
419 coefficients, and factor coefficients—with a subsequent discussion of model performance
420 measures. The threshold coefficients apply to the ordinal categories of the dependent variable,
421 which is the respondent’s stated support or opposition to feebates. These coefficients are similar
422 to intercepts and help define the response predicted by the model. For the covariates and factors,
423 positive coefficients indicate that the variable increases policy support. The model shows that
424 opinions regarding the occurrence of climate change are significant in influencing feebate
425 support. In addition, belief that foreign oil dependence is a serious problem also positively
426 influences support. Finally, respondents were asked whether they thought the policy was fair,
427 and this question served as an important covariate in explaining support. In both the raw and
428 weighted sample, roughly 70% of respondents felt the policy was fair. Within the focus groups,
429 feebates fairness was raised as an important issue, particularly for those with large families and
430 businesses that require larger vehicles.

431 The demographic covariates of the model showed that education and fuel economy were
432 positive and statistically significant in influencing policy support. Income, however, was
433 negative and statistically significant, suggesting that *ceteris paribus*, increased income lowers
434 policy support. Both household size and the number of children in the household had positive
435 coefficients but were not statistically significant. This suggests that these factors are not very
436 influential in determining feebate support. A cross-tabulation of the weighted responses and
437 policy support (not shown) confirms this insight, suggesting that smaller households were in fact
438 slightly more opposed to the feebate policy. Finally, among the covariates, the fuel economy of
439 the most efficient vehicle in the household was included and found to be positive and statistically
440 significant. Fuel economy of all vehicles in each household were linked to the fuel economy
441 database as provided by the U.S. Environmental Protection Agency.

442 Among the factor coefficients, three categorical variables were found to be influential on
443 the model. First, as shown in Figure 2, respondents were asked whether they considered global
444 warming or energy security to be more important. The coefficients suggest that a belief that
445 global warming is more important has a positive impact but is not significant. Meanwhile, the
446 belief that neither was important was negative and statistically significant. The coefficients
447 attached to respondent “race” were all positive and statistically significant, which means that the
448 relative magnitude of the coefficients distinguishes which ethnic groups are likely to be more
449 supportive. Finally, the politics coefficients were found to be statistically significant for the more
450 extreme categories of political views. The coefficient for “very liberal” is positive, while the
451 coefficient for “very conservative” is negative, and both are significant. More moderate
452 philosophies were of the expected sign but not significant.

453 The model performance parameters indicate how well the model predicts the sample
454 responses based on the estimation. Ordinal regression requires the application of an additional
455 test, called the parallel lines test, to confirm that the functional form is appropriate for the data.
456 The test has a hypothesis that should not be rejected to ensure validity. In addition, several
457 “pseudo-R²” statistics have been developed to provide metrics for assessing which models
458 produce the best fit for a given outcome and dataset. Like the conventional R², the Nagelkerke
459 pseudo-R² is bounded between 0 and 1 and for this model is 0.830, indicating a good fit.
460 Additionally, the test of parallel lines is not rejected (p=1.000), confirming that the
461 complementary log-log function is the appropriate specification. The model also performs well
462 with respect to predicting respondent policy response. The model was able to accurately predict

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463 whether a respondent was in support or against feebates for 89.5% of the sample. That is, the
464 model would correctly predict either “disagree” or “strongly disagree” for those opposed and
465 “agree” or “strongly agree” for those in support.

466 The model offers several insights beyond the conventional distributions presented by the
467 cross-tabulations. In particular, the coefficients illustrate how different factors influence policy
468 support when controlling for all other model factors. The insignificance of certain factors, such
469 as household size, is also important. While fairness to large households was raised as a concern
470 in the focus groups, the survey data suggest that being a large household was not a significant
471 factor in explaining policy position. Overall, the model provides a descriptive context for the
472 broad set of factors that influence policy position simultaneously. It may also be useful for
473 predictive applications in the future, but this would require that simulated distributions of
474 personal factors, such as politics and opinions, be predefined based on regional assumptions.

475

476 **CONCLUSION**

477 This study explored the public perception of California residents to a proposed feebate policy
478 within the State using focus groups conducted in Northern and Southern California and a
479 statewide telephone survey. The survey found that most people were supportive of the feebates
480 concept to lower GHG emissions. However, it should be understood that support was not
481 unanimous, as roughly one in five respondents in the sample were opposed to feebates. Feebate
482 opposition was found to be associated with skepticism about the seriousness of climate change
483 and its links to human activity, conservative political views, ownership of less efficient vehicles,
484 and higher income.

485 The focus group findings complement the survey results by showing that upon further
486 consideration, public opinion could change with greater feebate exposure, especially if concerns
487 about program fairness or other potential adverse impacts are raised. Differences in the focus
488 group and survey feebate response suggest a variety of influential dynamics. The intimate and in-
489 depth discussion nature of the focus groups may induce a more critical discourse, with critics
490 dominating more reticent supporters. In contrast, the survey permits people to opine without the
491 presence of others. It is also important to note that the focus groups were held in the late summer,
492 and the survey was conducted in the fall to early winter of 2009. The focus groups were
493 potentially influenced by events that factored prominently in the media at that time (e.g., “Cash-
494 for-Clunkers,” economic uncertainty in the State, etc.). This difference in timing may have
495 generated distinct reactions between the focus group and survey results.

496 Overall, the results showed that a fair amount of support existed for feebates within
497 California at the time of survey. Furthermore, feebate support cut across all key demographic
498 attributes within the sample. Nevertheless, focus group results suggest that the policy design
499 consider the impact that a feebate policy has on households that may require larger vehicles due
500 to business operations or family size. In the longer term, policy designs that effectively balance
501 program objectives with “fairness” considerations will likely exhibit greater endurance among
502 the public overall.

503

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514

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