

RESEARCH ARTICLE

# Federal Climate Policy Successes: Co-benefits, Business Acceptance, and Partisan Politics

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## Abstract

While most literature on federal climate change policies has focused on failures to adopt broad policies, this article describes and explains successes in two important sectors. Regulations to improve the fuel economy of motor vehicles and efficiency standards for appliances and equipment have produced substantial reductions in greenhouse gas emissions, although they largely have other goals and hence can be considered implicit climate policies. We synthesize the existing literature with our analyses of case studies to offer three explanations for the adoption of effective policies in these two sectors. First, the policies delivered politically popular co-benefits, such as reducing consumers' energy bills, enhancing energy security, and promoting public health. Second, they gained business acceptance because they were narrow in their scope, avoided long-term economic costs, and helped industry cope with state-level regulations; industry often strategically tried to influence these policies rather than resist them. Third, the legislation that initiated and expanded these policies received bipartisan support, which was aided by co-benefits and business acceptance; more recently, these laws have been strengthened through the actions of Democratic administrations. We conclude by comparing these policy areas to the passage of the Inflation Reduction Act of 2022.

**Keywords:** environmental politics; climate change; comparative politics; environmental policy; US politics

## Introduction

The Inflation Reduction Act (IRA) of 2022 has been accurately described as a breakthrough in federal climate change policies. This policy accomplishment is particularly notable when placed in the context of more than two decades of climate policy failures. Congress failed to ratify the Kyoto Protocol and the Paris Agreement, approve a cap-and-trade program, and establish a national renewable portfolio standard. The Barack Obama administration's Clean Power Plan was not implemented, and a carbon tax has never reached the political agenda.

While the IRA's passage was eased by its focus on incentives for, rather than restrictions on, the automobile and renewable energy industries, it is important to recognize that the federal government has also adopted many regulatory policies that have substantially reduced greenhouse gas (GHG) emissions. Since the 1970s, a long series of federal policies, mainly using "sticks" rather than "carrots," have reduced the energy consumed by vehicles and improved the energy efficiency of appliances and equipment. The policies adopted in these sectors have substantially reduced GHG emissions even though their primary goals lie elsewhere and they predate the emergence of climate change on the federal political and policy agenda.

Therefore, they can be thought of as implicit climate policies, in contrast with policies that have the explicit, primary goal of reducing GHG emissions.<sup>2</sup> Their sectoral rather than economy-wide focus and

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<sup>2</sup>Rabe and Borick (2012). Our use of this distinction defines a continuum in the purposes and justifications of policies; the policies we address here began as completely implicit climate policies and have become somewhat more explicit climate policies over time.

If adopted, federal carbon pricing would not necessarily be more effective than implicit policies have been. For example, the Waxman-Markey bill that was passed by the US House in 2009 would have preempted state cap-and-trade programs for five years

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their implicitness are separate dimensions, both of which have contributed to their adoption. The sectoral policies in these and other areas have been moderately effective at GHG reduction, especially when viewed in the aggregate, although they are not sufficient for the United States to meet its targets under the Paris Agreement and hence to address the risks of global climate change.

This article explores the adoption of implicit climate policies in the vehicles and appliances areas. Our aim is to describe the policies and processes that led to their adoption and to synthesize an explanation for them from the literature on the politics of climate policymaking and our analysis of the case study evidence. Our main strategy is to identify common factors operating in many episodes of successful policy adoption; we are not comparing them to the major policy failures mentioned at the outset. Rather, identifying common factors can advance understanding of how sectoral climate policies can be adopted in these and other areas.

We argue that there are three broad explanations for the adoption of these effective federal climate policies. The first concerns collateral benefits or co-benefits—that is, their impacts on politically popular policy goals in addition to reducing GHG emissions. In this article, we show how the political deployment of arguments about their public co-benefits—consumer energy savings, energy security, jobs, and public health—played critical roles in their initial adoption and later development. Accordingly, events that enhanced the salience of those co-benefits, such as energy supply shocks, energy price increases, or recessions, helped put the policies on the political agenda and build support for them. This helps explain why these policies originated in the 1970s, when climate change was not yet a political issue. But the co-benefits of these policies also represent an important reason for their continuation even after the issue of climate change emerged and became politically polarized.

The second set of explanations has to do with the political response of business. After a period of opposition in the 1970s, business acquiescence or support was crucial in both cases, and there were different ways of securing it. It was necessary for these policies to be narrow in scope and to avoid long-term costs to the industries being regulated. Beyond that, some of the most important factors leading to business acceptance include state governments' adoption of regulatory standards, which led industry to support uniform national standards; events that weakened the political standing of the affected industry and led it to try to influence key policy details rather than oppose the policy outright; and concessions in the policymaking process that allowed industry to prosper even while complying with federal rules that had the effect of reducing GHG emissions.

The third explanation concerns partisan politics. Divisions between the political parties about these policies have been present since the 1970s and have grown in recent years, and therefore election results have affected their adoption. Democratic control of Congress was often helpful in advancing legislation, and Democratic presidents more vigorously implemented standards authorized by Congress than did their Republican counterparts. However, the partisan pattern is not clear-cut, with some laws that were enacted through 2007 supported by congressional Republicans and signed into law by Republican presidents. In those instances, co-benefits and business acceptance of policies helped overcome partisan divisions.

In the next sections, we ground our arguments in the literature on climate policy and briefly describe our case selection and methods. Then we discuss in detail the motor vehicles and appliances case studies. The conclusion compares these two policy areas to each other and then to the IRA. This allows us to generalize about conditions that have made possible sectoral federal climate policy accomplishments. To be clear, policies on carbon pricing, binding targets, and the restriction of coal-fired electricity generation face steep hurdles because of their broad scope and their imposition of visible costs on businesses and consumers, and we are not offering ideas about how to overcome them. Rather, we argue that narrower, often overlooked policies have made major contributions to reducing emissions and that analyzing their causes can reveal ways to expand them and to pursue other sectoral policies.

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while including such generous provisions for offsets that it might not have required any actual GHG emissions reductions for eighteen years (Karapin 2016, 216).

## Explanations of federal climate policies

Most literature on federal climate policies describes a picture of almost complete failure at the federal level.<sup>3</sup> Its summary judgment is that the United States lacks a comprehensive, coherent climate policy such as that found in many European countries and the European Union, leaving only fragmentary, relatively insignificant efforts in this country.

But these studies of federal climate policy failures are incomplete. Descriptively, they focus almost entirely on comprehensive, explicit, costly climate policies—such as binding emissions targets, cap and trade, and the Clean Power Plan. These measures aim to affect the entire economy or a very broad sector of it (all electricity generation), have the reduction of GHG emissions as their main or sole purpose, and involve long-term, visible net costs. The studies of climate policy failure ignore or downplay the adoption of more narrowly focused federal policies that have had the effect of substantially reducing GHG emissions in particular sectors without imposing long-term costs on industry or consumers, and which may have been adopted mainly or entirely for reasons other than combating climate change.<sup>4</sup> This blind spot has led to a strange asymmetry in the literature: there are many publications on state climate policy accomplishments,<sup>5</sup> but few on those by the federal government. This article aims to fill that empirical gap by building on climate policy literature that has identified theoretical or explanatory mechanisms—concerning co-benefits, business acceptance, and partisan politics—that have shaped the politics of climate change.

## Co-benefits

A climate policy's implicitness may provide political advantages, since other policy goals are often more important to business and the public than mitigating climate change. Studies of climate policies at the state and federal levels argue that the co-benefits of climate policies increase political support for them, with four kinds of co-benefits being most important; our case studies provide support especially for the first three kinds. First and perhaps foremost, cost savings are involved in a wide range of energy efficiency policies on appliances, buildings, and vehicles. While there are up-front costs, if payback periods are reasonably short (e.g., less than three to five years), consumers can see that they will reap financial benefits from the policies. For example, California's 2002 Pavley bill, which created GHG standards for motor vehicles, required a cost-effective reduction in emissions.<sup>6</sup> There are similar economic feasibility provisions in federal laws on appliance and vehicle efficiency, which from the time of their initial adoption in the 1970s have made references to "economically justified" measures or to "economic practicability."

Second, energy security or independence is a more abstract, speculative, and temporally variable co-benefit.<sup>7</sup> At the federal level, energy security refers mainly to the benefits of reducing oil consumption and hence oil imports. The presumptive benefits include an improved balance of payments; a reduction in political dependence on oil-exporting countries such as Saudi Arabia, Iraq, Venezuela, and Nigeria; and a reduced risk of the kinds of supply crises and attendant price spikes that occurred in 1973, 1979, and 1990. These kinds of energy security concerns are higher during periods that see increases in global oil prices, such as during international tensions or war, including the mid-2000s.<sup>8</sup> However, when energy prices drop, interest in climate policy tends to wane again.<sup>9</sup> In many of the policymaking episodes discussed in this article, the salience of the energy security issue

<sup>3</sup>For example, Rabe (2010, chs. 6, 11); Meckling (2011, ch. 6); Kelsey and Madden (2014, 125–27); Mildenerger (2020); Harrison (2010); Wendler (2022, chs. 1, 4); Grossman (2013, ch. 9); Skocpol (2013); Bartosiewicz and Miley (2013); Brewer (2022).

<sup>4</sup>An exception is Bryner and Duffy (2012).

<sup>5</sup>For example, Rabe (2004); Mazmanian, Jurewitz, and Nelson (2008); Karapin (2016, chs. 4–8); Vogel (2018, ch. 7); Stokes (2020).

<sup>6</sup>Karapin (2016, 148).

<sup>7</sup>Cf. Smith (2013, ch. 5).

<sup>8</sup>Bang (2010, 1647).

<sup>9</sup>Graetz (2011, 179–80).

facilitated the passage of congressional legislation, notably in 1975 (CAFE program), 1992 (Energy Policy Act), 2005 (Energy Policy Act), and 2007 (Energy Independence and Security Act).

Reductions in urban air pollution are another co-benefit of climate policies. Common air pollutants such as sulfur oxides, nitrogen oxides, particulate matter, and ground-level ozone are produced by fossil fuel burning, especially by vehicles and power plants, and have well-known adverse effects on human health and mortality. At the federal level, the 1970 Clean Air Act is designed to protect human health, and it became the basis for GHG regulation when the Environmental Protection Agency (EPA) held in its 2009 endangerment finding that “six greenhouse gases taken in combination endanger both the public health and the public welfare of current and future generations.”<sup>10</sup> Similarly, reducing ozone and smog was the main motivation for regulations of the GHG methane in landfills.<sup>11</sup> In our cases, politicians referred to reductions in air pollution in their arguments for electric vehicle subsidies in the 2000s and for motor vehicle standards since 2009.

Finally, jobs and economic development are frequently cited as co-benefits of certain climate policies, namely, those promoting renewable energy, energy efficiency technologies, and electric vehicles. Prominent in these arguments is that the United States or individual states can gain or retain a competitive advantage in certain industrial sectors through technological advances that are spurred or supported by government policies. These co-benefits are especially salient at times and in regions with relatively high unemployment rates. At the federal level, green economy frames were used by business-labor alliances beginning in the mid-2000s.<sup>12</sup> Even after the 2009 recession ended, Obama countered arguments about the economic costs of climate policy with claims that a “low-carbon, clean energy economy can be an engine of growth for decades to come.”<sup>13</sup> However, the job creation argument is more credible for subsidies than for regulations, and in our case studies, it was made only in support of electric vehicle subsidies.

As we show in the case studies, the use of co-benefits can increase the political viability of climate policies in several ways. It can raise the salience of the policies on the political agenda. It also can facilitate the formation of broader coalitions, since energy cost savings are popular with business, while jobs and economic security arguments appeal to Republican elected officials. Moreover, it can affect the electoral calculations of elected officials, because all the co-benefits mentioned here are likely to appeal to the average voter. Voters like cost savings and generally view the environmental problems related to health (such as air pollution, water pollution, and toxic waste) as more important than global warming.<sup>14</sup> Of course, designing climate policies to produce co-benefits does not automatically increase their political acceptability. For co-benefit arguments to be effective, climate policy advocates need to use them and they need to prevail in the resulting contests over framing in which opponents try to distract from or denigrate the co-benefits frames.<sup>15</sup> In this process, it helps if the co-benefits of climate policies resonate well with American values, which is clearly the case for cost savings, energy independence, human health, and jobs.

### **Business acceptance**

Because of the substantial and visible direct costs that they impose on important business sectors, broadly focused, explicit climate policies have been strongly opposed by what has been characterized as “the extended carbon coalition.” This coalition comprises fossil fuel producers, the industries and firms that rely on fossil fuels, and their corporate customers and suppliers.<sup>16</sup> The breadth and intensity of business opposition to costly restrictions on the production and consumption of fossil fuels is an important reason why the federal government has been unable to enact broad policies to substantially

<sup>10</sup>*Federal Register* 74 (239): 66496–66546, at 66496.

<sup>11</sup>Yacobucci and Parker (2006, 8).

<sup>12</sup>Fletcher (2009, 809–10).

<sup>13</sup>Quoted in Wendler (2022, 140).

<sup>14</sup>Gallup (2023).

<sup>15</sup>Jett and Raymond (2021); Park, Liu, and Vedlitz (2010).

<sup>16</sup>Cory, Lerner, and Osgood (2020).

reduce greenhouse emissions.<sup>17</sup> Correspondingly, the lack of opposition from the extended carbon coalition is an important reason for the success of the narrower, sectoral, and mostly regulatory policies on which this article focuses.

However, the literature also identifies four reasons why some sectors and firms have supported or accepted policies that reduce GHG emissions. The first two of these have limited explanatory value for our cases, while the last two are more relevant.

The first reason given is that such policies may provide business opportunities or direct benefits to firms or sectors. In the case of subsidies for new technologies, such as research and development spending or tax credits, firms that are currently or prospectively invested in the technologies will often lobby for them.<sup>18</sup> For example, some auto companies and the electric utility industry supported federal tax credits and research and development spending for electric vehicles.<sup>19</sup> Renewable energy associations have been a factor in the creation of state-level renewable portfolio standards,<sup>20</sup> and they have lobbied for federal tax credits for wind and solar power.<sup>21</sup> Similarly, many authors have documented business support for California's Global Warming Solutions Act, which included, most notably, high-technology firms and venture capitalists in Silicon Valley who wanted to secure larger and more stable markets for their products.<sup>22</sup> In our cases, direct benefits can help explain the adoption of tax credits and other policies to support electric vehicle development, but they cannot explain why the motor vehicle and appliance industries supported or accepted a wide range of regulations, most of which did not provide them with any direct financial benefits or more profitable business opportunities.

The second reason why some firms have backed climate reduction policies is that such policies have made them relatively better off. Generally, "firms with greater capabilities for adoption to new legislation or regulation can use public policy strategically to gain firm-specific advantages over competitors."<sup>23</sup> Meckling argues that "renewable energy companies, providers of energy-efficient technologies and also the nuclear industry" support carbon pricing because it gives them a competitive advantage.<sup>24</sup> Kennard's extensive analysis of business and the American Energy and Security Act of 2009 found that firms that backed this cap-and-trade legislation did so because their adjustment costs were lower than those of their competitors.<sup>25</sup> Comparative advantage and relative adjustment costs help explain some of the positions of auto manufacturers on regulations during the Donald Trump administration, and some federal subsidies did advantage American firms vis-à-vis their Japanese competitors. But the carmakers usually, and the appliance manufacturers always, took unified positions on the regulatory policies discussed in this article.

A third explanation of business support for federal climate regulations, which focuses on the role of the states within federalism, is more helpful for explaining our cases. Within the United States, some state governments have played a leadership role in addressing climate change.<sup>26</sup> Most state policies, such as renewable energy mandates or cap-and-trade programs, have been production standards, which primarily impact home-state firms. But when states have regulated products, divergent state regulations have created challenges for national producers who would prefer uniform and consistent national regulations, creating pressure for upward harmonization in a "California effect."<sup>27</sup> A comprehensive study of the impact of state climate policies on federal regulation found that in many cases, the growth of state product regulations—which were enacted despite industry opposition—led the

<sup>17</sup>Rabe (2010). However, using auction revenue to benefit political constituencies is an option that has eased the adoption and survival of state cap-and-trade programs in the United States; see Raymond (2016); Rabe (2018).

<sup>18</sup>Meckling (2019, 86).

<sup>19</sup>Meckling and Nahm (2018, 518–20).

<sup>20</sup>Lyon (2016, 145–46).

<sup>21</sup>Eikeland (1993, 66–68); Stokes and Breetz (2018, 81).

<sup>22</sup>For example, Knox-Hayes (2012, 555); Kelsey and Madden (2014, 134); Biber (2013, 412).

<sup>23</sup>Delmas, Lim, and Nairn-Birch (2016, 179).

<sup>24</sup>Vormedal (2011, 19).

<sup>25</sup>Kennard (2020).

<sup>26</sup>Rabe (2004, 2011).

<sup>27</sup>Vogel (1997, 563).

regulated firms to switch to supporting federal regulations in order to preempt states rules.<sup>28</sup> Large states like California and New York are especially influential in this process, and California has had a special role as a “super-regulator,” whereby it leads other states and the federal government because of the authority carved out for it in federal clean air legislation.<sup>29</sup> In our cases, divergent state regulation played a major role in convincing the automobile and appliance manufacturers to support stricter, but also more uniform federal regulations.

Finally, firms may support or agree to climate reduction policies for strategic reasons, because they conclude that the passage of some government restrictions is inevitable.<sup>30</sup> Hence, although their first preference is to avoid regulation, they shift to support for climate policies in a “hedging strategy” in order to make their terms as business-friendly as possible<sup>31</sup> and to avoid “becoming the victim of a badly designed and costly regulatory system.”<sup>32</sup> According to Mildenerger, “many businesses supported the Waxman-Markey bill because they had come to believe that some form of climate policy was extremely likely” and wanted to be able “to choose between different climate policy responses.”<sup>33</sup> His assessment is echoed by Grumbach, whose research demonstrates that the first-order preference of industry stakeholders was to maintain the status quo and that they only joined the coalition supporting cap-and-trade once its passage appeared likely.<sup>34</sup>

This fourth explanation for business backing of climate policies helps explain the responses of the automobile and appliance manufacturers to federal regulations. For both industries, “tipping points” emerged at times and prompted them to strategically support federal regulations to influence their terms, which led to policy changes that increased business acceptance of these regulations.

### Partisanship

Most literature on explicit, comprehensive climate policy argues that partisanship and ideological polarization among elected officials and the public have prevented climate policy adoption. Conservative Republicans have led the opposition to climate policy, buttressed in 2009 by the Tea Party, leading to widening partisan divisions on the issue.<sup>35</sup> This has led moderate Republicans to retract their endorsement of federal climate policy or lose primary elections, setting the stage for the repeated failure of emissions trading and other comprehensive climate policy efforts in Congress.<sup>36</sup>

By contrast, studies of sectoral policies that reduce GHG emissions have found some support from Republicans. For example, in renewable energy, Republicans in many state governments have passed supportive policies,<sup>37</sup> and enough congressional Republicans supported the federal production tax credit for Congress to repeatedly renew it on bipartisan votes.<sup>38</sup> Our cases demonstrate that co-benefits and business acceptance of sectoral climate policies made bipartisan passage of congressional legislation possible at times and gave presidents political cover when they chose to adopt executive regulations of GHGs. There is also an alternative to partisan polarization and deadlock that does not require bipartisanship. Litigation by state governments in the *Massachusetts v. EPA* case (2007) led to a US Supreme Court decision that the EPA is authorized by the Clean Air Act to regulate GHGs. Democratic presidential administrations since then (Obama, Joe Biden) have used this authority to regulate, or attempt to regulate, GHG emissions in motor vehicles, the oil and gas industry, and

<sup>28</sup> Aulisi et al. (2007); see also Vogel (2022).

<sup>29</sup> Carlson (2009).

<sup>30</sup> Meckling (2011, 29–31).

<sup>31</sup> Meckling (2015, 23–24).

<sup>32</sup> Vormedal (2011, 18).

<sup>33</sup> Mildenerger (2012, 38); see also Mildenerger (2020, ch. 5).

<sup>34</sup> Grumbach (2015).

<sup>35</sup> Brewer and Pease (2008, 86, 93–96); Selin and VanDeveer (2012); Skocpol (2013, 2).

<sup>36</sup> Rabe (2010, 265–67); Bartosiewicz and Miley (2013, 7); Skocpol (2013, 9).

<sup>37</sup> Rabe (2006).

<sup>38</sup> Skodvin (2010).

power plants without seeking congressional approval. This executive authority is the basis of the multiple rounds of vehicle GHG regulations adopted since 2009, which are analyzed in our case studies.

### Case selection and methods

In the following case studies, we show how theoretical mechanisms concerning co-benefits, business acceptance, and partisan politics operate and influence federal policy adoption. We selected these two cases after surveying the full range of federal policies affecting GHG emissions. We found four areas in which federal policies have had major impacts on emissions: motor vehicles, appliances, renewable energy, and the regulation of non-CO<sub>2</sub> (carbon dioxide) greenhouse gases (mainly hydrofluorocarbons and methane).

We chose to analyze vehicles and appliances policies because they have been mostly regulatory, as shown by the tables in the Appendix. Hence, they pose a greater empirical puzzle than federal renewable energy policies, which have focused on tax credits and spending that provide direct financial benefits to the renewable energy sector.<sup>39</sup> In contrast with the non-CO<sub>2</sub> GHG policies, the two areas chosen have similarities that simplify the analysis: each concerns one industry, with policymaking that began in the 1970s.

We researched the cases using secondary literature, government documents, and newspaper articles. Using process tracing, our aim was to find evidence that supports or refutes our theoretical propositions regarding the three kinds of mechanisms and to use the evidence to modify our propositions.<sup>40</sup> Our unit of analysis is the policymaking episode (see the Appendix). Within these two policy areas, we carried out a universalizing comparison to identify common factors operating to help produce policy adoption in a large number of policymaking episodes over a long period of time (nineteen episodes during more than four decades from the 1970s to 2022).<sup>41</sup> This time span gives us a diversity of background conditions against which to seek common factors, yielding some of the advantages of a most-different systems design.<sup>42</sup> While we have selected on the dependent variable, this is appropriate for an effort to identify necessary conditions.<sup>43</sup>

### Motor vehicle policies and programs

#### *The adoption of effective policies*

Approximately 35 percent of US CO<sub>2</sub> emissions come from the transportation sector, with about 20 percent from light-duty vehicles (namely, cars and light trucks) and 9 percent from medium- and heavy-duty vehicles.<sup>44</sup> This means that improving fuel economy and switching transportation energy sources from gasoline and diesel to electricity, especially from renewable sources, can markedly reduce US GHG emissions.

The federal government has adopted two kinds of policies to reduce fossil fuel consumption by motor vehicles; Table 1 in the Appendix provides an overview. First, it has issued fuel economy standards, initially through legislation and more recently through regulations. The 1975 Energy Policy and Conservation Act created the Corporate Average Fuel Economy (CAFE) program, which specified a 53 percent increase in fuel economy for passenger cars over the 1978–85 period, with separate, less rigorous standards for light trucks. Although the law authorized the US Department of Transportation (DOT) to increase standards for both cars and light trucks, at the maximum feasible level for each

<sup>39</sup>In a book project, we are exploring the extent to which the theoretical arguments that we developed through these two cases also are supported by cases of federal policymaking on renewable energy and non-CO<sub>2</sub> pollutants.

<sup>40</sup>George and Bennett (2005, 147).

<sup>41</sup>Tilly (1984).

<sup>42</sup>Przeworski and Teune (1970, 34–39).

<sup>43</sup>Dion (1998, 127). While variation-finding comparisons would help in identifying sufficient conditions, that is beyond the scope of this article.

<sup>44</sup>EPA data for 2020.

model year after 1985, there were no increases in CAFE standards for passenger cars in the 1985–2010 period or for light trucks in the 1987–2004 period.<sup>45</sup>

But in 2007, Congress passed the Energy Security and Independence Act, which required the DOT to increase fuel economy standards by 40 percent for the 2011–20 period. The DOT did not implement new standards under the George W. Bush administration, and the 2007 law's targets were soon superseded by a new Obama administration program, which combined GHG and fuel economy standards. This was developed jointly by the EPA and the DOT, with the former acting on the basis of the US Supreme Court's 2007 *Massachusetts v. EPA* decision requiring the agency to regulate GHG emissions. The Obama and Biden administrations issued three rounds of light-duty vehicle standards, requiring annual reductions in fuel consumption and GHG emissions of 5 percent or more for the model years from 2010 to 2026. There have also been two rounds of standards for various categories of medium- and heavy-duty trucks, requiring substantial reductions in fuel use for the 2014–27 model years.

Second, beginning in the 2005–09 period, the federal government has pursued a multipronged industrial policy to promote electric vehicles through research and development spending (which rose to \$160 million per year), consumer tax credits for vehicle purchases, tax credits for commercial and consumer charging stations, and loans and grants to industry.<sup>46</sup> The GHG regulations of light-duty motor vehicles also encouraged plug-in electric vehicles by giving carmakers extra credits for selling such vehicles. These federal policies complemented the zero-emission vehicle quotas mandated by California and ten other states since 1990.<sup>47</sup> Consumer tax credits were initiated in the 2005 Energy Policy Act (at \$3,400 for each new hybrid electric vehicle), and they were extended and expanded in legislation adopted in 2008–09, rising to \$7,500 per vehicle. The 2005 act also included a temporary 30 percent credit for home and business charging facilities, which Congress extended seven times, often retroactively.<sup>48</sup> The 2022 IRA extended both kinds of tax credits through 2032 and expanded them to include used vehicles.

The vehicle standards helped increase the average fuel economy of the US light-duty vehicle fleet from 13 to 23 miles per gallon (mpg) over the 1975–2020 period. That increase saved a cumulative total of about 2.0 trillion gallons of motor fuel and avoided 17,000 million metric tons (megatons) of CO<sub>2</sub>. That is about 386 megatons per year on average, or about 6 percent of US emissions in 2005.<sup>49</sup> Greene, Sims, and Muratori estimate that only about 20 percent of this decline was due to increased fuel prices (in a counterfactual no-policies scenario), and about 80 percent was due to government standards, mostly those adopted during the 1970s and 1980s.<sup>50</sup> After a long period of policy stagnation, the strengthening of federal fuel economy standards after 2005 again helped reduce GHG emissions from light-duty vehicles. Those emissions fell by 10 percent over the 2005–19 period, while vehicle miles traveled increased by 9 percent, meaning there was an efficiency gain of approximately 20 percent.<sup>51</sup> A small but growing component of this emissions reduction was due to the success of policies to promote zero-emission vehicles, which helped raise sales of electric plug-in vehicles and hybrid electric vehicles to about 4 percent and 5 percent of total sales, respectively, in 2021.<sup>52</sup>

### Co-benefits

These policies have repeatedly emerged on the political agenda and gained political support largely because they involved four kinds of co-benefits. The first of these was a private co-benefit: lower fuel consumption saved vehicle owners (both households and businesses) money at the gas pump. Creating the CAFE program was politically palatable because policymakers expected the costs of

<sup>45</sup>Yacobucci and Bamberger (2007, 1–2); Dunn (2006, 198–200).

<sup>46</sup>Lane et al. (2013); Meckling and Nahm (2018).

<sup>47</sup>Stokes and Breetz (2018, 82–83); Northeast States for Coordinated Air Use Management (2014).

<sup>48</sup>Congressional Research Service (2019, 5).

<sup>49</sup>Greene, Sims, and Muratori (2020, 10); DOT data.

<sup>50</sup>Greene, Sims, and Muratori (2020).

<sup>51</sup>Data from EPA (2021) and DOT.

<sup>52</sup>Bureau of Transportation Statistics data.



manufacturing more fuel-efficient vehicles to be recovered by consumers in reduced fuel costs over the vehicles' lifetimes.<sup>53</sup> The increased standards adopted later by the Obama and Biden administrations were estimated to have short, calculable payback periods. For example, the EPA estimated that the regulations governing the 2012–16 model years would raise the average cost of a vehicle by \$1,100 but would save \$3,000 in fuel costs over the vehicle's lifetime.<sup>54</sup> This amounted to a payback within three years for cash purchasers, and immediate savings of \$130 to \$180 per year for those buying with the help of a five-year loan.<sup>55</sup>

Other co-benefits were public in nature. By reducing gasoline and diesel consumption, the policies promised to reduce oil imports and hence the United States' vulnerability to oil supply shocks and oil price increases, as well as its political dependence on oil-producing countries such as Saudi Arabia. The 1973 oil embargo, gasoline rationing, and price increases led President Richard Nixon to immediately announce Project Independence, which aimed to make the United States independent of energy imports by 1980. The national security implications of dependence on foreign oil imports motivated the 1975 law that created the CAFE program.<sup>56</sup> At the time of the embargo, the United States imported about 40 percent of the crude oil that it consumed, largely for transportation, and the fuel economy of new cars had actually declined 13 percent during the 1967–74 period.<sup>57</sup> Similarly, the revealingly named 2007 Energy Independence and Security Act (EISA) was spurred by a sharp increase in gasoline prices from 2002 to 2008. Those events helped to make reducing dependence on oil imports a salient political issue and hence increased the interest of political leaders in raising fuel economy standards through EISA.<sup>58</sup>

Another public co-benefit concerned the effects of these policies on industrial competitiveness and the retention of manufacturing jobs in the United States. Electric vehicle policies since 2005 have aimed to aid US vehicle and battery manufacturers in competing against foreign companies.<sup>59</sup> More broadly, rising oil prices in the 2000s convinced elected officials that forcing domestic carmakers to produce more fuel-efficient vehicles was necessary to maintain their long-term profitability and save jobs, given the competition they faced from foreign carmakers, especially from Japan.<sup>60</sup> Those companies produced vehicles that were more fuel efficient than the Big Three carmakers, whose share of the US market shrank from 85 percent to 45 percent during the 1975–2010 period. Therefore, in the crisis for the domestic industry that was created by the 2008 recession, congressional leaders and the Obama administration insisted that General Motors and Chrysler restructure themselves to reorient their production mixes toward more fuel-efficient vehicles in exchange for receiving federal bailouts.

Finally, proponents have emphasized the health benefits of reducing urban air pollution by burning less gasoline and diesel fuel. Public health organizations were involved in the negotiations about standards after 2009, and Presidents Obama and Biden touted the public health benefits of reduced air pollution that were expected to result from reduced fuel consumption by light-duty vehicles and trucks. In fact, they referred more often to “carbon pollution” or “climate pollution” than to global warming or climate change in their public justifications.<sup>61</sup>

### *The role of business*

What role did business play in the adoption of these policies? First, certain events weakened their political standing and led to their being defeated (in 1975) or choosing to negotiate and accept stricter regulations in order to influence important policy details, especially during the Obama and Biden

<sup>53</sup>Dunn (2006, 207).

<sup>54</sup>*New York Times*, 15 September 2009.

<sup>55</sup>*Federal Register* 75 (88): 25328–29.

<sup>56</sup>Black and Flarend (2010, 95).

<sup>57</sup>Yacobucci and Bamberger (2007, 2).

<sup>58</sup>*Ibid.*, 1.

<sup>59</sup>Meckling and Nahm (2018, 518–19).

<sup>60</sup>Dunn (2006, 213); AmericanProgress.org, 27 August 2012; Ceres (2021).

<sup>61</sup>White House (2011, 2021).

administrations. The industry's smog and safety problems in the late 1960s had damaged its reputation, and then the oil supply disruption of the 1970s elevated the national interest above the industry's preference to continue producing gas-guzzling vehicles.<sup>62</sup> The 2009 recession brought the domestic manufacturers to the verge of bankruptcy and, by making them dependent on government loans and grants, substantially weakening their ability to resist the new regulations.

A second key factor leading to industry acceptance of federal policies was the emergence of vigorous state-level regulation of GHG emissions from vehicles, following California's passage of the Pavley law in 2002. Fourteen other states subsequently announced their intent to follow California's lead, as permitted by the Clean Air Act Amendments of 1977, putting about 40 percent of new light-duty vehicle sales in the United States under the proposed California rules.<sup>63</sup> After a delay caused by the Bush administration, California received the EPA waiver needed to pursue its program in 2009. Facing the prospect of differing state and federal rules, the major carmakers negotiated with the Obama administration and California, accepting a nationalization of California's standards combined with an indefinite suspension of the state-level program. Federal policy makers at this time also took advantage of divisions within the industry, by negotiating with individual carmakers or allying with companies that were seeking first-mover advantages.<sup>64</sup>

Another reason for industry acceptance concerns the nature of the policies themselves. Federal standards did not necessarily disadvantage the carmakers if they could sell enough fuel-efficient or electric vehicles at profitable prices. The electric vehicle policies provided subsidies for purchasers and manufacturers that were a boon to the automobile industry, though they helped some companies more than others.<sup>65</sup> Moreover, by the start of the Biden administration, even the Big Three domestic carmakers saw themselves as technologically capable of rapidly increasing fuel efficiency and shifting toward electric vehicles.<sup>66</sup>

Finally, the dynamics of policymaking also facilitated business acceptance. Typically, policymakers first threatened to adopt stringent regulations and then made major concessions that reduced standards, gave automakers flexibility, and allowed for a shift in the product mix toward larger vehicles. This process occurred during the initiation of the CAFE program, which created separate standards for cars and light trucks without regulating the mix of vehicles produced. This loophole allowed carmakers to effectively weaken the standards by convincing vehicle purchasers to buy light trucks instead of cars.<sup>67</sup> The process occurred again with the standards authorized by the EISA and adopted by the Obama administration, which were based on a more complex footprint model that accomplished the same thing in a more granular way.<sup>68</sup> Carmakers also gained other concessions in meeting the fuel economy standards, such as extra credits for flexible-fuel and electric vehicles, and the ability to average, bank, and trade credits.<sup>69</sup> These concessions reduced industry's opposition to the standards, though they also undermined the standards' effectiveness in reducing GHG emissions.

### *Partisan politics*

This policy area reflects both bipartisan cooperation and partisan divisions. In Congress and in the White House, Democrats usually favored increased standards, and Republicans, in line with the domestic carmakers' position, usually opposed them. Democratic majorities in Congress pressed for more ambitious legislation in 1975 and 2007 than Republicans preferred. President Gerald Ford, like the carmakers, advocated voluntary and opposed mandatory standards, and he signed the law

<sup>62</sup>Dunn (2006, 204–5).

<sup>63</sup>California Air Resources Board (2022).

<sup>64</sup>Meckling and Nahm (2018, 520–21).

<sup>65</sup>Data from EVadoption.com.

<sup>66</sup>*Washington Post*, 28 January 2021.

<sup>67</sup>Nivola (2009, 2).

<sup>68</sup>Ungar et al. (2015, 5).

<sup>69</sup>*New York Times*, 15 September 2009; 28 July 2011.

creating the CAFE program only reluctantly, largely because of its other energy policy provisions.<sup>70</sup> Democratic Presidents Obama and Biden negotiated and adopted standards that were more ambitious than the EISA had foreseen. By contrast, Republican presidents blocked, delayed, or weakened the rules. The George W. Bush administration denied California's request for an EPA waiver for its GHG regulations for motor vehicles. Moreover, even after the US Supreme Court ruled against it in *Massachusetts v. EPA*, it failed to issue the requisite endangerment finding, California's waiver, or even the light-duty vehicle standards required by the EISA. The Trump administration went further, reducing the required increases in fuel economy from 5 percent to 1.5 percent annually, and it revoked an EPA waiver in an effort to block California from creating a rival program with standards closer to those of the Obama administration.<sup>71</sup>

However, the partisan pattern was not always clear-cut, either because vehicle policies were embedded in more comprehensive energy legislation or because of the importance of co-benefits and business support or acquiescence. The 1975 and 2007 laws increasing fuel economy standards were supported by bipartisan coalitions in Congress and signed by Republican presidents Ford and George W. Bush, in the latter case because he shared with Democrats the goal of reducing foreign oil imports. Moreover, Republican leaders sometimes were advocates of these transportation policies. Although Bush came to the issue late, he called for increased CAFE standards in his January 2007 State of the Union address, when he called for a 20 percent cut in gasoline consumption over the next ten years. The measures that Bush proposed included increasing CAFE standards by about 4 percent per year, although he also called for increased flexibility (car standards to be based on vehicle sizes, trading of credits among manufacturers) and for the transportation secretary, not Congress, to specify the rate of increase.<sup>72</sup> Similarly, Republican senators Orrin Hatch and Susan Collins pressed for electric vehicle policies in order to reduce air pollution and oil imports and to improve the competitiveness of the domestic carmakers. The tax credits were timed to help General Motors with its 2010 introduction of the plug-in hybrid Chevy Volt and intended to promote US global leadership in "plug-in electric vehicle and component production, like batteries and smart grid technologies."<sup>73</sup>

Also, although partisanship on vehicle standards increased during the Trump administration, its effects on the weakening of vehicle rules was limited, in part by the response of business. The carmakers had already shifted toward fuel-efficient technologies such as direct injection engines with turbocharging, transmissions with more gears, lighter materials, and idle stop-start systems,<sup>74</sup> and domestic carmakers were starting to follow their foreign rivals in investing in electric vehicle manufacturing. Moreover, the carmakers now faced separate state-level standards led by California, which required a 3.7 percent annual decline in GHG emissions and was followed by thirteen other states.<sup>75</sup> Five major carmakers agreed to this California program, dividing the industry between those supporting and opposing policy retrenchment and weakening Trump's effort to freeze the standards at the 2020 levels.<sup>76</sup>

### Policy limitations

As mentioned in the first part of this case study, vehicle policies have had major effects in reducing GHG emissions compared to business-as-usual scenarios. Overall CO<sub>2</sub> intensity per vehicle mile traveled by light-duty vehicles declined by 32 percent over the 1990–2020 period, if using the EPA's data on GHG emissions, or by 19 percent, if using the DOT's data on observed on-road fuel economy.<sup>77</sup>

<sup>70</sup>*New York Times*, 23 December 1975.

<sup>71</sup>*New York Times*, 17 September 2019.

<sup>72</sup>*New York Times*, 24 January 2007; White House (2007, 6–7).

<sup>73</sup>*US Federal News*, 3 May 2005; Meckling and Nahm (2018, 518–19); Cantwell (2009).

<sup>74</sup>*Scientific American*, 1 December 2016.

<sup>75</sup>Electrify.com, 27 July 2019.

<sup>76</sup>*New York Times*, 17 August 2020.

<sup>77</sup>Data from EPA (2021, Tables 3–13) and DOT; Greene, Greenwald, and Ciez (2020, Figure 4).

Yet the effects of the federal policies have been blunted in three ways that were largely the result of the car industry's lobbying and its business decisions. In the first place, the 1975 act included a loophole for light trucks, and in 2007, Congress authorized the DOT to develop a footprint model that requires manufacturers to increase fuel economy for each size of vehicle they make rather than for their entire fleet of cars or light trucks. Both policies have allowed the automobile industry to shift toward the production of larger, less efficient vehicles. Therefore, the fuel economy of vehicles sold has risen more slowly than the nominal standards. While the standards for new passenger cars increased about 40 percent over the 2010–20 period, from 27.5 to an estimated 38.6 mpg, real-world fuel economy increased only 23 percent.<sup>78</sup> Similarly, light truck standards rose 32 percent, from 23.4 to 31.0 mpg, but real-world fuel economy rose only 14 percent for new pickup trucks, 16 percent for new minivans and vans, and 21 percent for new truck SUVs over that period. Combined with the slow replacement of existing vehicles with new ones, the result of the shift toward larger vehicles is that the overall fuel economy of the entire US light-duty fleet on the road (not that of new vehicles sold that year) rose only 6 percent, from 21.7 to 22.9 mpg, during the 2010–20 period.<sup>79</sup>

Second, during a long period of low oil prices, the federal government failed to strengthen fuel economy standards for passenger cars (1985–2010) and for light trucks (during 1987–2004). Since these policies were often justified largely in terms of energy security and savings at the gasoline pump, before 2009 the impetus for adopting more stringent policies in opposition to the automakers depended on international events that increased the global price of oil and heightened awareness of US dependence on oil imports. These included the 1973 Arab oil embargo, the 9/11 attacks, the Iraq War, and the rise in oil prices in the mid-2000s. Only after 2007 did policymakers begin to employ arguments about climate change in this policy area, because the US Supreme Court in *Massachusetts v. EPA* authorized the EPA to regulate GHG emissions in order to address climate change and because the issue became important for Democratic elected officials and voters.<sup>80</sup> But even in this period, it has largely provided only one argument among many for the policies.

Finally, key features of congressional laws limited the role of the states in pressing for more stringent vehicle policies, and hence limited their impact on the development of federal policies. The 1975 law that authorized the CAFE program preempted states from adopting their own, stricter fuel economy standards. This provided carmakers with a basis for challenging California's zero-emission vehicle program and its Pavley law in federal court and the Bush and Trump administrations with a reason to deny or withdraw California's requested waiver for its GHG standards program.<sup>81</sup> Similarly, federal air pollution laws beginning with the 1967 Air Quality Act preempted states from adopting air pollution regulations for vehicles stricter than the federal government's, but they gave California permission to do so if the EPA granted the state a waiver. The Bush and Trump administrations used the EPA's discretionary authority to block California from adopting its own program on vehicle GHG emissions. This delayed the effective implementation of more stringent rules by that state and the federal government and hence created uncertainty for carmakers about what rules to consider when planning investments.

## Federal appliance energy efficiency policies and programs

### *The adoption of effective policies*

Approximately 40 percent of total United States energy consumption and CO<sub>2</sub> emissions are directly attributable to residential and commercial buildings, and 70 percent of those emissions come from the energy used by household and industrial appliances, including heating and cooling systems, washing machines, dryers and refrigerators, lighting, and equipment. Because most electric power generation comes from the combustion of fossil fuels, appliances, lighting, and other equipment account for

<sup>78</sup>Federal Register 77 (199): 62640; data from EPA (2021, 33).

<sup>79</sup>Federal Highway Administration data.

<sup>80</sup>Pew Research Center data.

<sup>81</sup>*Green Mountain Chrysler v. Crombie* (2007); Environmental and Energy Law Program (2018).

approximately 28 percent of CO<sub>2</sub> emissions in the United States.<sup>82</sup> Accordingly, improving the energy efficiency of appliances and other equipment used in residential, commercial, and other buildings can have and has had a measurable impact on reducing US GHG emissions. Table 2 in the Appendix provides an overview of federal policies in this area.

Federal efforts to improve the energy efficiency of appliances date from legislation enacted in 1975 and 1978 during the energy crisis, which directed the US Department of Energy (DOE) to issue standards for appliances. However, because of industry opposition and the refusal of the Ronald Reagan administration to issue the standards, the first federal regulations were not adopted until the passage of the National Appliance Energy Conservation Act of 1987. This law established minimum efficiency standards for twelve household appliances, all of which had been previously regulated by one or more states.<sup>83</sup> They have been significantly expanded and updated since then, through both legislation and rulemaking by the DOE. Currently, the DOE's Appliance and Equipment Standards Program covers more than sixty products, representing about 90 percent of home energy use, 60 percent of commercial building energy use, and 30 percent of industrial energy use.<sup>84</sup>

The EPA also administers a voluntary labeling program called Energy Star. Established in 1992, its purpose is to encourage producers to develop and market, and consumers to purchase more energy-efficient products. Beginning with labels for personal computers, monitors, and printers, it was subsequently expanded to include additional appliances as well as for commercial buildings, new homes, and manufacturing facilities. In 2019, consumers purchased 300 million Energy Star-certified products.<sup>85</sup> In addition, the federal government has supported and encouraged more energy-efficient residential and commercial buildings, through voluntary standards, federal payments, and tax subsidies<sup>86</sup>

These programs have had a considerable impact.<sup>87</sup> Federal regulations for appliances, equipment and lighting products are projected to reduce CO<sub>2</sub> emissions by 232 megatons and Energy Star labeled products by 266 megatons in 2030. Energy Star-designated commercial buildings are projected to reduce CO<sub>2</sub> emissions by 141 megatons, while the anticipated reduction of other programs to reduce energy use in existing homes is about 62 megatons. These reductions represent about 11 percent of the United States' 2005 total GHG emissions, meaning that they will contribute about one-fifth of the total reductions required by the Biden administration's target under the Paris Agreement to reduce emissions by 50 percent by 2030.

### Co-benefits

Much of the public and political support for making products more energy efficient is due to their major public and private co-benefits. Their public co-benefits include reducing overall American energy consumption and thus enhancing domestic energy security, which has periodically been an important public policy objective. Increased energy efficiency also reduces air pollution and hence improves public health by reducing the need to operate and to construct new fossil fuel power plants. According to a 2012 study, appliance efficiency standards, by reducing emissions of power sector pollutants such as nitrogen oxides, sulfur dioxide, and mercury, have helped states meet their air quality goals at a reduced cost.<sup>88</sup>

"Appliance standards are probably the most effective government policy for reducing electricity use and are probably one of the most effective policies for reducing energy use," second in impact only to

<sup>82</sup>Klass (2010, 340). Klass produced these estimates from data for 2006 supplied by the DOE's Office of Energy Efficiency and Renewable Energy; similar data for recent years is not available.

<sup>83</sup>The data on appliances regulated by each congressional statute is from Gold et al. (2011, 2).

<sup>84</sup>US Department of State (2021, 85).

<sup>85</sup>Ibid., 85.

<sup>86</sup>Congressional Research Service (2018b).

<sup>87</sup>US Department of State (2021, 195).

<sup>88</sup>Lowenberger et al. (2012, 6).

the CAFE standards, according to Nadel.<sup>89</sup> For example, in 2000, appliance standards reduced American electricity use by 2.5 percent, and by reducing peak electricity demand, they displaced the need for an amount of peak generating capacity equal to 2.8 percent of the United States' installed capacity. The national energy efficiency standards completed through 2016 were expected to save a total of 71 quadrillion British thermal units (quads) of energy through 2020 and nearly 141 quads through 2030—more energy than the entire nation consumes in one year.<sup>90</sup>

The third co-benefit is a private one: energy-efficient products save consumers and businesses money by reducing their energy bills. For example, the national appliance efficiency standards implemented since 1987 saved consumers \$63 billion on their utility bills in 2015 and are projected to save consumers a total of \$2 trillion in energy costs through 2030.<sup>91</sup> In 2014, purchases of Energy Star appliances saved consumers \$34 billion on their annual utility bills.<sup>92</sup> For consumers, the average payback for the additional costs of more energy-efficient appliances is 3.3 years, with the savings from new standards outweighing the incremental up-front costs by a ratio of 4.1 to 1.<sup>93</sup> Moreover, the price increases following the enactment of standards have often proven smaller than originally anticipated, as manufacturers often link improvements in energy efficiency with quality improvements and other new features.<sup>94</sup>

Co-benefits have helped make appliance efficiency standards politically popular, although this is only one factor that may influence elected officials. A national survey released by the Consumer Federation of America in 2018 reported that 71 percent of Americans “support the idea that the government should set and update energy efficiency standards for appliances.”<sup>95</sup> Significantly, 72 percent said that lowering electrical bills and 57 percent that avoiding construction of new power plants to keep electricity rates from rising were important reasons to increase appliance efficiency.

### *The role of business*

The second key factor explaining these policy achievements concerns the political responses of business to them. The direct regulatory impact of appliance efficiency standards and programs has primarily been on the manufacturers of appliances and equipment, along with their suppliers. The Association of Home Appliance Manufacturers represents many of these firms in Washington. In 2022, its membership comprised 175 companies employing 47,000 people, with total revenues of \$23.1 billion.

When Congress first authorized federal standards during the 1970s, the appliance industry strongly opposed them; it preferred to let market forces shape the supply of and demand for more energy-efficient products. But in the late 1980s, the industry's political position shifted, for two reasons.<sup>96</sup> Six states, led by California, had adopted efficiency standards for one or more appliances, and several more states were about to do so. This disrupted the national market for appliances and made the industry willing to support federal standards in exchange for limiting the regulatory role of the states. Also, the Natural Resources Defense Council had successfully sued the DOE over its refusal to issue the standards mandated by Congress in the 1978 legislation, and the appliance companies preferred that these standards be negotiated through the legislative process, rather than be established administratively.

<sup>89</sup>Nadel (2002, 170).

<sup>90</sup>US Department of Energy (2017).

<sup>91</sup>US Department of Energy (2017).

<sup>92</sup>Congressional Research Service (2018a).

<sup>93</sup>Lowenberger et al. (2012, 20). See also Gold and Nowak (2019).

<sup>94</sup>Brucal and Roberts (2019, 104).

<sup>95</sup>Consumer Federation of America (2018). Although general questions about policies reducing GHG emissions may produce biased estimates of public support because they lack information about consumer costs, appliance standards do not involve such costs and hence can be expected to have high levels of public support even if respondents had full information about costs and benefits.

<sup>96</sup>Nadel and Goldstein (1996, p. 2–165.5).

Remarkably, after this conflictual start, energy efficiency advocates and manufacturers have largely cooperated on standards since the 1980s.<sup>97</sup> The main reason is that federal standards have not economically harmed and often have helped the regulated firms. A review of several studies concludes that industry profitability will not be hampered by “reasonable energy efficiency standards,”<sup>98</sup> and an analysis of company annual reports and independent reports of financial analysts finds that the standards have often increased sales revenues and profits.<sup>99</sup>

Moreover, appliance manufacturers and distributors have politically supported and extensively participated in the Energy Star program. The industry has welcomed the voluntary nature of its standards, which involve awarding an official, widely recognized label to the most efficient products in each category, serving to boost their sales. In addition, the federal government has periodically provided tax incentives for consumers to purchase more energy-efficient appliances.<sup>100</sup> The appliance firms have welcomed these “carrots,” since they increase the demand for such appliances.<sup>101</sup>

Nor have utilities opposed appliance efficiency policies, despite their effects on reducing electricity demand. In fact, the utility industry consistently has given its political backing to these policies, largely because changes in state and subsequently federal energy policies by the 1990s incentivized utilities to meet the demand for power by promoting energy efficiency and conservation, rather than by constructing new power plants.<sup>102</sup> Moreover, in marked contrast with, for example, the Clean Power Plan, the impact of reduced energy demand has been neutral with respect to both power sources and geography, and hence has not created a concentrated source of opposition, such as from those utilities more dependent on coal.

The politics of the legislative process have also defused potential opposition from the fossil fuel sector. The 1992, 2005, and 2007 congressional laws that expanded the number of regulated appliances were broad political packages that involved compromises which gave something to multiple constituencies, including the fossil fuel industries. For example, the Energy Policy Act of 1992 provided important benefits to the coal industry, while the Energy Policy Act of 2005 reduced regulation of the fluids used in hydraulic fracking and provided financial incentives for oil drilling in the Gulf of Mexico. In fact, some conservative legislators agreed to support the appliance efficiency provisions in these statutes to make these laws appear more balanced.<sup>103</sup>

What about the rest of the business community? Despite its strong opposition to international climate agreements, a federal cap-and-trade program, and the Clean Power Plan, the politically powerful coalition of fossil fuel producers and their business customers has not sought to exercise a veto on national efficiency standards for appliances. The explanation is a simple one: these standards do not burden, disadvantage, or disrupt fossil-fuel-dependent firms. Indeed, these regulations benefit all business consumers of energy by reducing their electricity bills.

### *Partisan politics*

What has been the role of elections and partisan policies, our third explanatory factor? The politics of this policy area have alternated between partisan and bipartisan periods. A Democratic congressional majority, with the support of President Jimmy Carter, enacted the legislation authorizing the DOE to develop mandatory appliance efficiency standards in 1978. However, the standards’ implementation was delayed for more than a decade due to the opposition of President Reagan. The subsequent willingness of the appliance industry to support federal regulation led to strong, bipartisan congressional backing for the 1987 legislation, which was then signed by Reagan. Bipartisan support for appliance energy efficiency regulation continued during the George H. W. Bush administration, when

<sup>97</sup>Ungar et al. (2015, 19).

<sup>98</sup>Nadel (2002, 175).

<sup>99</sup>Ibid., 176.

<sup>100</sup>Congressional Research Service (2018b).

<sup>101</sup>Wall Street Journal, 4 August 2005, D1.

<sup>102</sup>See, for example, Costello et al. (1993).

<sup>103</sup>Nadel (2002, 165).

Congress enacted the Energy Policy Act of 1992, which established energy efficiency standards for nine additional appliances. However, partisan differences reemerged during the Clinton administration, when the Republican controlled Congress elected in 1994 sought to prevent the DOE from strengthening existing standards or issuing any new ones.

But bipartisan support for appliance energy efficiency standards returned during the George W. Bush administration, when Congress enacted both the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007, which regulated a total of twenty additional appliances. However, partisan differences reemerged during the Obama administration. The Republican House majority elected in 2010 was strongly opposed to appliance efficiency regulation and refused to approve any new standards, while the Obama administration regarded energy efficiency as one of the clearest and most cost-effective ways to save families money and reduce GHG emissions.<sup>104</sup> During the Obama administration, the DOE issued more new or updated standards than during the three previous administrations combined. These new standards were projected to reduce 2.2 billion metric tons of carbon emissions by 2030—the equivalent of taking 578 typically sized coal power plants offline for a year.<sup>105</sup>

By contrast, the Trump administration was strongly opposed to appliance standards, on the grounds that “regulating energy efficiency limits consumer choices.”<sup>106</sup> One of its most important policy initiatives was to revise federal rules to limit the upgrading of previously enacted regulatory standards. This policy shift reflected growing industry dissatisfaction with the requirement, incorporated into the 1987 legislation and subsequently expanded by Congress in 2007, that appliance standards be regularly reviewed and possibly strengthened every six years.<sup>107</sup> The Trump administration also sought to end federal funding of the Energy Star program. However, this latter policy retrenchment met with strong industry opposition, with more than one thousand companies and trade associations expressing strong support for Energy Star. Congress agreed to reauthorize the program, while cutting its funding by 25 percent.<sup>108</sup>

Appliance efficiency standards continue to be a partisan issue during the Biden administration, which has reversed several of the Trump administration’s deregulatory initiatives.<sup>109</sup> Its most important policy initiative with respect to appliance energy efficiency was the IRA, which, among its many other provisions, provided new rebates for the purchase and installation of energy-efficient appliances, including heat pumps.<sup>110</sup> This legislation did not include any new or strengthened appliance standards, although the DOE strengthened one important standard—for energy-efficient light bulbs—reversing its rollback by the Trump administration.<sup>111</sup>

### *Policy limitations*

The impact of federal appliance standards on reducing CO<sub>2</sub> emissions and energy use, and hence on saving consumers money, has been limited in several ways. Importantly, business opposition, along with the 1980 election of a conservative Republican president, delayed the enactment of the first federal regulatory standards for more than a decade. This meant that the federal role in this environmental policy area trailed far behind the other major expansions of federal environmental regulation, including CAFE standards. Congressional Republican opposition to appliance standards was critical in limiting their growth during the Bill Clinton administration, and there was little expansion during the first

<sup>104</sup>Klass, McAllister, and Radin (2012, 5).

<sup>105</sup>deLaski et al. (2016, 2).

<sup>106</sup>Gunther (2017).

<sup>107</sup>McGuire (2016).

<sup>108</sup>Ibid.

<sup>109</sup>Walton (2021).

<sup>110</sup>*New York Times*, 30 September 2022.

<sup>111</sup>*New York Times*, 27 April 2022.



term of the George W. Bush administration. The number of appliances covered began to grow again only in 2005, but it was not until the end of the Obama administration in 2016 that the number of nationally regulated appliances had substantially increased.<sup>112</sup>

Other factors also played a role in the slowness of standard adoption. One is the standard-setting process itself. In contrast with many pollution control statutes that regulate a broad group of products, such as automobiles or specific pollutants such as sulfur dioxide, the efficiency standards for each appliance must be determined separately, with an analysis based on technological capacity, impact on future energy use, and cost effectiveness. This process has often been tedious and time consuming, especially for many of the standards issued by the DOE itself, which require that a new or amended standard be “economically justified” based on seven statutory factors.<sup>113</sup> It is not unusual for the standard-setting process, including analyses and comment periods, to take at least three years, and in some cases up to a decade.<sup>114</sup>

A second limitation on the effectiveness of appliance efficiency standards has been the persistent delay in reviewing and upgrading them, which, according to Congress, must take place at least every six years. Once again, business opposition and partisan preferences have constrained the pace of standards upgrading, especially during the Clinton and Trump administrations. Appliance firms have been more opposed to the strengthening of existing standards than to the adoption of rules for new products, partly because the latter benefited them by preempting existing state standards. Considering the administrative challenges of implementing the ambitious statutory rulemaking schedules for reviewing product standards that Congress has mandated, it is not surprising that the updating of standards has continuously lagged—especially since DOE has had limited resources and some proposed upgrades have been resisted by industry.<sup>115</sup>

These lags have been highly consequential. Because many consumer and industrial appliances, especially those that are highly energy intensive, are purchased infrequently, it can take many years for updated standards to have an impact. Consequently, the lack of timely upgrades to standards means that many products whose energy efficiency requirements are too lax or out of date, and thus whose energy consumption could be further reduced—often substantially—continue to be sold for several years. Continuing to market appliances that use less energy-efficient technologies locks in higher energy consumption and thus additional carbon dioxide emissions during the useful lifetimes of the inefficient products. On the other hand, annual savings rates grow over time as more standards come into force and as those already in place affect a greater portion of product use.<sup>116</sup>

Finally, while this case study has focused on federal appliance efficiency standards, it is also important to recognize that federal efforts to improve the energy efficiency of appliances include the voluntary labeling program, Energy Star, which has been less controversial and easier to administer. In fact, it covers 40,000 products, many more than the DOE’s Appliance and Equipment Standards Program. However, in 2009, an internal audit by the DOE found that in many cases, appliances that had an Energy Star label did not meet the required specification for energy efficiency.<sup>117</sup> Not only were many Energy Star ratings not “accurate or verifiable,” but for some product categories, the government had certified nearly all existing products, making the label meaningless. The Obama administration, whose federal stimulus bill, had authorized \$300 million in rebates for consumers who purchase Energy Star products, strengthened the government’s oversight of labeled products by requiring all products to be third-party certified and tested in an EPA-recognized laboratory.

<sup>112</sup>US Department of Energy (2017).

<sup>113</sup>Congressional Research Service (2022a).

<sup>114</sup>Klass (2010, 350).

<sup>115</sup>Ibid, 349–50.

<sup>116</sup>deLaski et al. (2016, 8).

<sup>117</sup>*New York Times*, 18 October 2009.

## Conclusion

These case studies have several features in common, underlining the three factors that have made it possible for the federal government to enact policies that substantially reduce GHG emissions: co-benefits, business acceptance, and partisan politics.

### *Climate change and co-benefits*

Significantly, both policies emerged on the policy agenda before global climate change became a policy focus. Neither the 1975 Energy and Policy Conservation Act that created the corporate fuel economy standards (CAFE) nor the 1987 National Appliance Energy Conservation Act that created the first national appliance energy efficiency regulations was intended to address the problem of climate change. These laws were adopted for other reasons, which, from the viewpoint of climate policy advocates, now appear as co-benefits. This enabled these two policy areas to develop a record of political accomplishments and political constituencies before the climate change issue became politically salient—and contentious.

Reducing energy use and thus fossil fuel consumption in order to promote energy independence underlay both the initial creation of CAFE standards in 1975 and their expansion by Congress in 2007, with salient concerns about oil imports playing a large role in congressional deliberations. Energy security concerns also informed the 1975 and 1978 statutes that initially authorized the DOE to adopt national appliance efficiency standards, although the standards were not actually adopted until 1987. Moreover, as policymakers consistently emphasized, these policies also benefited consumers by reducing the costs of operating their motor vehicles and appliances. Reducing energy use for both transportation and appliances also improved air quality and thus public health.

Climate change rose on the national political agenda for a variety of reasons after 2005,<sup>118</sup> and reducing GHG emissions became part of—but only part of—the justifications for federal policies on vehicles and appliances. In the case of motor vehicles, the initial policies to promote electric vehicles, along with the passage of the EISA in 2007, prominently referred to GHG emissions, though they also emphasized the co-benefits of economic development and energy security. Spurred by the 2007 *Massachusetts v. EPA* decision, federal vehicle standards began to regulate both GHG emissions and fuel economy beginning in 2010. However, even during the Obama and Biden administrations, officials' public statements about all five rounds of standards that they adopted for light-duty vehicles and trucks emphasized cost savings and oil import reductions much more than the benefits of mitigating climate change. Similarly, during the Obama administration, when improving the energy efficiency of appliances first became explicitly linked to reducing GHG emissions, these policies were also promoted as a cost-effective way to enable families to save money.

### *The role of business*

In addition to the prominent role played by co-benefits, another key to the survival and development of these policies concerns the political role of business. Over time, the political positions of the two directly affected industries traveled an arc from opposition to acceptance, and later to a more mixed position. During the early decades of these policies, both the automobile and appliance industries clearly preferred to allow market forces to shape the design of their products, and the appliance industry effectively fought federal regulation for more than a decade. Automotive manufacturers also resisted fuel economy rules, though more effectively in the 1980s and 1990s than earlier. In 1975, they were forced to accept a government-mandated increase in fuel economy because of strong public and political support for reducing oil imports and reducing fuel costs. The situation was similar in the late 2000s, when a combination of factors left the industry little choice but to accept the Obama administration's demand that it produce more fuel-efficient vehicles. At that time, the industry contended with rising oil and gasoline prices, the dependence of some domestic carmakers on a federal

<sup>118</sup>Karapin (2016, 193–95, 212–14).

bailout during the 2009 recession, and the prospect of a California-led program requiring reduced GHG emissions in vehicles.

But over time, the automobile and appliance sectors both became more accepting of federal regulation. An important factor underlying this policy shift was the role of the states in American federalism. In both cases, industry faced state governments with the legal and administrative capacity to enact their own standards that could fragment national product markets, and industry came to prefer a uniform federal program that preempted diverse state regulations. Energy efficiency appliance regulations and automotive emission standards targeted at GHG emissions both began at the state level, in California—the former in 1976 and the latter in 2002.<sup>119</sup> In 1987, the appliance industry finally became willing to accept federal standards in order to preempt state appliance regulations, whose proliferation it had found increasingly burdensome. Similarly, for the automobile industry, an important benefit of the Obama administration's federal vehicle standards in 2010 was that it created one uniform national program of GHG standards at a time when California and fourteen other states were about to issue their own standards affecting about 40 percent of the national market.

These industries also came to the bargaining table because and when they faced an adverse political environment. The rise in gasoline prices in the mid-2000s put the automobile industry on the defensive, and the 2009 recession gave the federal government leverage over domestic carmakers that required government financial bailouts. The election of Democratic presidents and congressional majorities in 2008 and 2020, coupled with the 2007 US Supreme Court ruling giving the EPA authority to set vehicle GHG standards, convinced the carmakers they needed to negotiate with federal policymakers. Even during the Trump administration, California's creation of a separate program of GHG standards led half of the industry to sign onto that approach rather than back Trump's rollback. For the appliance industry, the key moment came in the 1980s, when the loss of a federal court case prompted it to support a federal law that would preempt state standards rather than continue to oppose federal standards.

The design of these regulations also contributed to the willingness of these two industries to agree to them. Fuel efficiency standards were intended to strengthen the competitiveness of American automobile manufacturers, whose market share had been declining due to competition from the more efficient vehicles being marketed by foreign firms. Moreover, at every stage, policymakers made concessions that provided carmakers with important flexibility. The programs allowed them to shift their product mix to larger, more profitable vehicles, including SUVs and other light trucks, as well as the ability to average, bank, and trade credits for meeting the standards. These concessions, which reduced the burdens of the standards on the automobile manufacturers, also undermined the effectiveness of federal regulations.

In the case of federal efforts to promote the sale of electric cars and light trucks, the business benefits were straightforward. Through funds for research and development, manufacturing loans and grants, and tax credits, the federal government has helped promote the production and sales of these vehicles, benefiting the firms that produced them and, over time, the entire automotive industry. The importance of these early federal effects at promoting domestic capacity for producing electric vehicles became quite apparent in the late 2010s, as the entire industry began to make massive investments in this technology.

Like the automotive standards, most federal appliance standards have been negotiated, in this case between energy efficiency advocates and appliance and equipment firms, and they have not adversely affected sales or profits. Moreover, the voluntary Energy Star labeling program has been strongly supported by both the producers and sellers of appliances. Appliance manufacturers have also benefited from federal tax credits for the purchases of more energy-efficient appliances.

However, these industries' positions on the regulatory policies that affected them became more mixed over time, especially since about 2016, which underscores the importance of a strategic motivation for their support at other times. Many appliance manufacturers came to find the statutory provisions requiring the DOE's periodic review of standards for already regulated products to be too

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<sup>119</sup>Vogel (2018).

burdensome. Hence, the industry welcomed it when Republicans cut off federal funds to prevent the agency from reviewing the standards during the Clinton administration, as well as when the Trump administration issued new rules that limited the reviews. For their part, some automotive firms supported the Trump administration's weakening of the vehicle standards that had been strengthened by the Obama administration, and they joined the Trump administration in litigation aimed at blocking California from adopting its own, stricter program. But, on balance, government energy efficiency requirements do not appear to have burdened or disadvantaged either the vehicle or the appliance industry. Rather, federal regulations have mainly required technological innovation that was generally consistent with, or in some cases, even enhanced, their long-term profitability.

What of their broader impact on business? Each set of regulations directly affected or regulated only one industry, namely the manufacturers of motor vehicles and of appliances, equipment, and lighting. While those industries are certainly economically important, this means that the scope of these policies' impacts on business was limited: they did *not* regulate most businesses and economic sectors in the United States. Indeed, since these policies lowered their electricity and transportation costs, they benefited all companies.

Significantly, the nation's fossil fuel industries did not oppose energy efficiency standards for appliances, even though the standards adversely affected fossil fuel firms since electric utilities are among their major customers. However, they did not target those firms directly and their impact on reducing energy consumption and thus the demand for fossil fuels was both gradual and incremental. By contrast, both vehicle fuel economy standards and the promotion of electric vehicles directly reduced the demand for oil. This was especially true for the latter policies, which oil companies understandingly strongly opposed.<sup>120</sup> But the energy impact of fuel-efficient motor vehicle policies was also limited: importantly, they did not restrict the demand for two other important fossil fuels—natural gas and coal.

### *Patterns of partisan politics*

Our third major factor is partisan politics. In both policy areas, there was a pattern of alternation between periods of Democratic Party predominance and partisan deadlock or retrenchment. In the former, Congress often passed bipartisan legislation, in the form of comprehensive laws that permitted deal making to occur, and Democratic administrations adopted regulations through executive actions or administrative rulemaking.

The 1978 National Energy Conservation Policy Act was authorized by a Democratic majority in Congress and signed into law by President Carter. But its implementation was delayed for a decade due to the opposition of President Reagan. Each of the four federal statutes that issued appliance standards (1987, 1992, 2005, and 2007) was enacted with bipartisan congressional support and signed into law by Republican presidents. Democrats controlled both congressional chambers in three of those cases (not in 2005). Three of the laws (not in 1987) were comprehensive energy laws that also provided considerable benefits to fossil fuel producers, which likely played an important role in the willingness of Republicans to support their appliance efficiency provisions.

There were sharp partisan divisions during the Clinton administration, when Republican majorities in Congress refused funding for the DOE to strengthen appliance standards. This occurred again during the Obama administration, when Republican congressional majorities prevented the DOE from enforcing standards that would effectively phase out incandescent light bulbs, a regulation that had become politically unpopular. Partisan differences have also been characteristic of the three most recent presidencies, with Obama a strong and effective supporter of strengthening appliance standards, Trump equally opposed to doing so, and Biden reversing some of the deregulatory policies of his predecessor.

There has been some bipartisan support for fuel economy standards. Both the 1975 and 2007 statutes that created and then strengthened fuel economy standards were supported by bipartisan coalitions in Congress and signed into law by Republican presidents. There has also been Republican

<sup>120</sup> *Washington Post*, 25 June 2019.

congressional support for policies to promote electric vehicles. But overall, there have been marked partisan divisions, with Democrats more supportive and Republicans more opposed to stronger federal fuel economy standards, with the latter reflecting the position of domestic car firms. The George W. Bush administration denied California's request for an EPA waiver to allow that state to issue GHG regulations for motor vehicles, which delayed their implementation until 2010. It also did not implement the light-duty vehicle standards required by the 2007 legislation—even though the president had advocated for the law and signed it. The Trump administration significantly reduced previously mandated increases in the vehicle standards, going much further than the auto firms preferred. By contrast, the Obama administration was a strong supporter of tighter vehicle standards, and they were further strengthened under President Biden.

### *The Inflation Reduction Act*

In important respects, our analysis of these two cases helps explain the passage of the Inflation Reduction Act in 2022. Most obviously, the legislation reflected the steady growth of partisan divisions: it was approved without any Republican votes in Congress, the first time this had occurred for any energy legislation, and it was signed into law by a Democratic president.

But the bill's main provisions that reduce GHG emissions also included major co-benefits that clearly were politically crucial for its passage, since congressional leaders and President Biden promoted the legislation on that basis. The statute includes an estimated \$379 billion in tax credits and spending, including major amounts for tax credit extensions for wind and solar power installations for ten years; tax credits for electric vehicle purchasers and charging stations (also for ten years), energy-efficient homes, and commercial buildings; and manufacturing tax credits for firms in the clean energy sector.<sup>121</sup> The vehicle provisions are coupled to requirements for domestic manufacturing content and labor provisions (prevailing wages, apprenticeships), and the vehicle tax credits are now encouraging major investments in electric vehicle manufacturing in the United States, which had been lagging behind Europe and China.<sup>122</sup> Renewable energy is expected to reduce air pollution and increase energy security, the domestic manufacturing and labor requirements are expected to create well-paid jobs in the United States, and the electric vehicle credits are expected to enhance the competitiveness of the country's automobile industry. Moreover, the electric vehicle credits and the buildings provisions are expected to save consumers money. Significantly, the language used by congressional Democrats in support of the legislation and by President Biden in speeches and press releases has emphasized these co-benefits, while also prominently highlighting its impact on climate change.<sup>123</sup>

Finally, like the 1992 and 2005 Energy Policy Acts, which expanded the number of regulated appliances, and the 2007 Energy Independence and Security Act, which both strengthened fuel economy standards and increased the scope of appliance standards, the IRA was a comprehensive piece of legislation. Like those other energy bills, it also included provisions that benefited fossil fuel firms, including major increases in tax credits for carbon dioxide sequestration and a requirement that the Department of Interior conduct offshore oil and gas lease sales in the Gulf of Mexico.<sup>124</sup> Its passage was also aided by the fact that it contains no regulatory requirements: it seeks to accomplish its objectives primarily by federal spending and tax credits. However, many of the same factors that enabled its passage also facilitated the adoption of the regulatory policies described in our case studies.

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Our analysis of federal vehicle and appliance efficiency policies and of the passage of the IRA allows us to identify conditions that appear to be necessary, though not sufficient, for the adoption of sectoral federal policies that reduce GHG emissions—since they were found in all or almost all of the twenty policymaking episodes that we investigated. First, these policies cannot exclusively or even primarily

<sup>121</sup>Congressional Research Service (2022b).

<sup>122</sup>*New York Times*, 25 August 2022; Bui, Slowik, and Lutsey (2021, 20).

<sup>123</sup>White House (2022).

<sup>124</sup>*Ibid.*

focus on climate change. Rather, they must also deliver and be justified by other, politically popular public and private co-benefits. Second, industry acceptance of government intervention is critical and the burdens that policies impose on business must be limited. Third, the policies must either be pushed legislatively by Democrats and receive bipartisan support, be implemented unilaterally by Democratic administrations, or be put forward while Democrats have unified control of government. We expect that these factors will be present in other cases in which sectoral GHG-reducing policies are adopted by the federal government in these and other policy areas.

**Acknowledgments.** We thank the anonymous reviewers for this journal for their detailed comments on earlier versions of this article, as well as David Victor for his suggestions.

## References

- Aulisi, Andrew, John Larsen, Jonathan Pershing, and Paul Posner. 2007. "Climate Policy in the State Laboratory." World Resources Institute, 1 September. Accessed on 18 July 2023, <https://www.wri.org/research/climate-policy-state-laboratory>.
- Bang, Guri. 2010. "Energy Security and Climate Change Concerns." *Energy Policy* 38 (4): 1645–53.
- Bartosiewicz, Petra, and Marissa Miley. 2013. "The Too Polite Revolution." Paper prepared for the Symposium on "The Politics of America's Fight Against Global Warming," Harvard University, 14 February.
- Biber, Eric. 2013. "Cultivating a Green Political Landscape." *Vanderbilt Law Review* 66 (2): 399–481.
- Black, Brian, and Richard Flarend. 2010. *Alternative Energy*. Santa Barbara, CA: Greenwood Press.
- Brewer, Paul, and Andrew Pease. 2008. "Federal Climate Politics in the United States." In *Turning Down the Heat*, edited by Hugh Compston and Ian Bailey, 85–103. New York: Palgrave Macmillan.
- Brewer, Thomas. 2022. *Transforming U.S. Climate Change Politics*. Cham, Switzerland: Springer.
- Brucal, Arian, and Michael Roberts. 2019. "Do Energy Efficiency Standards Hurt Consumers?" *Journal of Environmental Economics and Management* 96: 88–107.
- Bryner, Gary, and Robert Duffy. 2012. *Integrating Climate, Energy, and Air Pollution Policies*. Cambridge, MA: MIT Press.
- Bui, Anh, Peter Slowik, and Nic Lutsey. 2021. "Power Play." International Council on Clean Transportation, 29 June. Accessed on 18 July 2023, <https://theicct.org/publication/power-play-evaluating-the-u-s-position-in-the-global-electric-vehicle-transition>.
- California Air Resources Board. 2022. "States That Have Adopted California's Vehicle Standards under Section 177 of the Federal Clean Air Act." 13 May. Accessed on 18 July 2023, <https://ww2.arb.ca.gov/resources/documents/states-have-adopted-californias-vehicle-standards-under-section-177-federal>.
- Cantwell, Maria. 2009. "Cantwell, Hatch Push for Incentives for Plug-In Vehicles and Smart Grid Technologies in Stimulus." Press release, 16 January. Accessed on 18 July 2023, <https://www.cantwell.senate.gov/news/press-releases/cantwell-hatch-push-for-incentives-for-plug-in-vehicles-and-smart-grid-technologies-in-stimulus>.
- Carlson, Ann. 2009. "Iterative Federalism and Climate Change." *Northwestern University Law Review* 103: 1097–1161.
- Ceres. 2021. "New Analysis Shows That Stronger Federal Fuel Economy Standards Have Major Benefits for the U.S. Auto Industry." 27 September. Accessed on 18 July 2023, <https://www.ceres.org/news-center/press-releases/new-analysis-shows-stronger-federal-fuel-economy-standards-have-major>.
- Congressional Research Service. 2018a. "Energy Star Program." Updated 10 May. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/IF/IF10753/3>.
- Congressional Research Service. 2018b. "Residential Energy Tax Credits." Report R42089. Updated 9 April. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/R/R42089/22>.
- Congressional Research Service. 2019. "Vehicle Electrification." 3 June. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/R/R45747>.
- Congressional Research Service. 2022a. "The Department of Energy's Appliance and Equipment Standards Program." 18 February. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/R/R47038>.
- Congressional Research Service. 2022b. "Inflation Reduction Act of 2022 (IRA) Provisions Related to Climate Change." 3 October. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/R/R47262>.
- Consumer Federation of America. 2018. "Consumers Support Appliance Efficiency but Trump Administration Delays and Seeks to Weaken Standards." 5 October. Accessed on 18 July 2023, [https://consumerfed.org/press\\_release/consumers-support-appliance-efficiency-but-trump-administration-delays-and-seeks-to-weaken-standards](https://consumerfed.org/press_release/consumers-support-appliance-efficiency-but-trump-administration-delays-and-seeks-to-weaken-standards).
- Cory, Jared, Michael Lerner, and Lain Osgood. 2020. "Supply Chain Linkages and the Extended Carbon Coalition." *American Journal of Political Science* 65 (1): 69–87.
- Costello, Kenneth, Robert E. Burns, Daniel J. Duann, Robert J. Granieri, Mohammad Harunuzzaman, and Kenneth J. Rose. 1993. "A Synopsis of the Energy Policy Act of 1992." National Regulatory Research Institute. Accessed on 18 July 2023, <https://ipu.msu.edu/wp-content/uploads/2016/12/Costello-Energy-Policy-Act-93-7-June-93-1.pdf>.
- deLaski, Andrew, Joanna Mauer, Jennifer Amann, Michael McGaraghan, Bijit Kundu, Sameer Kwatra, and James E. McMahon. 2016. "Next Generation Standards." Report A1604, American Council for an Energy-Efficient Economy. Accessed on 18 July 2023, [https://legacy-assets.eenews.net/open\\_files/assets/2016/08/04/document\\_pm\\_01.pdf](https://legacy-assets.eenews.net/open_files/assets/2016/08/04/document_pm_01.pdf).
- Delmas, Magali, Jinghui Lim, and Nicholas Nairn-Birch. 2016. "Corporate Environmental Performance and Lobbying." *Academy of Management Discoveries* 2 (2): 175–97.

- Dion, Douglas. 1998. "Evidence and Inference in the Comparative Case Study." *Comparative Politics* 30: 127–45.
- Dunn, James. 2006. "Automobile Fuel Efficiency Policy." In *Punctuated Equilibrium and the Dynamics of U.S. Environmental Policy*, edited by Robert Repetto, 197–231. New Haven, CT: Yale University Press.
- Eikeland, Per Ove. 1993. "US Energy Policy in the Greenhouse." EED Report 1993/1, Fridtjof Nansen Institute, Lysaker, Norway.
- Environmental and Energy Law Program. 2018. "CAFE Standards and the California Preemption Plan." 24 August. Accessed on 18 July 2023, <https://eelp.law.harvard.edu/2018/08/cale-standards-and-the-california-preemption-plan>.
- EPA (Environmental Protection Agency). 2021. "The 2021 EPA Automotive Trends Report." November. Accessed on 18 July 2023, <https://nepis.epa.gov/Exec/zyPURL.cgi?Dockey=P1013L5Z.txt>.
- Fletcher, Amy Lynn. 2009. "Clearing the Air: The Contribution of Frame Analysis to Understanding Climate Policy in the United States." *Environmental Politics* 18 (5): 800–816.
- Gallup. 2023. "In Depth: Topics A to Z: Environment." Accessed on 20 June 2023, at <https://news.gallup.com/poll/1615/environment.aspx>.
- George, Alexander, and Andrew Bennett. 2005. *Case Studies and Theory Development in the Social Sciences*. Cambridge, MA: MIT Press.
- Gold, Rachel, and Seth Nowak. 2019. "Energy Efficiency Over Time: Measuring and Valuing Lifetime Energy Savings in Policy and Planning." Report U1902, American Council for an Energy-Efficient Economy. Accessed on 18 July 2023, <https://www.aceee.org/research-report/u1902>.
- Gold, Rachel, Steven Nadel, John A. "Skip" Laitner, and Andrew deLaski. 2011. "Appliance and Equipment Efficiency Standards." Report ASAP-8/ACEEE-A111, American Council for an Energy-Efficient Economy. Accessed on 18 July 2023, <https://www.aceee.org/sites/default/files/publications/researchreports/a111.pdf>.
- Graetz, Michael J. 2011. *End of Energy: The Unmaking of America's Environment, Security, and Independence*. Cambridge, MA: MIT Press.
- Greene, David, Judith Greenwald, and Rebecca Ciez. 2020. "U.S. Fuel Economy and Greenhouse Gas Standards." *Energy Policy* 146: 1–15.
- Greene, David, Charles Sims, and Matteo Muratori. 2020. "Two Trillion Gallons." *Energy Policy* 142: 1–13.
- Grossman, Peter. 2013. *U.S. Energy Policy and the Pursuit of Failure*. New York: Cambridge University Press.
- Grumbach, Jacob. 2015. "Pollution Industries as Climate Protagonists." *Business and Politics* 17 (4): 633–59.
- Gunther, Marx. 2017. "Killing Energy Star." *Yale Environment* 360, 4 May. Accessed on 18 July 2023, <https://e360.yale.edu/features/killing-energy-star-a-popular-program-lands-on-the-trump-hit-list>.
- Harrison, Kathryn. 2010. "The United States as Outlier." In *Global Commons, Domestic Decisions*, edited by Harrison and Lisa Sundstrom, 67–104. Cambridge, MA: MIT Press.
- Jett, Janel, and Leigh Raymond. 2021. "Issue Framing and U.S. State Energy and Climate Policy Choice." *Review of Policy Research* 38 (3): 278–99.
- Karapin, Roger. 2016. *Political Opportunities for Climate Policy: California, New York, and the Federal Government*. New York: Cambridge University Press.
- Kelsey, Nina, and Alice Madden. 2014. "The United States." In *Can Green Sustain Growth?*, edited by John Zysman and Mark Huberty, 125–49. Stanford, CA: Stanford University Press.
- Kennard, Amanda. 2020. "The Enemy of My Enemy." *International Organization* 72 (2): 187–221.
- Klass, Alexandria. 2010. "State Standards for Nationwide Product Revisited." *Harvard Environmental Law Review* 34: 336–68.
- Klass, Alexandria, Lesley McAlister, and Wayland Radin. 2012. "States Can Lead the Way to Improve Alliance Energy Efficiency Standards." Briefing Paper 1210, Center for Progressive Reform. Accessed on 18 July 2023, [http://progressivereform.net/articles/Appliance\\_Efficiency\\_Standards\\_1210.pdf](http://progressivereform.net/articles/Appliance_Efficiency_Standards_1210.pdf).
- Knox-Hayes, Janelle. 2012. "Negotiating Climate Legislation." *Regulation and Governance* 6 (4): 545–67.
- Lane, Bradley W., Natalie Messer-Betts, Devin Hartmann, Sanya Carley, Rachel M. Krause, and John D. Graham. 2013. "Government Promotion of the Electric Car." *European Journal of Risk Regulation* 4 (2): 227–45.
- Lowenberger, Amanda, Joanna Mauer, Andrew deLaski, Marianne DiMascio, Jennifer Amman, and Steven Nadel. 2012. "The Efficiency Boom: Cashing in on the Savings from Appliance Standards." Report ASAP-8/ACEEE-A123, American Council for an Efficient Economy. Accessed on 18 July 2023, <https://www.aceee.org/sites/default/files/publications/researchreports/a123.pdf>.
- Lyon, Thomas. 2016. "Drivers and Impacts of Renewable Portfolio Standards." *Annual Review of Resource Economics* 8: 141–55.
- Mazmanian, Daniel, John Jurewitz, and Hal Nelson. 2008. "California's Climate Change Policy." *Journal of Environment and Development* 17: 401–23.
- McGuire, Joseph. 2016. "Testimony of President and Chief Executive Officer of the Association of Home Appliance Manufacturers." Hearing before the Subcommittee on Energy and Power, U.S. House of Representatives, 10 June. Accessed on 18 July 2023, <https://docs.house.gov/meetings/IF/IF03/20160610/105034/HHRG-114-IF03-Wstate-McGuireJ-20160610.pdf>.
- Meckling, Jonas. 2011. *Carbon Coalitions: Business, Climate Politics, and the Rise of Emissions Trading*. Cambridge, MA: MIT Press.
- Meckling, Jonas. 2015. "Oppose, Support, or Hedge? Distributional Effects, Regulatory Pressure, and Business Strategy in Environmental Politics." *Global Environmental Politics* 15 (2): 19–37.
- Meckling, Jonas. 2019. "A New Path for U.S. Climate Politics." *Annals of the American Academy of Political and Social Sciences* 685: 82–95.
- Meckling, Jonas, and Jonas Nahm. 2018. "When Do States Disrupt Industries?" *Review of International Political Economy* 25 (4): 505–29.
- Mildenberger, Matto. 2012. "The Politics of Strategic Accommodation." Unpublished paper.
- Mildenberger, Matto. 2020. *Carbon Captured: How Business and Labor Control Climate Politics*. Cambridge, MA: MIT Press.

- Nadel, Steven. 2002. "Appliance and Equipment Efficiency Standards." *Annual Review of Energy and Environment* 27: 159–92.
- Nadel, Steven, and David Goldstein. 1996. "Appliance and Equipment Efficiency Standards." In *Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings*, 163–74. Washington, DC: American Council for an Energy-Efficient Economy.
- Nivola, Pietro S. 2009. "The Long and Winding Road." Brookings Institution, 25 February. Accessed on 18 July 2023, <https://www.brookings.edu/articles/the-long-and-winding-road-automotive-fuel-economy-and-american-politics>.
- Northeast States for Coordinated Air Use Management. 2014. "Multi-State ZEV Action Plan." May. Accessed on 18 July 2023, <https://www.nescaum.org/documents/multi-state-zev-action-plan.pdf>.
- Park, Hyung, Xinsheng Liu, and Arnold Vedlitz. 2010. "Framing Climate Policy Debates." Accessed on 19 July 2023, [https://www.researchgate.net/publication/43797133\\_Framing\\_Climate\\_Policy\\_Debates\\_Science\\_Network\\_and\\_US\\_Congress\\_1976-2007/citation/download](https://www.researchgate.net/publication/43797133_Framing_Climate_Policy_Debates_Science_Network_and_US_Congress_1976-2007/citation/download).
- Przeworski, Adam, and Henry Teune. 1970. *The Logic of Comparative Social Inquiry*. New York: Wiley.
- Rabe, Barry. 2004. *Statehouse and Greenhouse: The Emerging Politics of American Climate Change Policy*. Washington, DC: Brookings Institution Press.
- Rabe, Barry. 2006. "Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards." Pew Center on Global Climate Change, 14 June. Accessed on 18 July 2023, <https://www.pewtrusts.org/en/research-and-analysis/reports/2006/06/14/race-to-the-top-the-expanding-role-of-us-state-renewable-portfolio-standards>.
- Rabe, Barry. 2010. "Can Congress Govern the Climate?" In *Greenhouse Governance*, edited by Barry Rabe, 260–85. Washington, DC: Brookings Institution Press.
- Rabe, Barry. 2011. "Contested Federalism and American Climate Policy." *Publius* 41 (3): 494–521.
- Rabe, Barry. 2018. *Can We Price Carbon?* Cambridge, Mass.: MIT Press.
- Rabe, Barry, and Christopher Borick. 2012. "Carbon Taxation and Policy Labeling." *Review of Policy Research* 29: 358–82.
- Raymond, Leigh. 2016. *Reclaiming the Atmospheric Commons: The Regional Greenhouse Gas Initiative and a New Model of Emissions Trading*. Cambridge, MA: MIT Press.
- Selin, Henrik, and Stacy VanDeveer. 2012. "Federalism, Multilevel Governance, and Climate Change Politics across the Atlantic." In *Comparative Environmental Politics*, edited by Paul Steinberg and Stacy VanDeveer, 341–68. Cambridge, MA: MIT Press.
- Skocpol, Theda. 2013. "Naming the Problem." Paper prepared for the Symposium on "The Politics of America's Fight Against Global Warming," Harvard University, 14 February.
- Skodvin, Tora. 2010. "'Pivotal Politics' in US Energy and Climate Legislation." *Energy Policy* 38: 4214–23.
- Smith, Alison. 2013. *The Climate Bonus: Co-benefits of Climate Policy*. New York: Routledge.
- Stokes, Leah. 2020. *Short Circuiting Policy: Interest Groups and the Battle over Climate Policy in the American States*. Oxford: Oxford University Press.
- Stokes, Leah, and Hannah Breetz. 2018. "Politics in the U.S. Energy Transition." *Energy Policy* 113: 76–86.
- Tilly, Charles. 1984. *Big Structures, Large Processes, Huge Comparisons*. New York: Russell Sage.
- Ungar, Lowell, Garrett Brinker, Therese Langer, and Joanna Mauer. 2015. "Bending the Curve." Report E1503, American Council for an Energy-Efficient Economy. Accessed on 18 July 2023, <https://www.aceee.org/sites/default/files/publications/researchreports/e1503.pdf>.
- US Department of Energy. 2017. "Saving Money with Appliance and Equipment Standards in the United States." Accessed on 19 July 2023, <https://www.energy.gov/eere/buildings/articles/appliance-and-equipment-standards-fact-sheet>.
- US Department of State. 2021. "A Review of Sustained Climate Action through 2020." 7th National Communication to the United Nations Framework Convention on Climate Change. Accessed on 19 July 2023, [https://www.whitehouse.gov/wp-content/uploads/2021/10/ClimateNationalCommunication.pdf?utm\\_medium=email&utm\\_source=govdelivery](https://www.whitehouse.gov/wp-content/uploads/2021/10/ClimateNationalCommunication.pdf?utm_medium=email&utm_source=govdelivery)
- Vogel, David. 1997. "Trading Up and Governing Across." *Journal of European Public Policy* 4 (4): 556–71.
- Vogel, David. 2018. *California Greenin': How the Golden State Became an Environmental Leader*. Princeton, NJ: Princeton University Press.
- Vogel, David. 2022. "The Politics of Preemption." *Regulation & Governance* 16 (4): 1160–73.
- Vormedal, Irja. 2011. "From Foe to Friend? Business, the Tipping Point and U.S Climate Politics." *Business and Politics* 13 (3): 1–29.
- Walton, Robert. 2021. "DOE Begins 'Repairing Damage' Done by Trump to Energy Efficiency Program, Say Advocates." *Utility Dive*, 5 April. Accessed on 18 July 2023, <https://www.utilitydive.com/news/doe-begins-repairing-damage-done-by-trump-to-energy-efficiency-program/597776>.
- Wendler, Frank. 2022. *Framing Climate Change in the EU and US after the Paris Agreement*. New York: Palgrave Macmillan.
- White House. 2007. "President Bush Delivers State of the Union Address." 23 January. Accessed on 18 July 2023, <https://georgewbush-whitehouse.archives.gov/stateoftheunion/2007>.
- White House. 2011. "President Obama Announces New Fuel Economy Standards." Press release, 29 July. Accessed on 18 July 2023, <https://obamawhitehouse.archives.gov/blog/2011/07/29/president-obama-announces-new-fuel-economy-standards>.
- White House. 2021. "Executive Order on Strengthening American Leadership in Clean Cars and Trucks." Press release, 5 August. Accessed on 18 July 2023, <https://www.federalregister.gov/documents/2021/08/10/2021-17121/strengthening-american-leadership-in-clean-cars-and-trucks>.
- White House. 2022. "Statement by President Biden on Senate Passage of the Inflation Reduction Act." Press release, 7 August. Accessed on 18 July 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/08/07/statement-by-president-biden-on-senate-passage-of-the-inflation-reduction-act>.
- Yacobucci, Brent, and Robert Bamberger. 2007. "Automobile and Light Truck Fuel Economy." Report R45204, Congressional Research Service. Updated 1 June. Accessed on 18 July 2023, <https://crsreports.congress.gov/product/pdf/R/R45204>.



Yacobucci, Brent, and Robert Parker. 2006. "Climate Change: Federal Laws and Policies Related to Greenhouse Gas Reductions." Congressional Research Service. Updated February 22. Accessed on 18 July 2023, [https://www.everycrsreport.com/files/20060222\\_RL31931\\_8cd898dda8c5212c7f70a91d4e67943f5f85d836.pdf](https://www.everycrsreport.com/files/20060222_RL31931_8cd898dda8c5212c7f70a91d4e67943f5f85d836.pdf).

## Appendix

**Table 1.** Motor vehicle policies and programs.

Date	Policy	Description ( <i>policy type</i> )
1975	CAFE program created by Energy Policy and Conservation Act	Fuel economy standards for cars and light trucks initiated; 53% increase for passenger cars specified for 1978–85; separate standards for light trucks; implemented by DOT ( <i>regulatory</i> )
2005–09	Electric vehicle promotion policies by Congress and DOE	Research and development spending; tax credits for electric vehicles and charging equipment (with changing caps); manufacturing loans and grants ( <i>tax expenditures and spending</i> )
2007	Energy Independence and Security Act	Required 40% increase in fuel economy standards over 2011–20 period; not implemented by Bush administration, then superseded by 2010 standards ( <i>regulatory</i> )
2010	Light-duty GHG and fuel economy standards, round 1	Increased 2007 standards to require 5% per year decrease in fuel consumption for 2011–16 model years; henceforth vehicle standards regulate both GHG emissions and fuel economy, implemented jointly by EPA and DOT ( <i>regulatory</i> )
2011	Medium- and heavy-duty truck standards, round 1	Initiated standards for these vehicles, requiring fuel consumption to decrease 10%–20% over the 2014–18 model years ( <i>regulatory</i> )
2012	Light-duty GHG and fuel economy standards, round 2	Required 5% per year decrease in fuel consumption for cars and 3.5%–5% decrease for light trucks for 2017–25 model years ( <i>regulatory</i> )
2016	Medium and heavy-duty truck standards, round 2	Required 9%–25% decrease in fuel consumption over 2021–27 model years; semi-trailers added to the program in 2018 ( <i>regulatory</i> )
2020	Rollback of light-duty GHG and fuel economy standards (Safe Affordable Fuel Efficient Vehicles Rule)	Reduced required fuel consumption decline from 5% to 1.5% per year for 2020–26 model years; ultimately was implemented only for 2021–22 model years ( <i>deregulatory</i> )
2021	Light-duty GHG and fuel economy standards	Increased required decline in fuel consumption to an average of 8% per year over 2023–26 model years ( <i>regulatory</i> )
2022	Electric vehicle policies in Inflation Reduction Act	Tax credits for electric vehicle purchases (\$7,500 per new vehicle) and electric vehicle charging stations (30%) ( <i>tax expenditures</i> )

**Table 2.** Appliances policies and programs.

Date	Policy	Description ( <i>policy type</i> )
1975	Energy and Policy Conservation Act	DOE to issue voluntary appliance standards, with the option to issue mandatory standards ( <i>voluntary, regulatory</i> )
1978	National Energy Conservation Policy Act	DOE to issue mandatory appliance standards (a few were developed by the Carter administration); energy conservation loans for households and tax credits for businesses ( <i>regulatory, spending, and tax expenditures</i> )
1981–87	Reagan administration executive actions	Mandatory appliance standards in process were canceled and no new standards issued ( <i>deregulatory</i> )
1987	National Appliance Energy Conservation Act	Established energy efficiency standards for 13 household products, including refrigerators, freezers, and furnaces; DOE to review standards every six years; states preempted from issuing standards for federally regulated products ( <i>regulatory</i> )
1992	Energy Policy Act	Established energy efficiency standards for nine types of appliances or equipment used in commercial and industrial facilities, such as commercial furnaces and air-conditioning systems; required states to develop energy codes and standards for commercial and residential buildings; Energy Star program authorized ( <i>regulatory, voluntary</i> )
1993–present	Energy Star Program	EPA and DOE in Clinton administration expanded the program, which recognizes the 25% most energy-efficient products with a label; expanded to buildings and new homes in 1995 and to apartments, manufacturing facilities, and commercial buildings in 2006 ( <i>voluntary</i> )
1995–98	Congressional freeze on new standards	Congress used budgetary authority to prevent DOE from using funds to develop standards and prevented adoption of new standards ( <i>deregulatory</i> )
2005	Energy Policy Act	Issued standards for 14 additional household, commercial, and industrial products, including commercial refrigerators and freezers; required DOE to develop a plan to catch up on overdue revisions of existing standards; created tax credits for energy efficiency improvements in commercial and residential buildings ( <i>regulatory</i> )
2007	Energy Independence and Security Act	Established standards for six household, commercial, and industrial products, including heating and cooling products; phased out incandescent light bulbs; other measures to promote energy conservation in commercial, industrial, and government buildings ( <i>regulatory</i> )
2009–16	Obama administration executive actions	DOE, with increased funding from Congress, caught up with its backlog to review and upgrade existing standards; issued new or updated standards for 45 products, including significant efficiency rules for commercial air conditioners and furnaces; third-party certification of Energy Star labels initiated in 2011 ( <i>regulatory</i> )
2017–20	Trump administration executive actions	DOE rolled back the light bulb efficiency standard, delayed other standards, and ignored legal deadlines for 26 other standards; new rule required 10% energy savings before issuing a new standard; Energy Star program funding reduced ( <i>deregulatory</i> )
2021–present	Biden administration executive actions	DOE revised Trump rules limiting the review of existing standards; slow to work through backlog of standards and revise other Trump rollbacks; incandescent light bulbs phased out ( <i>regulatory</i> )
2022	Inflation Reduction Act	Federal tax credits for home efficiency improvements, tax rebates for purchases of energy-efficient appliances; and financial incentives for purchases of heat pumps ( <i>tax expenditures</i> )

**Cite this article:** Karapın R, Vogel D (2023). Federal Climate Policy Successes: Co-benefits, Business Acceptance, and Partisan Politics. *Business and Politics* 25, 450–475. <https://doi.org/10.1017/bap.2023.21>