Does dynamic federalism yield compatible policies? A study of the designs of federal and state vehicle policies

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ABSTRACT
Governance systems that allow jurisdictions housed at different levels to develop policies pertaining to common issues can foster the development of innovative and contextually appropriate solutions. Sometimes, however, the policies that emerge from different levels of government with overlapping policy jurisdiction can offer mixed, even contradictory, messages to policy targets. In such cases, the potential to achieve goals that are common among different policies may be compromised. This potentiality prompts questions about the extent to which policies developed at different levels of government relating to the same issue are mutually reinforcing, or compatible. In this paper, we investigate compatibility among a set of federal and state vehicle environmental performance standards in terms of policy goals, instruments, and incentives. The study entails a descriptive, qualitative analysis of federal fuel economy and vehicle greenhouse gas standards, and policies contained in California’s Advanced Clear Car Program.

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Introduction
In 2012, upon the direction of the Obama administration, the U.S. National Highway Traffic Safety Administration (NHTSA) and the U.S. Environmental Protection Agency (EPA) released coordinated environmental performance standards for cars and light trucks. NHTSA is the federal agency responsible for developing miles-per-gallon requirements for vehicles under the corporate average fuel economy, or CAFE, program. NHTSA’s 2012 standards specified increasingly stringent miles-per-gallon requirements for vehicles under the corporate average fuel economy, or CAFE, program. NHTSA’s 2012 standards specified increasingly stringent miles-per-gallon requirements for vehicles over the 2017–2025 period. The EPA is the federal agency responsible for establishing limits on greenhouse gas (GHG) emissions for cars and light trucks. EPA’s 2012 standards also apply to the 2017–2025 period. The same year that NHTSA and the EPA released new vehicle requirements, the state of California
adopted an updated suite of standards designed to minimize vehicle emissions and facilitate the dissemination and use of alternative vehicles. Specifically included within this suite of vehicle standards were limits on GHG emissions for cars and light trucks, standards for reducing smog-forming emissions, requirements for clean fuel outlets, and requirements relating to the production of zero emission vehicles. These California standards are developed and implemented by the California Air Resources Board (CARB). With the re-enactment of the suite of vehicle related policies, California was exercising its unique authority under the Clean Air Act to establish vehicle emissions standards separate from those set by the EPA; all other states are preempted from generating their own vehicle standards. However, to pursue its own vehicle emissions standards, California too must periodically seek reauthorization of its preemption waiver from the federal EPA.

The case of vehicle environmental performance standards offers a fascinating illustration of how policymaking authority is sometimes shared across levels of government. It is also a useful case for assessing how policy outputs generated at one level of government are informed by outputs, and related activities, from another level. Both of these phenomena have been extensively explored by scholars of federalism (e.g., Engel, 2006; Osofsky and Wiseman, 2013). Missing from existing scholarship, however, are studies that examine, independently or comparatively, the designs of public policies produced by different levels of government. Such examinations are critical for evaluating whether policies that emerge from different levels of government with overlapping policy jurisdiction are compatible. We broach this topic, and thus respond to an existing research gap, by responding to the following research question: Are federal CAFE, federal vehicle GHG, and California vehicle standards compatible in their designs? We define policy compatibility as the extent to which the policy directives and design elements specified in two or more polices do not compromise the ability of each policy to achieve its stated objectives.

We selected our policy case for two reasons. First, it provides a clear case where federal and state governments are granted authority to develop policies on the same subject and with common policy targets. Second, it is a timely case. The federal and California policies recently underwent a major revision; a revision which is currently undergoing a thorough review by the Trump Administration. A critical issue being discussed within the context of this review is how federal and California’s policies align, and the concomitant implications for automobile manufacturers and attaining policy objectives.

Through our study, we demonstrate the value of the concept of policy compatibility in the vehicle standards case. We also posit the value of applying the concept to any case where multiple jurisdictions are charged with producing outputs with common foci. Ultimately, we argue that policy compatibility is a variable worthy of attention in descriptions, explanations, and or predictions regarding why policies meet or fail to meet intended objectives in federated governing arrangements.

**Literature review: federalism and policy design**

The scope and complexity of problem solving in the public domain often require that jurisdictions situated at different levels of government have overlapping policy
authority. An ensuing challenge in such cases is ensuring that policies enacted at different levels of government are coordinated, or compatible. Although compatibility among federal and state policies can be achieved organically or unintentionally, it is much more likely an intentional product resulting from dynamics among actors, activities, and issues across levels of government. These dynamics are of central concern to scholars of federalism.

Federalism scholars particularly interested in highlighting the interactive relationship between the federal and state government(s) have branded this phenomenon as dynamic federalism. Other terms used to describe the phenomenon, although each with some variation, are iterative federalism (Carlson, 2008) and adaptive federalism (Adelman and Engel, 2008). Through the dynamic federalism lens, policy activities occurring at one level of government are viewed as proactive or reactive responses to those occurring at another level. Further, under this conception of federalism, policymaking authority can be overlapping, such that governments situated at different levels can regulate the same policy targets or function within the same policy domains. Carlson (2008) uses iterative federalism, for example, to describe policy feedback between levels of government that is observed in cases where the federal government grants policy authority to a single state or set of states. While adaptive federalism does not have a precise definition, it generally reflects the observation that policy initiatives originate from more than one level of government (Adelman and Engel, 2008).

Dynamic federalism stimulates questions about the various types of devolution in policymaking that emerges across contexts, the forms and designs of mechanisms that devolve policymaking responsibilities, and whether policies developed in variably structured intergovernmental relationships are compatible enough to achieve common public goals. Responding to some of these questions requires thought on how policy compatibility can be conceptualized and operationalized. One strategy for advancing an understanding of policy compatibility is to explore how it manifests and can be assessed in the actual design of policies.

Policy design, policy compatibility, and linking these concepts to federalism

Policy design refers to the content or substance of policy (Schneider and Ingram, 1988). It is through policy design that policymakers convey, among things, to whom policies apply, policy objectives, and the instruments for compelling behavior toward the attainment of policy objectives (Howlett 2009; Schneider and Ingram 1988). There is often an implicitly or explicitly recognized connection between the attributes of the problem a policy is intended to address (e.g., complexity, scale, scope of the problem), and the type of policy instruments embedded within policy designs (Hoornbeek and Peters, 2017). In a related vein, also typically reflected within a policy’s design is an implicit causal logic linking instruments, targets, goals; for example, an informed expectation that the performance of certain activities by policy targets will result in certain outputs or outcomes.

Scholarship on policy design can be organized into three camps. In one camp are studies that seek to connect attributes of policy (e.g., policy functions) with characteristics of the contexts (e.g., politics) in which they are developed and applied (see, e.g.,
Lowi, 1969). In another camp of policy design scholarship are studies that characterize policies in terms of the type of instrument(s) (e.g., regulatory, incentive-based, symbolic) embodied therein (see, e.g., Salamon, 2002). In the third camp are studies that view policies as comprised of various directives relating to different design elements that cohere to form a policy (see, e.g., Schneider and Ingram, 1988; Ostrom, 2005). According to Schneider and Ingram (1988), for example, policies generally contain the following elements: policy goals, policy targets, policy tools or instruments, policy implementation instructions, and an implicit causal logic connecting all other elements of policy design. Underlying this latter camp’s approach to assessing policy design is the assumption that policies, across contexts, typically have a common architecture. Having a common architecture, or common set of elements that are populated with policy case specific information, enables policy comparisons.

In line with the objectives of this research, policies can be compared along different design elements to determine their compatibility. It is possible that policies may be compatible along some elements but not others (e.g., have common goals but present different types of instruments as means to encourage achieving common goals). Understanding policy compatibility through policy design builds on existing research that seeks to characterize how policies within “mixes” (Gunningham and Sinclair, 1999; Howlett and Rayner, 2013) or “bundles” (Kassekert and Feiock, 2009) relate in their focus or effects. Within this track of scholarship, Howlett and Rayner (2013) highlight the notion of “integration” among the designs of policies comprising mixes and concertedly applied in a common policy domain. They describe “integration” in terms of coherence in policy goals and consistency among the policy instruments such that they support each other in the achievement of the goals.

The concept of policy compatibility also builds from the concept of “policy coherence,” that May et al. posit in this realm of research. According to May et al. (2006, 382), “coherence implies that various policies go together because they share a set of ideas or objectives.” May et al. imply that a coherent set of policies would have commonality in their directives, however, they do not offer suggestions for engaging in a directive-based analysis. Overall, the assumption motivating research on policy mixes or policy bundles is that governments pursue policy objectives with the simultaneous application of multiple policies, naturally prompting investigations into how policies applied in concert align and interact.

The importance of policy design is implied in studies of federalism but has not yet been thoroughly examined. Scheberle (2004, 2) prompts inquiry on policy design, positing that understanding how environmental policy unfolds in the context of inter-governmental relations requires the examination of statutory and regulatory language. Butraw and Shobe (2009) specifically discuss the implications of incommensurability in stringency between federal and state cap-and-trade programs on the behavior of program targets. Scheberle also draws attention to contextual features that shape the policy process in environmental federalism, and thus have implications for policy design.

Compiling these arguments presents a case for more research that explicitly compares the designs of policies developed at different levels of government. We assess compatibility among federal and state policy designs in terms of policy goals,
instruments, and incentives as a basis to suggest potential consequences of policy compatibility for achieving shared policy goals. Consistent with previous scholarship, we define goals as policy objectives. We define instruments as the specific mechanisms or tools that are intended to compel behavior in support of policy objectives; including, but not limited to, taxes, mandates, credit systems, capacity building tools, and hortatory tools. Incentives are the rewards or penalties for policy compliance/non-compliance with policy directives (Ostrom, 2005). The following section describes the methods we used in this study to respond to our research questions.

Methods

We pair an historical explanation of a case of federalism with a qualitative policy analysis. Data collection for our case study entailed a comprehensive review of the NHTSA, EPA, and CARB policies coupled with a review of policy relevant secondary sources [e.g., regulatory impact assessments (RIAs) and policy reports]. The purpose of the policy review was to gain a complete understanding of the main elements of the policies’ designs. Secondary sources provided additional information on the design and historical development of policies. Policy information was qualitatively summarized and organized along policy design elements – goals, instruments, incentives. Once policy content was organized around the aforementioned policy elements (i.e., once policy information was classified as pertaining to goals, instruments, and incentives), members assessed policy compatibility.

Policy goal compatibility was operationalized as goal alignment. The primary question applied in evaluating policy goal compatibility was: do the policies have shared or different goals? As the policies are generally designed to achieve the same overarching objective, in this case setting vehicle environmental performance standards, it is useful to assess the specific policy goals articulated within the context of the policies’ designs in relation to this broad objective. Policy instruments were deemed compatible if they compelled similar types of policy action. The question applied to assess policy instrument compatibility was: do policy instruments compel similar or different types of behavior by policy targets? For example, do instruments support similar compliance pathways? Where sets of policies address a common issue and target, a lack of compatibility in compliance pathways can send mixed signals to the target about the operational activities they should pursue. This is particularly problematic where policy targets do not have the capacity to pursue multiple compliance activities to satisfy varying policy demands. Policy incentive compatibility was operationalized as commensurability in the severity of policy sanctions.

Descriptive overview of policy history and policy design

In this section, we provide an overview of the historical development of the federal and state vehicle environmental performance standards. Table 1 provides a summary of important features of the context surrounding these various regulations.
Federal fuel economy standards

The 1975 Energy Policy Conservation Act authorized NHTSA to establish fuel economy standards for new passenger cars and light trucks sold in the U.S. (Energy Policy Conservation Act, 1975). The Act was established in response to rising oil prices and fuel shortages prompted by the Arab Oil Embargo of 1973–1974. Since their initial establishment, fuel economy standards have been updated several times—sometimes tightened, sometimes relaxed. In 1992, the Clinton-Gore campaign pledged rapid increases in fuel economy standards from 27.5 MPG to 45.0 MPG by 2015, but the Clinton administration encountered substantial opposition in Congress. Republicans made large gains in the 1994 midterm elections, further complicating Clinton’s plans for tighter standards. A bipartisan coalition in Congress used the appropriation rider as a device to essentially “freeze” CAFE standards at 27.5 MPG (cars) from 1996 to 2002.

A rapid increase in retail gasoline prices in the early 2000s, from approximately $1.50 per gallon in 2000 to over $3.00 per gallon in 2008, prompted the George W. Bush administration to revive the CAFE program (Graham, 2010). The administration, aligned with industry, sought to preempt California’s growing interest in regulations to reduce GHG emissions. Congress lifted the CAFE freeze in 2002, and NHTSA responded by raising light-truck CAFE standards from 20.7 MPG in model year 2005 to 22.2 MPG in 2007. For model years 2008 to 2011, NHTSA tightened the light-truck standards based on footprint—the area between the four wheels—to achieve an industry-wide average of approximately 24 MPG (Graham, 2010). Those standards were ultimately remanded to the Department of Transportation (DOT) by a federal appeals court due to inadequate emphasis on global warming benefits.

When the Democrats secured a majority in Congress in January 2007, they worked with the Bush administration on a major reform of the CAFE law included in the Energy Independence and Security Act of 2007. Support for the legislation was widespread in both parties (Ungar et al., 2015). Many Democrats saw a strong environmental rationale for the reform (e.g., controlling GHGs), while many Republicans shared Bush’s concerns about energy security. The Energy Independence and Security Act (a) applied a footprint adjustment to cars as well as trucks, and (b) established a minimum performance standard of 35 MPG by 2020 for both cars and light trucks. Higher standards were authorized for model years 2021 and beyond (Graham, 2010).
Drawing on this new legislative authority, the new Obama administration further tightened CAFE standards. A 2012 final rule set footprint-based standards at an average of 41 MPG by model year 2021 (cars and light trucks combined), and a goal of 54.5 MPG by model year 2025.

Federal ghg standard for motor vehicles

The U.S. Supreme Court determined in 2007 that the EPA possesses authority under the Clean Air Act to regulate GHG emissions from motor vehicles (Mass. vs. EPA, 2007). In response to a 2009 instruction from President Barack Obama, EPA, in consultation with NHTSA, created an entirely new performance standard governing GHGs emitted by new cars and light trucks. The new standards are essentially equivalent to NHTSA’s CAFE standards, though differ in their designs. GHG emissions standards equate to fuel economy requirements but NHTSA and EPA have different ways of compliance accounting; differences that are reflected in the instruments embodied in the two policies. Notably, EPA’s GHG standards were set at levels of stringency roughly equivalent to what regulators in California were planning (Graham, 2010).

California’s ghg standards for motor vehicles

Due to unique authority under the U.S. Clean Air Act, California is authorized to establish vehicle emissions standards separate from the federal government. Further, vehicle emissions standards set by California can exceed in stringency those set at the federal level. The bounds on California’s authority to set vehicle emission standards have been contested (Huffman and Weisgall, 2008). During the administrations of Presidents Bill Clinton and George W. Bush, environmentalists and their allies in the California legislature became disenchanted with the federal government’s handling of the CAFE program. Despite objections from the auto manufacturing industry and dealers, California passed a new law in 2002, AB 1493, that placed limits on GHGs from new motor vehicles sold in California (Huffman and Weisgall, 2008). A legal battle ensued as to whether California possessed the authority to impose its own GHG standards (Graham, 2010). Industry and the Bush administration argued that the Energy Policy and Conservation Act preempts any state regulation of motor vehicles related to fuel economy. California and environmentalists argued that the 1990 amendments to the Clean Air Act provide California with the power to set stricter auto emissions standards than the federal government. EPA, under the Bush administration, denied California the preemption waiver as required under the Clean Air Act, but a federal court ruled in 2007 that California does possess the authority under the Clean Air Act to set its own emissions standards for motor vehicles (for a review of the litigation, see EPA, 2013).

In 2002, the California legislature did not collaborate with the U.S. Congress or the George W. Bush administration. At the time, the California legislature was responding to public concerns that the federal government was not acting to address climate change (Hall, 2007). When the 2006 CARB standards for GHG emissions were enacted, collaboration with the federal government was limited because the
Bush administration was preparing its legal case that the CARB standards were preempted by federal legislation (Graham, 2010).

When the Obama administration fashioned its federal fuel economy and GHG policies from 2009–2012, California was included in the discussions with industry, labor, environmentalists, and consumer groups. The Obama administration decided to enact highly stringent CAFE standards, similar to what California had enacted for 2016 and was considering for 2017–2025. California agreed to allow automakers to treat compliance with the new federal standards as compliance with its GHG standards. The complex combination of the California GHG standards, the EPA GHG standards, and the NHTSA CAFE standards began to seem like a uniform national program because the compliance obligations for vehicle manufacturers were coordinated and measured only on a national basis. The three programs were called the Joint National Program (JNP).

**California’s zero emission vehicle program**

California’s current GHG standards are one of four vehicle related policies included in its Low Emission Vehicle (LEV) Program; the first iteration of which was passed in 1990 and the most recent iteration of which was passed in 2012 and is referred to as the Advanced Clean Car Program. Another policy within the policy suite constituting the Program is the zero emission vehicle (ZEV) regulation, which requires that a portion of the vehicles manufacturers distribute for sale in California have zero tailpipe emissions.

In its current form, as finalized in 2012, the ZEV regulation mandates approximately 15.4 percent of ZEVs in each automaker’s fleet by 2025. Amendments to the ZEV regulation have coincided with those made to other policies in California’s LEV/Advanced Clean Car Program. Although the ZEV regulation was initially established in order to address local air quality, like the other policies included in the Program, it is now also considered a tool to reduce the GHG emissions linked to global climate change. The ZEV regulation is expected to stimulate the commercialization of a relatively less polluting technology (CARB, 2011).

However, the ZEV regulation, while a part of California’s package of GHG regulations, was not among those harmonized in the Obama administration’s JNP. At the present time, the California GHG standards do not impose any regulatory burdens on the auto industry that go beyond the federal requirements. However, the 2012 ZEV regulation, which covers model years 2018–2025, imposes separate compliance obligations on auto manufacturers. Whereas the JNP incentivizes manufacturers to make cost-effective refinements to the internal combustion engine, the California ZEV regulation requires investments in alternatives to the internal combustion engine such as plug-in electric vehicles and hydrogen fuel cell vehicles.

**Descriptive overview of policy design**

**NHTSA’s CAFE Regulation**

CAFE standards for individual manufacturers are specified in two product categories: passenger cars and light trucks. A manufacturer’s standard is determined by
computing the sales-weighted average of the mileage targets for individual vehicles in
a manufacturer’s fleet. The requirements for individual vehicles vary based on their
footprint; vehicles with larger footprints have lower minimum fuel economy targets
than vehicles with smaller footprints. To assess manufacturer compliance with CAFE
standards in a specific model year, the average fuel economy of vehicles distributed
for sale by a manufacturer is compared with the manufacturer’s CAFE standard. A
manufacturer’s fleet is compliant if the aggregate fuel economy of the fleet is at or
above the stated standard. A separate compliance determination is made for the man-
ufacturer’s passenger car and light truck fleets.

The CAFE regulatory program is credit based. Each year a manufacturer exceeds
compliance targets it earns a certain number of credits. Manufacturers can address
under-compliance in one model year by using credits accumulated in previous model
years or by paying a monetary penalty. Currently, the monetary penalty is set at $14
per tenth of an MPG. The value of the civil penalty was increased in the summer of
2016 (from $5.50 per tenth of an MPG) pursuant to the Federal Civil Penalties
Inflation Adjustment Act of 2015.

**EPA’s GHG Standard**

Similar to the CAFE program, EPA’s vehicle emission standards for GHGs are set
according to vehicle footprint, where larger footprint vehicles have more permissive
GHG emissions targets than smaller footprint vehicles. Also like the CAFE program,
the EPA’s program relies on a credit system. Unlike NHTSA, the EPA does not allow
manufacturers to pay monetary penalties in place of meeting GHG emissions stand-
ards, and it has the discretion to administer penalties of up to $37,500 per vehicle if
manufacturers are deemed out of compliance (Schroeder, Smith, and Cregger 2015,
12). EPA – unlike NHTSA – also has the power to withdraw a manufacturer’s ability
to sell vehicles in the U.S.

Manufacturers that under-/over-comply with GHG emissions standards can carry
credits forward or backward to account for compliance shortfalls, trade credits with
other manufacturers, and transfer an unlimited number of their excess credits
between truck and car fleets. The incorporation of certain types of vehicle technolo-
gies or vehicle design features (e.g., efficient air conditioning systems, solar panels)
earns manufacturers credits. Further, under EPA’s program, manufacturers earn extra
credit for certain types of vehicles. In 2017, each fully electric and fuel cell vehicle
distributed for sale by a manufacturer was counted as two vehicles. By 2021, the
multiplier will decrease to 1.5. Plug-in hybrid electric vehicles were multiplied by 1.6
in 2017 and will be multiplied by 1.3 in 2021. These extra credits are sometimes
called “super credits” and they may be seen as an effort to coordinate the JNP with
the California ZEV program; since they both compel the production of ZEVs.
NHTSA lacks the authority to offer super credits and a vehicle manufacturer must
have sufficient credits to comply separately with NHTSA and EPA standards.

Federal agencies were aware that growing use of ZEVs could contribute to indirect
emissions of pollution at electric power plants (EPA, 2012). Under EPA’s program,
fully electric and fuel cell vehicles sold between 2017 and 2021 are counted as emit-
ting zero grams CO₂ equivalent per mile, including upstream emissions and on-road
emissions. For subsequent model years, up to 2025, EPA will allow manufacturers who sell 300,000 fully electric or fuel cell vehicles between 2019–2021 to count up to 600,000 of these types of vehicles as zero-CO$_2$ emitting vehicles, beyond which manufacturers will need to report on upstream emissions. The agency will allow all other manufacturers to count up to 200,000 vehicles as zero-CO$_2$ emitting during this period.

In summary, the practical impact of the EPA’s favorable treatment of ZEVs is limited because NHTSA does not offer similar incentives in the CAFE program. NHTSA does not offer any credit multipliers for such vehicles, as it does not have the legal authority to do so (NHTSA, 2012).

**The ZEV Regulation**

The ZEV regulation currently applies to large and intermediate volume manufacturers, defined as those that sell more than 60,000 vehicles per model year in California. The threshold drops to 20,000 in 2018. Currently, under the ZEV regulation, CARB grants credits to all manufacturers, including small-volume manufacturers (those producing less than 4,500 vehicles per year), for battery electric and fuel cell vehicles, as well as for others that operate as extremely low polluting technologies (ex. plug-in hybrid electric vehicle). Manufacturers that over-comply with ZEV requirements (i.e., earn more ZEV credits than required in a given year) can bank those credits for future use to accommodate compliance shortfalls or sell excess credits to other manufacturers. Under-complying manufacturers must pay a fine of $5,000 per vehicle not produced or purchase credits from manufacturers with excess credits.

Table 2 summarizes the designs of the federal and California regulations by the following elements: the primary goal(s) of the current versions of the policies, policy instruments, and policy incentives.

### Qualitative analysis of policy compatibility

In this section, we interpret the descriptive policy history and policy design information provided in the preceding section in responding to the research question
motivating this study: Are federal CAFE, federal vehicle GHG, and California vehicle standards compatible in their designs?

**GOALS**

The current versions of the NHTSA fuel economy, EPA vehicle GHG, California vehicle GHG, and California ZEV policies are all framed as policies to control GHG emissions from the transportation sector (Rabe, 2011). The ZEV policy has the additional goal of encouraging ZEV diffusion. However, the original rationales motivating the regulations were not GHG control. Fuel economy regulations at NHTSA/DOT were originally enacted to promote energy independence. The Clean Air Act, which affords EPA the regulatory mandate to set vehicle GHG standards, was originally adopted to regulate emissions of local air pollutants such as smog and soot. California’s vehicle emission standards, also authorized by EPA under the framework of the Clean Air Act, were designed to improve local air quality conditions.

The focus on GHG emissions control as a policy objective was propelled by California, which adopted this policy stance in response to emerging concerns about climate change in the 1990s and early 2000s. A shift in focus from energy independence—as it relates to fuel economy regulations—and general air quality—as it relates to the Clean Air Act—to GHG emissions reduction accompanied the Obama administration’s harmonization of federal and California GHG standards. As such, the current approach of using federal vehicle standards as tools for achieving GHG emissions reductions can be attributed, at least partially, to California’s original activism on the climate issue.

**Instruments**

All four policies under consideration are based on the credit trading systems, where: (a) credits correspond to a unitized performance standards (i.e., vehicles with certain fuel economy, emissions, or technology characteristics); and (b) credits can be averaged, banked, and or transferred within and across policy targets (i.e., vehicle manufacturers) over a single or multi-year period. When considering alignment in credit provisions among the federal and California policies, three issues must be considered: the extent of alignment in credit provisions, the regulatory implications of alignment for policy targets, and how the alignment in instruments has the potential to influence the attainment of shared policy goals. We do not address the specifics of the credit provisions in the California GHG standards since compliance with those standards is currently deemed to occur if a manufacturer complies with the federal standards.

The federal and California ZEV regulations each contain a variety of credit provisions that affect how manufacturers can achieve regulatory compliance. A review of the credit provisions included in the different regulations reveals a lack of alignment between the federal fuel economy and GHG standards, and thus how the policies individually interface with California standards. The major way the regulations differ in their credit provisions is in their offering of “extra credit” for certain compliance...
pathways. For example, EPA multiplies credits assigned to certain types of vehicle technologies (e.g., fully electric vehicles) as well as confers extra credits for certain vehicle characteristics (e.g., efficient air conditioning systems). EPA also allows some vehicle technologies to be counted as being lower emitting than they actually are. NHTSA, conversely, does not offer incentive multipliers as the agency is precluded from doing so by the Energy Policy Conservation Act and the Energy Independence and Security Act.

Next comes the critical issue of whether the federal and California policies align to achieve the shared policy goal of reducing GHG emissions. The extent of environmental benefits that can potentially be achieved through the simultaneous application of the policies is mostly affected by how compliance with one regulation enables, or not, compliance with others, and whether the designs of instruments favor certain policy compliance pathways over others. While one might think that the stricter ZEV standards in California will enhance the federal GHG controls, the mechanics of the compliance calculations do not work that way. Manufacturer compliance with the ZEV regulation moves a company closer to meeting federal CAFE and GHG targets. Manufacturers count the vehicles produced for California in their compliance calculations for the EPA and NHTSA programs, which compromises the potential for the programs to achieve incremental environmental benefits (Goulder, Jacobsen, and Van Benthem 2012). As long as the federal program is binding on a vehicle manufacturer, each ZEV produced for California will permit the manufacturer to sell at least one other vehicle with high GHG emissions in California or elsewhere in the country (NRC, 2015a; 2015b).

Further, the compounded effect of the various credit allowances offered to vehicle manufacturers under EPA’s program also limits the amount of GHG reductions that can be achieved. Since one battery electric or fuel cell vehicle is allowed to count as two vehicles up through 2021, and since both are considered zero-emitting (despite upstream powerplant emissions), an auto manufacturer may seize the opportunity to sell several more gasoline vehicles and still result in a lower average GHG output per mile than if they had simply sold one of those vehicles without the multiplier.

Jenn, Azevedo, and Michalek (2016) quantify the environmental impact associated with these credit provisions and show that their combined effect actually leads to higher GHG emissions than would result from the policy with no such incentives. Jenn and his colleagues’ analysis reveals that the cumulative net effect of the alternative fuel vehicle technology credits in the EPA regulation is an increase of 30 to 70 metric tons of carbon dioxide during the 2012-2025 period relative to the same policy without the credit incentives (Jenn et al., 2016, 2171). EPA has explicitly acknowledged the environmental implications of the current design of the vehicle GHG policy in the near and long terms. EPA maintains the position, however, that policy leniency curtails environmental benefits in the near term will facilitate the attainment of large scale environmental improvements in the long run (EPA, 2012, 62811; Jenn et al., 2016).

**Incentives**

Incentives for compliance with NHTSA fuel economy and EPA vehicle GHG standards differ in value and approach. Until recently, when NHTSA nearly tripled the
cost of non-compliance penalties, the incentives for non-compliance under each set of regulations could differ substantially. Non-compliance with EPA standards could result in a penalty of up to $37,500 per vehicle or a complete loss of marketing permission in the U.S. The recent increase in CAFE fines aligns the policies’ incentives more closely.

However, the policies also differ in their approach to dealing with non-compliance. Here again, differences in the policies relate to the legal frameworks under which they were established. The Energy Independence and Security Act and the Energy Policy and Conservation Act, which assign NHTSA the responsibility of developing federal fuel economy regulations, allow the agency to collect civil penalties from vehicle manufacturers in place of achieving fuel economy standards (Schroeder et al., 2015, 12). In contrast, the Clean Air Act, which grants the EPA authority to develop GHG standards for vehicles, does not allow the agency to collect civil penalties in place of achieving GHG standards (Ibid). Under the EPA program, manufacturers must meet GHG standards and could pay a hefty fine until vehicles are brought into compliance. Currently, the penalty for non-compliance with the ZEV regulation is lower than the maximum non-compliance penalty under the EPA program, but is still substantial. The implication of the ZEV program incentive is that vehicle manufacturers will feel compelled to maintain regulatory compliance.

Noteworthy are practical tendencies of policy targets in terms of how they are likely to respond to the instruments and incentives embedded within the examined policies. Specifically, while availing the compliance flexibilities afforded to manufacturers in the regulations (i.e., leveraging credit multipliers for zero emission vehicles to produce a greater number of less fuel efficient vehicles) might pose some advantages, it is also likely to be viewed as a risky corporate strategy. By failing to comply with regulations, even if fines are paid, manufacturers may confront pushback from shareholders, consumer protests, or a degraded public image.

Overall, in terms of policy design, compatibility in policy goals and policy instruments is associated with the potential to achieve policy outcomes. More specifically, incompatibility among the policies, goals, and instruments undermines the ability to attain GHG reduction goals. The ZEV policy, in addition to the GHG reduction goal it shares with the federal policies, has the added focus on ZEV technology diffusion. Goal disparity coupled with differences in the provisions built into the credit programs supporting each policy can hinder environmental objectives as described in the previous section.

**Discussion**

The sharing of policy responsibility across the levels of government is a key feature of American governance. Scholars have devoted considerable attention to understand how this sharing actually manifests, how factors that support and challenge intergovernmental relations are addressed, and the practical implications of various multi-level governance arrangements (see, e.g., Konisky, 2011; Rabe, 1999; 2007; 2011; Scheberle, 2004). Some of this research focuses on coordination of policies developed at different levels of government. Some even suggest the value in considering
statutory and regulatory language when seeking to understand how policymaking responsibilities are shared across the levels of government (Scheberle, 2004).

In this paper, we examine compatibility among federal and state vehicle policies in terms of their designs. Our assessment of their designs focuses on their compatibility in terms of policy goals, instruments, and incentives, and how this compatibility can potentially influence reductions in GHG emissions from vehicles. We learn from our examination of policy cases that federal and state policies do contain common design features enabling their systematic comparison and that how policies compare in their designs—in terms of goals, instruments, and incentives—can have critical bearing on the potential of achieving shared public policy objectives. We do acknowledge that applying a policy design lens reflects a “top-down” orientation. It thus does not account for how policies are implemented by administrators or interpreted by policy targets. In addition to confronting the incentives embodied in the designs of policies that regulate their behavior, policy targets also confront various incentives stemming from the social and environmental contexts in which they are embedded.

Here we suggest practical implications of our research; first for the specific regulatory context as well as those that transcend across policy domains. Practically, our assessment of compatibility among the designs of federal and state vehicle policies suggests that, together, they may not be the most efficient means to address GHG emissions. In part, this may be because the regulations were not originally intended for the control of GHGs. This was an emergent goal of the policies, sparked by California’s shifting focus to GHG reduction in response to growing concerns about global climate change. Operationally, this matters because auto manufacturers that are dually subject to state and federal standards receive mixed signals, represented as incentives embodied in policy designs, about types of compliance pathways to pursue to meet regulatory requirements. Additionally, the environmental implications of the simultaneous application of the policies, currently directed as three separate agencies, raises questions about the kinds of environmental benefits that could be achieved should regulation of GHG emissions from the transportation sector be managed through only one policy.

More broadly, our assessment highlights the concept of policy compatibility as one worthy of the attention of practitioners. In nested governance systems, such as the federalist system observed in the U.S., governments situated at different levels of government are often charged with the simultaneous development of policies that pertain to common topics, and even groups within society. Any instance in which this is observed raises questions about the extent to which policies promulgated by different jurisdictions are, or are not, compromising the ability of each policy to achieve its stated objectives. The concept of policy compatibility thus carries across policy domains. We reiterate that a key contribution of our study is tying an assessment of policy compatibility to features of policy design. Practitioners can follow an approach similar to that employed in this paper; utilizing common features of policy design as a basis for comparing policies. Alternatively, they could employ formal modeling approaches to ascertain, for example, how policy incentives embedded in different policies interact to shape outcomes of interest.

Finally, for our fellow academic we suggest extending the analysis of policy cases reported in this paper by exploring the compatibility of instruments and incentives
among related policies developed at different, and also the same, levels of government; including the federal, state, and municipal level. Moving forward, we also suggest future research offer formally investigate how contextual factors – such as interagency collaboration and legal frameworks – influence compatibility among policy designs.

Notes

1. We emphasize that, based on our analysis, we offer potential consequences of the discerned extent of policy compatibility. We do not evaluate actual policy outputs or outcomes.
2. We do not address here two other policy rationales that are sometimes advanced to support these programs: economic development (e.g., green jobs in making technologies for cleaner vehicles) and consumer welfare (e.g., savings in gasoline expenses).

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