Intergovernmental Climate Change Mitigation Policies: Theory and Outcomes

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Abstract

This paper develops a framework for analyzing the desirability of greenhouse gas (GHG) mitigation policies. Policies can generate conflict or cooperation between levels of government which affects the probability of enactment: 1) Cooperative policies occur when federal fiscal transfers are made to subnational governments. 2) Coordination policies include enabling and funding mechanisms between interdependent governments. 3) Competitive policies such as federal performance standards and price mechanisms increase political conflict over authority between governments. We categorize 23 GHG mitigation policies developed by over 1500 state stakeholders into the conflict taxonomy that, if fully scaled to the national level, could reduce emissions by over 3 billion metric tons by 2020. Macroeconomic simulations show a potential increase of nearly 2.2 million jobs (1.19%) from baseline projections. We call for a national Climate Action Plan that explicates funding, enabling policies, and performance standards to achieve GHG emissions reductions while increasing aggregate economic efficiency.

"*The coordination required to deal with climate change will be a challenge for any jurisdiction, sub-national or national, but has received little scholarly attention.*" (Rabe, 2008, p. 788)

The U.S. Senate rejection of potential economy-wide, federal cap and trade programs to reduce greenhouse gases (GHGs) suggests an inquiry into alternatives. While potentially transformative, a federal cap and trade initiative would have been only one element of a comprehensive national climate plan. Richards and Richards (2009) argue that federal actions need to be more comprehensive than technology-based supply-side regulation. Scientists, business leaders, and policy makers are increasingly strident in saying that doing nothing is an unacceptable alternative as well (NRC, 2011).

We argue that government authority and intergovernmental conflict should be explicitly considered in designing and implementing comprehensive climate policy, including policies that are "complementary" to federal actions that would put a price on GHGs. States have long been considered the central actor in the federal system (Elazar, 1966). States and/or local governments have primary regulatory authority over energy policy in general, demand-side fuel/electricity management, and land-use planning. Furthermore, states are likely to have implementation authority for economy-wide federal climate policies. States are therefore critical in climate policy design.

However, a large federal role in attaining GHG emission reductions is essential for two reasons. First, new federal authority will be required to enable policy actions and to provide funding for state and local actions to reduce GHGs. State and local governments cannot go it alone, as evidenced by the fact that the

major policy options developed by stakeholders in the state climate action plans analyzed below require some type of new federal authority to maximize GHG reductions. Federal leadership is *essential* even if a national cap on GHG emissions is not forthcoming anytime soon.

Second, federal actions are essential because combined state-level actions are not likely to be adequate to halt, much less reverse, GHG emissions growth. The U.S. Department of Energy (2012) estimates that reference case U.S. GHG emissions will increase from 5.6 billion metric tons of carbon dioxide equivalents ($BMTCO_2e$) in 2010 to 5.7 $BMTCO_2e$ in 2035. Emissions forecasts have declined significantly recently, but further GHG declines are hampered due to a lack of targeted mitigation policies, as exemplified by only 9 of 50 states spending more than two percent of electricity sector revenues on demand-side management (DSM) programs. This is a minimum level of investment to capture all cost-effective DSM opportunities to slow the growth in electricity demand and associated GHG emissions (Molina et al., 2010). Federal price instruments (e.g., carbon taxes, cap and trade) and/or minimum performance standards (e.g., national renewable energy portfolio, national clean car standard and national demand-side management subsidies) are necessary to scale up the activities recommended in state climate action plans to enable meaningful GHG mitigation at the national level. The design and implementation of a comprehensive approach to reducing the emissions of GHGs must be broader and deeper than existing energy and environmental policies.

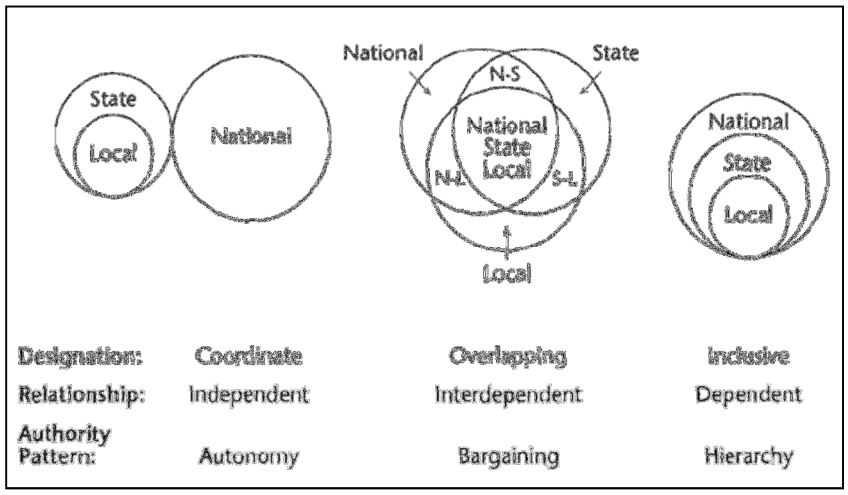
The main contribution of this paper is to develop and apply a theoretical framework of inter-jurisdictional governance for climate change policy in the U.S.

Following a brief review of intergovernmental theory and the presentation of our framework, we highlight the critical intergovernmental aspects of climate policy focusing on major mitigation options that can significantly reduce GHG emissions. We then perform macroeconomic simulations of a comprehensive suite of twenty-three aggregate options to estimate their employment and GHG reduction impacts in relation to the jurisdictions that currently have the authority to implement them. We identify a need for a national Climate Action Plan that explicates performance standards, funding, and enabling actions at all levels of government to reduce GHG emissions and increase aggregate economic efficiency.

INTERGOVERNMENTAL RELATIONS THEORY

Following a brief review of intergovernmental relations theory, this section develops a framework and empirical support for the relationship between conflict and the probability of policy enactment. The role of the federal government relative to the states in American society is an enduring "cardinal" question (Wilson, 1908), and preoccupations with it have been described as a "neurosis" (Rubin and Freeley, 1993). The extent to which the federal government has been the dominant actor in exchanges between levels of government has been the subject of exhaustive debate (see among others, Schieber, 2000; Sovacol, 2008). Overlapping authority is the term often used to describe American federalism, and it has moved even more into the vernacular in the wake of the 2008 financial crises (Bary, 2010). Figure 1 shows the overlapping authority model, in contrast to two alternatives (from Wright, 2001; p. 75).

Figure 1. Models of Intergovernmental Relations



Overlapping authority is based on independent units of government that bargain for authority in engaging in activities. Bargaining entails an exchange, in which states typically receive federal funding and authority, with the quid pro quo of adequate accounting, reporting, and performance. Rabe (2011) highlights the state-federal bargaining that occurred in the Rose Garden Agreement of 2009 between the Obama Administration, governors, and the industry in a new approach to setting automobile fuel efficiency standards. Environmental regulation typifies this type of overlapping authority and has also been labeled cooperative federalism (Adelman and Engel, 2007).

Scholars have noted a recent shift from cooperative federalism to "coercive" federalism. With the few exceptions noted below, the federal government has been the centralizing authority for decades (Kincaid, 1990), during both Democratic and Republican administrations (Posner, 2007). Mandates and preemptions are two common federal policy actions with centralizing effects. Mandates are statutory direct orders from the federal government imposed on state and local governments.

Preemption refers to the authority of the Congress under the supremacy clause of the U.S. Constitution to enact statutes that displace or replace state and/or local laws and powers (ACIR, 1992). Preemption has the effect of limiting state legislative independence and in a consolidation of federal power.

Federalism in climate change mitigation policy was the subject of a special edition of the *Arizona Law Review*, which primarily addressed preemption and cap and trade authority (see Farber, 2008, among others). The 1960s to the 1990s has been described as a period of cooperative federalism, where the federal government adopted national authority to set minimum performance standards or conditions in a policy domain, such as the Clean Air Act Amendments (1970), and then delegated implementation to the states. States promulgated state level authority to implement and enforce the federal standards. If states did not participate, or did not secure federal approval of their implementation plans or performance, then implementation switched to conjoint national and state authority (Wellborn, 1988). Cooperative federalism describes most landmark environmental legislation, such as the Endangered Species Act and the Federal Water Pollution Control Act Amendments of 1972, which were designed to prevent a race-to-the-bottom in regulatory quality.

However, the federal government has also limited state climate policy actions that it perceives as going beyond state authority. Rather than establishing a "floor" for state performance, the federal government has used executive, legislative, and judicial authority to place a cap, or "ceiling" on state regulation. For example, the justification for federal preemption of aggressive state policies, like the Pavely Bill in California that increased auto fuel efficiency, was that federal law is required to ensure regulatory

consistency in order to reduce the burden on regulated actors. In his 2007 letter to Governor Schwarzenegger rejecting California's request for a waiver to allow California to implement its law, U.S. EPA Administrator Johnson claimed to be preventing a "patchwork" of state standards (Johnson, 2007). Heinzerling (2008; p. 928) notes that federal preemption can result in "upending" state action and create a host of uncertainties for firms and regulators. Put another way, federal preemption can be, and has been, justified in preventing both a race-to-the-bottom and a race-to-the-top in state regulation.

Federal mandates and preemption describe conflict, or political competition for power, between vertical levels of government during the policy design phase (Breton, 1998; Volden, 2005). Conflicts over authority between jurisdictions are typically settled through bargaining (Wright, 2001) or fiat from hierarchical authority (Stoker, 1992). Other intergovernmental policy arenas are less confrontational and more cooperative in nature (Elazar, 1991). For example, Gormley (2006) dichotomizes the conflict versus cooperation continuum as money versus mandates. Conflict will most likely occur when the federal government imposes mandates, while cooperation is more likely with expanding financial largess.

We extend Gormley's typology by 1) including coordination as an intermediate category between conflict and cooperation that includes bargaining between levels of government that enables mutual goal attainment as described in more detail below, and 2) explicating specific mechanisms to explain and predict outcomes from political conflict in regulatory policy domains. Our premise is that conflict occurs because actors at all levels of governments are seeking power and protection of their own self-

interests: sectoral policy goals, macroeconomic control, and local autonomy (Blom-Hansen, 1999). Our main theoretical claim is, *ceteris paribus,* the likelihood of successful enactment of public policies decreases with increased intergovernmental conflict. The support for our argument is based on several related strands of political theory.

First, it is a truism to hear about states (and municipalities) as laboratories for democracy (Shipan and Volden, 2006). Bottom-up policy learning can also be conceived of as shared preferences, or reduced conflict, between levels of government. Also, viewing conflict *between* levels of government shows that state, local, and special district governments have direct access to congressmen, staffers, and agency specialists that are very influential in policy development (Weible, 2005). Furthermore, actors from subnational governments are critical actors in policy networks that are responsible for policy enactment and implementation (Sabatier and Jenkins-Smith, 1999). The result is that subnational actors can block or delay policy enactment from policy networks responsible for enactment that is not in their self-interests.

In addition, subnational governments have their own, effective lobbying resources (Cammissa, 1995) to pursue their self-interests at the federal level. The National Governors Association (NGA) and National Conference of State Legislatures (NCSL) directly lobby federal officials. Finally, cities and states also influence federal policies through the courts to achieve their own self-interests in energy policy, climate change, consumer protection laws, tobacco regulation, and many other issues (Provost, 2006; Winder and LaPlant, 2000). Dinan (2008) summarizes the effects of state

influence on federal activities in 2007-2008 as, "state officials …experienced notable success in persuading federal officials to take account of their concerns" (p. 382).

Beyond shared intergovernmental preferences and the efficacy of subnational government lobbying, political conflict *within* levels of government also reduces the likelihood of policy enactment. State policymakers and interest groups have jointly mobilized on a regional basis to fight federal environmental regulations that put them at a comparative disadvantage with other regions (Joskow and Schmalensee, 1998). Dozens of bills requiring a minimum level of renewable electricity sales have failed over the last several decades because of alliances between powerful regional utilities and their congressional allies who have argued that the policy would raise costs due to a lack of renewable energy supplies (Snyder, 2007). State heterogeneity also predicts federal-state conflict in formal models in assignment of authority at the policy design phase (Volden, 2005).

Our claim that the likelihood of policy enactment is correlated with political conflict is consistent with other political theories including legislative incentives such as credit claiming and blame avoidance (Weaver, 1986). While beyond the scope of this analysis, theories of delegation (Bendor, et al. 2001) also support our theoretical claims. In sum, state or regional heterogeneity in compliance costs and subsequent political support is directly related to policy enactment.

A FRAMEWORK OF INTERGOVERNMENTAL AUTHORITY FOR CLIMATE MITIGATION POLICIES

The core claim from our theoretical framework is that while the federal government can, and does, impose mandates on the states, these mandates extract a higher political

cost than when preferences are more aligned between levels of government. Therefore, mandates are less likely to be enacted than more consensual policies.

Based on these linkages between conflict and the probability of policy enactment, we offer three categories of intergovernmental relations policies:

1) Competitive: This type of policy is identified by political conflict over authority for sources and uses of funds, minimum performance standard setting, monitoring, reporting, and program evaluation and review. The above conflict between U.S. EPA and California over the authority to set automobile fuel efficiency standards under the Pavely Bill (2006) is a classic example of competitive climate policy where California and the U.S. competed for the authority to set minimum performance standards for automobiles. Similarly, a national renewable portfolio standard (RPS) would imply a federal takeover of renewable energy policy from a realm currently dominated by state authority. Carbon pricing or cap and trade programs would also result in an expansion of government authority, and we would expect intergovernmental bargaining to occur over the location and level of authority over key program attributes such as funding disposition, program implementation, as well as monitoring and evaluation. We also expect vertical competition to occur because the U.S. constitution does not limit subnational authority and allows joint federal-state actions.

2) Coordination: coordination reflects recognition of the condition of interdependence in modern policymaking where governmental programs intend to ameliorate complex social problems. Here, we refer to coordination as the condition when potentially adverse outcomes to actor B are considered when actor A makes a decision (Lindblom, 1965). Federal enabling policies for climate mitigation are typical

cases of sequential interdependence (Hall and O'Toole, 2000), where an output from one actor is needed as part of the input for another. Coordination is more likely in policies that result in benefits from agreement between levels of government when it facilitates goal attainment in one jurisdiction through enabling policies in another.

We consider three types of coordination policies in the climate policy domain: a) Enabling policies at all levels of government refer to cases where a level of government in a superior position in the hierarchy undertakes an action (e.g., a law or executive order) that allows lower jurisdictions to potentially maximize the effectiveness and efficiency of the implementation of mitigation policies. For example, improving coal plant generation efficiency could, by itself, potentially reduce U.S. GHG emissions by 2% (De Peitro, 2009). States that wish to pass standards in this area are hampered by ambiguity in the federal EPA New Source Review (NSR) permitting program. Owners of coal generators are reluctant to increase generation efficiency by installing efficient fans, fuel dryers, and other equipment modifications if they trigger the expensive and time consuming NSR permitting process. Without federal enabling legislation that clarifies what activities are acceptable under state coal generation efficiency policies, GHG mitigation from these sources will be greatly attenuated.

b) The second type of coordination policies are financing mechanisms. These policies redistribute, or recycle, funds from consumers or producers *within* states or municipalities. Financing mechanisms ameliorate the market barrier of lack of access to capital in energy services and other areas (IEA, 2007). This would include programs that offer collection mechanisms, such as on-bill financing of incremental cost of energy-efficient equipment, or that can provide a pool of capital to fund the equipment

upfront. For example, a federal collection mechanism for energy demand-side management programs, which are firmly under existing state authority, could be an example of a coordinative intergovernmental policy arena. A federal surcharge on electricity generation modeled on the Nuclear Waste Fund could provide considerable funding for state DSM programs. A pay-as-you-go, federal DSM fund redistributed back to states would prevent free riding from states that wanted to avoid DSM charges that might cause them to lose energy-intensive industries. Such a DSM program could provide the lowest-cost resource procurement. In addition, to optimize the implementation of state energy efficiency policies, state administrative capacity will need to be augmented (Nelson, 2012). The pay-as-you-go design would minimize concerns about an extension of federal authority into an area dominated by state authority.

c) The final type of coordinating policies are performance standards that are implemented by the market or voluntarily by states and municipalities. These standards do not include implementation and enforcement by subnational governments. For example, minimum performance standards for appliances are primarily established and implemented by the U.S. However, states can set their own standards for equipment not included in federal rulemakings as the process is slow. Recycling standards and smart growth standards would allow jurisdictions to opt-in for reducing solid waste and compact urban design, but would equate to federal mandates.

3) Cooperative policies: These are redistributive policies that use federal taxation authority to fund expanded activities that are currently under state authority. As Gormley (2006; p. 525) notes: “The more money the federal government makes

available to the states, the happier the states tend to be." Cooperative policies provide exogenous sources of funding for states and municipalities come from federal income taxes or other general federal sources. The existing federal renewable energy production tax credit is strongly supported at the state level in wind-rich states (Camia, 2012). A federal combined heat and power feed-in tariff, green building incentives, and high efficiency vehicle incentive that subsidizes clean energy supply and demand are likely to be cooperative in nature between vertical levels of government.

GHG MITIGATION POLICIES AND AUTHORITY

As the above list indicates, a portfolio of actions and implementation tools across all sectors and employing a wide range of policy instruments are needed to achieve reductions beyond national goals. If implemented in a proper manner, these policies and actions can also help strengthen the economy. In addition, a portfolio approach can also provide important co-benefits to GHG reduction from energy security and reduction of ordinary pollutants that will result in public health improvements.

We build on prior work (Peterson et al., 2010a) to identify a comprehensive suite of twenty-three policies, termed "super-options", across all sectors of the economy to significantly reduce GHGs (see Table 1). Further information on the data sources for these policies is described below. The super-options were chosen from state climate action plans based on two criteria: 1) they reflect common recommendations for implementation in state climate action plans, 2) they represent the vast majority of GHG reductions from the plans. However, they are by no means all-inclusive. We direct those readers interested in the composition of those state-

level stakeholder groups and their climate planning outcomes to Maggioni, Nelson, and Mazmanian (2012, pp. 240-242).

The microeconomic data, assumptions, and methods used in this study are based on the results of formal agreements by over 1,500 stakeholders made through intensive, deliberative processes that used consensus-building, fact-finding, and advanced analytical techniques in 16 American states that have developed climate action plans. Although the extent to which these policies have been effective in reducing GHG emissions has been contested (Drummond, 2010; Wheeler, 2008), given the lack of federal action, U.S. states and municipalities have taken the lead in developing climate plans and policies (Rabe, 2011).

The policy actions in Table 1 provide GHG reductions that are additional to reference (baseline) case actions, but most require some type of federal authority, whether enabling state activity or setting standards for minimal acceptable performance from states. The recommendations include a variety of matching policy instruments (including price and non-price approaches) needed for achieving GHG targets, economic and energy benefits. The guidance in Table 1 is organized by government level. At the federal level there are two columns, one titled "Existing Authority" and the other, "New Authority." The existing authority column reflects actions available to the administration and agencies under current law, although new appropriations may be required. The new authority column in bold reflects actions Congress would most likely have to authorize.

Table 1. Federal, State and Local Authority for 23 GHG Reduction Policies.

		Federal		State	Local
Sector	**Climate Mitigation Actions**	**Under Existing Authority**	**Under New Authority**	**Actions by Governors, Other Executive Branch, Public Utilities Commissions, Legislatures**	**Actions by Mayors, City/County Managers, City Councils or County Commissioners**
AFW-1	Crop Production Practices to Achieve GHG Benefits	Continue funding and associated research and development (R&D) under the Farm Bill	**Enact a national GHG program that allows for carbon offsets from the agricultural sector.**	Implement State agriculture commodities purchasing programs that recognize in-state production with lower carbon content.	Enhance programs of county extension offices in nutrient management and technology transfer.
AFW-2	Livestock Manure - Anaerobic Digestion and Methane Utilization	Continue funding and associated R&D under the Farm Bill	**Enact a national GHG program that allows for carbon offsets from the agricultural sector.**	Provide cost share for demonstration programs.	Provide technology transfer through local extension offices.
AFW-3	Forest Retention		**Enact a national GHG program that allows for carbon offsets from the forest sector.**	Implement State programs to incentivize local smart growth planning and development.	Implement smart growth programs; urban growth boundaries.
AFW-4	Reforestation/ Afforestation		**Enact a national GHG program that allows for carbon offsets from the forest sector.**	Implement State/local tax incentives for working forest lands or lands with permanent conservation easements; Establish bioenergy markets as a way to promote the establishment/ maintenance of working forests.	Enact local tax incentives for working lands or lands with permanent conservation easements.
AFW-5	Urban Forestry		**Enact a national GHG program that allows for carbon offsets from the forest sector.**	Implement State cost share programs to promote expansion and maintenance of urban forests.	Partner with state on cost share programs; explore programs with local electrical utilities on shade tree planting programs.

		Federal		State	Local
Sector	**Climate Mitigation Actions**	**Under Existing Authority**	**Under New Authority**	**Actions by Governors, Other Executive Branch, Public Utilities Commissions, Legislatures**	**Actions by Mayors, City/County Managers, City Councils or County Commissioners**
AFW-6	Municipal Solid Waste (MSW) Source Reduction		**Develop national programs with industry associations on cradle to grave to cradle management of products and packaging; programs to reduce junk mail.**	Implement Government lead by example source reduction programs.	Government lead-by-example source reduction programs.
AFW-7	Enhanced Recycling of Municipal Solid Waste		**Programs to assist states in the development of end use markets for recycled commodities**	Provide incentives for use of recycled construction materials; mandatory targets for landfill diversion	Increase disposal fees; pay-as-you-throw programs
AFW-8	MSW Landfill Gas Management		**Enact a national GHG program that allows for carbon offsets from the waste management sector.**	Enact mandatory programs for landfill gas collection and control or beneficial use	
ES-1	Renewable Portfolio Standard (RPS)	Vested in state-level public utility commissions	**Enact national minimum RPS overseen by Department of Energy**	Enact or make more stringent RPS; extend beyond current expirations	Promote renewable energy procurement at municipal agencies
ES-2	Nuclear	Resolve spent fuel issue; address accident risks; resolve accident insurance subsidies	**Enhance authority for Nuclear Regulatory Commission**	Address siting issues perhaps by pro-actively identifying acceptable new facility sites	Monitor siting developments to ensure adequate emergency evacuation plans
ES-3	Carbon Capture and Sequestration (CCS)	Fund R&D, develop CCS-specific regulations for safe reliable storage	**Examine and address liability issues, monitoring, and verification**	Support federal RD&D, commission technical feasibility studies of potential reservoir sites	Facilitate/share right-of-way exclusions, if/as needed, through metropolitan corridors for transmission pipelines
ES-4	Coal Plant Efficiency Improvements and Repowering	Work with industry to address New Source Review (NSR) issues	**Clarify what efficiency measures trigger NSR is required for many generators to undertake coal plant efficiency improvements.**	PUC to enact minimum performance standards for coal station combustion efficiency	Support public utility commission (PUC) activities to increase coal station efficiency

		Federal		State	Local
Sector	**Climate Mitigation Actions**	**Under Existing Authority**	**Under New Authority**	**Actions by Governors, Other Executive Branch, Public Utilities Commissions, Legislatures**	**Actions by Mayors, City/County Managers, City Councils or County Commissioners**
RCI-1	Demand Side Management (DSM) Programs	Expand funding and eligibility criteria for weatherization programs	**Fund state or utility DSM through national revenue program.**	Decouple utility sales from profits in regulated markets. Performance incentives for DSM. Establish systems benefits charges to fund DSM.	Implement local DSM peer competition programs between municipalities or school districts
RCI-2	High Performance Buildings (private and public sector)	Establish stringent federal facility carbon footprint standard; fund agency budgets as needed to comply	**Offer incentives for 'beyond code' private sector building performance**	Establish public sector lead by example standard; Offer incentives for 'beyond code' building performance. Develop a retained savings policy where energy bill savings can be retained for capital investments.	Establish public sector lead by example standard; Offer incentives for 'beyond code' building performance
RCI-3	Appliance Standards	Federal government has authority to set appliance standards.	**Establish annual process to include new equipment and existing appliances not already subject to federal standards in federal standard setting.**	Implement standards for appliances not covered under federal rules. Implement Energy Star or other appliance efficiency procurement requirement for state purchasing.	Implement Energy Star or other appliance efficiency procurement requirement for local government purchasing.
RCI-4	Building Energy Codes	ARRA (2009) requires states applying for federal energy grants to meet most recent building energy codes and demonstrate plan for enforcement.	**Enact mandatory minimum energy efficiency codes for new and retrofit construction based on state climate zones. Require enforcement by state or local jurisdictions. Require building benchmarking and labeling as part of code process.**	Enact state "stretch" codes more stringent than federal minimums. Require enforcement by state or local jurisdictions. Give code agency authority to update codes rather than legislature. Require building benchmarking and labeling as part of code process.	Adopt local "stretch" codes more stringent than federal or state minimums; establish lower thresholds for retrofits to meet new code compliance. Require building benchmarking and labeling as part of code process.

		Federal		State	Local
Sector	**Climate Mitigation Actions**	**Under Existing Authority**	**Under New Authority**	**Actions by Governors, Other Executive Branch, Public Utilities Commissions, Legislatures**	**Actions by Mayors, City/County Managers, City Councils or County Commissioners**
RCI-5	Combined Heat and Power (CHP)	Energy Improvement and Extension Act (2008) provides for a 10-percent investment tax credit (ITC) up to 15 Megawatts. CHP can also receive accelerated depreciation.	**Introduce net metering and interconnection standards for all distributed generation. Increase accelerated depreciation allowance for CHP. Federal CHP feed in tariff. Implement reasonable standby rates, backup rates, and exit fees. Include CHP/heat recovery in federal EE / renewable performance standard.**	Implement Output-Based Environmental Regulations for new generation facilities. Net metering and interconnection standards for all distributed generation. Include CHP/heat recovery in EE / renewable performance standard. Implement reasonable standby rates, backup rates, and exit fees.	Implement Output-Based Environmental Regulations for new generation facilities. Include CHP in green building policies.
TLU-1	Vehicle Purchase Incentives, including rebates	Historic tax credit and other incentive programs	**Provide additional funding for incentive programs and additional authorizations for tax credits**	Develop new and additional state legislation providing both funding and authorization for vehicle purchase incentive programs	Generally vehicle purchases are not affected by local actions. Implement some incentive by local practices
TLU-2	Renewable Fuel Standard (RFS) with biofuels goals	Federal RFS	**Remove Barriers to State "over and above' RFS goals that go beyond federal goals**	Develop new and additional state legislation and rule development for 'over and above' RFS development that goes beyond federal requirements	Generally renewable fuels standards are not affected by local actions. Implement some incentives by local practices
TLU-3	Smart Growth/Land Use	Federal facilities placement decisions	**Remove of Barriers to State and Local Actions**	Implement funding and regulatory reform to incentivize 'smart growth' land use. Removal of barriers to local actions	Implement changes in regulatory and programmatic local government actions to promote smart growth

		Federal		State	Local
Sector	**Climate Mitigation Actions**	**Under Existing Authority**	**Under New Authority**	**Actions by Governors, Other Executive Branch, Public Utilities Commissions, Legislatures**	**Actions by Mayors, City/County Managers, City Councils or County Commissioners**
TLU-4	Transit	Federal Funding for Capital investment in transit systems	**Provide additional federal funding of capital, preventive maintenance, and operations and maintenance of transit systems**	Provide additional funding and 'fast tracking' of both capital investment and increasing operations and maintenance for transit systems	Authorize and fund increased development of transit capacity and maintenance of level of effort to sustain transit services
TLU-5	Anti-Idling Technologies and Practices	Voluntary Partnership programs with US EPA, including Smartway	**Establish new federal minimum standards for anti-idling technologies and practices.**	Develop state minimum standards, funding, and enforcement of anti-idling technologies and practices	Develop local rules and enforcement would support state and federal programs
TLU-6	Mode Shift from Truck to Rail	Federal regulatory and infrastructure funding programs	**Establish additional federal funding of rail infrastructure and reform of federal regulations to incentivize more energy efficient transportation**	Provide state funding and incentives to promote more energy efficient transportation of goods	Change local land uses to allow for more rail capacity so as to enable increases in energy efficient transportation of goods

The vertical axis in Table 2 (the first column) below presents each of the policies in Table 1 (Column 4) categorized according to the competition-coordination-cooperation continuum based on the policy's position in the bold column headed "Under New Authority". This categorization provides an innovative way to analyze climate policies based on hypothesized intergovernmental conflict and the type of funding required. In the "Competition Policies" box in Table 2 (where there are no fiscal transfers), all of the Ag, Forestry and Waste policies (except AFW-7) require a cap and trade program to create demand for GHG offset reductions from the sector. Federal cap and trade proposals have, however been resisted by stakeholders because they were perceived as an intrusion of federal "tax" authority (Brody, 2010). In the middle of the Column 1 are federal appliance standards adopted by industry without states incurring implementation costs through unfunded mandates. At the bottom of the vertical axis are coordination and cooperation policies. Recall that only cooperation policies require federal transfers.

The horizontal axis categorizes the policies on the degree to which they result in, or require, federal fiscal transfers to the relevant economic sector. The coordination (enabling) policies can provide mutual benefits to multiple levels of governments. A federal DSM charge would help attain federal energy policy goals, such as a reduction in criteria air pollutants, as well as improved energy security. Uniform state and municipal government DSM programs would foster low-cost resource acquisition without leakage of energy-intensive industries to other states, as the DSM charge would be incurred in all jurisdictions.

Table 2: Authority and Type of Funding for Climate Policy Options

Competition-Coordination-Cooperation Continuum	**Competition Policies**	
Federal Preemption (requires national cap and trade or other new federal primacy in authority)	AFW-1 Crop Production Practices AFW-2 Livestock Manure AFW-3 Forest Retention AFW-4 Reforestation/Afforestation AFW-5 Urban Forestry AFW-6 Source Reduction AFW-8 MSW Landfill Gas Management	
Federal Minimum Standards with State Implementation	ES-1 Renewable Portfolio Standard RCI-4 Building Codes	TLU-4 Transit ES-3 Carbon Capture and Storage Standards
	Coordination Policies	**Cooperation Policies**
Federal Minimum Standards with Market Implementation	RCI-3 Appliance standards TLU-5 Anti-Idling Technologies/Practices	
Voluntary Federal Minimum Standards	AFW-7 Enhanced Recycling of MSW TLU-2 State Renewable Fuel Standard TLU-3 Smart Growth	TLU-1 Vehicle Purchase Incentives
Federal Enabling Policies	ES-4 Coal Plant Efficiency Improvements TLU-6 Mode Shift from Truck to Rail	
Financing Mechanisms	RCI-1 DSM	ES-2 Nuclear Incentives RCI-2 High Performance Building Incentives RCI-5 Combined Heat and Power Feed In Tariff

We posit a direct negative relationship between the likelihood of intergovernmental conflict and policy enactment, controlling for other factors such as

the perceived compliance costs of the policies. However, in an era of tax cutting and budget deficits, the cooperation policies that require significant federal transfers are perhaps less likely to be enacted.

MACROECONOMIC IMPACT SIMULATIONS

The major focus of climate action plan analysis has typically been on the direct, or on-site, microeconomic impacts (such as cost effectiveness) of individual mitigation options and aggregate portfolios of actions. However, the assessment of indirect effects, including multiplier effects of increased or decreased output and employment in other sectors of the economy are more politically important. For example, energy efficiency reduces the demand for electricity generation from all sources, including both fossil energy and renewables. It therefore reduces the demand for fuel inputs such as coal and natural gas. At the same time, businesses and households whose electricity bills have decreased have more money to spend on other goods and services. If the households purchase more food or clothing, this stimulates the production of these goods, at least in part, within the state. Food processing and clothing manufacturers in turn purchase more raw materials and hire more employees. Then more raw material suppliers in turn purchase more of the inputs they need, and the additional employees of all these firms in the supply chain purchase more goods and service from their wages and salaries. The sum total of these "indirect" impacts is some multiple of the original direct on-site impact; hence this is often referred to as the multiplier effect, a key aspect of macroeconomic impacts. It applies to both increases and decreases in economic activity. The multiplier effect can be further stimulated by price decreases and muted by price increases.

REMI Model Analysis

The extent of many types of linkages in the economy and macroeconomic impacts is extensive and requires the use of a sophisticated model that reflects the major structural features of an economy, the workings of its markets, and all of the interactions between them. After careful consideration of modeling criteria, such as accuracy, transparency, manageability, and cost, we use the Regional Economic Models, Inc. (REMI) Policy Insight Plus (PI^+) modeling software (REMI, 2009) to evaluate the macroeconomic impacts to the U.S. of implementing the 23 GHG mitigation super-options across the states[1]. This builds on our methodology developed in the analysis of the macroeconomic impacts of climate action plans in several major states (Rose and Wei, 2009; Miller et al., 2010; Rose et al., 2011; Rose and Wei, 2012).

The REMI Model has evolved over the course of 30 years of refinement (see, e.g., Treyz, 1993). It is a (packaged) program, but is built with a combination of national and region-specific data. A macroeconometric forecasting model covers the entire economy, typically in a "top-down" manner, based on macroeconomic aggregate relationships such as consumption and investment. REMI differs somewhat in that it includes some key relationships, such as exports, in a bottom-up approach. In fact, it makes use of the finely-grained sectoring detail of an input-output model, i.e., in the version we used it divides the economy into 169 sectors, thereby allowing

[1] The REMI model is the most widely used macroeconomic modeling software package in the U.S. and has been extensively peer reviewed. The model is used by government agencies in nearly every state of the U.S. REMI Model is superior to the others reviewed in terms of its forecasting ability and is comparable to CGE models in terms of analytical power and accuracy.

important differentials between them. This is especially important in a context of analyzing the impacts of GHG mitigation actions, where various options are fine-tuned to a given sector or where they directly affect several sectors somewhat differently. The macroeconomic character of the model is able to analyze the interactions between sectors (ordinary multiplier effects) but with some refinement for price changes not found in I-O models. The REMI PI^{+} Model also brings into play features of input substitution, labor and capital markets, as well as trade with other states or countries, including changes in competitiveness.

Input Data

The quantification analysis of the microeconomic costs/savings undertaken by the state stakeholder processes was limited to the direct effects of implementing the options.[2] Before undertaking macroeconomic simulations in the REMI model, the direct costs and savings for each policy option are translated to model inputs that can be utilized in the Model. This step involves the selection of appropriate variables and policy levers in the REMI PI^{+} Model to simulate the policy's changes. The reader is referred to previous applications of the model to climate policy impacts (Miller et al., 2010; Rose and Wei, 2011; Rose et al., 2011).

The major data sources of this analysis are the scaled-up quantification results on costs and savings of state level mitigation policy options. See Peterson et al. (2010b) for the scale-up methodology used to derive the national level data of

[2] For example, the direct costs of an energy efficiency option include the ratepayers' payment for the program and the energy customers' expenditure on energy efficiency equipment. The direct economic benefits of this option include the savings on energy bills.

mitigation options from the state climate action plan analysis results. The Stakeholder/Portfolio Scenario from Peterson et al. (2010a) is an aggressive scenario containing no federal cap and trade or taxing authority and assumes full implementation of the 23 GHG mitigation measures in all 50 states. Because of data and resource limitations, our analysis focused our data collection for macroeconomic linkage variables (only) on seven states (Colorado, Washington, North Carolina, Florida, Iowa, Michigan, and Pennsylvania) that are economically and geographically representative of the national economy.

Results

The simulation results indicate that most of the super-options yield positive impacts to the economy. Table 3 presents the impacts in terms of a major macroeconomic indicator –employment– for each super-option for the year 2020. The estimates on GHG reduction potentials for the options are also presented. In the table, the results are presented for both individual options and major sectoral categories, but also for the three categories of intergovernmental relations (competitive, coordinated, and cooperative). By 2020, the employment gains are 2,191 thousand which represent an increase of 1.19% from the baseline levels in 2020. The Net Present Value of the total GDP impacts for the period 2010-2020 is about $356 billion (constant 2007 dollars-not shown). These GHG mitigation options also have the ability to lower the nation's Price Index by 0.77% from baseline by the Year 2020 (not shown). This price decrease has a positive stimulus on GDP and employment.

- The macroeconomic impacts of 15 of the 23 options are positive, which means implementing these policy options is expected to bring about a positive stimulus to the nation's economy by creating more jobs and increasing GDP. Positive stimulus occurs in these options because they result in cost-savings (benefits are greater than costs), and thus lower production costs in their own operation and that of their customers. This raises business profits and the purchasing power of consumers in the country, thus stimulating the economy. Those policy options that result in negative macroeconomic impacts do so primarily because, while they do reduce GHGs, the payback on investment from a purely economic perspective is negative. Options from the Residential, Commercial, and Industrial sector would yield the highest positive impacts on the economy, followed by the options from the Agriculture and Waste Management sector, and the Transportation and Land Use sector.

- Analysis of job impact intensity (jobs per billion tons of CO2e reductions) for the Energy Supply sector indicates that although higher costs result in job losses, they are relatively small, in the order of less than 0.1% of the total economy-wide employment. Full implementation of a national renewable portfolio standard could result in job losses at a rate of 123,000 per billion tons CO2e. Comparatively, the job loss rate for a nuclear standard is much higher at about 293,000 jobs per billion tons CO2e.

Table 3. Employment and GHG Impacts of 23 GHG Mitigation Policy Options in Year 2020 (thousands of full-time-equivalent jobs)*

Mitigation Policy Option	Sectoral Total Employ-ment Impact (thousands)	Employment Impact by Intergovernmental Conflict (thousands)				GHG Reduction (million tCO2e)
		Competitive-No Funding	Competitive-Funding	Coordinated	Cooperative	
ES-1 Renewable Portfolio Standard		-59				473
ES-2 Nuclear					-73	250
ES-3 Carbon Capture and Storage			-35			144
ES-4 Coal Plant Efficiency Improvements				1		138
Energy Supply (ES)	**-166**	**-59**	**-35**	**1**	**-73**	**1005**
RCI-1 DSM				886		471
RCI-2 High Performance Buildings					183	218
RCI-3 Appliance standards				25		70
RCI-4 Building Codes		181				184
RCI-5 Combined Heat and Power					-128	162
Residential/Commercial/Ind. (RCI)	**1148**	**181**	**0**	**911**	**55**	**1105**
AFW-1 Crop Production Practices		88				66
AFW-2 Livestock Manure		-1				17
AFW-3 Forest Retention		71				32
AFW-4 Reforestation/Afforestation		-118				155
AFW-5 Urban Forestry		505				41
AFW-6 Source Reduction		26				85
AFW-7 Enhanced Recycling of MSW				114		225
AFW-8 MSW Landfill Gas Management		94				47
Agriculture, Forestry & Waste (AFW)	**780**	**665**	**0**	**114**	**0**	**668**
TLU-1 Vehicle Purchase Incentives					180	97
TLU-2 Renewable Fuel Standard				-25		92
TLU-3 Smart Growth				166		52
TLU-4 Transit					52	31
TLU-5 Anti-Idling Technologies/Practices			17			32
TLU-6 Mode Shift from Truck to Rail					41	33
Transportation and Land Use (TLU)	**430**	**0**	**17**	**141**	**273**	**337**
Total Employment Impact (thousands)	**2191**	**788**	**-19**	**1167**	**255**	
Total GHG Mitigation (million tCO2e)		**1100**	**176**	**1048**	**791**	**3115**

*Totals may not add up due to rounding

Table 3 also categorizes results according to the three typologies of competition, coordination, and cooperation of intergovernmental conflict for the super-options.

For competitive policies, we also distinguish those that do not receive federal funding and those with some federal fiscal transfers. These employment impact results highlight several important points:

- More than half of the employment gains come from the coordinated policy options that use enabling or financing mechanisms. Option RCI-1 (Demand Side Management) yields the highest positive impacts on the economy—an employment increase of 886 thousand jobs by 2020;

- The competitive policies show mixed economic outcomes. The Renewable Portfolio Standard requires large amounts of capital investment, which will in turn increase energy prices and raise the production cost of businesses and results in considerable dampening effects on the conventional fossil fuel supply sectors. Conversely, the Urban Forestry policy under a federal regulatory regime would result in job growth due to the large labor component for the policy.

- The cooperative policies also show considerable variation in employment effects, with vehicle purchase incentives and high performance building incentives showing large job gains, but CHP and carbon capture and storage showing negative effects due to the high capital investment cost.

DISCUSSION

Overall, the macroeconomic simulations indicate that implementing the mitigation policy options recommended in the state climate change action plans at the national level would generate net positive economic impacts. This win-win portfolio of policies provides significant GHG reductions as well as employment and output gains. The

enabling and financing coordination policies are especially strong candidates for concerted policy development. These policies contribute large economic development benefits; adequate federal funding of DSM alone across the 50 states could result in nearly a million new jobs.

However, to achieve the economic and environmental benefits of the policies will require a shift from conflictual governance to collaborative governance, where authority for implementation between levels of government is represented by joint planning and joint provision of services (Mazmanian and Kraft, 2009). Governments experienced success in coordinating authority between three levels of government in watershed management (Lubell, Leach and Sabatier, 2009) and regional land use planning (Layzer, 2006).

The main theoretical implication from our analysis of conflict and the probability of enactment is that policy design needs to be an explicit exercise in coordination of shared authority between levels of government. The competition-coordination-cooperation taxonomy is one means to measure intergovernmental conflict that impacts the likelihood of enactment. However, institutions and mechanisms for intergovernmental coordination are underprovided because the start-up costs for coordination are often high (Bardach, 1996).

We believe that our theoretical approach is generalizable to other regulatory domains beyond climate policy for several reasons. First, our theory is an extension of Gormely (2006) who coded intergovernmental conflict in the health, education, and environmental policy domains into the money vs. mandate categories. Second, we extend Gormely's approach by applying it to energy regulatory policies, but regulatory

policies in other domains can also be qualitatively identified as minimum standards with state implementation, market or voluntary standards, financing, enabling, or funding policies. Third, our approach is possible because of the large number of "new" climate policies in the portfolio we analyzed. This sample enabled us to categorize the policies on the competition-coordination-cooperation continuum and to relate these with the likelihood of legislative enactment. Each of these policy categories is associated with declining degrees of intergovernmental conflict. However, further research is required to develop empirical estimates of the relationship between intergovernmental conflict and the probability of enactment.

Climate mitigation policies, as with many other regulatory domains, also yield significant "co-benefits". In our case, these include the reduction of air pollution, reduced energy and water consumption, as well as improvements to quality of life that occur mainly at the local level. Institutional design that leverages these co-benefits into GHG mitigation policies is likely to be desired by a wide range of stakeholders at all levels of government and society.

There are also several policy implications from the analysis. First, successful programs to overcome market barriers and failures in the energy sector are optimized when they minimize intergovernmental conflict. Our analysis suggests that instead of national minimum performance standards, energy and environmental efforts should instead focus on financing, enabling, and market and voluntary performance standards. Because a national energy efficiency standard is not likely to be enacted, we should consider that demand reductions from a federal surcharge refunded directly to states for DSM programs. Although such a surcharge based on energy sales is not as

economically efficient as a tax on the carbon content of the fuel, it can still begin to ameliorate energy market failures and barriers and is much more politically feasible.

Second, it is clear from the current debates on federal climate change legislation that the institutions for intergovernmental coordination are not in place. Dialogues between stakeholders at all levels of government and society need to develop shared understanding of what actions are required to optimize U.S. energy and climate policies. These dialogues need to be formalized into policy proposals to facilitate coordination and cooperation between interdependent units of government. We believe that state Climate Action Planning efforts provide a valuable analytical and process template for a national Climate Action Plan that would bring together federal, state, local governments with industry and civil society representatives. A national Climate Action Plan, convened by the U.S. government, with broad stakeholder participation would create federal leadership in collaboration, and reduce perceptions of its domination of state and local climate policies. A national plan would make policy recommendations on: 1) mandatory, market-based, and voluntary performance standards, 2) funding programs to reach GHG reduction targets, 3) enabling and coordination policies that are necessary for all levels of government to attain their GHG reduction targets, economic development goals, and environmental plans. These three elements could be pursued jointly or independently. Each policy is likely to be complex and unique and will require flexible coordination mechanisms and can help fit regulatory authority to the scale of the problem (Freeman and Farber, 2005). Our analysis shows that solutions to climate change will not come *solely* from Washington, DC, nor from state capitals, but rather will be the product of bargaining

between key stakeholders who share common understandings and preferences about GHG mitigation. Climate change mitigation policies need not provoke competition and resistance from either the top down or bottom up.

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