Mobilizing Political Action on Behalf of Future Generations: The Case of Climate Change Policy

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Abstract

By nearly any perspective, insufficient effort has been undertaken to address the risks posed by global climate change. This failure to mobilize sufficient effort to combat climate change reflects the difficult political economy that characterizes the problem. To grossly simplify the problem, the challenge is that future, unborn generations will enjoy the benefits of climate policy while the current generation, and in particular those reaping substantial returns from a status quo that fails to address climate change, will bear the costs. In this paper, I describe the returns to narrowly-defined business capital and a broad concept of capital – physical capital, human capital, environmental capital, social capital, etc. – to illustrate differences in investment incentives and hence political economy considerations for those engaged in climate policy debates. While the standard economist's prescription to price the externality could align private and societal investment incentives and ensure that future generations have the opportunities to enjoy a standard of living at least as good as the current generation, it must confront the political economy that the costs of changing prices are borne primarily by the current generation and concentrated among incumbent firms and the benefits are enjoyed disproportionately by future generations and emerging insurgent firms that aim to bring new technologies to market and capture the incumbents' market share. Tailoring the design of climate policy to mollify the incumbents in opposition and to leverage the potential of the insurgents to build broad political support will be necessary to mobilize successful political action to combat climate change.

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Mobilizing Political Action on Behalf of Future Generations: The Case of Climate Change Policy

Joseph E. Aldy

From nearly any perspective, our efforts to confront the risks posed by global climate change have been insufficient. Since the international community negotiated a treaty focused on climate change in 1992, global carbon dioxide emissions have increased more than 60 percent.[1] President George H.W. Bush agreed to limit U.S. emissions to 1990 levels by 2000, President Bill Clinton agreed to cut U.S. emissions to 7 percent below 1990 levels by 2010, and President Obama has called for an economy-wide cap-and-trade program to lower emissions more than 80 percent by 2050. Yet their stated intentions haven't produced substantive policy. Economic analyses suggest that the benefits of incremental reductions in greenhouse gas emissions greatly exceed the current explicit or implicit price to emit a ton of greenhouse gases by nearly all emission sources around the world.[2] Environmental advocates call for limiting warming to no more than 2 degrees Celsius (3.6 degrees Fahrenheit), while academics question whether such a goal is still feasible.[3]

This failure to mobilize sufficient effort to combat climate change reflects the difficult political economy (that is, the interplay between politics and economics) that characterizes the problem. Mitigating emissions (a) yields a global public good that no individual, firm, or country has a strong incentive to produce unilaterally; (b) imposes near-term costs with benefits spread over centuries; (c) risks exposing domestic firms to adverse pressures from foreign competitors; (d) delivers unclear returns, given uncertainties in climate science, multilateral coordination, market behavior, and technological innovation; and (e) requires a fundamental transformation of the energy foundation of modern industrial economies. Moreover, the distribution of climate change policy's benefits and costs varies across space and time, as well as among various political constituencies and special interests.

To grossly simplify the problem, the challenge is that future, unborn generations will enjoy the benefits of climate policy while the current generation, and in particular those reaping substantial returns from a status quo that fails to address climate change, will bear the costs. Even if this challenge could be overcome, what kinds of investments in protecting the global climate should we make? Nobel Prize-winning economist Thomas Schelling's observation on the eve of the 1997 Kyoto Conference provides some context: "The future beneficiaries of these [climate change] policies in developing countries will almost certainly be better off than their grandparents, today's residents of those countries."[4] Like many other economists, Schelling believes that continued investment in productive physical capital and knowledge creation will make possible a better standard of living for future generations. In effect, these unborn generations will enjoy the benefits of investments made today. Children alive today, however, may bear substantial costs associated with mitigating climate change. Given the discretionary nature of much public spending on children (relative to adults and, especially, the elderly), these costs borne by children today could be disproportionately large.

Thus investing in global climate protection may further enhance future generations' quality of life, but this comes with costs that merit consideration. First, investing in emissions mitigation may reduce the resources available to invest in other forms of capital that the future may value. Second, investment of any kind today represents forgone consumption among members of the current generation, including children.

The current dearth of meaningful investment in climate protection indicates that more climate investment is called for. But the increase in investment shouldn't be random. Going all in on climate protection would not necessarily make future generations better off. Instead, a prudent approach to investing capital, defined in a very broad sense (physical capital, human capital, environmental capital, social capital, etc.), can ensure that future generations will enjoy a standard of living at least as good as that of the current generation. Maintaining if not increasing the capital stock in its broadest sense requires us to use analytic tools to identify the social returns to various kinds of investments, including investments in climate protection, and then translate the results of these analyses into policies that can guide a shift in current economic activity to maximize the social returns on investment in capital, writ large.

This formulation of the problem leads to the standard economist's prescription: "Get prices right." By putting a price on the damage that carbon emissions cause to the environment, the economy and human wellbeing, the private returns to investment could be aligned with the social returns to investment. This prescription, however, must confront the political fact that the costs of changing prices are borne primarily by the current generation while the benefits are enjoyed disproportionately by future generations. Moreover, these current costs are concentrated among politically influential firms whose existing capital imposes net adverse effects on the global climate; economists call these "incumbent" firms. In contrast, as newcomers to the market, emerging "insurgent" firms—those with new and potentially disruptive technologies intended to deliver low- and zero-carbon goods and services that could capture incumbents' market share—have less political power. Given that incumbent firms have long experience using the policy and regulatory processes to their own ends, designing a policy to enhance the influence and investment of insurgent firms to deliver climate benefits to children today (as well as future generations) represents a tall challenge.[5]

The Economics of Sustainability

To frame the political challenge of mobilizing effort on climate change, let's consider the returns to two different types of capital and the incentives for trying to influence policy. First, let's define business capital as appropriable physical and human capital associated with private firms. Second, let's define societal capital as a much broader concept that includes natural capital (such as the global climate), social capital, and knowledge (which can be thought of as a form of non-appropriable human capital).

Given current policies and laws, the agents responsible for managing business capital make decisions to maximize the return on that capital. They decide on procurement of equipment, hiring of personnel, marketing, etc. They may also decide how to engage in policy debates. Industry attempts to shape, influence, and capture regulators and policymakers in order to maximize the returns on its capital.[6] This is true in an array of contexts, from antitrust policy to trade policy to environmental policy.

Some agents who manage incumbent firms may actively oppose policy proposals—such as regulating greenhouse gas emissions or pricing carbon—because they think such policies may reduce the return on their capital. Indeed, they may consider it their fiduciary responsibility to the owners of the firm to allocate resources to oppose climate protection policy. This stylized representation of "business capital" is characterized by (a) incumbents in the market economy (that is, those with existing capital) and (b) firms whose net effect on climate is adverse (thus any regulation to reduce climate change risks would impose net costs on these firms).

Agents of insurgent firms may support climate protection policy proposals because such policies would expand markets for the goods and services that they produce. These firms tend to be relatively new entrants, especially in energy markets, who are developing innovative and potentially disruptive technologies. They compete with the incumbents and aim to capture some of the incumbents' market share, which creates an incentive to try to influence policy.

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In the climate context, much of the incumbents' relevant business capital of fossil fuel extraction and energy production firms are assets whose value could fall, and potentially fall dramatically, with emission mitigation policies. Coal-fired power plants, commercially developed oil fields, and natural gas pipelines could all become stranded assets if climate policy significantly reduced the use of fossil fuels. This creates a strong incentive for the owners of these assets and their managers to oppose such climate change policies, absent some form of compensation. Since fossil fuels vary in their carbon intensity—for example, coal is nearly twice as emission-intensive per unit of energy as natural gas—modestly ramping up climate change policy could benefit natural gas at the expense of coal (and, over the longer term, as climate change policy becomes more ambitious, benefit renewable and nuclear energy at the expense of natural gas). This suggests that fossil fuel producers might not act as a monolithic block in opposing and/or shaping climate policy.

The second, broader type of capital effectively includes all resources left for the next generation.[7] Thus it includes the business capital described above as well as other forms of capital that are imperfectly or incompletely valued in markets, such as natural capital (including the global climate), social capital, and technological knowledge. This broader definition of capital is more closely associated with people's wellbeing than are narrower, market-oriented definitions.[8]

Economics of Sustainability: Policy Implications

Describing capital in this manner has several important policy implications. First, given the various kinds of capital under this broad umbrella, opportunities exist to substitute one kind of capital for another. Future generations might be better off with more climate-related capital and less energy-related physical capital; on the other hand, a small increase in climate capital and a dramatic decrease in physical capital could make them worse off. Investing in natural capital would mean forgoing investment in other kinds of capital. Related to this trade-off, investing the returns from drawing down one form of capital can ensure that consumption doesn't decrease across generations.[9] For example, the extraction of non-renewable resources results in lower non-renewable resource capital. If these returns are consumed by the current generation instead of invested in other forms of capital, then the non-renewable resources may deliver a short-term bump in consumption that will fall as the returns on resource extraction decline with the asset base. Likewise, if drawing down "climate" capital by burning fossil fuels yielded returns that were subsequently invested in new knowledge, then future generations might be no worse off than the current generation even with some climate damages. It is unlikely, however, that the market is currently delivering optimal investment in line with this thinking.

The broad approach to capital that includes all resources left for the next generation has been referred to as the economics of sustainability. Though I won't explore in detail the ethics of our responsibilities to future generations (as well as to our contemporaries), a generally benign formulation of our obligations has been to leave the future with opportunities for consumption no worse than those our generation has enjoyed. Some economists describe this as weak sustainability, because it permits for substitution across various kinds of capital; they contrast it to strong sustainability, which calls for maintaining capital in each category. Underlying the concept of weak sustainability is that a small reduction in one type of capital can be offset by a small increase in another type of capital.

Second, as the stock of capital in any given category decreases, the returns to investment in that kind of capital are likely to increase. In other words, different kinds of capital are roughly interchangeable, but there are limits to substitution. A decline in climate capital that produced catastrophic impacts would make future generations worse off regardless of the returns on other forms of capital. A policy framework that accounts for how changes in each kind of capital alter the returns on incremental investments can account for these limits to substitution.

Third, given strong private incentives to invest in traditional business capital and very weak private incentives to invest in natural capital (combined with inadequate public policy to correct these incentives), the returns to incremental investment in capital protection likely exceed the returns to incremental investment in business capital. Policies that can better align incentives for investment in natural capital can help correct this imbalance, as described in the next section.

Fourth, uncertainty in the returns to capital, and potential differences in the uncertainty in returns across different types of capital, will influence investment decisions. Typically, the greater the uncertainty (or variation) in returns, the larger the expected return necessary to justify an investment. Moreover, uncertainty about the benefits of a policy can reduce the support from the lay public that is likely necessary to drive policymakers' actions.[10] Incumbents face a variety of uncertainties in a conventional business investment, but uncertainty regarding the returns to climate policy is likely much greater, given uncertainties in the science, in technological innovation, in future policies, and in the extent to which other countries around the world will mitigate climate change.

Stakeholders can influence uncertainty. Some may undertake communication campaigns that emphasize the uncertainties in climate change in an effort to delay policy action and investment in climate-friendly technologies.[11] Others may call for investing more in the basic science and holding off on policy prescriptions until the findings of the research are realized; this was the Reagan Administration's approach to acid rain. Of course, businesses make investment decisions every day in the face of uncertainty and risk, which raises the question of why the uncertainty about climate change justifies delaying action. Indeed, businesses often look for ways to hedge risks when making decisions in an uncertain environment. In the climate context, some have done so by simultaneously questioning the science of climate change—hoping to delay policy action—and investing in new resources and technologies (for example, shale gas) whose returns would likely increase under policies to mitigate climate change.

Finally, the prospect of abrupt or catastrophic climate change could result in large, discrete falls in consumption and wellbeing and violate this assumption in the weak sustainability paradigm.[12] In such a case, a strong sustainability framework based on maintaining or enhancing the status quo climate could be justified. The key question is how policy choices could influence the magnitude and/or likelihood of catastrophic climate change. For example, reducing uncertainty about the timing and scale of abrupt and catastrophic climate change could help spur the multilateral collective action necessary to avoid crossing a threshold into a climate catastrophe.[13] Yale economist William Nordhaus suggests that policymakers could react to the potential for catastrophic climate change by investing in geo-engineering technology, such as injecting sunlight-reflecting particles into the upper atmosphere to cool the planet and offset global warming.[14] Employing geo-engineering interventions, while unproven and controversial, to prevent catastrophic climate damages could effectively return the framework for climate policy to the marginal trade-offs in investment and consumption associated with weak sustainability.

Refocusing investment from traditional business capital to capital in the broader sense could promote sustainability. But to do so would require public policy intervention, since private firms do not bear the societal costs that their emissions impose through climate change. How should we consider future generations' interests in developing such policies, and should we engage the two kinds of business capital—incumbents and insurgents—in building political support for climate policy?

Benefit-Cost Analysis and Future Generations' Interests

Benefit-cost analysis is a decision tool that can evaluate various public policy options for correcting a market failure, such as greenhouse gas emissions, in much the same way that private investors assess options for allocating their savings. The policymaker who pursues the option that maximizes net social benefits delivers the outcome that would be expected in the market if it were not characterized by the market failure (that is, if private and social returns were identical). In practice, many benefit-cost analyses are narrow assessments of a specific policy in a specific sector. But we have a number of modeling approaches that permit a dynamic evaluation of the economy-wide impacts of climate protection policies. As a result, we can clearly draw a connection from the outputs of a benefit-cost analysis—which could be described as a societal investment policy—to the economic sustainability framework outlined above.

In the context of a greenhouse gas mitigation policy, benefit-cost analysis typically shows near-term costs associated with reducing emissions and long-term benefits associated with reducing the risks posed by climate change. Given that most greenhouse gases have long atmospheric lifetimes—on the order of hundreds to thousands of years—the benefits of a climate change policy could accrue to many generations in the future. This framework permits an accounting of the streams of benefits and costs over time by using a discount rate to convert benefits and costs that occur in various periods of time into a single, present-day measure. A discount rate reflects the fact that an individual typically values a dollar of consumption today more than a dollar of consumption in the future – for example, she could invest the dollar today and its returns would provide her more than one dollar in the future. A relatively low discount rate, which means that a dollar of consumption in the future is nearly as valuable as a dollar of consumption today, effectively places greater weight on the impacts of climate policy that affect future generations in the distant future.

The Role of Discounting

The future benefits of any climate policy thus depend on the choice of discount rate. Economists have had a long and robust debate on the appropriate discount rate for long-term policy problems.[15] Some support a more prescriptive approach on ethical terms, effectively arguing that all generations should be treated equally, with the permissible discounting to reflect changes in wealth and how the incremental value of consumption declines at higher levels of wealth. Others support a descriptive approach based on revealed preferences in markets in which rates of return on investment could guide the discounting of societal benefits and costs from a climate policy intervention. Complicating the considerations under these very different schools of thought are the implications of uncertainty in determining the appropriate discount rate. As a result, an analyst can draw from a range of plausible discount rates in evaluating the economic impacts of climate policy.

In choosing a discount rate, the stakes are large. Table 1 shows how the present value of $1,000 in climate damage occurring in 2050 varies by a factor of more than 30, from $19 to $623, depending on a choice among four different discount rates. Similarly, the present value of $1,000 in year 2100 damages ranges from 5 cents to $311, and the present value of $1,000 in year 2200 damages ranges near zero to $77.

<<INSERT TABLE 1 ABOUT HERE>>

When Nicholas Stern used a discount rate of 1.4 percent in his 2006 review of the economics of climate change for the government of the United Kingdom, the majority of the present value damages from climate change (that is, the benefits of mitigating climate change) reflected benefits enjoyed after the year 2200.[16] To characterize the benefits of mitigating greenhouse gas emissions, the U.S. Interagency Working Group on the Social Cost of Carbon produced estimates of the social cost of carbon—the dollar value of reduced climate change damages associated with reducing carbon dioxide emissions by one metric ton (1,000 kilograms, or about 1.1 U.S. tons).[17] These estimates have been used by federal regulatory agencies whose rulemaking impacts carbon dioxide emissions, including the Environmental Protection Agency (EPA), the Department of Energy, and the Department of Transportation. The Interagency Working Group’s two reports presented social cost of carbon estimates for three discount rates: 2.5 percent, 3 percent, and 5 percent. The 2015 social cost of carbon at the 2.5 percent rate is $58 per metric ton of carbon dioxide, which is more than 50 percent greater than the social cost of carbon estimate for that year based on a 3 percent discount rate and nearly five times greater than the social cost of carbon estimate at the 5 percent discount rate. These results are not necessarily surprising. The National Research Council has noted that the social cost of carbon can plausibly range by two orders of magnitude with the choice of discount rate determining one order of magnitude.[18]

Since the social cost of carbon distills the impacts of climate change into a single measure of the marginal damages associated with carbon dioxide emissions, it can guide the design of welfare-maximizing public policies. Just as an investor in business capital will pursue investment until the return on her last dollar of investment is equal to the return of the next-best alternative investment, a policymaker can pursue climate protection policy until the marginal cost of emission mitigation is on par with the societal return on that mitigation—the social cost of carbon. Thus, mitigation policies with a marginal cost equal to the social cost of carbon—for example, a carbon tax in line with the social cost of carbon—would maximize net social benefits.

In practice, public policies appear to deviate significantly from the guidance that benefit-cost analysis could supply. With the exception of a few carbon tax programs in northern Europe and the Canadian province of British Columbia, most policies that impact greenhouse gas emissions do not explicitly set a price (or marginal cost) on emissions. Some governments—such as the European Union, California, Quebec, and several cities in China—employ carbon dioxide cap-and-trade programs. (A cap-and-trade system constrains the aggregate emissions of regulated sources by creating a limited number of tradable emission allowances—whose sum is equal to the overall cap—and requiring those sources to surrender allowances to cover their emissions.[19]) The dramatic volatility in allowance prices in these markets, especially in the EU

Emission Trading Scheme, indicates that, in all likelihood, the marginal cost of compliance rarely equals the social cost of carbon.[20] An examination of policy instruments around the world suggests that explicit and implicit carbon prices under these policies vary by a factor of 100.[21]

The variation in carbon prices could reflect differences in how governments evaluate the benefits of their climate protection programs. Given the uncertainty in the social cost of carbon, it's possible that failure to coordinate on a single estimate of the benefits has resulted in policies that reflect the tremendous variation in marginal costs. It's more likely, however, that special interests have influenced the policy debates, which have yielded a vast array of nth-best public policies in lieu of a carbon tax. This influence can take several forms.

Engagement of Stakeholders

First, insurgent firms may push for public policies that subsidize and/or mandate their innovative technologies. They may have a strong interest in policies that could, in the context of the broad capital framework presented above, produce excess investment in their technologies. For example, some possible renewable power policies have implicit carbon prices ten times greater than the U.S. Government's estimate of the social cost of carbon at a 2.5 percent discount rate.[22] Incumbent firms might not oppose such policies if they perceive that their implementation would weaken political resolve for more comprehensive and ambitious policies, such as a carbon tax.

Second, some special interests may attempt to use public support for climate protection policies as a rationale for their preferred policies, even if those policies would have negligible impacts on the global climate. For example, biofuel producers have claimed that their output can substitute for carbon-intensive petroleum products. In practice, the vast majority of biofuels sold in the United States are corn ethanol blends, which, over their life cycle, yield very small carbon dioxide emission benefits when compared with gasoline manufactured from crude oil.

Third, incumbents may support public policies that impose more substantial regulatory requirements, and hence greater costs, on new sources of emissions.[23] This so-called vintage-differentiated regulation has been used in many contexts, including vehicle pollution standards and power plant pollution regulations.[24] The incumbents may claim that it would be unfair to set strict standards on their existing assets, since that would effectively change the rules of the game relative to when they made their initial investments in those assets. They also frequently claim that it would be less expensive to impose requirements on new capital, as opposed to retrofitting existing capital. In effect, vintage-differentiated regulation can extend the lifetimes of existing, pollution-intensive capital, since the cost of new capital is higher under the regulation. Imposing a single, common carbon price on emission sources would eliminate mitigate the inefficiencies of vintage differentiation and establish a level playing field for existing and new capital. But this prospect of a level playing field is exactly what spurs incumbents to push for the vintage-differentiation approach.

Fourth, and most important, is what Bruce Yandle calls the “Baptists and bootleggers” phenomenon.[25] The Baptists, who opposed Sunday liquor sales for moral reasons, and the bootleggers, who opposed Sunday liquor sales for business reasons, found common cause in many state and local policy debates. The key characteristics of such coalitions are that the moral champion sets the policy objective while the business champion determines the implementation. For example, in the climate policy context, environmental groups may call for ambitious emission mitigation goals. Some businesses may support such policies, conditional on their being able to influence the policies designed to implement these goals. As a result, a simple economy-wide carbon tax could be rejected in favor of a much more complicated suite of policies that conveys returns to (at least some) incumbent firms, perhaps in a relatively opaque manner.

When Can Future and Current Generations' Interests Coincide?

We might be able to design climate change policies that can draw support from various special interests in the current generation, including (some) incumbents and insurgents. To provide background for these opportunities, I identify insights from other policy contexts and point out some important differences between those contexts and climate change.

Other Policy Contexts: Insights and Differences

A successful climate change policy will transform the energy foundation of industrial economies. This transformation will require a long-term, comprehensive commitment in the United States and in economies around the world. As we've seen, the political challenge reflects the near-term costs, borne by one group, coupled with the long-term benefits, enjoyed by other groups. In this regard, climate change differs from other major policy reforms in American history. Let's consider a few examples.

The innovation of public pensions through the 1935 Social Security Act provided almost immediate economic benefits to current retirees as well as the promise of retirement benefits for all individuals when they attain retirement age. All workers bear the costs of participating in Social Security, through the payroll tax, but these workers all enjoy the returns of doing so on retirement. Moreover, creating an age-specific program gave elderly populations a strong incentive to mobilize politically to sustain the public pension program. The elderly can and have lobbied for similar programs around the developed world as a result of successful special interest political competition.[26]

The Interstate Highway Act of 1956 called for a 40,000-plus mile network of high-speed freeways across the country. This created substantial demand for construction jobs in every state and every Congressional district, delivering broad near-term economic benefits. In addition, the Interstate Highway System answered important needs in terms of homeland defense and the military threat posed by the Soviet Union. This infrastructure investment facilitated rapid growth in transportation of goods and people over the following decades. Moreover, these freeways were financed through gasoline and diesel taxes—which are effectively user fees—so that many of those enjoying the benefits also bore much of the costs.

The Clean Air Act of 1970 and the Clean Water Act of 1972 established ambitious standards, new regulatory authorities, and extensive enforcement tools to clean up the nation's poor air and water quality. Media images of a river catching on fire and cars driving with headlights on during the middle of a cloud-free but highly polluted day illustrated the environmental crisis that motivated a broad political response through these laws. Americans' everyday experience with poor air and/or water quality dramatically improved the salience of these problems and the need for policy remedies. In contrast to climate change policy, which is intended to prevent a future environmental crisis, these laws aimed to correct existing environmental degradation and, in some places, a current environmental crisis.

These three examples—of social insurance, infrastructure investment, and environmental policy—highlight some of the key characteristics of long-term, durable, successful public policies. First, they each remedied a publicly salient contemporary crisis or threat. Second, they show how near-term benefits can be enjoyed broadly across the country. Third, in the case of

Social Security and the Interstate Highway System, there were few private sector incumbents who could be adversely affected by the public policies. The absence of private old-age insurance and private freeways served as the motivation for these public interventions.

The case of climate change differs in all three aspects. First, when it comes to climate change, the task today is to prevent rather than remediate. Second, most benefits of climate policy will accrue in the coming decades and even centuries. Third, climate change policy could easily reduce the value of an extensive array of fossil fuel capital and resource stocks.

Implications for Climate Change Policy

Climate change differs in another important way from these three public policy examples. Old-age pensions, freeway construction, and local air and water quality are distinctly domestic challenges, but climate change is a global problem that will require multilateral coordination. Although I've focused in this article on the U.S. political economy, the same issues play out in other countries and shape the conduct of climate-related international relations. The question of who bears the cost of climate change mitigation has served as one of the primary factors limiting progress in multilateral climate negotiations.[27] The prospect that the United States could impose costly, unilateral emission mitigation policies while its trade partners fail to implement climate change policy has made U.S. manufacturers worried about losing competitiveness, even if the empirical evidence suggests quite modest impacts.[28] Moreover, many developing countries claim that their current economic development needs—including education and public health benefits for today's children—trump the need for them to invest in climate mitigation. Some developing countries have indicated that they will undertake substantial emission mitigation only when they have raised the wellbeing of their population to a satisfactory level.

Yet despite the differences, insights from successful policies in other domains could help solve the political economy challenge of climate change policy. For example, designing climate policy to deliver broad, near-term benefits could help overcome some of the political opposition. To do so might require linking climate policy with other policy issues, or linking various interest groups. Prominent events—such as Hurricane Sandy, heat waves, etc.—may also be used to focus public interest in tackling the climate change problem. And if climate policy can pass Congress, then Congress's inertia may create an institutional bias for sustaining climate policy.

Given these insights, let's consider a few examples of how policy could alter the difficult political economy of climate change and produce meaningful action.

Policy Choice and Design

The political need for near-term benefits, coupled with the Baptists and bootleggers phenomenon, suggests that climate policy could be tailored to compensate owners of capital who might bear the costs of protecting the climate. For example, a greenhouse gas emission cap-and-trade program could be designed in a way that secures support from a broad array of the owners of private capital. Faced with the choice of surrendering an allowance or reducing emissions, firms would place a value on an allowance that reflects the cost of the emission reductions that they could avoid by surrendering an allowance. Regardless of how the allowances are initially distributed, trading can ensure that allowances are put to their highest valued use: covering the emissions that are most costly to reduce and providing an incentive to undertake the least costly reductions.[29]

By setting a binding cap on emissions and establishing tradable emission allowances, the government would effectively create an asset with substantial value. Various analyses that model proposed economy-wide cap-and-trade programs for the United States suggest that the value of allowances could range from $100 billion to $300 billion annually.[30] At least in the early years of a cap-and-trade program, this value would likely exceed the direct costs borne by owners of capital in complying with the program. One analysis showed that giving approximately 15 percent of emission allowances to U.S. fossil fuel producers would leave their profits unchanged under a cap-and-trade program.[31] Moreover, strategic allocation of allowances could elicit support from industry for a cap-and-trade regime.[32] The American Clean Energy and Security Act of 2009 (H.R. 2454), also known as the Waxman-Markey bill, which passed the U.S. House of Representatives, received the support of the U.S. Climate Action Partnership, a business-environmental group coalition that included about 20 major corporations in the energy, manufacturing, and services sectors. The bill gave away allowances at no cost to a vast array of users, slowly transitioning to an auction system over several decades.

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By modifying implementation to secure political support from incumbents, such an approach might risk forgoing socially valuable investment that future generations would prefer. For example, channeling some of the value of emission allowances to finance research and development could significantly lower the long-term costs of emissions mitigation and yield returns to other sectors of the economy. Revenues from climate policy could also be used to reduce the burden of existing taxes (more on this below).

Strategically Linking Interest Groups

I've shown that tailoring climate policy to give direct economic value to incumbent firms could compensate them for the costs of such policies and thus reduce or eliminate their opposition. An alternative approach could take the value created under climate policy and dedicate it to tax reform. [33] The government could set a tax in terms of dollars per ton of CO_2 emissions from sources covered by the tax, or—more likely—a tax on the carbon content of the three fossil fuels (coal, petroleum, and natural gas) as they enter the economy. The revenues raised by the carbon tax (or, similarly, by a an auction of emission allowances under a cap-and-trade program) could be used to elicit strong support from a broader business constituency. Writing elsewhere, I've proposed using carbon tax revenues as part of a larger reform of the tax code coupled with eliminating preempting greenhouse gas regulation under the Clean Air Act.[34] Business stakeholders interested in corporate tax reform and lowering the marginal tax rate on corporate income could find this proposal appealing.

A potential drawback to this approach is that it would distribute the benefits of tax reform to a much broader group of business interests than those directly impacted by climate policy. Firms may not support direct subsidies if they can't effectively limit who receives the subsidies, as in the case of an across-the-board cut in the corporate income tax rate.[35]

Carbon taxes also face a great deal of resistance. Despite economists' enthusiasm for carbon taxes, the general public and the American political system have been less receptive. A carbon tax makes the cost of environmental policy much more obvious than conventional regulatory approaches do, which could in turn impose political costs for politicians seeking reelection. Moreover, a tax imposes costs on concentrated, influential, and resourceful business interests, such as oil, gas, and coal companies. Finally, few environmental groups have embraced a carbon tax because they worry that it would be less effective in reducing emissions than conventional regulations.

In contrast, a carbon tax has received support in other countries, with Scandinavian governments as well as the government of the province of British Columbia having implemented a carbon tax. Differences in political institutions, in public attitudes toward the environment, and the emission-intensity of the resource base (e.g., about 90% of British Columbia's power comes from hydroelectric dams) help explain the greater support for a carbon tax in these economies than in the United States. Nonetheless, the majority of the world's population lives in developing countries that subsidize the consumption of fossil fuel-based transportation fuels and electricity.[36] The challenges in reforming fossil fuel subsidies reflect similar political obstacles to pricing carbon through a carbon tax. The global trend, however, is towards greater interest in and support for policies that price carbon.[37] In light of the emerging international climate policy regime focused on countries making unilateral emission mitigation pledges subject to periodic review, such domestic policy reforms could serve as the foundation for international coordination on protecting the global climate. Indeed, the structure of international climate policy reflects, in large part, the domestic political constraints in the major economies participating in the climate negotiations.

Alternatively, policy designers could aim to draw support from across multiple generations. Public opinion polls tend to show that younger people have stronger interests than older people do in addressing climate change, while older people have stronger interests in supporting Social Security and Medicare. Climate policies that integrate these interests could attract a broad political constituency across generations.[38] For example, the tax or auction revenues from climate policy could be used to fill funding gaps in other government programs, such as Social Security or Medicare. In 1997, staff to the Council of Economic Advisers conducted analysis on how revenues from a carbon dioxide cap-and-trade program could offset forecasted funding shortfalls in Social Security.

Strategically Linking Issues

The marketing of climate policy could focus on ancillary benefits enjoyed by the current generation. Politicians advocating for climate change mitigation policies will often talk about the fact that improved local air quality also improve respiratory health and reduce the risk of death.[39] For example, in his 2013 Georgetown University speech, President Obama said, “So today, for the sake of our children, and the health and safety of all Americans, I’m directing the Environmental Protection Agency to put an end to the limitless dumping of carbon pollution from our power plants, and complete new pollution standards for both new and existing power plants.” In August 2015, the U.S. Environmental Protection Agency issued the standards Obama called for in this speech through the so-called Clean Power Plan. In its economic evaluation of the regulation, the EPA estimated year-2030 climate benefits of $20 billion and public health benefits from reducing local air pollutants ranging from $14 to $30 billion.[40]

Given the severe air pollution problems in large developing countries, some climate policy advocates have seized on the prospect that climate policy could improve the current generation’s health. For example, in China, reducing carbon dioxide emissions under some long-term climate stabilization scenarios could deliver health benefits worth from $70 to $840 per ton of carbon dioxide abated.[41]

Yet the argument that climate policy could also improve health faces political and policy obstacles. Some opponents of climate policy agree on the value of improving local air quality but question whether greenhouse gas mitigation policies are the most effective way to deliver those benefits. For example, they might argue that if reducing fine particulate pollution yields major health benefits, then environmental policy should target particulates directly. A report from the Organisation for Economic Co-operation and Development found that the local air quality co-benefits of mitigating carbon dioxide emissions may not motivate large developing countries to implement ambitious climate change policies because directly controlling air pollution appears to be less costly in these countries.[42] Moreover, many policies that directly target conventional air pollutants do not necessarily reduce—and in some cases may increase—carbon dioxide emissions. Installing scrubbers on coal-fired power plants, for example, imposes an energy penalty that effectively increases the emissions of carbon dioxide per kilowatt-hour of power generated.

In the 2009 debate over the Waxman-Markey bill, politicians often described it as a "jobs bill" that would promote U.S. energy independence. For example, at the end of the floor debate on the bill, Speaker Nancy Pelosi's entire speech was "Jobs, jobs, jobs, jobs." On the other side of the debate, opponents decried the bill as part of a broader pattern of "job-killing regulations." In practice, neither of these rhetorical positions is on target. Pricing carbon is unlikely to serve as a credible substitute for economic stimulus, and empirical analyses suggest that the potential for job losses in energy-intensive manufacturing—the sectors most likely at risk under climate change policy—is quite modest and is swamped by other factors affecting the same labor markets, such as technological innovation and trade policy.[43] Nonetheless, advocates for U.S. climate policy continue to highlight the job creation opportunities associated with insurgent technologies.

Make Insurgents into Incumbents

Subsidizing energy efficiency and renewable energy can, over time, increase the size and potential clout of the “insurgent” business constituency. For example, the U.S. solar industry recently claimed that it employs more workers than the U.S. coal industry. The growth of the solar industry reflects a variety of market and policy factors, including the very generous support for solar power through the American Recovery and Reinvestment Act of 2009. Several new utility-scale solar facilities have been supported through government-subsidized loan guarantees. All solar investment benefits from accelerated depreciation and a capital subsidy in the form of a grant or an investment tax credit. These policies have also significantly enhanced the growth of the U.S. wind power industry, which has more than doubled its installed capacity since 2008.[44]

Likewise, the ramping up of clean energy investment, especially in Silicon Valley, has helped promote support for climate protection policies. Owners of capital with large investment positions in novel energy technologies have a vested interest in policies that create markets for these innovations. As a result, during the public debate about the future of California climate policy around the 2010 ballot proposition 23—which would have effectively ended California’s efforts to design and implement climate change policies, including a cap-and-trade program—incumbent big oil companies made substantial donations supporting the proposition, and major investors in clean energy ventures made substantial donations opposing it. The proposition’s opponents raised nearly three times as much in donations as the proponents, reflecting the political and economic strength of clean energy capital in California.

Finally, investing in research and development for new technologies can change the economic calculus for future policies. Encouraging innovation can deliver new knowledge, new technologies, new processes, and new products whose existence is irreversible. A major R&D

program today could lower the costs of mitigation policies tomorrow, by increasing the range of commercial low- and zero-carbon technologies. Indeed, the August 2015 EPA Clean Power Plan set more ambitious carbon dioxide targets for the U.S. power sector than the EPA had proposed earlier partly because the costs of new renewable power-generating technologies had fallen.[45] The declining costs reflect a number of factors, including a multi-decade history of public sector support for renewable energy R&D and subsidies that have contributed to scale economies and learning by doing.

Institutions and Durable Climate Policy

Economists have often assumed away the importance of institutions in their scholarship on environmental policy.[46] Nonetheless, the political institutions through which climate policy is made can significantly affect the influence of various constituencies and the outcome of policy debates. In particular, the design and implementation of policy-making institutions can create veto points and opportunities for people engaged in climate policy debates. Let's consider a few illustrations from the process of drafting new statutes in Congress and writing rules in regulatory agencies before examining how to design a durable climate policy by exploiting existing institutional frameworks.

In Congress, committees play the initial role in writing, rewriting, and voting on bills. The composition of committee memberships is not random but reflects the interests of specific members as well as the interests of their constituents and campaign backers. For example, the composition of the House Energy and Commerce Committee affected the design and revision of the 2009 Waxman-Markey bill, as well as the committee's voting.[47] In particular, the disproportionate representation of energy-producing districts affected the way allowances were allocated; for example, a set-aside of free allowances for petroleum refineries was necessary to secure the votes of several members with refineries in their home districts.

Various stakeholders' political influence with members of specific committees can influence the type of policies these stakeholders support. Some stakeholders have developed strong relationships with committees whose jurisdiction constrains the kinds of policies that they write into bills. For example, the preference for cap-and-trade in U.S. climate policy debates—at least relative to a carbon tax—may reflect environmental advocates' preference for working with environmental committees (such as the Senate Environment and Public Works Committee and the House Energy and Commerce Committee) than with tax-writing committees, which they view as "less green" and controlled by incumbent business interests.[48]

The voting rules in Congress—and particularly in the Senate, with its de facto super-majority vote requirement under today's filibuster procedures—also influence the characteristics of policy. For example, two colleagues and I simulated support for a national clean energy standard in the House and Senate, and contrasted it to what would be expected under a national referendum (that is, majority rule) based on survey data.[49] The 60-vote threshold to defeat a filibuster in the Senate suggests that only a very low-cost, modest clean energy standard would pass that chamber, in contrast to what would be possible under simple majority-rule voting in the Senate. Given the greater support for policies to reduce greenhouse gas emissions among the young, relative to older voters, voter turnout among younger generations could change the composition of Congress and make it more inclined to consider climate change legislation.[50] Of course, other factors may constrain such influence, such as the construction of Congressional districts; the extent to which any voters, young or old, will vote in an election primarily based on a candidate's position on climate change; the campaign finance landscape; and other factors.

Alternatively, the Executive Branch may use its statutory authority to draft new regulations on climate policy, as the EPA did with the Clean Power Plan.[51] This regulation illustrates the many institutions involved in—and the many opportunities for delaying or vetoing—climate policy. First, the EPA proposed the rule and solicited comment in 2014. It received more than four million public comments, which allowed feedback to shape the final rule. Second, the EPA's final rule, issued in August 2015, gave Congress the opportunity to strike down the regulation under the Congressional Review Act. Third, several coal companies opposing the rule filed lawsuits on the same day that the EPA issued the final rule, and legal scholars anticipate an important and potentially lengthy judicial review process. Finally, the Clean Power Plan includes a very important role for the states to develop their own plans for reducing power-sector carbon dioxide emissions. This reflects the nature of federalism generally in American public policy and in particular for climate policy (under the Clean Air Act, the statutory authority for this regulation), which can influence incentives and create opportunities for policy innovation as well as establish another veto point for opponents of climate policy.[52]

Building a durable, long-term climate policy will require accounting for and exploiting existing political institutions.[53] The veto points raise barriers to realizing meaningful climate policy in the first place. For example, the failure to pass national cap-and-trade legislation in the Senate in 2010 precipitated the development of the regulatory approach through the 2015 Clean Power Plan. Of course, the veto points built into American political institutions can also serve to maintain climate policy should it becomes the new status quo. Securing a long-lived political constituency for a climate policy would help it last. Given the strong bias for the status quo in American political institutions, this would mean bringing together a sufficiently strong political coalition to change policy from the status quo and then maintaining this coalition to defend the new status quo once climate policy has taken affect. The design of climate policy, including the design of new institutions and the use of existing institutions, could facilitate such a defense. Incorporating flexibility—to permit modifications of policy as new information arrives—may also ensure strong political support and policy durability, so long as we don't introduce new veto points in the process.

Conclusions

Mark Twain allegedly said, "Everybody talks about the weather, but nobody does anything about it." The risks posed by climate change have elicited political rhetoric for decades, but little substantial policy action. This political outcome is not surprising given that the benefits of climate policy disproportionately accrue to future generations and that the costs are disproportionately borne by current generations—and concentrated among select incumbent firms in the fossil fuel industries.

I've used a stylized capital framework to illustrate both how to frame the current generation's obligations to future generations and the political economy challenges of mobilizing action to address climate change. Owners of existing business capital—especially the large incumbent firms—have strong incentives to oppose climate policy. Their private interests diverge from the larger societal interests to maximize the return to all forms of capital, including natural capital. Ensuring that today's children (as well as their children and their children's children) will grow up to enjoy a level of wellbeing and consumption no worse than what today's generation experiences requires a public policy response that promotes a broad approach to investment in all forms of capital.

Children, as well as future generations, lack a strong voice in climate policy debates. But we can design policy approaches that attempt to drive action consistent with their interests. The key challenge lies in crafting policies that mesh the interests of the current generation with those of future generations. I've presented several such approaches, drawing from both economic research and real-world policy debates. Indeed, the incumbent firms' preference for policies to maximize private returns can be used to design climate policies that deliver some near-term benefits in exchange for meaningful climate change mitigation. Alternatively, a successful climate policy design could link issues or link interest groups in a way that builds support in a policy space broader than just climate change. Finally, policy support for insurgent firms with low-carbon, disruptive technologies could eventually transform them into politically potent incumbents who could challenge the fossil fuel firms. Tailoring climate policy to mollify the incumbents who oppose it and to boost the potential of the insurgents to build broad political support will be necessary if we are to mobilize successful political action to combat climate change.

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