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Political Institutions and Greenhouse Gas Controls

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Executive Summary

This paper applies ideas from the field of political economy to the subject of climate policy. It stresses the work by Douglass North and others active in what is sometimes called the 'new institutional economics' (NIE). It also borrows heavily from studies of international political economy by Stephen Krasner, Robert Keohane, and others.

Viewing climate policy in light of concepts drawn from their work reveals that institutions limit the extent to which policies to reduce greenhouse gas (GHG) emissions will be adopted, and it suggests that the policies that are adopted are likely to be far less cost-effective than the economists' ideal. Some of these policy failures arise at the global level, and some can be traced to institutions within major states.

Globally, no third party exists to enforce agreements. The incidence of the costs and benefits of GHG controls appears to be highly asymmetric; hence, for a global accord to be the well-being of every participant, it would require large wealth transfers among parties. Even with less stringent, and therefore less costly, targets, a free-rider problem will always remain.

Game theoretic literature suggests that the only remedy to that problem would be to build a coalition of major emitting countries. At a minimum it would need to include the EU, U.S. and China. The coalition would need to stand ready to use trade (or other) sanctions to enforce controls on all other states. Each coalition member would have to make substantial emissions reductions and credibly commit to impose trade sanctions under predefined conditions.

The major states' past and current policy choices are reflected in the global agreements that have emerged and even more in those that have not emerged. This record implies that either they are unwilling to make the needed commitments or that they are unable to do so. Individual states, or small coalitions, may still opt for controls. In that case, though, the next question comes to the fore: how will disparate national institutions affect the measures and outcomes taken-up by different countries?

Institutional constraints also exist within key nations, and they will affect willingness to make international commitments and the nature and outcomes of domestic policies. In the United States, political institutions of representative government seem to block comprehensive climate legislation based solely on cap-and-trade or carbon taxes, and legislators' re-election incentives

lead to adoption of regulatory and subsidy programs that greatly increase costs of mitigation. China's legal and economic institutions currently support an energy-intensive form of development and could not apply an effective GHG cap-and-trade or carbon tax. These kinds of GHG controls require the full rule of law, market prices for energy, market discipline for major industries, and transparency in areas where other policies could reverse the economic incentives. In China, the prospects for such a transformation remain highly uncertain.

The most likely course for future efforts to reduce emissions is drift and fragmentation. Some countries, including the U.S., may adopt GHG limits, or, more likely, they will enact some set of policies that in a makeshift and inefficient way begin to lower emissions. One key issue is whether the U.S. will be able to make institutional changes to limit the economic harm from adopting poorly designed GHG controls. The trade-off between the benefits of correcting policy mistakes and the costs of added uncertainty needs serious thought. A second issue is whether the institutional changes that would be required to alter the likely development path in countries like China will, in fact, occur.

The grim outlook for global and national action poses questions about whether it will be possible to adapt to climate change or to find means to prevent warming despite continuing GHG emissions. Cost-effective adaptation can greatly reduce harm from climate change, but it too requires supporting institutions. The poor countries that are thought to be most the vulnerable to climate change lack such institutions, which is indeed a major cause of their poverty.

Exploring these options will require a new, broader focus for climate policy analysis. To achieve this wider view, the lessons of political economy must become central to the study of climate policy. An initial step toward this goal would be to encourage a systematic exchange of views between the climate modeling community and leading scholars in the traditions of political economy and institutional economics.

1. Introduction: Need for broader view of climate policy

"What passes for optimism is most often the effect of an intellectual error." (Raymond Aron)

"Organized hypocrisy--the presence of longstanding norms that are frequently violated--has been an enduring attribute of international relations." (Stephen Krasner)

This paper applies ideas from the field of political economy to the subject of climate policy. In doing so, it stresses the work by Douglass North and others active in what is sometimes called the 'new institutional economics' (NIE). It also borrows heavily from studies of world political economy by Stephen Krasner, Robert Keohane, and others.

Viewing climate policy in light of concepts drawn from these scholars reveals that deeply-rooted institutions of the major world powers impede efforts to control greenhouse gas (GHG) emissions within those nations. It also discloses other, equally obstinate, barriers to GHG controls that are at work at the global level. These barriers have defeated past efforts to cap emissions, and they are likely to continue to do so for decades to come; thus alternative ways of limiting the damage from climate change merit careful exploration.

The need for new analysis is, we believe, manifest. Climate policy is in disarray. After twenty plus years of effort, GHG emissions are rising, not falling, and there is no prospect for a near-term reversal of that trend. Some countries, it is true, are proposing to impose emission limits; yet these limits are structured in ways that, if they were implemented, would cause them to produce net costs rather than benefits.

Yet much mainstream climate policy analysis has slighted questions about the causes of these failures. Instead, it has stressed the use of large integrated models of the climate system and the economy. These models do indeed produce valuable insights about economic and demographic constraints. They are, though, poorly suited to the task of answering central questions about institutions and national and global power balances. Work by NIE scholars and world political economists may open new windows through which to view these neglected factors.

1.1. Climate policy: Accomplishments versus aspirations

1.1.1. Current status of climate policy

In the twenty plus years since the first meeting of the Intergovernmental Panel on Climate Change (IPCC), the UN body established to solve the problem of warming, 'progress' has been almost purely rhetorical. Currently, according to the U.S. Energy Information Agency, global emissions of CO_2, the most important greenhouse gas, were over a third higher than they had been in 1988. The IPCC reports that the rise in atmospheric GHG levels, at least until the current recession, speeded-up through the last several decades.

After twenty years of laborious efforts, the plain truth is that greenhouse gas controls have failed to move the needle on global emissions. Even in Europe, where the social consensus for GHG reduction is supposedly strongest, emissions continue to grow.[1] Where they have fallen, underlying changes in economic structure may have played a bigger role than climate policy.

This record should call to mind the adage, "What cannot happen, will not happen." Given the results to date, it seems reasonable to ask if the conditions required for making steep cuts in global GHG emissions are, in fact, present. There is very little sign that this question is receiving the attention that it deserves. Instead, proposals for hasty frontal attacks on near-term emission levels continue to dominate the public discourse on global warming.[*] As a result, much of the policy discussion focuses on arguments about the details of 'options' that may be illusory.

1.1.2. The standard of success

Halting climate change through GHG control would require achieving zero net GHG emissions. If the goal is to stabilize at 550 ppm CO_2, global emissions must fall to roughly 20 percent of business-as-usual projections by mid to late century.[2] The speed with which this emission rate is achieved will determine the GHG level at which the atmosphere stabilizes, but this emission rate must be reached at some point or concentrations will go on rising. Indeed, even after no more GHG is being added to the atmosphere, lags in the climate system will case the planet would go on to warming for many decades.

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[*] Aspirations to even more ambitious long-term goals are found in the EU's commitment to limiting long-term concentrations to 450 ppm or less, and discussion in the U.S. Congress of emission caps for 2050 requiring 80% reductions in emissions from current levels.

Recent trends foresee global energy consumption doubling, or even tripling, by 2050. Existing GHG-free energy technologies, and incremental improvements to them, cannot supply this growth at realistic costs. This trend, given the importance of fossil fuel as an energy source casts a very dark cloud over hopes of significantly curbing emissions.[3]

A successful GHG control strategy would need to meet two challenges. One is to develop radically less costly and more abundant new GHG-free energy sources. The other is to secure the worldwide adoption of those sources. Both of these challenges are likely to encounter major hurdles at both the national and the global levels of decision making.

1.2. Need for greater focus on institutions

The central fact of climate policy is that institutions are a filter through which climate policy proposals must pass before they can take effect. The filter turns out to be highly selective. Analysis that assumes away the resulting narrowing of the available choices risks mistaking quixotic options for real ones.

In recent decades many social science disciplines have experienced the rise of "a new institutionalism", and this paper borrows heavily from some of that work. In international political economy, this trend has led to the rise of what has sometimes been called institutional liberalism, and the latter, with a distinctly realist twist, will be used here and is discussed at greater length in the next full section.

This paper's debt to the work of Douglass North and his colleagues is especially heavy. North has said that his work could be summed-up by the words, "institutions matter". North is one of the founders of what is sometimes called the new institutional economics or NIE.

1.2.1. Institutions defined

The reader, though, should beware. By institution, North means something that differs from what one often meets elsewhere. He uses an analogy to distinguishes between "institutions" and "organizations". As he puts it, institutions are the rules of the game and organizations are the teams that play it.[4]

Rules of the game, here, is a broad term. It covers constitutions, laws, regulations, organizational rules and procedures, cultural norms, and social mores, but it excludes General Motors, or the U.S. Congress, or the UN. The latter are organizations.

This word choice differs from that seen in much existing climate policy analysis. There, the terms "institution" and "institution building" are often used in contexts where North and his colleagues would refer to organizations. As a result much climate policy analysis can appear at first glance to reflect a concern with institutions, but it does not, in fact, focus on the changing of the economic political and social "rules of the game".

It is not that North and his colleagues dismiss the importance of organizations. To the contrary, a recent book finds the strength and number of organizations to be quite important to a society's economic performance.[5] They do, though, sharply distinguish between the terms. This paper will follow their practice.

Some institutions are formal (written), and others are informal. Some of the latter, North points out, can be extremely durable. They can survive even revolutions. Think of the survival of Confucian family values through China's Communist period.[6]

1.3. Current climate policy analysis

Most climate policy analysis largely ignores questions about the capacity and limits imposed by political institutions and global power politics. Instead of focusing on the measures in place or under active consideration, its longer term studies most often deal with the hypothetical impacts of ideal policies.[*] Tellingly, IPCC analysis eschews overt mention of the entire process of policy formation. Thus a recent report rather blithely states that changing technologies, lifestyles, and management practices can limit GHG emissions. Governments; it goes on to claim, have many options with which to effect the needed changes.[7] The chance that the existing matrix of institutions may simply precludes making desired changes seems to be as remote from the authors' minds as is the risk that unexpected outcomes could do more harm than good. It is as if the long sorry record of development aid programs gone awry[8] had never been assembled or assessed.

Long-term policy analysis has largely been based on Integrated Assessment Models (IAMs) designed to explore some of the costs and benefits of reducing greenhouse gas emissions. The models have been used to estimate the probable range of marginal abatement costs and the total

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[*] In other cases they assess the impact of imagined combining future technologies and behavioral changes without specifying the policies needed to effect them.

cost of achieving stated greenhouse gas emission or concentration goals. Policy instruments assessed by the models generally take the form of cap-and-trade systems or carbon taxes, which are further assumed to have the property of leading to the choice of the least cost mitigation measures in all societies and economies where they are applied.

In a few cases, IAM's have been used to estimate the costs of straying outside the bounds of well-designed policies. This has most often taken the form of limiting the scope of an emission trading system, either regionally, by industry, or inter-temporally, in order to illustrate the cost increases possible if an optimal policy is not adopted. Effects of alternative uses of revenues from carbon taxes or auctions have been addressed in some detail. Much of this work throws valuable light on many policy choices. It explains a great deal about which policies are likely to be cost-beneficial, which are not, and what features distinguish the former from the latter.

The questions that have not been addressed fall into two broad categories: 1.) how will market-based instruments like cap-and-trade or carbon taxes perform in economies that do not have the institutional prerequisites for the efficient functioning of markets and 2.) what will be the costs of achieving emission reduction goals if nations undertake other, more costly policy instruments than idealized emission trading or carbon tax systems.

In the decades of effort to limit greenhouse gas emissions, even without a global agreement some nations and regions have adopted greenhouse gas mitigation measures and many have proposed and debated approaches in some detail. The measures that have been adopted in this process differ markedly from the ideal cap-and-trade or carbon tax systems represented in IAMs. Instead, in Australia, Canada, the EU, Japan, and the United States we see only limited application of cap-and-trade principles and instead, adoption of a broad range of measures that fall into the categories of command and control regulations and subsidies or mandates for specific favored technologies. In the rest of the world, we see an unwillingness to commit to any actions on emissions that would not have been undertaken in the absence of climate concerns. China, for instance, made Copenhagen pledges that largely reflected already announced policies designed to serve other purposes.[9] Efforts to imitate global cap-and-trade by replacing caps with

counterfactual baselines have not led to the efficient results of an ideal market, but rather to gaming and high transaction costs.[2]

At this point in their development, it is difficult for IAMs to estimate the impacts of measures that do not lead to an optimal outcome. To a degree, the IA framework can assess some of the effects of broad and relatively simple non-market approaches, such as renewables standards, energy subsidies, or nuclear moratoria. Capturing the full range of their effects or assessing the much more labyrinthine policies that are now being prescribed requires a level of detail beyond that which is possible in any economic model. Certainly it exceeds that which aspires to the broad coverage of an IAM.

These difficulties appear even in modeling policies that are being adopted in advanced market economies like the U.S., EU, Australia, and Japan. The IA approach has no framework for assessing whether, for instance, a cap-and-trade system could operate in China, Russia, or the many other states with large state-directed investment and weak contract law.

Finally, even if IAMs succeed in including more "second best" or worse policies in the suite of interventions they can model, they will remain unable to determine which of the infinite number of possible inefficient policies are likely to be adopted in different regions over even the next few decades let alone the full time horizon of a typical IAM.

On top of all these challenges, which apply to predicting and evaluating policies that might be adopted by a single sovereign nation, there arise the questions of why no effective international GHG control agreement has emerged and what the prospects for reaching such an agreement in the future might be. Descriptions of the institutional makeup of different key countries and the constraints that institutions place on the choice and operation of domestic policies will be enlightening. Beyond this, there remains the question of how a solution for the global free rider problem of carbon mitigation is to be found. For these tasks, new analytic approaches are needed.

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[2] See Wara for a discussion of the performance of the largest of these efforts, the Clean Development Mechanism.

2. Barriers to global cooperation on GHG control

At the global level, as well as at that of the single state, climate policy analysis largely dismisses lessons that might be drawn from other kinds of policy study. In studying many of those other policy realms, political economists focus on the distribution of power and the varied preferences among the major states, *i.e*. the great powers. They do so because historically these factors often shape outcomes.[10]

Climate policy analysis, though, often shrinks from this kind of analysis. It has largely assumed that states agree on the goal of GHG control, and different preferences are mainly confined to the question of cost sharing. Power, in this field of study, is rarely mentioned. A closer look raises strong doubts about the realism of these assumptions.

2.1. Climate policy and national preferences

Power would not matter much if states' interests were in fact harmonious, *i.e.* if their preferences were identical.[11] In the case of GHG control, however, states' interests diverge. Large uncertainties exist, but some states might actually be better off without controls than they would be with them. Russia with its cool climate and the prospect of gains from the retreat of Arctic Sea ice might be an example. So too might other states that are counting on exporting their large reserves of fossil fuels. GHG curbs might harm their economies far sooner and more severely than would climate change.[12]

In still other cases, states might simply feel that GHG controls would slow their economic growth hobbling their efforts to adapt to climate change – some of which is inevitable either with GHG controls or without them. For fast growing states, or already rich ones, adapting to climate change may be cheaper than trying to stop it.[13] China and the U.S. may stand to reap only quite modest benefits from GHG controls.[14]

States that would reap net benefits from GHG limits would still prefer to free ride, *i.e.* to reap the benefits of controls by others while avoiding costs of curtailing their own emissions. Free riding is the classic barrier to cooperation on global problems, and economists tend to assume that it is the principal source of opposition to GHG control. There are, however, important nuances.

To lump these diverse motives under the rubric of “free riding” is, then, to conflate the aims of states that simply want to evade the costs of controls with those that would rather not have controls at all. In doing so, it tacitly assumes that the motives for resistance are weaker than in fact they are. Few states, to be sure, openly dispute the need for GHG control; rather, almost all of them profess to believe the consensus view that GHG control is a high global priority. The false pretense of agreement brings to mind Abba Eban’s line: "A consensus means that everyone agrees to say collectively what no one believes individually." That so little action can emerge from such broad “consensus” should surprise only the naive.

2.2. The dynamics of a GHG regime-building

In many other policy areas, regimes have sprung-up to help states achieve a degree of cooperation despite disparate objectives. Regimes consist of "implicit or explicit principles, norms, rules, and decision-making procedures around which actors’ expectations converge in a given area of international relations.”[15] The World Trade Organization and World Bank are regimes, but many others exist, and they take myriad forms. Some regimes prove weak and some may do more harm than good,[16] but the large trade and capital flows that have enabled globalization testify to the power of some international regimes to yield large benefits.

A global GHG control regime does, in fact, exist. It is the United Nations Framework Convention on Climate Change (UNFCCC). Its fecklessness was on display for all to see at the 2009 talks in Copenhagen. That result is, in some ways, less of a puzzle than that some other regimes work pretty well. A regime that tackles a big international problem might, to be sure, offer big benefits, but it is also subject to the challenge posed by the need for collective action. In such cases, each state will be tempted to try to reap the benefits of others’ adherence to the rules while seeking to shirk its own obligations; yet, in the anarchic milieu of world politics, no authority exists to impose and enforce those rules. How, then, are regimes formed and maintained?

In modern history and for the widest ranging regimes, the answer has largely been that the most powerful state in the global system coerced and cajoled others into joining and obeying. First Britain played this role, then, after World War II, the U.S. did. Because of the large size of their economies, these “hegemons” often had stronger motives than other states did to bear the costs of setting up and maintaining regimes;[17] moreover, their power gave them the means of

enforcing membership and adherence to the rules.[18] Even so, the role could be vexatious. As one scholar has noted, no post-war American statesman titled his memoirs *My Life as a Happy Hegemon*.[19]

2.3. Context creates power

Power matters. It matters in climate policy, as in other realms, but "there is no single hierarchy of power in international relations."[20] Indeed, at least three different kinds of power are at work, and their importance varies from issue to issue. Relative power among states also varies from issue to issue; so context creates power.

First, in some situations states have go-it-alone power; *i.e.* they can act together to change the *status quo*. For instance, in 1988, the U.S. and Canada had go-it-alone power to reach a trade agreement. Other countries might have preferred that they not do so, but those states had no choice in the matter, and, indeed, they came under pressure to join the agreement. Once the trade pact was formed, these states were better off joining it than remaining outside of it.[21]

Second, in other cases, though, states may be able to block actions that they oppose; *i.e*. they may have hold-up power.[22] Technology can determine where hold-up power exists; hence, states have little hold-up power with regard to stopping satellite-based remote sensing within their borders but quite a bit more with regard to blocking TV signals.[23] Technology, by determining the relative costs of moves and counter-moves, sets the power balance between them.

Third, in the above examples, power derives from the nature of the problem or technology in question. That power may limit other states' choices, but it does not involve coercing them with sanctions or force. Coercion, though, can be used to settle disputes in world politics, and it often has been. Coercion is often costly for those applying it;[24] yet it can sometimes be the only available expedient.[25]

Coercion is most likely to work and to be low cost when strong states impose them on weak ones. It can take several forms. States with market power over some vital good or service may threaten to selectively withhold it, but the threat to limit access to a very large and rich domestic market is often even more puissant; thus the relative size of two states' domestic markets is a key metric of their relative power to use economic coercion.[26]

2.4. Hegemony and the prospects for effective GHG control

The hegemony of one power, the United States, was the main force in building the regimes that led to the great post-World War II revival and sustained surge in global wealth. The prospects of successful global regime-building may have waned with the ebbing of U.S. hegemony, and that fact may explain some of the problems with the GHG control regime.

2.4.1. Factors shaping the prospects for building an effective GHG control regime

The role of hegemonic power in regime-building prompts a question: how will regime building fare in a more multi-polar world? Perhaps a small set of powerful states might still be able to muster the power needed for the tasks.[27] In that case, though, absent hegemony, differing preferences among the great powers can prevent regimes from taking shape, or can paralyze them.[28]

A weaker U.S. might no longer be capable of building a global GHG control regime. In part this fading of U.S. power reflects the success of its post-war policy. That policy sought to rebuild the global economy, and it succeeded. As it did, though, other states, first in Europe, then in Asia, became stronger relative to the U.S.[29]

Meanwhile, demands on U.S. resources have multiplied, and other great powers like China and Russia are actively balancing against the U.S. by providing diplomatic shelter and material support to rogue states like Iran and North Korea. Since power balancing is a textbook response, the U.S. can probably do little to alter this pattern.[30]

At home, burgeoning public debt and negative demographic trends add to the pressure on resources. Thus, the post-World War II surfeit of U.S. resources has become a dearth, and the post-Cold War peace dividend has been spent. Resources are scarce, and some nettlesome features of GHG control may cast yet deeper shadows on the hopes for success.

2.4.2. GHG control: a nettlesome challenge

Thus, the global configuration of power is less favorable to regime building than it once was. Still, a coalition of states might attempt to take up the task that a hegemon might once have attempted, but the transaction costs are likely to be higher, and at least five aspects of the GHG control problem are especially daunting.

First, the global net benefits of even optimal GHG controls appear to be relatively modest. One recent estimate pegged their present discounted value at slightly more than $3 trillion over the next two hundred and fifty years.[31] Compared to the size of the global economy, this is not a very big number. Also, controls are certain to be far from optimal,[32] and costs could easily exceed benefits.[33] The rewards of an agreement on controls may, then, be offer only a weak incentive.

Second, the disparities in national preferences over climate require that any deal must involve complex bargaining. In principle, those states most anxious to rein in emissions could offer side payments to those that are opposed or indifferent. In practice, the prospect of such payments encourages all states to display reluctance in hopes of being paid. That so many states are involved, that their values differ, and that trust among many of them is scarce are all factors that add to the problem.[34]

Third, the distribution of power among states in the global system could hardly be less favorable to the prospects of reaching an accord. The states best able to effect a global system of controls are those with high and rising emissions and high bargaining power in world politics; yet these states appear to be the ones least exposed to direct harm. Of course, such states must still fear spillovers; climate change might add to disease, migration, poverty, crime, and insecurity within the borders of some states; and the ill-effects might then spread abroad. These concerns are real, but the high costs of GHG controls seem to have blunted their impact on policy.

The most comprehensive formal analysis of the resulting outcomes that we are aware of concludes that

> Only coalitions including all large emitting regions are found to be technically able to meet a concentration stabilization target below 550 ppm CO_2eq by 2100. Once the free-riding incentives of non-participants are taken into account, only a “grand coalition” including virtually all regions can be successful. This grand coalition is profitable as a whole, implying that all countries can gain from participation provided appropriate transfers are made across them. However, neither the grand coalition nor smaller but still environmentally significant coalitions appear to be stable. This is because the collective welfare surplus from cooperation is not

> found to be large enough for transfers to offset the free-riding incentives of all countries simultaneously.[35]

Moreover, the nature of the task of GHG control confers great power on hold-outs. Successful controls require nearly worldwide cooperation;[36] therefore, go-it-alone power, although it exists, is futile, and hold-up power dominates. Thus GHG control poses a weakest link problem – or something close to it.[37] Even if many states take part in a control regime, a very few hold-outs, could defeat the effort. Worse, Third World states have chosen to exploit this fact by demanding added financial transfers as the price for their cooperation. Since they would be the main beneficiaries of controls, they are, in effect, demanding to be paid to help themselves. That such a deal has been hard to strike is hardly surprising.

In light of these facts, the global GHG control regime serves more to assuage domestic political demands than as a means to achieve concrete national interests. Much of the impetus has arisen in countries that have been rich enough for long enough to have developed strong Green movements. Such movements are, by their nature, inspired more by symbols than by substance; hence, the Kyoto Protocol, an accord that would have done almost nothing to curb GHG emissions,[38] has become the Holy Grail of Green causes. Governments subject to demands of this type have strong motives to substitute gaudy pomps for substance.

2.5. Prospects for an effective GHG control regime

This pattern will persist for a long time. To be sure, some recent analysis suggests that the risk of catastrophic climate change is bad enough to justify taking strong steps;[39] yet its effects on the prospects of a global GHG control regime might be small. For one thing, GHG controls could be too slow to block catastrophic climate change, and in light of the high costs of abatement; the prospect of such change may remain too uncertain to motivate action.[40] More generally, past experience shows that new technical knowledge tends to have little impact on the actions of international regimes.[41]

Other hopes have centered instead on restructuring the GHG control regime, and there can be no doubt that the UNFCCC is a very dense labyrinth. Still, other forums have been tried, such as the G-8 and *ad hoc* groups of major emitters. The results have been promising, in that small steps and cooperation on technical matters do appear to be possible, but only by abandoning discussion of binding global commitments. A simpler structure is clearly a necessary step toward

successful GHG control; it has not been a sufficient one for a global agreement sufficient to hold temperature increases to 2°C or less.

3. Inefficient domestic policies

Whereas the absence of institutions for third party enforcement creates grave problems for a global GHG pact, within nations, national governments can in principle make and enforce rules. This fact allows governments to in some cases surmount the free rider problems that have frustrated international climate policy. However, even national governments are complex institutions, and their workings can frustrate the adoption and enforcement of comprehensive emission limits or lead to the use of policies that are needlessly costly. There is good evidence that this will occur in the case of domestic GHG limits. We take two examples, the United States and China, to illustrate how the systematic study of institutions and the political economy of choices can expand understanding of current policy choices and likely future progress in countries with very different kinds of political and economic institutions. This analysis suggests several conclusions:

First, there is a strong, systematic and comprehensible political logic that leads to choice of policies that differ widely from the economist's ideal of a single price on all greenhouse gas emissions

Second, it is very difficult to quantify the full magnitude of the costs and unintended consequences of the kinds of policies that are likely to be adopted in the United States

Third, in China it is likely to be difficult or impossible for the central government to enforce comprehensive and binding limits on greenhouse gas emissions; a related finding is that the outcome of China's adopting a comprehensive cap-and-trade policy is likely to be very different from that predicted by economic models that assume costless enforcement and efficient markets

Fourth, in neither country are policies consistent with a global path toward a 550 ppm CO_2e goal likely to be adopted unless institutions change significantly.

3.1. Using inefficient policy tools to limit GHG output

In a recent analysis, the International Monetary Fund (IMF) described the features that virtually all economists and IAMs agree are necessary for a GHG control program to be cost-effective. It noted that the program should impose a price on GHG emissions. This price should be distributed uniformly across all economic sectors and all nations.[42] The price on emissions should be stable. Carbon taxes, the report observed, were the best means of achieving that goal.[43]

Actual policies and most proposals now under consideration bear little resemblance to this vision. The list of differences is long.

3.1.1. Command-and-control regulation returns in the United States

Since 2006 legislative and executive action at the state and federal level, and in the courts, has put in place a large number of policies, programs and regulations intended to reduce greenhouse gas emissions. These have not taken the form of a comprehensive, national cap-and-trade program as many expected and hoped, but rather have appeared as a series of regulatory programs, efficiency standards, mandates and subsidies for specific technologies and fuels, and some limited regional emission trading systems.

The Energy Independence and Security Act of 2007 enacted a series of command-and-control regulations aimed in part at lowering GHG emissions. These cover lighting and other uses of electricity and natural gas, a national renewable fuel standard, and corporate average fuel economy. The Bush Administration initiated a series of rulemakings at the Environmental Protection Agency intended to promote use of renewable fuels in transportation. Additional subsidy measures for specific energy technologies were included in the stimulus package passed in 2009.

On the state and regional level, California passed a law, AB32 that set targets for reducing greenhouse gas emissions and created a process to develop implementing regulations. Frustrating early supporters who expected a cap-and-trade program to energy, California agencies tasked with implementing the bill created a series of command and control regulations, including low carbon fuel standards, state CO_2 emission standards for new vehicles, and a clean energy standard for electric generators, that were predicted to account for 80% of the required reductions. Northeastern states adopted a Regional Greenhouse Gas Initiative that created a barely-binding cap-and-trade program on utilities in those states.

Currently on the agenda at the national level are legislative proposals for comprehensive climate legislation and a proposed rule from the Environmental Protection Agency to regulate CO_2 emissions from large sources under the authority of the Clean Air Act. Although all of the comprehensive climate bills contain cap-and-trade programs, with one notable exception* all of them also layer on a series of additional regulatory measures, technology subsidies and other command and control elements either directly or through allocation of allowances. The EPA has clearly indicated its intention to pursue technology-based standards in implementing the Clean Air Act.

Side by side with policymaking by elected officials, lawsuits in U.S. courts and in regulatory proceedings have effectively brought to a halt the construction of new coal-fired power plants that do not incorporate technologies for capturing CO_2 emissions.

The effect of these existing measures can be seen in the drastic reductions in forecasts of greenhouse gas emissions in the most recent long term forecasts by the Energy Information Administration. Even after taking into account the effects of the recession, these forecasts demonstrate quite significant action to reduce emissions that has virtually none of the elements of a cap-and-trade program.

Policies actually adopted and under active consideration represent far less cost-effective approaches to control than the comprehensive programs to put a common price on CO_2 emissions that were analyzed in most studies of the costs and benefits of climate policy. Studies of the costs of proposed legislation in the U.S. identify one reason for higher costs of the prevailing approach, which is that piecemeal legislation or bills that combine cap-and-trade with other regulatory or subsidy measures will not put a consistent price on CO_2 emissions from all sources.

Some of the policy approaches that differ from uniform carbon pricing are tractable to study with current models. For example, an analysis of California's plan to implement the AB32 regulations compared two policy scenarios: a pure cap-and-trade program with lump sum dividends paid to each resident was compared to the proposed program that included low carbon

* The so-called Cantwell "cap and dividend" proposal that imposes a comprehensive cap on GHG emissions and specifies that most allowances be auctioned with proceeds returned to individuals.

fuel standards, renewable energy standard for electric generators, cogeneration mandates, and a set of efficiency standards for energy using equipment. The study found that excluding these regulatory measures reduced overall costs of meeting the AB32 cap by about 50%.[44]

An analysis of legislation passed by the U.S. House of Representatives in 2009 (the American Clean Energy and Security Act – HR 2454 -- that did not proceed further) described the costs of a duplicate regulatory system including both a GHG cap-and-trade program and a series of command-and-control mandates. In some cases, the regulations did not appear to be binding; i.e., the cap itself would motivate all of the actions needed to meet the standard. In these instances, the standards would waste resources on needless monitoring, measuring, enforcement, and compliance, but they would not affect the pattern of GHG reductions. In other cases, the standards would change the allocation of abatement resources by mandating different choices. However, the cap sets the total GHG cutback. If the regulations mandate more change in one area, less will take place somewhere else. Standards, therefore, force the economy to substitute more expensive GHG emission decreases for decreases of the same amount that could have been made elsewhere at lower cost.[45]

A study of a stand-alone national Low Carbon Fuel Standard that required a 10% improvement in CO_2 emissions over a 10 year period, estimated costs to be 1.8% to 3.4% of GDP at the end of the 10-year period, far higher than any estimate of what it would cost to achieve comparable reductions in emissions through a nationwide cap-and-trade program.[46]

There is a deeper problem with analysis of the costs of the kinds of regulatory and fiscal interventions that have been proposed and/or adopted in the U.S. Models can capture the way in which overall macroeconomic costs are increased when one sector, e.g. transportation, is required to incur much higher marginal abatement costs than another sector, e.g. electricity, or when use of fuels with higher costs and little benefit in reducing CO_2 emissions are mandated. To cite a notorious example of the consequences, mandates for biofuels may actually add to climate change, and, at best, they are an extremely costly means of curtailing GHG emissions.[47] But efficiency standards for new capital equipment and many types of subsidies can induce many other unanticipated behavioral changes and associated costs. A common price on CO_2 emissions provides a consistent signal to all users of energy to make tradeoffs between the cost of reducing emissions and paying the carbon price. A uniform efficiency standard will enforce a common

decision, rather than allowing users to evaluate their own situations to determine the best choice. No model could capture enough detail about individual circumstances to determine what all the small losses thus imposed throughout the economy add up to. Costs are inevitably underestimated unless the model has diverse agents and decisions and represents the fine structure of regulations.

3.1.2. Overlapping, duplicative controls

A well-structured cap-and-trade program, or better still a carbon tax, would avoid the worst of these problems. Cap-and-trade is an element is most legislative proposals, but nearly every bill has also included a strong overlay of additional regulations, mandates and subsidies. Nor does any bill include provisions to replace or rescind existing regulations. Instead, the current cap-and-trade proposals seem likely to add new layers of controls atop existing command-and-control mandates. A related and undecided issue is whether Congress will take away EPA's authority to regulate greenhouse gases under the Clean Air Act.

Indeed, federal cap-and-trade may be super-imposed on state controls leading to a farrago of sector specific controls at both levels of government. This course would be similar to that taken in Europe and California. There, relatively narrow cap-and-trade programs stand side by side with a plethora of regulatory initiatives. Again, the issue of state pre-emption has complicated national legislation.

3.1.3. Designed-in allowance price volatility

Most of the current congressional bills are designed so as to guarantee that the prices for GHG emission allowances will be very volatile. It is possible to design a GHG cap-and-trade system with either stable allowance prices or volatile prices. For the economy as a whole, stable prices for GHG emissions would be much less costly than volatile ones.

Technically, price stability could be achieved easily, through either a carbon tax or establishment of ceiling and floor prices at which the regulator would, respectively, sell and buy unlimited amounts of allowances. By selling unlimited allowances at the ceiling price, government would ensure that market prices did not rise above this level. By buying allowances at the floor price, government would limit downward volatility. Specific proposals to create price

stabilization authorities, such as the CMEB in the Lieberman-Warner bill, seem unwilling to provide this amount of authority to introduce and retire allowances, and therefore may have less success in stabilizing prices. The history of attempts to create commodity price stabilization authorities suggests that agencies with limited resources cannot control volatility and may indeed make it worse.[48] Again, the preference for complex schemes over simple and effective policies seems to appear.

3.1.4. Numerous gaps and exemptions in cap-and-trade

Numerous exemptions are likely to further decrease the cost-effectiveness of cap-and-trade. Current proposals have included exemptions for favored sectors (farmers, small business, trade-vulnerable industries, New England households, the poor, and so forth). If a quantity-based target remains in place, carving out exemptions increases the severity of the cuts exacted from those sectors that are still covered. Control costs for these sectors will rise steeply. Thus, according to Nordhaus, exempting half of the economy while trying to meet the same cap with concentrated action in the remainder does not just double the marginal costs of reaching a specific emission cap; it imposes a cost penalty of 250 percent.[49]

3.1.5. Using allowance auction revenues to fund specific technology subsidies

The creation of emission allowances under cap-and-trade creates a revenue source that can be used to offer new subsidies to promote technologies that would not be economic with only the incentive of a uniform carbon price. The cost-effectiveness of cap-and-trade depends in part on whether they raise revenue for the government and on how that revenue will be spent.

> A cap-and-trade program can raise revenue by auctioning off some or all of the allowances. … The enthusiasm for using auctions and taxes, however, has not been accompanied by sober assessments of whether and how the revenues would actually be used. Most of the evidence suggests that at least some of the revenues would not be spent wisely, at least from an economic perspective.[50]

In theory, a cap-and-trade program could use revenues from the auction of emission allowances to supplant other taxes, lessening the deadweight loss that those levies impose on society.[51] In actuality, though, governments rarely use additional revenues to reduce taxes.[52] Government

could also distribute auction revenues as lump sum payments, *i.e*. the size of the allocation could be fixed and the recipient could do nothing to increase or decrease it. Under the EU plan, however, governments have tied continued allowance allocations to continued operation of facilities in their original locations. If the allocation is designed in this way, firms are encouraged to preserve older facilities even when closing them down would be more efficient.[53]

Worse, draft legislation indicates that Congress is inclined to use emission allowances to fund some technologies at the expense of others. A great deal of experience shows that Congress is an extremely poor institution for picking future technological winners.[54] Much of the large amount of money that seems destined for this exercise is likely to be wasted.

In order to account for the welfare effects of GHG cap-and-trade, these losses should be subtracted from gains, if any, attributable to the emission reductions. S. 2159, a cap-and-trade bill offered in the 110th Congress, would have created and granted to myriad interests new property rights worth more than $60 billion per year. As an opportunity for politically advantageous rent seeking, this bill may exceed in scale any measure since the nineteenth century land grants. Although, alas, unlike the latter policy, it promises no vast boon to national output and wealth.

3.2. A pattern of costly haste

Cass Sunstein has recently opined that the U.S. may accept controls too stringent to maximize its own material interests.[55] Sunstein, in making that judgment, did not consider that the controls might also be badly designed in other regards. In fact, many state and congressional plans entail hasty emission cuts that are guaranteed to needlessly raise costs not because of the extent of the absolute emission reductions, but because of the haste with which GHG output is required to fall.[56] Given the extent of the nation's capital stock that is tied to fossil fuels, legislation that attempts to make large reductions over the next fifty years or so must be considered very ambitious.

Policies of this kind could be costly. Globally, proposals by former vice president Gore and British government economist Nicholas Stern have been calculated to entail net costs of $17 trillion and $22 trillion, respectively. That is, these proposals are far more expensive than doing nothing at all would be. Even these estimates, though, assume that governments would meet their

targets through optimal policies.[57] In other words, the use of non-optimal policy tools will raise costs still higher.

The adoption of goals based on very steep GHG cuts is likely also to create a different source of unnecessary costs. Legislation that, if fully implemented, would lead to very high future costs may be greeted with skepticism. Investors might speculate that, when the economic crunch arrives, future office holders may choose to relax the goals rather than impose high costs on influential constituents.

If so, real options analysis suggests that regulatory uncertainty about future GHG policy can discourage near-term investment. In some circumstances, uncertainty about future climate policies could lower electricity supply and boost utility rates.[58] Blyth finds that the critical issues arise when more definitive information is expected, and that announcing dates in the relatively near future at which significant policy choices will be made has the most chilling effect on investment. IAM analysis has ignored this possibility, but its costs could be substantial.

4. Factors making GHG controls needlessly costly

Aspirants to political power must win enough support to gain and hold power. To do so, those in government often back measures that impose net costs on society. These costs are the inevitable consequence of government, not an aberration.[59] One obvious example of how such outcomes can occur is the choice of policies that favor more powerful interests over those with less power. Observers at least since Thucydides have been remarking on this aspect of political reality.

A more subtle point may be that institutions have a large effect on the distribution of power. The rules of the game make some strategies more effective than others and some groups stronger than others. As rules change, so can the distribution of power. Institutions, once put in place, strengthen their supporters. This effect is another source of policy path dependence,[60] and it implies that mistakes, once made, can be hard to correct.

Climate policy may be especially prone to result in the adoption of welfare-decreasing measures. Three factors may lead to this outcome: a) the information-processing capabilities of the electorate, b) the nature of climate change, and c) the structure of U.S. government.

4.1. Non-market control instruments in the voters' eyes

Understanding the consequences of political decisions requires an investment of time and effort. Some studies find that people are attention misers in general.[61] They are even less inclined to attend to politics than to other spheres of life.[62]

The public, though, may find it easier to grasp the net effects of some policies than those of others. The more logical steps it takes to connect a policy with its good or bad outcomes, the smaller the number of voters who will invest the cognitive effort needed to see the connection. All else being equal, as the number of voters connecting a policy with a perceived cost or benefit falls, the outcome will have a smaller and smaller impact on voters' preferences. Thus, early order causal effects are likely to grab more voter attention than later order ones.[63] If a policy's first order effects contradict its later order ones, voters will be prone to mistake the balance of costs and benefits.

4.1.1. Political visibility of costs and benefits

Voters readily grasp the benefits of command-and-control mandates. The stated purpose, after all is to curb harmful emissions. Seeing the costs, lessened disposable income, requires following several more links in the causal chain. The cognitive miser will likely perceive the benefits and miss the costs. [64]

In contrast, for a carbon tax, the costs to the consumer, higher prices, are easy to discern. The benefits depend on a grasp of how market incentives can lower the costs of curbing emissions. Most voters appear never follow the train of logic to this destination. The package of overt benefits and covert costs helps to explain why command-and-control remains popular with legislators.[65]

Survey data confirm that voters do not readily grasp the power of market incentives to affect behavior. Instead, the electorate tends to focus on the self-interested motives of the for-profit sector instead of the power of incentives to harness those motives to an environmental purpose.[66] Because of this anti-market bias, holding cost constant, more people support mandates than either a tax or cap-and-trade as tools for curbing GHG emissions.[67]

4.1.2. Political visibility of sacred versus secular trade-offs

Part of the reason for this bias against market-based measures is that many voters, on moral grounds, strongly reject *explicit* trade-offs of 'sacred' values against secular ones. Voters may invest GHG control with 'sacred' significance because of Green ideology or because of a presumed link between emissions and risks to human life. If so, trading-off GHG control benefits against their costs would fall afoul of this "taboo".[68] The public is likely to morally condemn those who even *contemplate* such trade-offs.[69] Of course, the main rationale for using price-based GHG control tools is to facilitate making just such trade-offs.

As a result, supporters of such policies risk triggering moral outrage. Cap-and-trade may appear to be a less immoral choice, because mandatory emission caps can be set without regard to cost; costs are explicitly considered only in deciding how to achieve the 'sacred' goal. Command and control appears even better, because it directs those who endanger the "sacred" goal to change their behavior. In contrast, carbon taxes make the choice between sacred values and costs explicit. This aspect of carbon taxes offends many greens in particular, and since they are a mainstay of GHG control proposals carbon taxes have gained little traction.

4.1.3. Voters' anti-market bias

A legislator seeking re-election must consider all factors likely to shape voters' choices. If he is astute, he will suspect that many people who vote may not do so as a means of enhancing their individual economic well-being. After all, a single vote cannot have a noticeable impact on an election's outcome; so voting would be a poor investment if the goal were to enhance the voter's individual interests. Someone solely interested in maximizing his private economic welfare would not be at the polls in the first place, because the inconvenience far outweighs the expected benefit of casting the deciding vote.

Rather, many people use the voting booth as a place to indulge moral feelings and other emotions. Voting becomes an act in self-expression. The interest of the community, as voters conceive of them, often motivate voting choices, but opinion survey results show that the public's notions of community interest often clash with those held by economists.[70] The general public, for instance displays "*a tendency to underestimate the performance of the market mechanism*."[71] Thus, carbon taxes, beloved by economists, are scorned by most other voters, and elected officials have strong reasons to heed the latter much more than the former.

4.2. The nature of the issue leads to inefficient solutions

The long-term nature of the risk of climate change creates still other incentives for policy-makers to craft responses that entail net costs rather than benefits. The U.S. political systems has been slow to address problems that are likely to become salient only far in the future and whose solutions impose current costs. Think of the failure to address Social Security and Medicare funding or the growing national debt, and all of these problems are far more immediate than the worst risks of global warming. Faced with a short time horizon in the electorate, elected officials who support GHG controls are tempted to adopt strategies that increase support by providing immediate benefits to critical constituencies but raise the costs of GHG controls.

4.2.1. GHG limits must include special interest favors

In order to gain the number of votes needed to enact GHG limits, legislators must include an unusually large stock of special interest favors. The deferred nature of the benefits of GHG curbs means that few current voters have reason to expect to reap direct benefits from GHG cuts. On the contrary, most will suffer a net decline in their living standard. The benefits of U.S. policies to curtail GHG discharges will accrue only to future generations and largely to foreigners.

For a legislator, this allotment of costs and benefits is a poor base on which to build a re-election strategy. In response, legislators can and do package GHG control measures with others designed to confer windfall gains on special interests. Often these interests will be narrow, which allows them to act cohesively.[72] The interests need not be purely local and economic, as in the case of dealings to gain votes for health reform by allocating greater federal funding to individual states. Environmental advocacy groups, business interests that have some connection to technologies or products that could be considered climate-friendly, and ideological supporters of particular regulatory approaches can all be electorally significant to an individual member. The problem is that the process of conferring these windfalls is likely to raise the measure's total costs.[73] An official seeking re-election, though, is likely to need support from special interests in order to offset the political onus of raising energy costs to current voters. So long as the voters cannot see the costs entailed by creating the windfalls, the office holder may improve his electoral prospects even as he imposes net costs on society.

The mere threat of GHG controls exacts a social cost. Office-holders can use regulation to impose private sector costs, and they can use the threat to do so to induce those that would be harmed to "buy" complete or partial exemptions. The office holder collects campaign contributions; the potential target of the regulation pays to avoid higher costs. The risk of such rent extraction, and the constant threat that the office-holder will not stay bought, depresses investment in the threatened sectors.[74] The vast expansion of regulation implied by GHG controls clearly implies a large increase in political risk. How much investment will be deterred by this risk is hard to say, but, at the very least, the threat is hangs over the entire energy sector, transportation, and energy-intensive manufacture.

4.2.2. Competition for media coverage leads to bad policy choices

A threat like climate change that lies many decades or a century into the future may from time to time win media coverage, but it suffers from a disadvantage in the competition for public attention. To compete for media attention, issues must be dramatic:

> "[N]ews is "consumed" by much of the American public (and by publics everywhere) largely as a form of entertainment. As such, it competes with other types of entertainment for a share of each person's time. Every day, there is a fierce struggle for space in the highly limited universe of newsprint and television viewing time. Each issue vies not only with all other social problems and public events, but also with a multitude of "non-news" items that are often far more pleasant to contemplate. These include sporting news, weather reports, crossword puzzles, fashion accounts, comics, and daily horoscopes. In fact, the amount of television time and newspaper space devoted to sports coverage, as compared to international events, is a striking commentary on the relative value that the public places on knowing about these two subjects.[75]

The for-profit American media are likely to be especially responsive to audience restiveness.[76]

To win this competition, issue advocates must make their cause seem more pressing than the other claimants on the public's attention. The threat of something bad happening around the

year 2200 may not be that compelling for most audiences. Advocates need to do something to enhance their competitive position.

A report titled "An Abrupt Climate Change Scenario and its Implications for United States National Security" is an example of a climate change story that did get media attention. It painted an apocalyptic view of climate change based on a hypothetical scenario in which warming disrupted Atlantic Ocean currents supposedly with various catastrophic results. The report placed this possibility only a few decades in the future. This claim generated extensive media attention. A new book has now recycled this scenario.[77] Other "nightmare scenarios" have also been devised.

News organizations have at least some profit motive for abetting this sensationalism. They also often report later corrections and qualifications. Nevertheless, the later reports are far less sensational stories, and they generate far less coverage.

Thus, a leading scientific expert published a stinging critique of the report described above. In it, he noted that the report had greatly exaggerated both the risk of near-term disruption of the Atlantic currents and the extent of the harm likely to result.[78] Later an IPCC report basically confirmed his critique.[79] Yet, neither of these efforts received the media attention of the initial claims of looming disaster.[80]

In this example and others, the advocates of GHG cuts have largely succeeded in using the news media to persuade much of the public that many of the threats of global warming are much more imminent and more damaging than they probably are. Their success, though, pressures Congress to adopt the goal of curtailing GHG emission very sharply.

This effect is doubtless just fine with some NGOs, but steep cuts in emissions are much more costly than gradual ones. Thus, without an effort to sensationalize the risks of climate change, advocates of steep GHG cuts are hard put to win the media attention that they need. Yet sensational coverage tends to lock advocates into extreme demands which, if granted, would likely lead to emission cuts far more expensive than justified by more realistic assessments of the threat to the United States. Almost equally troubling, intransigent demands for very steep cuts have impeded efforts to implement more moderate controls that could offer benefits greater than their cost as part of global action.

4.3. Advocacy, rent-seeking and GHG targets

Historically, moral zeal has often prompted actions that are at odds with the goal of allocative efficiency.[81] In America, green advocacy groups have become an important political force. Most Green groups in the U.S. draw on voluntary contributions by wealthy individuals, environmentally-oriented foundations, and small grassroots contributors.[82] In recent years, Green groups have raised over $2 billion per year in the United States, and it is possible that the climate issue might boost this sum.[83]

Most of the Green groups operate in one or more advocacy niches.[84] Quite a few of these organizations are actively pushing for GHG controls. Having adopted an advocacy role, and having made that role key to their financial survival, these NGOs are, in a sense, now special interest groups. The groups' own marketing strategies indicate that their fund-raising success rests on their being seen as successful advocates of their causes. It is, of course, not based on maintaining a fine balance between environmental values and other social goals.[85]

Almost all green NGOs insist, for example, that GHG controls must take the form of hard quantitative targets rather than that of setting a price that emitters must pay. The latter, they object, would leave the level of emissions uncertain. Their demand is wedded to the goal of achieving by mid-century very steep GHG cuts.

The Green organizations' zealotry has spurred a reaction on the right. Indeed, the United States is rare in having a streak of economic individualism that, compared to Europe, is relatively strong. This tradition can sometimes limit the greens' influence and curb regulatory excess.[86] The presence of a countervailing ideology may not, though, ensure that GHG controls will effectively balance costs and benefits. Hence, conservative anti-tax attitudes add to the resistance against what is probably the most cost-effective approach to GHG control.

Rather than simply arguing that drastic GHG cuts cost too much, some on the right have gone on to assert that human-induced climate change is a hoax. By inference, even small expenditures on GHG controls are an error. The clash of two ideological positions has so far failed to call forth much reasoned discussion of the search for welfare-enhancing responses to climate change. One wag has described the outcome as "bad science opposing bad policy analysis."

4.4. Congressional organization favors duplicative policies

Congressional process also plays a role. When an issue becomes ripe for action, a variety of measures will quickly be repackaged in ways that cast them as solutions to the problem *de jour*. Interest groups seeking to gain from these measures will buy the support of members of the committees with jurisdiction over them.[87] Congressional rules favor log rolling; so the process is well-suited to producing all-of-the-above outcomes.[88] Several comprehensive energy reform measures that have been adopted since 1974 illustrate the process.

GHG cap-and-trade programs are especially well adapted to serve as sources of political favors. As already noted, their cumulative cash value is high. To an office-holder, the distribution of allowances is, in effect, a free off-budget disbursal of money that can be steered into the pockets of potential supporters. If a legislator is not a member of one of the appropriations committees, allowance allocation may be the best available source of such resources. The fact that the transfer of allowances is less politically transparent to the wider world adds to the appeal.

4.5. Policy path dependence

Existing institutions shape future policy choices. This link is the root of what NIE scholars have termed policy path dependence. An institution, once in place, can limit future choices, and the larger matrix of existing institutions, as in the case of the South American states that adopted the U.S. Constitution, may cause a new institution to produce results that vary widely from those which their authors intend.

Path dependency implies that "…in order to uncover the logic (or illogic) of the world around us, we sometimes must first understand the details of how it got that way."[89] North states:

> "Path dependency is a fact of history and one of the most enduring lessons to be derived from studying the past. The difficulty of fundamentally altering paths is evident and suggests that the learning process by which we arrive at today's institutions constrains future choices. It is more than simply that the organizations brought into existence by the existing organizational matrix owe their survival and well-being to that matrix and

> therefore will attempt to prevent changes that would adversely affect their well-being. It is also that the belief system underlying the existing matrix will deter radical change."[90]

Many mechanisms contribute to path dependence. One simple factor is that events change the relative strength of social interests. Thus, GHG controls, for example, will strengthen some interests and weaken others:

> "Policies aimed at mitigating global warming will depress returns in the oil and gas industries and raise costs in sectors that use energy intensively (e.g., transportation), but benefit alternative energy industries and less energy-intensive producers. Within each country there will be winners and losers from climate change and from every possible policy to slow or reverse it. In redistributive politics, the concept of a national interest shared equally by everyone evaporates."[91]

The industries that suffer as a result of GHG controls will shrink and perhaps simply seek refuge abroad. Their political voice against the extension of the new policy will, therefore, over time fade in strength or be stilled altogether. The longer the process runs, the less likely a policy course correction becomes.

As discussed in a previous section, exactly the opposite process will occur in countries, like China, that initially decline to limit emissions. Increasingly these nations will become the havens for energy-intensive industries. As investment in such industries shifts to countries like China, the political voice there against limiting emissions will be strengthened and the less likely a policy correction will become.

In itself, policy path dependence is neither good nor bad. It could, in principle, lock-in good policies as well as bad ones, but in GHG control, there is a striking dearth of good policies. The prevalence of path dependence in other should convey a strong warning that early missteps may prove to be very difficult to correct.

5. China's institutional future

As some of the previous discussion suggests, China is key to hopes for curbing global GHG emissions, and India, while not quite as central, is also crucial. This reality reflects the rapid economic growth in the two Asian giants, an event of world historical proportions. Today, China, as a result of the scale and nature of its economic growth and, is the leading global GHG emitter, and its output is growing rapidly.

Consequently, countless schemes have been offered for moving its economy toward less GHG-intensive technologies. Some of these plans hope to reach their goal without imposing GHG controls; some require controls. Neither is likely to face an easy road.

In countries like China and India, government may be unwilling to reform markets that have been distorted by prior interventions. For instance, government may subsidize energy production or regulate prices. By doing so, it generates rents with which it buys the support of favored industries or it curries favor with some consumers. These policies, though, often have the effect of boosting GHG emissions.[92] They can also make it impossible to implement effective market-based GHG controls.

5.1. Government policy and China's GHG intensity

China's high GHG intensity is linked directly to the nature of its institutions. In fact, simply replacing existing Chinese technology with designs from the West and Japan would greatly lower China's GHG intensiveness. That shift would also raise the value of China's total economic output. Nevertheless, the GHG efficiency of China's new investment continues to lag behind that of the West, let alone that of Japan.[93] Technology and institutional forms are tightly linked,[94] and a few examples can help to explain the impact on GHG intensity.

First, the growth of heavy industry is the main force behind China's rising energy use, and would remain a powerful driver even if all new investment used the most efficient world-scale technology.[95] Regional and local governments strongly promote "their" heavy industries. They use subsidies, captive courts, taxes, capital allocation, price controls, and land price manipulation to favor investment in local firms. At the national level, powerful ministries watch over "their" favored sectors.

Second, regulation and by hidden subsidies distort energy prices. Market-determined prices reflecting opportunity cost have a limited role in driving consumer behavior and investment decisions.[96] The coal, rail, and electric power sectors, as well as others, have been cartelized. Budget constraints within these sectors remain soft, and government distorts prices in these sectors in order to buy political support.[97]

Thus, at the Bali international conference, the Chinese government demanded and won acceptance of the idea of technology transfer from the West as a major theme of international climate policy. Yet less than a month after the close of that event, it announced new energy price controls[98] that, by their very nature, subvert the incentives for investing in energy-saving technologies. It would be hard to imagine a more blatantly contradictory policy stance or one that more starkly underlined the powerful interaction between technology and institutions.

More recently, the Chinese government has begun to allow some increases of energy prices. Interestingly, it was reported that the motivation for these policy changes was the advocacy of refiners and electricity generators, who were suffering large losses between what they paid to buy oil, gas, and coal at prices driven up by global market forces and what they could sell refined products and electricity at in China. This shift, then, may reveal more of the balance of forces among political constituencies in China than any strong trend toward market reform.

Third, China's governance problems may have checked the inflow of energy-efficient technologies owned by Western or Japanese firms. Many experts argue that China's judicial system cannot yet deliver impartial, predictable, rule-based justice. Its chronic abuse of intellectual property rights is well-known. Such problems inevitably act as a brake on Western and Japanese foreign direct investment.[99] Other scholars argue that this effect is of declining importance and point to improvements.[100]

5.2. Economic institutions and GHG intensity

In China lines between government and business are blurred. Local and regional governments have much autonomy, and their incentives are to foster rapid economic growth. Local leaders and cadres are judged largely on the rate of economic growth in their regions. Further, the central government has, in effect, imposed large unfunded mandates on these

governments. Their ability to carry these burdens depends on a close relationship with business.[101]

The nature of Chinese business system reflects these realities. Much Chinese business still relies on what are best called "clan" relationships. Within clan networks, suppliers, purchasers, and government officials are bound by tight duties and obligations. Outside these networks, obligations and trust are far weaker. Business owners and government officials are often united by clan ties. Business owners seek favors (and protection) from local officials, and the latter depend on payments from business to augment state expenditures and personal consumption.[102]

The capital market exhibits the same blurring of lines between state and business. State owned banks are still a dominant part of the Chinese economy. They pay little or no interest to depositors, but they also demand little of creditors with government backing. As a result, the latter can continue to invest well beyond the point of excess capacity. And their inability to earn adequate returns on bank savings may encourage them to do so. The product of the resulting excess capacity can be shunted into export markets—thanks to the under-valued Yuan.[103]

The result of this complex system of business and government has been a concentration of growth in energy-intensive industries. Some of these industries use world class technology and some rely on regional resources. The latter tend to have much higher carbon intensity than their Western counterparts.[104] Which is the case depends on the specifics of decisions that may be made on different grounds in each region.

5.3. Institutions and GHG limits

China's institutions not only raise its GHG intensity, they also greatly decrease the odds that the country will adopt controls. Existing institutions sap the appeal of controls while also undermining the government's ability to enforce them in the unlikely event that it should wish to do so.

To be sure, China has valid grounds for concern about potential harm from climate change. Water supply is already a problem and much of the economic activity is concentrated on the coast.[105] Even so, economic development can reduce this vulnerability, and, for China, development may be a better shield than GHG controls would be.[106]

Nonetheless, China's government and market structures both create high hurdles for GHG control measures. Recent scandals have raised serious questions about the integrity of China's regulatory systems. Some progress toward more effective and consistent law enforcement has taken place, and more may be in the offing,[107] but institutions still fall short of those that would be required for changing the direction of regional growth, let alone implementing an effective domestic emission trading scheme.

Even a "no lose" cap-and-trade system, which might seem to promise revenue gains, could exceed its capacity to enforce its will. The central government controls the destiny of some key sectors, but its sway over investment in power generation and much regional industry appears quite limited. Thus, its commitment to a cap-and-trade system might not have much impact on many sectors and regions.

Over time, the balance of power between regions and central government may shift. Financial sector privatization and less use of no-recourse lending to state and regional enterprises might instill much stricter market discipline. The central government can create some new industries, and it appears to be taking some steps, for example, to promote electric vehicles. But these steps are likely to be slow, and they are not fit easily with any commitment to specific emission targets. In this regard, the China's policy process may produce results much like that of the U.S.

While the two countries' policy process could hardly be less alike both governments seem to exhibit a common dislike of taking actions that boost energy prices. The CCP clearly fears the popular backlash that higher energy prices might unleash.[108] The country's high GHG intensity would amplify the costs of controls, which would doubtless further crimp Beijing's appetite for such measures.

5.4. Institutional reform, future growth, and political power

While still achieving what are by global standards only middling scores for the rule of law and related institutional development, China has logged huge economic gains. The record indicates that other countries, too, have achieved rapid growth without having first built rule-of-law-based societies. The real test comes when a country has closed much of the technological gap with the industrialized world. At that point, further institutional reform becomes critically important.[109]

For China, the test lies in the future. The continuing trend to integrate the labor market between the west and the east and between rural and urban areas provides a reservoir of yet to be fully tapped productivity growth.[110] As this pool is drained, the issue of further institutional reform is likely to become more pressing.[111] Despite these concerns, other experts, remain sanguine that China can and will solve the institutional challenges.[112]

Yet history shows that governments often stray from the path to such reforms.[113] In order to sustain its economic development, China may have to adapt its property rights and judicial systems to more closely resemble those of the West.[114] Such deep economic reforms may lead inexorably to the creation of a more open and competitive political system.[115] Traditionally, reform threatens the foundations on which stability rests, which makes it a risky venture for those in power.[116] By inference, if the Chinese Communist Party (CCP) wishes to complete the process of economic reform, it might have to be willing to abdicate its monopoly on political power.[117]

6. Looking toward future policy

More attention to political economy could lead to more chastened expectations about the likely future course of climate policy. Through a lens of political economy, climate policy is likely to record only halting progress for as long as it continues to focus on the single-minded pursuit of GHG limits. A few thoughts about the possible course of future policy might draw out some possible implications of the foregoing analysis.

6.1. Possible patterns of future mitigation efforts

The effort to control greenhouse gases will continue, but probably not very effectively. Internationally, a patchwork with many gaps seems unavoidable. Domestically, costly control measures and poor policy tools seem likely to prevail. The key challenge for climate policy will be to adjust in ways that mitigate the economic harm otherwise likely to ensue from the likely policy choices. A more diversified mix of strategies may be superior to today's single-minded focus on GHG controls.

6.1.1. Internationally, a patchwork outcome

Internationally, no comprehensive system appears to be on the horizon. The inability to make an agreement individually rational at acceptable transaction costs lies at the heart of the problem, and nothing seems likely to change this basic reality.

If international policy continues to be driven by the sum of domestic developments in relatively few countries, the international system seems destined to evolve, but it will do so incrementally and without a centrally driven concept. Some nations, especially the United States, will probably adopt more stringent controls than they now have in place. Some blocs of states, notably the EU, may well continue to coordinate internationally.

Other industrialized countries differ in their institutional frameworks, their cultural traditions, and their economic interests. How far their efforts will be harmonized with the EU remains an open question. For example, Japan has advocated a sectoral approach. It is hard to imagine how their concept could be directly linked to a United States or EU emission trading system.

One possible outcome could be a more or less parallel development of independent approaches. In such a system, nations and blocs would be constantly watching over their shoulders to see how well others are keeping up. The predictable outcome of such a system is likely to be a race in which the slowest competitor, the one with the least to gain from abatement, sets the pace. Since many nations have weak motives for speeding up GHG cuts, such a dynamic may be long on symbolic gestures and short on action.

The United States-China relationship is the fulcrum of global climate policy. So far, climate specialists have considered U.S.-China relations as if climate policy were the dominant issue. In fact, the relationship is multi-faceted. Measures to lessen GHG output are likely to impinge upon many other American policy objectives. Thus, the U.S. government, in dealing with China, is implicitly trading-off GHG abatement against Taiwanese security, Chinese relations with rogue states, trade, human rights, and countless other objectives.

Attempting to persuade China to make GHG cuts implies opportunity costs on these other margins. Domestic politics makes such cross issue trade-offs difficult because disparate domestic interests hold great influence over specific policy domains.[118] *Ex ante*, perhaps all that can be

said is that many factors will affect the tenor of the U.S.-China relationship and that its tenor could, in turn, profoundly change the course of global climate policy.

If progress is defined only as movement toward global cap-and-trade with universal adherence to strict targets and timetables, prospects are bleak. A more optimistic outlook comes out of suggestions by very seasoned observers and scholars in international relations. They have argued that some form of muddling through has much better prospects. In this incrementalist approach, negotiations do not start with the objective of revolutionary change. Rather, they work gradually through a process of eliminating factual disagreements, developing proposals for domestic policies and measures and cooperative activities, and then reaching agreement on a set of specific actions that each country will take contingent on others doing the same – and on the consequences to be imposed if review reveals that a country has not kept to its pledge.

This pledge and review process is unlikely to produce large and immediate reductions in greenhouse gas emissions, but it is likely to produce progress on many fronts necessary to global action over the long term. Much of this progress, for example in the areas of reaching agreement on facts and getting around "spoiler" issues, has probably been impeded by the presence of "targets and timetables" on the agenda. In this regard, the course of international negotiations since the Berlin Mandate in 1993 seems like an immense detour.

6.1.2. Domestic institutions and GHG abatement costs

The debate about future abatement costs is usually waged in terms of conflicting predictions about future technology. It has largely ignored the likely role of institutions. In fact, American rules of the game for political and economic competition have so far produced climate policies that are far less cost-effective than those that most economists would prefer. At the same time, they have not yet locked in extremely costly GHG targets of the kind that would imply the risk of large net costs. Climate policy, in other words, seems to be evolving along lines much like those that prevail in other spheres of environment and energy policy.

However, the smallish net benefits projected for ideal GHG controls suggest a narrow margin for error. If GHG controls can do no better than to match the cost-effectiveness of other pollution limits, then GHG curbs are likely to produce net costs. After all, for the next two decades, according to at least some views, warming may yield net benefits for the U.S., although results will later probably turn negative.[119] If any of the many possible forms of inefficient

control measures are adopted, costs will rise and the benefit-cost ratios of even the optimal level of GHG output abatement could easily decline below 1.[120]

6.2. The goal of flexibility

The slide toward policies that are likely to yield net costs puts a premium on creating options to make later policy course corrections. If mistakes are likely, vigilance against baleful path dependency should be a priority. Frequent policy reviews, ideally reviews backed with sunset provisions, would offer major advantages.

6.2.1. Adaptive efficiency and muddling through

North uses the term "adaptive efficiency" to describe the capacity to innovate and to correct mistakes. Adaptive efficiency is different from allocative efficiency. Indeed, the concepts may sometimes be at odds.[121] Earlier, Lindblom had praised the virtues of incremental "muddling through".[122] Knowledge is imperfect, so errors are common. Adaptive efficiency, a reliance on muddling through, is, therefore, likely to be an important way of limiting the costs of the many inevitable mistakes.

Lindblom describes examples of how large changes in the role of the federal government in the twentieth century came about as the result of a series of small, almost experimental steps. These steps provided learning; they minimized the impact of unwanted side effects or outright mistakes. They developed constituencies and built-up to major shifts in direction.

This model of policy change contrasts with the grand solution that seeks wholesale change through a single law or treaty. The way that log-rolling has transformed comprehensive climate legislation and past energy legislation suggests that an incremental approach could have great merit, trading slower progress and less-than-ideal policies for excessive haste and far worse policies on a much larger scale.

Winnowing out failures is a key marker of high adaptive efficiency, and political structures as well as economic ones can be better or worse at this task.[123] Representative democracies, for example, tend to produce governments that are open to a wide range of influences. This characteristic may not prevent erroneous policies, but is likely to boost a society's ability to correct them.

6.2.2. Adaptive efficiency versus regulatory uncertainty

The powerful sway of path dependency puts a premium on policy flexibility. Some GHG control bills propose to build "off-ramps" and review provisions into initial legislation. The ability of these provisions to enhance adaptive efficiency might be a key question in determining the future costs of such GHG limits.

Off-ramps for GHG control policy may offer an instance in which adaptive efficiency must be traded-off against the benefits of regulatory certainty. No policy design can overcome the inherent uncertainty of future decisions. Off-ramps, which provide for relief on carbon prices or adjustment of targets based on future events. The advantage could be important if technology or participation by other countries does not materialize.

Off-ramps, though, would be a significant source of policy uncertainty. They would set certain dates at which investors would expect to receive better information. That prospect would dampen incentives for near-term investment and, thereby, increase costs. This loss would have to be weighed against the odds that the policy course correction would diminish the harmful effects of an overly stringent GHG policy.

6.3. Back-up strategies

In the longer term, the nature of the climate problem may shift. The inability to actually halt the rise in global temperatures could, over time, become more threatening than are ill-advised and ineffectual government emission controls. One consequence is that government should begin considering back-ups to GHG limits. Adaptation measures, steps that allow societies to adjust to rising temperatures at lower costs, are an obvious example. Adaptation is able to promise a large potential to reduce costs.[124] It is also true, though, that government policy is likely to heavily influence the effectiveness of adaptation. Policies that misallocate water protect too much land from rising sea levels, and can increase the costs of climate change and impede market-driven steps that would otherwise lower those costs.[125]

Another family of technologies, known collectively as 'geoengineering', might provide an added margin of safety during the transition. The idea behind them is simple. When sunlight strikes the Earth's surface, greenhouse gases in the atmosphere trap some of the heat that is generated. A slight decrease in the amount of sunlight reaching the Earth's surface could, in principle, offset the warming. Scientists estimate that deflecting into space only 2 percent of the

total sunlight that strikes the Earth would be enough to cancel out the warming effect of doubling the pre-industrial levels of greenhouse gases.[126]

Scattering this amount of sunlight may be relatively easy. Past volcanic eruptions have shown that injecting relatively small volumes of matter into the upper atmosphere can scatter enough sunlight back into space to cause discernable cooling. The 1991 eruption of Mt. Pinatubo reduced global mean temperature by about .5 degrees Celsius. These temperature reductions were apparent in just a few months and persisted for about three years.[127]

Some scientists propose, therefore, to use modern technology to create a carefully engineered analogue to this effect. Proposals to seriously study geoengineering are gaining adherents among climate policy experts. In late 2006, NASA and the Carnegie Institution jointly sponsored a high-level expert workshop on the subject. The workshop report observed that such distinguished scientists as Ralph Cicerone, Paul Crutzen, and Tom Wigley have suggested further study, and it noted, "Prominent economists such as William Nordhaus and Thomas Schelling have long argued that the concept warranted further exploration as well."[128]

Of course, neither adaptation nor geoengineering will be exempt from institutional and ideological influences. On the contrary, those influences are likely to be strong. How they will play out is an empirical question. The poor prospects for mitigation underscore the need to investigate this question.

7. A Research Agenda for Integrated Assessment

Applying NIE to climate policy shows how largely pointless it is to describe ideal policies that will supposedly lead to an optimal combination of changes in lifestyle and new technologies. This does not imply that the IA approach has nothing to contribute. An appreciation of the difficulties of achieving necessary institutional change or first-best outcomes warn against using model results to "tell policymakers what they must do," to imagine futures in which the problem is solved, to prove that the benefits will necessarily exceed the costs of achieving some stated goal for CO_2 concentrations or temperatures, or to as a basis for designing elaborate social engineering schemes to achieve that goal. But these are not useful efforts in any event.

Impact analysis and integrated assessment models, like any other tools of policy analysis, can serve three legitimate purposes: educate citizens, advise elected officials and assist

businesses. The application of insights and approaches from the new institutional economics does not change the value of IM/IAM any of these purposes, but does suggest some different approaches.

7.1. Educate citizens about the nature of the climate problem and the issues in taking action:

Confusion between positive and normative statements is epidemic. Most mainstream climate policy analysis has not asked which options have realistic prospects for reducing damages from climate change nor has it asked which approaches have a realistic chance of being adopted and which do not.

Failure to stress this point has led some in the U.S. to paint opponents of any climate bill, no matter how badly designed, as guilty of "treason against the planet."[129] Meanwhile pundits on the other side dispute the merits in even modest and sensible legislation. Education about how policy approaches differ, and in particular about what can be expected from attempts to pass "comprehensive climate legislation" in the context of U.S. political institutions,[130] is a key insight from NIE that could go far toward making the political debate more civil and productive.

Another lost lesson is that other countries may not be willing to do what Americans believe they should. The above analysis suggests, for example, that there is little chance that China will limit its emissions to levels in line with achieving a 550 ppm goal. These findings, if they withstand scrutiny, are critical to a realistic assessment of what can be accomplished and what strategy the U.S. should pursue both at home and abroad.

The issue of what to do about the effects of climate change on the world's poor is also confused. Factually incorrect propositions have been pressed into service as normative rhetoric. The World Bank's World Development Report for 2010, for instance, states that "Switching from SUVs to fuel-efficient passenger cars in the U.S. alone would nearly offset the emissions generated in providing electricity to 1.6 billion more people" and highlights a map of Africa. Yet there is no causal link between energy use in the United States and energy poverty in Africa. Eschewing purchases of SUV's will have no effect on African poverty or energy supply.

The World Bank's rhetoric is still more misleading. For many decades, poverty in Africa has proven highly resistant to bilateral and multi-lateral aid.[131] Despite billions of dollars in aid, violence and predatory governments have made life worse for most of sub-Saharan Africa.

Lower temperatures several decades hence will not save the lives already at risk to violence and deprivation. Programs for encouraging alternative energy and supporting adaptation in poor countries will face an array of institutional obstacles much like those that have so frustrated development aid. NIE has said much about the latter, and, by inference, has much to teach about the former.

7.2. Advise policymakers about likely consequences of their decisions:

"Speaking truth to power"[132] is a phrase that describes both the aspirations and the limits of the role of a policy analyst. The primary use of IAMs in government is to inform officials, their staffs, and their advisors. It can illuminate the likely results of the policy choices that they face, and it can expand the set of realistic choices on the agenda. Even if it be futile to design and recommend "first-best" policies, there is a role for information about impacts of alternatives. IAM's have had remarkable success in quantifying positive and negative effects of specific options and identifying uncertainties. In particular, illuminating unintended consequences and unnecessary costs or burdens can help to nudge decisions in the right direction.

To serve this purpose, analytical tools must view policies in actual political and institutional contexts. A focus on first best policies or on equating the marginal costs of all forms of control everywhere tells us little about the policies actually on the agenda for adoption in any country. On this point, the NIE approach suggests a radical change in direction.

As a stage in the development of IAM's this application is natural: economic models are naturally suited to characterization of the costs and benefits of optimal interventions in economic systems. Therefore, when the research task was to develop the appropriate frameworks to combine economic theory, historical data, and information and assumptions on impacts and new technologies, it made sense to test those models with simple and globally optimal policy interventions.

These test results from a model development process have been mistakenly used to support arguments in favor of long-term GHG targets, but estimates of the costs and benefits of achieving a 550 ppm GHG levels through a global system of emission trading tell us nothing about the costs and benefits of the policies likely to be adopted in a mosaic world with no global

framework. Still less do they say much about likely outcomes in countries lacking the institutions needed for the efficient markets.

Insights and approaches drawn from NIE and world political economy are key to understanding why IAMs should not be used in this manner. They can also help to describe the kinds of stable international regimes or accords that are likely to succeed, and which kinds are not. They can also suggest which kinds of institutions are needed for a particular policy measures to be adopted or to work as intended in nations with different institutional and political systems. Existing studies of the institutional frameworks needed for sustained economic growth can also provide a basis for more realistic and internally consistent long-term emission scenarios. These scenarios can be valuable for use in planning adaptation and geoengineering responses.

7.3. Assist businesses in making long term decisions about investments and strategic directions:

Normative studies done to advocate or compare the relative merits of particular policy goals or approaches are not useful as guides to business decisions. Firms require assessments about how future policies could unfold, and about their consequences for markets and profits. Further, they need guidance about risks and uncertainties. Internally consistent and realistic scenarios for policy developments and their market impacts, both nationally and globally, are the key missing input into systematic scenario analysis in support of long-term business decisions.

The common brainstorming approach to scenario definition, practiced by businesses and the IPCC SRES, leaves out the historical evidence and institutional logic found in NIE studies. Application of the NIE can help to determine what kinds of growth scenarios are internally consistent. It could also use historical precedents, or their absence, to weed out scenarios that are historically and institutionally unlikely. The unrelenting focus of NIE on the role of institutions is also an antidote to the unwillingness of international organizations,[133] to address important constraints on sustainable growth like endemic violence in failed states.

7.4. Conclusion and directions for research

A session, or sessions, designed to foster the exchange of ideas between political economists and modelers might enhance the latter's contribution to climate policy analysis.

Political institutions will shape climate policy outcomes. Current IAMs do not reflect the complexities implied by this fact; further, because modeling optimal policies is much easier than modeling non-optimal pones, the analysis has tended to understate the costs of controlling greenhouse gases and overstate the net benefits of doing so. This tendency has almost certainly reinforced the current narrow focus on rapid emission cuts.

Combining the methods of the climate modelers with those of political economists may offer an antidote to this optimistic bias. Expertise borrowed from the NIE, and from other areas of political economy, may point to ways of modeling more realistic policies. At least, it would provide a useful warning against overly optimistic assessment of the realism of today's model results.

Cooperation offers advantages to both groups of scholars. The approaches complement each other. IAM-based analysis can explain what policies would be optimal and the costs of deviating from them. This ability could provide a metric by which to compare the efficiency of existing political and economic institutions. A joint workshop attended by scholars from both camps might be a useful first step toward exploring the possibilities for fruitful collaboration.

Potentially such collaboration could have important implications for climate policy. IPCC assessments have tremendous influence, but the IPCC process strongly resists consideration of institutional realities. For example, it took a considerable effort on the part of a small set of analysts to convince the authors of the IPCC Fourth Assessment Report to qualify a statement that the results of economic models assuming perfect implementation of policies in all countries and internationally provided a "lower bound" on costs of stabilizing emissions. Clearly, the climate policy debate would benefit from greater familiarity with the political economy and NIE literature.

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