Climate Change, Procrastination and Asymmetric Power

Korkut Alp Ertürk & Jason Whittle[1]
University of Utah, USA

Abstract

This paper argues that policy conclusions of the economics of climate change literature based on "integrated assessment models" (IAM) fails to take into account the intricacies of collective action. Specifically, IAMs do not account for how asymmetric power between developed and undeveloped countries changes the former's pay off matrix with respect to mitigation and adaptation strategies. Using a simple one-sided prisoner's dilemma model, the paper illustrates how developed countries' power to externalize their emissions to the global commons skews their cost-benefit calculation in favor of putting off mitigation efforts into the future. Undeveloped countries on the other hand are incentivized to act in concert to deter developed countries from passing their climate costs onto them in the present. The extent to which they may succeed in doing so also helps developed countries overcome their short-termism on climate change policy.

Keywords: climate change, collective action, asymmetric power

Introduction[2]

The current ongoing debate on what to do about anthropogenic climate change boils down to two essential options, *mitigation* or *adaptation*. Mitigation involves an attempt to avoid climate change all together by limiting greenhouse gas (GHG) output now. Adaptation involves putting off dealing with the impacts of climate change into the future. Adaptation is a strategy of incurring costs in the long term while mitigation is a strategy of incurring them much sooner.

A curious divergence of opinion has developed between climatologists and economists on the preferred course of action with respect to these two policy options in recent years. While the weight of opinion among the former has decisively shifted towards mitigation, economists continued to favor adaptation, arguing that the costs of trying to mitigate climate change right away might exceed its benefits.

Economists' arguments derive from cost-benefit analyses based on models that specify what policy is optimal. These models are often criticized for the unreliability of their assumptions, for understating costs and risk of adverse climatic responses to warming while being overly sanguine about the ability of human societies to adapt to future impacts of climate change. More importantly, they are also criticized for ignoring the uncertainty about the possibility of an ecological catastrophe, the risk of which increasingly worry climatologists. While we agree with these criticisms and point to the conceptual limitations of the type of cost-benefit analyses they undertake as others have done (Tol *et al*. 2003, Stern 2007, Akerman *et al* 2009, Ackerman & Stanton 2013, Pyndyck 2013), our criticism takes a rather different tack. We argue that economists' models and policy conclusions ignore the intricacies of collective action. While perfunctory references to the "tragedy of the commons" and "free-riding problem" are commonplace in this literature, there is little recognition how costs distributed across agents with asymmetric power can distort cost-benefit calculus and change what policy option is "optimal". In addition to having important policy implications, this also matters for the discourse on climate change policy, since economists often make the heroic assumption that societies, just like individuals, would do what is optimal if they are "rational".

Most studies consider whether or not a strategy of mitigation or adaptation is in the best interest of an individual country or a group of countries in a region. Whether or not collective action is achieved in favor of pursuing a global policy of mitigation depends on a critical mass of countries or regions finding such a

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policy to have a clear cost-benefit interest for them individually. Often, this is where the analysis ends. But, of course, what policy is optimal for an individual country depends very much on what others do, and thus the argument becomes circular when we try to determine the collective outcome by summing up individual decisions.

Adaptation involves the emitter distributing its GHG emissions into the global commons, externalizing them onto all countries and regions regardless of their own emissions and level of vulnerability. Mitigation, by contrast, entails the emitter internalizing the costs it emits within its economy. Two general implications follow from this. One, because costs of mitigation are incurred individually while its benefits accrue to all, adaptation enables its pursuers to free-ride on those who mitigate. Given this intrinsic free-rider problem, mitigation requires extensive if not full cooperation and is thus hard to achieve, making adaptation the default outcome. Two, mutual defection from cooperation, i.e., all around adaptation which involves distributing costs to the global commons by all, amounts to passing on costs from high to low emitters.

Given the strong correlation between the rate of emission and the level of economic activity, low emitters are generally poor and high emitters the rich countries. Poor countries also tend to be located in regions more vulnerable to climate change, which also lowers their bargaining power over global policy on climate change. Asymmetric power between the rich and the poor enables high emitters to shift costs onto the low emitters with relative impunity, and that makes "kicking the can down the road" tempting for developed countries, undercutting their interest in forging a harder to achieve but in the long run superior, coordinated solution mitigation requires. But, procrastination could lose much of its appeal had the emitters lacked the power to pass on costs with impunity. If all adversely affected powerless actors could act in unison to deter cost shifting by the emitters that could potentially make mitigation the preferred policy for the powerful players. In other words, the power balancing effect of such a coalition could be the very impetus for overcoming short-termism and acting in their long term enlightened self-interest. This implies that in evaluating different policy options an important consideration should be whether they help or hinder coalition building on the part of the powerless actors.

The rest of the paper is organized as follows. In Sections I and II, we give a brief overview of the positions taken, respectively, by economists and climatologists on climate change. In Section III and IV, we situate the climate change policy debate in the context of a clash between short-term and long term objectives, and go on to argue in Sections V the link between asymmetric power and short termism on the part of developed countries. We emphasize the importance of power balancing by undeveloped countries through coalition building in overcoming short termism, and point to the policy implications of our argument. We end with a brief conclusion.

1. The economics literature on climate change

Economic studies of climate change impact began in the late 1980s and early 1990s (Cline 1992, Nordhaus 1991, 1992). Many of these studies looked at a single country like the US, asking what would be the impact of a doubling of pre-industrial level of atmospheric CO_2 concentration (560 ppm) on sectors of the economy most dependent on nature such as agriculture. Since agriculture makes up only about 2 to 3% of the US and most other OECD countries' GDP (Tol *et al* 2003) and other vulnerable sectors make similarly a small relative contribution, these initial estimates of the economic impact of global warming were small. When these country specific studies were aggregated to the rest of the world the global impact was likewise found to be relatively insignificant as well.[3] This first generation of impact assessment models estimated about a 1.5 to 2 percent cost in terms of global GDP for a doubling of pre-industrial CO_2 concentration with associated levels of warming in the range of 2.5c (Tol *et al* 2003).[4] Clearly, none of these studies lent support to a policy of mitigation as they seemed to suggest that waiting to mitigate greenhouse gas emissions (implicitly choosing an adaptation policy) involved relatively modest costs.

[3] See, for instance, Nordhaus' (1992) DICE model.
[4] In these models, the warming levels assumed from given increases in CO_2 concentration is rather optimistic in comparison to the IPCC (2007) estimates.

However, most developing countries derive a much higher relative share of their GDP from agriculture, often in excess of 50%, than do OECD countries, and thus using the US or Europe's agricultural impact as a baseline for these countries grossly underestimated the impact of climate change on developing countries (Nordhaus & Yang 1996, Tol *et al* 2003). The problem was addressed by regionally calibrating the impact assessment models (Nordhaus & Yang 1996, Mendelsohn & Schlesinger 1999, Mendelsohn *et al* 2006). These so-called the "integrated assessment models" (IAMs), showed that different regions in the world would be affected very differently by climate change especially in the initial phase of global warming. Out of this literature came the "hill shaped" response function to climate change (Mendelsohn *et al* 2006). According to this, the impact of rising temperature is initially positive on a *cool* region's economy and becomes negative only past a certain threshold after the region's climate becomes too warm. The regions that are already warm in lower latitudes in many parts of Africa and Southeast Asia with limited ability to protect coastal areas are the most vulnerable (Mendelsohn *et al* 2006). By contrast, warming is expected to move other regions such as Russia, Canada, some parts of the US and Europe, initially to a temperature level that might be economically beneficial (Mendelsohn *et al* 2006).

These findings implied that developed regions had less of an incentive to opt for corrective action early on than undeveloped and regionally vulnerable areas. The latter faced not only immediate costs but also the prospect that these costs could cumulate to debilitating and possibly catastrophic levels by the time developed countries ceased externalizing costs to the commons. Yet, factoring in undeveloped countries' losses did not tip the scales much in a "global" cost-benefit analysis,[5] because relatively small gains in a country like the US more than offset the economic devastation in smaller undeveloped countries in the aggregate because of the smaller size of their economies.[6] Thus, delaying mitigation could be shown to involve a net benefit until warming reached higher levels. This led to the notion that there was some "optimal" level of warming.

Nordhaus (2010) specifies what this optimal level might be and compares it against several different climate scenarios. He starts out by calibrating a worst-case baseline scenario, involving a situation where no action is taken by world governments with emission growth proceeding unchecked. Atmospheric CO_2 concentrations reach 795 ppm by 2100 and top 1200 ppm by 2200. Warming from such levels of CO_2 is estimated to reach 3.5c by 2100, eventually peaking at a 6.7c increase relative to 1900 temperatures. It is uniformly accepted that such levels of warming would most likely involve an ecological disaster (IPCC 2007).

Nordhaus' "optimal" scenario, an example of what an "adaptation" strategy might look like, involves the reduction of CO_2 emission level to 50% of its 2005 level by 2100, where warming peaks at 3c increase with atmospheric concentration rising to 600 ppm.[7] Comparing the optimal with the baseline scenario, he estimates that the former yields a higher level of global consumption by 8.06 trillion in 2005 USD, a 0.35% improvement of discounted income over the baseline scenario. He then compares the optimal (adaptation) scenario with, what might be called mitigation, defined as maintaining a 2c ceiling on warming by taking more immediate action which the climate science community has been advocating (more on this below). He calls this the "temperature limited" case and estimates that it requires again roughly a 50% cut in emissions from their 2005 levels, but much sooner, by 2075. Now, CO_2 concentration rises to 500 ppm by mid-century and eventually stabilizes at 450 ppm. This case also fares significantly better than the worst-case baseline scenario, yielding a 4.37 trillion worth of higher, a 0.19% increase in discounted, consumption, but falls short of the optimal case roughly by half.

This is perhaps the clearest statement of the basis on which economists believe that developed countries can reap a net benefit from delaying mitigation. They oppose trying to limit warming to 2c or less, since that becomes very costly "because of the difficulty of attaining that target with so much inertia in the

[5] Note that these models made the implicit assumption that the marginal utility of consumption in poor countries is the same as that in rich countries. Known as "Negishi-weighing," this assumption basically amounts to ruling out of consideration any improvement in global welfare through income redistribution (Stanton 2009). We thank Tariq Banuri for pointing this out.

[6] These estimates from the 1990s predate the explosive economic growth of China and India. In Nordhaus & Yang (1996) India is part of "the rest of the world" while China is mentioned only in passing. Today, China is the second largest national economy and the largest emitter of CO_2 in the world. Reaching any global climate targets today would require both China and India to mitigate along with developed countries.

[7] These estimates are again on the optimistic side of the spectrum as they leave out land use changes and greenhouse gases other than CO_2, and assume the lower bound of probable warming from a 600 ppm concentration. IPCC (2007, p. 66) estimates that warming from the same level of CO_2 concentration (600ppm) can be as high as 6c.

climate system" (Nordhaus 2010). The intriguing question is whether economists might be peddling "fool's gold"? At the risk of sounding alarmist, climatologists think that delaying mitigation is basically tantamount to playing Russian-roulette with the planet's very survival. For them the notion that one part of the planet can benefit from warming while the other part is devastated is not only misguided but also a dangerous illusion (Stern 2007).

2. Climatologists

When looked at from the point of view of climate science the picture is grim. Climate scientists warn that humanity is risking leaving behind the very climatological epoch – the Holocene era of the last 12,000 years – that gave it agriculture, science and industry (Hansen *et al* 2008). Their main concern is that warming can trigger a nonlinear reaction that takes the planet to a fundamentally different climate system where warming intensifies independently of what humans do. If that were to happen, any mitigation effort at that point would be too late.

With global temperature at its warmest level in the Holocene, little additional climate forcing from GHG emissions and land use changes are required to trigger positive feedbacks. Rapid melting of land ice as recently observed in Greenland[8] is an example of the kinds of changes that can give rise to the feared positive feedback effects given that ice reflects 90% of the solar radiation hitting it whereas water and land absorb nearly all of it. Among others, the rising CO_2 content of the deep oceans and surface Albedo can also trigger positive feedback effects. If these show up earlier than expected, as is now seen more likely than before, warming can proceed even without any additional forcing. Climate change would then be locked in a trajectory of automatic warming that could be next to impossible to mitigate. This is what climatologists are becoming increasingly concerned about (Stern 2007, Hansen 2008, IPCC 2007 & 2014).

No one knows with any precision at what point that might happen. Yet, there is little doubt that these tipping points are real, and that makes the situation alarming. In previous periods of higher CO_2 ppm atmospheric concentrations and higher temperature the speed at which CO_2 ppm increased was approximately 0.01 ppm per year. Now, humans are increasing it by 2ppm per year (Hansen *et al* 2011). Never before in Earth's known history has so much CO_2 been added to the atmosphere from year to year. It is possible that warming up to the economically "optimal" level of 3c might entail crossing some tipping points. Of course, building in additional warming beyond 3c will only increase the risk of passing that critical threshold beyond which mitigation becomes much more costly, if at all possible.

Because crossing tipping points can have such grave consequences, climatologists call for immediate action to prevent them from happening at all cost (Stern 2007, Hansen *et al* 2008, 2011, Hansen 2008, IPCC 2007, 2014). In their view, the current CO_2 ppm concentration of 400 ppm is already too high. Even if such tipping points are not crossed, warming risks causing irreparable damage to the ecosystem as it is. The northerly migration of plant and animal zones that has already been taking place is an alarming sign. Given that humanity relies on the ecosystem for its survival, pushing it to its breaking point threatens not only polar bears but also the civilization itself (Hansen 2008).[9] Minimizing the risk we face requires that climate change is limited to 2c, and that means CO_2 concentration should not be allowed to exceed 350 ppm. Thus, staying in the "safe" range requires immediate action, which the most recent 2014 IPCC again calls for with even direr warnings than in 2007.

However, while there might be little uncertainty that climate change is happening, climate science still lacks precision on many questions: how much and fast warming will occur, how sensitive the climate will be to rising CO_2 levels, land use changes and other greenhouse gases; and how will the Earth change climatically and physically at rising levels of warming, among others. Thus, cost estimates unsurprisingly remain far from robust and fail to converge over time. In fact, the very danger of an ecological disaster and the uncertainty it creates brings into question the very viability of the exercise. If future contingent outcomes

[8] In the summer of 2012 the melting in Greenland ice sheet in just 4 days jumped from 40% to 97% melting: http://www.nasa.gov/topics/earth/features/greenland-melt.html

[9] As Daly (1997) and other ecological economists have argued for a long time it is important not to lose sight of the fact that the economic system resides within the larger ecosystem.

cannot even be specified given the level of uncertainty, cost estimates end up becoming arbitrary as slight variations in what contingent scenarios unfold produce drastically different results.[10] How does one quantify the increased extinction risk of a given percentage of species and estimate its implications for the ecosystem over time?

3. Changing preferences and procrastination

Economists engage in considerable cherry picking in their cost benefit analyses, but otherwise their assumptions are based on climate science albeit with a time lag. As climate scientists' forecasts become more pessimistic over time, economists are soon likely to revise their optimistic assumptions at least on issues related to hard science. One exception that appears impervious to changing opinion within climate science involves *discounting*, a putative forte of economists.

With a given set of science based assumptions, the balance between present value of long-run costs and benefits from growth can vary drastically depending on what discount rate one uses.[11] Economists postulate of a *pure* discount rate on the presumption that a time-invariant time preference of consumption exists for humanity as a whole.[12] This rate supposedly captures our inborn impatience that makes us prefer consumption today over consumption tomorrow. A higher discount rate values current consumption more heavily relative to future consumption in general, and, holding all else constant, makes mitigation less desirable given that future costs then weigh relatively less today.

We believe that economists can make a better contribution to the debate on climate change if they focus on how behavior might be affected when preferences evolve over time rather than postulating an invariant discount rate that seem unconvincing. Defining our relative preference for immediate consumption independently of what we think of how our actions today might influence the future might be of doubtful value. Given that our preferences are all mediated by some form of cognition[13] (Bowles 1998), it is only reasonable to think that they would change when our understanding of how what we do today affects what happens in the future changes. Thus, the notion that as humanity absorbs the findings of climate science regarding the risks associated with delayed action on climate change its *pure* discount rate would militate against taking action sooner than later lacks purchase.

Take changing views on smoking as one example of how our preferences change when our notion of the future consequences of our actions today changes. Few today doubt that smoking is harmful including those who continue to smoke (CPPE 2011). Once the future consequences of our actions are better understood, our subjective evaluation of costs today versus costs tomorrow also changes. The more pertinent problem is that this might not translate into change in behavior readily. Often when our "long term" preferences change our actual behavior might not, at least for a considerable time, and this might be the more important issue for economists to focus on.

The smoking example also highlights this problem. We know only too well that many smokers who want to quit perpetually put off quitting. While they do not want to be smokers in the long run, they keep smoking in the present. As is the case with *procrastination* more generally, this involves a situation where the two sets of preferences, long and short term, are caught up in a perpetual clash. A smoker who knows that quitting is good for him/her might still dread the difficult adjustment cost it entails in the short run. Continuing to smoke (adaptation) involves rising future health costs and risks that can be alarming. But, these costs are mainly probabilistic, long run and thus discounted, while the cost of quitting (mitigation) is certain and all front-loaded. That can make the smoker's discount rate an important determinant of when (and if) s/he will quit. For instance, public health messages that warn teenagers about the future health risks of smoking often

[10] Most economics models neglect possible sudden impacts such as rapid ice melt off or sudden sea-level rise let alone an ecological catastrophe however defined (Roughgarden & Schneider 1999, Stern 2007, Akerman *et al* 2009, Pindyck 2013) See Weitzman 2011 for a broader discussion of deep structural uncertainty and "fat tails" in critical probability distributions in climate change research.
[11] See, Stern (2006), Nordhaus (2007) and Azar & Sterner (1996).
[12] The discount rate is thought to comprise a *pure* time-preference component and another part that reflects marginal utility of consumption that is expected to diminish with increasing levels of affluence (Arrrow et al 1995; Fankhauser 1994). Here our discussion focuses on the former.
[13] The exception being the subset of preferences that find expression in visceral reactions of the type, "I hate this, or love that".

fall on deaf ears because teenagers tend to discount the future very heavily.

We clearly do not consider teenagers' high discount rate an unchangeable inborn trait but a problem that needs correction, and when an adult discounts the future heavily we consider it a moral failing.[14] If we thought the *pure* discount rate was an immutable *given*, continuing to smoke for a time could then be shown to entail a net utility benefit. In fact, the higher a youngster's discount rate, i.e., the more "shortsighted" one is, the economists could conceivably advise smoking longer in the name of maximizing utility.

Counselling smoking teenagers not to be rash in quitting and arguing for delayed mitigation in climate change policy might share some similarities. True, in the case of smoking the relevant trade-off is between the well-being of the same person today *versus* tomorrow, whereas in the case of climate change it is between the well-being of future generations *versus* that of people who are alive now. But, in both cases the well-being of the future self or future generations are very much dependent on what the present self or generation do in the present, which suggests that what we want for the future and do in the present can clash in a similar manner.

4. Short-termism and climate change

Just as the typical teenager, the present generation can be said to have difficulty imagining a future that is fundamentally different than the present. That tends to shrink the very time horizon that defines the *long run*. Consider the different time horizons involved in how the future or "long-run" is conceptualized respectively by economists and climatologists. The long run equilibrium of climatologists might take as long as a thousand years to materialize. It is a state where the climate forcing effects of GHG emissions and land use changes have stabilized and there is no further endogenous warming or cooling. By contrast, for economists it is hard enough to trust any long run equilibrium model predicting 10 years out, let alone a hundred years.

This means that economists' long run models cannot possibly take into account the full long run cost of climate change from a level of GHG emissions that upsets the ecological long run equilibrium. The sea level in the new ecological equilibrium might rise, say, so much as to leave only the Andes and Himalayas dry, but if that takes one thousand years and we are only looking at next 100 years at a time, the cost of mitigation might remain higher than adaptation in much of the hundred year intervals before reaching ecological equilibrium. When finally adaptation becomes the more costly option, climate might no longer be responsive to mitigation. One is reminded of the story of the frog too lazy to get out of the warming pond under the rising sun, finding a way to adapt to the increasing heat every step of the way until it boils to death. Economists might have something useful to say on why that happens and how such short-termism (procrastination) can be overcome.

Akerlof's (1991) analysis of the dynamic inconsistency between short and long run preferences in procrastination gives an idea why the proverbial lazy frog procrastinates to death. With a decision horizon that is exceedingly short taking action now rather than later has a *salience cost*, giving rise to the inability - common to both the *lazy frog* and the *grasshopper* - to anticipate the future. If the cost of taking corrective action (say, quitting smoking) today is the same as tomorrow, both higher than its small short run benefit, the salience of the immediate cost in the current period makes it more "costly" than undertaking it in the next. Thus, taking action tomorrow ends up being always preferable to doing so today. Our short term preference is then caught up in a perpetual clash with our long-term preference.

In situations where we know this kind of a clash will occur we often devise practical schemes to safeguard our longer term preferences. Consider an example from Schelling (1984) with our twist on snoozing. Right before going to bed late at night we want to wake up early in the morning and not be late to work, but at the same time know quite well that come morning we will not want to get out of bed. In other words, we expect our long term preference to come into conflict with our short term preference in the

[14] The older generation of economists clearly have thought so. Similar to Aasop's fable with *the grasshopper and the ant*, Irving Fisher wrote, "Generally speaking, the greater the foresight, the less the impatience and *vice versa*.... This is illustrated by the story of the farmer who would never mind his leaking roof. When it rained he could not stop the leak, and when it did not rain there was no leak to be stopped! Among such persons, the preference for present gratification is powerful because their anticipation of the future is *weak*." (cited in Akerlof 1991, p. 6).

morning, and predict that we will keep pushing the snooze button only to end up rushing uncomfortably or be late. As we press the snooze button to silence the alarm clock for few minutes at a time our decision horizon is exceedingly short. At the end of the first snooze period, we decide to push the snooze button yet again because getting out of bed after the next snooze period is preferable to getting out now, and so it goes until we end up being late.

How do we deal with this problem? As Schelling remarks, one possible remedy is to put the alarm clock away from bed to make it harder to delay getting up. Once taking action cannot be delayed with ease the decision time horizon extends and the cost-benefit calculus then changes, and with it our myopic inability to anticipate the future is overcome. In more general terms, the moral is that dealing with procrastination involves finding a way to willfully constrain our freedom of choice/action in the short run such that it becomes easier to act on our long term preferences which we believe will make us better off (Schelling 1984, Akerlof 1991). In other words, when what appears "optimal" from a short run perspective is not so when looked at from a longer run perspective, constraints on our short run freedom of action to pursue what we desire to do might be in fact a blessing in disguise.[15]

What does this say about overcoming *collective* short-termism in climate change policy? At a cursory level, clashing long and short term preferences/interests in the realm of political decision making is also commonplace. Governments the world over find their policy agendas shaped by pressing short run political pressures that have urgent appeal for their constituencies, leaving little room to address long term concerns that have little salience even if they are exceedingly important. Usually, political reforms that tackle long term, structural problems become politically feasible only after a crisis.[16] Crises have this effect arguably because they reduce the relative salience of the short run by raising the public's attention on the long term issues and problems that need to be addressed. That, in turn, constrains the ease with which political power can elect to avoid taking steps that are politically costly in the short run. So, again, constraining short run freedom of choice (for inaction) makes it easier to serve long term objectives.

But, at a deeper more general level, arguments that generalize from individual behavior require closer scrutiny for they can run into two types of problems. One is fallacy of composition. What is true for the individual need not be so for the group as a whole. In the simple one-shot PD game, for instance, individuals acting on what is optimal for them produce in the aggregate a sub-optimal outcome. The other complication arises from the political and social determinants of collective agency. Even if social optimum could be specified by simply aggregating individual preferences (the first problem), the nature of social divisions between groups/classes and the *rules* of political contention among them might render it unachievable (the second problem).

It is not unusual for economists to ignore both problems – especially the second one which is often taken up if ever by non-Walrasian economists, old and new, on the fringes of the profession (Ertürk 2012). Broadly speaking we are inspired by this literature and draw on its insights to show in the next section how the consideration of a political/social variable (i.e., asymmetric power among countries/players) which bears on the second problem is integral to the outcome with respect to the first. The problem of *radical* uncertainty aside, cost benefit analysis on climate change is not purely a technical exercise as economists tend to assume. Political constraints can often prove decisive in altering what course of action is optimal for the powerful agents whose decision matters, and it turns out *procrastination* can indeed be a helpful analogy in discussing how collective short-termism can be overcome. Using simple game theory we show that the existence of asymmetric power is tantamount to the removal or absence of a short term constraint that could have potentially constrained developed countries' freedom of choice in favor of inaction in the ecological short run and helped them act on their long term interest. By implication, anything that changes the power imbalance can also alter what is *optimal*.

[15] In mythology, the story of "Dionysius (Ulysses) and the sirens" makes the very same point – see Elster (1977).
[16] Rahm Emmanuel's famous political dictum, "Never allow a crisis to go to waste. They are opportunities to do big things", captures this well. Quoted in Zeleny (2009).

5. Collective action, asymmetric power and climate change

The power asymmetry between the poor and rich countries is a pervasive, essential characteristic of the world economy that shapes their multi-faceted interaction, whether in the context of the global economy or the international political fora where terms of multilateral cooperation are typically negotiated. Yet, its ubiquitous nature and the complex, multi-faceted ways in which it manifests itself makes it hard to capture it in highly abstract, stylized economic models.

Here, we try to deal with this challenge by working with a simple, parsimonious definition of power asymmetry in simple game theoretic terms as to whether one's course of action has influence on the other players' payoff. The *powerless* can then be thought to face a one-dimensional prisoner's dilemma as what they do, defect or not, has no influence on the more powerful player's payoff. In our particular example, whether undeveloped countries choose mitigation (non-defection) or adaptation (defection) makes little difference to developed countries' wellbeing, and thus individually each developing country *vis a vis* developed countries as a group finds itself in a one-dimensional prisoner's dilemma. By contrast, when developed countries follow a policy of adaptation (defection), undeveloped countries are liable to suffer the ill-effects of warming regardless of what they themselves do.

Figure 1

	Developed Countries: Mitigation (non-defection)	Developed Countries: Adaptation (Defection)
Poor Countries	*Win* (1A) *Win*	*Win* + (1B) *Lose*

In Figure 1, in (1A) both regions benefit from mitigation, (first top entry is Column's payoff and the second below the Row's) while in (1B) developed countries get the superior *temptation payoff* from adaptation in contrast to the ***sucker's payoff*** the undeveloped countries receive. The disagreement between the economists and climatologists revolves around the question as to whether the temptation payoff (1B) is really preferable to (1A) for developed countries. In the shorter run perspective of the economists (1B) is superior to (1A), because developed countries can continue to benefit from growth at least for a time without paying an ecological price. Given their longer term perspective, the reverse holds true for climatologists.

According to the climatologists the likely outcome of adaptation in cell (1B) involves a *death spiral*. Warming rises beyond safe levels as powerful countries continue to externalize costs to the global commons. The vulnerable regions begin facing steeply rising ecological costs in the not too far-off future with prolonged droughts/floods, severe food shortages, both giving rise to heightened conflict over resources and an ever increasing exodus of environmental/war refugees. In the meantime, as developed countries continue adapting to warming some of the geophysical tipping points that accelerate warming are crossed. Warming settles on an unstable upward trajectory and the cost of mitigation proves inordinately higher than anticipated at the economically "optimal" level of warming.

What could prevent this ascent towards the *death spiral* the climatologists fear is of course the question. That is tantamount to asking, what would it take for the powerful countries to act on their enlightened long term self-interest and move from cell (1B) to (1A) in a timely manner? In our view, such a policy reorientation might entail a three step process. The first involves a sea change in long term preferences. Perhaps similar to how public attitudes towards smoking has evolved in the last few decades,

we are arguably in the midst of a similar global transformation with respect to public awareness about the threat global warming poses for the future of the planet. As public's awareness of the gravity of the threat extends, the second stage would be the growing recognition of the conflict between our short term propensity to postpone corrective action and the planet's long term wellbeing. This is the period of *procrastination* where the dynamic inconsistency between our short and long term preferences/interests results in the perpetual postponement of taking action. Finally, the third stage is when the conflict is resolved in favor of our long term objectives when constraints are placed on our short run freedom of choice for inaction.

Note that there is an essential asymmetry between (1B) and (1A) in terms of their respective implications with respect to collective action. All out adaptation in (1B) requires no cooperation and developed countries end up acting as a bloc (*vis-a-vis* undeveloped countries) by merely acting on their individual short term interest. By contrast, mutual mitigation in (1A) requires developed countries to agree on a mutually binding set of restraints on their behavior, and, for it to be effective, an ability to sanction defection among their midst.[17]

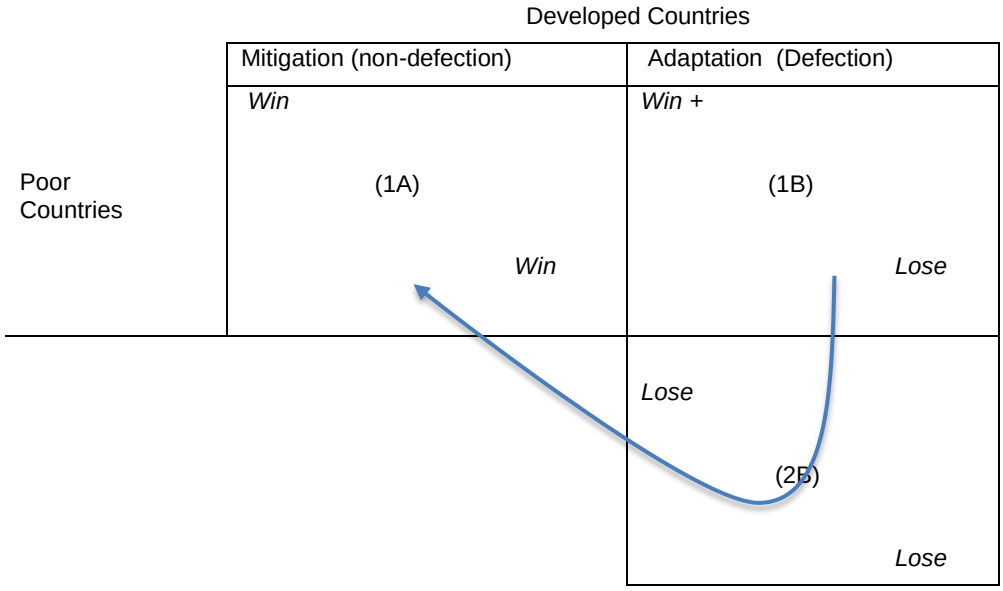
Returning briefly to our smoking example, the smoker who is trying to quit realizes that resisting smoking *today* is worthwhile only if s/he will be able to resist the temptation *tomorrow* as well. Otherwise, incurring the cost of not smoking *today* will be wasted effort. If the smoker had some credible reason to expect that some constraint will impede his/her freedom to backslide *tomorrow*, it becomes so much easier to *commit* to not smoking *today* (Schelling 2006). In a similar dynamic, any individual developed country that mitigates would incur costs in vain if other developed countries were to backslide on their commitment. Thus, in the absence of a constraint that can credibly be expected to impede backsliding by self and others it becomes hard to commit to mitigation by any individual developed country in the first place.

Given that they happen to be in regions that are not immediately vulnerable to warming, the developed countries' crucial *short run* freedom is their ability to externalize climate costs to the global commons. This is made possible mainly by asymmetric power, and thus the inability of undeveloped countries who are adversely affected in the present to deter it. It might be in the long term interest of developed countries not to externalize climate costs, but the fact that they can makes it hard for each of them individually to commit to mitigation. When one powerful agent gives up its freedom to individually benefit from the weakness of the weak agents for some collective benefit, it has to be confident that the other powerful agents will do so as well. Otherwise, self-restraint simply enables another to profit at one's expense. This is the *commitment problem* of the powerful, and its solution requires a *commitment device* that would enable an individual *powerful* agent to credibly expect others to follow suit when it self-restrains (Ertürk 2011).

But, if undeveloped countries were capable of changing the payoff matrix of developed countries through some concerted action, it could potentially work as a *commitment device* that would make it easier for developed countries to act in their long term interest. Stylistically, if a coalition of undeveloped countries could reduce the developed country payoff through some retaliatory action both group of countries would find themselves in (2B) in Figure 2. With (1B) no longer attainable, (1A) would then become the preferred option for developed countries not only in the long run but in the short run as well. Collective *defection* by undeveloped countries could in this instance perhaps refer to something much broader – an ability to speak in one voice on climate policy in international fora that energizes activists worldwide, raising political costs for developed countries in the home turf through *striking*, *boycotting* and public *shaming*.

[17] For instance, given the voluntary nature of the Kyoto Protocol there were no adverse repercussions when both Japan and Canada failed to meet their commitments made in it. That also brings up the question whether effective international obeisance can ever be achieved without active US involvement even though its willingness and even ability to exercise leadership is increasingly in doubt. Interestingly, there are some tentative signs that opinion on climate change might be beginning to change within the US political elite. A new study just released by the bi-partisan *Risky Business Project* (RBP 2014), and backed by former Treasury Secretaries Hank Paulson, Robert Rubin and George Shultz, examines the financial risks of global warming with an objective to transform how American businesses and politicians (do not) think about climate change.

Figure 2: Preventing the *Death Spiral*



To the extent growing awareness of financial and economic costs associated with extreme weather patterns (IPCC 2014)[18] and spillover effects of climate related calamities that are likely to begin unfolding in undeveloped countries in not a too distant future are transformed into *salient* politics at home it is conceivable that the developed country payoff can change. If continued adaptation is thereby made politically and economically more costly by a block of undeveloped countries acting in concert no individual developed country will be dissuaded from mitigation on account of fear of others' probable defection.

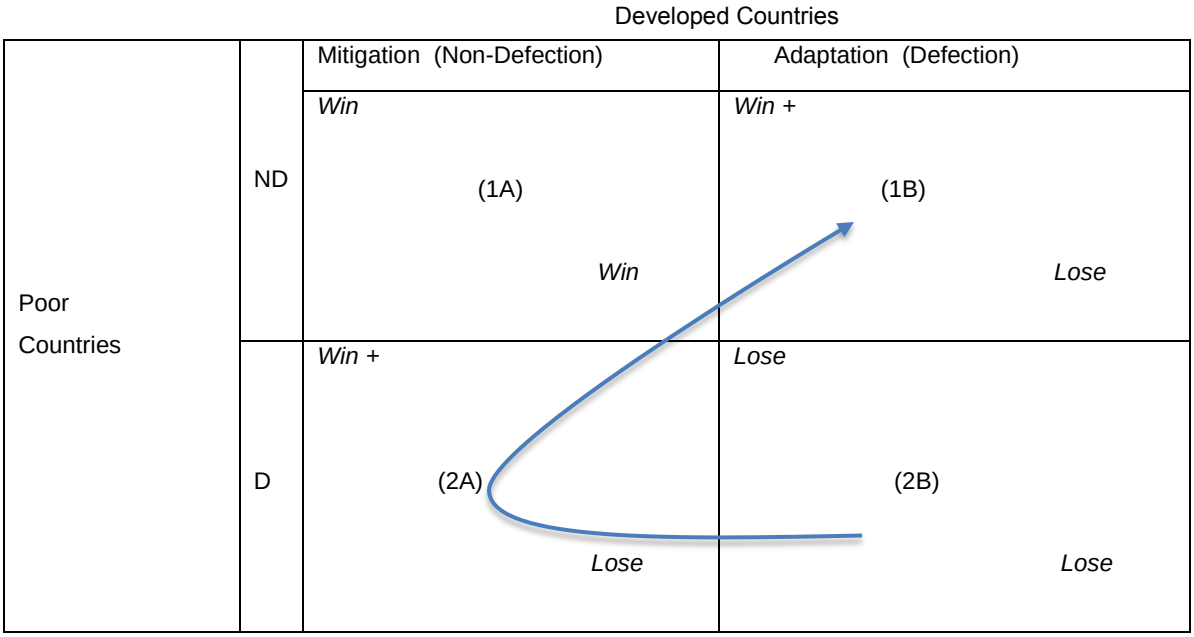
Clearly, whether undeveloped countries can at all act in concert, especially given that China and India might possibly favor delayed mitigation; and, if they did, what exact form would their *defection* take are questions not easy to answer. At this point we can only speculate. Though the comparison can be misleading, it is interesting to note that in the WTO's Doha trade talks undeveloped countries did manage to act in a block (Kleimann & Guinan 2011). Their collective ability to cause the collapse of the talks is an instance where they managed to reduce the developed country payoff to *mutual punishment* – (2B) in Figure 2 - which might yet prove to be the strategic prelude to the achievement of a more equitable accord based on cooperation (1A) in the long run.[19] Coalition building (and maintenance) requires that players are able to (i) coordinate behavior, (ii) monitor defection, and (iii) bring political pressure to bear on defectors. Individual members can thereby not only coordinate and identify norm breakers more easily, but also enforce rule obeisance within the group.[20]

There is also the possibility that developed countries can preempt or prevent any coalition building on the part of undeveloped countries by providing them incentives to break rank. That would cause them to compete among themselves for what we might call the "scab's payoff," (2A) in Figure 3, in the form of financial and economic favors from developed countries in exchange for hosting their ecologically costly activities and legitimating developed country actions and positions in international fora.[21] The effect would be

[18] See also a report by the British non-governmental organization, Carbon Tracking Initiative (CTI 2013).
[19] Climate policy is of course very different given that neither the terms nor the institutional framework of bargaining can yet be said to exist. Yet, future trade negotiations are likely to become increasingly enmeshed with environmental issues. Free trade agreements have been used on numerous occasions to dismantle environmental regulations at the local and national level (Klein 2014, page 69) and it is likely that they will continue to get in the way of efforts to address environmental concerns. On the other hand, while in principle trade sanctions can potentially be effective in controlling carbon emissions, it is also true that environmental issues can be used opportunistically to raise entry barriers for developing countries in advanced markets (Esty 2001).
[20] As a colleague who worked at the UN for long years put it, "when developing countries want something they try to have everything out in the open and when developed countries want something they work behind closed doors."
[21] See, O'Brein & Leichenko (2000) for an extended discussion on how the financial/economic and environmental vulnerabilities of undeveloped countries can interact to their detriment.

to keep most undeveloped countries locked in or return to (1B) in a one-dimensional prisoner dilemma. In fact, anything that lowers the ability of the powerless countries to form coalitions and deal with free riders in their midst will increase the probability of returning to the *death spiral*.

Figure 3: Back to the *Death Spiral*



6. Conclusion

We have argued that IAMs ignore how asymmetric power can skew the cost-benefit calculus of developed countries towards delaying mitigation. The distribution of climate costs around the globe is not just a geographic given, but also an attribute of asymmetric power. The freedom to externalize their emissions to the global commons makes it harder for developed countries to overcome short-termism, just as it incentivizes undeveloped countries to act in concert to deter the former from passing their climate costs onto them. Thus, to the extent undeveloped countries can succeed in coalition building and act in concert they can potentially help developed countries overcome short-termism and act in their enlightened long term interest as well.

Much of the policy discussion on climate change addresses the problem of controlling carbon emissions at a technical level, focusing narrowly on the instrument choice. Either emissions are to be capped at some level or the price of carbon is fixed through taxation. In the former approach quantity of carbon is fixed and its price varies with market demand, while in the latter price is fixed and quantity varies when demand changes. The implications of these two basic approaches are then discussed in terms of their relative advantages and shortcomings, without however any real clarity on what the relevant criteria are. The usual utilitarian rubric economists traditionally use in choosing between different policy options is hardly satisfactory at least when it comes to climate change. But, in the absence of an explicit discussion on an alternative it tends to slip back into the analysis by default. That in our view is a critical lacuna in this literature.

Thus, the emphasis on the instrument choice ends up obscuring the more central problem of stipulating the normative and political underpinnings of collective welfare and choice. Two salient facts about climate change policy complicates the possibility of a neat separation between *normative* and *positive* analysis, a separation that comes only natural to most economists. One, the policies that are taken (or not taken) today will have a decisive effect on the wellbeing of future generations, putting them possibly at peril;

and, two, their costs and benefits are distributed very unevenly across agents currently alive per their relative position of power. Our discussion shows that the "optimal" policy is not independent of the outcome of the interaction of agents with asymmetric power, which in turn depends on the success of the power balancing efforts of disadvantaged and powerless agents acting on the basis not only by self-interest but also the strength of their normative values.

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