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Decision-Making Constraints on the Implementation of Viable Disaster Risk Reduction Projects

Some Perspectives from Economics

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Decision-Making Constraints on the Implementation of Viable Disaster Risk Reduction Projects

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1. Introduction

> The current rate of progress is inadequate if we are to achieve, by 2015, the substantial reduction of disaster losses called for in The Hyogo Framework for Action and in the Millennium Development Goals. Fortunately, we know what to do. The report sets out a range of much-needed action and provides compelling evidence that investing in disaster risk reduction is a cost-effective means to protect development, reduce poverty and adapt to climate change.
>
> Ban Ki-Moon
> Secretary General of the United Nations
> Foreword to ISDR (2009)

Why has progress on implementation of disaster risk reduction (DRR) projects and programs been so slow over the last decade? There are, of course, many reasons. Some DRR activities, although they are likely to reduce the risk of loss of life and damage to property and livelihoods, may be costly to the point that they do not meet standard cost-benefit criteria. Others may generate positive net present values, but at a level that ranks them below competing activities; in a budget-constrained environment, such projects never make it to implementation. But many researchers and practitioners deeply involved in DRR remain convinced that there are many cost-effective DRR projects,[1] whether evaluated alone or relative to projects that are implemented, that nevertheless fail to be carried out.

Failure to implement cost-effective DRR projects may result from failures of decision making at any of three distinct levels. At the individual level, people may fail to undertake privately valuable DRR actions because they weigh future payoffs against current costs in such a way as to lead them to procrastinate [e.g., O'Donoghue, and Rabin (2008)]. They may also fail to evaluate risks appropriately; in particular people tend to be overoptimistic about the chances that bad things will not happen to them [e.g., Weinstein (1980)]. Private individuals may also fail to undertake socially optimal actions because part of the benefits of those actions accrue to others.

Failures in individual decision-making typically require policy intervention. But failures also occur at the level of the policy analyst and policymaker. Because this short paper is intended as background to assist in the preparation of the UNISDR's 2011 *Global Assessment Report on Disaster Risk Reduction*, we focus our attention on pol-

[1] We shall use the short-hand term "projects", although our discussion is intended also to encompass activities more appropriately termed "programs" or "policies".

icy failures. Moreover, we be very selective, restricting our attention to a small set of issues that have been attracting significant attention from economists in recent years.

In Section 2, we review how standard practices of discounting the distant future induces a systematic downward bias in estimates of the net present value of projects with long planning horizons. This bias, which can lead policy analysts to reject projects that are attractive on expected net present value grounds, has become notable recently because of the long time horizons over which benefits are expected to be earned in projects related to climate change. In Section 2, we show that the structure of many DRR projects can make the problem equally important in DRR, even when the duration of the flow of benefits is expected to be relatively short.

In Section 3 we turn to advances that economists have made in explaining why policymakers may fail to implement projects that have been declared viable by analysts. One area of this research, a branch of political economy, has focused on formalizing well-understood notions of interest group politics. Economists, however, have also advanced other explanations, including asymmetry of information between policymakers and the public, limited credibility of governments, and the role of uncertainty in delaying policy implementation.

2. Uncertain Discounting and Cost-Benefit Analysis

In a recent report, Cabot-Venton, Venton and Shaig (2009) carefully analyzed the costs and benefits of disaster risk mitigation projects in the Maldives. After assessing the risks of disaster, investment costs, and expected losses avoided as a result of the projects, they select a baseline discount rate of 7.5 percent and a project planning horizon of fifty years, and calculate net present values (NPV) and benefit-cost ratios. They are also careful to conduct sensitivity analyses where they first hold the baseline planning horizon constant but change the discount rate first to zero percent, and then to fifteen percent. They subsequently , hold the baseline discount rate constant but reduce the planning horizon to 25 years.

Table 1 summarizes one set of their results.[2] In the baseline scenario, the NPV is negative, and the benefit-cost ratio is 0.96. The benefit-cost ratio falls further if the discount rate is increased, and if the time-horizon is made shorter. However, the benefit-cost ratio is well in excess of one if the appropriate discount rate is sufficiently

[2] Their study assesses costs and benefits for three types of projects under two disaster scenarios on three different islands.

low. Cabot-Venton *et al.* are careful to note the sensitivity of their results to the choice of discount rate, and also that the appropriate discount rate has long been the subject of debate and is highly uncertain.

Table 1. *Viability of Disaster Mitigation Project in Viligili*

	Benefit-Cost Ratios
Baseline r=7.5%, $T = 50$ years	0.96
Low discount rate: r=0%, $T = 50$ years	2.03
High discount rate: r=15%, $T = 50$ years	0.60
Short time horizon: r=7.5%, $T = 25$ years	0.86

Benefit-Cost ratios are for the selected safe island protection project, under the assumption of maximum hazard probability under climate change. From Cabot-Venton *et al.* (2009), tables ES10 and ES12.

Most policymakers will infer from Table 1 that, under the most likely or average scenario, the project is not viable. Unfortunately, this inference is likely to be wrong, for two reasons. First, when the discount rate is uncertain, the expected present value of projects with standard net benefit flows (i.e., with costs preceding benefits) is invariably greater than the present value calculated using the average of all possible discount rates. This is because, as we will shortly show, the appropriate deterministic discount rate that should be used in the baseline is lower, often significantly lower, than the expected value of the actual discount rate. Second, if it were the case that 7.5 percent is the appropriate baseline discount rate for a 25 year planning horizon, then the appropriate baseline discount rate for a fifty-year planning horizon must be lower, perhaps significantly lower, than 7.5 percent. This is because the appropriate deterministic discount rate declines as one looks further into the future.

These observations are of course not new. They were made originally by Weitzman (1998, 2001), who stimulated a quite extensive literature debating some technical issues raised by his exposition [e.g., Gollier (2002), Buchholz and Schumacher (2009), Freeman (2010)]. The technical issues now have been largely resolved, and Weitzman's principal conclusions (1998) found to be robust [cf., Gollier and Weitzman (2010)]. Indeed, Weitzman's main points should be pretty much standard textbook stuff, although they remain, much as Newell and Pizer (2003, p. 53) noted a number of years ago, underappreciated.

In the remainder of this section, we will show why, when discount rates are uncertain, (i) the effective discount rate to be used is lower than the expected discount rate, (ii) the effective discount rate declines over time, and (iii) the appropriate adjustments to the discount rates are increasing in the degree of uncertainty. We will provide a numerical example for the standard case (with a fixed planning horizon, T), showing that the magnitude of the bias induced by evaluating NPVs with the expected discount rate can be very large. We will then show that, for many DRR projects, the degree of uncertainty about the effective discount rate is larger than in the standard case.

2.1 The standard case

Suppose there is a flow of net benefits, $b(t)$, that is earned from time t=0 to time t=T. Suppose that the discount rate is known to be constant, but that its value is not known precisely. Instead, at the time the investment decision is made, it is known only to be a random draw with mean $\bar{r}$ and density $f(r)$. The expected present value in this case is

$$E\left[V(r)\right] = \int \left[\int_0^T e^{-rt} b(t)dt\right] f(r)dr$$

$$= \int_0^T E[\phi(t)] b(t)dt \,, \qquad (1)$$

where $E[\phi(t)] = \int e^{-rt} f(r)dr$ is the expected value of the discount factor that should be applied to the benefit flow at time t to convert it into present value terms.

Contrast (1) with the "pseudo" expected present value calculated using the expectation of the discount rate, $\bar{r}$:

$$V(E[r]) = \int_0^T e^{-\bar{r}t} b(t)dt \,. \qquad (2)$$

When the flow of net benefits is positive, using (2) instead of (1) leads to an underestimate of the expected present value of the project. This is a simple consequence of Jensen's inequality, where present values are convex functions of the discount rate, and for any convex function, $V(r)$, $E[V(r)] > V(E[r])$.

Tables 1 provides a numerical illustration of the magnitude of the bias that can be expected. Suppose that there exists a project yielding a flow of benefits at the rate of \$1 per unit of time, and that this flow begins at time 0 and continues until time T.

Suppose further that there are three candidate discount rates, 1%, 3% and 5%, which at the time a decision has to be made are believed to be equally likely. Table 1 provides the correct present value (1) and the pseudo present value (2) of these benefits for a wide range of time horizons. At all time horizons, the correct present value exceeds the pseudo present value. Notably, however, the degree of bias increases dramatically as the time horizon increases. With a 25-year planning horizon, the correct present value exceeds the pseudo present value by two percent; with a 75 year horizon the ratio is fourteen percent. At two hundred years, it is forty percent.

Table 1. *Expected present values of flow of benefits at rate $1 over interval (0,T)*

	$E[V(r),T]$	$V(\mathrm{E}[r],T)$	Ratio
0	0.00	0.00	1.00
10	8.68	8.64	1.00
25	17.99	17.59	1.02
50	27.86	25.90	1.08
75	34.04	29.82	1.14
100	38.25	31.87	1.21
150	43.55	32.96	1.32
200	46.57	33.25	1.40

Expected present values calculated for discount rates of 0.01, 0.03, and 0.05, each of which occurs with probability 1/3.

Table 2, showing correct and pseudo expected present values of $1 received at a single future point in time, t, clarifies why the bias in Table 1 grows as T increases. The expected present value of $1 received, for example, at time t=25, is 0.51, but the pseudo expected present value is only 0.47, a difference of nine percent. In comparison, the correct expected value of one dollar received at t=50 is 36 percent greater than the corresponding pseudo expected value; and at t=100 it is a massive 184 percent greater.

Another way to think about the bias is to derive the certainty equivalent discount rate that would yield a present value equal to the correct expected present value of a dollar received at some time t in the future. Let r_c denote this discount rate, which satisfies

Table 2. *Expected present value of $1 received at time t*

	E[PV(t, r,λ)]	PV(t, E[r], E[λ])	Ratio
0	1.00	1.00	1.00
10	0.75	0.74	1.01
25	0.51	0.47	1.09
50	0.30	0.22	1.36
75	0.20	0.11	1.90
100	0.14	0.05	2.84
150	0.08	0.01	7.05
200	0.05	0.00	18.54

Expected present values calculated for discount rates of 0.01, 0.03, and 0.05, each of which occurs with probability 1/3.

$$e^{-r_c t} = E[\phi(t)]$$

or, equivalently,

$$r_c = t^{-1} \ln E[\phi(t)]\,. \qquad (3)$$

Figure 1 plots r_c for two sets of candidate discount rates. In both sets, three values are again equally likely and their mean is 3%. The other two candidate values in the upper curve are 1% and 5%; in the lower curve they are 0.5% and 5.5%. The figure summarizes three important messages. The first is that, when the discount rate is uncertain, the appropriate certainty equivalent discount rate is always less than the mean of the candidate discount rates. The second is that this discount rate is lower the further into the future the benefit is to be received. Third, the greater the uncertainty about the candidate discount rates (in the sense of a mean-preserving spread), the lower is the certainty equivalent discount rate. More precisely, the certainty equivalent rate appropriate for discounting a future benefit begins at the mean of the candidate discount rates for a benefit received in the very near future, but declines as the time horizon grows, asymptotically approaching the lowest candidate discount rate that might be realized with positive probability, no matter how unlikely this rate is.

Newell and Pizer (2003) have shown that these results generalize to more complex situations. In particular, the result that the discount rate should be lower for benefits (costs) that are received (paid) further in the future holds in cases in which the rate is believed not to stay constant over the life of the project.

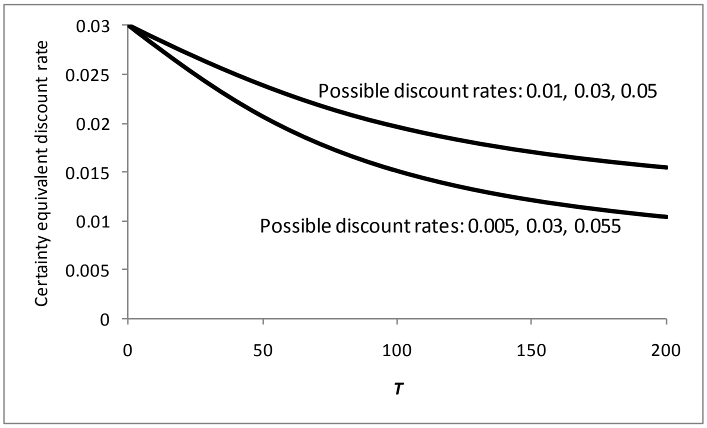

Figure 1. *Certainty equivalent discount rates.*

2.2 The DRR case

Discounting of future events has been the subject of considerable attention in recent years because of its unusual salience to policy debates about climate change. Most policies intended to ameliorate the expected costs of global warming involve investments today yielding benefits that may not become apparent for many years but, once they do, will persist for hundreds of years into the future. In such a setting, small variations in the discount rate can have very large impacts on the calculated net present value.

It might be presumed that many DRR projects, with shorter planning horizons, will not be so sensitive to variations in the discount rate. However, we will show here that, for DRR projects in which the planning horizon is itself uncertain, the effective rate at which future benefits should be discounted may be especially uncertain.

Consider the following two stylized examples.

- An investment in flood protection is contemplated at time 0. The project will provide reliable protection against all but catastrophic events. Flooding that would have caused damage $b(t)$ without the project occurs in each year with known probability p. Catastrophic flooding occurs with an estimated probability of λ in any given year, and when it occurs, the flood protection infrastructure is destroyed. Because only limited historical data exist to estimate the frequency of catastrophic flooding, considerably uncertainty exists about the value of λ.
- A seismic retrofitting project is under consideration. The project mitigates building damages for all earthquakes up to a certain magnitude, m, providing

benefits $b(t)$. Magnitudes greater than m destroy the building despite the retrofitting. Earthquakes of magnitude less than m occur at the rate p. Earthquakes of magnitude greater than rate m occur at the rate λ_1. There may also be economic development that makes the building obsolete, and this occurs with probability λ_2 in any given year. Denote $\lambda = \lambda_1 + \lambda_2$, and assume again that there is considerable uncertainty about the value of λ.[3]

In both cases, the expected value of the benefits (again ignoring the investment costs) can be written as

$$E\left[V(r,T)\right] = E\left[\int_0^T e^{-rt} p b(t) dt\right]. \tag{4}$$

The planning horizon, T, has an exponential distribution with intensity parameter λ, so we can write

$$\begin{aligned} E\left[V(r,\lambda)\right] &= E\left[\int_0^\infty \lambda e^{-\lambda T} \int_0^T e^{-rt} p b(t) dt\, dT\right] \\ &= E\left[\int_0^\infty e^{-(r+\lambda)t} p b(t) dt\right], \end{aligned} \tag{5}$$

where the second line is obtained from an integration by parts.

As equation (5) shows, a flow of benefits discounted at the rate r that terminates in any interval dt with probability λdt is mathematically equivalent to an infinite-horizon flow of benefits that is discounted at the rate $r+\lambda$. Thus, DRR projects of the type considered in our examples are equivalent to projects with very long time horizons. Moreover, There are now two sources of uncertainty. The first is the uncertainty about the appropriate social discount rate, r. The second is that the probability of a catastrophic event, λ, is also uncertain.

To see how this might matter, consider the following numerical example. As in the earlier numerical examples, suppose that r has expectation equal to 0.03, but is equally likely to take on the values 0.01 and 0.05. Suppose, further, that the chance of a catastrophic event is believed to be 0.02, but may equally be 0.03 or 0.01. Then, the mean effective discount rate, $r+\lambda$, is 0.05, but it may take on any of the values 0.02, 0.03, 0.05, 0.07, or 0.08, each with probability $^1/_9$, and 0.04 or 0.06 each with

[3] In this example, λ is likely to be an increasing function of time, but we shall put this minor complication to one side for ease of exposition.

probability $^2/_9$.

Table 3 provides the correct and pseudo expected present values of a project where $b(t)$ has again been normalized to one, along with the expected present values of $1 received at time t in the future, and the certainty equivalent discount rates. First, the additional uncertainty induced by the randomness of the timing of a catastrophic event causes the ratio of the correct to pseudo expected present values of $1 received at time t to rise more rapidly compared with the example in Table 2. Similarly, the certainty equivalent discount rate declines more rapidly as t rises. Finally, there is a significant difference of eighteen percent between the correct and pseudo expected net present values of the entire flow of benefits. To recall, in Table 1, the corresponding difference for a fifty-year planning horizon (equal to the expected value of T in Table 3) was only eight percent.

Table 3. *Expected present value of $1 received at time T – DRR example*

	E[PV(t, r,λ)]	PV(t, E[r], E[λ])	Ratio	r_c
0	1.00	1.00	1.00	0.050
10	0.617	0.607	1.02	0.048
25	0.317	0.287	1.11	0.046
50	0.121	0.082	1.48	0.042
75	0.054	0.024	2.28	0.039
100	0.026	0.007	3.87	0.036
NPV	24.11	20.50	1.18	--

3. Delay in Policy Adoption

A recurrent theme in the DRR literature is that while most policymakers readily acknowledge the need to adopt policies that reduce the exposure of populations to risk from disasters, implementation of these policies tends to be postponed for long periods of time [Juneja (2008)]. In what follows, we will critically explore why it is that adoption of socially desirable policies is often delayed.

It is useful to start this exploration by first noting the consensus that many DRR initiatives are socially beneficial in the most basic sense that the reduction in exposure to risk would unambiguously improve the lives of the members of society. Another way to put this is to point out that the total benefit accruing to the members of any given society is expected to exceed the total cost of implementing the policies in question. If it were otherwise, a society might rationally choose not to adopt these policies. It is, however, imperative to point out that expected total benefits being greater than the expected total costs does not necessarily imply that every member of society might be net benefiters; one would typically expect that some individuals or groups might shoulder more of the costs and therefore might expect to be net losers from the adoption of some of these policies. Yet, if total benefits for the society are expected to exceed the costs, in principle the society should be able to find ways to compensate the losers so that no member of the society is harmed by the implementation of the policy in question (in practice, however, the compensation schemes may be difficult to implement).

Granted that they are socially beneficial, it is, at least on the surface, puzzling as to why it has proven so hard to adopt DRR policies. Possible answers to this puzzle fall into two basic categories: political and non-political. We will start with the latter.

3.1 Non-political reasons

3.1.1 *Informational or structural problems*

First, policymakers may not have reliable information on which policy would work or which among those on the table would work best. This is especially the case if they receive conflicting information from their technical advisors. It is, however, a rather unconvincing argument when it comes to a number of DRR policies, where solid scientific and technical knowledge exists on the most appropriate specific measures to be adopted.

Second, policymakers may not have access to personnel with the requisite technical knowledge to implement the most appropriate policies. An example might be the lack of technicians and engineers to implement and enforce seismic building codes and retrofit standards. Although this is certainly an important constraint in a number of cases, it begs the question why many policies that do not seem to require the technical know-how, or where such know-how is readily available, fail to see implementation [see Drazen (2000)].

Third, even though policymakers may be willing to adopt risk reduction policies, the country may lack the physical infrastructure required for their implementation. A number of measures required for risk reduction presuppose a working infrastructure of roads, canals, or other transportation facilities, a reliable communications network, and utilities such as water and electricity. If all or some of these are lacking, the cost of building this infrastructure may prove prohibitive in the short and medium term.

. Yet, once again, although this factor may be important in some countries, a large number of other countries exist where the lack of infrastructure does not seem to be a constraint significant enough to explain adequately the lack of adoption or implementation of the appropriate policies.

3.1.2 *Optimal delay*

A second major non-political reason typically proffered to explain the delay in the adoption of requisite policies is that it might be better to postpone taking action now as circumstances are expected to be more favorable in the future. One example would be an expectation of a reduction in the cost or opportunity cost of the adoption of the policies in question. This may be the case, for instance, if large infrastructure projects are under way, and implementation of DRR policies would thus be less costly once these projects are finished. Similarly, the expectation of the production of significant numbers of technical personnel by a recently developed secondary and tertiary education system would indicate a relaxing of some of the technical constraints mentioned above and lead to lower expected costs in the future. Or, the country may be in the grip of economic problems believed temporary in nature, where the policymakers might rightly believe that monies to finance DRR policies could be put to better use. As a result, the opportunity cost of implementing these policies would be significantly lower once the country economically stabilizes.

All these examples share a common thread: It is better to wait for more opportune times in the future because, for one reason or another, the cost of implementing new policies will be lower at that time.

Yet another version of optimal delay is "benign neglect," however, where policymakers expect things to improve without their intervention. They may, for instance, believe that ongoing economic growth will enable private agents to implement their own private DRR measures without the need for action by policymakers. If the latter ascribe a high enough probability to this outcome, their best choice is to continue to delay [see Orphanides (1992)].

3.1.3 *Other*

Other non-political reasons for the failure to adopt socially beneficial DRR policies may simply be the fact that individuals in their role as private citizens or as policymakers tend to put off difficult decisions for several other reasons (EXPAND OR ELIMINATE?).

3.2 Political reasons

Conflicts of interest, driven by the heterogeneity of economic agents and their divergent economic interests, come to the forefront in the political arena. It is typically the case that a proposed policy change has different expected effects on different segments of the society: Some see benefits from the change, others see loss. Whether the policy is adopted or not depends on the political interplay among different interest groups.

3.2.1 *Vested interests*

A major political reason typically offered for the non-adoption of socially beneficial policies is that the political decision making process may have been captured by minority interests that stand to lose from the adoption of the proposed policies and may therefore block them. However, this rather standard answer begs an important question. If proposed policies are indeed welfare improving and, therefore, socially beneficial in the sense of increasing the "size of the pie" for everyone involved, why don't the minority vested interests that have captured the political decision making process allow the pie to grow and then share the rewards in such a way as to compensate those interests that lose?

One may object to the formulation of the question in the case of disaster risk reduction proper by pointing out that in many specific policy cases the circumstances may be such that agents find themselves in a zero-sum game where the benefit accruing to some is a loss to others. Or it may be argued that compensating losers by redistributing from those who benefit may not be technically feasible, especially if those who stand to benefit from the adoption of DRR measures are the poorer segments of society. However, as the DRR literature has repeatedly emphasized, a crucial aspect of these policies is poverty reduction. Recognition of the close link between poverty and vulnerability to hazards has put macro policies that attempt to reduce poverty at the forefront of the DRR policy agenda. But, if this is the case, one needs also to recognize, as recent development literature has done, that poverty reduction and socio-economic development are non-zero-sum games where success indeed spells an overall increase in the size of the pie.

This brings us back to the initial question of why politically powerful vested interests may choose to block the implementation of policies that could potentially increase aggregate welfare but still allow them to redistribute the proceeds to themselves. In fact, an insightful theorem in political economy, the Coase Theorem, predicts that they would. One formulation of this theorem states that "With well-defined property rights and no transaction costs, agents will contract to a Pareto efficient outcome irrespective of the initial distribution of property rights." Applied to the current context, the theorem would suggest that only those policies that are expected to be optimal will be adopted -- regardless of who gets to make the policy decisions. Put differently, this statement says that under certain conditions inefficient policies (like the ones that prevent the growth of the aggregate pie) should not be observed. That is because even those vested interests that stand to see their share of the pie shrink would, again under certain conditions, benefit from a bigger pie by claiming some of the additional slices.

Why do we then observe so many inefficient outcomes that run counter to the logic of the Coase theorem? One answer is that if vested interests have captured the political decision- making process to the extent that they can also capture some of the additional slices the new policy promises to generate, there may not be any plausible means of stopping them from grabbing all of the additional slices. If this is the case, there is no incentive for other groups to cooperate in the implementation of the promising new policy. Promises on the part of the current power-holders to refrain from ex post wholesale redistribution are bound to remain hollow as there is typically no mechanism to enforce them. The problem could be solved by the voluntary transfer of decision-making power to other groups, but they, in turn, may not credibly promise to compensate the now powerless vested interests, in which case we face a problem similar to the old one [see Acemoglu (2003)].

We now turn to some prominent variants of the vested interests hypothesis.

• *Loss of political power.* In this variant of the hypothesis, adoption of policies that increase aggregate welfare is expected also to lead to the loss of political power by the current power-holders. As they benefit from their monopolistic hold on power, these groups will be reluctant to adopt any policy that would imply renunciation or even diminution of such power [see Acemoglu and Robinson (2000)].

• *Increase in the number of vested interests.* Economies that enjoy growth tend to see the emergence of new successful groups over time. As these groups gain first economic and then political prominence, they constitute powerful vested interests that defend their status against others. As economic growth introduces more and more such groups, they tend to dominate the political landscape and with time form a powerful block that tries to suppress policy changes that may be detrimental to their interests [see Olson (1982)].

• *Vested interests for change.* There is also some historical evidence that major policy reforms are at times initiated by vested interests themselves when they come into conflict with other vested interests. One way such conflicts may play out is when one group uses changes in policy to weaken or eliminate a rival group or groups. Such changes tend to occur when the economic situation is deteriorating. This is because in the short run implementing a policy change is costly for those vested interests that sponsor the policy in question. However, there are expected long-run benefits as the policy hurts rival groups. In good times resources to be used to implement change have a higher opportunity cost as the return to them tends to be higher when the economy is undergoing rapid growth. As the economy deteriorates, the opportunity cost of these resources also decreases, providing an incentive for policy change to those vested interests that can afford to take the opportunity to implement the policy and reap the future benefits of a greater share of resources [see Tornell (1998)].

• *Politicians*. In this variant, opportunistic politicians themselves form a vested interest group that prevents the adoption and/or implementation of policies that increase aggregate welfare. They may block change for a number of reasons, including the possibility that a change might reduce their rents or threaten their hold on political power. Further, in some popular versions of this view politicians are averse to the adoption of policies that have short-run costs but long-run benefits because their short horizons only extend to the next election. This begs the question, however, of why the electorate votes for short-sighted politicians. If voters themselves have long horizons, they should reward those politicians with similar views. If, on the other hand, voters have short horizons (or high or hyperbolic discount rates) the political system must be rewarding those politicians who truly reflect the preferences of their constituencies.

3.2.2 *Policy adoption as a public good*

Adoption and implementation of a policy from which everyone benefits shares some of the features of a public good in that it is non-rival and non-excludable, where non-rivalry means that when an individual enjoys the benefits of a policy, it does not reduce its benefits for others; non-excludability implies that no one can be effectively excluded from benefitting from the policy. This characteristic of certain policies implies that they are also subject to problems similar to those encountered in the provision of public goods. For our purposes the most important of these problems is free riding, here taken to mean that everyone wants to enjoy the expected benefits of the adoption of a new policy but wants others to shoulder its costs.

One prominent way to think about free riding in the case of delays in policy adoption is to think of it in terms of a war of attrition. Policies that promise to increase aggregate welfare typically require cooperation among different social groups. One reason the adoption of such policies may be delayed is that some or all of the groups that need to cooperate and shoulder the costs may want to shift some of the burden to other groups and therefore refuse to come to an agreement in hopes that others will concede. Such concessions tend to take considerable time (hence the attrition analogy) and only eventuate when one or more of the other groups realize that waiting is relatively more costly for them (as might be the case when it becomes apparent that their potential partners have access to more economic or political capital). Here the passage of time (and, therefore, delay) occurs as the updating of beliefs occurs rather gradually [see Alesina and Drazen (1991)].

Another way to think about the public good nature of proposed policies is to note that government assets needed to finance socially optimal DRR policies may be viewed as common property by interest groups that are able to appropriate them. Suboptimal policies result from the behavior by a number of groups that appropriate this resource, a variant of the well-known "overuse of the commons" Problem. Delay in adopting/implementing the socially beneficial policies may therefore arise because individual interest groups find it optimal to appropriate assets from the common pool. Economic models exploring this argument typically find that appropriation levels tend to be high when the government asset stock subject to appropriation is also high. Interest groups that tend to raid the commons find it optimal to curb their appropriative behavior when the asset stock is reduced [see Benhabib and Rustichini (1996), Velasco (1998)].

3.2.3 *Ex ante uncertainty about future private benefits*

Another possible explanation for the delay in the adoption of socially beneficial policies derives from uncertain future private benefits, where although it is known that the adoption of a certain policy would benefit the majority, individuals or groups may be uncertain as to whether they will indeed be part of that majority, and therefore may therefore oppose the adoption of the policy in question. Furthermore, for this result to hold, individuals must be risk averse (as most typically are), and it must be impossible to compensate the losers ex post. Given the current context of policies that reduce risk from natural disasters and the quasi-random nature of such disasters, this view can be directly applied as a potentially important explanation for the non-adoption of socially beneficial policies. To the extent that both group and individual uncertainty exists about net benefits from the policy (there will typically be some uncertainty, for instance, as to the precise identity of those who will be affected by a proposed disaster risk reduction , but the cost of its implementation may be more equally distributed) and that typically insurance against the uncertainty is hard to obtain (with the consequence that ex post compensation of losers is not feasible), this argument gains validity in explaining the non-adoption of socially beneficial DRR policies. However, it then fails to explain why in practice some of these policies are adopted, albeit with some delay. To explain delayed adoptions a variant of this argument is needed [see Fernandez and Rodrik (1991)].

The required variant [due to Laban and Sturzenegger (1994)] points to another feature of observed delayed adoptions: In many cases such adoptions take place under deteriorating conditions. The argument here relies on two crucial features under which delayed adoptions occur. One is that in many cases there is sufficiently large uncertainty as to the effects of the policy under consideration that makes status quo at least temporarily more attractive. The other is a significant deterioration in that status quo that renders adoption beneficial. When these two conditions are met, it is optimal to retain the status quo until the deterioration in conditions makes it imperative to change policy. A useful analogy here is that of a patient with poor and deteriorating health who has the option to undergo a risky operation. Even when she knows that her chances of surviving the operation decrease with time, the patient may rationally choose to postpone rather than agree to an operation that she may not survive.

3.2.4 *Better informed policymakers unable to convince the public*

A final reason why socially beneficial policies may not be adopted or adopted with delay is that although policymakers may be better informed about the effects of the proposed policies, they are unable to communicate this information credibly to the electorate.

One reason for this might is that as long as announcements of politicians are costless to make they are considered "cheap talk" by the public. In game theory "cheap talk" denotes signals that do not directly affect the payoffs to an agent. As such they are not credible, as anyone can costlessly replicate them. In the present context this means that an opportunistic politician can easily mimic those who are willing to promote social well-being by declaring his favorite policies as socially optimal. To the extent that the public finds it difficult to assess the effects of different proposals, such announcements will be taken as cheap talk, which then makes it even more difficult to offer credible announcements about socially beneficial policies. In such an environment, it is easy to see that honest politicians who propose policies that would increase aggregate welfare may have a difficult time convincing the electorate that the policy change on the table is really optimal. One reason for the distrust may be the public's perception of the politician as having partisan preferences over issues. In this case, the public would discount the expected effects as being colored by the partisan bent of the politician in question. An interesting implication of this argument is that the partisan bent of the politician who proposes a policy may at times help convince the public of the veracity of the claims being made – in reverse. That is, if a right-wing politician proposes what the public considers a left-wing policy, the proposal actually gains increased credibility and support (Richard Nixon's opening to China in the early 1970s is a classic example). Voters then may believe that in reality the efficacy and appropriateness of the proposed policy approximates their announced levels with higher probability [see Cukierman and Tomassi (1998)].

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