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THE POLITICS OF GLOBAL PUBLIC GOODS

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ABSTRACT

Below, I illustrate how a wide range of political economics forces influence nations' provisions of global public goods. The forces can make it difficult for international cooperation to succeed, but they can also be taken advantage of by carefully designed treaties, so that they are stronger because of the domestic political forces. The chapter concludes that global cooperation and democratization reinforce each other, so that multiple equilibrium outcomes are possible. The models are simple and the text is accessible to students at any level.

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- It's the politics, stupid.

Rodrik (2017)

1. INTRODUCTION

To economists, or others assuming rational behavior, it may appear puzzling why nations aren't cooperating more. There are plenty of domestic decisions that generate benefits or costs to other nations. Some, but not all of these externalities are addressed by successful international treaties. When they are not, countries can benefit from collectively raising the contributions to climate policies, trade liberalization, pandemics, and peace, for instance. The inefficiencies are, essentially, free lunches – surplus left on the table – that can be exploited with the use of negotiations and side payments (Coase, 1960). The quote above, from Rodrik (2017), points to the reasons for the backlash against globalization, despite the endorsement by economists.

There are two purposes of this chapter. First, it discusses key political economy forces that may be important when it comes to the provision of global public goods. The forces can shed light on why the provision is inefficient. Second, it shows how carefully designed treaties can take advantage of the domestic political forces. That is, global cooperation can be deeper and broader than if the forces were absent.

A simple workhorse model is sufficient to illustrate the connections between domestic politics and international cooperation, . Thus, the chapter is accessible for students at all levels, whether they study economics, political science, or environmental science. Graduate students and leading scholars can be challenged by working out reasonable expansions of the frameworks, or by consulting with the referenced original research articles.

Section 2 begins by discussing the *economics* of global public goods and introducing the simple game that will be referred to later. It applies the framework to climate change policies, and shows the distinction between local and global public goods, before discussing standard models of free riding, coalition formation, compliance, and self-enforcing agreements.

When introducing politics, we start with the two-level games discussed in Section 3. Negotiators might face the constraint that the bargaining outcome must be ratified by Congress. In democracies, there are checks-and-balances, or multiple pivotal players, that contribute to status-quo biases, especially in dynamic contexts. The identities of the pivotal players are endogenous in Section 4, which discusses strategic delegation and elections of policymakers that can negotiate on behalf of the voters. Lobbying and the influence of organized interest groups are analyzed in Section 5. While interest groups

may lobby against the introduction of costly policies, they can also motivate policymakers to sign treaties as a commitment device.

Leaders of democracies might lose power in the future. Thus, an incumbent might want to promise future policies that seem beneficial from today's point of view, but, without commitment, the plan will not be time consistent. The desire to commit, and tie the hands of future policymakers, can be addressed by international treaties if they commit future, but not necessarily present, policymakers.

Whether or not the leaders lose power is, in itself, endogenous. Section 7 discusses the electoral cycle and how it can influence the provision of global public goods. The section also illustrates the political economy of weak treaties, which characterizes a situation in which the incumbent wants to make future compliance depend on her reelection. Section 7 concludes by observing that when the electoral outcome is endogenous, it might be influenced by foreign governments or interest groups. In principle, these groups can induce the government to internalize some of the externalities on stakeholders abroad.

Can there be global democracy? If countries cooperate on several issues, they can more easily find ways to compensate the countries that would otherwise lose from individual deals. These types of issue linkages, or side payments, are often perceived to be grease on the wheels in the art of politics. The possibility to receive such transfers can, however, motivate countries to negotiate harder, or to delegate to representatives that are reluctant to deepen cooperation, as discussed in Section 8. Relaxing the unanimity requirement is another way of avoiding gridlock, studied in Section 9. In fact, all countries may be better off if the unanimity requirement is replaced by majority requirements. The best voting rules depends on whether side payments are on the table and countries delegate strategically. The optimal voting rule will depend on how much the minority can be taxed, how heterogeneous the preferences are, and the need to motivate countries to prepare for and invest in the global project.

In sum, democracy and international cooperation interact in multiple ways. Empirically, it seems like democratic countries are more likely to participate in international agreements than are nondemocracies. The forces discussed in this chapter provide several possible explanations. In Section 10, I also argue that international cooperation can help nations to consolidate their democratic institutions. Because of the two-way interaction, and the complementarity between democratization and international cooperation, there can be multiple equilibrium outcomes. How can we move from the current equilibrium to a better one? It is unrealistic to expect that non-democratic countries will reform first, so that global cooperation will be feasible later. Thus, democratic countries must take the lead to deepen and broaden global cooperation. More research is necessary, however, to understand how a change in the equilibrium outcome might be initiated and continued.

The selection of models and topics in this chapter is chosen subjectively, driven by space constraints as well as by the authors' biases, personal views, interests, research, and lecture notes. I do not at all intend to offer an exhaustive literature review, and there are many things that will not be covered in this chapter.

Fortunately, the reader has many other reviews available. Buchholz and Sandler (2021) focus mostly on the economic and game-theoretic mechanisms (here, that focus is limited to Section 2). Tavoni and Winkler (2021) survey some of the literature on how delegation and lobbying influence environmental agreements. They also discuss media capture by special interest groups and how these political forces influence international emission permit markets. Caparrós (2016) focuses on the negotiation process, while Aidt et al. (2021) provide a literature review of foreign influence on domestic policies. This chapter, in contrast, will mainly focus on domestic influence on international policies. I will also concentrate on democracies. For the political economics of non-democracies, see Egorov and Sonin (2024), and for a survey of the literature on sanctions, see Morgan et al. (2023). This chapter even fails to honor many of the earlier papers on the topics that are covered. Many of them are reviewed in the overviews provided by Oates and Portney (2003) or Wangler et al. (2013).

In another 'companion' chapter (Harstad, 2024), I review dynamic games that are more specialized to climate policies. In those models, countries both invest in green technology and emit greenhouse gases over time. The two policies imply that treaties can be analyzed as incomplete contracts and, with that, several institutional details become relevant. That chapter does not discuss domestic politics, however.

2. THE *ECONOMICS* OF GLOBAL PUBLIC GOODS

In most of the chapter, the various ideas will be illustrated in a very simple framework. The purpose of the simplicity is to introduce non-experts to the connection between global public-good provision and different political forces. Experts (and graduate students) can be challenged with generalizations of the formulae – with or without consulting the original papers that will be referred to.

In this framework, there are n countries. Country $i \in N := \{1, ..., n\}$ contributes $x_i \in \mathbb{R}$, benefits from the sum of contributions, $X := \sum_N x_i$, and is endowed with a linear-quadratic utility function:

$$u_i = aX - (k_i + x_i)^2 / 2. \tag{1}$$

Thus, $a > 0$ measures the appreciation of the aggregate contributions. The marginal cost of contributing begins at k_i, and it increases in x_i. Thus, the marginal contribution

cost is larger if i contributes a lot, and it increases in i's characteristic, or cost parameter k_i. A negative $k_i < 0$ can be interpreted as a local benefit of the local provision.

Country i's dominant strategy is to maximize u_i by selecting $x_i^{BAU} = a - k_i$. This outcome is referred to as the non-cooperative outcome or the business as usual (BAU). In contrast, the quantity that maximizes the sum of utilities is referred to as the first best (FB) and requires that the following first-order condition (foc) is satisfied:

$$x_i^{FB} = na - k_i > x_i^{BAU} = a - k_i. \tag{2}$$

A larger k_i reduces x_i in BAU as well as in the FB. The role of k_i is simply to characterize how large is the cost, or how small is the local benefit, when i contributes. In the next subsection, k_i is, essentially, i's bliss consumption level of fossil fuel.

Subsection 2.1 presents a slightly more general model with emissions and pollution to illustrate that a model with a "public bad" is analogous to the above model with a "public good". Section 2.2 distinguishes between "local" public goods and "global" public goods. Both these subsections can be skipped if the reader would like to go straight to the analysis of coalitions (Section 2.3) and compliance (Section 2.4). Domestic political forces are introduced thereafter.

2.1 Public Bads vs. Public Goods

Global climate change is a public bad. Other environmental problems can similarly create negative externalities across countries. A typical formalization of environmental problems is as follows. Suppose the payoff of country $i \in N$ is:

$$\widetilde{u}_i = B_i(g_i) - C_i(G_i), \text{ where } G_i = \phi_i g_i + \sum_{j \in N \setminus i} \varepsilon_{ij} g_j.$$

An interpretation of these equations is that country i benefits $B_i(g_i)$ from consuming fossil fuel and emitting g_i, but the emission accumulate to the pollution stock G_i in country i, causing the cost $C_i(G_i)$. Parameter ϕ_i measures the direct impact of g_i to G_i, while ε_{ij} represents the amount g_j that crosses the border to country i. For climate change, $\varepsilon_{ij} = \phi_i$, because it does not matter to i where the emission originates from. For acid rain problems, ε_{ij} is larger if i and j are geographically close and if the wind tends to blow from j to i.

In BAU, country i maximizes $\widetilde{u}_i$ by selecting the g_i that satisfies the following first-order condition:

$$B_i'(g_i) = \phi_i C_i'(G_i).$$

By differentiating this condition, we can find:

$$B_i''(g_i)\,dg_i = \phi_i C_i''(G_i)\left(\phi_i dg_i + \sum_{j\in N\setminus i}\varepsilon_{ij}dg_j\right) \Leftrightarrow$$
$$\frac{dg_i}{dg_j} = -\frac{\phi_i\varepsilon_{ij}C_i''(G_i)}{\phi_i^2 C_i''(G_i) - B_i''(g_i)} \leq 0$$

when $\phi_i \geq 0$ and $\varepsilon_{ij} \geq 0$. Because $dg_i/dg_j \leq 0$, g_i and g_j are strategic substitutes: The larger is country j's emission level, the smaller is country i's preferred emission level. The fact that i would like to emit more when j emits less can be referred to leakage. For climate change, for example, countries are often concerned about carbon leakage of this type. Leakage can discourage a country from reducing emission, or for taking actions that raises the expectations that the country will contribute a lot. If $B_i(\cdot)$ is linear, and $\phi_i = \varepsilon_{ij}$, then $dg_i/dg_j = -1$, so the leakage rate is 100 percent if country i acts after country j. If, instead, $C_i''(G_i) = 0$, as when $C_i(\cdot)$ is linear, there is no leakage, and i has a dominant strategy for g_i, regardless of what other countries do.

In the following, we will abstract from leakage by assuming $B_i(g_i) = -b(\overline{y}_i - g_i)^2/2$, and $C_i(G_i) = cG_i\ \forall i \in N$. Here, b reflects the benefit of consuming g_i, $\overline{y}_i$ is i's bliss level of g_i-consumption, while c is the marginal present-discounted cost of a unit of greenhouse gas, for example (which can take into account that it can remain in the atmosphere for a long time).

Models of public goods and positive externalities are isomorphic to models of public bads and negative externalities. The reason for the analogy is simply that a reduction in the decision variable in the latter model generates public goods and positive externalities in the former model. To see this, take any benchmark $\overline{g}_i$ and define i's contribution and cost as

$$x_i = \overline{g}_i - g_i \text{ and } k_i = \overline{y}_i - \overline{g}_i.$$

With this, i's payoff is

$$u_i = cX_i - b(k_i + x_i)^2/2, \text{ where } X_i = \phi_i x_i + \sum_{j\in N\setminus i}\varepsilon_{ij}x_j,$$

minus a constant (i.e., $c\phi_i\overline{g}_i + \sum_{j\in N\setminus i}\varepsilon_{ij}\overline{g}_j$). With $b = 1$ and $c = a$, we have (1). Thus, a larger consumption bliss point ($\overline{y}_i$) implies a larger contribution cost (k_i).

2.2 Local vs. Global Public Goods

Suppose country i obtains the payoff $u_i = aX_i - (k_i + x_i)^2/2$, where $X_i = \phi_i x_i + \sum_{j\in N\setminus i}\varepsilon_{ij}x_j$, so that ε_{ij} measures how much i benefits from j's contribution. Clearly, i

maximizes u_i by selecting the x_i that satisfies the following first-order condition:

$$x_i^{BAU} = \phi_i a - k_i. \tag{3}$$

By comparison, the quantity that maximizes the sum of payoffs (FB) is:

$$\arg\max_{x_i} \sum_{j \in N} u_j = x_i^{FB} := \left(\phi_i + \sum_{j \in N \backslash i} \varepsilon_{ji} \right) a - k_i.$$

If x_i contributes to a *purely local or domestic public good*, then $\varepsilon_{ji} = 0$ for every $j \neq i$. In this case, $x_i^{BAU} = x_i^{FB}$, so there is no international inefficiency.

If, instead, one of the ε_{ji}'s is strictly positive, then $x_i^{BAU} < x_i^{FB}$, and i contributes too little compared with the FB. For a *pure global public good*, $\phi_i = \varepsilon_{ji}$ for every pair of country. If these parameters are normalized to 1, then we obtain (2). We will consider this situation in the following (with an exception in Section 6.3).

2.3 Coalition vs. Free Riding

Because countries contribute too little in BAU, they could benefit from an international agreement. Consider a set of members, M, which is a subset of all the countries, N. We say that the grand coalition has formed if and only if $M = N$. If m is the number of members in M, and we fix x_j, $j \in N \backslash M$, it is easy to see that the sum of payoffs for all members combined is maximized with:

$$x_i(m) = ma - k_i. \tag{4}$$

Furthermore, these quantities will also be the outcome of standard bargaining games, such as the Nash Bargaining Solution (NBS), if the threat point is BAU. The NBS predicts contributions $\mathbf{x} = (x_1, ..., x_n)$ that solves:

$$\max_{\mathbf{x}} \Pi_{i \in M} \left(\left[a \sum_{j \in M} x_j - (k_i + x_i)^2 / 2 \right] - \left[a \sum_{j \in M} x_j^{BAU} - \left(k_i + x_i^{BAU} \right)^2 / 2 \right] \right).$$

Excercise: By solving the foc's, you obtain (4).

With the contributions (4), we can see that it is costly to be a member. Every member will end up contributing more than in their dominant strategy. The benefit of being a member, however, is that if the number of members is m, instead of $m-1$, then all the other members will contribute a units more. A country is better off being a member,

than to free ride, if and only if ("iff"):

$$a\left[\sum_{j\in M} x_j(m) + \sum_{j\in N\setminus M} x_j(1)\right] - (k_i + x_i(m))^2/2 \geq$$
$$a\left[\sum_{j\in M\setminus\{i\}} x_i(m-1) + \sum_{j\in N\setminus(M\setminus\{i\})} x_i(1)\right] - (k_i + x_i(1))^2/2.$$

By combining this inequality with (4), simple algebra leads to the inequality:

$$m \leq 3.$$

The proof is left as an excercise.

Thus, at most three countries are members in equilibrium, given these linear-quadratic utility functions. This result follows, for example, from Hoel (1992), Carraro and Siniscalco (1993), and Barrett (1994), which build on how collusions are modelled in industrial organization, for example (d'Aspremont et al., 1983, Palfrey and Rosenthal, 1984). There are multiple equilibria regarding which exact countries that will be the participants, but even weak organizations can solve that coordination problem (Battaglini and Palfrey, 2024).

Because the small-coalition prediction is inconsistent with some of the large coalitions that are formed in reality, the result motivate various extensions. Karp and Simon (2013), for example, show that the number can be quite different from 3 if the functional forms are not linear-quadratic. Harstad (2024) discusses how other modifications of the model can allow for larger coalitions in equilibrium. In this chapter, I discuss how the coalition size can be influenced by domestic political forces.

2.4 Compliance vs. Time Inconsistency

When the members negotiate the contributions, country i needs to make it credible that it will stick with its promise, described by x_i. This type of credibility may be necessary for the other countries to be willing to stick to their promises. However, the country faces a time inconsistency problem. When the other countries are about to fulfill their promises, country i's best response is, after all, x_i^{BAU}. The time inconsistency problem is challenging to address because there is no world government that can or will force countries to abide by their pledges. Thus, it must be in the self-interest of country i to stick with x_i, even after the contributions have been negotiated. In other words, the agreement must be self-enforcing.

What happens if a country defects, instead of complies? If the one-shot game in Section 2.1 is repeated, then one scenario is that other countries may be less inclined to

cooperate in the future, when they have learned that they cannot take it for granted that other countries will do their part. The risk that cooperation may end can be sufficient for countries to be willing to comply.

To check this logic, let the pledges by denoted by x_i^*. Suppose that, if country i defects, then, with probability q_i, the defection is detected and countries revert to BAU. With the discount factor $\delta_i \in (0,1)$, i prefers to comply always rather than to defect a single time iff:

$$\begin{aligned}\frac{a\sum_{j\in M} x_j^* - \left(k_i + x_i^*\right)^2/2}{1-\delta_i} \geq\ & a\sum_{j\in M\setminus i} x_j^* + a x_i^{BAU} - \left(k_i + x_i^{BAU}\right)^2/2 \\ & + (1-q_i)\,\delta_i \frac{a\sum_{j\in M} x_j^* - \left(k_i + x_i^*\right)^2/2}{1-\delta_i} \\ & + q_i\delta_i \frac{a\sum_{j\in M} x_i^{BAU} - \left(k_i + x_i^{BAU}\right)^2/2}{1-\delta_i} \Leftrightarrow\end{aligned}$$

$$q_i \geq \overline{q}_i\left(k_i\right) := \left(\frac{1}{\delta_i} - 1\right)\frac{\left[k_i - a + \left(x_i^* + x_i^{BAU}\right)/2\right]\left(x_i^* - x_i^{BAU}\right)}{a\sum_M\left(x_j^* - x_j^{BAU}\right) - \left[k_i + \left(x_i^* + x_i^{BAU}\right)/2\right]\left(x_i^* - x_i^{BAU}\right)} \quad \text{(CC)}$$

where $\overline{q}_i\left(k_i\right)$ decreases in δ_i and, thus, we could have written (CC) as a lower bound on δ_i (which is more standard). In this chapter, the above version of (CC) will be more helpful.

Importantly, $\overline{q}_i\left(k_i\right)$ increases in k_i, for any given $\left(x_i^* - x_i^{BAU}\right)$. Intuitively: if i finds it costly to contribute to the public good, then i will be tempted to defect at the compliance constraint unless the probability for being detected (q_i) is very large. (In fact, $\overline{q}_i\left(k_i\right)$ increases in k_i also if we substitute in with $x_i^{BAU} = a - k_i$, for a fixed x_i^*.)

If every $\left(x_i^* - x_i^{BAU}\right)$ equals, say, Δ, then we can rewrite the condition as:

$$q_i \geq \left(\frac{1}{\delta_i} - 1\right)\left(\frac{\Delta/2}{a\left(m-1\right) - \Delta/2}\right).$$

This inequality has several implications: It defines the largest contribution level (or Δ) that a coalition of size m is able to enforce. It also defines a lower boundary for what the discount factor can be for countries to be willing to comply. Thus, an international agreement with additional contributions Δ can be self-enforcing iff Δ is small, δ_i is large, q_i is large, and m is large. With $x_i^* = x_i\left(m\right)$, given by (4), then $\Delta = a\left(m-1\right)$, and the inequality simplifies to:

$$q_i \geq \frac{1}{\delta_i} - 1. \tag{5}$$

The literature on compliance in environmental economics (e.g., Barrett, 1994; Dutta and Radner, 2004) follows the game-theoretic literature on repeated games (see Mailath and Samuelson, 2006 for a text-book treatment).

Time inconsistency is a deep and general problem for governments because it is difficult for one government to tie the hands of what decisions will be made in the future. Acemoglu (2003) argues that the inability to commit to future choices is a reason for why we cannot expect a "political Coase theorem."

The remainder of this chapter introduces several political economics forces. After all, countries are not unitary players. Domestic decisions are subject to legislative bargaining, ratification, and lobbying. Decisions can be vulnerable because the government negotiating the treaty might be different from the government that ought to comply. All these political forces must be taken into account if we are to understand the provision of global public goods, and how agreements must be designed so that policies are both desirable and politically feasible.

3. TWO-LEVEL GAMES

In a democracy, policies must be politically acceptable, more broadly. As explained by Putnam (1988), a negotiator at the international stage plays a two-level game: The international bargaining game and the domestic political game. The simplest interpretation of Putnam's idea is that an international agreement, after is has been negotiated, must be ratified. The key decision maker who, in the end, decides on whether to approve and ratify the agreement may have different preferences than those of the negotiator.

For example, parameter k_i might be characterizing the negotiator, but $\overline{k}_i$ may similarly be characterizing the ratifying party. If $\overline{k}_i > k_i$, the ratifying party has different preferences than the negotiator does, and is more reluctant to accept an agreement with large contributions.

3.1 Ratification Requirements

A simple situation arises if $n = 2$, $k_1 = k_2$, and the size of the agreement, $\sum_{i \in N} x_i = X$, is fixed, unless the countries end up with BAU. In this situation, the two countries negotiate how to split the cost of making an agreement. The Pareto frontier, describing all pairs of possible payoffs, is a straight line. With the NBS, or Rubinstein (1982), the bargaining outcome is $x_i = X/2$, if there are no domestic feasibility constraints.

For the agreement $\mathbf{x} := (x_1, x_2)$ to be acceptable, it must be more attractive than BAU. For the negotiator, $\mathbf{x}$ is more attractive than $\mathbf{x}^{BAU}$ iff:

$$aX - (k_i + x_i)^2/2 > aX^{BAU} - \left(k_i + x_i^{BAU}\right)^2/2 \Rightarrow$$
$$x_i \leq \overline{x}_i(k_i) := \sqrt{2a\left(X - X^{BAU}\right) + \left(k_i + x_i^{BAU}\right)^2} - k_i.$$

To be ratified, we must also have $x_i \leq \overline{x}_i\left(\overline{k}_i\right)$. Given the ratification constraints, the

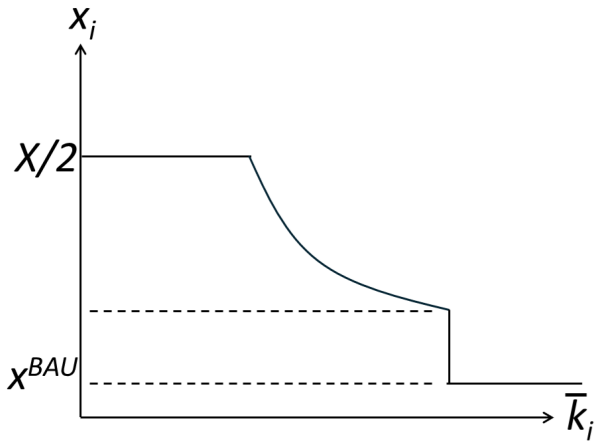

Figure 1: *A more demanding ratification requirement can reduce the contribution that country i ends up providing.*

negotiators are negotiating over (x_1, x_2) subject to $x_1 + x_2 = X$, and $x_i \leq \overline{x}_i\left(\overline{k}_i\right)$ for $i \in \{1, 2\}$.

With the Rubinstein (1982) alternating-offer bargaining game, one can show that if $k_1 = k_2$, the unique subgame-perfect equilibrium is simply $x_i = X/2$ if this deal will be ratified, i.e., if $X/2 < \overline{x}_i\left(\overline{k}_i\right)$ for $i \in \{1, 2\}$. In this case, the domestic constraints will not influence the outcome, unless they are binding. The proof is left as an excercise.

Suppose that the ratification constrains binds in country i but not in country j. That is, $\overline{x}_i\left(\overline{k}_i\right) < X/2$ and $\overline{x}_j\left(\overline{k}_j\right) > X - \overline{x}_i\left(\overline{k}_i\right)$. Then, it is not politically feasible to ratify $X/2$ in country i, but some agreement is still politically feasible for both countries. In this case, the bargaining outcome (following Rubinstein, 1982), will be $x_i = \overline{x}_i\left(\overline{k}_i\right)$ and $x_j = X - \overline{x}_i\left(\overline{k}_i\right)$. That is, the agreement will be the one that is closest to the fair outcome, $X/2$, among those that are politically feasible.

What if both ratification constraints are binding? Then, $\overline{x}_i\left(\overline{k}_i\right) < X/2$ and $\overline{x}_j\left(\overline{k}_j\right) < X - \overline{x}_i\left(\overline{k}_i\right)$, so there is no pair (x_1, x_2) that is politically feasible in both countries.

Combined, equilibrium x_i, as a function of $\overline{k}_i$, is as illustrated in Figure 1. A moderate increase in $\overline{k}_i$, contributing to a small $\overline{x}_i\left(\overline{k}_i\right)$, has no impact, as long as the bargaining outcome without the constraint will be acceptable. When $\overline{k}_i$ is sufficiently large, however, x_i must decrease in $\overline{k}_i$. If $\overline{k}_i$ is very large, there is no x_i that is acceptable in both countries. In this case this, we are left with the status quo.

In sum, domestic constraints can help a country obtain a more preferable bargaining outcome, but they also raise the risk that the negotiators will be unable to find an agreement that is feasible in both countries, even though it is attractive from the negotiators' point of view.

As noted, the idea of the two-level games goes back to Putnam (1988), at least. The

way I formalized it here, with multiple pivotal players, is related to the multiple veto player analysis of Tsebelis (1995) and Krehbiel (1998).

3.2 Dynamics, Gridlock, and Endogenous Status Quo

In the static game above, a status-quo bias can arise because a new policy must satisfy multiple pivotal players (such as the negotiator and the ratifying party). The status-quo bias can be even worse in the dynamic setting: When the status-quo bias makes it difficult to repeal the policy in the future, one may be reluctant to introduce the policy today. Thus, even a policy that seems attractive to all parties today may not be acceptable when the parties expect that the new status quo will be difficult to change in the future.

This possibility can be illustrated even if there is a single country – country i. Consider a political decision that would generate benefit θ_t for everyone in period $t \in \{1, 2\}$ at cost $\underline{k}_i$ and $\overline{k}_i > \underline{k}_i$ for two different pivotal players, all relative to the status quo. Suppose, also, that the policy in period 1 is the status quo in period 2.

If the policy is not introduced in period 1, it will be introduced in period 2 if $\theta_2 > \overline{k}_i$ but not if $\theta_2 < \overline{k}_i$. If the policy is introduced in period 1, in contrast, it will stay in place also in period 1 if if $\theta_2 > \underline{k}_i$ but not if $\theta_2 < \underline{k}_i$. The reason is, of course, that the pivotal player with the smallest cost will disagree on repealing it unless $\theta_2 < \underline{k}_i$. Therefore, there is a status-quo bias if $\theta_2 \in \left(\underline{k}_i, \overline{k}_i\right)$, which can be referred to as the gridlock region: the policy will be the same in period 2 as it is in period 1, regardless of what the players decide for period 1, if θ_2 is an element of this interval.

The gridlock region will be even larger in period 1. When the future status-quo bias is anticipated, it is not sufficient that $\theta_1 > \overline{k}_i$ for the policy to be introduced in period 1. The reason is that there is a cost, for the high-cost pivotal player, to change the status quo. The cost is that the policy will stay in place even if $\theta_2 \in \left(\underline{k}_i, \overline{k}_i\right)$. For the high-cost player, the expected cost of changing the status quo in period 1 is, therefore:

$$\begin{aligned} &\delta \Pr\left(\theta_2 \in \left(\underline{k}_i, \overline{k}_i\right)\right) \cdot \mathrm{E}\left(\overline{k}_i - \theta_2 \mid \theta_2 \in \left(\underline{k}_i, \overline{k}_i\right)\right) \\ &= \delta \left(\overline{k}_i - \underline{k}_i\right)^2 / 2 \text{ if } \theta_2 \sim U\left[0, 1\right]. \end{aligned}$$

Consequently, the policy will be introduced in period 1 only if the present benefit outweighs the future cost for the high-cost pivotal player. Formally, this means that:

$$\theta_1 - \overline{k}_i > \delta \left(\overline{k}_i - \underline{k}_i\right)^2 / 2 \text{ if } \theta_2 \sim U\left[0, 1\right].$$

By inspection, the threshold for the benefit, above which the policy will be introduced, is not only increasing in $\overline{k}_i$, but it is also decreasing in $\underline{k}_i$. The intuition is that if $\underline{k}_i$ is small, the policy is less likely to be repealed in the future, and thus the high-cost player

is reluctant to introduce the policy in period 1. In plain English: Polarization between the parties enlarges the status-quo bias, especially in a dynamic setting with endogenous status quo.

Similarly, if the policy is already in place at the start of period 1, it will be repealed by both parties in period 1 iff

$$\underline{k}_i - \theta_1 > \delta \left(\overline{k}_i - \underline{k}_i\right)^2 / 2 \text{ if } \theta_2 \sim U\left[0,1\right].$$

To summarize: In a static version of this model, and in the second period, there is a status-quo bias, and gridlock, iff:

$$\theta_2 \in \left(\underline{k}_i, \overline{k}_i\right).$$

In the first period of the two-period dynamic game, there is a status-quo bias, or gridlock, iff:

$$\theta_2 \in \left(\underline{k}_i - \delta \left(\overline{k}_i - \underline{k}_i\right)^2, \overline{k}_i + \delta \left(\overline{k}_i - \underline{k}_i\right)^2\right) \subset \left(\underline{k}_i, \overline{k}_i\right).$$

Thus, the gridlock region is larger in the dynamic game.

Dzuida and Loeper (2016) provide a more general analysis of this situation, with an infinite number of periods. Austen-Smith et al. (2019) show that the gridlock-interval also depends on the policy instrument in question. For example, they show that if everyone prefers a Pigou tax instead of an emission quota in a static setting, the parties may end up selecting a quota in the dynamic game. The reason is that the high-cost pivotal player understands that the popular Pigou tax will be harder to repeal in the future.

In the model by Austen-Smith et al. (2019), a Pigou tax is less costly than a quota, in that both $\underline{k}_i$ and $\overline{k}_i$ are smaller when the tax is used, because the tax revenues can be used by the government in the best possible way. However, when the high-cost player internalizes a larger fraction of the firm's cost than does the low-cost player, then $\left(\overline{k}_i - \underline{k}_i\right)$ will also be larger then a tax is used, instead of an emission quota. When δ is large, the effect of the larger $\left(\overline{k}_i - \underline{k}_i\right)$ dominates the effect that both costs are smaller. The consequence is that even though all parties would be better off with the emission tax than with the emission quota in a one-period setting, it might be impossible to agree on the tax in period 1 because the gridlock interval is very large when $\left(\overline{k}_i - \underline{k}_i\right)$ is large. Consequently, the parties may only be able to agree on the second-best instrument, i.e., the emission quota.

3.3 Exploiting the Status-quo Bias

Political constraints and weaknesses can sometimes be exploited by international treaties. In particular, the status-quo bias discussed above can actually be useful in situations in which the policy would otherwise be time inconsistent. In Section 2.4, we showed that if

δ is small, then a country may find it difficult to make credible promises regarding future contribution levels. It will be too tempting to contribute less when other countries have decided on their contributions. When this temptation is strong, credibility is lost, and countries may not trust one another enough to succeed with a self-enforcing agreement.

In this situation, the political status-quo bias can be helpful because it limits a country's ability to change its policy.

In particular, suppose that when country i has agreed on x_i^*, this policy is the new status quo. Thus, to select another policy, and defect on this agreement, it must be approved by both a pivotal policymaker with characteristic $\overline{k}_i$ and a pivotal policymaker with characteristic $\underline{k}_i < \overline{k}_i$. Since the low-cost player will be the player that is relatively more willing to stick with the policy, the compliance constraint changes from (5) to

$$q_i \geq \overline{q}_i\left(\underline{k}_i\right), \tag{6}$$

which is more likely to hold when $\underline{k}_i$ is small, as discussed in Section 2.4.

With multiple pivotal players, the compliance constraint changes from $q_i \geq \overline{q}_i\left(k_i\right)$ to $q_i \geq \min_{j \in P(i)} \overline{q}_i\left(k_j\right)$ where $P\left(i\right)$ is the set of pivotal players in country i. This constraint is weaker than the one-pivot compliance constraint, $q_i \geq \overline{q}_i\left(k_i\right)$. The larger is the set of pivotal players in country i, the weaker is the compliance constraint, and thus the more credible it is that country i will stick to its promises.

Consequently, gridlock and status-quo biases can contribute to explaining why democratic countries find it worthwhile to negotiate more treaties than do non-democracies.

The fact that strategic delegation can help in achieving credibility in situations with time inconsistency is related to the argument for central bank independence by Rogoff (1985). Keefer and Stasavage (2003) expand on this logic and study when multiple veto players can enhance credibility depending on the extent of uncertainty about the location of the status quo and on how agenda-setting power is distributed among the veto players.

3.4 Exploiting the Ratification Requirements

Consider the non-binary situation in which the policy can be any $\mathbf{x} = (x_1, ..., x_n) > 0$. In this case, a domestic ratification requirement will not only increase a country's bargaining power. They can also change how ambitious the agreement will end up being. To see this, suppose that all countries have domestic ratification requirements. In reality, it can be quite uncertain whether a set of contributions will, eventually, be ratified by all countries. When the preferences of the ratifying parties are not yet known, the consequence of this uncertainty can be that the bargainers negotiate less ambitious contribution levels, just to raise the probability that the agreement will be ratified in all countries (Köke and Lange, 2017). The reduced level of ambition can make it less costly for countries to participate

at the participation stage. Thus, when the level of ambition is reduced, the coalition can be larger (Finus and Maus, 2008). A treaty can be strengthened if the ratification requirements are so demanding, and the feasible contributions are so modest, that the participation level will increase.

4. STRATEGIC DELEGATION

In Section 3, the ratification constraints were exogenously given. Because a constraint can be beneficial for the negotiating party (as illustrated in Figure 1), it may arise endogenously. That is, country i may benefit from strengthening the domestic feasibility constraint in order to improve its bargaining power.

There can be several ways of doing this. In the U.S., for example, Congress must ratify international agreements. In some cases (following the Trade Act of 1974), Congress has granted a fast-track procedure, so that, after the negotiation stage, Congress cannot modify the agreement but it can only accept or reject it. The decision on whether to grant fast track is, in essence, making the ratification threshold endogenous. Conconi et al. (2012) interpret the fast track procedure in this way.

4.1 Endogenous Ratification Requirements

Returning to the fixed-size example in Section 3.1, suppose country i can influence the ratification threshold before the international bargaining game begins. By selecting the identity of the pivotal player at the ratification stage, $\overline{k}_i$, country i is, essentially, limiting how much it can end up contributing. Thus, the other country must contribute more when $\overline{k}_i$ is large.

Because $\overline{k}_i$ places a limit to the country's contribution, by selecting $\overline{k}_i$ country i is making a claim to utility, so that it will decline anything that is less attractive. That is, the minimum utility the country will get is:

$$aX - \left(k_i + \overline{x}_i\left(\overline{k}_i\right)\right)^2/2,$$

which is increasing in $\overline{k}_i$.

When both countries can make such a claim to its utility, they are, in effect, playing the Nash Demand Game (NDG, from Nash, 1953). When there is no uncertainty in the game, there are multiple equilibria in this game: If one country requests a smaller fraction of the surplus, the other player will request whatever is left, so that the two requests are exactly compatible with one another. Formally, if country i's decision is a larger $\overline{k}_i$, so that $\overline{x}_i\left(\overline{k}_i\right) < X/2$, country j's best response is a smaller $\overline{k}_j$, so that $\overline{x}_j\left(\overline{k}_j\right) = X - \overline{x}_i\left(\overline{k}_i\right)$, as long as $\overline{x}_j\left(\overline{k}_j\right) < \overline{x}_j\left(k_j\right)$, meaning that the agreement continues to be beneficial for country j.

Nash argued that there may be uncertainty about whether the demands will be compatible. Thus, suppose that they are compatible with probability $p\left(\overline{x}_i\left(\overline{k}_i\right), \overline{x}_j\left(\overline{k}_j\right)\right)$, decreasing in both arguments. In this situation, Nash (1953) argued that the equilibrium in the game will be described by the NBS when the uncertainty vanishes. That is, in equilibrium, the choices of $\overline{k}_i$ and $\overline{k}_i$ will ensure that the outcome for the contributions approaches the NBS outcome as if there were no ratification constraint, i.e., the equal allocation, given by $\left(\overline{x}_i\left(\overline{k}_i\right), \overline{x}_j\left(\overline{k}_j\right)\right) = (X/2, X/2)$. Thus, the game with endogenous ratification thresholds leads to an outcome that coincides with the outcome if the countries simply negotiated, without these constraints.

If the uncertainty does not vanish, however, the game with endogenous ratification thresholds may lead to breakdowns, without any agreements, because each country has an incentive to raise $\overline{k}_i$ even when this increases the risk.

For details on the relationship between the NDG and the NBS, see Binmore and Dasgupta (1987). Haller and Holden (1997) analyze how the bargaining power is influenced by a domestic super-majority (ratification) requirement, but also that this strategy can reduce the likelihood of ratifying the agreement when total surplus is uncertain. In the model by Mideksa and Harstad (2024), a country improves its bargaining power by either centralizing or decentralizing decision making authority, depending on the nature of the domestic externalities. In that model, the country receives payments from a donor in return to resource conservation. The logic applies also to settings in which the country is negotiating with other countries regarding how much global public goods to provide: Organizational design can improve one's bargaining power and thus it can reduce one's costly contribution to international agreements.

4.2 Delegation and Bargaining

In a setting without multiple pivotal players, a rather direct way of improving one's bargaining power is to strategically elect the identity or the characteristic (say, k_i^d) of the country's leader. After the leaders have been selected, they negotiate contributions and, as the threat point, they decide on the non-cooperative contribution levels. For a given set of m delegates, characterized by these k_i^d's, the bargaining solution is given by the version of (4) that is relevant for these delegates. I.e.:

$$x_i = ma - k_i^d. \tag{7}$$

Thus, by delegating to a representative with a high k_i^d, the country ends up contributing less: $\partial x_i/\partial k_i^d < 0$. The choice of k_i^d does not influence other countries' contribution levels in this game.

For the typical voter in country i, with characteristic k_i, the dominant strategy is

given by x_i^{BAU} in (2). This dominant strategy can be implemented if it coincides with (7). The two coincides if the delegate is characterized by k_i^d, where

$$k_i^d = (m-1)\,a + k_i > k_i.$$

By delegating in this way, i's representative negotiates higher contributions than what this delegate would have preferred non-cooperatively, because it will be induced to take the externalities on the other members into account. The negotiated quantity, however, ends up being exactly what the typical voter would have preferred in any case.

When all countries can delegate in this way, the outcome coincides with BAU, even if the representatives negotiate cooperatively. This holds no matter the number of members in the coalition.

The result that strategic delegation exactly reverses and cancels the effect of cooperation is specific to this model, but there is a large literature on how strategic delegation to reluctant representatives can help in bargaining contexts. The idea that one can improve one's bargaining power with strategic delegation was discussed by Schelling (1956), and the argument has been formalized by Jones (1989) and Segendorff (1998) in bargaining games with two players. Buchholz et al. (2005) compare the outcome of strategic delegation when countries cooperate vs. when they do not. Loeper (2017) does the same, and shows that cooperation is beneficial iff the demand function for the public good is sufficiently convex, but not otherwise (as in the example in this subsection). Spycher and Winkler (2022) study the impact on coalition sizes, and they find that strategic delegation crowds out all efforts in a so-called "weak delegation game", where delegation takes place only after a country has decided on whether to participate in a coalition. That result is in line with the result derived presented above. Sections 8 and 9 in this chapter draw on the models in Harstad (2008 and 2010) where the choice of delegate will depend on whether side payments are feasible and what the majority requirement is.

4.3 Exploiting Delegation

A country may delegate to improve its bargaining power, as above, but strategic delegation can also help a country to deal with the time inconsistency problem discussed in Section 2.4.

That is, if the compliance constraint (CC) fails for the quantity x_i^* that country i would like to offer in the negotiations, in return for other countries' contributions, delegation can help. Compliance can be credible if the compliance decisions are delegated to a representative, or bureaucracy, with a smaller k_i^d. In this way, the temptation to reduce the contribution will be weakened, and no necessarily place constraints on what the countries can offer and negotiate.

In particular, the compliance constraint (CC) will be satisfied if just k_i^d is so small that:

$$q_i \geq \overline{q}_i\left(k_i^d\right).$$

In contrast, suppose a country delegates to a decision maker with a larger k_i^d, so that the compliance constraint fails. Then, the other countries may want to reduce their contributions, in return, because they will anticipate that country i will not comply. With this response, country i would not benefit from this kind of delegation.

It follows than we can worry less about the compliance constraints associated with an international treaty when democratic countries can delegate strategically in order to make compliance credible. This argument is naturally related to the reasoning in Sections 3.3 and 3.4, and the literature mentioned there.

Delegation can also be beneficial in helping a larger coalition to form, if delegation takes place before countries have decided on whether or not to participate in a coalition (see Spycher and Winkler, 2022). Redoano and Scharf (2004) showed that when the question is whether jurisdictions should centralize authority, then the jurisdiction that prefers centralization can have an incentive to delegate to a representative with preferences more aligned with the other jurisdiction.

In BAU, delegation will have no effect in the present model. In every country, a voter with characteristic k_i prefers a delegate with characteristic $k_i^d = k_i$. If, however, the value of the sum of contribution were a strictly concave function, then it would be important to induce other countries to contribute more by committing to contribute less domestically. This commitment could motivate countries to select $k_i^d > k_i$. In other settings, such as international tax competition, countries may want to reduce the aggressiveness in the competition: they can do this by delegating to poorer agents that are less aggressive in reducing the domestic tax (Persson and Tabellini, 1992). The outcome is then better for all countries, because of the possibility to delegate before the countries compete.

5. LOBBYING

5.1 Symmetric vs. Asymmetric Lobbying

Lobbies and interest groups influence politics. There are many ways of formalizing lobbying. One may distinguish between informative lobbying and campaign contributions or other favours.

A common approach is to assume interest groups offer contribution schemes, as in Grossman and Helpman (1994). That is, for the policy x_i, and the stakeholder benefit ax_i, let $\alpha_a \in [0,1]$ measure the fraction of the benefitting parties who are organized in a lobby. Grossman and Helpman show that this group may find it optimal to offer a payment schedule $\max\{0, \alpha_a a x_i - \overline{u}_a\}$ as a function of the chosen policy, x_i. Part

$\alpha_a a x_i$ implies that the schedule is truthful, and reflects the group's appreciation of x_i. In contrast, the threshold $\overline{u}_a$ is set high to reduce the total payment, but still not so high that the policymaker will ignore the benefit. The max-term follows when promised payments must be positive.

Analogously, let $\alpha_k \in [0,1]$ measure the fraction of the cost-side that is organized and that offers a truthful contribution schedule. With these contributions, the policymaker will end up maximizing:

$$(1+\alpha_a)\, a x_i - (1+\alpha_k)\,(k_i + x_i)^2/2. \tag{8}$$

Evidently, the lobby contributions do not influence the policy if the two sides are equally well organized: If $\alpha_a = \alpha_k$, the optimal x_i, maximizing (8), is independent of this number. Thus, the policy is the same if all stakeholders are equally well organized as if none of them are. This is a major result in Grossman and Helpman (1994).

In general, it is reasonable to permit the organizational skills to be different for the benefactors of the policy (α_a) and for the stakeholders paying the cost (α_k). After all, when x_i is a public good, everyone benefits from the policy. Following Olson (1965), coordination and lobbying are likely to be less effective if there are many benefitting parties. Thus, α_a is predicted to be small when x_i is a public good.

In contrast, most of the cost of emission reduction, for example, is likely to be concentrated to relatively few and large companies in the energy sector. Thus, we can expect α_k to be large when x_i represents emission abatement. Consistently with this prediction, Meng and Rode (2019) present statistical analyses suggesting that lobbying by firms expecting losses from the policy was more effective than lobbying by firms expecting gains from the Waxman–Markey climate bill in the U.S..

The consequence of $\alpha_k > \alpha_a$ is clear: The contribution x_i, maximizing (8), will be smaller when $\alpha_k > \alpha_a$ than if $\alpha_k = \alpha_a$:

$$x_i = a\frac{1+\alpha_a}{1+\alpha_k} - k_i.$$

Thus, if $\alpha_k > \alpha_a$, the asymmetry implies that x_i will be low in the noncooperative situation. In addition, it is reasonable that x_i is low, also when the countries are bargaining, if $\alpha_k > \alpha_a$. The energy sector, for example, can influence country i at the bargaining stage so that it will act *as if* the costs are high. Consequently, the country will end up with a smaller contribution.

Even at the compliance stage, the cost-side may lobby and influence the political decisions. At this stage, the cost-side lobby can induce the policymaker to defect by emitting more than promised. If the lobby is expected to exert political pressure in this

direction, also at the compliance stage, then an effect of lobbying will be to further reduce the contribution x_i that can be credibly complied with later on. Countries may thus find it difficult to make future promises trustworthy, unless the contributions are reduced so that they are robust to the pressure from the lobbies.

5.2 Self-fulfilling Expectations and Multiple Equilibria

In reality, the cost of contributing to public goods is endogenous. Suppose, for example, that the energy sector in country i decides on whether to invest in research and development expenditures to reduce the cost, characterized by k_i. Thereafter, the policymaker decides on x_i. The game between the policymaker and the investors is introduced in this subsection for a situation in which there is no lobbying. When this simple model is understood, lobbying will be introduced in Section 5.3.

Binary investments. Suppose, first, that there are many firms, but each can pay the fixed cost F_i to reduce its firm-specific cost k_i to zero. For each firm, taking the expected policy ($\mathrm{E}x_i$) as given, this investment is worthwhile iff it reduces the total cost. I.e., if:

$$\begin{aligned}(0+x_i)^2/2 + F_i \leq (k_i + \mathrm{E}x_i)^2/2 \Leftrightarrow \\ \mathrm{E}x_i \geq F_i/k_i - k_i/2.\end{aligned}$$

If the contribution level, and therefore the cost, is expected to be high, then it makes sense to invest in order to reduce the cost.

In BAU, after the investments are sunk, the policymaker in country i will find it optimal to set $x_i = a - k_i$ if the firms do not invest, and $x_i = a$ if the firms invest.

By combining the policy decision and the investment decision, we note that there can be multiple equilibria in this economy. One equilibrium can be that firms do not invest because they expect x_i to be small (i.e., $x_i = a - k_i$), and x_i will, indeed, be this small because firms do not invest. Another equilibrium is that firms invest because they expect x_i to be high, and x_i will be high because firms invest. Both equilibria coexist iff:

$$a - k_i < F/k_i - k_i/2 < a.$$

Quadratic investment cost. Suppose the cost parameter is $k_i = k_{i,0} - r_i$, and that which can be reduced with r_i at convex cost, $fr_i^2/2$. Here, r_i can measure the firms expenditures on research and development that will reduce their cost of complying with emission abatement requirements, for example. If the firms take the expected contribution level ($\mathrm{E}x_i$) as given, they will invest until the marginal cost is equal to the marginal

benefit. I.e.,

$$fr_i = (k_i + \mathrm{E}x_i)\,.$$

Combined with $k_i = k_{i,0} - r_i$, we get

$$r_i = \frac{k_{i0} + \mathrm{E}x_i}{1+f} \text{ and } k_i = k_{i,0} - r_i = \frac{fk_{i0} - \mathrm{E}x_i}{1+f}.$$

Here, the equilibrium investment level increases in $\mathrm{E}x_i$. Combined with the policy response $x_i = a - k_i$, there will be a unique equilibrium pair (x_i, r_i) in this model.

Multiple steady states (with and without a green transition) can also arise in settings in which consumers, and not the firms, are making the adaptation decision. For example, consumers' environmental values can change over time depending on the costs and benefits of purchasing goods from green firms, and depending on the expectation of future policies (see Besley and Persson, 2023).

5.3 Strategic Sectors and Endogenous Policy

Strategic investments. In Section 5.2, the investments were analyzed under the assumption that firms could take the future policy as given. If the firms are organized, they may take into account that the actual x_i will be decreasing in k_i. In fact, with the endogenous $x_i = a - k_i$, the sector's cost simplifies to

$$(k_i + x_i)^2 / 2 = a^2/2,$$

minus the investment cost. Thus, the industry will find it optimal to invest zero, because x_i will adjust and become less ambitious, as a result. This holds both in the model above, with the fixed investment cost F, and also in the model with the convex investment cost, $fr_i^2/2$.

Consequently, although there can be multiple equilibria when firms take x_i as given, an organized sector, acting first, ensures that only the low-investment equilibrium survives.

Organized lobby. What are the effects for investments and the government's payoff, when there is lobbying in this game? To learn that, we must re-introduce the lobby model from Section 5.2. Suppose only the cost-side is organized (i.e., $\alpha_k > \alpha_a = 0$).

When we solve the game by backward induction, we start by taking the investments as being sunk and given.

Suppose the sector has all the bargaining power when they negotiate over the policy and the compensation from the sector to the policymaker. That is, the sector can propose a policy x_i in return for a compensation to the policymaker. If the policymaker declines,

the policymaker finds it optimal to select x_i^{BAU}, which gives the policymaker the payoff

$$u_i^{BAU} = ax_i^{BAU} - \left(k_i + x_i^{BAU}\right)^2/2 = a^2/2 - a\left(k_{i,0} - r_i\right).$$

The combined payoff, for the lobby group and the policymaker, is

$$u_i^L = ax_i - (1+\alpha_k)\left(k_i + x_i\right)^2/2,$$

minus the investment cost. The investment cost is sunk at the policy stage, and thus the policy, with lobbying, will be:

$$x_i^L = a/\left(1+\alpha_k\right) - k_i < x_i^{BAU} = a - k_i. \tag{9}$$

When the sector has all the bargaining power, the sector can capture the combined payoffs, minus what the policymaker will obtain by declining the offer from the lobby. Thus, the lobby obtains $u_i^L - u_i^{BAU}$.

This payoff is anticipated when the sector invests. Even in this situation, it turns out, the sector finds it optimal to invest nothing at all, so that $r_i = 0$. To see why $r_i = 0$ is the equilibrium investment level, note that a marginal increase in r_i raises the combined payoff by:

$$\partial u_i^L/\partial r_i = a,$$

when we use (9). However, the government's payoff from declining the sector's contribution is also increasing in r_i:

$$\partial u_i^{BAU}/\partial r_i = a.$$

Thus, the two effects cancel, given that the lobby obtains $u_i^L - u_i^{BAU}$. Hence, the sector does not benefit from a reduced k_i, and the sector will not invest at all.

The models in Sections 5.2-5.4 are inspired by the analysis of trade lobbies by Maggi and Rodriguez-Clare (1998). The title of the next subsection is named after their article.

5.4 The Value of Agreements in the Presence of Political Pressures

The outcome derived in Section 5.3 is not very attractive for the policymaker. Not only does it obtain simply the BAU payoff, $a^2/2 - a\left(k_{i,0} - r_i\right)$. In addition, the firms will not invest, so that $r_i = 0$.

The value of commitment. If it was possible to commit to a larger and fixed x_i^c, the sector would invest $r_i = \left(k_i + x_i^c\right)/f > 0$. This outcome can be more attractive to the policymaker. As an excercise, one can show that the commitment outcome is better,

indeed, for every x_i^c such that:

$$ax_i^c - \left(f\frac{k_{i0}+x_i^c}{1+f}\right)^2/2 > a^2/2 - ak_{i,0}.$$

International agreements can help a government to commit. If peer pressure and international reciprocity ensure that the compliance constraint is satisfied, then signing a treaty specifying contribution x_i^c can remove the pressure from domestic lobby groups.

For country i, in isolation, the level x_i^c that maximizes the policymaker's payoff is $x_i^* = a\left(1/f+1\right)^2 - k_{i,0}$, leading to the payoff

$$a^2\left(1/f + 1/2f^2\right) + \left[a^2/2 - ak_{i0}\right].$$

The second term, in brackets, is the BAU payoff (without commitment). The difference with commitment to x_i^* is therefore the first term, $a^2\left(1/f+1/2f^2\right)$. Thus, the larger is a, and the smaller is the investment cost f, the larger is the benefit from committing. Since this benefit is strictly positive, commitments to larger x_i^c's can also be acceptable. The commitment value can thus motivate more countries to participate in an international agreement that enables countries to commit.

Example with binary investments. Consider, again, the binary investment model in Section 5.2. Consider the case in which the firms will not invest, unless the government has committed to large contributions. If the government does not commit, in this way, it ends up contributing $x_i = a - k_{i,0}$ and obtains the payoff $a^2/2 - ak_{i,0}$.

This model can be combined with the participation game in Section 2.3, where members of a coalition of size m will contribute $x_i^*(m) = ma - k_i$. Suppose that a commitment to such a large contribution level will motivate the firms to invest F to reduce the cost parameter k_i to zero. With these investments, a member's contribution level is simply ma. By comparison, by participating, not only will the other members raise their contributions by $(m-1)a$, but, in addition, the sector in country i will invest. Facing this trade-off, a member is better off participating iff

$$\begin{gathered} a(m-1)x^*(m-1) + a^2/2 - ak_{i,0} \leq amx^*(m) - \left(x_i^*(m)\right)^2/2 - F \Leftrightarrow \\ (m-1)(m-3) \leq 2\left(ak_{i,0} - F\right)/a^2. \end{gathered}$$

Thus, in contrast to the finding in Section 2.3, a member can be better of by participating even if $m > 3$, thanks to the commitment value of the treaty. If the value of investment $(ak_{i,0} - F)$ is large, a larger coalition can be possible. The reason is, of course, that the country benefits from induced investments exactly when the effect of the investment is large (i.e., $k_{i,0}$ is large) and the investment cost (F) is small. If $(ak_{i,0} - F)$

is close to zero (for example because both $k_{i,0}$ and F are close to zero), then we are back to the result in Section 2.3, where m can be at most 3.

For the participation level to increase, it is essential that the treaty is designed in a way so that it can help incumbents to commit in this way.

While the subsection is named after the article by Maggi and Rodriguez-Clare (1998), Marchiori et al. (2017) show, based on similar logic, that coalitions can be larger when the policymakers' benefit from a commitment to withstand the lobbies. They also study the situation in which the sector can lobby at the participation stage (against the membership) and finds that, in this case, the result is quite different.

Instead of signing international agreements, the government might have other ways in which it can commit to future contributions. Aklin and Urpelainen (2013) explain how "green" governments may want to provide support for renewable energy in order to create green consistencies. "Brown" governments will do the opposite, in their model.

6. TURNOVER AND POLARIZATION

In democracies, tomorrow's policymaker can be different from today's. Thus, today's policymaker may want to influence what later policymakers will do, but it is often difficult to do this in practice. This fact generates a new type of time inconsistency.

The time inconsistency problem may be particularly relevant for global public goods that accumulate over time and generate future benefits. These types of public goods are investments for the future. Today's government may want that future governments invest more but, right now, the government in office faces a unique opportunity to spend the budget on its favorite projects and perks. So, sustainability, for example, seems like a great idea to pursue – for the next government.

6.1 How are Policymakers Discounting?

To illustrate and formalize the time inconsistency, suppose that there is only one country but there are many time periods, $t \in \{1, ..., \infty\}$. Contributions at time t lead to benefits in the next period. Further, assume that the party in power benefits $\Delta > 0$ units more from each dollar spent when in office, than when the party is not in power. After all, the party in power can give priority to party perks or particular policies that it favours. If the parties differ a lot in their preferences, Δ can be large. It is thus natural to think that when the interests are polarized within a country, then Δ is large. Suppose, further, than the party in power today is in power in any future period with probability $p \in (0, 1)$. With this, the party in power today faces an opportunity cost of future expenditures equal to $(1 + p\Delta)$, but, today, the opportunity cost is $(1 + \Delta)$ (because the party is in power with probability 1 right now).

An excercise left for the reader is to show that, with the assumptions discussed above, the government at time 1 prefers contributions at any time t that maximizes:

$$v_{i,1}^P := u_{i,1}^P + \beta \sum_{t>1}^{\infty} \delta^{t-1} u_{i,t}^P, \text{ where} \tag{10}$$

$$u_{i,t}^P = a^P X_{t-1} - (k_i + x_{i,t})^2 / 2,$$

$$\beta := \frac{1 + p\Delta}{1 + \Delta}, \text{ and} \tag{11}$$

$$a^P := a / (1 + p\Delta).$$

Equation (10) shows that the government does not only discount future costs by the discount factor, δ, when comparing future costs to present costs. In addition, all future benefits and costs are discounted by $\beta < 1$, where the inequality is strict if the government is uncertain about whether it will be in power in the next period. Thus, the government does not act as if it applies exponential discounting. Instead, the discount factor characterized by $\beta\delta^{t-1}$ is referred to as quasi-exponential discounting, quasi-hyperbolic discounting, or sometimes beta-delta ($\beta\delta$) discounting.

The consequences of these discount factors include the following. For any future decisions, the government in power today prefers a commitment to:

$$x_i^{CO} = \delta a^P - k_i.$$

For the government that is in power at time t, however, $v_{i,t}^P$ will be maximized with the BAU decision:

$$x_i^{BAU} = \beta\delta a^P - k_i < x_i^{CO}.$$

Thus, every government would like to commit to x_i^{CO} for future decisions, but it prefers to contribute less when it is in power.

If $\Delta = 0$, then $\beta = 1$, and we are back to the model of the earlier sections. Also, if $p = 1$, then $\beta = 1$, and there is no time inconsistency problem. A ruler that remains in power with certainty will not be time inconsistent. But if both $\Delta > 0$ and $p < 1$, then $\beta < 1$, and decisions are time inconsistent: today's government would like future governments to contribute more, but the future government will not do so. The larger is parameter Δ, or the smaller is parameter p, the smaller is β, and the larger is the difference between x_i^{CO} and x_i^{BAU}. Thus, more polarization in preferences, and more frequent turnover in office, makes the time inconsistency problem more severe.

The consequences of $\beta\delta$-discounting can influence many types of political investments. The government today may want to promise that, in the future, investments in education

will increase, public debt will be paid off, and costly reforms will be implemented. Right now, it is tempting to postpone these reforms. The promises may never be fulfilled, therefore, unless today today's government can tie the hands of future governments.

When the incumbent can lose power, it is well known in the macroeconomic literature that it will be tempting to run budget deficits (Alesina and Tabellini, 1987; Persson and Svensson, 1989; Tabellini and Alesina, 1990). International cooperation can make the domestic problem even worse in these models, because international cooperation can reduce the incumbent's cost of running a budget deficit (Tabellini, 1990) and the cost of depreciation of one's currency (Lohmann, 1993).

Models of policy rotation, and why it leads to time inconsistent preferences, are analyzed by Amador (2003) and Chatterjee and Eyigungor (2016). With incumbency advantages, preferences are time inconsistent, but they are not as simple as $\beta\delta$-discounting (Harstad, 2020).

6.2 Global Warming and Hyperbolic Discounting

When policymakers rotate being in office, an incumbent has an incentive to overcome the time inconsistency problem described in Section 6.1. This can be difficult, however, because the next government is quite free to decide on policies, without being held accountable to promises made by opponents.

In some cases, as when today's policy decisions affect stocks or variables that are payoff relevant for the next government, then future decisions can be influenced.

For example, if the current government would like future governments to pollute less, it may be possible to increase the cost of emitting. Suppose that the cost of emission is convex in the accumulated stock, as discussed in Section 2.1. Then, the marginal cost of emitting is larger if the accumulated stock is larger. Thus, if the next government inherits a larger emission stock from the past, it will find it optimal to emit less. To induce this behavior, the current government has an incentive to raise the emission level, above the best-response to the future emission decisions.

This idea is analyzed by Karp (2005), from where I have borrowed the title of this subsection.

Another way of influencing future decisions is to invest in the right type of technologies. By investing in abatement technology, or the capacity to provide future public goods, the next government will be incentivized to contribute more. In a situation with polarized preferences and rotation of political power (so that β is small), the current government may invest strategically much in technologies that reduce the future contribution cost, and strategically little in technologies that has the potential of lowering future contributions. These incentives are analyzed in Harstad (2020).

6.3 Self-Committing Treaties

An international treaty can help the government to solve its domestic time inconsistency problem. If today's government would like future governments to contribute more, it may want to sign a treaty that punishes the future government, unless the promise is fulfilled. When the compliance constraints of treaties can be satisfied, membership can be especially attractive if the parties are polarized (so that Δ is large) and if the probability of staying in power is limited (in that p is small), because both aspects contribute to a smaller β, the way it is defined above by eq. (11).

Because p may be smaller in democracies with multiple political parties, than in single-party dictatorships, this reasoning explains why democratic countries have a stronger desire to sign international treaties, than do non-democracies.

To check this reasoning, we can return to the participation game in Section 2.3. By repeating the analysis in that section, but now with $\beta\delta$-discounting, we can show that the coalition size will be larger when β is small. The analysis is especially simple if the treaty specifies contributions for future periods (but not the current period). In this case, every member is better off participating, than free riding, even if the coalition is so large that:

$$m = \overline{m} := \left\lfloor 2 + \sqrt{1 + \frac{1-\beta^2}{\varepsilon^2}} \right\rfloor . \tag{12}$$

We are back to the result $m = 3$ iff $\beta = 1$, but m can be larger if $\beta < 1$. The smaller is β, the larger is the benefit from tying the hands of future policymakers, and the larger is the coalition before free riding pays off more.

In the above formula, parameter ε follows from the equation $X_i = x_i + \varepsilon \sum_{j \in N \setminus i} x_j$, discussed in Section 2.2. (Except for Section 2.2, we have focused on the special case of a global public good where $\varepsilon = 1$.) Thus, if the externality, ε, is limited, so that a country's contribution is mainly a domestic benefit, then the coalition can be larger. When $\varepsilon \to 0$, the treaty allows the governments to commit to the future contribution levels that they like, x_i^{CO}, and every country would like to participate. (I.e., if $\varepsilon \to 0$, $\overline{m} \to \infty$.) If ε is large, however, the members will end up raising contributions above x_i^{CO} in order to internalize the global externalities. This raises the cost of membership, and this cost must be outweighed by the benefit from commitment (which decreases in β), for participation to be worthwhile. Thus, if ε is large, then β must be small for a large coalition to be sustainable. As in Section 5, the treaty can be strengthened by the desire to commit – if the treaty is designed in a way that makes this type of commitment credible. This credibility may require sanctions or penalties associated with noncompliance.

Literature. The details for how eq. (12) is derived can be found in Harstad and Kessler (2024). In fact, that paper proves that a country i may even be willing to

participate in a convention in which the other members' contributions are invariant to whether or not i participates. Such a convention would not be attractive for a country if $\beta = 1$ in the model above, because it is only the change in the other members' contribution that motivates participation in the model in Section 2.3.

Regarding compliance, Harstad and Kessler (2024) find that countries can be more willing to comply if β is reduced from 1, because of the commitment benefit that the treaty provides.

If β is very small, however, it is tempting to defect because the cost will be paid by the future governments. For similar reasons, term limits can shorten the time horizon of policymakers, and make it difficult to sustain international cooperation (see Conconi and Sahuguet, 2009, who also explain when term limits can help to avoid collusion among the incumbents).

Buisseret and Bernhardt (2018) study how the possibility to loose power influence the bargaining game between two countries. They find that the threat of electoral turnover can strengthen the prospect for successful negotiations, but that it can also cause negotiations to fail, depending on the situation. In addition, they study how the possibility to loose power affects the division of the surplus from cooperation.

If there is uncertainty regarding future costs, it will not be optimal to commit to a particular quantity. Hefeker and Neugart (2023) compare international policy coordination with delegation to a common agency. In that paper, delegation means that they can select an appropriate agent to take decisions on their behalf, while the outcome under coordination will reflect the preferences of the domestic policymaker. Hefeker and Neugart show that domestic political parties may disagree on the choice between coordination and delegation, but, if the outcome of the election is close to being random (as in this section), the parties will agree that delegation is preferable to policy coordination.

6.4 Resource Extraction, Compensation, and the Conservation Multiplier

Conserving natural resources is an investment because they can be beneficial in the future, but extracting the resource can generate revenues today. A simple way to formalize this trade-off is to let there be a stock, S_t, while x_t is the fraction that is conserved from one period to the next, so that $S_{t+1} = x_t S_t$. The stock that is not conserved is consumed. In line with the logic of Section 6.1, the equilibrium x_t will be smaller if β is small (i.e., if Δ is large or p is small). The party in power today can benefit from commitments to larger future x_t's.

With such a depletable resource, the expectation about future policies will be important. If future governments are not expected to conserve anyway, then conservation today is less attractive. Conversely, if the future conservation level increases, then it pays off more to conserve, also today. This dynamic complementarity generates a "conservation

multiplier", because a parameter change that raises the motivation to conserve has a large (multiplicative) effect: Not only does conservation increase directly, but when also future conservation levels are expected to increase, then that will motivate more conservation today.

Donors paying for conservation can exploit the multiplier. When it is credible that they will pay for conservation at time $t+1$, then x_{t+1} increases, directly, but x_t will also increases because conservation is more attractive at time t when the government at time $t+1$ is expected to extract less.

The multiplier can create a time inconsistency problem for the donor, because it can be tempting to pledge a payment in the next period, rather than just now, if this promise is sufficient to motivate conservation today. When the next period arrives, it will be tempting to renege, and promise a payment at time $t+2$, etc. When it is no longer credible that future compensations will be forthcoming, the government will be discouraged from conservation, and resource exploitation will increase. Thus, the market for conservation is inefficient (Harstad, 2016).

But when the donor can commit, it can exploit the multiplier effect by making future compensations credible. In this way, more can be conserved per dollar because of the multiplier effect (Harstad, 2023), and more public goods will be provided.

6.5 Pro-Exploitation Lobbies vs. Compensations for Conservation

The multiplier, discussed in Section 6.4, can also be exploited by lobby groups that benefit from resource extraction (e.g., agricultural associations that need access to deforested land). If it is expected that a lobby group will pay the future government, in return for extraction, then the incentive to conserve today is weakened. Thus, such a lobby group can benefit from more extraction already today, if it is simply expected that it will lobby for extraction in the future.

The two interest groups do not have a symmetric impact on decisions, however, even if both the pro-exploitation group and the conservation-friendly group are equally well organized. In contrast to the efficiency result of Grossman and Helpman (1994), the outcome will lead to too little conservation, and too much exploitation, if both sides are lobbying (Harstad, 2023). The reason for this inefficiency result is that the pro-exploitation lobby will compensate the government only when it depletes the resource. The pro-conservation lobby, however, does not win the game forever if the resource is conserved today. With conservation today, the game and the costs continue in the next period. The need to compensate every government to conserve reduces the willingness to pay for conservation in any particular period. When $\beta < 1$, the flow of future compensations (in return for conservation) will be discounted heavily by the government today. The present-discounted value of these payments will be less attractive than the compensation that is obtainable

right away by giving in to the pro-exploitation lobby. In other words: Those that benefit from conservation needs to win the game in every period. Those who benefit from exploitation needs to win just one single time. This fundamental asymmetry breaks the efficiency result (from Grossman and Hart, 1994) for when all groups are organized.

7. ELECTIONS AND REELECTIONS

7.1 Electoral Cycles and Public Goods

Policymakers need to win elections. One's chances of staying in power is not exogenous, as presumed in Section 6, but it depends on policies and promises. An incumbent can often take various actions that will influence the probability of staying in power.

In particular, incumbents may prefer to introduce or continue policies that are especially popular in the eyes of the voter. The idea of the "electoral cycle" is that this preference is especially strong when there is a short time to the next election.

In principle, it is not clear why political decisions close to the election should be more influential than those made at the beginning of the electoral period. One possibility is that voters tend to forgive or forget, so that more attention is paid during the last year, or so, before the voters choose between the incumbent and the challengers. Another rationale is that when a policy decision is made, voters see the short-term consequences but not immediately the long-term consequences of the decision. Thus, policies that are beneficial up front, but costly in the long term, can help the incumbent to be reelected iff the long-term costs are realized or observed only after the election.

Based on this rationale, there is a large literature in macroeconomics studying the incumbent's incentive to spend money, reduce taxes, and run an expansionary monetary policy that will boost the economy in the short run. (See Nordhaus, 1975; Alesina 1987; Rogoff, 1990; Besley and Case, 1995.)

Electoral cycles are important for global public goods, too. Klomp and de Haan (2016) show, empirically, that in election years, natural resource rents increase in young democracies, and incumbents use the rents to expand on public spending and reduce taxes before the election. Pailler (2018) and Cisneros et al. (2021) show that deforestation rates in the tropics increase in election rates. Forest fires, in contrast, declined in election years and increased in the following year, in Indonesia, presumably because the fires are costly and visible to the general voter (Balboni et al., (2021). Regarding climate policies, Schulze (2021) study 20 democracies between 2009 and 2016 and finds that "soft" climate policies – characterized by subsidies, research grants, and information provision – increase as the elections approach.

When it comes to the compliance with an international agreement, Conconi and Sahuguet (2009) suggest that the incumbent may want to defect in an election year,

because the costly consequences will be realized only after the election. They compare the "re-election boost", which can decrease the severity of the punishment for defecting, to a long-run "re-election penalty."

The decisions to ratify an international treaty can also be strategic before the election. Kleine and Minaudier (2017) find that upcoming national elections reduce the chances of concluding an international agreement at the international level. This finding confirms the finding by Cazals and Sauquet (2015), who documented this effect for developed countries. Developing countries, in contrast, often use ratification as a pre-electoral strategy to raise their chances of staying in office. Cazals and Sauquet explain that the difference is that developing countries typically benefit from preferential treatments that raise their gains from participation, and that these countries obtain international support and concessions in return to their participation.

7.2 The Political Economy of Weak Treaties

What about the form of cooperation, or the design of an international agreement? Tying the hands of future policymakers (by committing to a particular x_i^*) may not necessarily be the best idea, because then the incumbent cannot differentiate itself from the opponents (at least not when it comes to decisions on x_i). That is, a "strong" treaty, that will always be complied with, makes the alternative policymakers identical when it comes to the global public good provision.

To win elections, it can be better to differentiate oneself.

One way of raising the probability of winning is to sign a "weak" treaty, where compliance will depend on the identity of the next policymaker. From Section 2.4, we know that a delegate with characteristic k_i^d will comply iff $q_i \geq \overline{q}_i\left(k_i^d\right)$. This compliance constraint is more likely to hold if k_i^d is small. The compliance constraint is also more likely to hold if q_i is large. In Section 2.4, q_i was explained to be the probability in which country i's defection was observed and punished by the other countries. By requiring and offering transparency when it comes to domestic decision making, and by using stronger threats in the treaty text, parameter q_i can be adjusted and increased.

Now, suppose there are two parties, characterized by $k_G < k_B$, while the median voter has some characteristic $k_m \in (k_G, k_B)$. An interpretation of this heterogeneity is that parties and voters vary regarding how much they value the local cost and benefit of contributions, or the relative difference between them.

If $q_i \in (\overline{q}_i(k_m), \overline{q}_i(k_B))$, then both the median voter and party G prefer compliance, but party B prefers to defect. In this case, the median voter prefers to elect party G, everything else equal, because only party G will find it ex post optimal to make the decision preferred by the voters.

If, instead, $q_i > q_i(k_B)$, both parties would prefer to comply. Thus, both parties

would be identical, in this respect, from the median voter's point of view. Thus, if party G is in power, it will increase its chances of being reelected by signing a relatively weak treaty, where $q_i \in (q_i(k_m), q_i(k_B))$, instead of a strong treaty where $q_i > q_i(k_B)$.

If $q_i \in (q_i(k_G), q_i(k_m))$, party G prefers to comply, but both party B and the median voter prefer to not comply with the treaty. In this case, the median voter prefers to elect party B, everything else equal. Thus, if the incumbent is party B, it increases its chance for reelection by signing a relatively weak treaty, in which $q_i \in (q_i(k_G), q_i(k_m))$, rather than a strong treaty that everyone will comply with. Party B will also be reelected with a larger chance with such a weak treaty than by signing no treaty, or by a treaty which no-one will comply with, because also in this case the two parties will be ex post identical, when it comes to this political issue.

Consequently, whether the incumbent is green or brown, it will always be able to improve its odds of winning the next election by signing some kind of weak treaty that may or may not be complied with.

This incentive will not be present if there is no election, of course. If the probability of staying in power is not influenced by the treaty in this way, then the incumbent will either sign a strong treaty or no treaty at all.

Battaglini and Harstad (2020) derive similar results in a setting in which the level of the sanction is negotiated. If the sanction following defection is high, policymakers are less tempted to defect. A high sanction has the similar effect as a high q_i. That paper is also permitting a probabilistic voting model, so that it is not guaranteed that a party wins just by agreeing on the appropriate weak treaty. Nevertheless, either party can benefit from negotiating a treaty that is weak, so that it may or may not be complied with.

The incentive to influence the reelection probability by taking certain policy actions is not limited to signing weak treaties, of course. Battaglini and Harstad (2020) show that also technology investments can reduce the contribution costs (i.e., parameters k_m, k_G, and k_B) just enough so the incumbent can differentiate itself from the opponent. In this way, either party can win the election by investing the amount that aligns the voters with the incumbent's future decision, while the challenger will act differently.

Similar strategies can be used when it comes to domestic policies, of course. One can raise one's reelection probabilities by accumulating public debt (Aghion and Bolton, 1990), by investing in public infrastructure (Besley and Coate, 1998; Robinson and Torvik, 2005), or by privatization (Biais and Perotti, 2002), if these decisions are carefully made so that only the incumbent – but not the opponent – will find it optimal to implement the decision preferred by the median voter.

7.3 Foreign Influence and Welfare

This subsection is named after the article by Antràs and Padró i Miquel (2011). They note (p. 136) that, for example, "the United States routinely allocates funds to organizations dedicated to the promotion of democracy and human rights, and... certain "friendly" political parties."

In the model, they assume that the incumbent in one country can take costly actions that influence the electoral outcome in another country. This can be modelled similarly to campaign contributions, but a more reasonable interpretation of the action is that one can publicly endorse or discredit the candidates in a neighboring country. To obtain the support of the foreign government, candidates may have incentives to commit to policy platforms that take into account the international externality. When the foreign influences can induce a country to internalize externalities, it will promise larger public goods contributions in the model discussed above. This effect has the potential of being welfare improving.

The outcome is less efficient if the influence is asymmetric, however. If a powerful nation can influence a smaller country, but not vice versa, then the powerful country does not find it necessary to sign an international agreement. After all, it can in any case influence and raise the neighbor's contribution to the international public good. An international agreement would require *all* contributions to increase, even that of the large country, and that can be costly and less attractive for a powerful nation. In such an asymmetric situation, foreign influence can prevent international treaties from being formed, and it can reduce welfare. Antràs and Padró i Miquel (2011: 144) find that "in the context of trade policy, foreign influence is most damaging when it is positively correlated with economic size."

Antràs and Padró i Miquel draw on Conconi (2003) and Aidt and Hwang (2008, 2014) who study how *foreign lobby groups* facilitate the internalization of international externalities. Gawande et al. (2006) argued that foreign lobby groups can raise total welfare because they can reduce the distortions that arise from asymmetric domestic lobbying. This insight aligns well with the lessons from Section 5.1: That section argued that those stakeholders that find the contributions to be costly are more likely to be organized than those groups that benefit from the contributions (i.e., $\alpha_k > \alpha_a$). When the contributions add to a global public good, many of the benefitting parties will be in other countries. For the lobby groups to balance one another, it can then be beneficial that also foreign interest groups influence domestic policies.

8. LINKAGES, TRANSFERS, AND POLICY HARMONIZATION

This section and the next discuss the possibilities for and the consequences of deeper

integration. Empirically, we have already observed deep cooperation at the regional level. The European Union is not only a club for countries cooperating on a single issue. The members are cooperating on a large number of issues, and the decision making procedures are formalized by institutions and voting rules. What does deeper global cooperation imply, and how can this be successful? One likely implication is that a larger number of issues will be cooperated on. Thus, a country's contribution on one issue can compensate for another country's contribution on another issue.

8.1 Issue Linkages and Transfers

It can be difficult to reach agreements on single issues with unanimity and without side transfers. If there are enough countries, and enough uncertainty, then surely someone will oppose and block progress.

For example, suppose the n countries consider a single and binary project, on which the valuations are $v_i \in \mathbb{R}$ for $i \in N$. If side transfers cannot be used, i will agree only if $v_i \geq 0$. If unanimity is required, the project is implemented only if $v_i \geq 0$ for every i. This is a demanding requirement, especially if n is large and the countries are heterogeneous.

To illustrate this, assume that $v_i = v_0 + \epsilon_i$, where ϵ_i iid $\sim U[-h/2, h/2]$, meaning that each shock is country-specific and distributed uniformly on an interval with length h, measuring the ex post heterogeneity between the countries. If we permit $h > 2v_0$, then $v_i \geq 0$ with probability $(v_0 + h/2)/h < 1$. The probability that all n countries have positive valuations is:

$$\left[(v_0 + h/2)/h\right]^n \to 0 \text{ when } n \to \infty. \tag{13}$$

In contrast, if the average value is $v_0 > 0$, then the total surplus of the project increases in n:

$$\mathrm{E}\sum_{i \in N}(v_0 + \epsilon_i) \to \infty \text{ when } n \to \infty.$$

Thus, if n is getting large, it is increasingly valuable to agree on collective projects (for which $v_0 > 0$), but it is increasingly difficult to do so in practice.

To overcome the status-quo bias that is associated with n veto players, it can help with issue linkages. Assuming $v_i < 0 < v_j$, country j should be motivated to find another issue that has the valuations ω_i and ω_j for countries i and j. If $\omega_i \geq -v_i$ and $\omega_j \geq -v_j$ both countries benefit from the combination of the two project. Thus, the valuation of the second project must be positive for i. Country j is willing to accept it even if it has a negative value for j, as long as $\omega_j + v_j \geq 0$ and the addition is necessary for i to agree.

If $\omega_i > 0$ for all countries, then this project would have been approved even without the issue linkage. In this case, country i looses from the linkage, because it implies that i obtains $\omega_i + v_i < \omega_i$. However, if $\omega_j < 0$ for another country, the two projects can only

be approved by everyone if they are combined. In this case, the issue linkage is beneficial for everyone.

With creativity in a complex world, one can always find additional projects of this type. They can work as side transfers from one country to another, in return for agreeing on the total package. In fact, when side transfers are permitted in models of bargaining and cooperation, the interpretation is often that they can represent concessions on another issue, rather than monetary transfers from one country to another.

Thus, suppose s_i represents a transfer to country i. A budget balance condition, simplified to $\sum_N s_i = 0$, reflects that, in the end of the day, raising one country's payoff might come at the expense for another country. It is easy to play around with the transfers to see that it is always possible to pass the project with valuations v_i, $i \in N$, as long as $\sum_{i \in N} (v_0 + \epsilon_i) \geq 0$. When $n \to \infty$, this is simply requiring $v_0 \geq 0$. Thus, with side transfers, the binary project can be implemented if and only if it is socially valuable. If one country loses from a project, the other countries may offer carrots or favours that can be used as side transfers to ensure that it agrees on the deal and receives the payoff $v_i + s_i \geq 0$.

For these reasons, side transfers can ensure the first-best decisions even if unanimity is required. This is in line with the Coase Theorem (Coase, 1960). For international cooperation to succeed, Nugent (2003, p. 357) argued that "linking issues together in 'package deals' can open the door to agreements by ensuring that there are prizes for everybody," and Cesar and de Zeeuw (1996, p. 158) claimed that "side payments are needed to reach the best result". For a survey on the literature on issue linkages, see Maggi (2016).

8.2 Side Payments Motivate Strategic Delegation

Suppose that v_i is the value of the project for the median voter in country i. As discussed in Section 4, the median voter might delegate authority to a delegate with valuation v_i^d.

If there are no side payments, and a binary project, there is no value for i to delegate strategically. Instead, i will find it optimal delegate sincerely, in that $v_i^d = v_i$ is a best response for i. After all, if $v_i > 0$, i would like to approve, and the delegate will push in this direction iff $v_i^d > 0$. If $v_i < 0$, i would like to veto the project, and i's delegate will do so iff $v_i^d < 0$.

With side transfers, however, the bargaining outcome (such as the NBS) among the delegates will ensure that for every delegate,

$$v_i^d + s_i = v^d,$$

where $v^d := \sum_N v_i^n / n$ is the average v_i^d. In this way, all the delegates are getting the

same surplus of the agreement.

Consequently, s_i will be higher if v_i^d is smaller. Thus, to obtain side transfers, i may want to delegate to a representative with a smaller valuation of the project.

The intuition is similar to the intuition in Section 4.2. There, the median voter benefitted from electing a delegate that placed a relatively higher weight on the cost compared to the benefit. With that, country i got away with contributing less to the global public good. With side transfers, such a delegate will receive more compensations, or end up paying less compensations to the others.

The cost of reducing v_i^d, in order to raise s_i, is that the delegates will fail to make an agreement if $\sum_N v_i^d < 0$. This is costly for country i if $v_i > 0$, and this cost will limit how small the optimal v_i^d is, in the eyes of the median voter in country i.

In the model of Harstad (2008), the individual values, the v_i's, are known, but there is an aggregate cost shock $\theta \sim U[-\sigma, \sigma]$. Thus, the probability that the delegates will find the project worthwhile is $\Pr\left(\sum_N \left(v_i^d - \theta\right) \geq 0\right) = \left(v^d + \sigma\right)/2\sigma$, which decreases in every v_i^d.

I leave it as an excercise to show that, in this situation, the equilibrium v_i^d satisfies:

$$v_i^d = v_i - (1 - 1/n)(v_0 + \sigma) < v_i.$$

Thus, v_i^d is reduced, relative to v_i. The strategic reduction in v_i^d is especially large when the average value, v_0, is large, and when n is large. The intuition is as follows. If v_0 is large, the project is most likely going to be implemented, in any case, so i finds it worthwhile to reduce v_i^d, in order to raise s_i. When n is large, country i is relatively small, and it is less likely that i's delegate will be the one that fails the collective project. In fact, we have:

$$\text{If } n \to \infty, \text{ then } \sum v_i^d/n \to -\sigma, \text{ and, therefore, } \Pr\left(\sum_N \left(v_i^d - \theta\right) \geq 0\right) \to 0.$$

In other words, when n is very large, the median voters delegate strategically in order to improve their bargaining power, and they do not internalize the full cost of this type of delegation. The consequence is that when all delegates are reluctant, it is unlikely that the aggregate shock is so favorable that the project will be approved by the delegates.

The result is analogous to eq. (13) for the situation without side payments. By comparing the two cases, allowing for side transfers increases the expected total surplus, and it raises the probability that good projects will be approved, iff:

$$v_0 - \min v_i \geq (v_0 + \sigma)(1 - 1/n).$$

Deriving this inequality is left as an excercise.

Thus, even though a large n reduces the chance for the project to be implemented with side transfers, the outcome with side transfers is even worse. The reason is, as explained, that countries delegate strategically and the v_i^d's decline by a lot when this type of delegation raises the side payments to country i, without reducing the risk by a lot. If $n \to \infty$, the inequality can never hold, implying that permitting side payments makes the outcome strictly worse.

If there is a lot of heterogeneity, however, in that $v_0 - \min v_i$ is large, while the aggregate uncertainty (σ) is small, then allowing for side payments is desirable, given any moderately small n.

8.3 Policy Harmonization vs. Differentiation

In the earlier sections, i's payoff was $a\sum_N x_j - (k_i + x_i)^2/2$. If we require all contributions to be harmonized to x, then i's value of the binary project can be written as $anx - (k_i + x)^2/2 - u_i^{BAU}$, which can be defined as v_i. Thus, with policy harmonization, we end up with the model with the binary project in Section 8.1-8.2. In this setting, v_i^d would follow from the appointment of a representative placing a different emphasis on the cost (k_i^d): $v_i^d = anx - \left(k_i^d + x\right)^2/2 - u_i^{BAU}$.

If policies are not harmonized, so that the x_i's can differ, then Section 4.2 taught us that countries will delegate strategically even in the absence of side payments. The reason is, of course, that varying the x_i's is quite similar to the introduction of side payments. If i needs to compensate j, i can increase x_i while j decreases x_j.

In domestic politics, it is quite common that certain policies are relatively uniform across different districts. In fact, this uniformity assumption has traditionally been assumed in the literature on fiscal federalism, and it is a key building block for Oates' (1972) decentralization theorem. This theorem states that if preferences are heterogeneous, then the political decisions should be decentralized and decided on by the districts themselves. The uniformity assumption is fundamental also in the literature on the size of countries (Alesina and Spolaore, 2005) and for the analyses of international unions (Alesina et al., 2005).

Because relaxing the harmonization requirement will motivate countries to delegate strategically (as in Section 4.2), just as when they bargain with side payments (as in this section), countries may be better off with the harmonization requirement, just as they may be better off not permitting side payments.

Besley and Coate (2003) criticized the micro-foundation for the uniformity assumption. But strategic delegation is just one reason for why policies should be harmonized rather than differentiated. Cremer and Palfrey (2000) showed that harmonization can be the equilibrium when the median voter in one jurisdiction is pivotal for federal man-

dates, while Wrede (2006) predicts harmonization as the outcome when districts compete. Harstad (2007) shows that permitting policy differentiation or side payments can lead to delays and signalling in bargaining games when there are asymmetric information about the local preferences.

9. VOTING RULES FOR A GLOBAL DEMOCRACY

The unanimity requirement is natural in international contexts, because countries are sovereign and there is no world government that can force countries to participate if they do not approve. At the same time, the unanimity requirement is demanding, and costly. If side payments are not possible, the unanimity requirement means that every single country must obtain a positive valuation of a binary project. If side payments or issue linkages are possible, countries will find it optimal to delegate to status-quo biased representatives in order to improve their bargaining power. In either case, it is unlikely that collective decisions will be approved unanimously when n is large, as explained in Sections 8.1-8.2.

Because of these problems, all countries might be better off if they agreed on more flexible rules. Behind the veil of ignorance, before learning whether one benefits or loses from a particular project (i.e., the ϵ_i's), the countries would like institutions that implemented projects as long as $\sum_N \left(v_i^d - \theta\right) \geq 0$, and not only when $\left(v_i^d - \theta\right) \geq 0$ for every single country.

For these reasons, suppose the countries can agree on a different voting rule. To simplify, let $n \to \infty$. The mass of countries is normalized to one. The majority requirement, $m \in [0,1]$, is the required fraction of all countries that must approve the project. If it is approved by the fraction m, all countries are bound by it.

9.1 International Voting Rules in the Absence of Delegation

Consider, first, the setting without side payments. As in Section 8.1, suppose that $v_i = v_0 + \epsilon_i$, where ϵ_i iid $\sim U\left[-h/2, h/2\right]$. Because of the symmetric distribution of preferences, it is socially optimal to implement the project iff $v_0 \geq 0$, or, equivalently, if half of the countries benefit from the project. This collective choice rule is implemented by the simple majority rule, ensuring that a project is implemented iff it are approved by the majority of countries: $m = 1/2$. The optimality of the simple majority rule, when there are no side payments, is in line with May's Theorem (May, 1952).

When side payments can be used, Section 8.1 concluded that projects that increased the sum of payoffs could always be approved by unanimity, if just the winners are compensating the losers. Thus, unanimity implements the first best. This is in line with the reasoning of Wicksell (1896), who argued that only the unanimity rule could guarantee that the policies were Pareto improvements.

However, even if side payments can be used, it may be costly for the parties to haggle and negotiate to the point when everyone is satisfied. Unanimity would lead to large "decision-making costs", according to Buchanan and Tullock (1962). If transfers can be used, but only to a limited extent, or if there are transaction costs, then the optimal majority requirement is smaller and it depends on the budget or the transaction costs. Aghion and Bolton (2003) derived the optimal social contract in this situation.

Maggi and Morelli (2006) take into account that it must be in the interest of the minority losers to comply with the majority's decision. Thus, a compliance constraint must be respected, and this constraint will influence the optimal voting rule.

When heterogeneous countries are voting, it is not clear, of course, that they should be given the same weights or number of votes. Barbera and Jackson (2006) derive the optimal weights in a situation in which larger countries include multiple heterogeneous groups and those, in turn, influence the intensity of preferences. They show that the weight of the vote of a country should increase in the country's size, but it should not be proportional to the size. The reason is that a large country is less likely to have intense preferences when it includes several heterogeneous districts.

None of these papers allow for strategic delegation.

9.2 Voting Rules and Strategic Delegation

Suppose, first, that no side payments can accompany the binary project discussed above. It is easy to check that no country will find it optimal to delegate strategically in this situation. For every median voter i, with valuation v_i, electing a delegate with valuation $v_i^d = v_i$ is optimal. The intuition for this claim is as described at the beginning of Section 8.2.

With side payments, however, we know country i prefers delegates with valuations $v_i^d < v_i$ when $m = 1$. The question, now, is how the choice of v_i^d varies with m and what, then, is the optimal m.

To answer this question, we need to formalize the bargaining game when unanimity is not required. The following model is motivated better in Harstad (2005; 2010). After the countries have chosen the delegates, all shocks (the ϵ_i's and θ) are realized and observed by everyone. One of the delegates is randomly drawn to be the formateur of the coalition. This formateur selects a minimum-winning coalition with a mass m of delegates. Referring to the NBS, it is assumed that the set of delegates bargain and use side transfers so that they all get the same surplus from the project. This implies that for any pair of members (i, j), $v_i^d + s_i = v_j^d + s_j$. The side payments to the countries that are not in the majority coalition is, at least, $s_i \geq -T$, where T is the largest tax it is possible to impose on a sovereign country that does not want to vote in favour of the project. The level of T can be viewed as the minority protection, or as the depth of the international institution that

will enforce the collective decision.

When $m < 1$, it is no longer the case that a country will necessarily delegate so that $v_i^d < v_i$. The reason is that the formateur will prefer to select as coalition members those delegates that are associated with the largest v_i^d's. To see this, note that if $v_i^d > v_j^d$, then the smallest side payments to i and j that are acceptable, before they decline the project, satisfy $s_i < s_j$. In other words, when $v_i^d > v_j^d$, it is less expensive to bribe i to support the project, than to bribe j. Equivalently, i is willing to be taxed more than j is, before disapproving the project.

The prediction that the majority coalition will consist of the winners is in line with Ferejohn et al. (1987). For this reason, Chari et al. (1997, p. 959) wrote that "voters [will] attempt to increase the probability that their district is included in the winning coalition by choosing a representative who values public spending more". This idea is also related to the results by Austen-Smith and Banks (1988) and Baron and Diermeier (2001), who showed that voters elect representatives taking into account how their delegates will influence the formation of coalitions.

This incentive to elect a delegate that will become a member of the majority coalition should be combined with the incentive to delegate strategically in order to obtain bargaining power. With the two incentives are combined, country i is facing a trade-off. A larger v_j^d increases the chance of being included in the majority coalition. A smaller v_j^d raises one's bargaining power, if the country ends up being a member. The equilibrium choice of v_i^d depends on T, m, and h.

If T is large, it is costly to be excluded from the majority coalition. To reduce this risk, i finds it optimal to delegate to a representative with a larger value, v_j^d. If m is large, most countries become coalition members, in any case. Then, it is relatively more important to raise one's bargaining power, and this is achieved by delegating to a representative with a smaller valuation, v_j^d.

The optimal majority requirement balances these concerns. To succeed with this, m must be larger if T is larger, for example. If the minority is well protected in that T is small, then m should be reduced because, otherwise, countries will find it optimal to delegate to reluctant, status-quo biased representatives.

It turns out that if h is large, i's optimal v_j^d declines, for any given m. The intuition is that if the heterogeneity h is large, it is mainly the country-specific preference differences that determine if i will be in the majority coalition. The choice of v_j^d will not influence the probability very much. In this situation, i prefers to delegate to a representative with a smaller valuation, v_j^d, so as to improve one's bargaining power. To limit the temptation to reduce v_j^d, and ensure that the socially optimal projects will be approved, the optimal m is smaller if h is large. (For details on this analysis, see Harstad, 2010.)

9.3 Domestic Investments in Global Cooperation

The capacity to produce public goods is endogenous. With deeper international cooperation, it will be important that countries prepare and invest in the collective projects and the capacity to produce global public goods. For climate change, for example, it is essential with the right type and quantity of investments in green technologies, so that abatement levels can increase at limited costs.

Section 5 argued that the cost parameter k_i is likely to be endogenous, as it can be reduced by investments in research and development. Section 5 considered the case when firms and industries invested in the reduction of k_i. The equilibrium investment level will also depend on governmental policies, of course. When the government can decide on policies that influences k_i, the question arises whether the government will benefit from these polices, and thus ensure that the investment level is socially optimal.

When a coalition members negotiate after the investments are sunk, then Section 2.3 predicted that equilibrium contributions would be higher if k_i is lower:

$$x_i(m) = ma - k_i.$$

Suppose $k_i = k_i^0 - r_i$, where r_i is the investment that reduces the contribution cost relative to some initial level, characterized by k_i^0. Let the investment cost be $fr_i^2/2$, as in Section 5.2. Then, the social value of a marginally larger r_i is na, because the contribution level will increase by one unit, the benefit will be a for every country, and there are n countries in the world. This implies that the socially optimal investment level is $r_i^{FB} = na/f$. For the coalition, the margial value of a larger r_i is ma. For country i, the value is simply a, so i's government prefers to set policies inducing $r_i^{BAU} = a/f$, which is much smaller than the socially optimal level, r_i^{FB}.

If, in contrast, the countries had already negotiated contribution x_i, before i invested in the reduction of k_i, then the other countries would not be influenced by i's level of investment. Therefore, i would make the socially optimal decision when deciding on how much to invest in order to reduce k_i.

The under-investment problem that arises when the smaller k_i leads to a larger equilibrium x_i is related to the so-called hold-up problem in economics. When the hold-up problem is expected, investments fall. To avoid the hold-up problem, and motivate larger investments, it would help with a long-term agreement that pinned down x_i before i invests.

The hold-up problem has been extensively discussed in the international trade literature. For example, McLaren (1997) focused on how a small country may be subject to the hold-up problem when liberalizing trade with a large country. McLaren (2002) predicted that the hold-up problem can prevent global free trade from being agreed upon. More

recently, Celik et al. (2020) argued that the hold-up problem can arise at the ratification stage: Before a trade agreement is ratified, countries may invest to be able to export more to the new trading partner. After the investments are sunk, it might be tempting for the trading partner to renege on the agreement, and to require larger concessions by the country that has invested. Anticipating this, countries will be discouraged from investing. To avoid the hold-up problem, and motivate larger investments, it would help with a commitment to not renege on the treaty. Granting fast-track authority can allow for such a commitment. With the fast-track procedure, the negotiated agreement is either accepted or rejected. Consequently, the U.S. Congress cannot adjust the requirements depending on how much the new trading partner has invested, for example.

Because both the investment and the delegation decision influence k_i^d, or the delegate's project value v_i^d, the model with investments is analogous to the model with strategic delegation: If side payments are used, or the policy can be differentiated, then both decisions will be made with an eye to how one's bargaining power will be influenced. If the unanimity requirement is relaxed and replaced with a majority requirement, then countries will take actions that raise one's chance of being included in the majority coalition, especially if the minority is poorly protected because T is large or m is small. This action will require the country to invest in the public project, or the capacity to provide the necessary public good. The incentive to invest will depend on the majority requirement, m, just like the incentive to delegate strategically was depending on m.

Harstad (2005) studies how m influences the incentive to invest in collective projects, and thus how m should be adjusted so that the incentives are just right: If m is too high, the hold-up problem arises. If m is too low, it is so important to become a member of the majority coalition that countries might end up investing more than what is socially optimal.

My companion chapter (Harstad, 2024) discusses the hold-up problem in depth and how it can be addressed by long-term contracts, endogenous durations of the contract, or renegotiation design.

10. GLOBALIZATION AND DEMOCRATIZATION

Democratic forces and international cooperation tend to strengthen one another. Because of this complementarity, it is possible to get stuck in an equilibrium outcome with fewer democracies and less cooperation than what may be possible in other equilibria. Future research will be necessary to shed light on how it can be possible to move from the current situation to an equilibrium outcome that is more attractive in both respects.

It is not necessarily true, however, that democratic countries will provide more global public goods in the business-as-usual scenario. On the contrary: There are several reasons

for why democratic forces can limit the possibility to conserve forests or reduce greenhouse gas emissions, for example. Above, we showed that when interest groups have power, or policymakers rotate being in office, the contribution levels can fall. As written by Clulow (2019, p. 244): "On the one hand, by increasing the value placed on quality of life, creating more opportunity for environmental actors to influence policymaking and holding elected politicians accountable, an increase in democratic institution and process should promote emissions reduction. On the other hand, the desire to safeguard individual freedom presumably brings with it an aversion to intervene in lifestyle and market decisions, thereby raising the risk of climate inaction." Relatedly, von Stein (2022, p. 339) shows that "the relationship between civil liberties protections and environmentalism depends on which actors within society hold power", and, "political constraints make environmental policy change – be it environmentally friendly or damaging – more difficult".

There are reasons to believe, however, that democratic countries are more likely to participate in international cooperation. On the one hand, democratic countries can face status-quo biases (Section 3), opposition from lobby groups (Section 5), time inconsistency problems (Section 6), and be vulnerable to electoral cycles (Section 7.1). On the other hand, Section 3 showed that checks-and-balances can make promises credible, and thus international negotiations can be worthwhile to pursue. Relatedly, Section 4 showed that strategic delegation or elections can make compliance credible. Democratic leaders are also more likely to sign international treaties because they may need to commit in the presence of lobby groups (Section 5), the possibility that they loser power (Section 6), and to influence the outcome of the next election (Section 7).

The empirical evidence seems to support this latter list of forces. For trade agreements, Mansfield and Milner (2012) explain why democracies are more likely to sign agreements than are nondemocratic regimes, but they also find that with a larger number of interest groups that have the power to block new policies, the likelihood of a new trade agreement to be approved is reduced. In Mansfield et al. (2002), the probability of a trade agreement being signed by two countries increases as either country becomes more democratic. Empirically, Table 1 in Battaglini and Harstad (2020), which draws on the data available in the previous literature, shows that democratic regimes are more prone to signing international agreements, even when other relevant characteristics are controlled for.

The converse is also empirically supported: International cooperation seems to contribute to the consolidation of democracies. The reasons include that cooperation are both increasing the cost of international conflict, and they are reducing the benefit of seizing power domestically. Pevehouse (2002) documented that membership in regional international organizations is correlated with the transitions to democracy over the pe-

riod 1950-1992. Keohane et al. (2009) has explained how multilateral institutions can contribute to better functioning democracies by, for example, restricting the influence of special interests and raising the quality of democratic deliberation. Fang (2008) finds that international institutions can provide information and thus help voters to hold their leaders accountable and select the right type of policymakers.

Furthermore, the cost of international conflicts, including war with other countries, is larger if the gains from continued cooperation will be threatened by the conflict. When wars are less attractive, the need for authoritarian regimes are reduced.

The benefit of coups and the seizure of domestic power is reduced also if international agreements limit how much discretion domestic rulers will have. For example, international agreements that require contributions to public goods, such as the conservation of natural resources, limit the possibility to extract revenues by exploiting the country's natural resources. From the literature on resource curses, we know that if it is possible to extract valuable resources in the short term, then the incentives to fight and seize power will be strengthened (van der Ploeg, 2011). Conversely, if an economy is not, mainly, built on the exploitation of natural resources, it is more important to incentivize firms to invest in infrastructure and individuals to invest in human capital. Due to hold-up problems, these investments will not materialize if rulers can, ex post, expropriate the value of the investments. To incentivize these investments, it can thus be necessary to make a commitment to not expropriate the values ex post. Democratization can facilitate such a commitment, and thus be necessary when it is important to incentivize private investments (Acemoglu and Robinson, 2000; Acemoglu et al., 2005), as when the usage of natural resources is regulated by treaties.

When democratization facilitate international cooperation, and cooperation can strengthen democratic forces, then there can be multiple equilibrium outcomes for the society. One possible outcome is that most countries are democratic and engaged in deep cooperation. Another possibility is that many countries are nondemocratic and the level of international cooperation is weaker.

As of 2024, we cannot claim that we have ended up in the best equilibrium outcome. There ought to exist a better outcome with both more widespread democratic institutions and international cooperation on global public goods, where the two parts are reinforcing and supporting one another.

Moving from one equilibrium to another is not an easy task. By the definition of an equilibrium, every institutional choice might be a best response to the others. Ideally, for a change to occur, several decisions, institutions, and expectations need to change all at the same time. Alternatively, some choices must be made that are costly, and not best responses to the others, under the hope that other decisions will be updated over time so

that one arrives at a new equilibrium outcome.

Citizens in individual non-democratic countries cannot be expected to bear this burden, however. It is reasonable that they will take the level of international cooperation as given, and not something that they can influence by protesting against the current regime.

Instead, a more realistic path towards a better equilibrium outcome is that existing democratic countries work towards deepening global cooperation, strengthening international institutions, and enlarging the coalitions. If democratic countries are pushing further in this direction, it might be possible to induce stakeholders and groups in non-democratic countries to work towards democratization. When successful, these changes can contribute to a development towards global cooperation. Eventually, the changes can consolidate a new equilibrium outcome that is more attractive when it comes to democratization as well as global cooperation.

Future research should explore how it may be possible to strengthen global cooperation in an imperfect world – perhaps by trading off the need for efficient outcomes today with the importance of motivating institutional change, especially democratization. On the theoretical side, such an exploration will require scholars to combine insights from economics, political science, and dynamic and evolutionary game theory. On the empirical side, more research will be necessary to uncover the important institutional details that are especially crucial for a successful transition to a new global democratic equilibrium.

References

Acemoglu, Daron (2003): "Why not a political Coase theorem? Social conflict, commitment, and politics", Journal of Comparative Economics 31(4), 620-652.

Acemoglu, Daron, and Robinson, James. (2000): "Why Did the West Extend the Franchise? Democracy, Inequality and Growth in Historical Perspective." Quarterly Journal of Economics, CXV, (2000), pp. 1167-1199.

Acemoglu, Daron; Johnson, Simon, and Robinson, James A. (2005): "Institutions as Fundamental Causes of Long-Run Growth" in Anghion, P. and S. Durlauf (eds.), Handbook of Economic Growth, Vol. 1A, Amsterdam, NL: Elsevier, North-Holland.

Aghion, Philippe, and Bolton, Patrick (1990): "Government Domestic Debt and the Risk of Default: A Political-Economic Model of the Strategic Role of Debt." in Dornbusch and Draghi (eds.), 2011: Public Debt Management: Theory and History, Cambridge University Press. 315-345

Aghion, Philippe, and Bolton, Patrick. 2003 "Incomplete Social Contracts." Journal of the European Economic Association, 1 (2003).

Aidt, Toke S., and Hwang, Uk (2008): "On the Internalization of Cross-National Externalities through Political Markets: The Case of Labour Standards", Journal of Institutional and Theoretical Economics 164(3), 509-533.

Aidt, Toke S., and Hwang, Uk (2014): "To Ban or Not to Ban: Foreign Lobbying and Cross-National Externalities", The Canadian Journal of Economics 47(1), 272-297.

Aidt, Toke S.; Albornoz, Facundo, and Hauk, Esther (2021): "Foreign Influence and Domestic Policy", Journal of Economic Literature 59(2), 426-487.

Aklin, Michaël, and Urpelainen, Johannes (2013): "Political Competition, Path Dependence, and the Strategy of Sustainable Energy Transitions", American Journal of Political Science 57(3), 643–658.

Alesina, Alberto (1987): "Macroeconomic Policy in a Two-Party System as a Repeated Game", The Quarterly Journal of Economics 102(3), 651-678.

Alesina, Alberto, and Spolaore, Enrico (2005): The Size of Nations, The MIT Press.

Alesina, Alberto; Angeloni, Ignazio, and Etro, Federico (2005): "International Unions", The American Economic Review 95(3), 602-615.

Antràs, Pol, and Padró I Miquel, Gerard (2011): "Foreign influence and welfare," Journal of International Economics 84(2): 135-148.

Austen-Smith, David, and Banks, Jeffrey. 1988 "Elections, Coalitions, and Legislative Outcomes", American Political Science Review 82 (2): 405-22.

Austen-Smith, David; Dziuda, Wioletta; Harstad, Bård, and Loeper, Antoine (2019): "Gridlock and inefficient policy instruments", Theoretical Economics 14, 1483-1534.

Baccini, Leonardo, and Urpelainen, Johannes (2014): "International Institutions and Domestic Politics: Can Preferential Trading Agreements Help Leaders Promote Economic Reform?", The Journal of Politics 76(1), 195-214.

Balboni, Clare; Burgess, Robin; Heil, Anton; Old, Jonathan, and Olken, Benjamin A. (2021): "Cycles of Fire? Politics and Forest Burning in Indonesia", AEA Papers and Proceedings 111, 415-19.

Barbera, Salvador, and Jackson, Matthew O. 2006 "On the Weights of Nations: Assigning Voting Weights in a Heterogeneous Union", Journal of Political Economy 114 (2): 317-339.

Baron, David, and Diermerier, Daniel. (2001): "Elections, Governments, And Parliaments In Proportional Representation Systems", Quarterly Journal of Economics 116 (3): 933-967.

Barrett, Scott (1994): "Self-Enforcing International Environmental Agreements" Oxford Economic Papers 46, 878-894.

Battaglini, Marco, and Palfrey, Thomas R. (2024): "Organizing for Collective Action: Olson Revisited" Journal of Political Economy 132(9), 2881-2936.

Battaglini, Marco, and Harstad, Bård (2019): "The political economy of weak treaties," Journal of Political Economy 128(2): 544–90.

Besley, Tim, and Coate, Stephen. (2003): "Centralizies versus Decentralized Provision of Local Public Goods: A Political Economy Approach", Journal of Public Economics 87 (2003): 2611-37.

Besley, Timothy Persson, Torsten (2023): "The Political Economics of Green Transitions", The Quarterly Journal of Economics 138(3), 1863–1906.

Besley, Timothy, and Coate, Stephen (1998): "Sources of Inefficiency in a Representative Democracy: A Dynamic Analysis" The American Economic Review 88(1), 139-156.

Biais, Bruno, and Perotti, Enrico. (2002): "Machiavellian Privatization." American Economic Review 92 (1) (March): 240-58.

Binmore, K. G., and Dasgupta, Partha (1987): The Economics of Bargaining, Basil Blackwell, Oxford, UK

Buchanan, James M Tullock, Gordon 1962 The calculus of consent, ch 5 and 6

Buchholz, Wolfgang, Haupt, Alexander, and Peters, Wolfgang. (2005): "International Environmental Agreements and Strategic Voting," Scandinavian Journal of Economics 107 (1): 175-95.

Buchholz, Wolfgang, and Sandler, Todd (2021): Global Public Goods: A Survey Journal of Economic Literature 59(2), 488-545.

Buisseret, Peter, and Bernhardt, Dan (2018): "Reelection and Renegotiation: International Agreements in the Shadow of the Polls", American Political Science Review 112(4), 1016–1035.

Caparrós, Alejandro (2016): "Bargaining and International Environmental Agreements", Environmental and Resource Economics 65, 5-31.

Cardona, Daniel, and Ponsatí, Clara (2015): "Representing a democratic constituency in negotiations: delegation versus ratification", Social Choice and Welfare 45, 399-414.

Carraro, Carlo and Siniscalco, Domenico (1993): "Strategies for the international protection of the environment," Journal of Public Economics 52 (3): 309-28.

Cazals, Antoine, and Sauquet, Alexandre (2015): "How do elections affect international cooperation? Evidence from environmental treaty participation", Public Choice 162, 263-285.

Celick, Levent; Karabay, Bilgehan, and McLaren, John (2020): "Fast-track authority: A hold-up interpretation", Journal of International Economics 127, 103392.

Cesar, Herman, and de Zeeuw, Aart (1996): "Issue Linkage in Global Environmental Problems", in Xepapadeas (ed.), 1996, Economic Policy for the Environment and Natural Resources, Edward Elgar Publishing.

Chari, V. V., Jones, Larry E., and Marimon, Ramon 1997 "The Economics of Split-Ticket Voting in Representative Democracies", The American Economic Review 87(5), 957-976.

Clulow, Zeynep (2019): "Democracy, electoral systems and emissions: explaining when and why democratization promotes mitigation", Climate Policy 19(2), 244-257.

Coase, Ronald H. (1960): "The Problem of Social Cost," Journal of Law and Economics 3: 1-44.

Conconi, Paola (2003): "Green lobbies and transboundary pollution in large open economies", Journal of International Economics 59(2), 399-422.

Conconi, Paola, and Sahuguet, Nicolas (2009): "Policymakers' horizon and the sustainability of international cooperation", Journal of Public Economics 93, 549-558.

Conconi, Paola; Facchini, Giovanni, and Zanardi, Maurizio (2012): "Fast-Track Authority and International Trade Negotiations", American Economic Journal: Economic Policy 4(3), 146-189.

d'Aspremont, Claude; Jacquemin, Alexis; Gabszewicz, Jean, and Weymark, John (1983): "On the Stability of Collusive Price Leadership" Canadian Journal of Economics 16 (1), 17-25.

Dutta, Prajit K. and Radner, Roy (2004): "Self-enforcing climate-change treaties," "Proc. Nat. Acad. Sci. U.S.," 101 (2004), 4746-4751.

Dziuda, Wioletta, and Loeper, Antoine (2016): "Dynamic Collective Choice with Endogenous Status Quo", Journal of Political Economy 124(4), 1148–1186.

Egorov, Georgy, and Sonin, Konstantin (2024): "The Political Economics of Non-democracy", Journal of Economic Literature 62(2), 594-636.

Fang, Songyin (2008): "The Informational Role of International Institutions and Domestic Politics", American Journal of Political Science 52(2), 304–321.

Ferejohn, John, Fiorina, Morris, and McKelvey, Richard D. 1987 "Sophisticated Voting and Agenda Independence in the Distributive Politics Setting", American Journal of Political Science 31: 169-93.

Finus, Michael and Maus, Stefan (2008): "Modesty May Pay!" JPET 10(5): 801-26.

Gawande, Kishore; Krishna, Pravin, and Robbins, Michael J. (2006): "Foreign Lobbies and U.S. Trade Policy", The Review of Economics and Statistics 88(3), 563-571.

Grossman, Gene M. and Helpman, Elhanan. (1994): "Protection for Sale," The American Economic Review 84 (4): 833-50.

Haller, Hans, and Holden, Steinar (1997): "Ratification Requirement and Bargaining Power", International Economic Review 38 (4): 825-51.

Harstad, Bård (2005): "Majority rules and incentives", The Quarterly Journal of Economics 120(4), 1535-1568.

Harstad, Bård (2007): "Harmonization and Side Payments in Political Cooperation", The American Economic Review 97(3), 871-889.

Harstad, Bård (2008): "Do Side Payments Help? Collective Decisions and Strategic Delegation", Journal of the European Economic Association 6(2/3), 468-477.

Harstad, Bård (2010): "Strategic delegation and voting rules", Journal of Public Economics 94, 102-113.

Harstad, Bård (2016): "The market for conservation and other hostages," Journal of Economic Theory 166: 124-51.

Harstad, Bård (2020): "Technology and time inconsistency," Journal of Political Economy 128(7): 2653-89.
Harstad, Bård (2023): "The Conservation Multiplier", Journal of Political Economy 131(7), 1731-1771.
Harstad, Bård (2024): "On International Cooperation", The Handbook of Climate Change. Forthcoming.
Harstad, Bård, and Kessler, Anke (2024): "Present Bias in Politics and Self-Committing Treaties", NBER WP 32780
Harstad, Bård, and Mideksa, Torben (2024): "The Journal of Law, Economics, and Organization", The Journal of Law, Economics, and Organization 40(1), 1-33.
Hefeker, Carsten, and Michael Neugart (2023): "Political polarization and international cooperation", European Journal of Political Economy 78, 102401.
Hoel, Michael (1992): "International environment conventions: The case of uniform reductions of emissions," Environmental and Resource Economics 2 (2): 141-59.
Jones, Stephen R. G. (1989): "Have your lawyer call my lawyer: Bilateral delegation in bargaining situations", Journal of Economic Behavior & Organization 11 (2): 159-74.
Karp, Larry S. (2005): "Warming and Hyperbolic Discounting." Journal of Public Economics 89: 261 - 282.
Karp, Larry, and Simon, Leo (2013): "Participation games and international environmental agreements: A non-parametric model" Journal of Environmental Economics and Management 65 (2), 326-344.
Keefer, Philip, and Stasavage, David (2003): "The Limits of Delegation: Veto Players, Central Bank Independence, and the Credibility of Monetary Policy", The American Political Science Review 97(3), 407-423.
Keohane, Robert O.; Macedo, Stephen, and Moravcsik, Andrew (2009): "Democracy-Enhancing Multilateralism", International Organization 63(1), 1-31.
Kleine, Mareike, and Minaudier, Clement (2017): "Negotiating under Political Uncertainty: National Elections and the Dynamics of International Co-operation", British Journal of Political Science 49(1), 315-337.
Klomp, Jeroen, and de Haan, Jakob (2016): "Election cycles in natural resource rents: Empirical evidence," Journal of Development Economics 121: 79-93.
Köke, Sonja, and Lange, Andreas (2017): "Negotiating environmental agreements under ratification constraints", Journal of Environmental Economics and Management 83, 90–106.
Loeper, Antoine (2017): "Cross-border externalities and cooperation among representative democracies", European Economic Review 91, 190–208.
Lohmann, Susanne (2013): "A Signaling Model of Informative and Manipulative Political Action", American Political Science Review 87(2), 319-333.
Maggi, Giovanni (2016): "Issue linkage," in K. Bagwell and R. Staiger (Eds.), Handbook of commercial policy Vol. 1, pp. 513-64.
Maggi, Giovanni, and Rodriguez-Clare, Andres (1998): "The value of trade agreements in the presence of political pressures," Journal of Political Economy 106(3): 574-601.
Mailath, George J., and Samuelson, Larry (2006): "Repeated games and reputations: long-run relationships," Oxford University Press
Mansfield, Edward D., and Milner, Helen V. (2012): Votes, Vetoes, and the Political Economy of International Trade Agreements Princeton University Press, Princeton,

US.
Mansfield, Edward D.; Milner, Helen V., and Rosendorff, B. Peter (2002): "Why Democracies Cooperate More: Electoral Control and International Trade Agreements," International Organization, Vol. 56, No. 3: 477-513.
Marchiori, Carmen; Dietz, Simon, and Tavoni, Alessandro (2017): "Domestic politics and the formation of international environmental agreements", Journal of Environmental Economics and Management 81, 115–131.
May, Kenneth (1952): "A Set of Independent, Necessary and Sufficient Conditions for Simple Majority Decisions." Econometrica 20, (1952), pp. 680-684.
McLaren, John (2002): "A Theory of Insidious Regionalism", The Quarterly Journal of Economics 117(2), 571-608.
McLaren, John. 1997 "Size, Sunk Costs, and Judge Bowker's Objection to Free Trade." American Economic Review, Vol. 87, No. 3. (June 1997), pp. 400-420.
Meng, Kyle C., and Rode, Ashwin (2019): "The social cost of lobbying over climate policy", Nature Climate Change 9, 472-476.
Morgan, T. Clifton Syropoulos, Constantinos, and Yotov, Yoto V. (2023): "Economic Sanctions: Evolution, Consequences, and Challenges", Journal of Economic Perspectives 37(1), 3-30.
Nash, John (1953): "Two-Person Cooperative Games", Econometrica 21(1), 128-140.
Nordhaus, William D. (1975): "The Political Business Cycle", The Review of Economic Studies 42(2), 169-190.
Nugent, Neill (2003): The Government and Politics of the European Union, MacMillan Press.
Oates, Wallace E. (1972): Fiscal Federalism, Harcourt Brace Jovanovich.
Oates, Wallace E., and Portney, Paul R. (2003): "Chapter 8 - The Political Economy of Environmental Policy", Handbook of Environmental Economics 1, 325-354.
Olson, Mancur (1965): The Logic of Collective Action: Public Goods and Theory of Groups. Harvard University Press (1965).
Pailler, Sharon (2018): "Re-Election Incentives and Deforestation Cycles in the Brazilian Amazon," Journal of Environmental Economics and Management 88: 345-65.
Palfrey, Thomas R., and Rosenthal, Howard (1984): "Participation and the provision of discrete public goods: a strategic analysis," Journal of Public Economics 24 (2): 171-93.
Persson, Torsten and Tabellini, Guido (1992): "The politics of 1992: Fiscal policy and european integration", RES 59, 689-701
Persson, Torsten, and Svensson, Lars E. O. (1989): "Why a Stubborn Conservative would Run a Deficit: Policy with Time- Inconsistent Preferences", The Quarterly Journal of Economics 104(2), 325-345.
Pevehouse, Jon C. (2002): "Democracy from the Outside-In? International Organizations and Democratization", International Organization 56(3), 515-549.
Putnam, Robert D. (1988): "Diplomacy and domestic politics: the logic of two-level games", International Organization 42(3), 427–460.
Redoano, M., and Scharf, K. A. (2004): "The Political Economy of Policy Centralization: Direct versus Representative Democracy", Journal of Public Economics 88 (2004): 799-817.

Robinson, James A. Torvik, Ragnar (2005): "White elephants", Journal of Public Economics 89(2-3), 197-210.
Rodrik, Dani (2017): Straight Talk on Trade, Princeton University Press, Princeton, US
Rogoff, Kenneth (1985): "The Optimal Degree of Commitment to an Intermediate Monetary Target", The Quarterly Journal of Economics 100(4), 1169-1189.
Rogoff, Kenneth (1990): "Equilibrium Political Budget Cycles", The American Economic Review 80(1), 21-36.
Rubinstein, Ariel (1982): "Perfect Equilibrium in a Bargaining Model", Econometrica 50(1), 97-109.
Schelling, Thomas. (1956): "An Essary on Bargaining", American Economic Review 46 (??) (1956) (3): 281-306.
Schulze, Kai (2021): "Policy Characteristics, Electoral Cycles, and the Partisan Politics of Climate Change", Global Environmental Politics 21(2), 44-72.
Spycher, Sarah, and Ralph Winkler (2022): "Strategic delegation in the formation of modest international environmental agreements", European Economic Review 141, 103963.
Tabellini, Guido (1990): "Domestic politics and the international coordination of fiscal policies", Journal of International Economics 28(3-4), 245-265.
Tavoni, Alessandro, and Winkler, Ralph (2021): "Domestic Pressure and International Climate Cooperation", Annual Review of Resource Economics 13, 225–243.
Tsebelis, George (1995): "Decision Making in Political Systems: Veto Players in Presidentialism, Parliamentarism, Multicameralism and Multipartyism", British Journal of Political Science 25(3), 289-325.
Van der Ploeg, Frederick (2011): "Natural resources: curse or blessing?" Journal of Economic Literature 49(2): 366-420.
von Stein, Jana (2020): "Democracy, Autocracy, and Everything in Between: How Domestic Institutions Affect Environmental Protection", British Journal of Political Science 52(1), 339–357.
Wangler, Leo; Altamirano-Cabrera, Juan-Carlos, and Weikard, Hans-Peter (2012): "The political economy of international environmental agreements: a survey", International Environmental Agreements: Politics, Law and Economics 13, 387-403.
Wicksell, Knut (1896): "A New Principle of Just Taxation." Translated by James M. Buchanan and reprinted in Classics in the Theory of Public Finance, edited by Richard A. Musgrave and Alan T. Peacock, MacMillan (1967), pp. 72-118. Also reprinted in Public Choice and Constitutional Economics, edited by James D. Gwartney and Richard E. Wagner, Jai Press (1988), pp. 117-131.
Wrede, Matthias (2006): "Uniformity Requirement and Political Accountability" Journal of Economics 89(2), 95-113.