Issue Linkage*

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Abstract

What are the potential benefits and costs of issue linkage in international cooperation? How can we interpret the patterns of issue linkage (or lack thereof) that we observe in the real world? I address these questions through a unifying framework that distinguishes between thee types of linkage: *enforcement* linkage, *negotiation* linkage and *participation* linkage. I argue that it is important to distinguish between these three notions, because the nature of the linkage and of the associated gains and losses are different in the three cases. I will pay particular attention to linkages between trade policy and non-economic policies (such as security, human rights and environmental policies). My framework aims at bringing together and organizing a number of insights from a very fragmented literature, as well as suggesting potential new insights and avenues for future research.

1 Introduction

The main focus of this chapter is the theory of issue linkage in international agreements. The central question I will focus on is: What are the benefits and costs of issue linkage for the various countries involved? The ultimate objective is to gain a better understanding of the patterns of issue linkage (or lack thereof) that we observe across different policy areas and across international institutions.

It is important to define what I mean by "issue linkage". This is an umbrella notion that includes several types of linkage, as will be clear in a moment, but when I say that issue areas A and B are linked, I mean that international agreements in policy areas A and B are connected at some level. More concretely, I will consider three types of linkage: *enforcement* linkage, *negotiation*

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linkage and *participation* linkage. Put simply, there is "enforcement linkage" if a violation of an agreement in area A is punished with sanctions (also) in area B; there is "negotiation linkage" if agreements in areas A and B are negotiated jointly (i.e. in the context of a single bargain), as opposed to separate bargains; and there is "participation linkage" if the threat of sanctions in area A is used to encourage participation in an international agreement in area B.[1]

While many of the ideas in this chapter apply to any issue areas, I will pay particular attention to linkages between trade policy and non-economic policies. Analyzing this type of linkage requires crossing inter-disciplinary boundaries between economics, politics and international law, which I believe is a fascinating and important challenge. Of course the boundary between "economic" and "non-economic" policies is blurred, since virtually any policy has economic relevance. The main examples of "non-economic" policy areas I will consider are the areas of security, human rights and the environment. A common feature of these policies is that they generate significant non-pecuniary international externalities, such as trans-boundary pollution externalities, security externalities, and psychological/moral externalities in the human-rights area.[2] Questions of issue linkage between trade policies and non-economic policies are particularly intriguing precisely because these policy areas are not intimately connected, as compared for example with the connection between trade policy and domestic taxes/subsidies or intellectual property right (IPR) policies. It is important to note that Chapters 12 and 14 of this Handbook focus respectively on domestic taxes/subsidies and IPR policies in relationship with trade policy.

Regarding trade policy, I will focus on scenarios where trade agreements are motivated by the presence of international externalities from trade policy (including, but not limited to, terms-of-trade externalities). An interesting question that will remain open is to what extent the insights developed for this kind of scenario may apply also if trade agreements are motivated by domestic-commitment problems;[3] to my knowledge, this question has not been addressed at all in the literature.

As I mentioned above, a key organizing principle of this chapter is the distinction between enforcement linkage, negotiation linkage and participation linkage. The existing discussions of issue linkage in the literature typically do not make this three-way distinction.[4] I will argue that it is important to distinguish be-

[1] Note that my definition of issue linkage does not include what I will refer to as "interdependencies" between policy areas, for example the impacts of a change in trade taxes on the state of the environment or on the costs and benefits of environmental taxes. But of course these interdependencies can affect the costs and benefits of linking agreements across policy areas, as I will discuss throughout the chapter.

[2] Even if the main international externalities from these policies are non-pecuniary, often they also generate significant pecuniary externalities, to the extent that they have significant impact on prices. My discussion will not assume away pecuniary externalities, it will only assume that there exist significant non-pecuniary externalities.

[3] See for example Maggi (2014) for a discussion of the domestic-commitment theory of trade agreements.

[4] For example, Ederington (2009) surveys the literature on linkage between trade and environmental agreements, but only distinguishes between linkage in negotiation and linkage in enforcement.

tween these three modes of linkage, because the nature of the linkage as well as the associated gains and losses are different in the three cases.

I will present a unifying framework within which the three modes of issue linkage described above can be formalized and analyzed. The main objective of the analysis will be to shed light on the potential benefits and costs of each mode of linkage for the various countries involved, and how they compare and interact with each other. I believe that the framework presented in this chapter can be useful in bringing together and organizing a number of insights from the existing literature on issue linkage, which is surprisingly fragmented.

As I will argue in the next section, in the real world of international agreements non-linkage is much more prevalent than linkage. This is at odds with the formal theoretical literature, which emphasizes the potential gains from linkage more than its potential losses. This raises the possibility that there might be drawbacks of issue linkage that are not captured by the existing formal models. Motivated by this observation, after the formal analysis I will discuss briefly some arguments against issue linkage that have been articulated informally by scholars, especially in disciplines outside economics.

For reasons that I will discuss below, the empirical literature on issue linkage is considerably less developed than the corresponding theoretical literature. It is therefore natural for the purposes of this chapter to focus mostly on the theoretical aspects of issue linkage, but I will nevertheless offer a brief critical survey of the existing empirical literature in this area.

Finally, even though my main focus is issue linkage in the context of international agreements (or "cooperative" issue linkage), at the end of the chapter I will briefly discuss the topic of non-cooperative (or "coercive") issue linkage, meaning the use of trade sanctions to induce policy changes in another country. In particular, I will discuss how the notion of coercive issue linkage relates to the notion of cooperative issue linkage.

The chapter is structured as follows. Section 2 discusses some patterns of issue linkage that we observe in real-world international agreements. Section 3 presents a unifying theoretical framework that formalizes the different forms of linkage and their implications. Section 4 examines the potential gains and losses from enforcement linkage. In section 5, I turn my attention to negotiation linkage. Section 6 focuses on the implications of participation linkage. In Section 7, I pause to summarize the main insights of the formal theoretical analysis. Section 8 discusses some informal arguments that have been proposed to explain the relative infrequence of issue linkage, based on the presence of transaction costs. Section 9 surveys the empirical literature on issue linkage. Section 10 focuses on non-cooperative issue linkage. Section 11 concludes.

2 Where do we see issue linkage in reality?

Examples of issue linkage in real-world international agreements are not hard to find. In this section I will mention some examples of linkages between trade and non-trade issues, and discuss some empirical regularities suggested by casual

observations.

Before proceeding, however, it is important to note that identifying issue linkage empirically is not always straightforward. First, there may be issue linkage even if this is not made explicit in a written agreement, for two reasons: (i) Sometimes issue linkage is informal, rather than being formally incorporated in written agreements. For example, trade sanctions are often used in response to violations of security agreements, even though this kind of punishment is not specified explicitly in the agreements (think about the trade sanctions imposed by various countries on Russia for the annexation of Crimea: the Helsinki Accords of 1975 that Russia violated do not mention explicitly the use of trade sanctions). (ii) If there is issue linkage at the level of negotiations, this need not produce an integrated agreement. For example, suppose a trade agreement and a security agreement are the result of linkage in negotiations, whereby governments exchange concessions across the two issue areas: still, the two contracts may be separate, and there may be no formal interaction between the trade policy commitments and the security commitments. Moreover, the reverse observation also applies: if an agreement mentions policies in different issue areas, this does not mean necessarily that there is issue linkage. Suppose for example that governments sign a trade agreement but do not cooperate on environmental policy; if there are structural interactions between trade and the environment it may be a good idea to make trade policy commitments contingent on environmental circumstances, but this does not mean that there is issue linkage.

While identifying linkage empirically may be difficult, there are many examples suggesting that linkages between trade and non-trade policies do occur in reality. In what follows I list some of these examples.

Examples of linkage between trade and human-rights agreements are surprisingly many. Following are a few, borrowed from Charnovitz (1998) and Hafner-Burton (2005): (i) the 1825 Amity, Commerce and Navigation Treaty between UK and Argentina provided that Argentina suppress slave trade; (ii) the 1894 Commerce and Navigation Treaty between UK and Japan required each country to grant the other country's citizens freedom of worship; (iii) the Commercial Agreement of 1921 between the Czech Republic and Austria required that each country assure that workers from the other country would enjoy equivalent treatment with respect to worker rights; (iv) the ITO Charter of 1948 contained several provisions about non-trade issues, including on worker rights and on cooperation with the IMF (although of course the ITO never saw the light of day). (v) The Common Market for Eastern and Southern Africa (COMESA) Treaty articulates the "recognition, promotion and protection of human and people's rights in accordance with the provisions of the African Charter on Human and Peoples' Rights..." (vi) The Lomé Agreement and its successor, the Cotonou Agreement (which are preferential trade agreements between Europe and a number of ex-colonies) commit member countries "to promote and protect all fundamental freedoms and human rights, be they civil and political, or economic, social and cultural". Beyond the specific examples above, Hafner-Burton (2005) shows that, as of 2002, about 70 preferential trade agreements

contain human-rights clauses of some kind.[5]

Examples of linkage between trade and environmental policies are relatively rare: (i) The Free Trade and Economic Integration treaty between Guatemala and Honduras of 1956 directed both governments to "co-ordinate their activities with a view to protecting forest reserves and water resources and preventing forest fires and soil erosion in the frontier regions of their respective territories." (ii) The International Whaling Commission (IWC, 1978) directs member countries to prevent the export of ships and gear used for whaling to non-signatory countries (e.g. Japan); (iii) the Montreal Protocol on Substances that Deplete the Ozone Layer (1987) encourages members to restrict imports of products with adverse effects on the ozone layer from nonmembers.

Examples of linkage between trade and security policies are plentiful. This type of linkage has been studied empirically for example by Long and Leeds (2006) and Poast (2012, 2013). Following are some examples: (i) The 1913 Treaty of Alliance between Greece and Serbia states that "Greece shall grant all the necessary facilities and guarantee for a period of fifty years the complete freedom of the export and import trade of Serbia through the port of Salonika and the railway lines from Salonika to Uskup and Monastir". (ii) In their 1863 alliance agreement, Peru and Bolivia "agree to give the most ample freedom for the reciprocal commerce of both countries, and to establish full exemption from duties on the national products of both"; (iii) The 1921 alliance between France and Poland specifies that it does not become effective until a commercial agreement is in force. (iv) The 1934 treaty signed by Austria, Hungary, and Italy specifies that bilateral trade agreements must be concluded within two months; (v) The 1946 mutual defense pact between the United Kingdom and Jordan proclaims that "Neither High Contracting Party will extend to the nationals or commerce of the other treatment less favorable in any respect than that which he accords to the nationals and commerce of the most favoured foreign country;" (vi) Recent examples of trade sanctions imposed for violations of security agreements include the sanctions on Iraq for violating the territorial integrity of Kuwait, those on Iran for violating UN Security Council resolutions, and those on Russia for violating the territorial integrity of Ukraine (which is a violation of the Helsinki Accords). Beyond the specific examples above, Poast (2013) shows that of the 648 security alliances in his dataset, 56 include explicit trade concessions, such as the granting of MFN status.[6]

There are also numerous examples of non-cooperative linkage, and in particular "coercive" trade sanctions aimed at influencing other countries' non-economic policies or political regimes. The U.S. embargo on Cuba is a clear example of this kind of sanctions. Many other examples can be found in the book by Hufbauer, Schott and Elliott (1999).

Finally, there is also a clear example of linkage within the World Trade

[5] Some partial linkage between trade and human rights is present also in the GATT: in particular, Article XX allows a country to raise tariffs above the negotiated levels on products that are produced with prison labor.

[6] I will also mention the paper by Davis (2009), which examines linkages between trade concessions and security concessions in the context of the Anglo-Japanese Alliance of 1902-23.

Organization (WTO): while the main focus of the WTO is trade policy and trade-related domestic policies, the WTO also includes commitments on IPR policies, which are spelled out in the Agreement on Trade-Related Aspects of Intellectual Property Rights. Similarly, a number of regional trade agreements, including NAFTA, Mercosur and the recently negotiated Trans-Pacific Partnership, include commitments on IPR policies.

Beyond the specific examples mentioned above, are there empirical regularities in issue linkage? Based on my own casual observations, there seem to be two interesting patterns. First, even though examples of linkage are not hard to find, non-linkage is far more prevalent in reality, especially if compared with the maximum possible degree of linkage, which would be a fully integrated agreement that links trade, security, environment, human rights and more. Indeed, most examples of linkage that we see in reality are cases in which an agreement in policy area A contains a clause regarding policy area B, but we do not see integrated agreements, such as an integrated trade-and-environment agreement.

Second, there are some striking asymmetries in issue linkage at the enforcement level. In particular: (i) Trade sanctions are sometimes used to enforce policies in the security and human-rights areas; but they are rarely used to enforce agreements on environmental policies or in "softer" policy areas (such as animal protection, extradition of criminals, health cooperation).[7] (ii) Military sanctions are virtually never used to enforce agreements outside the security area.[8] Perhaps one aspect of these patterns is that cross-issue punishments seem aimed at making the punishment fit the crime. For example, in the human-rights area the only feasible way to punish a violation is arguably to use policies in different areas, such as trade; on the other hand, trade punishments would exceed the crime for violations in soft policy areas; and military sanctions tend to be very disruptive, so if they were used to punish violations outside the military area (or even mild violations in the security area) they would far exceed the crime.

It is not obvious what can explain these "stylized facts". Along the way I will discuss to what extent existing theories are capable of accounting for these observations.

3 A unifying framework

In this section I will sketch a unifying framework that encompasses the three modes of linkage and can help understand the potential benefits (and costs) of each, as well as how they relate to each other.

In the literature on issue linkage, all the models that I am aware of focus on a single type of linkage and assume a type of game that is suitable to ex-

[7] By "softer" policy area I mean one where, broadly speaking, the costs of a breakdown in cooperation are lower. I also note here that the notion of trade sanctions as punishment is different from the notion of trade restrictions as commitments that are part of an agreement itself, as in the case of agreements that ban production and trade of ivory or whaling.

[8] The only example that comes to mind here is the use of military interventions in response to massive violations of human rights.

amine that particular type of linkage. More specifically, papers that examine enforcement linkage typically focus on repeated games; papers that examine negotiation linkage typically focus on bargaining games; and papers that examine participation linkage typically focus on simple coalition-formation games. A challenge that one faces if one wants to examine all three types of linkage within a unified framework is that one needs to consider a "grand game" that includes participation decisions, bargaining within each agreement, and a repeated-game component to examine enforcement issues. This is the approach I will attempt to take here, although in the simplest possible way.

Consider N governments, indexed by $i = 1, ..., N$. In each period government i has a choice of trade policies, say $\boldsymbol{\tau}^i$ (this might be for example a vector of tariffs) and of policies in some non-trade area, say $\mathbf{x}^i$. The per-period payoff of government i is $U^i(\boldsymbol{\tau}, \mathbf{x})$, where the vectors $\boldsymbol{\tau} \equiv (\boldsymbol{\tau}^1, \boldsymbol{\tau}^2, .., \boldsymbol{\tau}^N)$ and $\mathbf{x} \equiv (\mathbf{x}^1, \mathbf{x}^2, .., \mathbf{x}^N)$ include the trade and non-trade policies of all countries. These payoff functions can be interpreted as including not just welfare considerations, but also possible political-economy considerations; for example they could capture in reduced form the political influence of different interest groups within a country. An interesting question is whether modeling the interaction between a government and domestic lobbies more explicitly through some kind of "two-level game" would generate new insights about issue linkage, but to my knowledge the existing formal literature has not explored this avenue.[9]

Assume that there exists a unique Nash equilibrium of the one-shot game, denoted $(\boldsymbol{\tau}^{NE}, \mathbf{x}^{NE})$.[10] I will use the notation $\boldsymbol{\tau}^{NE}(\mathbf{x})$ to indicate the one-shot Nash equilibrium in trade policies conditional on non-trade policies (assumed to be unique), and similarly for $\mathbf{x}^{NE}(\boldsymbol{\tau})$. All governments have the same discount factor δ.

I will often focus on the special case in which payoffs are separable in trade and non-trade policies, that is: $U^i(\boldsymbol{\tau}, \mathbf{x}) = V^i_\tau(\boldsymbol{\tau}) + V^i_x(\mathbf{x})$. When payoffs are non-separable, I will often say that there are structural "interactions" or "interdependencies" between the policies, not to be confused with the "linkages" that may characterize international negotiations and contracts. I will generally assume that international transfers are not available, but I will point out along the way how the availability of transfers would affect the key arguments.[11]

A key simplifying assumption I will make is that there is only one global agreement in each policy area. This can be interpreted as a multilateral agree-

[9] Partial exceptions are Lohmann (1997) and Davis (2004), who consider the role of domestic interest groups for negotiation linkage. See also Kaempfer and Lowenberg (1988, 2004), who examine the role of domestic politics in the context of coercive trade sanctions.

[10] In a typical tariff game there is not only an interior Nash equilibrium, but also a set of autarky equilibria, but following most of the literature I ignore such equilibria, since (as is well known) they entail weakly dominated strategies.

[11] In reality cash transfers are used rather infrequently in international agreements, but there are important exceptions: first, (conditional) cash transfers to developing countries are a component of the Kyoto Protocol (the so-called "Adaptation Fund"); and second, foreign aid often takes the form of cash transfers (although it has been argued by many that the process of aid allocation generates important inefficiencies). Transfers have also been used in rare occasions for the purposes of trade dispute settlement.

ment, such as the GATT-WTO, the Montreal Protocol, the Chemical Weapons Convention, or the UN Convention against Torture. In principle one should allow for multiple regional agreements, which would call for a more general coalition-formation game. However the literature on issue linkage has typically stayed away from full-blown coalition-formation games;[12] a likely reason for this – aside from the complexities of coalition-formation games – is that questions of *participation* in international agreements and how issue linkage can affect participation decisions have arisen mostly in the debate on global environmental agreements, and in this context focusing on a single multilateral agreement seems reasonable.

Broadly speaking, the "grand game" I consider has three phases: in the first phase (say $t = -1$) governments choose in which agreements (if any) to participate; in the second phase (say $t = 0$) governments bargain within each agreement over the set of self-enforcing policies; and then governments choose policies repeatedly from $t = 1$ until the end of time. I will next describe in more detail each of these three phases, moving in backward fashion.

Enforcement

I start by describing the enforcement phase, that is the infinitely repeated (sub)game that starts at $t = 1$. To keep exposition lean, here I focus on the case in which all N governments participate in the global agreement(s); it would not be hard to extend the formalization to the case of incomplete participation.

In each period starting at $t = 1$, governments simultaneously choose trade and non-trade policies. Governments are assumed to have complete information, so it is natural to focus on subgame perfect equilibria of this (sub)game. I will focus on stationary equilibria, i.e. those that specify time-invariant policies on the equilibrium path. As usual there will be many such equilibria, each of which specifies the policies to be played on the equilibrium path and the punishment strategy that should follow a deviation. I will take the standard approach of interpreting a subgame perfect equilibrium as a *self-enforcing agreement*.

I will use interchangeably the phrases "punishment strategy" and "enforcement strategy". One can consider two types of enforcement strategy, which I label "linked" and "unlinked". A linked enforcement strategy is defined as one where a deviation in any policy area is followed by a punishment phase in *both* policy areas, and more specifically, any deviation is followed by a permanent reversion to the static Nash policies. An unlinked enforcement strategy, on the other hand, is defined as one where a deviation in a given policy area is followed by punishment only in that policy area: more specifically, a deviation in the trade area is followed by a permanent reversion to the non-cooperative trade policies while non-trade policies continue to be set at cooperative levels, and similarly for a deviation in the non-trade area. I will denote $\mathbf{S}^{le}$ the set of policy vectors $(\boldsymbol{\tau}, \mathbf{x})$ that can be sustained with linked enforcement, and $\mathbf{S}^{ue}$ the

[12] One exception is Conconi and Perroni (2002), which I will discuss later.

set of policy vectors that can be sustained with unlinked enforcement.[13]

Negotiation

Next consider the negotiation phase at $t = 0$. Here I will consider two different bargaining (or "negotiation") protocols, namely a single "linked negotiation" versus two "unlinked negotiations." Again, I focus initially on the case where all governments participate in the agreement(s).

A linked negotiation is defined as follows: governments engage in Nash bargaining over the set of self-enforcing policies $\mathbf{S}^k$ (where $k = le$ or $k = ue$ depending on the mode of enforcement), with a disagreement point given by the one-shot Nash equilibrium $(\boldsymbol{\tau}^{NE}, \mathbf{x}^{NE})$. The idea is that the negotiation at $t = 0$ enables governments to coordinate on a (constrained-) Pareto efficient equilibrium of the ensuing repeated game, with bargaining powers determining which point on the Pareto frontier is selected. If the bargain fails, governments are not able to coordinate, and are assumed to play the static Nash policies.[14]

Next consider the case of unlinked negotiations. Here one can distinguish between simultaneous and sequential unlinked negotiations. Note that in the case of separable payoffs the sequencing of negotiations is immaterial. In any event I assume that, in the unlinked-negotiations scenario, in each policy area governments Nash-bargain over the set of self-enforcing policies with a disagreement point given by the static Nash policies. If negotiations are unlinked, it is natural to assume that also enforcement is unlinked, so the set of self-enforcing policies that governments bargain over in each area is the one sustained by unlinked enforcement.[15]

Participation

Finally, let us focus on the participation phase ($t = -1$). Recall the assumption that there is only one global agreement in each policy area, so each government simply decides whether or not to participate in each agreement. More specifically, if negotiations are linked, each government decides whether or not to participate in the linked negotiation; and if negotiations are unlinked, each government decides whether to participate in one, both, or neither of them.

[13] Note that here I do not distinguish between bilateral and multilateral punishment strategies within an agreement (a comparison that is the focus of Maggi, 1999). Without loss of generality here we can focus on punishment strategies that involve all participants in the self-enforcing agreement, since in this type of game they can do no worse than bilateral punishment strategies.

[14] The idea of considering a bargaining game prior to a repeated game as a way for players to coordinate and select one of the many equilibra of the repeated game is not novel. This idea was first developed in the context of firm collusion by Harrington (1989, 1991). Later, Tedeschi (1995) developed this approach in a more general game-theoretical setting. And in the trade literature, this approach was adopted by Bac and Raff (1997), Furusawa (1999) and Maggi (1999).

[15] If policy areas are interdependent (i.e. payoff functions are not separable in trade and non-trade policies), of course the static Nash policies and the sets of self-enforcing policies are interdependent. It would be easy to capture this in the formal notation.

As I pointed out above, if agreements are negotiated separately, they may be negotiated simultaneously or sequentially. For the purposes of evaluating participation linkage, it is more natural to focus on the case of sequential negotiations. More specifically, for the case of unlinked negotiations I will consider the following timing: (i) each government decides whether or not to participate in the trade agreement, then participants bargain over trade policies, and then non-participants choose their trade policies; (ii) the same sequence as above takes place in the non-trade area.[16]

I say that there is "participation linkage" if the two agreements are negotiated separately but the trade agreement includes a clause providing for sanctions against countries that do not participate in the non-trade agreement. More specifically, such clause specifies that the trade concessions made to country i will be (partially or fully) withdrawn if this country does not participate in the **x**-agreement. Thus, the trade agreement specifies baseline tariff levels as well as tariff increases to be applied to countries that do not participate in the **x**-agreement.[17] Note that the notion of participation linkage is meaningful only in the case of unlinked negotiations: if negotiations are linked, then participation is automatically linked as well. So when discussing participation linkage I can focus on the case of unlinked negotiations.

How the three notions of linkage relate to each other

To summarize, I have conceptualized the three notions of linkage in the following way. Compared with the benchmark of no linkage: (i) enforcement linkage means coordinating on a different punishment strategy in the repeated (sub)game starting after negotiations; (ii) negotiation linkage means adopting a different bargaining protocol; and (iii) participation linkage means including a clause in agreement A providing for sanctions against countries that do not participate in agreement B.

Note also that there is a natural "hierarchy" in the possible forms of linkage. This is because participation linkage is meaningful only if negotiations are unlinked, and enforcement linkage is a natural possibility only if negotiations

[16] Note the assumption that the coalition acts as Stackelberg leader. This seems reasonable, since signing an agreement presumably is more of a commitment than choosing unilateral policies. But whether or not the coalition acts as Stackelberg leader does not make a big difference for the points I will make below.

[17] While I have conceptualized participation linkage as a clause in the trade agreement, in reality it may also show up as a clause in the environmental agreement itself. For example, the Montreal agreement includes a clause that provides for higher tariffs on non-participants. But note that the possibility of raising trade barriers in support of environmental objectives *is* allowed by a clause in the GATT-WTO. Article XX of GATT states: "Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures ... necessary to protect human, animal or plant life or health, ... or relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption ..."

are linked. Thus there are only four natural possibilities: (a) no linkage at all; (b) only participation linkage (with unlinked negotiations and enforcement); (c) negotiation linkage (with unlinked enforcement); and (d) full linkage (i.e. linked negotiation and enforcement).

Endogenous linkage

Thus far I have not discussed what determines whether and how agreements are linked. For participation linkage and enforcement linkage there is a natural way to think about this question. Participation linkage takes the form of a clause in the trade agreement, so it is natural to suppose that when governments bargain over the trade agreement they also bargain over whether to include such a clause. Enforcement linkage can also be thought of as an agreement clause, namely one that specifies how violations are to be punished, so it is natural to suppose that governments can bargain over such a clause as well.

But the question is conceptually more subtle when it comes to the choice of linked versus unlinked negotiation protocols. One possibility would be to suppose that the negotiation protocol is chosen by governments in some prior *meta-negotiation*.[18] This is not an abstract idea: for example, in the history of GATT/WTO the choice of bargaining protocol has been a matter of negotiation among governments since the beginning of the institution, and the protocol has indeed changed several times over the various negotiation rounds since 1948. But negotiations over bargaining protocol in GATT/WTO are still within the boundaries of a single trade institution. It is hard to think of real-world examples of global meta-negotiations on whether to link agreements over disparate policy areas, so there is an open question as to how the "grand negotiation protocol" is determined in reality.

Here I will offer one quick thought on how this question might be approached. My thought is that history matters. Historically, international cooperation issues have not emerged simultaneously. For example, trade cooperation has largely preceded international environmental cooperation, so it is natural to suppose that trade agreements are negotiated before environmental issues come up. And when the need for an environmental agreement comes up, the existing trade agreement constitutes the status quo for any subsequent negotiations, so it is reasonable to suppose that any renegotiation of the trade agreement – including linking it to an environmental agreement (which would imply changes to the trade rules) – will be adopted only if all its participants agree. Thus a reasonable approach might be that the default scenario is the one with unlinked negotiations, and linkage is adopted only if all participants agree.

4 Gains and losses from enforcement linkage

In this section I discuss the potential benefits and costs of linking enforcement across issue areas. Here I focus on the theory, and defer a discussion of the

[18] Some papers take this approach explicitly, for example Carraro and Marchiori (2003).

relevant empirical research to section 9.

Potential gains

For simplicity here I will focus on the case where all countries participate in the agreement, because the key points about the potential gains from enforcement linkage can be made abstracting from participation issues. I will suppose that negotiations in the two issue areas are linked, because as I mentioned above, it does not seem natural for governments to link enforcement if negotiations are not linked.[19] I also assume initially that countries are symmetric.

Let us first consider the unlinked punishment strategy. I will describe this punishment strategy focusing on a deviation in the trade area; analogous definitions apply for a deviation in the non-trade area. The strategy is as follows: a deviation on trade policy triggers a permanent reversion to the Nash trade policies $\boldsymbol{\tau}^{NE}(\mathbf{x})$, while cooperation continues on non-trade policies $\mathbf{x}$; and if someone deviates from this punishment strategy, players revert permanently to the global Nash policies $(\boldsymbol{\tau}^{NE}, \mathbf{x}^{NE})$. Formalizing this punishment strategy is subtle, because the initial cooperative levels of $\mathbf{x}$ (on the equilibrium path) might not be sustainable during the trade-punishment phase, so the levels of $\mathbf{x}$ may have to be adjusted when moving from the equilibrium path to the trade-punishment phase. In what follows I will ignore this adjustment issue and simply assume that, if policies $\mathbf{x}$ are sustainable on the equilibrium path, they are also sustainable in the trade-punishment phase; this assumption is satisfied for example if payoffs are separable in $\boldsymbol{\tau}$ and $\mathbf{x}$.

We can now write down the self-enforcement constraints in the case of unlinked enforcement. Recalling that we focus on stationary equilibria where countries choose constant policies $(\boldsymbol{\tau}, \mathbf{x})$ on the equilibrium path, a country has no incentive to defect if and only if the following three conditions are satisfied:

$$U(\boldsymbol{\tau};\mathbf{x}) \geq (1-\delta)U^{\tau D}(\boldsymbol{\tau};\mathbf{x}) + \delta U(\boldsymbol{\tau}^{NE}(\mathbf{x});\mathbf{x}) \quad (1)$$

$$U(\boldsymbol{\tau};\mathbf{x}) \geq (1-\delta)U^{xD}(\boldsymbol{\tau},\mathbf{x}) + \delta U(\boldsymbol{\tau};\mathbf{x}^{NE}(\boldsymbol{\tau})) \quad (2)$$

$$U(\boldsymbol{\tau};\mathbf{x}) \geq (1-\delta)U^{\tau xD}(\boldsymbol{\tau},\mathbf{x}) + \delta U(\boldsymbol{\tau}^{NE};\mathbf{x}^{NE}) \quad (3)$$

where $U^{\tau D}(\boldsymbol{\tau};\mathbf{x})$ denotes the payoff a country can obtain by unilaterally deviating only on trade policies when the equilibrium path prescribes policies $(\boldsymbol{\tau},\mathbf{x})$, $U^{xD}(\boldsymbol{\tau},\mathbf{x})$ is the analogous payoff from deviating only on non-trade policies, and $U^{\tau xD}(\boldsymbol{\tau},\mathbf{x})$ the payoff from deviating jointly on trade and non-trade policies. Condition (1) states that a country has no incentive to deviate on trade policy, knowing that this would trigger punishment only in the trade policy area from the next period on. Similarly, condition (2) states that a country has no incentive to deviate on non-trade policy, knowing that this would trigger punishment

[19] In any event, the main insights of this section will not depend on the bargaining protocol, because as will soon become clear, the key effect of linking enforcement is to expand the set of self-enforcing policies, and this expansion *per se* does not depend on the bargaining protocol; what the latter can affect is the extent to which the expansion of the self-enforcing set translates into an increase in overall payoffs.

only in the non-trade policy area. And condition (3) states that a country has no incentive to deviate jointly on trade and non-trade policy, knowing that this would trigger punishment in both policy areas. Within the class of equilibria that we are focusing on, policies $(\boldsymbol{\tau}, \mathbf{x})$ are self-enforcing if and only if the conditions above are satisfied for all N countries. The resulting $3 \times N$ inequalities define the set of self-enforcing policies under unlinked enforcement, $\mathbf{S}^{ue}$.

Next focus on the case of linked enforcement. In this case, it is clear that, if a country is to deviate, it might as well deviate in both policy areas, therefore there is at most one binding self-enforcing constraint for each country, namely constraint (3) above. The resulting N inequalities define the set of self-enforcing policies under linked enforcement, $\mathbf{S}^{le}$.

One basic point is already transparent. Since unlinked enforcement introduces two additional constraints that are not present under linked enforcement, $\mathbf{S}^{ue}$ must be a subset of $\mathbf{S}^{le}$: linking enforcement across issue areas can only expand the set of self-enforcing policies, and therefore it can only expand the set of sustainable payoffs. As a consequence, if countries are symmetric, so that the bargain maximizes their common payoff, all countries must be weakly better off under linked enforcement.[20] However this does not guarantee that governments will be *strictly* better off under linked enforcement, even if they are symmetric. This will be the case only if one or both of the single-issue incentive constraints (1) and (2) is binding.

The first papers that examined whether linkage in enforcement can make players strictly better off appeared in the literature on firm collusion. In particular, Bernheim and Whinston (1990) and Spagnolo (1999) examined whether firms colluding over several market can sustain higher profits by linking punishments across markets.[21]

Bernheim and Whinston showed an important *irrelevance result*, which I will re-cast here in the terminology of international agreements: if payoff functions are symmetric and separable in the two issue areas, then there are no gains from enforcement linkage. The intuition is simply that linkage doubles the punishment from cheating on each issue, but since the relevant deviation is then to cheat on both issues, linkage effectively doubles both the punishment and the the gain from cheating, hence the net effect on incentives is a wash. Formally, if issue areas are symmetric and separable, we can write $U(\boldsymbol{\tau}, \mathbf{x}) = V(\boldsymbol{\tau}) + V(\mathbf{x})$, and the self-enforcing constraints above become

$$V(\boldsymbol{\tau}) \geq (1-\delta)V^D(\boldsymbol{\tau}) + \delta V(\boldsymbol{\tau}^{NE}) \quad (4)$$

$$V(\mathbf{x}) \geq (1-\delta)V^D(\mathbf{x}) + \delta V(\mathbf{x}^{NE}) \quad (5)$$

$$V(\boldsymbol{\tau}) + V(\mathbf{x}) \geq (1-\delta)[V^D(\boldsymbol{\tau}) + V^D(\mathbf{x})] + \delta[V(\boldsymbol{\tau}^{NE}) + V(\mathbf{x}^{NE})] \quad (6)$$

where $V^D(\boldsymbol{\tau})$ denotes the payoff from deviating to the best-response trade policy when other countries play the equilibrium policies**,** and similarly for $V^D(\mathbf{x})$.

[20] I will later discuss the case of symmetric countries.

[21] I should mention that, even before these papers, there were some early attempts at analyzing enforcement linkage in industrial organization (Telser, 1980) and in political science (McGinnis, 1986).

Under linked enforcement, the optimal agreement maximizes the countries' common payoff subject to (6). Such solution is symmetric, with $V(\boldsymbol{\tau}) = V(\mathbf{x})$ and $V^D(\boldsymbol{\tau}) = V^D(\mathbf{x})$, so it also satisfies (4) and (5), hence it is sustainable also under unlinked enforcement.

Strict gains from enforcement linkage can easily emerge if there are asymmetries across issues or if there are structural interactions between them. Focusing on asymmetries first, a clear example is the case where, under unlinked enforcement, there is slack in one of the issue-specific self-enforcement constraints but not in the other, or in other words, there is a problem of self-enforcement only in one of the issue areas. For example, letting $V_\tau(\boldsymbol{\tau})$ and $V_x(\mathbf{x})$ denote the issue-specific payoff functions, suppose the "first best" (i.e. unconstrained-optimal) trade policies $\boldsymbol{\tau}^{FB}$ satisfy the trade incentive constraint with slack, so $V_\tau(\boldsymbol{\tau}^{FB}) > (1-\delta)V_\tau^D(\boldsymbol{\tau}^{FB}) + \delta V_\tau(\boldsymbol{\tau}^{NE})$, while the first-best non-trade policies $\mathbf{x}^{FB}$ violate the non-trade incentive constraint. Then, the optimal unlinked non-trade policies $\mathbf{x}^U$ satisfy $V_x(\mathbf{x}^U) = (1-\delta)V_x^D(\mathbf{x}^U) + \delta V_x(\mathbf{x}^{NE})$, so the joint incentive constraint is satisfied with slack at $(\boldsymbol{\tau}^{FB}, \mathbf{x}^U)$. Now, recall that under linkage only the joint incentive constraint matters, and hence non-trade policies $\mathbf{x}$ can be moved slightly toward the first-best without violating the joint incentive constraint, while keeping $\boldsymbol{\tau}$ at the first best. The basic insight here is that, when there are asymmetries across issue areas, enforcement linkage allows a beneficial *reallocation of enforcement power.*

Note however that, in this example, the optimal linked agreement will not feature first-best trade policies, because this can be improved upon by moving trade policies slightly away from the first best (which entails a second-order loss) and non-trade policies slightly toward the first best (which entails a first-order gain). This has an interesting implication: while the reallocation of enforcement power allowed by linkage is overall beneficial, it increases the level of cooperation in one issue area at the expense of the other. I also note that the points I just made are valid also if both single-issue enforcement constraints are binding under non-linkage: also in this case, one can show that linkage leads to a strict improvement in overall payoffs by effecting a reallocation of enforcement power across issues.

While Bernheim and Whinston focus on asymmetries across issues as a source of gains from linkage, Spagnolo (1999) points out that gains from enforcement linkage can arise even in the absence of asymmetries, if payoff functions are non-separable. In particular, Spagnolo considers an oligopoly model where each firm's objective function is concave in its total profits, which implies that the prices charged by a firm in different markets are substitutes, and shows that in this case enforcement linkage allows firms to collude more effectively than unlinked enforcement. The insight here is that, when there are structural interactions between issue areas, under some conditions linkage allows beneficial *creation of enforcement power.*

Limão (2005) considers a more general model than Spagnolo's, in that it allows for more general patterns of interaction between policy areas, and applies the model to questions regarding trade and environmental agreements. Each government chooses trade taxes and pollution taxes, which exert terms-of-

trade externalities and cross-border pollution externalities on the other country. Governments are symmetric, but the trade cooperation problem and the environmental cooperation problem are asymmetric in nature, and the two policy issues may interact with each other. Limão shows that in this setting linked enforcement always allows governments to achieve a strictly higher payoff relative to unlinked enforcement. If policies are independent in the governments' objective functions, the key effect of linkage is to reallocate enforcement power across issue areas, thus promoting cooperation in one policy area at the expense of the other (as in the example I showed above). However, if trade and pollution taxes are complements in the governments' objective functions, linkage can create enforcement power, thus leading to more cooperation in both policy areas. Limão explores under what conditions trade and pollution taxes are complements in the sense above, showing that this is the case if cross-border pollution externalities are strong and governments place relatively little weight on import competing lobbies.

Also Ederington (2002) examines the potential gains from linkage between trade and environmental agreements, but focuses on a scenario where pollution externalities are purely local (i.e. they do not cross national borders), so that the only international externality is through the terms of trade.[22] In this case results are sharply different than in the scenario considered by Limão (2005): Ederington shows that, if the punishment strategy takes the form of a permanent reversion to the static Nash policies, then there are no benefits from linked enforcement. The basic intuition for this result is related to the targeting principle. First, when the only international externality is through the terms of trade, at the Nash equilibrium environmental policies are set efficiently, because these policies are targeted to correct the domestic distortion, while tariffs are targeted to manipulate terms of trade. Furthermore, environmental policies are set at their efficient levels also in the optimal self-enforcing agreement; only tariffs are raised to accommodate self-enforcement constraints, because the only reason countries are tempted to deviate from the agreement is to manipulate terms of trade, so raising tariffs is the most efficient way to neutralize this incentive to defect. The result that enforcement linkage need not provide gains to governments is an intuitive consequence of this latter result.[23]

The models discussed thus far assume away international transfers. A point worth highlighting is that transfers typically facilitate the enforcement of international agreements but may not completely solve the enforcement problem, for the simple reason that transfers must be self-enforcing, just like trade and environmental policies (see Maggi, 1999, and Limao and Saggi, 2008). Thus the availability of transfers need not wipe out the gains from enforcement linkage. This contrasts with the case of negotiation linkage (discussed in the next section), where there are no gains from linkage if international transfers are

[22] Also Ederington (2001) characterizes the optimal self-enforcing agreement in a similar scenario, but does not compare linked enforcement with unlinked enforcement.

[23] However Ederington also shows that, if the punishment strategy takes a different form than Nash reversion, for example a reversion to autarky, then linkage may be beneficial.

available.[24]

Potential losses

All papers mentioned above assume symmetric countries, but an interesting question is the following: if countries are asymmetric, can enforcement linkage hurt some of the countries, and under what conditions? In principle this seems possible. Imagine a situation where linkage expands the sustainable policy set mostly in the direction of allowing for more efficient environmental policies, and suppose country A cares much more about the environment than country B; then linkage expands the set of sustainable payoffs mostly in the direction of allowing higher payoffs for country A. Then it seems possible that the Nash bargaining solution will pick a point on the new payoff frontier where country A is much better off than before and country B is worse off. But I am not aware of papers that have examined this question formally.

There is another possible reason why enforcement linkage may hurt countries, which has been highlighted by a number of scholars. The result explained above that enforcement linkage must be weakly beneficial (at least if countries are symmetric) relies on the assumptions of complete information and perfect monitoring. Under these assumptions, punishments never occur on the equilibrium path, and hence it is optimal to maximize the severity of punishment threats (see Abreu, 1986). But if punishments occur on the equilibrium path, which can happen if policies are imperfectly observed or if governments are subject to privately observed shocks, then maximal punishments are no longer optimal, and therefore linked enforcement (with maximal cross-issue punishments) may be worse than unlinked enforcement.

Pushing this logic one step forward, it seems that if punishments are triggered on the equilibrium path, countries might have different preferences over linked versus unlinked enforcement. Suppose that linking enforcement entails the use of trade sanctions to punish perceived violations in the non-trade area. If the cost of trade wars falls disproportionately on some countries, which is likely to be the case for small countries or countries that are very dependent on trade, it seems possible that these countries prefer non-linkage while other countries prefer linkage.

The idea that enforcement linkage is not necessarily a good idea if punishments occur on the equilibrium path has been formalized by a few papers.

[24] I will mention here another potential gain from issue linkage, proposed by Lee (2007), that is somewhat related to the notion of enforcement linkage, but is distinct from it. The basic idea is that making trade taxes conditional on domestic taxes/subsidies can help to induce truthtelling when governments have private information. Suppose governments observe privately the value of a domestic externality that can justify the use of a domestic subsidy. A government may have an incentive to overstate this value, because a higher subsidy can improve the country's terms of trade at the expense of the other country. This incentive to lie can be removed by imposing a cost for raising the subsidy, for example by linking the subsidy increase to an increase in the tariffs faced by the country. Note that, in this argument, issue linkage operates as an imperfect substitute for a transfer – indeed, a conditional transfer would make issue linkage unnecessary in Lee's model.

Ederington (2003) shows that this argument is valid in case of "type I" errors in monitoring, meaning that with a certain probability countries mistakenly perceive violations that were not committed, but is not valid in case of "type II" errors, meaning that with a certain probability violations go undetected. In a related paper, Bajona and Ederington (2012) consider a setting where domestic policies and foreign trade shocks are imperfectly observed, and show that the monitoring imperfection for domestic policies may increase – rather than decrease – the gains from enforcement linkage, because such monitoring imperfection makes the incentive constraint for domestic policies more relevant, and linkage helps relax this incentive constraint. Chisik (2009) considers a model where governments choose trade policies over multiple sectors, and trade policies are observed with noise. Chisik shows that cross-sectoral punishment linkage may be strictly undesirable, but only when the noise is imperfectly correlated across sectors; if the noise is perfectly correlated across sectors, linkage is always desirable.[25] I note that these papers focus on the case of symmetric countries, so they do not examine the possibility that countries may have different preferences over linkage.

Optimal cross-issue punishments

The papers mentioned above make the point that unlinked enforcement may be preferred to linked enforcement if monitoring is noisy, but they focus on a very stark comparison: they compare an unlinked punishment strategy with a linked punishment strategy that involves *maximum* cross-issue punishments, whereby a deviation in either issue area is met by a maximum punishment in both issue areas. But some additional insights can be gained if we consider the possibility of *limited* and *one-way* cross-issue retaliation.

Suppose for simplicity that issue areas are separable and countries are symmetric. The first observation is that, absent monitoring noise, *maximum cross-issue sanctions are not needed* to achieve the maximum level of cooperation: the same outcome can be sustained with less-than-maximum and one-way cross-punishments. To get intuition, consider a more general punishment strategy with partial linkage, in the following sense: a deviation in the trade area is followed by a permanent Nash reversion in the trade area and a Nash reversion in the non-trade area for T_x periods. Similarly, let T_τ denote the length of cross-punishment in the trade area for a deviation in the non-trade area. If $T_x = T_\tau = 0$, this collapses to unlinked enforcement, and if $T_x = T_\tau = \infty$ it collapses to fully linked enforcement. We can then write the three incentive constraints as

$$V_\tau(\boldsymbol{\tau}) \geq (1-\delta)V_\tau^D(\boldsymbol{\tau}) + \delta V_\tau(\boldsymbol{\tau}^{NE}) - \Delta_x \tag{7}$$

$$V_x(\mathbf{x}) \geq (1-\delta)V_x^D(\mathbf{x}) + \delta V_x(\mathbf{x}^{NE}) - \Delta_\tau \tag{8}$$

$$V_\tau(\boldsymbol{\tau}) + V_x(\mathbf{x}) \geq (1-\delta)[V_\tau^D(\boldsymbol{\tau}) + V_x^D(\mathbf{x})] + \delta[V_\tau(\boldsymbol{\tau}^{NE}) + V_x(\mathbf{x}^{NE})] \tag{9}$$

[25] See also Chisik and Onder (2012). In the industrial organization literature, Thomas and Willig (2006) make similar points, arguing that cross-market punishment strategies may strictly hurt firms' profitability if monitoring is imperfect.

where Δ_x denotes the reduction in continuation payoff due to cross-punishment after a deviation in the trade area, and Δ_x has a similar meaning. Recall that if issues are symmetric, even without cross-punishments ($\Delta_x = \Delta_\tau = 0$) the single-issue incentive constraints (7) and (8) are not binding at the optimum. Next suppose there is a small asymmetry between the two issues: then intuitively one can make both single-issue incentive constraints non-binding – and hence replicate the optimum with fully-linked enforcement – with a small amount of cross-punishment (i.e. small values of Δ_x and Δ_τ). More generally, one can show that less-than-maximum cross-punishments are sufficient to replicate the fully-linked optimum.

The next observation is that one-way cross-punishments are enough: loosely speaking, if the needed reallocation of enforcement power is from issue A to issue B, what is needed is cross-punishment in area A for violations in area B, but not vice-versa. One can show this point formally by arguing that, at the fully-linked optimum, only one of the single-issue incentive constraints is binding, thus it is sufficient to threaten cross-punishment in one direction to make that constraint non-binding.

I label cross-issue sanctions "minimal" if they are the least severe that can replicate the fully-linked optimum. My final observation is that, if there are small type-I errors in monitoring, in the sense of a small probability that players will observe a violation when none was committed, then "minimal" cross-issue sanctions are strictly preferable to maximum cross-issue sanctions. The intuition is the following: if monitoring is perfect, there is indifference between minimal and full cross-issue sanctions, and if there are small monitoring errors, punishments will occur on the equilibrium path with a small probability, and this breaks the indifference in favor of minimal cross-issue sanctions.[26]

These observations perhaps can help explain why in reality cross-issue punishments are used in parsimonious ways, even if monitoring imperfections are small, and why they tend to be very asymmetric, in the sense that sanctions in issue area A are used to punish violations in issue area B but not vice-versa.

On the other hand, some of the patterns of enforcement linkage that we observe in reality – see section 2 – are not easy to explain with this theoretical approach. Why, for example, are violations in the security area often punished with trade sanctions and not with military sanctions? Perhaps part of the explanation lies in the fact that military sanctions have a discontinuous nature, in the sense that it is hard to calibrate them to impose a "moderate" amount of cost on the target country. Even very limited military sanctions, such as "surgical" air strikes, involve considerable risk of loss of human life. There do exist "soft" sanctions in the security area, such as closing an embassy or

[26] This argument is similar to the one made in Maggi (1999) regarding the desirability of third-country sanctions in a multilateral trade setting. In that paper I show that introducing an arbitrarily small probability of type-I errors (governments mistakenly perceive a violation when none was committed) dramatically lowers the optimal degree of third-country sanctions. This is because, absent noise, the maximum level of cooperation can be achieved with less-than-maximal third-country sanctions, and introducing a small noise makes this level of third-country sanctions strictly optimal.

imposing travel restrictions on a country's politicians, but the costs imposed by these sanctions are fairly minimal, so one might argue that it is difficult to find a "middle ground" in security sanctions, and this is a void that trade sanctions can fill.

5 Gains and losses from negotiation linkage

In this section I discuss how linking negotiations across issue areas can affect the payoffs of participating countries.

Before proceeding, I want to mention an often-heard argument that may sound like an argument for issue linkage, but is not. It has been observed by many scholars that contracting over trade and environment policies can provide important gains relative to contracting over trade policy alone while leaving environmental policies to the discretion of governments. For example, Copeland (1990, 2000) points out that environmental policies (or the lack thereof) can be used as disguised tools of protectionism, and therefore it may be quite costly to leave these policies to the discretion of governments. A similar argument has been made about a variety of other domestic policies, such as production subsidies and labor standards.[27] While this is a compelling argument, it must not be confused for an argument that there are gains from issue linkage, because it is not about a comparison between linked negotiations and unlinked negotiations: it is about a comparison between cooperating on both issues versus cooperating on just one issue.

Asymmetries between issues

To explain the relevant points in the simplest possible way, I focus on a world with two countries ($N = 2$), abstracting from issues of incomplete participation, and I assume δ is sufficiently close to one, so that the folk theorem holds both under linked and unlinked enforcement, so enforcement linkage is immaterial.[28] With the folk theorem holding, all the points on the Pareto frontier that give each government at least its disagreement payoff (one–shot Nash payoff) are sustainable, so the scenario is just the same as in a world of enforceable contracts. But note that allowing for lower levels of δ would not change anything substantial in the analysis: the only difference would be that the set of sustainable policies that governments bargain over is smaller than with a high δ, because self-enforcement constraints are binding.

The idea that linking negotiations may provide gains to the participating countries was highlighted first in the political science literature (to my knowledge). The standard references in this area are Tollison and Wilkett (1979),

[27] For another paper that focuses on the cost of leaving discretion over domestic policies, see Horn et al. (2010).

[28] The folk theorem states that, if players are sufficiently patient, any feasible and individually-rational payoff profile can be sustained as a subgame perfect equilibrium.

Raiffa (1982) and Sebenius (1983).[29] In the economics literature, papers that examine the impacts of negotiation linkage include Copeland (2000), Horstmann et al. (2005) and Limão (2007); I will return to these papers below.[30]

The basic logic is simple and can be illustrated with a stark example. Suppose international transfers are not available. In the trade area, only country 1 chooses a policy, say τ, and in the non-trade area only country 2 chooses a policy, say x. Country 1's payoff function is $V_\tau^1(\tau) + V_x^1(x)$ and country 2's payoff function is $V_\tau^2(\tau) + V_x^2(x)$. Suppose each policy exerts a negative international externality ($V_x^{1'}(x) < 0$, $V_\tau^{2'}(\tau) < 0$). In the non-cooperative scenario, country 1's choice of trade policy τ^N is determined by the first-order condition $V_\tau^{1'}(\tau^N) = 0$, and country 2's choice of non-trade policy x^N is determined by $V_x^{2'}(x^N) = 0$. Clearly, in this setting an international agreement can provide a Pareto improvement over the non-cooperative scenario: if country 1 reduces τ slightly and country 2 reduces x slightly, both countries will be better off, because reducing each policy causes a second-order loss for the country applying the policy but a first-order gain for the other country. However, consider what happens if international negotiations are not linked. The trade negotiation is a Nash bargain where the disagreement point is the noncooperative policy τ^N. Clearly, there is no way to achieve a Pareto improvement by just moving τ away from τ^N, and the same is true for the non-trade negotiation. So if the two negotiations are not linked they will go nowhere fast: quite simply, in a given issue area it would be efficient for a country to make a concession and move the policy away from the noncooperative level, but the country on the receiving end has nothing to offer in return. By linking negotiations, governments can exchange concessions across issue areas and thus achieve a Pareto improvement over the unlinked-negotiation scenario.

The example above conveys the key intuition, but it is simple enough to generalize the analysis. In what follows I will illustrate a few general points. First, unless issue areas are symmetric, unlinked negotiations generically lead to Pareto-inefficient outcomes, and the reason is that *the slopes of the issue-specific Pareto frontiers are not equalized*, whereas this condition is satisfied with linked negotiations. This suggests that the inefficiency of unlinked negotiations is more severe when issues are more asymmetric. Second, negotiation linkage can be thought of as an *imperfect substitute for lump sum transfers*: while linked negotiations are more efficient than unlinked negotiations, they are less efficient than negotiations (linked or unlinked) with transfers. And third, asymmetries across issues are the *only* reason for the inefficiency in the unlinked negotiations, in the sense that if issues are symmetric, unlinked negotiations are efficient even if issues are non-separable, so structural interactions between issues *per se* are not a cause of inefficiency from non-linkage.

[29] A more recent paper in political science where negotiation linkage plays a key role is Carnegie (2014), who considers the linking of negotiations between trade and security.

[30] Also Abrego et al. (2001) suggest gains from linking trade and environment negotiations, but do not formally compare linked negotiations with unlinked negotiations; they compare trade-only negotiations with linked trade-and-environment negotiations.

To see these points formally, focus first on the case of separable issues, where government i's payoff is $U^i = V^i_\tau(\boldsymbol{\tau}) + V^i_x(\mathbf{x})$ $(i = 1, 2)$. Note that I am now allowing each government to choose multidimensional trade and non-trade policies ($\boldsymbol{\tau}$ is the whole matrix of trade policies and $\mathbf{x}$ is the whole matrix of non-trade policies). In this case we can define two issue-specific Pareto frontiers, denoted respectively $V^1_\tau = F_\tau(V^2_\tau)$ and $V^1_x = F_x(V^2_x)$, which I assume strictly concave. The *overall* Pareto frontier will be denoted as $U^1 = G(U^2)$.

Consider first the case of a linked Nash bargain. The solution maximizes

$$\sum_{i=1,2} \sigma_i \ln(U^i - \bar{U}^i)$$

where σ_i is country i's bargaining power (with $\sigma_1 + \sigma_2 = 1$) and $\bar{U}^i$ is country i's disagreement payoff. Breaking down the payoff functions into their issue-specific components and plugging in the Pareto frontiers, the problem boils down to maximizing the following objective in V^2_τ and V^2_x:

$$\sigma_1 \ln(F_\tau(V^2_\tau) + F_x(V^2_x) - \bar{U}^1) + \sigma_2 \ln(V^2_\tau + V^2_x - \bar{U}^2)$$

The first order conditions for this problem are

$$\begin{aligned} \frac{\sigma_1}{F_\tau(V^2_\tau) + F_x(V^2_x) - \bar{U}^1} \cdot F'_\tau(V^2_\tau) + \frac{\sigma_2}{V^2_\tau + V^2_x - \bar{U}^2} &= 0 \\ \frac{\sigma_1}{F_\tau(V^2_\tau) + F_x(V^2_x) - \bar{U}^1} \cdot F'_x(V^2_x) + \frac{\sigma_2}{V^2_\tau + V^2_x - \bar{U}^2} &= 0 \end{aligned}$$

Clearly, a necessary condition for an optimum is

$$F'_\tau(V^2_\tau) = F'_x(V^2_x),$$

meaning that the slopes of the single-issue Pareto frontiers are equalized. It is easy to see that this condition is necessary and sufficient for *overall* Pareto efficiency, that is, countries are on the overall Pareto frontier $U^1 = G(U^2)$ if and only if the slopes of the issue-specific frontiers are equalized. Of course the condition does not pin down a specific value for the common slope: each point of the overall Pareto frontier corresponds to a different value of this common slope.

Now consider a scenario of unlinked negotiations. Trade negotiations maximize $\sigma_1 \ln(F_\tau(V^2_\tau) - \bar{V}^1_\tau) + \sigma_2 \ln(V^2_\tau - \bar{V}^2_\tau)$, and non-trade negotiations maximize $\sigma_1 \ln(F_x(V^2_x) - \bar{V}^1_x) + \sigma_2 \ln(V^2_x - \bar{V}^2_x)$ (where the $\bar{V}$'s denote single-issue disagreement payoffs). If issues are symmetric, in the sense that $F_\tau(\cdot)$ and $F_x(\cdot)$ and $\bar{V}^i_x = \bar{V}^i_\tau$ $(i = 1, 2)$, then unlinked negotiations will select points on the single-issue Pareto frontiers that have equal slopes, so that the outcome is overall Pareto efficient. But if there are asymmetries across issues there is no reason to expect that those slopes will be equalized, so generically the outcome will be Pareto-inefficient.

For example, imagine that trade negotiations deliver a point on the trade bargaining frontier that has slope -3, while non-trade negotiations deliver a

point on the non-trade bargaining frontier with slope -4: then a Pareto improvement can be achieved if trade policies are changed slightly to reallocate utility toward country 2, where the trade frontier is steeper, and non-trade policies are changed slightly in a way that reallocates utility toward country 1, where the non-trade frontier is flatter.[31]

Broadly speaking, the message here is that the potential Pareto gains that negotiation linkage can offer are bigger when unlinked negotiations lead to a bigger wedge between the marginal rates of utility transformation across issues. Note that the example considered at the beginning of the section is an extreme case of the situation considered just above: the τ negotiation is not able to improve on the noncooperative choice of τ and hence yields the point on the τ-bargaining frontier that has slope 0, and the x negotiation yields the point on the x-bargaining frontier with slope $-\infty$.

The next observation is that negotiation linkage is an imperfect substitute for lump sum transfers. Suppose for a moment that transfers are available and enter governments' utilities linearly, as in $U^i = V^i_\tau(\boldsymbol{\tau}) + V^i_x(\mathbf{x}) + T$. In this case, unlinked negotiations will yield the point of the single-issue bargaining frontier with slope -1 in each issue area, thus the slopes are equalized and Pareto efficiency is achieved. But note a further point: even though a linked negotiation without transfers achieves Pareto efficiency *conditional on the absence of transfers,* it is less efficient than negotiations with transfers. To see this, think of the transfer T as a third negotiating issue (a "zero sum" issue), for which the single-issue bargaining frontier is linear with constant slope -1. Linking negotiations on $(\boldsymbol{\tau}, \mathbf{x})$ with negotiations on T generates potential Pareto gains over separate negotiations over $(\boldsymbol{\tau}, \mathbf{x})$ and T,[32] for much the same reason as negotiations on $(\boldsymbol{\tau}, \mathbf{x})$ generate potential Pareto gains over separate negotiations on $\boldsymbol{\tau}$ and $\mathbf{x}$. Just as before, Pareto efficiency in this three-issue scenario requires equalization of the slopes of the single-issue frontiers, and since the slope of the T-frontier is constant at -1, it requires equalization of all slopes at -1. This condition is not satisfied by negotiating separately on $(\boldsymbol{\tau}, \mathbf{x})$ and T.[33]

The discussion above makes clear that, when issues are asymmetric, negotiation linkage offers potential Pareto gains relative to unlinked negotiations, but this does not necessarily imply that both countries will share in these gains. In other words, it is in principle possible that one country prefers unlinked bargaining to linked bargaining. Indeed, Horstmann et al. (2005) show that this

[31] Note that unlinked negotiations may be inefficient even if the issue-specific Pareto frontiers are identical, if for some reason bargaining powers are different across issues. Suppose that country 1 is more skilled at negotiating trade issues while country 2 is more skilled at negotiating non-trade issues: this will cause a wedge in the slopes of the issue-specific Pareto frontiers and thus an overall Pareto inefficiency.

[32] Of course if governments negotiate separately just over transfers, the outcome will be that no transfer is exchanged, because this is the disagreement point, and no Pareto-improvement is possible over the disagreement point.

[33] This discussion also suggests that the infrequency of the use of transfers in international negotiations can be understood as part of the broader "puzzle" of the relative infrequency of issue linkage in international negotiations. I am grateful to Nuno Limão for suggesting this point.

may happen under some conditions, in a model similar to the one presented here but with linear bargaining frontiers. However, the kind of scenario under which this happens is rather extreme and seems unlikely to be relevant in practice. More specifically, in Horstmann et al. (2005) a country may prefer unlinked negotiations only if, in one of the issue areas, this country is much better off in the status quo than on any point of the single-issue bargaining frontier.[34]

A paper that does not focus directly on issue linkage but suggests a reason why linkage may hurt one of the bargainers is Drazen and Limão (2008). Their model focuses on bargaining between a government and a domestic lobby, where the government can potentially use two redistribution policies, one more efficient than the other. The more efficient instrument could be for example a lump-sum transfer. In this model, the government may prefer to keep the transfer out of the bargain, because even though allowing for such instrument expands the set of feasible payoffs, it may change the slope of the Pareto frontier in such a way that the bargaining solution selects a point that is very unfavorable to the government. This is more likely to happen when the government has low bargaining power. What this suggests in terms of issue linkage can be understood by recalling the point above, that transfers can be seen as a distinct issue for negotiation: linking such zero-sum issue to other issues offers potential Pareto gains, but as Drazen and Limão suggest, it may ultimately hurt one of the bargainers.

Finally, Limão (2007) considers a scenario where regional agreements may link trade objectives with non-trade objectives. While linkage provides gains to the members of the regional agreement relative to the absence of linkage, this type of agreement may hurt countries outside the agreement, because as Limão shows, the formation of this kind of agreement may lead its members to raise their external tariffs against non-members. Intuitively, suppose the regional deal involves one country making a non-trade concession and the other country lowering the tariff below the external tariff level; then increasing the external tariff raises the preference margin that this country can offer in the regional agreement and consequently the level of non-trade concession it can extract.

Interactions between issues

So far I have focused on the role of asymmetries across issues as a source of gains from negotiation linkage. Next I consider the role of interactions between issues. The first point I will make is that issue interdependence *per se* does not imply gains from negotiation linkage. Suppose there is interdependence but no asymmetries between issues. I will argue that, even if policies in one area exert "externalities" on the other issue area, this does not imply that unlinked negotiations are inefficient. Of course, for unlinked negotiations to work well, it must be the case that, when negotiating over trade, governments

[34] In their model, countries bargain over the sharing of two "pies," with each pie produced by one country at a certain cost. The scenario described in the text corresponds to the case where the cost of producing one of the pies is much higher than the value of the total pie for the country producing it.

have correct expectations about the policies that will emerge from the non-trade negotiations, and vice-versa, but this does not mean necessarily that issues must be negotiated jointly. Note the contrast with the case of enforcement linkage: as I discussed above, issue interdependence *can* be an independent source of gains from enforcement linkage.

To see this point formally, assume each government's payoff function $U^i(\boldsymbol{\tau}, \mathbf{x})$ is symmetric in the arguments $\boldsymbol{\tau}$ and $\mathbf{x}$, and let M denote the number of policies in each of the vectors $\boldsymbol{\tau}$ and $\mathbf{x}$. It can easily be shown that a necessary and sufficient condition for Pareto efficiency is that the ratios of marginal utilities $\frac{\partial U^1/\partial \tau_j^i}{\partial U^2/\partial \tau_j^i}$ and $\frac{\partial U^1/\partial x_k^i}{\partial U^2/\partial x_k^i}$ be equalized across all trade and non-trade policies (for all $j, k \in \{1, ..., M\}$ and $i \in \{1, 2\}$). Is this condition satisfied in the case of unlinked negotiations?

I will suppose for simplicity that the unlinked negotiations occur simultaneously.[35] Assume that trade policies are chosen via Nash bargaining taking non-trade policies as given, and vice-versa. Then the policy outcome is given by:

$$\max_{\boldsymbol{\tau}} \sum_{i=1,2} \sigma_i \ln(U^i(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^i(\mathbf{x}))\}$$
$$\max_{\mathbf{x}} \sum_{i=1,2} \sigma_i \ln(U^i(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^i(\boldsymbol{\tau}))\}$$

where $\tilde{U}^i(\mathbf{x}) \equiv U^i(\boldsymbol{\tau}^N(\mathbf{x}), \mathbf{x})$ is country i's disagreement payoff in the trade negotiation given non-trade policies $\mathbf{x}$, and similarly $\tilde{U}^i(\boldsymbol{\tau}) \equiv U^i(\boldsymbol{\tau}, \mathbf{x}^N(\boldsymbol{\tau}))$. The implicit assumption here is that, it the trade bargain fails, governments will choose the non-cooperative trade policies given the negotiated non-trade policies, and vice-versa. The first order conditions for this system are

$$\frac{\sigma_1 \cdot \partial U^1/\partial \tau_j^i}{U^1(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^1(\mathbf{x})} + \frac{\sigma_2 \cdot \partial U^2/\partial \tau_j^i}{U^2(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^2(\mathbf{x})} = 0 \quad (10)$$

$$\frac{\sigma_1 \cdot \partial U^1/\partial x_k^i}{U^1(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^1(\boldsymbol{\tau})} + \frac{\sigma_2 \cdot \partial U^2/\partial x_k^i}{U^2(\boldsymbol{\tau}, \mathbf{x}) - \tilde{U}^2(\boldsymbol{\tau})} = 0 \quad (11)$$

for $j, k \in \{1, ..., M\}$ and $i \in \{1, 2\}$. Given the full symmetry across issues, the solution of this problem entails $\boldsymbol{\tau} = \mathbf{x}$, and hence $\tilde{U}^i(\mathbf{x}) = \tilde{U}^i(\boldsymbol{\tau})$ for $i = 1, 2$. It follows immediately that the solution of this problem satisfies the conditions for Pareto efficiency, i.e. the ratios $\frac{\partial U^1/\partial \tau_j^i}{\partial U^2/\partial \tau_j^i}$ and $\frac{\partial U^1/\partial x_k^i}{\partial U^2/\partial x_k^i}$ are equalized for all policies.

The above argument establishes that interactions across issues are not *per se* a cause of inefficiency in unlinked negotiations: such inefficiency arises if and only if issues are asymmetric. However, in this setting with symmetric but interdependent issues, linked negotiations will in general select a different point on

[35] Whether the same results extend to the case of sequential negotiations is an open question, but the intuition for the argument I will present does not depend on the timing of the negotiations.

the Pareto frontier than unlinked negotiations, so countries will generally have opposite preferences regarding linkage. To see this, note that a linked Nash bargain maximizes $\sum_{i=1,2} \sigma_i \ln(U^i(\boldsymbol{\tau}, \mathbf{x}) - U^i(\boldsymbol{\tau}^N, \mathbf{x}^N))$. The first order conditions for this problem are similar to (10) and (11) *except* that the disagreement utilities $U^i(\boldsymbol{\tau}^N, \mathbf{x}^N)$ are in general different from the single-issue disagreement utilities in (10) and (11). Intuitively, linkage will hurt the government that has more to lose when going from a single-issue negotiation breakdown to a global negotiation breakdown, because this goverment's threat point gets worse. Broadly speaking, then, linkage has stronger distributional effects when there is a bigger wedge across governments in the cost of a global breakdown relative to the cost of a single-issue breakdown.

Thus far I have not considered explicitly the case of sequential unlinked negotiations. While the sequence of unlinked negotiations does not matter much if issues are separable or if issues are symmetric, it does matter if there are interdependencies *and* asymmetries across issues, because in this case committing to an agreement in one issue area affects the future disagreement point for the other issue area in ways that may impact countries asymmetrically. This point is made by Copeland (2000), who focuses on the negotiation of trade agreements and environmental agreements, and compares two bargaining protocols: a linked negotiation over trade and environmental policies and an unlinked scenario where trade negotiations occur before environmental negotiations. Copeland argues that a country exporting goods whose production contributes more to global pollution is likely to prefer the sequential protocol, while the other country is likely to prefer linked negotiations. The intuition is that, if countries make a prior commitment to free trade, the exporter of pollution-intensive goods will have a better threat point in the environment negotiation, because free trade indirectly commits this country to pollute more, which gives it a Stackelberg-like advantage in the noncooperative pollution game. The other country, on the other hand, will prefer to negotiate trade and pollution levels simultaneously. Note that Copeland's observation strengthens the general point I made above, that in the presence of interdependence across issues, negotiation linkage can have important distributional consequences, so that some countries may oppose such linkage.[36]

Even though in this chapter I focus mostly on non-trade policies that exert non-pecuniary international externalities, it is useful to mention briefly a

[36] In my discussion I have assumed that negotiations take the form of Nash bargains. If negotiations are instead modeled as alternating-offer games a' la Rubinstein, there are several different timing possibilities, including the case where bargains are sequential but completely unrelated, the case where one bargain cannot start until the other is concluded, and the case where an agreement cannot be implemented until both are signed. The latter two sequential protocols can be thought of as falling somewhere between fully linked and fully unlinked negotiations. Horstmann et al. (2005) consider some of these alternative protocols. Moreover there are several papers in the literature on multi-issue bargaining that consider one or more of these protocols, e.g. Fershtman (1990) and Busch and Horstmann (1997). A common finding across these papers is that players are likely to have different preferences over these protocols. However, it is not clear to me that any of the sequential semi-linked protocols are particularly relevant for the case of international agreements.

point made by Bagwell and Staiger (2000, 2001a, 2001b) concerning the negotiation of non-trade policies that exert only terms-of-trade externalities on foreign countries (such as labor standards and certain types of environmental policies). Bagwell and Staiger argue that it is not necessary to write an agreement that explicitly specifies the levels of such non-trade policies, in addition to tariff levels, but the same efficient outcome can be achieved with an agreement that commits countries only to specified levels of market access (or equivalently, terms of trade), in addition to tariff levels. In other words, market access can be a "sufficient statistic" for policies that have only terms-of-trade externalities, and this makes it unnecessary to engage in explicit cross-issue negotiations.[37]

Negotiation linkage with endogenous participation

Thus far I have focused on scenarios where all countries (in the simple model above, just two) participate in both agreements. But there are papers in the literature that focus on the implications of negotiation linkage when participation can be incomplete, in particular Conconi and Perroni (2002) and Carraro and Marchiori (2003). These papers are notable also because they treat negotiation linkage (or lack thereof) as endogenous. I next discuss these two papers, starting with the latter.

Carraro and Marchiori (2003) consider a multi-country scenario where governments choose whether two issues will be negotiatied in a linked or unlinked way through a prior meta-negotiation, assuming that non-linkage is the "status quo" and linkage is chosen only if governments unanimously agree (although the extension to the case of majority voting is conceptually simple). Once the negotiation protocol is chosen, each government decides in which negotiation to participate (if any), and then negotiations occur. Their analysis focuses mostly on the case where one of the issues is characterized by excludability of the benefits of cooperation (e.g. trade), and the other issue has a low degree of excludability (e.g. environment). In this scenario, there is typically a free-rider problem in the participation decisions for the environment issue. Linking negotiations can mitigate the free-rider problem for the environment issue, but it may have the drawback of reducing participation for the trade issue, so there is a trade-off. Carraro and Marchiori derive conditions under which all governments agree on linkage, but perhaps more interestingly, it is also possible that all countries will prefer unlinked negotiations. This possibility is surprising, especially because in the exogenous-participation scenario I considered above it can never happen that linkage hurts all of the countries.

Conconi and Perroni (2002) also consider the endogenous choice of negotiation linkage when participation can be incomplete, but they consider a richer coalition-formation game, which allows for multiple and overlapping agreements, and allows for single-issue as well as linked agreements. Thus negotiation linkage can arise endogenously in a free-form coalition formation game, which is

[37] Elsewhere I have argued (Maggi 2014) that this approach works less well in the presence of contracting imperfections such as privately observed shocks, and a similar point has been made by other authors, for example Lee (2007, 2016).

a novel and interesting feature. The main focus of the paper is on the effects of imposing an exogenous restriction that agreements must be of the linked type ("tie-in" requirement). This kind of rule could hypothetically be imposed by a supranational authority, or chosen by the countries in some prior meta-negotiation. Conconi and Perroni's main result is that a tie-in requirement can lead to less efficient coalition configurations than in the absence of the requirement. Thus, if some supra-national authority could force countries to link issues, this might not be a good idea. A possible criticism however is that, if a supranational authority could impose rules of this kind, it might as well impose full participation in a linked agreement, which would lead to an efficient outcome. A full-participation rule of this kind could take the form of a ban on regional agreements (or a minimum-participation requirement with a quota of 100%).[38]

6 Gains and losses from participation linkage

In this section I focus on the implications of issue linkage as a way to encourage participation in international agreements. I will start with some preliminary considerations on the existing literature, which has focused mostly on the possibility of trade sanctions to induce participation in international environmental agreements (IEAs).

Preliminary remarks on the literature

There has been considerable debate recently on whether it is a good idea to use trade policy in order to encourage participation in global IEAs. For example, in the 2015 AEA Presidential address, Bill Nordhaus argues in favor of tariff sanctions against countries that do not participate in global climate agreements (Nordhaus, 2015). The basic idea is to link cooperation on "public goods", which suffers from severe free-riding problems, with cooperation on "club goods," where the benefits from cooperation are largely excludable. Other scholars who have explored this idea formally are Barrett (1997, 1999) and Eichner and Pehtig (2014), and the idea had previously been proposed informally, for example in the book by Anderson and Blackhurst (1992).[39]

[38] Finally I will mention that there are some papers in the bargaining literature, for example Bac and Raff (1996), Inderst (2000) and Lang and Rosenthal (2001), that allow for an "endogenous agenda," in the sense that a player can choose between making an offer on a single issue or on a bundle of issues, and study under what conditions an unlinked agenda emerges in equilibrium. This modeling approach has been proposed to think about multi-issue bargaining settings such as labor negotiations, but it is not clear that it is equally useful to think about endogenous issue linkage in international negotiations.

[39] Trade policy is not the only policy that can be used to encourage participation in IEAs. In Carraro and Siniscalco (1995), for example, environmental cooperation is linked to cooperation in R&D. The idea is that if a country does not cooperate on the environment, it loses the benefits of technological cooperation. Also foreign aid has been proposed as a lever that can be used to encourage participation in IEAs, but aid has the obvious drawback that it can only be used to improve the incentives of developing countries that are currently receiving aid. Finally, "carrot" incentives in the form of cash transfers can also be used, but I will discuss them later in the text.

As a side note, it is interesting that the idea of participation linkage has been discussed virtually only in the context of IEAs. It is not obvious why. After all, the idea seems applicable to any issue area where there is a problem of free riding in participation. As will become clear soon, free riding in participation is a potential problem for any issue area where the benefits of cooperation are non-excludable. The environment is not the only issue area where this is the case. For example, there are serious free-riding issues in the areas of nuclear and chemical non-proliferation; indeed, there seems to be a significant participation problem for these treaties: India, Pakistan and Israel do not participate in the nuclear non-proliferation treaty, in spite of being nuclear powers. One could argue that also some human-rights policies, such as banning torture and protecting prisoners of war, are characterized by non-excludability of the benefits of cooperation.[40] Interestingly, however, for many of these treaties (such as the Convention Against Torture, or the Geneva Convention) participation is almost universal.[41] On the other hand, note that military alliances do not suffer from this non-excludability problem, because a key aspect of such alliances is the members' commitment to mutual help, and this help is excludable.

Before proceeding it is natural to ask: Is participation linkage truly a different mode of linkage than negotiation and enforcement linkage? The answer is yes. It is different from negotiation linkage, because threatening trade sanctions to induce participation in IEAs does not mean that governments bargain jointly on trade policies and environment policies (in fact, as I noted previously, participation linkage is a weaker notion than negotiation linkage, and it apples only if negotiations are separate). It is also very different from enforcement linkage, because it is aimed at inducing countries to participate in IEAs, not at improving compliance. If governments are very patient, so that there are no compliance problems, there is no need for enforcement linkage (i.e. trade sanctions to punish violations of environmental commitments), but participation linkage (threatening trade sanctions to encourage countries to make environmental commitments in the first place) may be useful.[42]

In what follows I will discuss the potential gains and losses from participation linkage more in depth, highlighting what I think is missing from the existing literature.

The models a' la Barrett (1997, 1999), Eichner and Pehtig (2014) and Nordhaus (2015) formalize participation linkage as trade sanctions imposed exoge-

[40] For example, the Geneva convention arguably generates non-excludable benefits, because it commits its signatories to apply the rules also to non-signatories.The Geneva convention states "*In case, in time of war, one of the belligerents is not a party to the Convention, its provisions shall nevertheless remain in force as between the belligerents who are parties thereto*".

[41] Perhaps part of the reason for this is that these agreements have also a domestic-commitment purpose, in the sense of binding future governments to the respect of human rights.

[42] One point to keep in mind is that this mechanism has potentially an important vulnerability: a country may avoid the sanctions by participating in IEA negotiations but not in a "serious" way, that is, it may refuse to make any meaningful concessions. Perhaps one possible solution to this problem might be to make continuing trade cooperation conditional on *signing* an IEA, not just sitting at the bargaining table.

nously against IEA non-participants, without modeling the endogenous choice of trade policy by governments or the formation of trade agreements. Thus the conceptual picture offered by these models is – in my view – incomplete and leaves some important questions open:

(i) How is this kind of linkage consistent with a multilateral trade agreement? Presumably the imposition of trade sanctions on IEA non-participants is a norm that must be agreed upon, so the trade agreement must allow an exception to accommodate this kind of sanctions.

(ii) If trade sanctions against IEA non-participants are determined endogenously, how severe will they be? And will they be incurred in equilibrium?

(iii) How does the depth of trade cooperation affect the scope for participation linkage? Intuitively, tariff increases against a country should bite more if the trade agreement has previously cut tariffs more deeply.

(iv) Can this type of linkage have repercussions on the level of participation and the depth of cooperation in the trade agreement?

Clearly, addressing these questions requires modeling *jointly* the endogenous formation of trade agreements and IEAs, which thus seems an important task for future research.

The free-rider problem in participation

I next turn to a more formal analysis of the questions discussed above. I will initially talk about a "**t**-issue" and an "**x**-issue" – as opposed to trade and environment – in order to highlight the fundamental features of issue areas that make them good candidates for participation linkage.

Recall the assumption that there is (at most) one global agreement in each issue area. I will consider the following timing for the no-linkage scenario: (i) each government decides whether or not to participate in the **t**-agreement, then participants choose their **t**-policies by Nash bargaining, and then non-participants choose their **t**-policies; (ii) the same sequence as above takes place in the **x**-area.

I will first suppose that countries are symmetric, and later I will discuss the extension to asymmetric countries. Assume governments are sufficiently patient that self-enforcement constraints do not bind, so that participants in an agreement can bargain over the whole set of feasible policies. To keep notation lean I also assume full strategic independence, that is, payoffs are separable in all policies, so that a government's optimal unilateral policy in one issue area is independent of all the other governments' policies and also of its own policy in the other issue area. Formally, let $U^i = \left(\hat{U}_x(\mathbf{x}^i) + \tilde{U}_x(\mathbf{x}^{\mathcal{N}\setminus i})\right) + \left(\hat{U}_t(\mathbf{t}^i) + \tilde{U}_t(\mathbf{t}^{\mathcal{N}\setminus i})\right)$ denote country i's payoff, where I split the vector of all policies $\mathbf{x}$ into the vector of country i's policies, $\mathbf{x}^i$, and the vector of the remaining countries' policies, $\mathbf{x}^{\mathcal{N}\setminus i}$.

Focus first on the **x**-agreement. Let the subsets of participants and nonparticipants be respectively $\mathcal{P}^x$ and $\mathcal{F}^x$ (where $\mathcal{F}$ is mnemonic for "free riders"). Coalition members select their policies by Nash bargaining (with symmetric

bargaining powers).[43] I denote such policies $\mathbf{x}_C(\mathcal{P}^x)$, where the notation emphasizes that these policies depend on which countries are part of the coalition (but do not depend on non-participants' policies, given the assumption of strategic independence). A non-participant i chooses its best-response policies (which do not depend either on other policies or on the size of the coalition), denoted $\mathbf{x}^i_{BR}$.

It is important to understand that the coalitions' policy vector $\mathbf{x}_C(\mathcal{P}^x)$ may or may not have a "targetable" structure, depending on the nature of the issue area. I say that a policy vector has a targetable structure if it consists of a set of bilateral policies, so that the policies can discriminate across foreign countries, as in the case of trade taxes;[44] while it has a non-targetable structure if the policies by nature cannot be discriminatory, as in the case of most environmental policies (e.g. domestic abatement standards).

Similar notation applies to the $\mathbf{t}$-area, except that the subset of participants may be different: the coalition's policies are denoted $\mathbf{t}_C(\mathcal{P}^t)$ and a nonparticipant's policies $\mathbf{t}^i_{BR}$.

Given the presence of international externalities, and given that countries are symmetric, an efficient outcome will typically require participation by all countries in each agreement. Let us consider then under what conditions we can expect complete participation in equillibrium. Here I will focus on subgame perfect equilibria. It would be reasonable in this context to require that equilbria are coalition-proof, but the main insights would not change much, so I will ignore considerations of coalition proofness.[45]

We can take an intuitive shortcut. Consider the grand coalition (where $\mathcal{P}^x = \mathcal{N}$) and ask whether an individual country, say country i, has an incentive to exit; if it does, we have a free-rider problem. Country i has no incentive to exit from the grand coalition if and only if $\hat{U}_x(\mathbf{x}^i_{BR}) + \tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i)) \leq \hat{U}_x(\mathbf{x}^i_C(\mathcal{N})) + \tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}))$, or, in a form that is easier to interpret,

$$\hat{U}_x(\mathbf{x}^i_{BR}) - \hat{U}_x(\mathbf{x}^i_C(\mathcal{N})) \leq \tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N})) - \tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i)). \tag{12}$$

The left hand side of (12) is the gain from moving unilaterally from the cooperative policy to the best-response policy, and the right hand side of (12) is the loss caused by the fact that the coalition re-optimizes its policies if country i exits. Under what circumstances do we expect this condition to be satisfied? We expect the gain from unilaterally deviating to the best-response policy to

[43] We can suppose for simplicity that the coalition bargains over *all* of its members' policies. This may not always be the case. For example, a preferential trade agreement may determine only the trade policies that members impose on each other, not the tariffs that members impose on outsiders. Note that in the case of a customs union the coalition indeed determines all of its members' trade policies. In any event, it would be easy to extend the analysis to allow for participating countries to bargain only on their reciprocal policies.

[44] The MFN rule in GATT-WTO requires tariffs to be non-discriminatory, but this does not change the fact that tariffs are intrinsically bilateral in nature, and the MFN rule does not apply in the case of tariff retaliation for violations of the agreement.

[45] In fact, intuitively in this setting the incentive to free ride and exit a coalition may be stronger for a single country than for a group of countries, so it is not clear that the coalition-proofness constraint would even bind.

be sizable in any cooperation problem, and there is no particular reason to expect that this gain is larger, say, in the trade area or in the environment area. On the other hand, the magnitude of the right hand side of (12) depends in a fundamental way on the *degree of excludability* of the benefits of cooperation in a given issue area, which in turn tends to be higher if the policies in this issue area are *targetable* in nature.

To understand this point, consider an issue area such as trade, where policies are bilateral in nature, hence targetable, and therefore the benefits of cooperation are highly excludable. In this case, if country i leaves the coalition, the re-optimized coalition policies $\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i)$ will entail large tariff increases against country i, because all coalition members will change their bilateral tariffs *vis-a'-vis* country i from their cooperative levels to their best-response levels. Thus we expect the loss $\tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N})) - \tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i))$ to be large. Indeed, in a typical trade model, condition (12) is likely to be satisfied, because given the bilateral nature of trade taxes, condition (12) will be similar in nature to the corresponding condition when there are only two countries, in which case the condition is simply that a country is better off cooperating with the other country than in the noncooperative equilibrium.

But now consider a policy area such as climate change, where policies are not bilateral in nature, and hence non-targetable. Then, if country i leaves the coalition, the re-optimized coalition policies $\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i)$ may not entail large policy changes, and more importantly, there are no bilateral policies that will be readjusted *vis-a'-vis* country i, so we expect the loss $\tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}))-\tilde{U}_x(\mathbf{x}_C^{\mathcal{N}\setminus i}(\mathcal{N}\setminus i))$ to be much smaller than in the case of targetable policies, and hence condition (12) is much more likely to be violated. As a consequence, for an issue area like climate change that is characterized by low excludability, participation is likely to be incomplete, and the outcome is likely to be inefficient.

Besides the degree of excludability, another parameter that critically affects condition (12), and hence the likelihood of a free-rider problem, is the total number of countries. We expect that condition (12) is more likely to be violated when the number of countries is larger. Indeed, if there are only two countries, as I mentioned above, condition (12) states simply that a country is better off under cooperation than in the noncooperative equilibrium, which is by definition satisfied in any cooperation problem.[46]

Suppose that in the $\mathbf{x}$-issue area condition (12) is violated, so there is incomplete participation in equilibrium. What is the size of the equilibrium coalition? First note that under plausible conditions an equilibrium coalition will have at

[46] Another characteristic of an issue area that can affect the severity of the free-rider problem is the concentration of resources (which cannot be formalized here because of the symmetric-countries assumption). Intuitively, a serious free-rider problem is less likely to emerge if one or a few countries account for a big share of the global economy, because they will internalize a large share of the effects of their own policies. At the same time, small countries are likely to be free-riders, but this will pose less of a problem for global efficiency. These considerations reflect a familiar logic of Olsonian collective action, but it is useful to point them out because the present setting is not one where players make fully unilateral choices, as in the simplest Olsonian setting, but rather one where a coalition of players is able to solve the collective action problem internally, but participation in the coalition is a unilateral choice.

least two members. Intuitively, if a coalition has two members there is little incentive for either to exit, because exit would lead to the global Nash equilibrium, and under reasonable conditions a country is better off cooperating with one other country than in the global Nash equilibrium.

Ignoring the integer constraint for a moment, an equilibrium coalition will be one where a country is indifferent between staying or exiting, that is, where condition (12) is satisfied with equality. In the example of an environmental agreement, an equilibrium coalition is such that a country's gain from free-riding balances out with the loss from the reaction of the coalition which, having one fewer member, will internalize its pollution less and hence relax its pollution controls.[47]

Note that, even though countries are ex-ante identical, participants and free-riders may have different payoffs ex post (if countries are not small, so that the integer constraint is relevant). However, assuming that ex-ante countries are under a veil of ignorance, in the sense of perceiving the same probability of ending up inside or outside the coalition, ex-ante payoffs will be the same. This feature is convenient for the discussion to follow because it means that countries will have the same preferences ex-ante regarding issue linkage.

I also note that lump-sum transfers may not help with the free-riding problem. Clearly transfers cannot help with symmetric countries. But even in the case of asymmetric countries, which I will discuss below, transfers may not help. Indeed, there are several papers in the IEA literature showing that transfers can at best mitigate the problem, and only under some circumstances.[48] It is interesting to contrast this finding with the case of negotiation linkage, discussed in section 5, where transfers are helpful, and in fact can make linkage redundant.

Linkage to encourage participation

Let us start by focusing on the benchmark case in which the two issue areas are symmetric, and suppose that in the absence of linkage the same coalition of countries arises in equilibrium in the two areas ($\mathcal{P}^x = \mathcal{P}^t$). In this case, participation linkage cannot accomplish much: reducing cooperation in the t-area with a country that does not participate in the x-coalition has little effect, because the set of participating countries is the same in the two areas, and participants in the t-area have little leverage to threaten non-participants, since

[47] Note that, if the assumption of strategic independence is relaxed, so that the coalition has a Stackelberg advantage over nonmembers, the free-rider problem may be mitigated because the gain from exiting the coalition is lower, but the essence of the tradeoffs does not change.

[48] See for example Barrett (2001) and Carraro and Siniscalco (1993). Transfers are problematic for several reasons. If transfers are used as "stick", in the sense that non-participants must pay a fine, how is this enforced? And if transfers are used as rewards for participants (a "carrot"), how are they financed? If a subset of participants (say large countries) pays for the transfer, this may backfire on these countries' participation incentives. Barrett (2001) finds that transfers can help (partially) only if countries are strongly asymmetric. Carraro and Siniscalco (1993) find that transfers can help only under committment scenarios that are not very realistic. Some authors have also argued that transfers can undermine the stability of coalitions by increasing the dimensionality of the bargaining problem (see the discussion in Nordhaus, 2015).

they are already in non-cooperative mode with them.[49] This argument applies whether or not the issues are interdependent, so it suggests that *there can be gains from participation linkage only if issues are asymmetric.*

At the cost of anticipating some of the points to come, I pause here to highlight how the potential benefits of participation linkage differ from those of negotiation linkage and enforcement linkage, which I examined in previous sections. For example, in the case of enforcement linkage, gains may arise even in the absence of asymmetries (if issues are interdependent), whereas participation linkage can be useful only if issues are asymmetric. Next note the contrast with the case of negotiation linkage: here linkage can be useful because it allows countries to move towards the x-issue efficiency frontier, whereas in the case of negotiation linkage the gains come from moving *along* each single-issue frontier; and also recall that negotiation linkage can be seen as an imperfect substitute for transfers, whereas the participation problem in general cannot be solved by transfers (as I discussed above).

Let us focus on the scenario where the potential benefits of participation linkage are clearest: assume that the t-policies are fully targetable in nature (e.g. trade taxes), so the benefits of cooperation are highly excludable, while the x-policies are non-targetable in nature (e.g. climate policies), so there is a low degree of excludability. Suppose further that, absent linkage, there is complete participation in the trade agreement but incomplete participation in the x-agreement.[50]

Recall that the trade agreement is assumed to be negotiated before the x-agreement, and that participation linkage is defined as a clause in the trade agreement providing for an increase in tariffs against countries that do not participate in the x-agreement. Importantly, the maximum *feasible* trade sanctions are given by an embargo, but the maximum *credible* trade sanctions are arguably less severe; for the sake of argument suppose that the maximum credible sanctions are given by a mutual reversion to the static best-response tariffs between the targeted country and the other countries, or in other words, a full reversal of the tariff cuts that the country had previously negotiated in the trade agreement.

Intuitively, by raising the cost of non-participation in the x-coalition, linkage will increase the equilibrium size of this coalition. A relevant point here is that, if a full reversal of the negotiated tariff cuts is a severe enough punishment, linkage

[49] In principle, participants in the t-agreement could threaten to impose tariffs that are even higher than the noncooperative levels, but it is not clear how this threat could be made credible.

[50] If one were to consider the possibility of regional trade agreements, there would be less of a presumption that there is no "participation problem" in trade agreements. The literature on regional trade agreements has shown that, when participation in these agreements is endogenous, the emergence of a global agreement (the "grand coalition") is not guaranteed. Indeed, there may be "stumbling bloc" scenarios where the equilibrium outcome is not a global agreement, and inefficiencies arise. But a reasonable conjecture is that participation linkage of the kind considered in the text can offer potential gains in spite of this: even in a world dominated by regional trade agreements, the use of trade sanctions to punish non-participation in IEAs may mitigate the IEA participation problem.

will achieve complete participation in the x-coalition, and no trade sanctions will be applied in equilibrium. But if trade sanctions are not a severe enough punishment, there will be countries that choose to stay out of the x-coalition and take the trade sanctions, thus *a cost will be incurred in equilibrium by both participants and nonparticipants*. This raises a question: what is the optimal severity of trade sanctions for non-participation in the IEA? It seems quite possible that, if the maximum credible sanctions are not severe enough, the optimal level of sanctions will be lower than a full reversal of the negotiated tariff cuts.

This question has not received much attention in the literature. In Barrett (1997), the maximum feasible level of sanctions is assumed high enough that there is complete participation in the IEA, so sanctions are not incurred in equilibrium. Nordhaus (2015) does consider the possibility that trade sanctions are incurred in equilibrium in the context of his numerical model. In particular, he computes equilibrium outcomes for tariff penalties between 0 and 10%, and finds that in all scenarios some countries choose to free ride and take these penalties, but the welfare cost of these tariff sanctions is small relative to the benefit of increase participation in the IEA. I will come back to Nordhaus' paper in the section on quantitative work, but I note here that he does not look for the optimal level of tariff sanctions, nor does he examine the maximum credible level of these sanctions.[51]

The next point I want to emphasize is that the effectiveness of trade sanctions to promote environmental cooperation depends on the depth of tariff cuts negotiated in the trade agreement: a mutual reversal of the negotiated tariff cuts of course is more costly if the negotiated tariff cuts are deeper in the first place. And a further point is that, if this effect is foreseen by governments at the time of trade negotiations, they may choose to cut tariffs more deeply than they otherwise would. So, paradoxically, it is possible that negotiation linkage may lead to more trade liberalization, rather than less.

Putting together the considerations above, introducing participation linkage may have two opposite effects on trade barriers: (i) a deepening of the negotiated tariff cuts; and (ii) the (partial or full) reversal of negotiated tariff cuts in equilibrium for countries that choose not to participate in the IEA. An interesting question is how these effects would play out in a fully specified model. I emphasize that the existing models cannot speak to this point, since they do not model explicitly trade agreements.

[51] The question of the credibility of tariff sanctions is examined in Barrett (1999, 2003) and Eichner and Pehtig (2014). Barrett (1999) argues that trade sanctions are credible only if they benefit the countries imposing them, and along similar lines, Barrett (2003) argues that trade sanctions are more credible when the coalition is bigger, because in this case the coalition is more likely to benefit from imposing the tariffs. Eichner and Pehtig (2014) consider extreme trade sanctions in the form of trade embargoes, and adopt the same notion of credibility as Barrett (an embargo is credible only if all coalition members prefer the embargo to free trade). Not surprisingly, in their model it is never the case that the threat of embargo is credible and makes the grand coalition stable, but they find (through numerical analysis) that intra-coalition transfers can make an embargo credible for a certain parameter region.

Endogenous participation linkage

I conclude this section by discussing briefly whether participation linkage is likely to arise endogenously.

With symmetric countries the conceptual picture is clear: if (and only if) there is a level of trade sanctions – even small – that improves the governments' equilibrium payoff, we would expect governments to introduce an environmental-linkage clause when negotiating the trade agreement, or renegotiate the trade agreement and add such a clause if a trade agreement is already in place.

However, countries in the real world are very asymmetric, and this complicates the question. Consider the conceptual approach I proposed above, that since history matters and a trade agreement is already in place, it is natural to take the existing agreement as the status quo and suppose it will be renegotiated only if all members agree.[52] Then the question is: does there exist an environmental-linkage clause that makes all governments better off? Some simple heuristics suggest that the answer may well be "no".

My heuristic argument is the following. With asymmetric countries, absent linkage, there will be some free-riders in equilibrium, and these free-riders strictly prefer to stay outside the coalition. Consider a relatively optimistic scenario where there is only one free rider in equilibrium, and ask whether there exists a trade sanction that can make this government (weakly) better off. If the sanction is severe enough that this country chooses to participate in the IEA, clearly it will be strictly worse off than before; and if the sanction is not severe enough, so that the country stays outside, it will be strictly worse off because it incurs the sanction. This simple intuition suggests that it might not be easy to find any degree of participation linkage that all countries can agree on, but this is an open question.[53]

7 Taking stock

In this section I briefly summarize the key insights developed thus far regarding the potential gains and losses from each type of linkage.

The first point suggested by the analysis is that, in the absence of significant asymmetries or interdependencies across issue areas, there cannot be significant gains from linkage of any kind (enforcement, negotiation or participation linkage).

[52] In principle, a trade agreement could be amended even if not all the member countries agree, for example by a super-majority rule. Indeed, in the WTO some matters are decided by two-third majority, for example admissions of new member countries. However, the amendment of core WTO commitments require consensus. In particular, Article XXX states that amendments to Part I of GATT – which contains the most-favored nation obligation and the negotiated tariff commitments – require "acceptance by all contracting parties." It is not obvious whether a new clause providing for withdrawal of tariff concessions as punishment for non-participation in IEAs could be introduced without consensus of all member countries.

[53] Nordhaus (2015) finds relatively positive results in his numerical simulations: in particular, a tariff of about 10% makes most countries better off, but some important countries (in his simulation, Eurasia and South Africa) are hurt by the tariff.

Second, interdependencies between issue areas *may* imply gains from *enforcement* linkage (e.g. if trade and non-trade policies are complements in the governments' objectives), but not from other types of linkage. Thus, at a broad level, the analysis suggests that issue interdependence *per se* does not provide a strong rationale for issue linkage.

Third, asymmetries across issue areas imply potential Pareto-gains from all three types of linkage, thus the analysis points to issue asymmetries as a stronger rationale for issue linkage. In particular, the model broadly suggests that: (i) potential gains from *enforcement* linkage tend to arise when the severity of self-enforcement constraints differs across issue areas; (ii) potential gains from *negotiation* linkage tend to arise when the relative bargaining position of governments (which is summarized by the slope of the Pareto frontier at the bargaining outcome, and a key determinant of which is the position of the disagreement point) differs across issue areas; and (iii) potential gains from *participation* linkage tend to arise when the degree of excludability in the benefits of cooperation, and hence the severity of the free-riding problem in participation, differs across issue areas.

The analysis also suggests that, while issue linkage typically offers *potential* Pareto-gains for the governments involved, these are not guaranteed to be realized in equilibrium, and some countries may lose from issue linkage.

One more note before proceeding. In my theoretical framework I have only considered the possibility of a single multilateral agreement in each policy area, abstracting from the possibility of regional or "plurilateral" agreements. Consideration of these more complex coalition structures is beyond the scope of this chapter, but a simple observation can be made here. I emphasized above that issue linkage may benefit some countries and hurt others. If this is the case, a natural possibility is that linkage may be adopted only by the countries that benefit from it. This could provide an interesting perspective from which to interpret deep-integration agreements characterized by strong issue linkages, such as the European Union, the West African Economic and Monetary Union, the East African Community, and perhaps also the recently-negotiated Trans-Pacific Partnership. And by a similar token, one can perhaps interpret the existence of "plurilateral" agreements within the WTO as clubs of countries that benefit from issue linkage. For example, one such plurilateral agreement is the Agreement on Government Procurement, whose objective is to open up government procurement to international competition, which currently enlists 15 of the WTO member countries (with 10 more WTO member countries currently negotiating to join it).

8 Transaction-cost arguments against linkage

As I argued in section 2, in reality non-linkage is much more prevalent than linkage. In contrast, the formal literature on issue linkage overviewed above paints a broad picture where gains from linkage are easier to find than losses from linkage. This motivates my discussion in this section: might there be other

drawbacks from linkage that existing formal models have not highlighted? Why do we observe so much fragmentation in international agreements? Here I will discuss briefly some arguments against linkage that have been articulated by scholars – mostly in political science and international law – at an informal level. The common theme underlying these arguments is the presence of some form of transaction costs.

Many scholars, including Horn and Mavroidis (2014), Koremenos et al. (2001) and Charnovitz (1998), have argued that the presence of *bargaining costs* and *contracting costs* can help explain why issue linkage is not very frequent. The idea is that increasing the dimensionality of a contract makes it harder and more time-consuming to bargain, specify details in the contract, and verify compliance ex-post.

Even though I will readily subscribe to the view that contracting costs are of first-order importance in reality, this argument has validity only if contracting costs are *convex* in the dimensionality of the bargain. If contracting costs are additive over issues, then having a single linked negotiations will not be more costly than bargaining separately over the various issues.[54] In fact, to the extent that there are fixed bargaining costs (such as the cost of organizing a big intergovernmental meeting or travelling to the negotiation site), this will make it more efficient to include multiple issues in the same negotiation.

Horn and Mavroidis (2014) suggest through a simple example why contracting costs might be convex in the number of issues. Suppose two countries bargain over tariffs, and each country can set a tariff high or low. Then in an unlinked trade negotiation, there are 4 possible tariff configurations that could be proposed. Suppose it takes trade negotiators a month to evaluate each potential proposal. In a similar unlinked environmental negotiation, there would be 4 potential proposals to be evaluated by negotiators. Then negotiators would spend a total of 8 months evaluating possible proposals over the two unlinked agreements. If negotiations were linked, on the other hand, it is easy to see that there would be 16 possible policy configurations, and hence 16 potential proposals to be evaluated, which would require more time than in the two unlinked negotiations combined. But while this seems like a plausible argument, whether or not the presence of convex contracting costs is of first-order importance is ultimately an empirical question.

Another argument that could be made, in a similar vein as the one just mentioned, is that negotiators typically have specialized expertise: for example, trade agreements are typically negotiated by trade experts, and environmental agreements are negotiated by environmental experts. If different issue areas are negotiated in the same bargaining room, it may be costly for specialized negotiators to communicate and coordinate, both across the bargaining table and within a national team. And if trade negotiators and environment negotiators speak different languages (which they often do), this by itself can make the

[54] Of course, one way to save on contracting costs is to leave some issue areas out of the agreement altogether, but this is not an argument for de-linking, it is an argument for leaving the contract incomplete. See Horn et al. (2010) for a model where trade agreements may be left incomplete to save on contracting costs.

bargain more complicated.

Still in the same general vein, one could argue that, to the extent that negotiators in different issue areas have asymmetric information, linking negotiations will inject asymmetric information in the bargaining room, and we know from bargaining theory that this may well increase the probability of bargaining failure.

Finally, a related argument is the one made by Harstad (2007), who shows that in the presence of asymmetric information, including transfers in the bargain may increase the probability of bargaining failures, and this may be a reason for the bargainers to commit not to use transfers. Since, as I explained above, negotiation linkage can be viewed as an imperfect substitute for transfers, Harstad's argument can be used to suggest a possible drawback of issue linkage.

Another line of argument focuses on the enforcement side of international agreements, rather than on the negotiation side.

International organizations often include a judicial system, such as the WTO's Dispute Settlement Body or the International Tribunal for the Law of the Sea. Even though in the models overviewed above there is no interesting role for an international court, in reality these courts play a non-trivial and complex role, and are often called upon not only to verify compliance by governments but also to interpret vague aspects of the agreement or fill its gaps.[55] An argument proposed by scholars such as Trachtman (2002, 2013), Charnovitz (1998) and Perez (2005) is that there are *diseconomies of scope in judicial activity*. The idea of diseconomies of scope in the judicial system is an intriguing one, so it deserves to be examined more closely. I will keep using the example of trade and environment issues to make the discussion concrete.

One point that seems valid is that, *if* the trade and environment courts are integrated into a single court that adjudicates all disputes, this could create inefficiencies, for reasons similar to the ones mentioned above regarding the negotiation process. Judges in a trade-dispute court have specialized trade expertise, and judges in an environment-dispute court have specialized environmental expertise; putting judges who have asymmetric information and perhaps speak different languages to work together in the same panel may inject inefficiencies in the judicial process.

However, the point just above is not sufficient to argue that there are diseconomies of scope in judicial activity: one has to argue that a full integration of the courts is inevitable if agreements are linked, but this is not clear. In what follows I argue that there can be linkage both in the sense of negotiations and in the sense of cross-issue punishments while keeping the courts separate, i.e. the two courts can be stapled together without true integration, so that there is a "trade branch" and an "environment branch" of the court, and more to the point, the two court branches can be kept separate without diminishing the potential gains from linkage at the level of negotiation and cross-issue

[55] See Maggi and Staiger (2011) for a model that elaborates on these ideas in relation to trade agreements.

punishment.

For the sake of argument, suppose initially that issues are separable. In this case, whether or not agreements are linked, they will specify separate commitments on trade policy and environment policy. In this case it should be clear that one can keep the two court branches separate without diminishing the potential gains from linkage. This point is obvious with regard to negotiation linkage (trading concessions at the negotiation stage does not require integrating the courts), but it applies also with regard to cross-issue punishments. Linking punishments simply means that, if a violation of an environmental-policy commitment is verified, there will be sanctions also in the trade area. Violations of environmental-policy commitments can be verified by the environment branch of the court without involvement of the trade branch, and without affecting the gains (or losses) from cross-issue punishments.

Next suppose there are structural interactions between the issues, so that trade and environment policy commitments are interdependent. Consider first the case of unlinked agreements. An unlinked trade agreement may specify trade-policy commitments that are contingent on environmental circumstances. In this case, the adjudication of trade disputes may require the trade court to verify the relevant environmental circumstances, and if the trade court needs to interpret vague aspects of the agreement, it may have to evaluate tradeoffs involving trade and environmental considerations.[56] A similar argument applies to an unlinked environmental agreement. Now let us compare the above-described unlinked agreements with a linked agreement. A linked agreement will specify both trade-policy *and* environmental-policy commitments, and perhaps will also specify cross-issue punishments. In such an agreement, one can replicate the performance of the unlinked courts by keeping the two branches of the court separate: the trade branch will examine claims regarding trade-policy commitments, and the environment branch will examine claims regarding environment-policy commitments; this will not be worse than having two unlinked agreements.

Of course, it may well be that making trade-policy commitments contingent on environmental circumstances (or vice-versa) has drawbacks, but then the argument applies also to unlinked agreements: it just means that in either case negotiators will have to be mindful of these drawbacks and perhaps settle on non-contingent policy commitments. But this is not an argument against linkage, it is an argument against making policies in one area contingent on circumstances in the other area, which applies whether or not agreements are linked.

To recap, my argument above is that the drawbacks from fully integrating courts across issue areas is not an argument for unlinked agreements, because these drawbacks can be avoided by organizing the court in separate branches,

[56] Note the semantics I am using. As in the rest of the chapter, I define "linkage" in the narrow sense of linked negotiations or cross-issue punishment. A trade agreement that makes trade-policy commitments contingent on environmental circumstances can still be "unlinked" in my terminology.

each specialized in one issue area.[57] This can be an argument against making policy commitments in one issue area contingent on circumstances in the other area, but again, this applies whether or not agreements are linked in terms of negotiation or cross-issue punishments.[58]

I conclude this discussion by mentioning an intriguing argument that has a bounded-rationality/sociological flavor. Some scholars (Perez, 2005; Esty, 2001) have argued that one impediment to linking trade and environment agreements is a "clash of cultures" between interest groups in the two areas (Esty for example states "the ideological cleavages underlying the trade/environment conflict may be unbridgeable"). I am not sure this argument can be squared with a rational-choice approach, but this does not mean that the argument has no basis. From a rational-choice point of view, if two interest groups have different beliefs about the world and/or different values, this does not imply that there is no scope for mutual gains, and the conflict of interests/beliefs between the two groups may be severe even if agreements are unlinked. So one interpretation of this argument is simply that these groups have a hard time co-existing in an integrated institution, like roommates that can't stand each other. Maybe so.

9 Empirical work on issue linkage

There is little empirical evidence on the gains and losses from issue linkage. There are at least two big ostacles for this kind of empirical research. The first one is the smallness of the samples: as I argued above, the number of instances in which there is clear issue linkage in reality is relatively small. The second obstacle is that the gains and losses in terms of government objectives are generally not observable. Thus a full econometric analysis of the above question based on observational data may be out of reach.

It is possible, however, to use the available data to shed light on some partial aspects of the above question. For example, one can try to gauge whether issue linkage in negotiations increases the likelihood of success in negotiations, or whether issue linkage in enforcement increases the likelihood of compliance with agreements in a given area. This approach has some serious limitations, however (in addition to the small-sample problem): regarding enforcement linkage, violations may remain off the equilibrium path, whether or not issues are linked; and regarding negotiation linkage, the potential benefit from linkage suggested by theory is a better negotiation outcome, not a higher probability of

[57] Of course, the presence of these drawbacks *is* a legitimate argument against a fully integrated court system (and against an integrated *institution*, if this is defined as having a fully integrated court system).

[58] Some scholars (e.g. Charnovitz, 1998) have mentioned a different argument against integrated institutions, based on the presence of limited judicial/institutional *capacity*. I do not find this argument very convincing. If the trade institution has an amount of resources X to devote to dispute settlement and the environment institution has resources Y, why would a linked institution be more constrained, with resources $X + Y$ at its disposal? Unless linking agreements leads to more disputes than the sum of the disputes generated by the two unlinked agreements (and it is not clear why this would be the case), this idea seems hard to justify.

agreement. Finally, when it comes to participation linkage, there is virtually no data on the effects of trade sanctions on governments' decisions to participate in environmental agreements, so this is a counterfactual question that one can only hope to address through quantitative/calibration approaches.

With all that said, there are a few interesting examples of empirical work on issue linkage, which I now review briefly.

Regarding enforcement linkage, a few papers have attempted to assess whether linkage is effective at improving compliance with international agreements. Hafner-Burton (2005) focuses on the linkage between trade and human-rights policies. In particular, she examines whether introducing human-rights clauses in preferential trade agreements (PTAs) improves state compliance with human rights, compared with unlinked human-rights agreements. She also makes a distinction between PTAs that include "hard" human rights commitments (meaning that the PTA explicitly provides for trade sanctions in case of human rights violations) and PTAs that include only "soft" human rights clauses (i.e. without specifying concrete punishments). She finds that compliance is highest in the case of PTAs that specify hard human-rights commitments. I note however that Hafner-Burton's results have been questioned by Spilker and Böhmelt (2013). Their main criticism is that there is a selection bias due to the fact that states with a higher general propensity to respect human rights are more likely to accept PTAs with hard human-rights commitments in the first place. Using a newer dataset and genetic-matching techniques, they find that issue linkage does not significantly improve compliance with human rights.

The question of whether issue linkage improves compliance has also been examined in the context of security agreements by Leeds and Savun (2007) and Poast (2012). Leeds and Savun (2007) find that security alliances are less likely to be opportunistically terminated when they include economic provisions. While this finding is just suggestive, Poast (2013) employs an interesting strategy to identify the causal relationship between issue linkage and treaty compliance: he focuses on alliances involving "buffer states" (states located between recently or currently warring rivals), which are especially vulnerable to invasion, and investigates whether the likelihood of treaty violations against these states is lower when the treaty includes trade provisions. The idea is that the temptation to violate alliance commitments is highest for states that neighbor buffer states, thus if issue linkage reduces this temptation, it should be effective in many other contexts as well. Poast finds that buffer states in alliances with trade provisions experience fewer violations of their territorial integrity than buffer states in other alliance arrangements.[59]

[59] This is a good juncture to mention the literature on "trade and war", some prominent examples of which are Gowa (1994), Gowa and Mansfield (1993) and Martin et al. (2008, 2012). I mention this literature only briefly because its focus is quite different from that of this chapter. Gowa (1994) and Gowa and Mansfield (1993) examine theoretically and empirically how an (exogenously given) security alliance affects trade between its members. They argue that allies are more prone to lower trade barriers between each other, both unilaterally and through trade agreements: the basic idea is that higher income implies more military power, so a country has incentive to trade more with an ally in order to make it richer, and trade less with an adversary in order to make it poorer. Martin et al. (2012) examine (theoretically

The impact of issue linkage on the success of international negotiations has been the subject of many case studies, but there have been hardly any econometric studies on this question. The main exception I am aware of is Poast (2012), who focuses on the impact of trade-security linkages on alliance negotiations between 1860 to 1945, a subset of which ended in negotiation failure. He finds that offers of trade linkage increased the probability of success in alliance negotiations by about 36 percent.[60]

Turning to participation linkage, as I pointed out above there is little hope for a genuine econometric approach, so it is not surprising that the few existing empirical papers on this topic have taken a calibration approach. A key paper in this literature is Nordhaus (2015), who focuses on tariff sanctions as a tool to encourage participation in a global climate agreement.[61] Nordhaus considers a computable-general-equilibrium model augmented by a climate component, the core of which is represented by transnational externalities from CO_2 emissions, whose global social cost is assumed to be in the range of \$12–\$100 per ton CO_2 (as suggested by existing estimates), and abatement costs calibrated on the basis of a McKinsey Company engineering model. The trade component of the model is based on a reduced-form tariff-impact function, which represents the impact of each country's tariffs on the welfare of each other country. The numerical parameters of the tariff-impact function are derived from Ossa (2014). The model considers 15 regions, each of which chooses simultaneously whether to participate or stay out of a global climate agreement, and focuses on coalition-proof Nash equilibria.

A limitation of Nordhaus' model, from the perspective of my discussion of participation linkage in section 6, is that tariff penalties for non-participation are taken as exogenous, and trade cooperation is not even considered in the model. This leaves open a number of questions, including what tariff penalties are consistent with a trade agreement, to what extent they are credible, and how trade cooperation itself is affected by issue linkage. Having said this, Nordhaus' work breaks some new ground and delivers some intriguing results. The first

and empirically) a mechanism that goes in the opposite direction: increasing trade increases the opportunity cost of war, thus if the probability of conflict between two countries is higher (e.g. because they are not part of the same alliance), they are more likely to sign a trade agreement with each other. And the reverse link, from trade to the probability of war, is the focus of Martin et al. (2008). A key point of this paper is that, even though trade increases the opportunity cost of war, it is possible that increasing a country's global trade openness makes this country more likely to end up in a bilateral war, because the country can more easily substitute away from bilateral trade with a specific country.

[60] I should also mention the paper by Davis (2004), who focuses on negotiations between the US, Japan and the EU aimed at liberalizing agriculture over the period 1970-1999. She shows that these negotiations were more likely to be successful in settings where multiple issues were on the bargaining table, such as multilateral GATT/WTO negotiation rounds, then in settings where the scope for linkage was much more limited, such as trade dispute settlement. However, the "linkages" considered by Davis are not between trade and non-trade issue areas, but rather across different sectors within the trade area, so they do not really fit my definition of issue linkage. In terms of my formal notation, Davis focuses on "linkages" between τ-policies in the agricultural sector and τ-policies in (e.g.) the manufacturing sector, not between τ-policies and x-policies.

[61] For some earlier attempts, see Kemfert (2004) and Lessmann et al. (2009).

result is that, absent tariff penalties for non-participants, no country will join the climate agreement, even if the pollution abatement required by the agreement is small. He then considers a penalty for non-participants in the form of a uniform percentage tariff, and finds that a relatively low tariff (on the order of 5%) is sufficient to induce a dramatic increase in participation (although not full participation) and deep emission reductions.[62] In terms of welfare, Nordhaus finds that a tariff penalty on the order of 5% is beneficial to most countries, as the cost of trade distortions incurred in equilibrium is small relative to the benefits of increased participation. And interestingly, even the countries that choose to free-ride and are penalized by the tariff typically prefer this regime to one without penalties, because they benefit significantly from a better environment.

10 Coercive trade sanctions

In this section I focus on the use of trade sanctions by one or more countries (the "senders") as a means of inducing policy changes by another country (the "target") in non-trade areas such as human rights, security, or the environment. My main objective here is not a comprehensive review of this research area, but rather to clarify how it relates to the questions and analysis I focused on above.

There is an interesting divide in the literature. Coercive trade sanctions are by definition a form of policy linkage, but the literature on this topic (which I will sometimes refer to as "non-cooperative" issue linkage) and the literature on issue linkage in international agreements (which I will refer to as "cooperative" issue linkage) have virtually ignored each other, in spite of the fact that there are interesting questions at the boundary of the two areas, including a very basic one: What is the conceptual difference, if any, between cooperative and noncooperative linkage? The boundary between the two kinds of linkage is actually blurred. Consider a government announcing to another government "if you do not protect human rights in your country, I will raise my tariffs on you." Is this a threat of coercive sanctions, or a take-it-or-leave-it offer (where the proposer has all the bargaining power) that can move countries from an inefficient status quo to the Pareto frontier?

I will propose a simple way to think about coercive trade sanctions and understand how they relate to cooperative linkage. Suppose Home chooses a tariff τ and Foreign chooses a human-rights policy x, with payoffs given respectively by $\omega(\tau, x)$ and $\omega^*(\tau, x)$. The starting point to think about coercive sanctions is a status quo where governments choose their unilaterally optimal policies, say (τ^N, x^N), just like the starting point for an international agreement. Assume the status quo is Pareto inefficient.

As usual, I will think of an international agreement as a negotiation that takes countries to the Pareto frontier and gives each country a (weakly) higher

[62] Nordhaus also discusses the possibility of carbon duties as a penalty for non-participation, but argues compellingly that they are less attractive than uniform tariffs, because they are complicated to design and have limited coverage, especially for countries like the US that export relatively little carbon-intensive products.

payoff than the status quo. Note that in this setting it is necessary to use (cooperative) issue linkage to achieve any Pareto-improvement over the status quo.

A simple way to think of coercive trade sanctions, on the other hand, is the following. Suppose Home has access to a commitment technology that allows it to credibly link its tariff to Foreign's policy, say a schedule $\tau(x)$. This schedule may specify that Foreign will be charged with higher tariffs if it chooses worse human-right policies. This kind of commitment might be possible for example because of Home's domestic laws. Suppose for the moment that Foreign does not have a similar commitment ability. Let $\bar{\tau} \geq \tau^N$ be the maximum credible tariff that this commitment technology allows; this could be a prohibitive tariff (e.g. an embargo), or it could be a less-than-prohibitive tariff if Home has only partial commitment ability. One could interpret $\bar{\tau} - \tau^N$ as a measure of Home's ability to commit to costly trade sanctions. The timing of the game is simply that Home chooses a schedule $\tau(x)$, and then Foreign chooses x.

It is not hard to show that the equilibrium of this game yields a point on the Pareto frontier that gives Home a payoff higher than the status quo payoff, and gives Foreign a payoff lower than the status quo. Moreover, Home is better off in this equilibrium than under an agreement (i.e. a negotiation where the disagreement point is the status quo), even if Home has all the bargaining power in the negotiation. And intuitively, the stronger is Home's commitment ability $(\bar{\tau} - \tau^N)$, the more Home gains and Foreign loses relative to the status quo.[63] Note that if the maximum credible tariff is τ^N, the outcome is the same as in the case of a bargain where Home has all the bargaining power. This can be seen as the boundary between coercive and cooperative issue linkage.[64]

The above bare-bones model suggests a way to understand how coercive issue linkage relates to cooperative issue linkage. Cooperative linkage leads to a Pareto-improvement over the status quo, while coercive linkage leads to a redistribution of payoffs, making the "sender" country better off and the "target" country worse off relative to the status quo (even though the outcome is Pareto-efficient). And the other key point is that coercive linkage can be successful only if the sender country has a superior commitment ability relative to the target country.

The model above also suggests a simple point regarding the endogenous emergence of coercive linkage versus negotiated linkage. Recall from the analysis

[63] To see this, first note that there is no loss of generality in focusing on stick-and-carrot schedules $\tau(x)$ that promise a tariff τ_1 is Foreign chooses x_1 and threaten the maximum credible tariff $\bar{\tau}$ if Foreign chooses any other policy. Next note that, if Foreign is to choose a policy different from x_1, it will choose x^N.The sender's problem can then be written as $\max_{\tau_1, x_1} \omega(\tau_1, x_1)$ s.t. $\omega^*(\tau_1, x_1) \geq \omega^*(\bar{\tau}, x^N) \equiv \bar{\omega}^*$. This problem clearly yields the point on the Pareto frontier where Foreign's payoff is $\bar{\omega}^*$. Note that $\bar{\omega}^*$ is weakly lower than Foreign's status quo payoff $\omega^*(\tau^N, x^N)$, as claimed in the text. It is also clear that Home is better off under coercive sanctions than under a negotiation where the disagreement point is the status quo, even if Home has all the bargaining power.

[64] Also note that, even if Home cannot commit to charging tariffs higher than the unilaterally-optimal level τ^N, the very fact that it can commit to a schedule $\tau(x)$ gives Home an advantage, which is tantamount to being able to making a take-it-or-leave-it offer in a bargain.

just above that Home is better off under coercive linkage than under negotiated linkage even if it has all the bargaining power in a negotiation. Thus, Home will always choose the coercive route if it has superior commitment ability relative to Foreign. Together with the arguments made above, this suggests that the *differential in commitment ability* (if any exists) between the countries is the critical aspect that distinguishes coercive from cooperative linkage and governs the relation between the two.

I conclude this section with a few remarks about the existing literature on coercive trade sanctions. The theoretical literature on this topic is quite small. Arguably the most influential paper in this area is Eaton and Engers (1992). The basic points I made above are broadly consistent with Eaton and Engers' theory. In their model, a sender country and a target country interact repeatedly under complete information, and the sender is able to commit for a limited time to a sanction mechanism whereby a mutually-costly policy is imposed if the target's policy does not satisfy a minimum standard (chosen by the sender). Focusing on Markov perfect equilibria, they study how the effectiveness of sanctions depends on the relative patience of the countries and on the extent to which each country suffers from sanctions. As in my simple model above, a critical aspect of Eaton and Engers' theory of sanctions is the superior commitment ability of the sender country; indeed, if the sender has the same ability to commit as the target, sanctions are completely ineffective.

A natural question is whether trade sanctions can be effective even if the sender country does not have superior commitment ability. One possibility is that, if the sender has private information, it may be able to build a reputation for toughness, by mimicking a "commitment" type that carries out sanctions even if they are harmful. An argument of this kind is made in Eaton and Engers (1999). However, a weakness of this argument in my view is that it relies on the assumption that only the sender has private information. It is not clear to what extent this argument retains validity if both countries have private information.[65]

Finally, I note that there is a large empirical literature investigating the determinants of the effectiveness of coercive sanctions; a prominent example of this literature is the book by Hufbauer, Schott and Elliott (1999). A comprehensive review of the empirical work in this area however is beyond the scope of this chapter.

11 Conclusion

I conclude this chapter by pointing to some possible avenues for future research that in my view are particularly promising.

One recurrent theme in my discussion above has been that issue linkage

[65] See also Lacy and Niou (2004) for a model of sanctions with private information. I will mention here also the work by Kaempfer and Lowenberg (1988, 2004), who develop a theory of sanctions that focuses on the role of domestic interest groups and the internal distributional consequences of sanctions.

is relatively uncommon in reality, in spite of the fact that theory highlights a number of potential benefits from issue linkage. Addressing this "puzzle of the missing linkage" in a more systematic way seems like a worthwhile objective for future research. Relatedly, a question that has not received much attention in the literature is the distributional effects of issue linkage. What types of countries are likely to gain, and what types of countries are likely to lose from issue linkage? This question is interesting not only in its own right, but also because addressing it might help resolve the above-mentioned puzzle. To the extent that issue linkage requires the support of most if not all countries involved, an obstacle to its adoption might be that countries have divergent preferences over linkage. And this in turn points to another question that has not been satisfactorily addressed in the literature, namely how issue linkage – or lack thereof – is determined endogenously.

As I argued in previous sections, one of the three forms of issue linkage, namely participation linkage, has received less attention than the others in the literature. The existing research on this topic, and more specifically on the potential role of trade policies to encourage participation in environmental agreements, is still in its infancy, and there are a number of important questions that are still open. In particular, I think we need to improve our (theoretic and quantitative) understanding of participation linkage through models that endogenize both trade agreements and environmental agreements.

Most of the work on issue linkage (including my analysis above) assumes that countries are unitary actors.[66] Considering explicitly the role of domestic interest groups and modeling international cooperation as a "two-level game" (in Robert Putnam's terminology) is likely to contribute important insights to the study of issue linkage.

And finally, the literature has focused only on scenarios where international agreements are motivated by international externalities generated by the various types of policy. An interesting open question is whether and to what extent the arguments developed for this kind of scenario extend to scenarios where international agreements are motivated at least in part by domestic-commitment problems.

[66] But see footnote 9 for some partial exceptions.

12 References

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