Beyond Trade: The Expanding Scope of the Non-trade Agenda in Trade Agreements*

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Abstract

Increased complexity and density of transnational problems creates unprecedented challenges and opportunities for contemporary international governance. 'Issue linkage' is one institutional arrangement through which states address these changing circumstances. In this paper, we examine the widening scope of the non-trade agenda in Preferential Trade Agreements (PTAs). Non-trade issues (NTIs) such as human rights, democracy, environment, corruption and labor standards are increasingly linked to PTAs. This issue linkage has important implications for understanding changing patterns of international trade, including the shift to PTAs and the rise of NTIs. We show that: (1) states' choices to commit to bilateral or plurilateral versions of traditional PTAs and to PTAs with NTIs are highly interdependent; (2) states increasingly incorporate NTIs into PTAs as the associated costs of policy change are lowered through earlier agreements and; (3) network pressures favor the increasing adoption of bilateral and especially plurilateral NTIs over time. Using an original data set on NTIs covering 522 PTAs and spanning the period 1951-2009, we evaluate states' motives behind the widening non-trade agenda of trade agreements using longitudinal network modeling. We employ multiplex co-evolution stochastic actor-oriented network models (SAOMs) in a novel design to account for interdependencies within and across states' decisions. Following a descriptive mapping of major non-trade issue areas, we evaluate our theoretical arguments. Testing against the alternative explanations of power and commitment, we find that endogenous cost considerations are the most significant factor explaining the inclusion of NTIs into PTAs.

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1 Introduction

Preferential trade agreements (PTAs) increasingly go beyond their traditional subject matter of market access. This has become especially visible in the current negotiations of the twelve-nation Trans Pacific Partnership (TPP) and the Transatlantic Trade and Investment Partnership (TTIP) between the EU and US. US President Barack Obama has deemed the TPP to be "the highest-standard, most progressive trade deal in history," praising its "strong, enforceable provisions for workers ... [and] on the environment" (The White House, 2015). Similarly, the TTIP is "about more than ... [an] economic boost" as it is likely to include provisions covering democracy, rule of law, environment, and social standards (Malmström and Hill, 2015). We term such provisions that do not directly concern trade and go beyond what is typically regulated by the multilateral trading system "non-trade issues" (NTIs).

While the inclusion of NTI provisions has received extraordinary attention in negotiations over the plurilateral TPP and bilateral TTIP, both agreements actually build on the experience of over 327 previous PTAs that include NTI provisions. NTIs are not just a feature of the contemporary trade agenda, but have become increasingly common over the past couple of decades. However, their incorporation remains largely outside of the World Trade Organization's (WTO) regulatory jurisdiction.[1] Although developed states have long sought to more fully incorporate NTIs into the WTO agenda, they have encountered strong resistance primarily from developing states, which see the linking of non-trade issues to trade as a cover for Northern protectionism (Bhagwati, 2002; Joseph, 2013; Shahin, 2002). Indeed, NTI provisions are potentially costly commitments that may require costly policy changes. For example, four TPP members – Vietnam, Mexico, Brunei and Malaysia – have labor rights practices that do not conform to current TPP proposals (Trumpka, 2015), implying the need for expensive reforms. Why then have NTIs proliferated along with PTAs?[2]

We begin our investigation of this question by considering three theoretical explanations. First, NTIs could express a commitment among trade partners to protect the trade agreement from being undermined by "race to the bottom" competition on non-trade issues and/or to use trade as a means to achieve NTI-related values. In this view, the TTIP also offers an opportunity to strengthen "shared Atlantic values, from the fundamentals of democracy and the rule of law, to key areas such as the environment and social standards" (Malmström and Hill, 2015). Alternatively, NTIs may be a way by which powerful states impose conditions on weaker states or for weaker states to attract powerful partners (e.g. Meunier and Nicolaïdis, 2006; Hafner-Burton, 2005; Postnikov, 2014). The TPP, for example, has been described as "an effort to use the holy grail of free trade to impose conditions" (Baker, 2012). Finally, the acceptance of NTIs may be shaped by the costs they entail for member states, which in turn depend on whether these impose substantially new obligations. Because PTA and NTI decisions are interrelated, however, the costs of choosing an NTI in one agreement depend on whether and which of the prospective partners have adopted similar obligations in earlier treaties.

We evaluate these explanations using actor-oriented network models. Specifically, we use multiplex stochastic actor-oriented models (SAOMs) to examine the post-1989 formation of bilateral and plurilateral PTAs and NTIs.[3] SAOMs are appropriate when the main concern is why actors choose their ties (Snijders, van de Bunt and Steglich, 2010). Here, we are primarily interested in explaining states' decisions to include NTIs. While SAOMs have previously been employed in International Relations (Manger, Pickup and Snijders, 2012; Manger and Pickup, 2016; Kinne, 2013, 2014; Warren, 2010), our simultaneous inclusion of both bilateral and plurilateral agreements as an interlocking two-mode network is novel.[4] Furthermore, we incorporate "cross-network effects" (Snijders, Lomi and Torló, 2013) to capture and compare interdependencies among states' choices to commit

to PTAs and NTIs, each either bilaterally and plurilaterally. This allows us to assess for instance whether a state is more likely to accept a bilateral NTI when it is already a member of one or more plurilateral PTAs.

Our empirical results show the cost argument to be most important in explaining the development of NTIs, and the NTI network, over time. Because the cost of accepting an NTI is heavily reduced once one or more parties have already committed themselves elsewhere, NTIs have significant network externalities. We show that this cost mechanism is specific to NTIs and not to PTAs more generally. By contrast, commitment to common values and raising standards does not appear to be a significant factor in explaining NTIs. Power also has a limited impact and operates not so much in the form of coercive leverage as through a combination of powerful states' preference for plurilateral NTIs coupled with weaker states being attracted to large plurilaterals. Finally, the cross-network effects show that there are strong pathways through which states "upgrade" bilateral and plurilateral PTAs by complementing or replacing them with NTIs. The result is that the NTI network has become a prominent feature of the international trade landscape.

2 Theory: Why do states link NTIs to PTAs?

States sign PTAs to expand their benefits from trade. The motivations behind PTA creation, their trade-related design choices and their impact on regional and international politics have been widely studied (e.g. Baldwin, 1997; Fernandez and Portes, 1998; Manger, Pickup and Snijders, 2012; Manger and Pickup, 2016; Milner and Mansfield, 2012; Smith, 2000). But the increasing tendency to link NTIs to PTAs has not been adequately investigated.[5] Indeed, we know little about states' motivations for the initial inclusion of NTIs into preferential trade agreements, although domestic political pressure appears to be a prime source of the non-trade agenda. States include NTIs into PTAs in order to appease domestic audiences

(author) and to avoid competition on regulatory standards. The saliency of non-trade issues such as labor standards or environmental protection has been vivid in recent TTIP and TPP negotiations. Public protests and opposition to trade policies that do not take into account the consequences for other policy domains have been crucial triggers behind states' willingness to expresses such concerns vis-à-vis trade partners. As we show below in section 3, the EU has assumed a leading role in promoting NTIs through PTAs; the US, on the other hand, has been much slower in this regard.

Our primary concern in this paper is not the spread of PTAs per se but the subsequent proliferation of PTAs with NTI clauses. We begin by developing three explanations for the proliferation of NTIs: commitment, power and costs (for an overview see Table 1). For each of our three theoretical arguments, we elaborate our explanations first for the bilateral case (e.g., between states a and b), and then consider their logic in the plurilateral (triadic) context. In a plurilateral agreement, a set of states accept the same NTI in one agreement (e.g., involving states $abcde$) undertaking a commitment that corresponds to a set of bilateral arrangements and that can be expanded to further states.

2.1 Mutual commitment

Agreements are mutual commitments to undertake (or cease) an action. PTAs are mutual commitments between states to lower trade barriers; NTIs are mutual commitments to pursue non-trade policy objectives. In some cases, NTI commitments are directly related to the purpose of the PTA (trade-related issues – TRI), but in other cases they are not directly related (trade-unrelated issues – TUI).

NTI commitments are directly related when their purpose is to support a trade agreement (or to prevent it from being undermined). For example, fear of "downward harmonization" leading to lower regulatory standards in terms of environmental and labor rights protection has put the spotlight on the TTIPs NTI clauses

(Walter, 2015). In response, an NTI clause might require states to avoid a "race to the bottom" to gain competitive advantage. A related possibility is when the NTI requires states to raise standards to a minimal level to erase any competitive advantage that might otherwise weaken the trade agreement.

Other NTI clauses bear no direct relationship that makes them a necessary part of a trade agreement. For example, the inclusion of a general "democracy" clause has no direct impact on trade.[6] Two states that share this common objective might include an NTI in a PTA to publicly commit themselves to this goal – perhaps to avoid backsliding if a different government came to power in either state. Of course, some NTIs (e.g., environment) may both uphold common values and also provide extra assurance against backsliding.

A plurilateral agreement works similarly but allows a set of like-minded states to undertake a common commitment, which may ultimately be stronger than would a corresponding set of bilateral arrangements. The mutual commitment of a group of like-minded states cannot be as easily tailored to the individual interests of the participants and therefore might be diluted to gain broader acceptance.

In sum, the commitment argument is that the inclusion of NTIs will be most likely when trade partners share non-trade values.

2.2 Power

States exercise their (trade) power when they are able to compel other (weaker) partners to accept NTIs that they would not otherwise accept. Meunier and Nicolaïdis (2006, 912) argue that the use of "trade power to achieve non-trade objectives" is a core feature of the EU's foreign policy[7] – which has been one of the prime movers in PTA-NTI linkage (see below, subsection 3.2).[8] Aggarwal (2013, 102) notes that "the large asymmetry in power among countries proved to be crucial for the U.S. ability to reopen [NAFTA] negotiations and secure side agreements", and Stiglitz (2015) argues that in TPP negotiations "the US effectively

dictates the terms".

The standard argument is that powerful trade actors such as the EU and US use their bargaining leverage within PTAs to require smaller states to accept NTIs (Postnikov, 2014). Their motives could be competitive, and meant to prevent nonconforming trade partners from gaining any advantage from lower standards. But in many cases, the PTA-NTI linkage is value-driven because the powerful state values the NTI goal for itself. In between lie cases where the NTI is valued for both competitive and value reasons.[9]

Power operates a little differently in the plurilateral context, since the only way to gain access to the markets of all plurilateral PTA members is to accept the NTI. Here the power asymmetry is a function of the combined trading power of current plurilateral members. Again, this relationship reflects power insofar as other states are attracted to large plurilateral PTAs and accept NTIs as a condition of attaining those trade benefits.

2.3 Costs

PTAs entail costs accompanied by benefits which are premised on reciprocal reductions in trade barriers. NTI clauses, by contrast, often do not produce such direct and immediate benefits, but do usually impose three different types of costs – start-up, subsequent and shared costs – resulting from the required policy adjustments. Unlike purely trade-related PTA clauses which are binding on states, NTI clauses are typically non-binding and so target states can sometimes postpone implementing them. Even if soft, however, NTIs have cost implications by empowering domestic activists and can entail significant domestic policy adjustments down the road (Abbott and Snidal, 2000). For example, under the Canada-Colombia FTA of 2008, both parties are required to produce annual reports on the impact of the agreement on human rights in both countries. Canada has consulted stakeholders within Colombia and filed four such human rights reports calling attention to

these issues in Colombia (Embassy of Canada to Colombia, 2015). Similarly, most labor rights clauses in US' PTAs focus on the enforcement of domestic laws in the other state. Thus, while NTI clauses are mostly soft and do not require immediate policy adjustment, they may well entail significant prospective obligations.

Start-up costs capture states' resistance to adopting their first NTI. Initiating an NTI entails negotiation costs but the most important costs are the substantive entailments of the NTI itself. For example, a labor clause might require a state to change its rules on child labor, or an environmental clause might require certain limitations on production processes. Former US Secretary of Commerce William Daley (2015) refers to such costly constraints in pointing out that "if the TPP passes, the poorer countries in the pact will have to conform ... to the standards of the United States, Japan, Australia, New Zealand and Canada". Although these changes might be desirable normatively, or for certain sectors of domestic society, the fact that states have not voluntarily adopted them suggests that they entail costs or constraints. To be sure, most NTI clauses are soft; they do not entail binding obligations and are in practice never invoked (United States Senate, 2015). But states recognize that signing non-binding agreements can bring about reputational costs, empower both domestic and international proponents of the NTI and lead to stronger requirements down the road (cf. Abbott and Snidal, 2004). Thus the inclusion of NTIs entails (potential) costs and states do not take such costs lightly, especially when they are not currently subject to any NTIs. This effect is the same in both bilateral and plurilateral contexts.

Subsequent costs. Once a state has accepted an NTI in one PTA, the cost of signing another PTA containing a similar NTI provision with a third state is reduced.[10] Negotiating costs are lower since the clause may be adapted from the earlier agreement; substantive costs are lower since the concession has already been made. It may arguably even entail a net gain, as it allows a state to reap additional reputational benefits at no cost. This mechanism operates similarly across both

bilateral and plurilateral contexts.

Shared costs. When two or more states already have similar NTI agreements with the same third state, the cost of concluding their own NTI agreement is further reduced.[11] For example, once Chile signed a trade agreement including non-trade issues with both the EU in 2002, and then with Colombia in 2006, it was relatively straightforward for Colombia and the EU to agree to their own NTI in 2012. This effect operates differently in the plurilateral context. If states a and b share a plurilateral NTI commitment, then a's costs of joining a second plurilateral are reduced insofar as it has already accepted similar commitments (along with b) in the first plurilateral NTI.

2.4 Cross-network effects

States' choices to include NTIs are subject to interdependencies between networks, which we call cross-network effects. Network effects capture how states' decisions regarding one NTI (or PTA) affect their decisions to consummate subsequent NTIs (or PTAs) bilaterally or plurilaterally, and the decisions of other states to establish NTIs (or PTAs). The result of these network externalities is that we expect to see co-evolution of the four networks (bilateral PTA, bilateral NTI, plurilateral PTA and plurilateral NTI) over time.

[Table 1]

3 Mapping the world of PTAs and NTIs

3.1 The PTAs-NTIs data set

Our PTA sample is based on the Design of Trade Agreements (DESTA) Database (2014) covering 522 bilateral and plurilateral PTAs signed between 1951 and 2009; our NTI data (Milewicz, 2014) is based on the same sample. The sample in-

cludes only reciprocal trade agreements involving two or more states and primarily concerned with trade. We do not include unilateral trade agreements, such as Generalized System of Preferences (GSP) programs. Framework agreements, trade and cooperation agreements, and agreements that are primarily symbolic (e.g. Thailand-Bahrain Framework Agreement 2002)[12] are excluded, as are interim agreements (e.g. EU-PLO Euro-Mediterranean Interim Association Agreement 1997), and agreements involving non-sovereign actors (e.g. Mainland-Hong Kong Closer Economic Partnership Arrangement 2003). Partial scope agreements are included if they liberalize trade.

NTIs incorporate additional issues that are neither directly associated with nor typically regulated by the multilateral trading system; they are sometimes described as part of the new 21st century trade agenda (Messerlin, 2013). Moreover, NTIs are not a central part of the GATT/WTO system, which has resisted the incorporation of non-trade measures. At most, the GATT/WTO provisions refer only indirectly to issues such as human rights, labor rights, and the environment – typically through exception clauses specified in Articles XX and XXI of GATT 1994.[13]

We thus define NTIs as provisions that go beyond GATT/WTO obligations. For the full sample of 522 PTAs, we coded all references to one or more non-trade issues including human rights, labor rights, environment, corruption and democracy. To our knowledge, this is the most comprehensive coding of non-trade issues in PTAs. We further distinguish whether references to these issues are in the main text and/or in the preamble of the agreement (Milewicz, 2014). We focus here only on main text references to NTIs as those tend to be more precise and "harder" than the more aspirational references in preambles.

NTIs entail an obligation with respect to one or more non-trade issues attached to a PTA. For example, an agreement might be "based on the respect of ... human rights" (EC-Lebanon Euro-Mediterranean Agreement 2002, Art. 2), intended

to "PROTECT, enhance, and enforce basic workers' rights" (US-Chile Free Trade Agreement (FTA) 2003, Preamble) or provide "that each Party has sovereign rights and responsibilities to conserve and protect its environment" (Canada-Jordan FTA 2009, Art. 10.1). Sometimes NTI clauses include explicit compliance mechanisms such as "[e]ach Party shall adopt or maintain appropriate penalties and procedures to enforce the criminal measures" (US-Bahrain FTA 2004, Art. 17.5). More recent NTI clauses include references to multilateral treaties, which add precision and – in some cases – make them more enforceable. For example, the labor clause in the Trade, Development and Co-operation Agreement between the European Community (EC) and South Africa 1999 (Art.86) designates the ILO as the point of reference for labor rights, thereby making the definition of labor rights in the context of the agreement clearer and the clause more straightforward to implement. While NTIs can impose obligations and constraints on states, they vary substantially in terms of length, wording, precision and delegation. Most NTI clauses are relatively soft and do not entail strong compliance mechanisms.[14]

References to security issues are different; they usually take the form of opt-out clauses to the agreement: "Nothing in this Agreement shall be construed: (a) to require a Party to furnish any information the disclosure of which it considers contrary to its essential security interests" (Japan-Singapore FTA 2002, Art. 4). Because security issues follow a different logic and mainly allow "exceptions" rather than impose "requirements", we exclude them from our analysis. Further examples are provided in Appendix B, Table 4.

NTIs have always been part of PTAs, and as shown in Figure 1, both have grown gradually beginning in the 1950s, experienced a dramatic jump in the early 1990s and then continued at a steady pace. Approximately 70% of all PTAs and 85% of NTIs have been agreed upon since 1990.[15]

[Figure 1]

Figure 2 shows the expansion of NTIs over time. 327 PTAs (63%) include

at least one NTI, while there are 623 NTIs across 522 PTAs[16] for an average of 1.19 NTI references per PTA. Environment (46%) is the most common NTI to be included in PTAs followed by labor (27%) and corruption (25%). Democracy (14%) and human rights (7%) are much less frequently the subject of NTI clauses in PTAs and also tend to occur together. For PTAs which include at least one NTI, the average number of NTIs in a PTA is 1.91 with most having one (40%) or two (29%). The maximum number of NTIs in a single PTA is five.

[Figure 2]

3.2 PTAs and NTIs networks

We illustrate the key dynamics and mechanisms of NTI incorporation by looking at the evolution of "ego networks" of the two most important trading nations – the EU and US (Figure 3).[17] Both have been major proponents of extending the global trade agenda through the GATT/WTO framework to include NTIs, especially in the areas of labor and environment.[18] NTI-related activities took center stage at the 1996 Singapore Ministerial, but strong opposition, mainly from the developing world, led to their dismissal (World Trade Organization, 2001). The Final Declaration only affirms the ILO as the competent body to deal with labor issues (World Trade Organization, 1996); and a more prominent place for environmental protection was abandoned due to fear of protectionist policies (Shahin, 2002).

Because of this backlash against NTIs in the WTO, both the EU and (more recently) the US have used PTAs as an alternative platform for NTI promotion (Vogel, 2013; Postnikov, 2014), but they differ in their approaches. The EU has included a broad range of NTIs into its PTAs – with democracy and human rights clauses being "essential elements" of all EU trade agreements since 1995 (Commission of the European Communities, 1995). The US has focused on corruption, environment and labor, the latter two often being incorporated through side agreements, such as those accompanying NAFTA.[19]

Figure 3 shows the different development of the EU's and US' ego networks at five year intervals. The EU has been a driving force behind PTA-NTI linkage from early on. The 1951 Treaty of Paris establishing the European Coal and Steel Community was the first trade-related agreement to include environmental, labor rights, corruption, and democracy provisions. The Lomé IV Convention of 1989 signed between the EC and the African and Caribbean States was the first trade agreement to incorporate human rights provisions. Thus by 1989, the EU already had an extensive network of PTAs with nineteen other states, fourteen including NTIs. Most of these ties are with nearby European neighbors or with Middle Eastern or North African countries. The EU network grew rapidly thereafter so that by 1999 it had twenty-nine partners (the number of ties drops for 2004 and 2009 primarily due to EU enlargement).

[Figure 3]

While the EU use of PTAs and NTIs is longstanding, the United States only begins in 1989 with three PTAs – two with Canada and one with Israel – represented by the three dashed lines. There is little change over the next decade except that the US drops one PTA with Canada while Israel and Canada develop an NTI – shown as a solid line. The new Canada-Israel tie (which "closed" the US-Canada-Israel triad) innovates an NTI not found in the initial PTA ties. Only in 2004 do we see a marked increase in US bilateral trade agreements; strikingly, all new ties are NTIs. This trend continued through 2009 and a number of the United States partners (such as Peru and Chile) have also consummated NTIs between themselves. Of the thirteen closed triads by 2009, only two were initiated by non-US dyads – again showing that the US plays a central role in this local neighborhood.

4 Modeling the PTA-NTI networks

4.1 Four interconnected networks

To recall, our central research question is why states choose a PTA with NTI clauses compared to a PTA without NTIs clauses. To investigate this question, we have to take into account that states have four alternatives when committing to trade agreements: They can choose between PTAs or NTIs, and between bilateral or plurilateral arrangements (Figure 4). While we emphasize the choice of NTIs, we are also interested in determining which factors drive NTIs but not PTAs more generally. We also distinguish bilateral from plurilateral agreements because states' choices operate differently in these contexts. Whereas a bilateral agreement ceases once either party withdraws, a plurilateral agreement enters into force and continues to exist independently of any individual state's choices.[20] These considerations result in four possible choices: i. a bilateral PTA without NTIs (BilatPTA); ii. a bilateral PTA with NTIs (BilatNTI); iii. a plurilateral PTA without NTIs (PluriPTA); and; iv. a plurilateral PTA with NTIs (PluriNTI).[21]

[Figure 4]

States' decisions to create ties are interdependent in two key ways. First, when a state is considering whether to establish, say, a BilatNTI, it does so in light of existing BilatNTIs. To allow for such *within-network interdependencies*, we assume current decisions are informed by existing PTA and NTI ties. Second, there are interdependencies across each of these decision streams – *cross-network interdependences*. For example, if a state has many BilatPTAs that may affect its decision to establish BilatNTIs; similarly, high PluriNTI activity may promote complementary BilatNTI activity or render it redundant.

4.2 Estimation technique and model specification

To allow for these within-network and across-network interdependencies, we model states' decisions in the context of four, coevolving networks using the multiplex form of the stochastic actor-oriented model (SAOM) (Snijders, Lomi and Torló, 2013). SAOMs are primarily used for studying change across longitudinal/panel network data and for depicting the evolution of networks ties among actors over time as a result of actors' choices. They are premised on four main assumptions (Snijders, van de Bunt and Steglich, 2010), which enable and constrain what can be done with the model.

First, although tie (and sometimes also behavioral) variables are only observed at discrete time points (i.e. each panel wave), SAOMs assume that time is continuous and so (tie) changes build up incrementally – and can even revert – during a process from one wave to the next. Since it is this process that is modeled, all changes are conditional on the structure of the first network. In other words, we take the state of each network at its initial point (i.e., 1989 in our analysis) as given, and model changes from there. This does not imply that this first network is at equilibrium. Rather it means that it is not the origins of the first NTIs that are modeled, but how they have proliferated.

Second, it is assumed that tie changes express actors' preferences over their local network. For example, states might want to cooperate with asymmetrically powerful actors (power) or with those which are already cooperating with their existing partners (shared costs). These preferences are combined in an objective function, and the relative contribution of each effect is estimated from simulated series of tie changes between observed waves.

Third, at each step in the simulation, only one randomly selected actor can consider a tie change in one of the networks. Since the initiator of a bilateral agreement cannot be discerned from the data, the utility of these agreements is modeled as the (multinomial) choice of one and the (binomial) agreement of the

other.[22]

Fourth, a simplifying Markov process assumption is that each change depends only on the state of the network at that particular moment in time and not past or potential future moments. This limits SAOMs' ability to capture strategic interaction.

In the present model, states optimize their choice of bilateral or plurilateral trade agreements with other states. For instance, state a might find a very trade-active state b a less attractive choice for a bilateral tie than state c which, despite its lower trading activity, shares similar non-trade values. SAOMs estimate the relative importance of such factors for change in the networks over time. More precisely, the structure of the networks and characteristics of actors affect the probability of ties being created or dissolved at any point in time.

We model our four networks over the 1989–2009 period using a longitudinal design based on five waves (1989, 1994, 1999, 2004, and 2009) defining four periods (1989–1994, 1995–1999, 2000–2004, 2005–2009).[23] Our analysis is based on 482 agreements, of which 408 are bilateral (with 253 including NTIs and 155 not including NTIs), and 74 plurilateral (with 53 including NTIs and 21 including no NTIs).[24] Note that for analytic and modeling purposes the 74 plurilaterals consist of 661 tie choices.[25]

Each of the four networks (our dependent variables) comprises four $N*M*T$ arrays, with N being 183 states, M being 183 potential partners in the case of the BilatPTA and BilatNTI networks, or 21 plurilateral PTAs in the case of the PluriPTA network and 52 plurilateral NTIs in the case of the PluriNTI network, and T being the five waves.[26] Since our SAOM model depicts the evolution of the network(s) through actors' PTA and NTI tie choices, the unit of analysis is a change in PTA or NTI tie between successive waves. This results in 66,612 observations for the BilatPTA and BilatNTI networks, 15,372 for the PluriPTA network, and 38,796 for the PluriNTI network.[27]

4.3 Explanatory variables

To investigate the factors determining NTI formation, we estimate structural network effects.[28] All effects are depicted in Table 2.

Commitment

In the bilateral network, COMMITMENT is the decision of states a and b to reinforce their shared and high common values by attaching an NTI to their trade agreement. This decision should be reflected in both states' commitment to high common values outside the trading regime, as evidenced through ratification of relevant multilateral treaties (MTRs). We represent shared values in Table 2 by the common shading, the dashed line represents a tie choice (x) to be made by one of the states with regards to network X. We measure shared commitment as the product of each state's number of MTRs based on 34 relevant treaties in the Institute for Agriculture and Trade Policy (2005) database.[29]

In the plurilateral network, commitment is measured as the product of a state's number of MTRs and the average number of MTRs for all current members in the plurilateral i (represented as a square in Table 2). A positive effect (in both networks) indicates that states with high values are more likely to create NTI ties among one another.

Power

We examine how POWER differentials affect states' choices over NTIs. Because we are considering power in the context of trade agreements, we use trade volume as the measure of power - although we also check our results against GDP as a broader measure of overall economic power. In the bilateral case, power is non-directional and so equally captures its coercive aspect – whereby larger states pressure smaller states to accept NTI, and its attractiveness side – whereby smaller states offer NTI concessions to attract larger partners. This asymmetric relationship is represented

in Table 2 with a large circle for the more powerful state a and a smaller circle for the weaker state b. Power is operationalized here as (dis)similarity of total trade volumes[30] for each state dyad based on the Correlates of War Trade Dataset (Barbieri and Keshk, 2012). A positive effect means that ties occur primarily among states with symmetric trade relations, whereas a negative effect means that ties occur among states with asymmetric trade relations. The latter case, where the larger trading nation has more leverage in promoting NTIs, supports the power hypothesis.

In the plurilateral setting, power is measured differently – as the sum of (logged) trade volume of all current members of an agreement. Here the choice is modeled as being made by state a – so power in the plurilateral context primarily captures attraction and not coercion. The larger the plurilateral, the more attractive it is for state a to join; a positive effect suggests that states accept the added cost of a plurilateral NTI in order to forge a relation with all of its members.

Costs

We distinguish three types of costs: start-up, subsequent, and shared costs. In both bilateral and plurilateral settings, Start-up Costs refer to a state's decision to join its first NTI which requires it to adapt to its provisions. We measure start-up costs according to whether or not a state has any prior NTIs, with the variable reading 1 where a state has at least one current NTI. This means that we expect a negative coefficient to reflect states' avoiding the costs inherent in creating their first NTI (cf. Ripley et al., 2015:110).

Subsequent Costs refer to declining marginal costs of an additional NTI after a state has already committed to earlier NTIs.[31] We measure these costs by the square root of a state's existing NTIs. A positive effect means that the more existing ties a state has, the more likely it is to establish and maintain additional ties.

Shared Costs refer to the decreased costs of adding ties with partners with whom a state already shares common connections to third parties. It is measured differently in bilateral and plurilateral networks. In bilateral networks, lower shared costs are indicated by ties that "close" open triads where two states already have agreements with the same third party. Table 2 illustrates the reduced burden for state a in choosing an NTI with state b when both already have an NTI with a common partner c (triadic closure). In the plurilateral setting, shared costs is measured by ties that "close" open 'four-cycles' of agreements; it captures the reduced costs to state a of joining a plurilateral i if it already shares another plurilateral j with one of i's members b (quadratic closure). A positive coefficient indicates strong endogeneities meaning that prior NTIs lower the costs of forming another NTI.

[Table 2]

Cross-network effects

Cross-network effects (BilatPTA, BilatNTI, PluriPTA and PluriNTI) capture how states' choices in one network affect their choices in other networks.[32] We include three such effects for each dependent network – one for the influence of each of the other three networks. For example, a positive effect of BilatPTA on the creation of a bilateral NTI tie captures whether a state with bilateral PTA ties is more likely to choose a bilateral NTI tie. We expect BilatPTA and PluriPTA to have a positive effect on the creation of plurilateral and bilateral NTI ties. By contrast, we do not expect a positive effect of NTIs on the creation of PTAs as this would indicate that once states have NTIs they do not include them in future agreements.

Controls

Our models include several monadic state-dependent covariate effects that are closely associated with our central theoretical arguments. Commitment (Ego) and Power (Ego) control for a state's individual level of commitment to non-trade issues and its trading volume, respectively. Commitment (Ego) is measured as a state's count of multilateral treaties ratifications, and Power (Ego) as a state's total trade (logged) at the beginning of each 5-year intervals.

In the plurilateral networks, we also control for a plurilateral's Membership, operationalized as the square root of the number of current members of a plurilateral a state is considering joining. This measure is related to Power and captures the possibility that connecting to multiple trade partners makes plurilateral PTAs more attractive – so we expect Membership to have a positive impact on the likelihood of states joining plurilateral NTIs. Finally, to account for the fact that plurilaterals require at least three members we include a technical corrective (First Three Members).[33]

Finally, we also control for a state's general involvement in the multilateral trading system, WTO (Ego), measured as whether a state is a member of the WTO/GATT at the beginning of each interval. The coefficient for each control indicates its influence on a state's likelihood to make a tie, regardless of partner or plurilateral.

5 Results

In Table 3 we report our final multiplex SAOM fit[34] for the four coevolving interdependent networks. Estimated parameters capture states' decisions to join a bilateral or plurilateral PTAs or NTIs network, respectively, while cross-network effects capture how decisions in one network affect decisions in other networks.

Parameters were estimated using the method of moments and all models re-

ported (see also Appendix B) converged on stable point estimates (maximum t-ratio convergence <0.1) (Snijders, Steglich and Schweinberger, 2007). At the bottom of the Table we report p-values for each network's degree distribution. The degree distribution summarizes how ties are distributed among nodes. Some states have fewer ties (i.e. low degree nodes) and some have more (i.e. high degree nodes), and it is when we replicate this distribution in simulations generated from the parameter estimates that we can say that we are reproducing the salient features of the network. The p-value indicates the overlap between the simulated and observed degree distributions with a value of >0.05 denoting a satisfactory degree of overlap. The p-values here suggest excellent model fits for all networks, especially for the plurilateral networks and the bilateral PTA network.

Now we turn to the parameter estimates, focusing on the interpretation of the NTI networks and using the PTA networks as our points of reference. Since the specification across PTAs and NTI networks is the same (apart from the two additional effects in the plurilateral networks) this facilitates comparisons. The parameter estimates can be read as if they were the outcome of a (conditional) multinomial logit. For the sake of narrative simplicity (and table size), we do not report the rate parameters (estimated for each of the four periods in each network). The Intercept in SAOMs is a Density parameter which represents the unconditional probability of an actor adding a tie.

[Table 3]

5.1 Main effects

Beginning with the main explanatory variables, we find very similar results for the bilateral and plurilateral NTI networks. There is no statistically significant evidence for the effect of Commitment in any of the networks, but there are statistically significant effects for Start-up, Subsequent and Shared Costs in the NTI networks, and some limited effect of Power. In the bilateral NTI

network, all three cost variables are significant and in the direction hypothesized. States are reluctant to forge their first NTI tie (as shown by the negative coefficient for Start-up Costs) but, once they pass this threshold, they have an increased tendency to establish subsequent NTI ties – especially with partners with whom they share other third parties (by 57% for each shared partner due to Shared Costs). By contrast, in the bilateral PTA network Subsequent Costs is significant at <0.01, Shared Cost only at <0.1, and Start-up Costs is not significant. This suggests that the bilateral PTA network grows as costs decrease, but without a strong threshold effect as found in the bilateral NTI network. The reason is that NTI costs are borne heavily in the first agreement whereas PTA costs continue as additional partners are given market access.

In the plurilateral context the comparison is even more straightforward. While there are no significant cost effects in the plurilateral PTA network,[35] Subsequent and Shared Costs are significant in the plurilateral NTI network at <0.05 and <0.001 and Start-up Costs at <0.1. As in the bilateral context, states are cautious about entering into their first plurilateral NTI (the odds being 86% lower than for a subsequent NTI). The negative coefficient for Subsequent Costs suggests that states are reluctant to hold membership in many plurilateral NTIs. This is partially offset, however, by a greater willingness to follow partners in one plurilateral NTI into other plurilateral NTIs (odds increase by 14% for each shared member).

While dyadic Power is insignificant in all networks, states' monadic Power (Ego) has significant impact in both NTI networks; this effect is positive in bilateral contexts, but negative in the plurilateral context. Irrespective of partners, powerful states prefer bilateral NTIs and weaker states prefer plurilateral NTIs. This makes sense since bilateral arrangements make it easier to exert power. Because monadic power is measured as the logged trade volume centered around its mean (of 8.13 corresponding roughly to Mozambique's trade in 2004), a state with

a one-unit higher logged trade volume such as El Salvador (logged trade volume of 9.17 in 2004) is about 37% more likely to make a bilateral NTI and 16% less likely to join a plurilateral NTI than Mozambique. The EU in 2004 was over six times more likely to establish a bilateral NTI than was Mozambique, and nearly 64% less likely to join a plurilateral NTI, which supports the view that this was a means of exerting power (Meunier and Nicolaïdis, 2006).

The positive and significant effect for MEMBERSHIP in the plurilateral NTI network also indicates that states are attracted to plurilaterals with more members.[36] Overall, this supports the power argument since the leverage of a plurilateral depends on its membership as well as its aggregate size. It also indirectly supports the cost arguments since the costs of accepting NTIs in a plurilateral do not increase with its size whereas the benefits do increase with plurilateral size.

5.2 Cross-network effects

Because states' decisions to establish bilateral PTAs or NTIs are not independent of one another, or of plurilateral PTA or NTI cooperation, we included cross-network effects in our model. In the bilateral context, each bilateral PTA a state has makes it 75% more likely to establish a bilateral NTI. However, each plurilateral NTI makes a state 40% less likely to establish a bilateral NTI. This suggests that bilateral and plurilateral NTIs are substitutes in that plurilateral NTIs make subsequent bilateral NTIs unnecessary. Prior plurilateral PTAs have no significant impact on bilateral NTI activity. In the plurilateral context, each bilateral or plurilateral PTA increases the odds of a state joining a plurilateral NTI by 48% and 65%, respectively. This strongly suggests that plurilateral NTIs are replacing bilateral and plurilateral PTAs. However, there is no evidence that bilateral NTIs promote plurilateral NTIs. Overall, there are clear and strong pathways from bilateral and plurilateral PTAs networks to NTI networks.

We can summarize how states' decisions in one network promote decisions in

another in terms of four pathways depicted by solid arrows (see Figure 5). Three of those pathways are direct routes, one is an indirect route. States can complement bilateral PTAs with bilateral NTIs (path 1) or can move directly to plurilateral NTIs (path 2). An example of a direct route from a bilateral PTA to a plurilateral NTI involves the United States and Canada. The two countries signed the bilateral Automotive Products Trade Agreement (APTA) in 1965 and the Canada-US Free Trade Agreement (CUSFTA) in 1988. Neither agreement included NTI clauses. In 1994, they then adopted the plurilateral NAFTA, which includes NTI clauses.[37] States with plurilateral PTAs tend to either upgrade their agreements to plurilateral NTIs (path 3), or take the indirect route to bilateral NTIs through bilateral PTAs (path 1b). Two negative cross-network effects (dashed arrows) show that plurilateral NTIs tend to displace both bilateral PTAs and bilateral NTIs. Thus once states are involved in either bilateral or plurilateral NTIs, reversion to PTAs is unlikely. In sum, we see a progression towards bilateral and especially plurilateral NTIs.

[Figure 5]

5.3 Controls

Of all the controls we checked (see subsection 5.4 on robustness checks), only WTO membership matters for the creation and maintenance of all four networks. States which belong to the multilateral trading regime are less likely to have bilateral trade agreements whether with or without NTIs, but members of the multilateral trading regime are more likely to have plurilateral NTIs. This suggests that the WTO has been an effective substitute for bilateral trade arrangements but that its ineffectiveness with regard to NTIs has led to plurilateral NTIs as complements to the WTO. WTO failure to address NTIs is thus a partial cause of the increasing competition it faces today from regional arrangements.

In addition, we controlled for the amount of trade between two states (Barbieri and Keshk, 2012), the geographical distance between them, their colonial status, and alliances (Hensel, 2014). Since those covariates did not affect our models in any significant ways, we did not include them into our final model.

5.4 Robustness checks

In order to check the robustness of our results, we fitted several models with different specifications. First, we used alternative operationalizations of our two main covariates: Power and Commitment. For Power, we substituted GDP for trade volume (World Bank, 2015); and for Commitment we substituted the polity2 scores (Commitment (Democracy) – from the Polity IV index ranging from -10 to 10; rescaled to: 0 to 2) (Marshall, Gurr and Jaggers, 2014) for multilateral treaty ratifications. We also divided the multilateral treaty ratification data into trade-related issues (TRI: environment and labor) and trade-unrelated issues (TUI: human rights and corruption). In addition, we applied another modification of the Power measure – Power (Interaction) – which is based on the interaction of both states' (logged) trade volumes (bilateral networks), and interaction of the sum of all current members' (logged) trade volume and the joining state's (logged) trade volume (plurilateral networks). The models with these alternative effects are presented in Appendix B, Tables 5–11. Our reported results are robust to all of these checks.

Second, cross-network effects in our main models are defined in terms of how active an actor is across two networks (i.e. how many ties the actor has – Activity effects). In Table 9 (Appendix B) we report an alternative specification that includes cross-network Closure effects defined it in terms of whether two actors joined in one network are joined in another, via a bilateral or plurilateral treaty.[38] These two specifications are complementary but not equivalent, and we have chosen to focus on variation in activity within and across networks.

Finally, to test whether the monadic Power (Ego) and Commitment (Ego) obscure the effects of their dyadic counterparts, we removed these controls from our final model (Table 3), and model 9 (Appendix B, Tables 10 and 11). Their exclusion indeed increases the significance of the (dyadic) Power measure in the NTI networks and Commitment in the bilateral NTI network. Nevertheless, their loss of significance in the final model points to the importance of states' own attributes and interests rather than dyadic asymmetry (Power) or shared values (Commitment). Overall, we are confident that our results are highly robust.

6 Conclusion

Our most important conclusion is that cost-based network effects matter for understanding the spread of NTIs. Because a state's first NTI is a costly undertaking, states are reluctant to sign their first NTI. Insofar as those obligations are duplicated in subsequent agreements, however, once a state has an initial NTI it is much more likely to deepen its connection to the network. This explains why NTIs were slow to get going but have now become very widespread. There are also important interdependencies across states' decisions, especially with existing PTAs promoting NTIs. Finally, the creation of further bilateral arrangements is inhibited by the availability of plurilateral NTIs, which are in some real sense the wave of the future.

Our results thereby speak to current on-going changes in the international trade system. The move towards large regional trading groups – such as the bilateral TTIP and the plurilateral TPP – has been enabled by the creation of a vast network of PTAs over the past twenty-five years. This network has significantly reduced the costs of NTIs for the many states that have already accepted such conditions in earlier agreements. Although power asymmetries have played an indirect role in the expansion of NTIs, the driving force has not been coercion but

rather the softer power created by the attractiveness of joining large plurilateral arrangements. Having failed to incorporate NTIs in the WTO framework where changes can be blocked by a few resistors, states are achieving the same goals on a more incremental basis.

Notes

1. See Vogel (2013) on the WTO's history regarding NTIs.

2. We will use PTAs to refer to trade agreements that do not include non-trade issues and NTIs to refer both to PTAs that include non-trade issues and sometimes simply to non-trade issues themselves.

3. Because states' PTA and NTI choices are interdependent over time (which violates the conditional independence of observations assumption), longitudinal network analysis provide a more appropriate approach for understanding the expanding scope of NTIs.

4. Warren (2010) studies multilateral treaties, but decomposes them into their constituent dyads, which poses methodological problems, especially where actors' choices or transitivity are modeled. Here we build on Hollway and Koskinen (2016*a*; 2016*b*), who argue for treating bilateral and multilateral treaties as interlocking and interdependent one-mode and two-mode SAOM networks.

5. For the few exceptions see: Anuradha (2011); Hafner-Burton (2005); Kim (2012); Spilker and Böhmelt (2013).

6. Manger and Pickup (2016) find that democracy promotes PTA formation and that PTAs encourage democratization. In looking at NTIs, we are implicitly investigating a plausible mechanism for their finding.

7. Recently, the EU has even insisted on a human rights clause in its proposed PTA with Japan despite the latter's strong objections (The Japan Times, 2014).

8. We treat the EU as a unified actor because it operates as such in trade issues (Meunier and Nicolaïdis, 2006).

9. Power asymmetries could conceivably work the other way. Having relatively less to offer in trade agreements, small states may seek to gain preferential trading terms with large trading partners by offering concessions on non-trade issues. Whichever party brings non-trade issues to the table, however, the expectation is that NTIs are more likely between asymmetrically powerful states.

10. For simplicity, we assume that states are considering an *identical* NTI. Variations in NTI content will lead to some costs, but presumably less than when no NTI is in place.

11. If states a and b each have similar NTI provisions with state c (i.e., ac and bc), then they face little additional cost to including an NTI into agreement ab.

12. All agreements are listed in Appendix A.

13. On WTO exceptions clauses regarding human rights see United Nations Office of the High Commissioner for Human Rights (UNOHCHR) (2005); and on the environmental exceptions clauses see Uimonen and Whalley (1997).

14. An exception is the North American Agreement on Labor Cooperation (NAALC) 1993 which can impose fines of up to USD20 million. Yet, these fines have never been used.

15. Since we treat the EU as a single actor, an agreement between the EU and another state is counted as a bilateral PTA rather than as a plurilateral PTA with a third country. Plurilateral agreements include on average a slightly higher number of NTIs than bilateral agreements.

16. Plurilaterals with third country agreements and region-region agreements are excluded from this analysis.

17. Although our NTI data goes back to 1951, only the post-1988 surge in new NTIs provides sufficient data to allow for network modeling. We also set aside plurilateral agreements until section 4.

18. The earliest US attempt to include labor provisions in the GATT occurred in 1953. Two decades later, the US Trade Act of 1974 directed the President to promote a fair labor standards clause at the GATT (Charnovitz, 1987). By 1979, the US proposed minimum labor standards for GATT members to help raise standards of living-a goal outlined in the preamble to the GATT 1947 (Hansson, 1983). The inclusion of labor rights in the GATT was also a negotiating objective of the US in the Uruguay Round (Charnovitz, 1987). The EU proposed in 1983 that the GATT incorporate provisions following the ILO conventions on freedom of association and collective bargaining, on discrimination in employment, and on forced labor (European Parliament, 1983). During the Uruguay Round, the EU was a proponent of environmental provisions (Konstantinov, 2009).

19. The US, Canada, and Mexico signed the North American Agreement on Labor Cooperation (NAALC) 1993 and the North American Agreement on Environmental Cooperation (NAAEC) 1993 to accompany the NAFTA.

20. While bilateral networks are one-mode networks consisting of one type of node (i.e., state) with a tie (i.e., bilateral agreement) between any two states, plurilateral networks are treated as two-mode networks with two types of nodes (i.e., states and plurilateral agreements) where each tie represents a single state's choice to join the plurilateral.

21. Note that we do not model our networks as ordered/nested networks but as separate choices. In an ordered network modeling approach, most NTI choices would have been strongly determined by PTA choices, leaving little statistical power to include many controls or the explanatory effects that we are theoretically interested in.

22. More technically, this combination of multinomial and binomial choices to approximate a dyadic negotiation process corresponds to SAOM model type 3, unilateral initiative and reciprocal confirmation, for undirected data.

23. The descriptive statistics in subsection 3.1 cover the period 1951–2009, but there is insufficient data to support network modeling prior to 1989. That the starting point of our analysis in 1989 where PTAs take off is also the end of the Cold War may suggest a structural shift in trading relations and their use for NTI purposes. However, we cannot test for this conjecture.

24. We exclude inter-regional, regional-third party agreements and EU accession agreements (e.g. Mercosur-SACU 2008; Canada-EFTA 2008; the EC Treaty of Accession, 2003).

25. Following Hollway and Koskinen (2016*a*; 2016*b*), the 74 plurilaterals become a second set of nodes in a two-mode network, and each state's adoption of each plurilateral represents a tie choice. By decomposing plurilaterals into a two-mode network instead of a one-mode network, each tie can be represented as a single choice by a state. This is important for modeling utility functions in SAOM.

26. 183 states is the total number of states in the data sample. Because we treat the EU as a unitary actor, states that accede to the EU are treated as if they leave the system. States already members of the EU at the start of the study period have been excluded. Accordingly, the number of states in the sample gets smaller as more states join the EU.

27. While the creation of new ties and the dissolution of old ones are the natural focus of attention, the maintenance of existing ties contains important information regarding their continuing value to states and is incorporated in the network analysis. Note that the actual number of observations is slightly less than reported here, as our modeling takes into account that states are unavailable

as partners before they gain sovereignty or after they join the EU.

28. For an overview and definition of all statistical network terms see Ripley et al. (2015).

29. The ratification data is available for all post-1945 treaties from the IATP (2005) sample in the areas of environment (11), human rights (15), labor law (7); we in addition included one treaty addressing corruption – the International Convention against Corruption of 2005. Note that the sample does not cover any explicit democracy-related multilateral treaties.

30. We use logged trade volumes (exports+imports) centered around the mean (overall 8.13).

31. If the NTI provisions were identical, subsequent costs would be low, perhaps zero. In practice NTI provisions vary across agreements so subsequent NTIs carry lower but non-zero costs.

32. We employ cross-network activity effects, not closure effects. Cross-network activity effects imply that actors a's activity in one network drives its activity in another network, irrespective of partner. We decided against the dyadic-specific version of closure (where both actors a and b are specified) as too complex.

33. This corrective suppresses the attractiveness of plurilaterals with no members (because they have not yet been formally established), and raises the attractiveness of plurilaterals with at least three members (that is, they have been established and thus are active).

34. All models have been fitted using the R package RSienaTest 1.1-286 (Ripley et al., 2015) in R project version 3.1.3 (R Development Core Team, 2015).

35. To check whether we face a Donner-Hauck case (whether the effect of Startup costs for the plurilateral PTA network is ill-determined but significantly positive), we conducted a score-type test. The test statistic was c=1.1963 with a p-value of 0.2741 (with 1 degree of freedom on a χ^2 distribution) indicating that this is not the case.

36. This effect is also reflected in the positive and significant coefficient for First Three Members.

37. NAFTA formally superseded CUSFTA. APTA continued until 2001 when it was declared illegal by the WTO, although NAFTA had effectively superseded it by then. Most PTAs include "upgrading" provisions for terminating agreements and negotiating new ones; some PTAs also include provisions for reviewing and updating specific provisions or the agreement as a whole.

38. Cross-network Activity is akin to Subsequent Costs (as applied as a within-network effect in our models), and cross-network Closure to Shared Costs. Cross-network Activity captures how a state's decision of one type (e.g. making a BilatPTA) may result in higher or lower subsequent costs for its decisions of another type (e.g. making a BilatNTI), irrespective of whether the same partners are involved. Cross-network Closure captures how a particular dyad's decision of one type may promote or discourage decisions of another type for the same dyad, for example a BilatPTA existing between two states may facilitate their negotiation of a BilatNTI.

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8 Tables and Figures

	Definition	Hypothesis
Commitment	Mutual agreement to undertake NTIs.	States with shared values are more likely to have NTIs.
Power	Ability to compel others to accept NTIs or attract others by accepting NTIs.	Powerful states are more likely to include NTIs in their PTAs.
Costs	Start-up Costs: Cost of creating the first NTI.	States without previous NTIs are less likely to create a first NTI.
	Subsequent Costs: Reduced cost of creating further NTIs.	States with more NTI experience are more likely to join additional NTIs.
	Shared Costs: Reduced cost of creating NTIs with partners that already have NTIs.	States that already have NTIs with the same partners are more likely to include NTIs.

Table 1: *Concepts, definitions and hypotheses.*

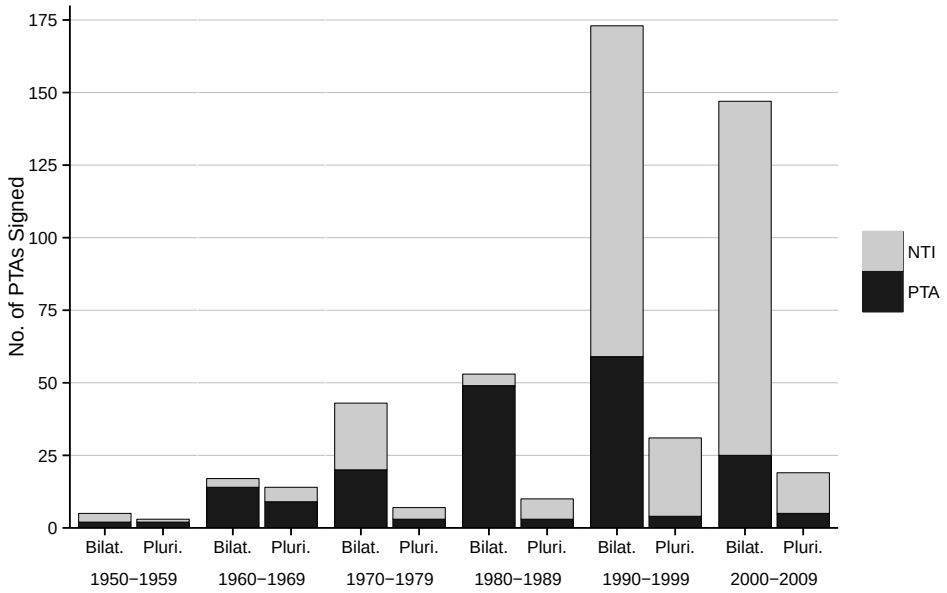


Figure 1: *Number of bilateral and plurilateral PTAs signed with and without NTIs by decade.*

Note: Only NTI references in main text are included (not references in preamble).

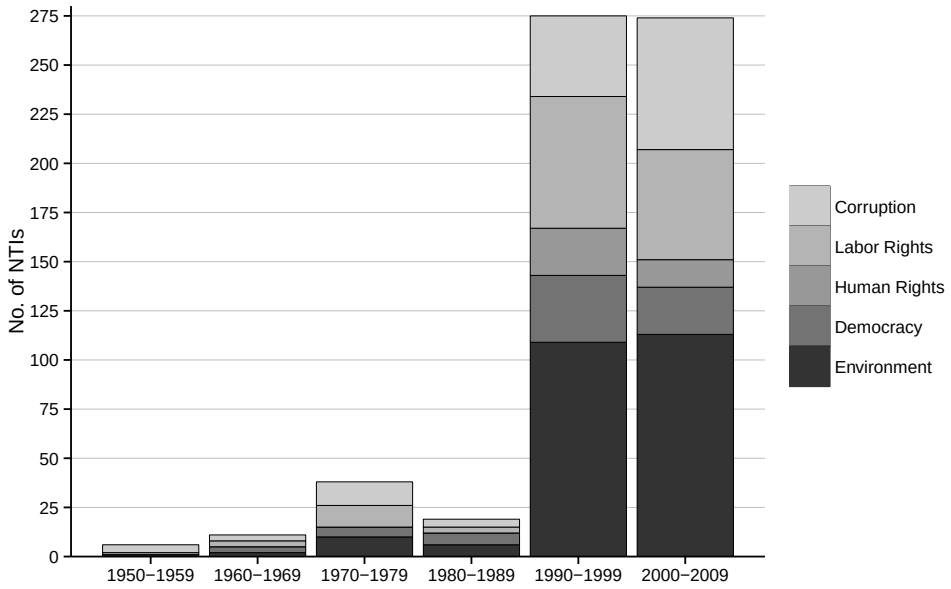


Figure 2: *Coverage of specific NTIs by decade.*

Note: Only NTI references in main text are included (not references in preamble).

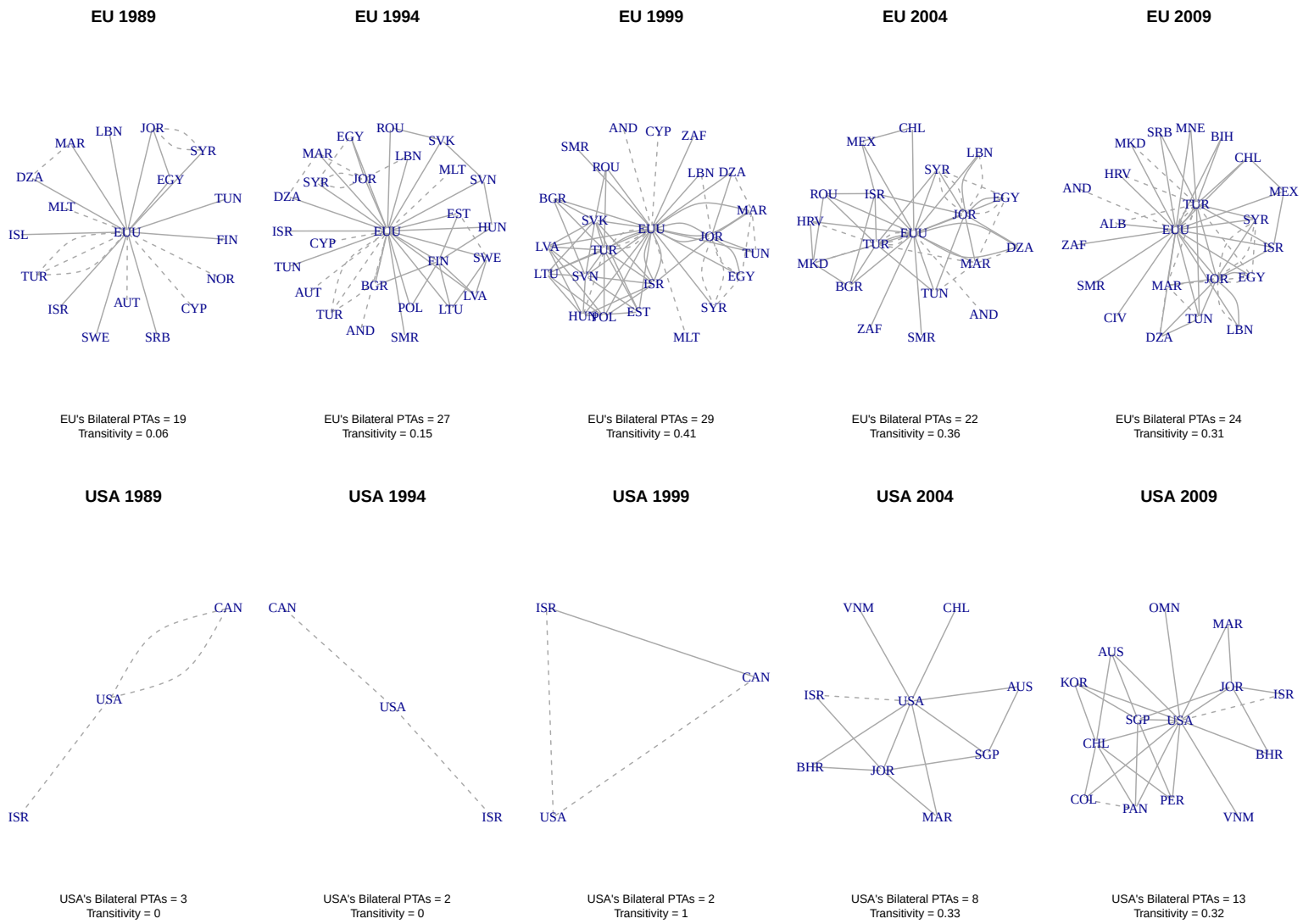


Figure 3: *EU's and US' ego networks (based on bilateral agreements).*

Note: Transitivity refers to the proportion of triadic closures in the network, which is the number of closed triads over the number of open triads.

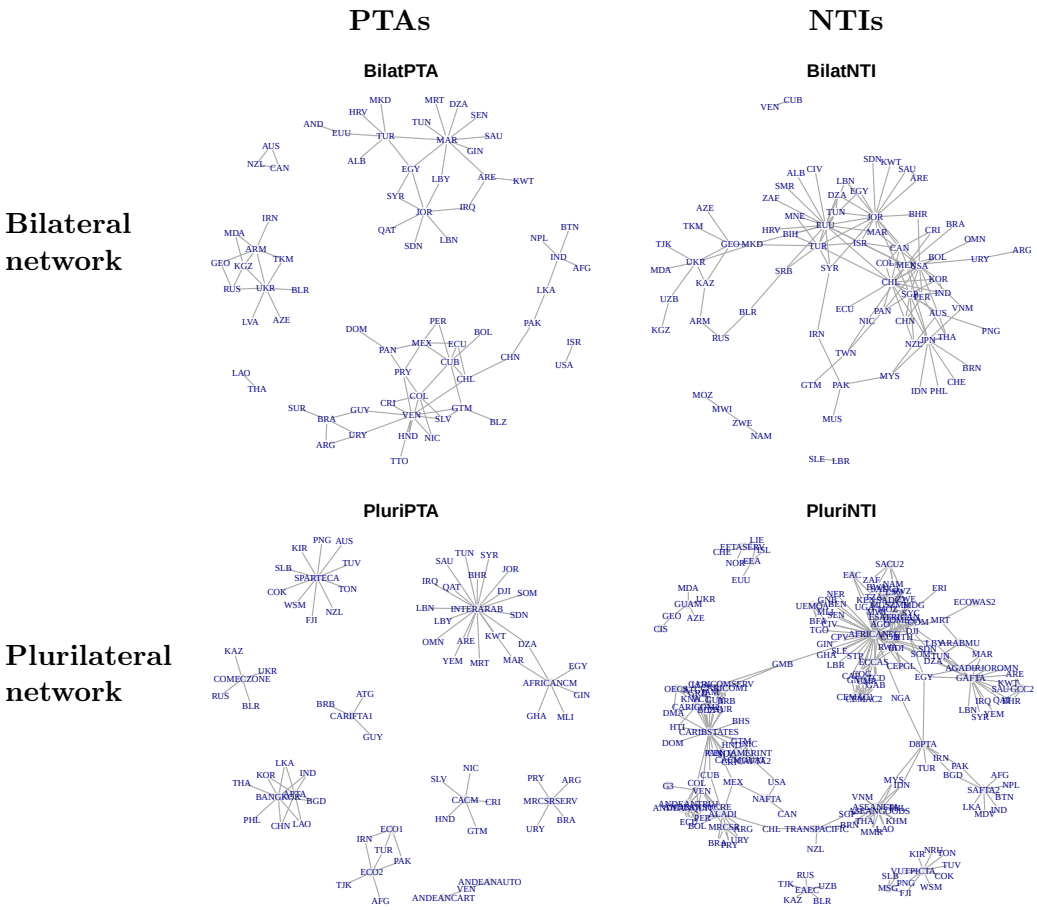


Figure 4: *Four interdependent networks (as of 2009).*

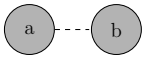
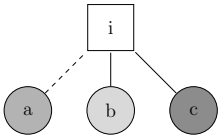
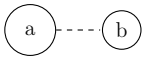
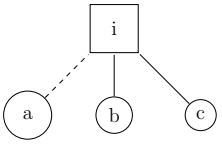
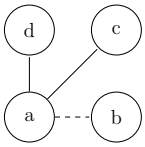
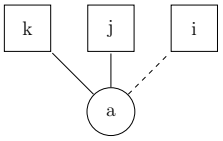
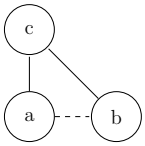
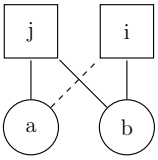
Measurement	Bilateral	Plurilateral
COMMITMENT Number of multilateral treaty ratifications (MTR)	 $\text{MTR}_a \sum_b x_{ab}\text{MTR}_b$	 $\text{MTR}_a \sum_i x_{ai} \frac{\sum_{b\neq a} x_{bi}\text{MTR}_b}{x_{+i} - x_{ai}}$
POWER Similarity/Sum of (logged) total trade volumes (TRADE)	 $\sum_b x_{ab}(\text{sim}_{ab}^{\text{TRADE}} - \widehat{\text{sim}^{\text{TRADE}}})$	 $\sum_i x_{ai} \sum_{b\neq a} x_{bi}\text{TRADE}_b$
START-UP COSTS Whether or not a state has any prior ties	 $\min(x_{a+}, 1)$	 $\min(x_{a+}, 1)$
SUBSEQUENT COSTS Square root of a state's existing NTIs	 $x_{a+}\sqrt{x_{a+}}$	 $x_{a+}\sqrt{x_{a+}}$
SHARED COSTS Closing of open 'triads' or 'four-cycles' of agreements	 $\sum_{b<c} x_{ab}x_{ac}x_{cb}$	 $\sum_{b,i,j} x_{ai}x_{aj}x_{bi}x_{bj}$

Table 2: *Measurement and visualization of main effects.*

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	-0.0014	-0.0016	-0.0042	-0.0003
	(0.0027)	(0.0013)	(0.0034)	(0.0009)
Power	1.04	-0.08	-0.11	0.0038
	(0.68)	(0.37)	(0.08)	(0.0189)
Start-up Costs	-1.30$^{\cdot}$	-0.96**	8.95	-1.97$^{\cdot}$
	(0.74)	(0.34)	(9.03)	(1.07)
Subsequent Costs	0.90**	0.34***	0.62	-0.93*
	(0.31)	(0.09)	(6.25)	(0.44)
Shared Costs	0.29$^{\cdot}$	0.45***	0.79	0.13***
	(0.15)	(0.07)	(0.53)	(0.02)
Controls				
Power (Ego)	0.17$^{\cdot}$	0.30***	0.67	-0.17**
	(0.10)	(0.08)	(0.53)	(0.06)
Commitment (Ego)	0.04	0.06	-0.10	-0.05
	(0.17)	(0.11)	(0.19)	(0.05)
WTO (Ego)	-1.45*	-0.80**	-3.76	0.57**
	(0.63)	(0.31)	(2.73)	(0.21)
Membership			1.32$^{\cdot}$	0.35*
			(0.78)	(0.17)
First Three Members			5.37	1.44*
			(3.30)	(0.73)
Intercept (Density)	-1.23	-1.79	-4.45	0.77
	(3.05)	(2.58)	(14.39)	(1.28)
Cross-network effects				
BilatPTA		0.56***	4.70$^{\cdot}$	0.39**
		(0.10)	(2.48)	(0.14)
BilatNTI	-0.05		-1.91	0.14
	(0.20)		(2.03)	(0.17)
PluriPTA	1.12*	0.11		0.50*
	(0.50)	(0.16)		(0.21)
PluriNTI	-1.23*	-0.51**	-2.12	
	(0.59)	(0.18)	(2.49)	
Estimation Iterations		2557.00		
Goodness-of-fit	0.980	0.185	0.839	0.948

Table 3: *Final multiplex stochastic actor-oriented model.*

Note: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

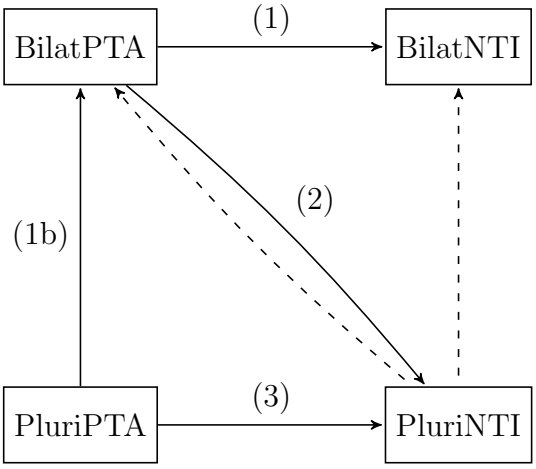


Figure 5: *Pathways to NTIs.*

Note: Solid arrows indicate positive effects, dashed arrows negative effects.

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zation (PLO) for the benefit of the Palestinian Authority of the West Bank and the Gaza Strip, of the other part. 1997. Available at: http://ec.europa.eu/world/agreements/prepareCreateTreatiesWorkspace/treatiesGeneralData.do?step=0&redirect=true&treatyId=254.

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B Appendix

Issues	Excerpts
Human rights	"AFFIRMING their commitment to respect the ... promotion and protection of human rights and fundamental freedoms as proclaimed in the *Universal Declaration of Human Rights*" (Canada-Colombia FTA 2008, Preamble) "Relations between the Parties ... shall be based on respect of ... fundamental human rights as set out in the Universal Declaration on Human Rights, which guides their internal and international policy and constitutes an essential element of this Agreement."; "The Parties shall take any general or specific measures required to fulfil their obligations under the Agreement." (EC-Jordan Euro-Mediterranean Agreement 1997, Arts. 2; 101)
Labor rights	"The Parties reaffirm their obligations as members of the International Labor Organization ("ILO") and their commitments under the ILO Declaration on Fundamental Principles and Rights at Work and its Follow-up. ... A Party shall not fail to effectively enforce its labor laws, through a sustained or recurring course of action or inaction, in a manner affecting trade between the Parties ... The Parties recognize that cooperation between them provides enhanced opportunities to improve labor standards. The Joint Committee established under Article 15 shall, during its regular sessions, consider any such opportunity identified by a Party."; "If the Joint Committee does not resolve the dispute within a period of 30 days after the presentation of the panel report, the affected Party shall be entitled to take any appropriate and commensurate measure." (US-Jordan FTA 2000, Arts. 6; 17, para. 2b) "The Parties affirm their obligations as members of the International Labour Organization (ILO) and their commitments to the *ILO Declaration on Fundamental Principles and Rights at Work (1998)*" (Canada-Colombia FTA 2008, Art. 1601)
Environment	"The Parties recognize that each Party has sovereign rights and responsibilities to conserve and protect its environment, and affirm their environmental obligations under their domestic law, as well as their international obligations under multilateral environmental agreements." (Canada-Jordan FTA 2009, Art. 10-1); "each Party shall effectively enforce ... its environmental laws"; "Each Party shall ensure that interested persons ... may request the Party's competent authorities to investigate alleged violations of its environmental laws" (Canada-Jordan Agreement on the Environment 2009, Arts. 4; 8) "Each Party recognizes that it is inappropriate to encourage investments by investors of the other Party by relaxing its environmental measures. To this effect each Party should not waive or otherwise derogate from such environmental measures as an encouragement for establishment, acquisition or expansion of investments in its Area." (Japan-Chile Strategic Economic Partnership 2007, Art. 87)
Corruption	"The Parties reaffirm their resolve to eliminate bribery and corruption in international trade and investment. ... Each Party shall adopt or maintain appropriate penalties and procedures to enforce the criminal measures. ... The Parties recognize the importance of regional and multilateral initiatives to eliminate bribery and corruption in international trade and investment." (US-Bahrain FTA 2004, Art. 17.5) "Each Party shall impose punitive measures for violations of its laws and regulations relating to this Chapter in accordance with its domestic legislation." (China-Singapore FTA 2008, Art. 33) "The Parties shall assist each other, in the areas within their competence, in the manner and under the conditions laid down in this Protocol, to ensure the correct application of the customs legislation, in particular by preventing, investigating and combating operations in breach of that legislation."; "Penalties shall be imposed on any person who draws up, or causes to be drawn up, a document which contains incorrect information for the purpose of obtaining a preferential treatment for products." (EC-Egypt Euro-Mediterranean Agreement 2001, Protocol 5, Art. 2; Protocol 4, Art. 34)
Democracy	"Relations between the Parties, as well as all the provisions of the Agreement itself, shall be based on respect of democratic principles"; "The area of political dialogue shall cover all subjects of common interest, and, in particular ... democracy."; "If either Party considers that the other Party has failed to fulfil an obligation under this Agreement, it may take appropriate measures." (EC-Egypt Euro-Mediterranean Agreement 2001, Arts. 2; 4; 86, para.2.) "Respect for the democratic principles ... established by the Helsinki Final Act and the Charter of Paris for a New Europe inspires the domestic and external policies of the Parties and constitutes an essential element of the present association." (EC-Bulgaria FTA 1993, Art.6)

Table 4: *Examples of NTI clauses.*

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	0.0002	-0.0014	-0.0098	0.0003
	(0.0022)	(0.0011)	(0.011)	(0.0022)
Power (GDP)	-0.03	0.02**	-0.0056	0.0101***
	(0.02)	(0.01)	(0.005)	(0.0021)
Start-up Costs	-1.55	-1.22***	8.04	-1.96*
	(0.83)·	(0.32)	(7.58)	(0.84)
Subsequent Costs	0.85**	0.31**	-0.36	-0.96**
	(0.27)	(0.11)	(5.39)	(0.34)
Shared Costs	0.29*	0.46***	0.93·	0.13***
	(0.13)	(0.06)	(0.53)	(0.02)
Controls				
Commitment (Ego)	-0.05	-0.04**	-0.29·	-0.07***
	(0.03)·	(0.02)	(0.17)	(0.02)
Power (GDP – Ego)	0.23	0.22***	0.42	-0.14*
	(0.12)·	(0.06)	(0.46)	(0.06)
WTO (Ego)	-1.58**	-0.82***	-2.13	0.61**
	(0.54)	(0.18)	(1.64)	(0.21)
Membership			0.22	0.25***
			(0.14)	(0.05)
First Three Members			3.50*	1.20*
			(1.51)	(0.48)
Intercept (Density)	-0.82	-1.06***	-7.86	-0.76
	(0.90)	(0.30)	(11.80)	(0.90)
Cross-network effects				
BilatPTA		0.49***	3.98*	0.45**
		(0.10)	(1.87)	(0.14)
BilatNTI	-0.02		-0.95	0.14
	(0.20)		(1.24)	(0.16)
PluriPTA	1.26**	0.15		0.52**
	(0.47)	(0.15)		(0.17)
PluriNTI	-1.20**	-0.44**	-1.81	
	(0.46)	(0.15)	(1.73)	
Estimation Iterations		2919.00		
Goodness-of-fit	0.975	0.127	0.830	0.985

Table 5: *Multiplex SAOM with* Power (GDP).

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment (Democracy)	0.0019	-0.0001	0.02*	0.0197***
	(0.002)	(0.0009)	(0.01)	(0.0022)
Power	-0.02	0.01	-0.0052	0.0052***
	(0.02)	(0.01)	(0.0036)	(0.0015)
Start-up Costs	-1.49	-0.90**	4.88	-1.70*
	(0.96)	(0.30)	(6.64)	(0.78)
Subsequent Costs	1.07***	0.27**	-2.07	-0.95**
	(0.32)	(0.08)	(5.14)	(0.30)
Shared Costs	0.27*	0.41***	0.86·	0.12***
	(0.13)	(0.06)	(0.44)	(0.01)
Controls				
Commitment (Democracy – Ego)	-0.04	0.01	-0.10	0.01
	(0.03)	(0.01)	(0.12)	(0.01)
Power (Ego)	0.30*	0.23***	0.48	-0.13**
	(0.14)	(0.05)	(0.40)	(0.05)
WTO (Ego)	-1.67*	-0.86***	-2.34	0.34·
	(0.74)	(0.21)	(1.86)	(0.20)
Membership			0.24·	0.25***
			(0.14)	(0.05)
First Three Members			3.16*	1.53**
			(1.41)	(0.54)
Intercept (Density)	-1.26	-1.25***	-4.83	-0.90
	(1.20)	(0.30)	(11.11)	(0.77)
Cross-network effects				
BilatPTA		0.49***	3.61·	0.36**
		(0.09)	(1.90)	(0.12)
BilatNTI	-0.33		-2.12	-0.14
	(0.22)		(1.71)	(0.14)
PluriPTA	1.23*	0.14		0.40*
	(0.56)	(0.15)		(0.16)
PluriNTI	-1.70**	-0.63***	-3.21	
	(0.60)	(0.15)	(1.98)	
Estimation Iterations		3544.00		
Goodness-of-fit	0.985	0.153	0.617	0.942

Table 6: *Multiplex SAOM with* Commitment (Democracy).

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	Bilateral		Plurilateral	
	PTA	NTI	PTA	NTI
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment (TRI)	0.0063	0.0053	-0.03	-0.0066
	(0.0075)	(0.0035)	(0.04)	(0.0074)
Commitment (TUI)	-0.0067	-0.0124**	-0.0033	0.0221·
	(0.0095)	(0.0045)	(0.0445)	(0.0114)
Power	-0.02	0.0117	-0.0053	0.0051**
	(0.02)	(0.008)	(0.004)	(0.0017)
Start-up Costs	-1.43·	-1.07**	6.02	-1.86*
	(0.85)	(0.34)	(6.04)	(0.84)
Subsequent Costs	0.91**	0.34**	-1.38	-0.84**
	(0.34)	(0.12)	(4.76)	(0.33)
Shared Costs	0.29*	0.45***	0.80·	0.13***
	(0.13)	(0.07)	(0.42)	(0.02)
Controls				
Commitment (TRI – Ego)	-0.10	-0.09**	-0.26	-0.09**
	(0.07)	(0.03)	(0.24)	(0.03)
Commitment (TUI – Ego)	-0.01	-0.02	-0.32	-0.05
	(0.08)	(0.04)	(0.27)	(0.04)
Power (Ego)	0.27·	0.30***	0.62	-0.13*
	(0.16)	(0.06)	(0.43)	(0.06)
WTO (Ego)	-1.57**	-0.85***	-2.43	0.60**
	(0.57)	(0.21)	(1.78)	(0.22)
Membership			0.21	0.28***
			(0.14)	(0.04)
First Three Members			3.37*	1.27*
			(1.63)	(0.54)
Intercept (Density)	-1.05	-1.25***	-4.45	-1.08
	(0.85)	(0.29)	(9.83)	(0.85)
Cross-network effects				
BilatPTA		0.56 ***	3.80*	0.38**
		(0.10)	(1.84)	(0.13)
BilatNTI	-0.05		-1.12	0.14
	(0.26)		(1.57)	(0.16)
PluriPTA	1.27*	0.10		0.53**
	(0.63)	(0.18)		(0.18)
PluriNTI	-1.18	-0.49**	-1.65	
	(0.74)	(0.17)	(1.81)	
Estimation Iterations		3596.00		
Goodness-of-fit	0.987	0.202	0.716	0.932

Table 7: *Multiplex SAOM with* Commitment *by issue type: (*TRI*) and (*TUI*)).*

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	0.0004	-0.0013	-0.0114	0.0008
	(0.002)	(0.001)	(0.0123)	(0.0025)
Power (Interaction)	-0.0172	0.0145*	-0.0058	0.0052**
	(0.0146)	(0.0073)	(0.0044)	(0.0016)
Start-up Costs	1.98$^{\cdot}$	1.56**	7.94	-2.00*
	(1.03)	(0.55)	(9.22)	(0.88)
Subsequent Costs	0.84*	0.33**	-0.79	-0.93**
	(0.37)	(0.11)	(5.48)	(0.34)
Shared Costs	0.31**	0.45***	0.93	0.13***
	(0.12)	(0.06)	(0.57)	(0.02)
Controls				
Commitment (Ego)	-0.05$^{\cdot}$	-0.05**	-0.31$^{\cdot}$	-0.07***
	(0.03)	(0.02)	(0.18)	(0.02)
Power (Ego)	0.24$^{\cdot}$	0.27***	0.70	-0.13*
	(0.13)	(0.06)	(0.53)	(0.06)
WTO (Ego)	-1.54*	-0.83***	-2.68	0.60**
	(0.63)	(0.19)	(2.43)	(0.20)
Membership			0.22	0.27***
			(0.13)	(0.05)
First Three Members			3.57*	1.25*
			(1.68)	(0.59)
Intercept (Density)	-1.00	-1.26***	-6.80	-0.83
	(0.89)	(0.29)	(12.66)	(0.86)
Cross-network effects				
BilatPTA		0.53***	4.17*	0.41**
		(0.11)	(2.11)	(0.14)
BilatNTI	-0.11		-1.39	0.16
	(0.20)		(2.03)	(0.16)
PluriPTA	1.11*	0.10		0.51**
	(0.50)	(0.18)		(0.18)
PluriNTI	-1.00*	-0.51***	-1.92	
	(0.49)	(0.15)	(1.72)	
Estimation Iterations		2863.00		
Goodness-of-fit	0.987	0.162	0.791	0.952

Table 8: *Multiplex SAOM with* Power (Interaction).

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	0.0006	-0.0015	-0.0077	-0.0000
	(0.0019)	(0.001)	(0.0102)	(0.0023)
Power	-0.02	0.0113	-0.0083	0.0075***
	(0.02)	(0.008)	(0.0061)	(0.0019)
Start-up Costs	-.07*	-1.88***	4.93	-2.06**
	(0.87)	(0.41)	(5.59)	(0.73)
Subsequent Costs	0.59**	0.60***	0.97	-0.93**
	(0.22)	(0.09)	(3.64)	(0.31)
Shared Costs	0.20$^{\cdot}$	0.32***	0.71$^{\cdot}$	0.13***
	(0.12)	(0.05)	(0.43)	(0.01)
Controls				
Commitment (Ego)	-0.07**	-0.06***	-0.26*	-0.07 ***
	(0.02)	(0.01)	(0.11)	(0.02)
Power (Ego)	0.24**	0.34***	0.61$^{\cdot}$	-0.14**
	(0.08)	(0.07)	(0.33)	(0.04)
WTO (Ego)	-1.55***	-0.98***	-2.13$^{\cdot}$	0.64**
	(0.42)	(0.20)	(1.19)	(0.20)
Membership			-0.27	0.04
			(0.28)	(0.06)
First Three Members			3.83**	1.24*
			(1.38)	(0.49)
Intercept (Density)	-0.73	-1.64***	-6.73	-1.10
	(0.74)	(0.26)	(8.29)	(0.82)
Cross-network effects				
BilatPTA (Closure)		0.63**	0.87*	0.69***
		(0.20)	(0.44)	(0.17)
BilatNTI (Closure)	0.26		0.91	1.03***
	(0.70)		(0.70)	(0.30)
PluriPTA (Closure)	0.89***	0.27**		0.17***
	(0.20)	(0.10)		(0.03)
PluriNTI (Closure)	0.06	0.45***	0.19*	
	(0.16)	(0.06)	(0.07)	
Estimation Iterations		2860.00		
Goodness-of-fit	0.973	0.056	0.656	0.919

Table 9: *Multiplex SAOM with* Closure *cross-network effects.*

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	-0.0016	-0.0039***	-0.0168$^{\cdot}$	0.0005
	(0.0017)	(0.0008)	(0.0097)	(0.0002)
Power	0.0022	0.04***	-0.0049	0.0085***
	(0.0138)	(0.01)	(0.0043)	(0.0018)
Start-up Costs	-1.97*	-1.97 ***	2.43	-2.28**
	(0.95)	(0.38)	(6.94)	(0.70)
Subsequent Costs	0.45*	0.83 ***	-0.33	-0.96**
	(0.22)	(0.10)	(5.51)	(0.30)
Shared Costs	0.26*	0.25 ***	0.73	0.11***
	(0.13)	(0.05)	(0.56)	(0.01)
Controls				
WTO (Ego)	-1.46***	-0.69***	-1.97*	0.16
	(0.43)	(0.14)	(0.86)	(0.15)
Membership			-0.10	0.07
			(0.24)	(0.06)
First Three Members			3.23**	1.18 **
			(1.02)	(0.40)
Intercept (Density)	-0.39	-2.09***	-3.49	-0.22
	(0.70)	(0.24)	(11.81)	(0.77)
Cross-network effects				
BilatPTA (Closure)		0.66***	0.66$^{\cdot}$	0.53***
		(0.19)	(0.37)	(0.14)
BilatNTI (Closure)	0.14		0.86	0.74**
	(0.73)		(0.69)	(0.25)
PluriPTA (Closure)	0.95***	0.44***		0.16***
	(0.18)	(0.10)		(0.03)
PluriNTI (Closure)	-0.12	0.25***	0.11*	
	(0.16)	(0.06)	(0.05)	
Estimation Iterations		2317.00		
Goodness-of-fit	0.995	0.241	0.483	0.863

Table 10: *Multiplex SAOM with* Closure *cross-network effects, but without* Power (Ego) *and* Commitment (Ego).

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.

Network	**Bilateral**		**Plurilateral**	
	PTA	**NTI**	**PTA**	**NTI**
	estimate (se)	estimate (se)	estimate (se)	estimate (se)
Main effects				
Commitment	-0.0009	-0.0035***	-0.0166	0.0003
	(0.0021)	(0.0009)	(0.0154)	(0.0022)
Power	0.0012	0.04***	-0.003	0.0063***
	(0.0161)	(0.01)	(0.0037)	(0.0019)
Start-up Costs	2.15*	1.84**	7.54	-2.33**
	(0.90)	(0.71)	(10.06)	(0.73)
Subsequent Costs	0.85**	0.45***	-1.68	-1.03***
	(0.33)	(0.12)	(6.51)	(0.30)
Shared Costs	0.33*	0.39***	1.29	0.11***
	(0.14)	(0.06)	(0.89)	(0.02)
Controls				
WTO (Ego)	-1.32**	-0.57***	-2.35	0.17
	(0.47)	(0.17)	(2.01)	(0.16)
Membership			0.22	0.27***
			(0.15)	(0.05)
First Three Members			3.71·	1.16*
			(2.16)	(0.48)
Intercept (Density)	-1.15	-1.58***	-7.03	-0.15
	(0.98)	(0.28)	(14.49)	(0.73)
Cross-network effects				
BilatPTA		0.49***	4.09·	0.22*
		(0.11)	(2.25)	(0.11)
BilatNTI	-0.17		-1.70	-0.20
	(0.18)		(1.49)	(0.13)
PluriPTA	1.18*	0.21		0.40**
	(0.46)	(0.16)		(0.15)
PluriNTI	-1.50**	-0.64***	-3.48	
	(0.54)	(0.16)	(2.32)	
Estimation Iterations		2419.00		
Goodness-of-fit	0.984	0.269	0.709	0.906

Table 11: *Multiplex SAOM without* Power (Ego) *and* Commitment (Ego).

Notes: $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{\cdot}p < 0.1$.