# BIT by BIT*

## How Bilateral Investment Treaty Network Shapes Foreign Direct Investment

Licheng Liu† & Ruofan Ma‡

November 22, 2024

Word Count: 11,270

**Abstract**

Do bilateral investment treaties (BITs) have broader effects beyond the signatory states? We posit that the network formed by the collection of BITs transmits information about countries' domestic investment environment, such as the quality of their legal institutions , to other states within the network, which shapes the flow of foreign direct investment (FDI) and facilitates new treaty negotiations. To test this claim, we compile a comprehensive dataset of dyadic investment flows between states from 1970-2012. Using an event study design, we find that when two states become indirectly linked via BITs through an intermediate state, the FDI flow between the pair increases 50% faster on average in the next twenty years relative to the unconnected state dyads. Additionally, the country pair become 16% more likely to form a new BIT between them. To examine whether the information transmission mechanism facilitates this process, we further investigate heterogeneous treatment effects based on the quality of domestic legal institutions. As countries' rule of law increases, treatment effects increase for FDI flows, and decrease for BIT formation. Our findings highlight network spillover as a substantial component of the overall effect of BITs: For state within the BIT network, ratifying investment treaties not only strengthens economic ties with its new partner, but it helps transmit information to many others.

*__Working paper, please do not cite or further circulate__. We thank Leopoldo Biffi, Inken von Borzyskowski, Anthony Calacino, Stephen Chaudoin, Christina Davis, Kosuke Imai, Amy Pond, Michal Swarabowicz, Jennifer Tobin, Rachel Wellhausen, as well as participants at APSA 2024 and Imai Working Group for helpful conversations and comments. All remaining errors are our own.

†Postdoctoral Scholar, Department of Political Science, Stanford University

‡Ph.D. Candidate, Department of Government, Harvard University

# 1 Introduction

For over half a century, over 3,000 pairs of countries have ratified bilateral investment treaties (BITs) that set the terms for how investments from one country are treated in the other's jurisdiction (Alschner, Elsig and Polanco, 2021). Moreover, these treaties frequently take on similar language, principles, and structures, deriving from what is often referred to as "model" or "prototype" treaties (Vandevelde, 2011; Bonnitcha, Poulsen and Waibel, 2017). Taken together, these bilateral treaties collectively form a multilateral network of international investment regime, extending the regulatory power of each individual BIT beyond its direct signatories. The network structure of BITs, therefore, may give rise to investment behaviors that any single treaty within this network can not fully explain. How, therefore, does the BITs network shape the flow of investment across countries?

In this paper, we develop an information-based theory that embeds bilateral investment flow and treaty formation in the more extensive network of the international investment regime. We argue that in addition to the direct *material* effect BITs have on the signatories, the flow of international investment is also shaped by the indirect *informational* effect generated from the network formed by each individual BIT. Home country investors evaluate the suitability of the investment environment in a foreign country – such as the market risks, financial institutions, and legal protections – not only by the framework of international treaties, but also through the experience of their peers within the network. By demonstrating how BIT network can facilitate investment flows between country pairs even if they are not directly connected by an enforceable treaty, we highlight an under-examined role of investment agreements in shaping the cross-national flow of investment.

Then, we show that where countries are positioned within the BIT network has further downstream implications for their decisions in forming treaty connections with one another. Notably, recent work by Tomashevskiy (2022) shows that states form BIT with partners that can help them access more potential investment destinations through the treaty network. Thus, to address the threat to inference presented by the co-evolution between investment flow and the network structure of BITs, we further distinguish the effects on investment flow through direct and indirect paths within the treaty network using a causal mediation framework (Acharya, Blackwell and Sen, 2016). These findings help us identify the structure of investment treaties – where to invest, and with whom to form contracts – as a theoretically and empirically crucial factor in international finance.

We also find evidence of treatment heterogeneity based on the quality of domestic legal institutions. A key information countries seek to evaluate in potential investment destinations is how their outflowing property will be treated and protected in a foreign location. We identify two sources for the legal protection of investor properties: the domestic rule of law and international arbitration such as investor-state dispute settlements (ISDS). We find that the effect of indirect BIT connections is most pronounced where the quality of domestic legal institutions is high in the destination countries, which provides suggestive evidence that knowledge about foreign destinations' legal institutions serves as a crucial component of the learning mechanism within the investment treaty network. In contrast, the onset of ISDS around a country pair's neighboring network has a limited impact on the volume of dyadic investment flows, as these arbitration cases are highly salient and visble and thus constitute informational shock to the entire network. These results support our theoretical mechanism and indicate that while ISDS helps host countries to engage in credible signaling *dyadically* to those investors who are covered by the treaty, the larger BITs network further shapes investment flows by channeling information about the investment environment of a host country to other investors, even if they are not under the direct legal protection of a treaty.

The contributions of this paper are threefold. First, we speak to the extensive literature on whether and how bilateral investment treaties are effective at attracting more international investment. Existing research that argues for the effectiveness of BITs often points to the ISDS mechanism, which allows investors to legally challenge the host country's domestic policy and practice on the grounds of interfering with their property. The inclusion of ISDS into investment treaties imposes sizable legal costs and policy constraints on host governments (Allee and Peinhardt, 2011; Pelc, 2017; Ge, 2022). Therefore, countries that choose to enter into BITs can use the treaty as a credible *commitment* to solve hold-up problems for the protected investors (Haftel, 2010; Blanton and Blanton, 2012; Kerner and Lawrence, 2014; Zeng and Lu, 2016). Alternatively, countries can also use BITs to *signal* to all potential investors, protected or unprotected, that they have laws and policies in place that protect foreign investment (Neumayer and Spess, 2005; Büthe and Milner, 2009; Tobin and Rose-Ackerman, 2011; Colen, Persyn and Guariso, 2016). An implicit assumption for both the commitment and the signaling theory is that, in order for a BIT to be effective, the host country must actively seek out a treaty partner and open itself to (potential) legal troubles. Our paper does away with this assumption and shows that a country's investment flow can also be shaped by other countries' decisions to enter BITs. We find that when two countries become indirectly connected in the BIT network[1], the FDI flow between the pair increases by nearly 50% in the next five to ten years. In other words, a newly enacted BIT may not only grant investors protected access to the host country, but also connect them with peers who have knowledge and experience with third-party states' markets.

Second, our results indicate that bilateral treaties have multilateral consequences. Recent literature on regime complex and treaty diffusion are increasingly attuned to the spillover effects created by international institutions (Strezhnev, Kelley and Simmons, 2021; Pratt, 2023). These spillover effects, however, are often theorized to lead to undesirable outcomes: treaty ratifications can cause unintended backlash over issues like human rights violations (Lupu, 2013), labor repression (Peksen and Blanton, 2017; Ye, 2020), stagnation in legal and financial institutions (Betz, Pond and Yin, 2021; Allen, 2023), etc. Ratifying treaties may also create negative incentives for other countries to jump on the bandwagon, resulting in a "race-to-the-bottom" in regulatory

[1] For example, China and the US are indirectly connected through mediating countries like Argentina, Russia, etc. We provide a more formal definition of indirect connection in Section 2.

standards (Arel-Bundock, 2017; Thrall, 2021; Qian, 2023). We contribute to this literature by offering an account of positive spillover in the BIT network. Our result from mediation analysis shows that when the BIT network indirectly connects a pair of countries, their dyadic investment flow increases, which in turn drives up the likelihood of the subsequent conclusion of a direct BIT, potentially resulting from the demand of existing investors for property protection (Johns and Wellhausen, 2016).

Third, to test our theoretical expectations laid out above, we apply a causal network estimator on a comprehensive dataset that records the inflow and outflow of foreign direct investment (FDI) at the dyad level from 1970-2012 among 120 countries (Arpino, De Benedictis and Mattei, 2017). We posit that the mixed statistical findings on the relationship between BIT ratification and investment flows can partly be attributed to data aggregation, which often collapses FDI movement as monadic inflows or outflows[2] or precludes the possibility that BIT network's effect may precede the effect of a direct BIT ratification. Using dyadic data that maps out the movement of FDI across country nodes, in contrast, we are able to answer both whether or not BITs attract investment *into* a country, and *from* whom. Differing from both the expectation derived from commitment and signaling theory, we find that BITs can attract investment from unprotected locations, but only if they are located in the neighboring network where accessing information about the host country's investment environment is less costly.

The paper proceeds as follows. In section 2, we develop a novel theory of how the BIT network shapes the pattern of international investment. We generate several observable implications of our theory in section 3, and describe the data and estimation strategies we deploy. We then present the main results in section 4. Section 5 addresses the issue of mechanism and treatment heterogeneity. Section 6 concludes and describes avenues for future research.

[2] This practice, while helpful in organizing the data structure, may introduce noises from "never-taker" countries – i.e., the subgroup of countries for whom BIT conclusions have little to no effects – when estimating BITs' effect.

# 2 BITs, and the Network of BITs

Bilateral investment treaties are intergovernmental agreements that "grant extensive rights to foreign investors, including protection of contractual rights and the right to international arbitration in the event of an investment dispute" (Elkins, Guzman and Simmons, 2006, p.811). As an increasing number of states adopt BITs, these treaties have come to be recognized as the most important international legal mechanism to promote and protect international investment in the absence of a multilateral institution regulating FDI (Elkins, Guzman and Simmons, 2006; Jandhyala, Henisz and Mansfield, 2011; Poulsen and Aisbett, 2013). We add to this discussion by demonstrating that BITs, in fact, do generate multilateral consequences by connecting countries into a network governed by treaties similarly designed to address a single issue: providing protection to international investments (Bonnitcha, Poulsen and Waibel, 2017).

As an empirical point of departure, we first document a stylized fact on the relationship between network distance and countries' foreign investment flows. Using bilateral FDI data[3] that cover over 14,000 pairs of countries between 1970-2012, we run a reduced-form analysis by regressing logged FDI volume in stock between country pairs on a measure of distance between them on the BIT network. Measuring the distance between a country pair by the shortest path that connects them in the BIT network. We first provide a descriptive evidence that the relative position of countries in the investment treaty network predicts the volume of FDI between them, as detailed by the regression results in section A.2. To further inform the causal relations between BIT network and countries' foreign investment behaviors, we develop in the rest of this section a network-based theory that considers the spillover effects of treaty ratification on non-signatory states.

## 2.1 BITs, what are they good for?

Before discussing the network effects created by the investment treaty regime, it is necessary to first understand why individual BITs may directly impact investment. Past research consistently agreed

[3] Details of the data can be found in Section 3.

on the theoretical mechanisms through which BITs may affect FDI, highlighting in particular the legal protections these treaties provide. In the following, we categorize these arguments into two camps: one that sees BITs as *dyadic* credible commitments, and one that sees them as *monadic* signaling devices (Tobin and Rose-Ackerman, 2011; Bonnitcha, Poulsen and Waibel, 2017).

First, BITs may tie the hands of signatory states by imposing legal costs on their contract-breaking behaviors. In particular, the inclusion of ISDS mechanisms is often seen as a solution to the hold-up problems common in international investments (Carnegie, 2014; Antràs, 2015). By granting recourse to international arbitration, BITs can help foreign investors circumvent potentially hostile judicial environments in the host countries and increase the prospect of receiving compensation. Moreover, BITs also grant investors from the signatory countries legal rights that are not available to competitors of other nationalities (Aisbett, Karp and McAusland, 2010; Bonnitcha, Poulsen and Waibel, 2017). As a result, BITs can deter host countries from interfering with foreign assets (Poulsen, 2014) and attract investment from assured partners (Blanton and Blanton, 2012; Zeng and Lu, 2016). Conversely, when countries break from their treaty obligations and infringe on foreign property, they are often punished financially and experience a marked decrease in foreign investment (Haftel, 2010).

Second, BITs are also conceptualized as signaling devices by other scholars: when a country enters into a BIT, it signals all foreign countries, regardless of whether there exists a BIT between the dyad, that its domestic legal and financial institutions are adequate in protecting foreign investment (Büthe and Milner, 2008; Kerner, 2009; Colen, Persyn and Guariso, 2016). Compared to the commitment theory of BITs, therefore, the signaling theory suggests that countries that enter into BITs are not only able to attract investments from treaty partners to whom they extended legal protection, but also from investment-exporting countries in general. Furthermore, the intensity of the signal reflects the underlying quality of domestic institutions of the host country. Thus, as an observable implication, researchers have shown that the more BITs a country concludes with other states, the more likely it will experience increases in the FDI inflow (Tobin and Rose-Ackerman, 2011; Kerner and Lawrence, 2014).

In sum, theories of BITs draw from the institution's ability to provide legal and political information about the states choosing to participate in it (Dai, 2002). Who learns from BITs, however, separate the two arguments from each other: Either the information is only received by the partner countries entering the bilateral treaty, or it reveals the monadic features about the host country which are then observable to all states. In the rest of this section, we provide a theoretical middle ground by turning to the multilateral network formed by each individual bilateral investment treaty. In short, we argue that the extent to which states can extract information about the treatment of their investors depends on their embeddedness in the regime of investment treaties. In other words, in addition to the direct material effect a BIT has on the signatories, it also connects the countries to the larger investment treaty network and helps them obtain further information about the investment environments of each other's "second-order" treaty partners (Tomashevskiy, 2022), i.e., the friends of their friend.

## 2.2 Learning through the BIT Network

Do countries embedded in a treaty network learn about each other? Theorists of international institutions have long stressed the social relations encoded in international treaties when it comes to cooperation. Regardless of their width or depth, international treaties usually impose limits on states' sovereignty through policy intervention. As states actively choose to enter into treaties, therefore, they "self-categorize into a group of states defined by their shared legal commitments" (Schmidt, 2023, p.3). In other words, treaties constitute inherently social contracts that reflect states' willingness to cooperate on an issue or a set of issues[4]. In a similar vein, recent research finds that "like-minded" states – either geopolitical or ideological – are more likely to cooperate and communicate with each other through international institutions (Voeten, 2021; Davis and Wilf, 2017; Davis, 2023). Thus, compared to countries outside of the network, countries posi-

[4]Particular to economic cooperation such as trade and investment, Büthe and Milner (2009) also refer to this "willingness to cooperate" as states' epistemological commitment to liberal economic policies.

tioned within the same regime network share more distributional, relational, and epistemological commonalities which incentivize them to further obtain information about other members' level of willingness and commitment for cooperation. Moreover, we argue that such incentives should be particularly pronounced between countries that are positioned closely to one another within the network.

Although how information transmission across the network generates additional consequences has been well studied in other types of treaties [5], the exact role the network plays in BITs requires further clarification: what do BITs help countries learn about each other? While we do not claim that learning occurs exclusively within the BIT network, two features of BITs make this network a particularly attractive forum: First, compared to other international treaties, BITs provide particular opportunities and incentives for the ratifying countries to learn about their partners' domestic institutions that may affect the treatment of their outgoing investment. Second, the network of BITs helps the transmission of such knowledge to the second-order partners of the ratifying countries. We discuss these two features in detail in the following:

First, signatories of BITs obtain information about their partner's domestic investment landscape both through public and private channels. States learn about their partners' investment conditions through negotiation. Legal scholars have long argued that the design and re-design of investment treaties depend on state officials and negotiators to navigate "a combination of contingency, path dependency, and competition"(Roberts and St John, 2022). As a result, countries that have more information about how treaty provisions could conflict with future political priorities tend to include a more extensive list of reservations (Bonnitcha, Poulsen and Waibel, 2017, Ch.5). Moreover, compared to treaties in other issue areas, BITs negotiated by the same leading country often share similar templates and wordings for investment provisions (Brown, 2013; Clark

[5]For example, in the context of double tax treaties (DTT), Hong (2018) and van 't Riet and Lejour (2018) found that countries' position in the DTT network significantly shapes their competitiveness in attracting firm investment. Similarly, Arel-Bundock (2017) and Qian (2023) note that other countries' decisions to adopt DTT further affect the home country's likelihood of ratifying a DTT, as well as the design of the treaty. In other words, the information about possible outside options in the DTT network generates a negative externality of tax evasion and provides countries with backdoor access.

and Pratt, WP). Thus, countries that have adopted a particular BIT framework accrued trainings in negotiating the particular type of treaties they signed, knowledge about the implication of its legal technicalities, as well as experience of how such treaties are applied (Poulsen, 2015, Ch.3). Such common experience, in turn, leads to an increased propensity for countries that have signed similar BITs to further initiate interactions with each other.

The expansion of the BIT network also motivates private investors to seek further information about potential investment destinations. Stiglitz (2007) posits that during negotiation, developed countries often have industry lobbies that understand the implications of treaty negotiations for their interests, these private lobbyists then inform and pressure their state to bargain for a more asymmetrically designed treaty in their favor[6]. Moreover, Thrall (2023) finds that the conclusion of US-led BITs is a significant predictor for US business to establish an American Chambers of Commerce in the destination country, in order to maintain on-the-ground communications with the US officials. Lastly, firms along the value chains often communicate and organize among themselves to protect against property rights violations in the host country (Johns and Wellhausen, 2016). In sum, from negotiation to enforcement, BITs drive both state and non-state actors to accumulate knowledge about their partner, particularly in relation to how their partner's domestic politics may interact with their own investment goals.

Second, in addition to states they are directly connected to via a BIT, countries within the treaty network are also incentivized to learn about those that are structurally proximate to them. As the previous paragraphs indicate, structural proximity indicates for the government who are the suitable partners in future cooperation. Empirically, states' incentives to gain deeper access to the investment treaty network are well documented in the global diffusion of BITs. For instance, Elkins, Guzman and Simmons (2006) argue competition to attract capital between developing countries with similar trade partners is a major determinant explaining why countries choose to ratify BITs. The authors find that potential hosts are more likely to sign BITs when their

[6] For a direct application of this argument on bilateral investment treaty, see Allee and Peinhardt (2014)

competitors have done so. Jandhyala, Henisz and Mansfield (2011) confirm similar dynamics, and further identify a period during which joining BITs was seen as an appropriate act for countries to engage in with similar peer states. Thus, we argue that BITs act as social ties that bring countries under a multilateral network regulating investment behaviors. Through this network created by each individual BIT, countries are able to identify other structurally proximate states as potential peers or partners (Gray, 2013), and obtain information about their investment environment and domestic institutions from their existing BIT partners.

Similarly, investors nested in these countries also frequently face decisions regarding the placement of their foreign investments. Under various constraints – such as factor co-specificity (Nunn, 2007; Iversen and Soskice, 2019), inter-subsidiary competition (Chaney, 2014; Antràs and De Gortari, 2020), and geopolitical concerns (Malesky and Mosley, 2021; Alfaro and Chor, 2023) – outgoing investments from their home country are often channeled to locales with whom the investors' home countries do not have formal investment treaties, and therefore lack direct means of contract enforcement (Antràs, 2015, esp. Ch.1). Faced with uncertainties over how their properties will be treated in foreign host countries, private investors also need to identify potential host countries with more desirable investment environments. When searching for potential destinations to situate their investment, therefore, investors may use the BIT network as institutional heuristics that inform investors which destinations their peers have invested in and therefore have knowledge about their investment environment.

## 2.3 South Africa: An Illustrative Case

The experience of South Africa with international investments post-apartheid illustrates how the BIT network shapes both the public and private actors' engagement with treaty negotiations and investments. Around the country's the first multi-racial elections in 1994, the African National Congress (ANC) endeavored to assure foreign investors that they would not be subjected to expropriation or nationalization[7]. Such promise, however, was met with widespread skepticism and uncertainties from international investors, as South Africa was in the midst of a series of constitutional debates pertaining to property rights, such as redistribution of lands and affirmative action policies.

Faced with the institutional uncertainties in South Africa, the British government, whose investors have a substantive presence in South Africa at the time (Gelb and Black, 2004), initiated a BIT negotiation with the newly elected South African government. Without perhaps fully understanding the legal implication of the treaty and eager to appease foreign investors, the South African negotiators quickly accepted "a six-page standard European BIT-model" (Poulsen, 2014, p.7) proposed by their British counterparts in 1994. Following South Africa's signature of its first BIT with the UK, two patterns quickly emerge. First, South Africa began to attract an increasing amount of investment from foreign multinationals, reversing the trend where companies exited the country *en masse* in the preceding years (Gelb and Black, 2004). Particular to our argument, locations that see the highest amount of capital outflows to South Africa are found among countries that have close investment ties with the UK or share a formal investment agreement with the UK. This go beyond the traditional investor states in Europe and North America but also include countries like Korea, China, Egypt, etc. Moreover, many countries with BIT ties to the UK also started negotiating and concluding investment treaties directly with South Africa, frequently borrowing from the experience and insight of the British negotiators and "did not depart significantly from the British text" (Poulsen, 2014, p.8).

Second, the outward FDI originating from South Africa was also shaped by the country's initial connection to the BIT network via its agreement with the UK. At the same time as post-Apartheid South Africa has sought to reassure foreign investors, South African companies were also expanding their outward investment activities[8]. This outward foreign investment is most concentrated in

[7] "Mandela Pleads for Investment in South Africa", *The Times*, October 13, 1993. See also Schlemmer (2016)

[8] A decade after ratifying its first BIT with the UK, the country's total inward FDI stocks stood at \$46.3 Billion (US), while outward FDI stocks reached \$28.8 Billion (US) in 2004 (Peterson, 2006; UNCTAD, 2005).

the Southern African region, with South Africa firms making their largest foreign investments in countries such as Zimbabwe (UNCTAD, 2005; Schlemmer, 2016), which also underwent BIT negotiation and ratification with the UK in 1995. The increasing investment ties between South Africa and Zimbabwe, in turn, made several South African firms to explicitly call for treaties to be put in place before they would consider new investments in Zimbabwe[9]. Moreover, other African countries with which South Africa concluded BIT, such as Mozambique, were later approached by the UK, seeking to initiate treaty negotiations.

Of course, while South Africa provides a concrete case that illustrates the dynamic of our theory, which suggests the BIT network facilitates both economic and political cooperation between countries with similar treaty obligations, our ability to extract causal interpretations from it remains limited. In the next section, we introduce how we measure structural proximity within the BIT network and describe our treatment assignment process. We then formalize the testable hypotheses derived from the theoretical discussion in this section.

# 3 Data and Research Design

To measure the network effect of connecting two structurally proximate countries, we examine a crucial feature in network analysis: the existence of an indirect connection between two country nodes – i.e., treaty bridging (Hafner-Burton, Kahler and Montgomery, 2009; Kinne, 2013). We define a treaty bridge to be a network structure formed by at least three nodes $(A, B, C)$. $A$ and $C$ are considered to be (indirectly) bridged if there exists an edge between $A$ and $B$ and an edge between $B$ and $C$. $B$ is considered as the intermediate node[10]. Using the ratification history of BITs from the Electronic Database of Investment Treaties (EDIT) compiled by Alschner, Elsig and Polanco (2021), we visualize in Figure 1 the overtime growth of direct connection and indirect

[9] "Zimbabwe: Impala Platinum Seeks Zim Govt Protection", *Zimbabwe Standard*, September 5, 2004; "South Africa: DA Lashes Delayed SA-Harare Accord", *Business Day*, February 11, 2005. See also Peterson (2006).

[10] For conceptual and measurement clarity, we restrict our definition of indirect connection to one degree of separation (i.e., the path from $A$ to $C$ is of length 2.), but it is possible to extend our framework to longer pathways.

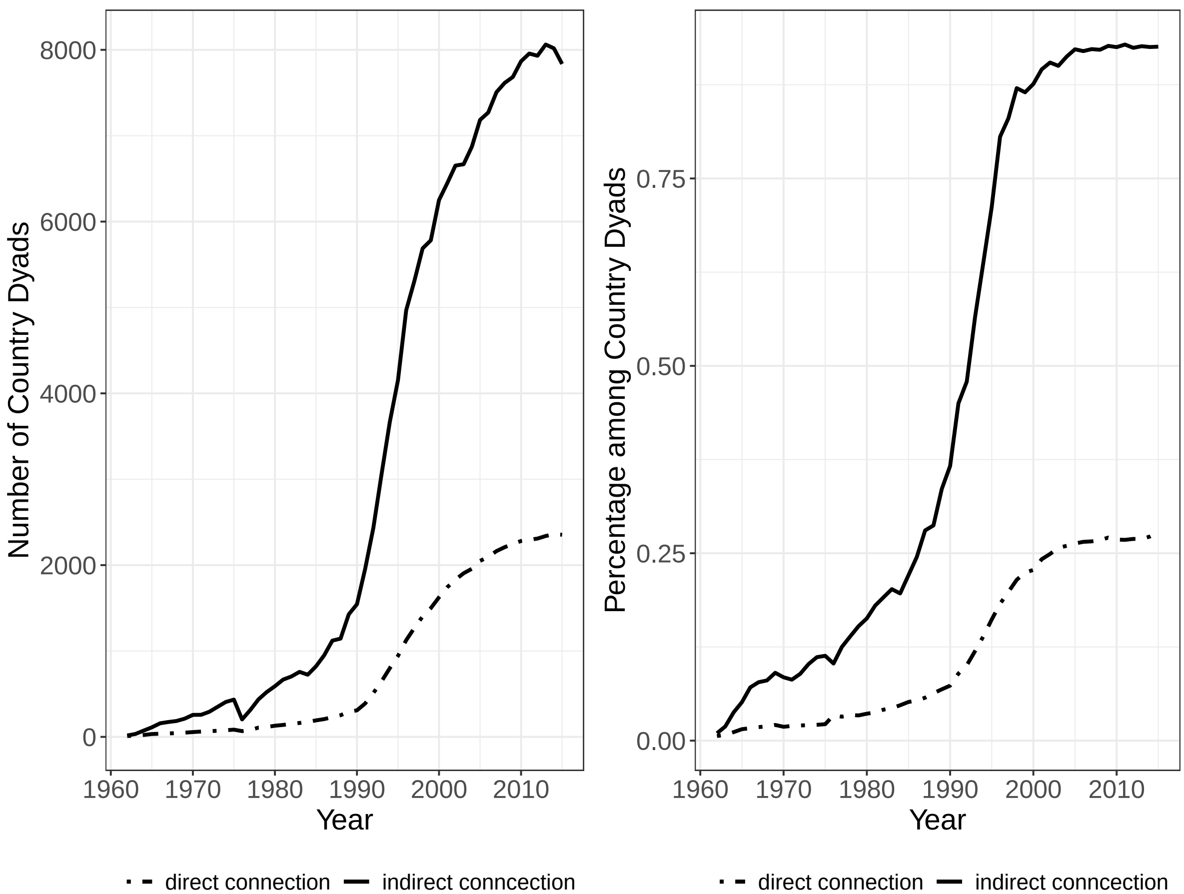
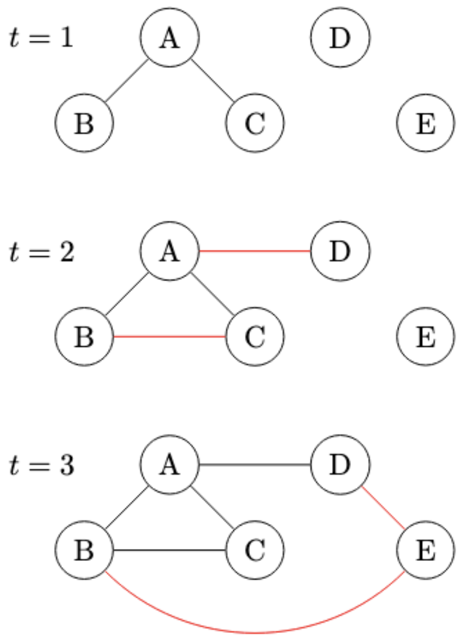



Figure 1: Evolution of the BIT network between 1960-2015. The left panel plots the total number of country dyads that are directly (dashed) and indirectly (solid, i.e., treaty bridge) connected by active BITs. The right panel plots the ratio of country dyads that are directly (dashed) and indirectly (solid) connected within the BIT network.

connection within the BIT network which emerged in the 1950s. As the BIT network involves more states and grows denser over time, the number of indirect connections increases exponentially faster than the direction connections in the BIT network. At least descriptively, therefore, ignoring the network feature comprised by the universe of BITs may result in an incomplete evaluation of their effect.

Figure 2 provides a stylized illustration of how the treatment of BIT bridges is assigned to country dyads using five states ($A - E$) as nodes and BITs as edges. At the beginning of period $t = 1$, country pair $AB$ and $AC$ are connected by their respective treaties, while country $D$ and $E$




| | $t = 1$ | $t = 2$ | $t = 3$ |
|---|---|---|---|
| $AB$ | 0 | 1 | 1 |
| $AC$ | 0 | 1 | 1 |
| $AD$ | 0 | 0 | 0 |
| $AE$ | 0 | 0 | 1 |
| $BC$ | 1 | 1 | 1 |
| $BD$ | 0 | 1 | 1 |
| $BE$ | 0 | 0 | 0 |
| $CD$ | 0 | 1 | 1 |
| $CE$ | 0 | 0 | 1 |
| $DE$ | 0 | 0 | 0 |

Figure 2: Illustration of research design

remain outside of the BIT network. As a result, there exists only one BIT bridge, which connects the country pair $BC$. In $t = 2$, two new investment treaties are concluded between $A$ and $D$ and between $B$ and $C$. Thus, as the BIT network expands, country pairs $AB$, $AC$, $BD$, and $CD$ become treated during this period. Finally, in $t = 3$, two more investment treaties are concluded between $B$ and $E$, and between $D$ and $E$, creating two more BIT bridges between $AE$ and $CE$. This results in a country pair-year panel data as illustrated by the table in fig. 2 on the right, where 0 indicates the controlled condition, and 1 indicates the treated condition. Following our theoretical arguments, when a pair of countries become treated, that is, when there exists a BIT bridge between them, they receive more information about the other's investment environment and legal institutions. As a result, we expect the dyadic flow of FDI will increase as such information alleviates the fear of investment hold-up.

Moreover, the existence of a BIT bridge brings the pair of countries closer in the treaty network, which further shapes states' decision to ratify BITs, thereby augmenting the structure of the overall network: Countries that are more connected within a treaty network may leverage their "broker" status to further negotiate new treaties (Hafner-Burton, Kahler and Montgomery, 2009). Alternatively, countries already in the network may be more likely to associate with nearby states (Elkins, Guzman and Simmons, 2006; Jandhyala, Henisz and Mansfield, 2011) – as Tomashevskiy (2022) observes, "governments are more likely to participate in BITs when states expect to access groups of capital-exporting states (p.36)" through treaty bridging. Finally, as the investment flow increases between the country dyad as a result of treaty bridging, private investors that operate directly between the two countries may also become collectivized to lobby for more formal protections (Thrall, 2023). These arguments indicate that the existence of treaty bridges may by itself induce a higher propensity for the two indirectly connected countries to conclude a direct BIT between them. As such, we derive the two main testable hypotheses of our theory of treaty bridging:

*H*1: *The existence of a BIT bridge between two countries increases the direct investment flow between them.*

*H*2: *The existence of a BIT bridge between two countries increases the likelihood of them directly forming a BIT.*

Additionally, to address the endogeneity concern that any effect we detect between treaty bridging and FDI flows may be explained by the formation of a direct BIT instead, we also propose a third hypothesis that separates the two effects:

*H*3: *The existence of a BIT bridge between two countries increases the direct investment flow between them, even after controlling for the effect of BIT bridge on direct treaty formation.*

Lastly, we derive three differentiating hypotheses that help establish our proposed mechanism (Blackwell, Ma and Opacic, 2024; Spirling and Stewart, 2024). Our theoretical arguments rely on the mechanism that countries learn about the domestic institutions of the countries they share a BIT bridge. Therefore, as the level of rule of law in the bridged country increases, we expect that the effect of learning will result in a larger increase in FDI flow through the BIT network. Conversely, higher levels of the rule of law in the bridged country provide greater reassurance, thereby reducing the need to form a BIT as institutional complements (Tobin and Rose-Ackerman, 2011). In comparison, we expect the alternative channel of legal protection – international arbitration through ISDS – to have little effect through BIT bridges. This is because ISDS cases are salient, visible events that represent system-level shock to the entire network, and are therefore observed by both treated and controlled country dyads. Therefore, while ISDS may reduce the overall FDI inflow to the defendant country (Allee and Peinhardt, 2011), our theory predicts that the effect of ISDS should not vary across treated and controlled groups. Thus, we formulate three hypotheses about the mechanism:

*H*4: *When the host country has a higher level of rule of law, the effect of BIT bridges on FDI flow will be larger.*

*H*5: *When the host country has a higher level of rule of law, the effect of BIT bridges on direct treaty formation will be smaller.*

*H*6: *The effect of a BIT bridge does not change when parties along the bridge experience an ISDS.*

We proceed to design empirical tests for our hypothesis in groups. In section 4, we first present our estimation strategy for the two main hypotheses, $H_1$ and $H_2$. Then, we adopt a causal mediation approach to provide empirical tests for $H_3$. In section 5, we provide further discussion on the mechanism and present empirical evidence for $H_4$, $H_5$, and $H_6$.

# 4 Empirical Findings

To test our first two hypotheses, we adopt a fixed-effect counterfactual estimator incorporating heterogeneous treatment effects (Liu, Wang and Xu, 2024) to deal with the undesired "negative weights" problem due to staggered treatment adoption (Sun and Abraham, 2021):

$$Y_{ij,t} = \beta_{ij,t} D_{ij,t-1} + \boldsymbol{X}'_{ij,t}\boldsymbol{\gamma} + \alpha_{ij} + \xi_t + \varepsilon_{ij,t}, \tag{1}$$

where the treatment variable $D_{ij,t-1}$ is a dummy variable that equals 1 if at time $t-1$, country $i$ and $j$ are indirectly connected by *at least* one intermediate country within the BIT network[11]. $\beta_{ij,t}$ is the heterogeneous effect of BIT bridge at time $t$. We are interested in the average treatment effect on the treated (ATT) at time $t$: $\beta_t = \frac{\sum_{ij} D_{ij,t-1}\beta_{ij,t}}{\sum_{ij} D_{ij,t-1}}$. We obtain data on the existence of BITs from the EDIT dataset (Alschner, Elsig and Polanco, 2021), which we also use as the outcome variable for $H2$. $\boldsymbol{X}$ is the design matrix which includes a series of covariates discussed below. To account for possible network-level shock that may constitute unobserved confounding – for example, a country may become more attractive as an investment destination due to an exogenous shock. That could make other countries simultaneously more likely to conclude BITs with it, as well as increase investment – we include $\alpha_{ij}$, the fixed effect for country dyad $ij$. $\xi_t$ is the fixed effect for time $t$. $\varepsilon_{ij,t}$ is a random shock with mean zero.

The outcome variable for $H1$ is bilateral FDI stock. The data are compiled from multiple sources which in turn draw on FDI stock data from UNCTAD (Barthel, Busse and Neumayer, 2010; Leblang, 2010; Schoeneman, Zhu and Desmarais, 2022; Tomashevskiy, 2022), covering the time period of 1970 to 2012[12]. Existing empirical studies on FDI use monadic data because scholars

[11]In additional regression analyses, we consider two alternative treatment variables: the number of such BIT bridges between the country pair and the log number of BIT bridges, the results for which can be found in Appendix A.4

[12]These papers cover different sub-periods between 1965-2012. We remove the data between 1965-1969 due to the sparsity of observations and concerns for data quality (Schoeneman, Zhu and Desmarais, 2022). We examine the validity of these open-source data by calculating the correlation whenever the time periods overlap. The overlapped data appear to be fairly consistent with $r > 0.91$. We further take the average of overlapped data to reduce possible

are primarily interested in how host countries' economic and political characteristics affect capital inflows (Neumayer and Spess, 2005; Büthe and Milner, 2009; Haftel, 2010; Allee and Peinhardt, 2011; Tobin and Rose-Ackerman, 2011; Kerner and Lawrence, 2014; Zeng and Lu, 2016). The advantage of using dyadic data is that it allows us to simultaneously model network relationships and control for spillover effects induced by dyadic level covariates such as geographic distances, alliances, and bilateral trade volumes. Following common practice (Barthel, Busse and Neumayer, 2010; Schoeneman, Zhu and Desmarais, 2022), we take the natural log of the FDI stock variable (adding 1 before logging) to account for the extreme outliers present in FDI stock data.

Furthermore, to increase the comparability between country pairs that are indirectly connected and those that aren't, we further include several control variables in additional regression analyses and robustness checks. Drawing from previous literature, we include three sets of covariates in the model. First, within each country pair $ij$, we define the country with the higher level of GDP to be the lead state at time $t$, and the country with a lower level of GDP to be the following state. We then include a set of monadic covariates for the lead and following states separately: V-Dem scores as a measurement of levels of democracy, rule of law index, GDP per capita, and total capital stock (Lindberg et al., 2014; Feenstra, Inklaar and Timmer, 2015). The second set of variables considers the dyadic relationship between $i$ and $j$. We include gravity measurements like contiguity, geographic distance, and trade volumes (Gurevich et al., 2021). We also record whether the country pair have any share memberships in other international institutions such as PTAs, DTTs, WTO, and OECD (Davis, 2023; Qian, 2023) as well as cultural affinities like common legal origins, languages, and colonial histories (Ahern, Daminelli and Fracassi, 2015). Lastly, and crucially for our first hypothesis, we account for the existence of direct BIT between a country pair in two ways: first, we record whether a country pair has an active BIT in place as a dummy variable as part of the covariates; second, we further adopt an alternative difference-in-differences estimator and conducted exact-matching on country pairs' pre-treatment BIT ratification history

noises from each individual source.

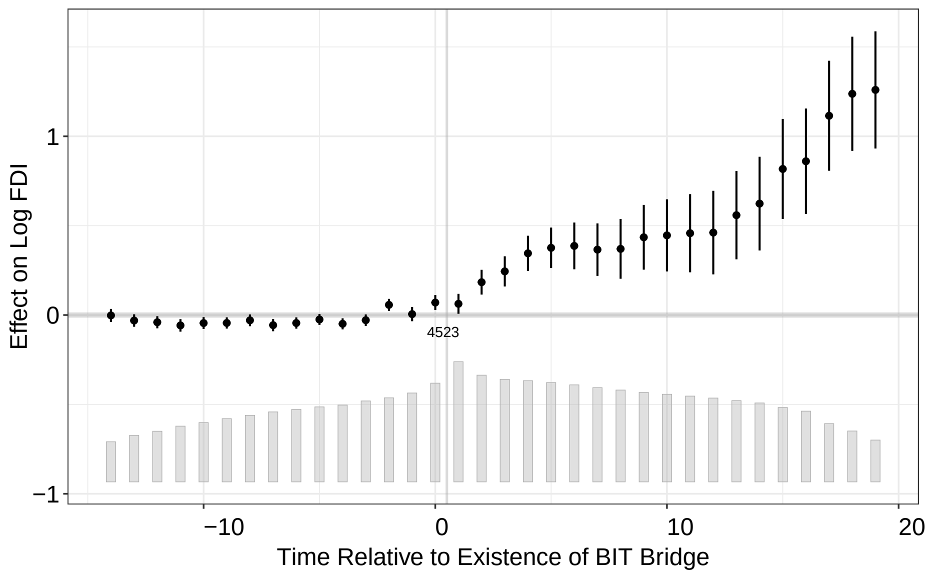



Figure 3: Effect of indirect connection in the BIT network on bilateral FDI flow: The plot shows the ATT (average treated effects on the treated units) of indirect BIT connection on the FDI flow between country pairs. The gray bars denote the number of observations used in computing the effect across each period. The model estimates 95% confidence intervals with 500 block bootstraps.

(Imai, Kim and Wang, 2023). Results for the latter analysis can be found in

## 4.1 Main results

We apply the fixed effect counterfactual estimator to evaluate two quantities of interest: the effect of indirect connection in the BIT network on bilateral FDI flows, and the likelihood of direct BIT conclusion. Focusing on the variation over time for each country pair that has recorded investment flows, we look for whether there is a difference in the trends of bilateral FDI flows and direct BIT formation before and after they become indirectly connected.

Figure 3 shows the estimated treatment effects among treated units (ATT) on bilateral FDI flows[13] with 95% confidence intervals ($H_1$). $t = 1$ indicates the first year when two countries are connected via a BIT bridge. We measure the effects from the onset of the treatment assignment,

[13]Note that, since our data on FDI documents the bilateral stocks, which is defined as "the value of the share of capital and reserves (including retained profits) attributable to the parent enterprise", the difference-in-differences estimators should thus be interpreted as effects on FDI flows. See `https://unctadstat.unctad.org/datacentre/dataviewer/metadata/dimension-element/US.FdiFlowsStock/1418/Flow/09` for a full definition of FDI stock.

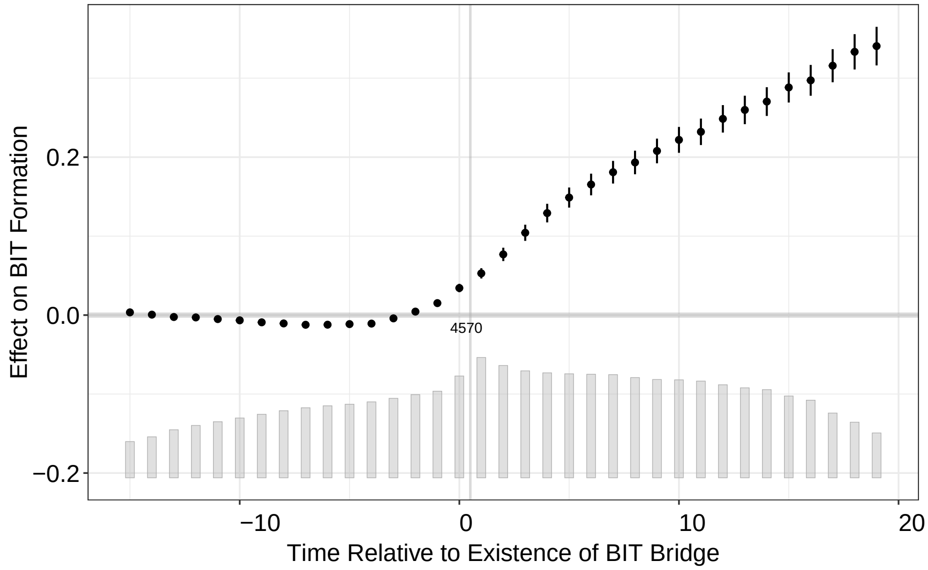



Figure 4: Effect of indirect connection in the BIT network on direct BIT formation: The plot shows the ATT (average treated effects on the treated units) of indirect BIT connection on the likelihood of direct BIT formation between country pairs. The model estimates 95% confidence intervals with 500 bootstraps.

leveraging the plausible exogeneity given the third-party state's ratification decision. We plot the contemporaneous effects at $t = 1$ and the persistent effects after the indirect connection is established for up to 20 years (from $t = 1$ to $t = 20$). The shaded regions for periods prior to the indirect connection aim to detect anticipation effects and pre-trends. We use $t = 0$ as the reference group and plot the estimated effects for up to fifteen years before the year of treatment ($t = -15$ to $t = -1$). We observe a strong and positive effect when comparing the trend of bilateral FDI flows between the indirectly connected and controlled dyads. We find that indirect connection in the BIT network leads to an increase between 8% to 122% in bilateral investment flows in indirectly connected country dyads relative to the controlled dyads.

Similarly, Figure 4 shows the estimated treatment effects among treated units (ATT) on the likelihood of direct BIT formation with 95% confidence intervals ($H_2$). Again, we observe a strong and positive effect when comparing the trend of direct BIT formation between the indirectly connected and controlled dyads. We find that indirect connection in the BIT network makes indirectly connected country dyads 0.5% - 31% percent more likely to form a direct BIT between themselves in the 20 years after treatment relative to the controlled dyads. All effects are significant at the 95% level for the 10 years after the initial treatment assignment. It is noteworthy, however, that the estimated dynamic effects, which are significant due to the large number of observations, in pre-treatment periods indicate a violation of the parallel-trends assumption.

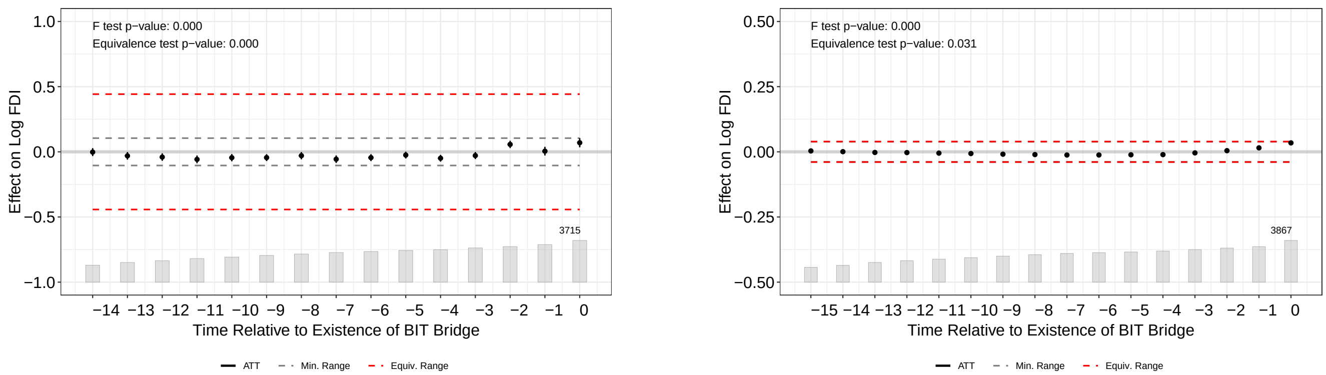
## 4.2 Robustness and Sensitivity

We noted that in Figure 3 and 4, several estimates in the pre-treatment period return statistically significant results that may raise concerns of 'pre-trends". To assess the severity of potential parallel trend violations and whether we can still recover any causally identified effects, we conduct the equivalence test and a placebo equivalence test for no pre-trends.

In the equivalence test, the null hypothesis is the existence of pre-trends (Hartman and Hidalgo, 2018; Liu, Wang and Xu, 2024). For the placebo equivalence test, we regard the first five periods before treatment, i.e, $\{-5, -4, -3, -2, -1\}$, as placebo periods. Figure 5 displays equivalence test results. The $p$-value of the $F$-test for joint significance is smaller than 0.05, as the 95 % confidence intervals do not cover 0. In the equivalence test, for both outcomes, the $p$-values are smaller than 0.05, suggesting that we can reject the null hypothesis of the existence of pre-trends.

Results for the placebo equivalence test are shown in Figure 6. As previously noted, the 95 % confidence intervals in both dynamic effects do not cover 0 in several placebo periods. Nevertheless, for both outcomes, the joint placebo tests have $p$-values greater than 0.05, suggesting that we cannot reject the null hypotheses that the parallel trends assumptions hold. In contrast, the $p$-value of the placebo equivalence tests are both smaller than 0.05, suggesting that we may reject the null hypothesis of non-zero placebo effects. Combining the equivalence test and placebo equivalence test, we conclude that the violation of parallel trend assumption is not severe in our main analyses and the estimated effects in the post-treatment periods are still valid.

Lastly, We further implement an additional sensitivity analysis proposed by Rambachan and




Log FDI　　　　BIT Formation

Figure 5: Equivalence Test

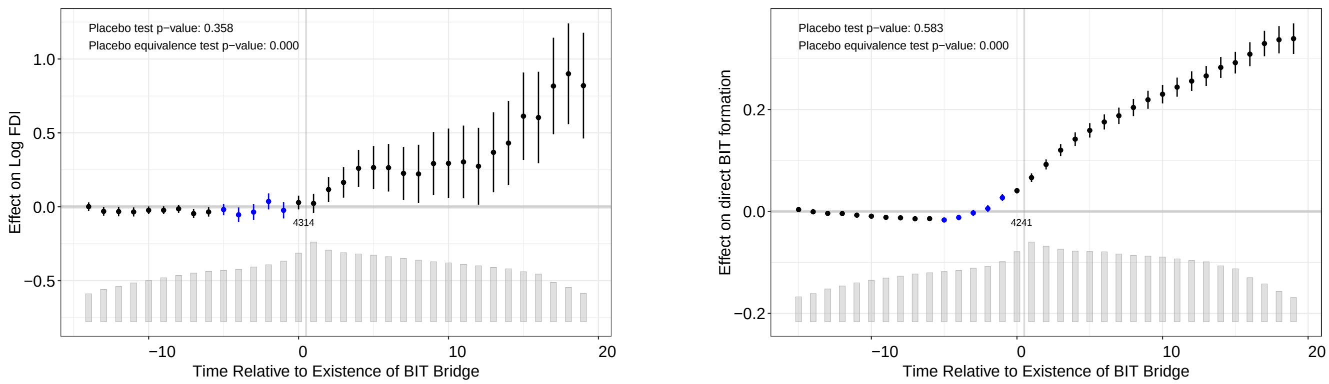
Roth (2023). This analysis assumes that the estimated dynamic effects $\beta = (\ldots, \beta_{-1}, \beta_0, \beta_1, \ldots)$ can be decomposed into two parts: the bias from differences in trends $\delta$ and the true treatment effects $\tau$, i.e.,

$$\beta = \underbrace{\begin{pmatrix} 0 \\ \tau_{\text{post}} \end{pmatrix}}_{=:\tau} + \underbrace{\begin{pmatrix} \delta_{\text{pre}} \\ \delta_{\text{post}} \end{pmatrix}}_{=:\delta},$$

where $\tau_{\text{pre}} = 0$ as the dynamic effects are zero in pre-treatment periods. This decomposition allows partially identification of $\tau_{\text{post}}$ given $\hat{\beta}$ and the relationship between the trends $\delta_{\text{pre}}$ and $\delta_{\text{post}}$. In essence, this analysis allows us to assess how severe the parallel trend violations can get before our main effects become explained away by pre-existing trends in direct BIT formation prior to the treatment assignments. We adopt the "relative magnitude" approach to bound $\delta_{\text{post}}$ given some positive real number $\bar{M}$:

$$\Delta^{RM}(\bar{M}) = \left\{\delta : \forall t \geq 0, |\delta_{t+1} - \delta_t| \leq \bar{M} \cdot \max_{s<0} |\delta_{s+1} - \delta_s|\right\},$$

which means that the violation of the parallel trend assumption in the post-treatment period is at most as large as $\bar{M}$ times the worst case in the pre-treatment periods. After adjusting the




Log FDI

BIT Formation

Figure 6: Placebo Tests

parallel trends using the most several violations ($t = -9$), our main results remain significant in the post-treatment periods for $\bar{M} \leq 0.5$ for log FDI in stock values and $\bar{M} < 0.5$ for BIT formation (see Figure A.6). However, if the value of $\bar{M} \geq 0.5$, the estimated effects become insignificant. Therefore, the estimates remain valid if we can tolerate a slight violation of the parallel trend assumption.

## 4.3 Alternative Explanations

Next, we address several potential alternative explanation for our results. As we aggregate investment data on the country-level, our main results may not be able to distinguish the actual actors that are increasing their investment flow post-treatment. Thus, one may worry that these patterns are driven primary by large, multinational companies rearranging their global value chains to utilize international legal protection (Betz, Pond and Yin, 2021) or streamline production (Alfaro et al., 2019), instead of new investors entering bridged destinations upon more information about their investment environment become available. We discuss these two scenarios in turn.

First, an increasing amount of anecdotal evidence indicate that large firms are strategically positioning their foreign subsidiaries in order to gain access to the international arbitration process for their investment. For example, in 2011, Philip Morris, a US multinational tobacco company, sued the Australian government for passing the Tobacco Plain Packaging Act. Notably, the claim arises not from Philip Morris' headquarter in the US, as the US and Australia have not ratified any binding investment treaties. Instead, it comes from the company's subsidiary in Hong Kong, a region with which Australia concluded a BIT back in 1993. While there is little doubt that such strategic behaviors exist, we argue that this phenomenon would only lead to a underestimation of our main results, as it only occurs when the home country do not have a BIT connection with the defendant country (i.e., the US and Australia), and would therefore falls under the controlled condition. Thus, upticks in the investment flow between country pairs where multinationals seek transnational legal shelters would create a downward bias for the effect of BIT bridges on treated country pairs.

Second, besides seeking legal shelter, multinationals may also drive the results we observe by incorporating the country they are bridged to into their production chain. As historical intra-firm investment data are scarce, our more limited goal here is to explore whether *trade* behaviors between country dyads become systematically different before and after the treatment. To do so we look at the number of product between a pair of country. If our findings can be explained by global value chain adjustments, then we would expect the number of traded product between the pair of country to remain relatively stable, assuming that on average, the range of products produced and traded by multinational companies do not change suddenly. In contrast, if more companies begin to engage in transnational economic activities post-treatment, then we are more likely to see an increase of the number of traded good over time. To test for these rival explanations, we collected country-dyad trade data between 1970-2012 using the SITC product classification scheme at the 4-digit level from the Atlas of Economic Complexity Project[14]. Using the same model specification as the main analyses, we find that after a pair of country becomes indirectly connect by a BIT bridge, the number of sectors they trade in significantly and persistently increases. This analysis,

[14]The Growth Lab at Harvard University. (2019). "Growth Projections and Complexity Rankings Data Set, Version 2". `https://doi.org/10.7910/dvn/xtaqmc`

which can be found in Figure A.4, suggest that value chain extension is also not the primary driver of our main results.

### 4.4 Decomposing the network effects through mediation

Lastly, we discuss an additional threat to inference as stated in $H3$: If indirect connections simultaneously affect direct BIT formation and FDI flows, to what extent can we attribute the increase in FDI flows to the indirect path, as opposed to the direct paths? While we remain agnostic about the effect of BIT bridges on direct BIT formation due to potential violations of the parallel trends assumption, the magnitude and sign of the post-treatment period estimates may still create concerns about the effect of BIT bridges on FDI being confounded by direct BITs. To address this issue, we conduct a causal mediation analysis based on Acharya, Blackwell and Sen (2016). We estimate the average controlled direct effect (ACDE) of indirect connection using direct BIT as the mediator. The causal structure can be represented using the DAG in Figure 7. In our application, the treatment $A$ represents the indirect connection in the BIT network at $t-1$, the mediator $M$ represents the existence of a direct BIT at $t$, intermediate confounders $Z$ includes the covariates discussed above, and the bilateral investment flow at $t-1$, and outcome $Y$ represents the bilateral investment flow at $t$. Identifying the ACDE relies on the so-called "sequential unconfoundedness" assumption, which stipulates that (1) $A$ and $Y$ are conditionally independent given pretreatment confounders $X$, and (2) $M$ and $Y$ are conditionally independent given $A$, $X$, and $Z$. While the sequential unconfoundedness assumption cannot be tested explicitly, we argue that it is a plausible assumption given (1) the parallel trends documented in Figure 3, and (2) the temporal dependency between $A$, $Z$, $M$ and $Y$ in our application.

The method for mediation analysis, named *sequential-g estimation*, is based on linear models. Still using the dummy variable of BIT bridge as our treatment, we further regard the lagged status of direct BIT at $t-1$ in two separate fashions: one as part of the pre-treatment confounders $X$, and the other as the intermediate confounders $Z$. When treating the lagged BIT as part of the

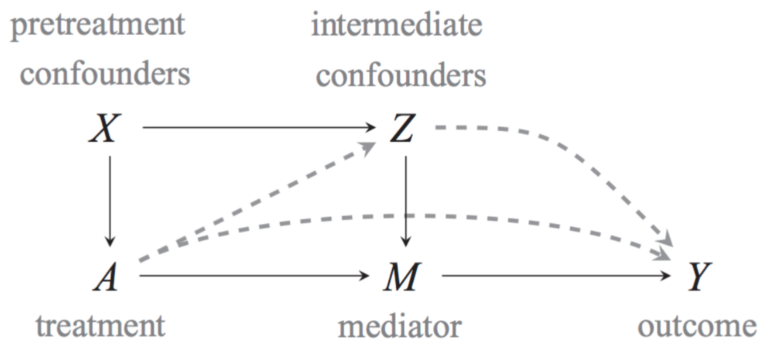



Figure 7: Directed Acyclic Graph Showing the Causal Relationships Present in Analyzing Causal Mechanisms (Source: Figure 3 from Acharya, Blackwell and Sen (2016) )

intermediate confounders, there is a positive and significant ACDE (0.077, 95% confidence interval of [0.075,0.079]) of BIT indirect connection on bilateral investment flow even after controlling for the potential mediating effects of direct BIT formation. In contrast, when we regard lagged BIT as a pre-treatment confounder, the average controlled direct effect become much smaller and insignificant at 0.05 level (0.022, 95% confidence interval of [-0.015,0.059]). Intuitively, the insignificant result indicate that the existence of a BIT prior to the treatment lead to a direct flow of institutional information between the dyad, absorbing the network effect of the BIT bridge. The full results of the mediation analysis is included in Table A.4.

# 5 Mechanism

Our results suggest that the structure of the BIT network generates sizeable implications for the patterns of FDI flows. We have argued that investors learn about the investment environment of a country with which their home country has no institutional arrangement through their peers' experience. In this section, we shed some light on this mechanism.

## 5.1 Learning about domestic legal institutions

We focus on the heterogeneous effects of the BIT bridge on FDI flow with respect to the country dyad's legal institutions. We hypothesized that the BIT network affects investment behaviors by reducing the informational hurdle between two bridged countries seeking to learn about each others' domestic investment environment. We argue that if the results we observed above are indeed driven by the information mechanism, then the magnitude of the network effects should differ based on the rule of law levels in the bridged countries. The quality of the rule of law is a crucial determinant of a country's investment environment, as it entails the independence and competence of multiple levels of the judiciary branch, the openness and transparency of laws, citizens' ability to redress rights violations through courts, the predictability of enforcement, etc (Allen, 2023). Thus, as this information gets transmitted through BIT bridges, countries with good legal institutions will attract more FDI through the informational mechanism of BIT bridges. Conversely, the need between the two bridged countries to form a direct treaty was reduces.

Operationally, we use the Rule of Law Index from the Varieties of Democracy Project (V-Dem) to measure the quality of judicial institutions (Coppedge et al., 2024). Since our analysis is at the undirected dyad level, we generate a variable that equals the minimal value of the rule of law index of a country dyad to measure the quality of legal institutions (RULE OF LAW). Additionally, we also control for two other theoretically relevant interactive effects: the distance between the country pair as a measure of gravity (GRAVITY) (Armington, 1969; Eaton and Kortum, 2002), and the absolute difference of their polity scores as a measure of institutional gap (INSTITUTIONAL GAP) (Mansfield, Milner and Rosendorff, 2000). Lastly, we include additional control variables and fit two-way fixed effects regression models with interactions between the variables above and BIT bridge as key independent variables. For regression, we consider three measures of BIT bridge: the number of BIT bridges between country pairs, the logged number of BIT bridges, and a binary indicator of the existence of BIT bridge. We present the treatment heterogeneous effects on FDI flows in Table 1, and direct treaty formation in Table 2.

First, we discuss the findings documented in Table 1. We find that, for each of the three measures of BIT bridge, the coefficient of the interaction between BIT bridge and the quality of a legal institution is positive and significant at a level of significance of 0.05, which confirms the

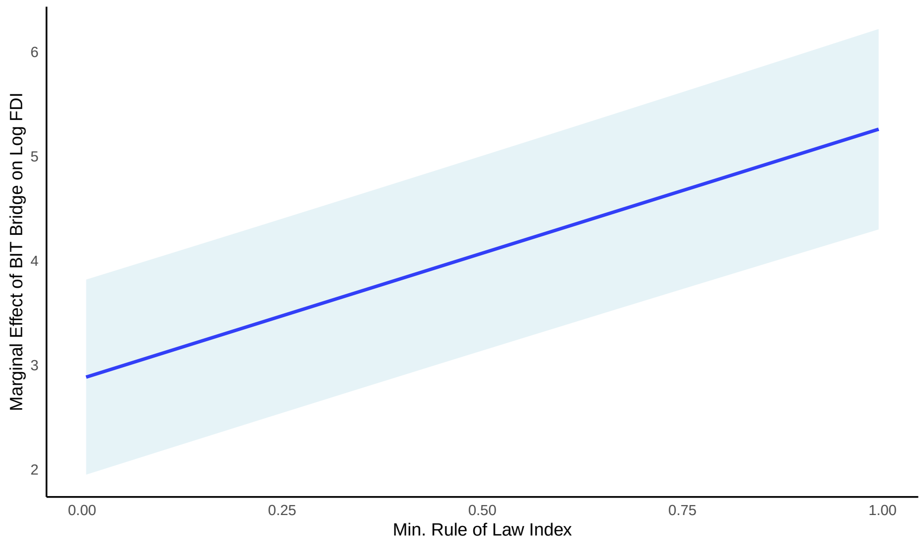



Figure 8: Marginal Effect of BIT Bridge on FDI w.r.t. Quality of Legal Institution

heterogeneous effect of BIT bridge and the *informational* mechanism. We show how the marginal effect of BIT bridge (binary indicator) on FDI increases with respect to increase in rule of law index in Figure 8. More interestingly, the coefficient of the interaction between the BIT bridge and distance is negative and significant at the 0.05 significance level, indicating that the effect of the BIT bridge is larger for the geographically approximated country dyad. It makes sense as in both vertical FDI and horizontal FDI, the cost of investment like transportation cost and imperfect communication may depend on distance. The coefficients of interaction between the BIT bridge and the gap of institutional quality are not always significant, showing mixed results.

Next, we investigate whether such *informational* mechanism affects the formation of direct BIT between country dyads. We replace the outcome variable with a binary indicator of BIT between country dyads and re-run the regression analysis. The results displayed in Table 2 are mixed. In particular, we note that when treated as a dichotomous variable, the interactive effect between the BIT bridge and the rule of law becomes difficult to interpret. Combining the mediation analysis in the previous section, we argue that the *informational* mechanism of BIT bridge mostly explains the increase of FDI flows between country dyads, while its influence on the formation of direct BIT

Table 1: The Heterogenous Effect of BIT bridging on FDI, given varying levels of rule of law

| Dependent Variable: | Log FDI | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.212*** | | | 0.157*** | | |
| | (0.031) | | | (0.029) | | |
| bridge num × rule of law | 0.100*** | | | 0.088*** | | |
| | (0.011) | | | (0.011) | | |
| log(bridge_num+1) | | 3.100*** | | | 2.127*** | |
| | | (0.201) | | | (0.209) | |
| log(bridge_num+1) × rule of law | | 1.341*** | | | 1.403*** | |
| | | (0.067) | | | (0.079) | |
| bridge_bin | | | 4.855*** | | | 2.876*** |
| | | | (0.509) | | | (0.476) |
| bridge_bin × rule of law | | | 2.352*** | | | 2.401*** |
| | | | (0.144) | | | (0.169) |
| Controls | No | No | No | Yes | Yes | Yes |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 169,423 | 169,423 | 169,423 | 169,423 | 169,423 | 169,423 |
| $R^2$ | 0.69652 | 0.69758 | 0.67924 | 0.70424 | 0.70605 | 0.69567 |
| Within $R^2$ | 0.08403 | 0.08725 | 0.03189 | 0.10735 | 0.11280 | 0.08148 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

is less consistent. To further examine the relative validity of our proposed mechanism, therefore, we compare it with a non-network based mechanism – learning through ISDS events.

## 5.2 Learning about ISDS events

To test for the validity of our proposed mechanism, we further conduct a placebo test using ISDS as an alternative mechanism. ISDS is frequently credited as the crucial enforcement mechanism in BITs that grants the treaties their credibility in property rights protection (Arias, Hollyer and Rosendorff, 2018). By initiating international arbitration through ISDS, investors reduce future investment in the defendant county in two ways (Allee and Peinhardt, 2011, pp.402-403):

> "First, the mere appearance of a government before an arbitration venue like ICSID sends a negative but noisy signal to investors that could make them hesitant to direct future investment into that country. Second, losing an arbitral panel ruling should be

Table 2: The Heterogeneous Effect of BIT Bridging on BIT Formation, given varying levels of rule of laws

| Dependent Variable: | BIT Formation | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.016*** | | | 0.000 | | |
| | (0.004) | | | (0.001) | | |
| bridge_num × rule of law | -0.016*** | | | -0.001*** | | |
| | (0.001) | | | (0.000) | | |
| log(bridge_num+1) | | 0.311*** | | | 0.028*** | |
| | | (0.030) | | | (0.005) | |
| log(bridge_num+1) × rule of law | | -0.039*** | | | -0.013*** | |
| | | (0.010) | | | (0.002) | |
| bridge_bin | | | 0.505*** | | | 0.059*** |
| | | | (0.071) | | | (0.011) |
| bridge_bin × rule of law | | | 0.060*** | | | -0.004 |
| | | | (0.020) | | | (0.004) |
| Controls | No | No | No | Yes | Yes | Yes |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 182,440 | 182,440 | 182,440 | 182,440 | 182,440 | 182,440 |
| $R^2$ | 0.74028 | 0.74216 | 0.71697 | 0.94183 | 0.94205 | 0.94183 |
| Within $R^2$ | 0.09389 | 0.10046 | 0.01256 | 0.79704 | 0.79783 | 0.79705 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

particularly damaging, since it provides more precise information to investors about what a government has done and the definitive illegality of its actions."

Therefore, ISDS cases, especially their outcomes, are highly salient events observed by both existing and potential investors. They represent, therefore, system-level shocks that affect all nodes within the BIT network. As a result, while ISDS may monadically reduce the aggregated inflow of FDI to the defendant country, our theory predicts that the effect of ISDS should not vary across treated and controlled groups. since the information on ISDS is not transmitted through the treaty edges. To empirically evaluate this claim, we coded a binary variable that indicates whether either of the edges on a BIT bridge has been invoked in an ISDS case over the past five years. We then interact the variable with our main treatment to detect whether the treatment effect varies based on the occurrence of ISDS along the BIT bridge. The results are reported in Table 3[15]. We

[15] Additional details about variable measurement and model specifications can be found in the appendix.

find no significant interactive effects between our main treatment of BIT bridging and exposure to ISDS across all specifications, which provides suggestive evidence that the network effect of BITs operates mostly through domestic information which needs to be learned and transmitted, rather than through international arbitration.

Table 3: The Heterogenous Effect of BIT bridging on FDI, given ISDS Cases

| Dependent Variable: | Log FDI | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.332*** | | | 0.262*** | | |
| | (0.030) | | | (0.030) | | |
| bridge num × ISDS cases | 0.000 | | | 0.000 | | |
| | (0.001) | | | (0.001) | | |
| log(bridge_num+1) | | 4.035*** | | | 2.933*** | |
| | | (0.216) | | | (0.222) | |
| log(bridge_num+1) × ISDS cases | | 0.014 | | | 0.010 | |
| | | (0.011) | | | (0.011) | |
| bridge_bin | | | 3.673*** | | | 2.420*** |
| | | | (0.471) | | | (0.460) |
| bridge_bin × ISDS cases | | | 0.057 | | | 0.037 |
| | | | (0.036) | | | (0.036) |
| Controls | No | No | No | Yes | Yes | Yes |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 125,191 | 125,191 | 125,191 | 125,191 | 125,191 | 125,191 |
| $R^2$ | 0.75965 | 0.75855 | 0.75116 | 0.76326 | 0.76324 | 0.75886 |
| Within $R^2$ | 0.04004 | 0.03566 | 0.00614 | 0.05447 | 0.05442 | 0.03692 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

# 6 Conclusion

We presented in this paper novel theoretical arguments and empirical evidence that network features are crucial in evaluating the effects of bilateral investment treaties. By learning about the investment environment of a destination country via indirect paths, investors can circumvent potential hold-up problems and engage in FDI even without a formal legal treaty. Moreover, such learned information further drives the formation of direct bilateral treaties. Finally, these effects are moderated by the quality of countries domestic rule of law, which is crucial information transmitted by the BIT network. Taken together, the spillover effect of BITs perpetuates a driving force to their rapid proliferation frequently observed by scholars of international institutions and political economy (Elkins, Guzman and Simmons, 2006; Jandhyala, Henisz and Mansfield, 2011).

Finally, we identify several avenues for future research. First, we posit that information learning is crucial in understanding international investors' behavior. A key component of this, as observed by recent literature, is firms' decisions on value chain position, such as the placement of subsidiaries (Alfaro et al., 2019; Antras, Fort and Tintelnot, 2017; Antràs and De Gortari, 2020; Betz, Pond and Yin, 2021). Our study abstracted away from firm-level analysis, as the statistics of FDI cover financial actors beyond firms and measure loans, equity, and reinvested earnings contributed by the investor to a foreign entity in general. Nevertheless, the granularity of firm-level investment data could further elucidate the learning mechanism across different firms and within a firm's different locations.

Second, the match between the investors covered by an investment treaty and what FDI statistics measure is not perfect. Many BITs cover both directly and indirectly owned foreign investments. For example, an investment in Ecuador that is owned by a Cayman Islands subsidiary of a US parent company qualifies for protection under the Ecuador–US BIT. In contrast, FDI data measures only the immediate source and destination of investment. To overcome this gap, a future iteration of the study should take into consideration of effect of prolonged investment paths, i.e., the effect of indirect connection through multiple intermediate countries. A significant component of multiple intermediate country investments is the so-called "phantom FDI" (Crivelli, De Mooij and Keen, 2016; Damgaard, Elkjaer and Johannesen, 2019). Separating the FDI designated for direct investment from those intended for tax avoidance, therefore, would help us understand whether the proliferation of BITs facilitates substantive investment, or provides yet another financial labyrinth for international investors to hide in.

Lastly, recent scholarship has become increasingly aware of the backlash against and withdrawal from BITs (Peinhardt and Wellhausen, 2016; Brutger and Strezhnev, 2022; Ge, 2022), citing often states' negative experience with the ISDS (Pelc, 2017) and their attempt to augment the design of investment treaties to crave out more space for policy autonomy (Thompson, Broude and Haftel, 2019; Moehlecke, 2020). While our paper does not directly speak to the legal challenge faced by BITs, we note the growing trend of backlash aligns with the saturation of the BIT network – as indicated in Figure 1. It is of interest for future research, therefore, to further investigate the relationship between the network features of BITs and patterns of treaty revisions and terminations.

# References

Acharya, Avidit, Matthew Blackwell and Maya Sen. 2016. "Explaining causal findings without bias: Detecting and assessing direct effects." *American Political Science Review* 110(3):512–529.

Ahern, Kenneth R, Daniele Daminelli and Cesare Fracassi. 2015. "Lost in translation? The effect of cultural values on mergers around the world." *Journal of Financial Economics* 117(1):165–189.

Aisbett, Emma, Larry Karp and Carol McAusland. 2010. "Compensation for indirect expropriation in international investment agreements: Implications of national treatment and rights to invest." *Journal of Globalization and Development* 1(2):0000102202194818371133.

Alfaro, Laura and Davin Chor. 2023. Global supply chains: The looming "great reallocation". Technical report National Bureau of Economic Research.

Alfaro, Laura, Davin Chor, Pol Antras and Paola Conconi. 2019. "Internalizing global value chains: A firm-level analysis." *Journal of Political Economy* 127(2):508–559.

Allee, Todd and Clint Peinhardt. 2011. "Contingent credibility: The impact of investment treaty violations on foreign direct investment." *International Organization* 65(3):401–432.

Allee, Todd and Clint Peinhardt. 2014. "Evaluating three explanations for the design of bilateral investment treaties." *World Politics* 66(1):47–87.

Allen, Michael O. 2023. "Unbundling the State: Legal Development in an Era of Global, Private Governance." *International Organization* 77(4):754–788.

Alschner, Wolfgang, Manfred Elsig and Rodrigo Polanco. 2021. "Introducing the electronic database of investment treaties (edit): The genesis of a new database and its use." *World trade review* 20(1):73–94.

Antràs, Pol. 2015. *Global production: Firms, contracts, and trade structure.* Princeton University Press.

Antràs, Pol and Alonso De Gortari. 2020. "On the geography of global value chains." *Econometrica*

88(4):1553–1598.

Antras, Pol, Teresa C Fort and Felix Tintelnot. 2017. “The margins of global sourcing: Theory and evidence from us firms.” *American Economic Review* 107(9):2514–2564.

Arel-Bundock, Vincent. 2017. “The unintended consequences of bilateralism: Treaty shopping and international tax policy.” *International Organization* 71(2):349–371.

Arias, Eric, James R Hollyer and B Peter Rosendorff. 2018. “Cooperative autocracies: Leader survival, creditworthiness, and bilateral investment treaties.” *American Journal of Political Science* 62(4):905–921.

Armington, Paul S. 1969. “A Theory of Demand for Products Distinguished by Place of Production (Une théorie de la demande de produits différenciés d’après leur origine)(Una teoría de la demanda de productos distinguiéndolos según el lugar de producción).” *Staff Papers-International Monetary Fund* pp. 159–178.

Arpino, Bruno, Luca De Benedictis and Alessandra Mattei. 2017. “Implementing propensity score matching with network data: the effect of the General Agreement on Tariffs and Trade on bilateral trade.” *Journal of the Royal Statistical Society Series C: Applied Statistics* 66(3):537–554.

Barthel, Fabian, Matthias Busse and Eric Neumayer. 2010. “The impact of double taxation treaties on foreign direct investment: evidence from large dyadic panel data.” *Contemporary Economic Policy* 28(3):366–377.

Betz, Timm, Amy Pond and Weiwen Yin. 2021. “Investment agreements and the fragmentation of firms across countries.” *The Review of International Organizations* 16:755–791.

Blackwell, Matthew, Ruofan Ma and Aleksei Opacic. 2024. “Assumption Smuggling in Intermediate Outcome Tests of Causal Mechanisms.” *arXiv preprint arXiv:2407.07072* .

Blanton, Robert G and Shannon L Blanton. 2012. “Rights, institutions, and foreign direct investment: an empirical assessment.” *Foreign Policy Analysis* 8(4):431–451.

Bonnitcha, Jonathan, Lauge N Skovgaard Poulsen and Michael Waibel. 2017. *The political econ-*

*omy of the investment treaty regime*. Oxford University Press.

Brown, Chester. 2013. *Commentaries on selected model investment treaties*. Oxford University Press, USA.

Brutger, Ryan and Anton Strezhnev. 2022. "International investment disputes, media coverage, and backlash against international law." *Journal of Conflict Resolution* 66(6):983–1009.

Büthe, Tim and Helen V Milner. 2008. "The politics of foreign direct investment into developing countries: increasing FDI through international trade agreements?" *American journal of political science* 52(4):741–762.

Büthe, Tim and Helen V Milner. 2009. Bilateral investment treaties and foreign direct investment: A political analysis. In *The effect of treaties on foreign direct investment: Bilateral investment treaties, double taxation treaties, and investment flows*. Oxford University Press.

Callaway, Brantly and Pedro HC Sant'Anna. 2021. "Difference-in-differences with multiple time periods." *Journal of econometrics* 225(2):200–230.

Carnegie, Allison. 2014. "States held hostage: Political hold-up problems and the effects of international institutions." *American Political Science Review* 108(1):54–70.

Chaney, Thomas. 2014. "The network structure of international trade." *American Economic Review* 104(11):3600–3634.

Clark, Richard and Tyler Pratt. WP. "The Art of Emulation: Treaty Negotiation, Legitimacy, and Imitation of the Liberal Canon.".

Colen, Liesbeth, Damiaan Persyn and Andrea Guariso. 2016. "Bilateral investment treaties and FDI: Does the sector matter?" *World Development* 83:193–206.

Coppedge, Michael, John Gerring, Carl Henrik Knutsen, Staffan I Lindberg, Jan Teorell, David Altman, Fabio Angiolillo, Michael Bernhard, Cecilia Borella, Agnes Cornell et al. 2024. "V-Dem Codebook v14.".

Crivelli, Ernesto, Ruud De Mooij and Michael Keen. 2016. "Base erosion, profit shifting and developing countries." *FinanzArchiv/Public Finance Analysis* pp. 268–301.

Dai, Xinyuan. 2002. "Information systems in treaty regimes." *World Politics* 54(4):405–436.

Damgaard, Jannick, Thomas Elkjaer and Niels Johannesen. 2019. *What is real and what is not in the global FDI network?* International Monetary Fund.

Davis, Christina L. 2023. "Discriminatory clubs: The geopolitics of international organizations.".

Davis, Christina L and Meredith Wilf. 2017. "Joining the Club: Accession to the GATT/WTO." *The Journal of Politics* 79(3):964–978.

Eaton, Jonathan and Samuel Kortum. 2002. "Technology, geography, and trade." *Econometrica* 70(5):1741–1779.

Elkins, Zachary, Andrew T Guzman and Beth A Simmons. 2006. "Competing for capital: The diffusion of bilateral investment treaties, 1960–2000." *International organization* 60(4):811–846.

Feenstra, Robert C, Robert Inklaar and Marcel P Timmer. 2015. "The next generation of the Penn World Table." *American economic review* 105(10):3150–3182.

Ge, Zoe Xincheng. 2022. "Obsolescent Treaties: Global Value Chains and the Termination of Bilateral Investment Treaties.".

Gelb, Stephen and Anthony Black. 2004. "Foreign direct investment in South Africa." *Investment strategies in emerging markets* pp. 177–212.

Gray, Julia. 2013. *The company states keep: International economic organizations and investor perceptions*. Cambridge University Press.

Gurevich, Tamara, Peter Herman, Farid Toubal and Yoto V Yotov. 2021. "One nation, one language? domestic language diversity, trade and welfare.".

Hafner-Burton, Emilie M, Miles Kahler and Alexander H Montgomery. 2009. "Network analysis for international relations." *International organization* 63(3):559–592.

Haftel, Yoram Z. 2010. "Ratification counts: US investment treaties and FDI flows into developing countries." *Review of International Political Economy* 17(2):348–377.

Hartman, Erin and F Daniel Hidalgo. 2018. "An equivalence approach to balance and placebo tests." *American Journal of Political Science* 62(4):1000–1013.

Ho, Daniel E, Kosuke Imai, Gary King and Elizabeth A Stuart. 2007. "Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference." *Political analysis* 15(3):199–236.

Hong, Sunghoon. 2018. "Tax treaties and foreign direct investment: A network approach." *International Tax and Public Finance* 25:1277–1320.

Imai, Kosuke and In Song Kim. 2021. "On the use of two-way fixed effects regression models for causal inference with panel data." *Political Analysis* 29(3):405–415.

Imai, Kosuke, In Song Kim and Erik H Wang. 2023. "Matching methods for causal inference with time-series cross-sectional data." *American Journal of Political Science* 67(3):587–605.

Imai, Kosuke and Marc Ratkovic. 2014. "Covariate balancing propensity score." *Journal of the Royal Statistical Society Series B: Statistical Methodology* 76(1):243–263.

Iversen, Torben and David Soskice. 2019. *Democracy and prosperity: Reinventing capitalism through a turbulent century.* Princeton University Press.

Jandhyala, Srividya, Witold J Henisz and Edward D Mansfield. 2011. "Three waves of BITs: The global diffusion of foreign investment policy." *Journal of Conflict Resolution* 55(6):1047–1073.

Johns, Leslie and Rachel L Wellhausen. 2016. "Under one roof: Supply chains and the protection of foreign investment." *American Political Science Review* 110(1):31–51.

Kerner, Andrew. 2009. "Why should I believe you? The costs and consequences of bilateral investment treaties." *International Studies Quarterly* 53(1):73–102.

Kerner, Andrew and Jane Lawrence. 2014. "What's the risk? Bilateral investment treaties, political risk and fixed capital accumulation." *British Journal of Political Science* 44(1):107–121.

Kinne, Brandon J. 2013. "Network dynamics and the evolution of international cooperation." *American Political Science Review* 107(4):766–785.

Leblang, David. 2010. "Familiarity breeds investment: Diaspora networks and international investment." *American political science review* 104(3):584–600.

Lindberg, Staffan I, Michael Coppedge, John Gerring and Jan Teorell. 2014. "V-Dem: A new way to measure democracy." *Journal of Democracy* 25(3):159–169.

Liu, Licheng, Ye Wang and Yiqing Xu. 2024. "A practical guide to counterfactual estimators for causal inference with time-series cross-sectional data." *American Journal of Political Science* 68(1):160–176.

Lupu, Yonatan. 2013. "Best evidence: The role of information in domestic judicial enforcement of international human rights agreements." *International Organization* 67(3):469–503.

Malesky, Edmund J and Layna Mosley. 2021. "Labor upgrading and export market opportunities: Evidence from Vietnam." *Economics & Politics* 33(3):483–513.

Mansfield, Edward D, Helen V Milner and B Peter Rosendorff. 2000. "Free to trade: Democracies, autocracies, and international trade." *American political science review* 94(2):305–321.

Moehlecke, Carolina. 2020. "The chilling effect of international investment disputes: limited challenges to state sovereignty." *International Studies Quarterly* 64(1):1–12.

Neumayer, Eric and Laura Spess. 2005. "Do bilateral investment treaties increase foreign direct investment to developing countries?" *World development* 33(10):1567–1585.

Nunn, Nathan. 2007. "Relationship-specificity, incomplete contracts, and the pattern of trade." *The quarterly journal of economics* 122(2):569–600.

Peinhardt, Clint and Rachel L Wellhausen. 2016. "Withdrawing from investment treaties but protecting investment." *Global Policy* 7(4):571–576.

Peksen, Dursun and Robert G Blanton. 2017. "The impact of ILO conventions on worker rights: Are empty promises worse than no promises?" *The Review of International Organizations* 12:75–94.

Pelc, Krzysztof J. 2017. "What explains the low success rate of investor-state disputes?" *International Organization* 71(3):559–583.

Peterson, Luke Eric. 2006. "South Africa's bilateral investment treaties." *Dialogue on Globalization: Occasional Papers* 26(2006):1–45.

Poulsen, Lauge N Skovgaard. 2014. "Bounded rationality and the diffusion of modern investment treaties." *International Studies Quarterly* 58(1):1–14.

Poulsen, Lauge N Skovgaard. 2015. *Bounded rationality and economic diplomacy: The politics of investment treaties in developing countries.* Cambridge University Press.

Poulsen, Lauge N Skovgaard and Emma Aisbett. 2013. "When the claim hits: Bilateral investment treaties and bounded rational learning." *World Politics* 65(2):273–313.

Pratt, Tyler. 2023. "Value differentiation, policy change and cooperation in international regime complexes." *Review of International Political Economy* 30(6):2206–2232.

Qian, Jing. 2023. Treaty shopping, race to the bottom, and treaty cascades. Technical report Working Paper. https://jingqian. org/documents/BTT_Cascade_Qian_Latest. pdf.

Rambachan, Ashesh and Jonathan Roth. 2023. "A more credible approach to parallel trends." *Review of Economic Studies* 90(5):2555–2591.

Roberts, Anthea and Taylor St John. 2022. "Complex designers and emergent design: reforming the investment treaty system." *American Journal of International Law* 116(1):96–149.

Schlemmer, Engela C. 2016. "An overview of South Africa's bilateral investment treaties and investment policy." *ICSID Review-Foreign Investment Law Journal* 31(1):167–193.

Schmidt, Averell. 2023. "Damaged relations: How treaty withdrawal impacts international cooperation." *American Journal of Political Science* .

Schoeneman, John, Boliang Zhu and Bruce A Desmarais. 2022. "Complex dependence in foreign direct investment: Network theory and empirical analysis." *Political science research and methods* 10(2):243–259.

Spirling, Arthur and Brandon M. Stewart. 2024. "What Good Is A Regression? *Inference to the Best Explanation* and the Practice of Political Science Research." *Journal of Politics* p. Forthcoming.

Stiglitz, Joseph E. 2007. "Regulating multinational corporations: Towards principles of crossborder legal framework in a globalized world balancing rights with responsibilities." *Am. U. Int'l L. Rev.* 23:451.

Strezhnev, Anton, Judith G Kelley and Beth A Simmons. 2021. "Testing for Negative Spillovers: Is Promoting Human Rights Really Part of the "Problem"?" *International Organization* 75(1):71–102.

Sun, Liyang and Sarah Abraham. 2021. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." *Journal of econometrics* 225(2):175–199.

Thompson, Alexander, Tomer Broude and Yoram Z Haftel. 2019. "Once bitten, twice shy? Investment disputes, state sovereignty, and change in treaty design." *International Organization* 73(4):859–880.

Thrall, Calvin. 2021. Spillover effects in international law: evidence from tax planning. In *International Studies Association Conference, virtual, Apr.* Vol. 6 p. 9.

Thrall, Calvin. 2023. "Informational lobbying and commercial diplomacy." *American Journal of Political Science* .

Tobin, Jennifer L and Susan Rose-Ackerman. 2011. "When BITs have some bite: The political-economic environment for bilateral investment treaties." *The Review of International Organizations* 6:1–32.

Tomashevskiy, Andrey. 2022. "Networked capital: indirect investment and BIT formation." *Business and Politics* 24(1):36–56.

UNCTAD. 2005. "Case study on outward foreign direct investment by South African enterprises.".

van 't Riet, Maarten and Arjan Lejour. 2018. "Optimal tax routing: Network analysis of FDI diversion." *International Tax and Public Finance* 25(5):1321–1371.

Vandevelde, Kenneth J. 2011. "Model bilateral investment treaties: the way forward." *Southwest Journal of International Law* 18:307.

Voeten, Erik. 2021. *Ideology and international institutions.* Princeton University Press.

Ye, Fangjin. 2020. "The impact of bilateral investment treaties (BITs) on collective labor rights in developing countries." *The Review of International Organizations* 15:899–921.

Zeng, Ka and Yue Lu. 2016. "Variation in bilateral investment treaty provisions and foreign direct investment flows to China, 1997–2011." *International Interactions* 42(5):820–848.

# A Appendix

## A.1 Summary Statistics

## A.2 Stylized Facts on Network Distance and FDI volume

We run the following regression model with dyad and year fixed effects:

$$Y_{ij,t} = \beta g(distance_{ij,t}) + \alpha_{ij} + \xi_t + \varepsilon_{ij,t}, \tag{2}$$

where $g(distance_{ij,t})$ decreases with respect to $distance_{ij,t}$. We consider two specifications of the function $g(\cdot)$ typical in the international economics literature (for a discussion, see Chaney, 2014), and the results are reported in Table A.1 and visualized in Figure A.1.

Table A.1: Distance on BIT Network and Log FDI in Stock

| Dependent Variable: | Log FDI in Stock | |
|---|---|---|
| Model: | (1) | (2) |
| *Variables* | | |
| $1/dist_{ij,t}$ | 0.944*** | |
| | (0.050) | |
| $e^{-dist_{ij,t}/3.5}$ | | 0.409*** |
| | | (0.044) |
| Controls | No | No |
| *Fixed-effects* | | |
| dyad | Yes | Yes |
| year | Yes | Yes |
| *Fit statistics* | | |
| Observations | 475,007 | 475,007 |
| $R^2$ | 0.60551 | 0.60121 |
| Within $R^2$ | 0.01286 | 0.00211 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

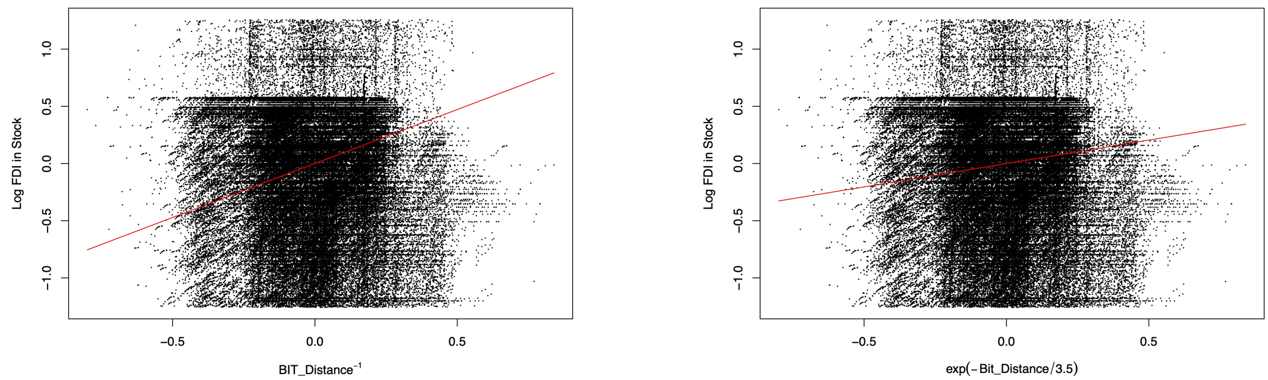



Figure A.1: Log FDI in Stock and Distance between Country Dyad on BIT network

## A.3 H1: Panel Match Analysis for Robustness Check

For robustness check, we adopt an alternative difference-in-differences estimator with staggered treatment adoption (Imai, Kim and Wang, 2023)[16] for our first hypothesis:

$$\hat{\tau}(F, L) = \underbrace{\frac{1}{\sum_{ij=1}^{N} \sum_{t=L+1}^{T-F} D_{ijt}} \sum_{i=1}^{N} \sum_{t=L+1}^{T-F}}_{\text{Average over all country dyads}} D_{ijt} \underbrace{\{(Y_{ij,t+F} - Y_{ij,t-1}) - \sum_{\neg ij \in M_{ij,t}} \omega_{ij,t}^{ij'} (Y_{\neg ij,t+F} - Y_{\neg ij,t-1})\}}_{\text{country-dyad specific estimate}},$$

where $F$ and $L$ denotes the number of years *leading to* and *lagging from* the time of treatment assignment.

Like in the main analysis, to increase the comparability between country dyads that are indirectly connected and those that aren't, we further include several matching covariates. Using these covariates, we compute a covariate-balancing propensity score (Imai and Ratkovic, 2014), which is then used as the weight $\omega_{ij,t}^{ij'}$. This adjusts the relative importance of each controlled observation given their similarity to the treated observation. We find that this procedure best maximizes the

[16] The conventional econometric approach to estimating the effect of a time-varying treatment is to use the two-way fixed effects estimator; however, this approach is shown to be biased in the context of repeated treatments. Callaway and Sant'Anna (2021); Imai and Kim (2021)

covariate balance between treated and controlled units[17] (Figure A.3), although our results are also robust to other refinement methods such as Mahalanobis matching, propensity-score matching, and propensity-score weighting.

We apply the DiD estimator to evaluate the effect of indirect connection in the BIT network on bilateral FDI flows. The results are displayed in Figure A.2. The overall patterns are similar to the main results, though the 95 % CIs are wider.

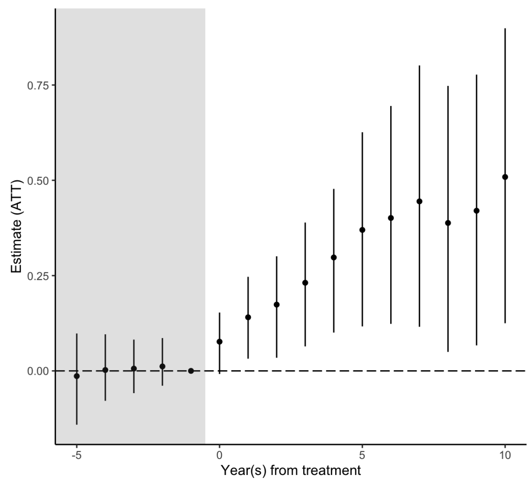
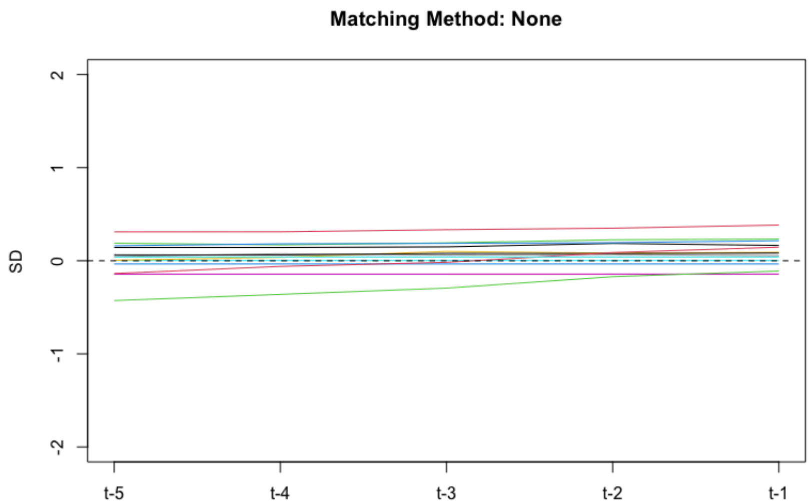
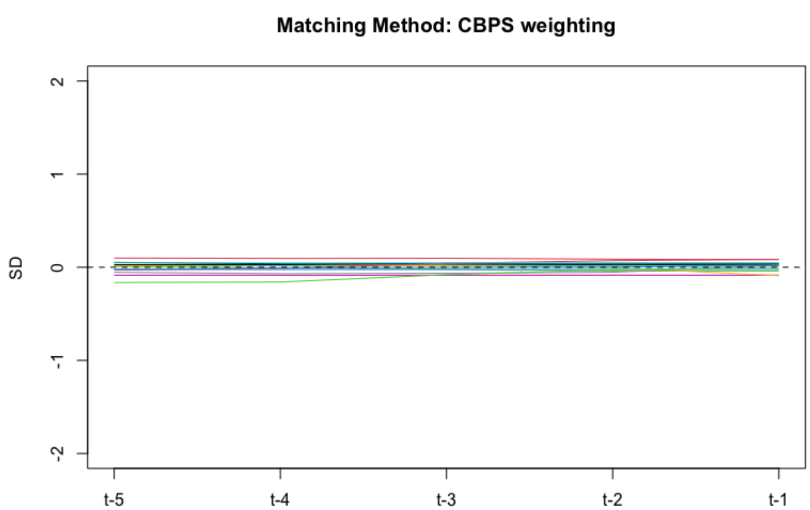



Figure A.2: Effect of indirect connection in the BIT network on bilateral FDI flow: The plot shows the ATT (average treated effects on the treated units) of indirect BIT connection on the FDI flow between country pairs. The model uses covariate balance propensity score weighting and estimates 95% confidence intervals with 1,000 bootstraps.

[17]For a more technical explanation, confer Ho et al. (2007) and Imai and Ratkovic (2014).




Matching Method: None




Matching Method: CBPS

Figure A.3: Covariate Balance

## A.4 H1 and H2: Additional Regression Results based on TWFE

We also fit two-way fixed effects regressions for additional robustness check. The results are displayed in Table A.2 and Table A.3.

## A.5 H1: Alternative Explanations

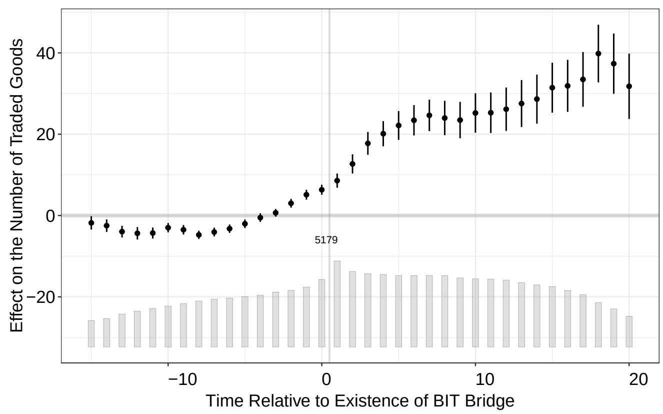



Figure A.4: Effect of indirect connection in the BIT network on the number of traded goods: The plot shows the ATT (average treated effects on the treated units) of indirect BIT connection on number of sectors with non-zero trade flows between country pairs. 95% confidence intervals estimated with 500 bootstraps.

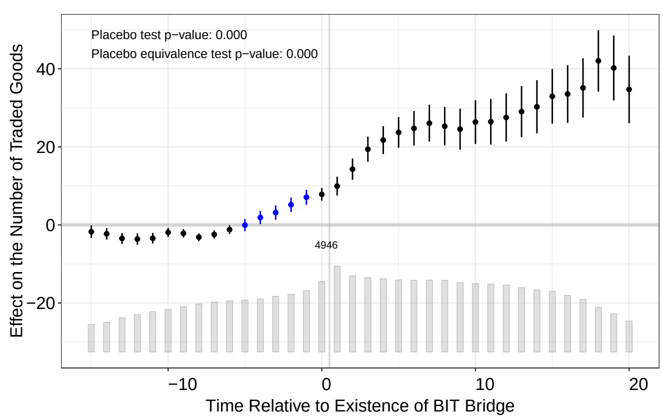
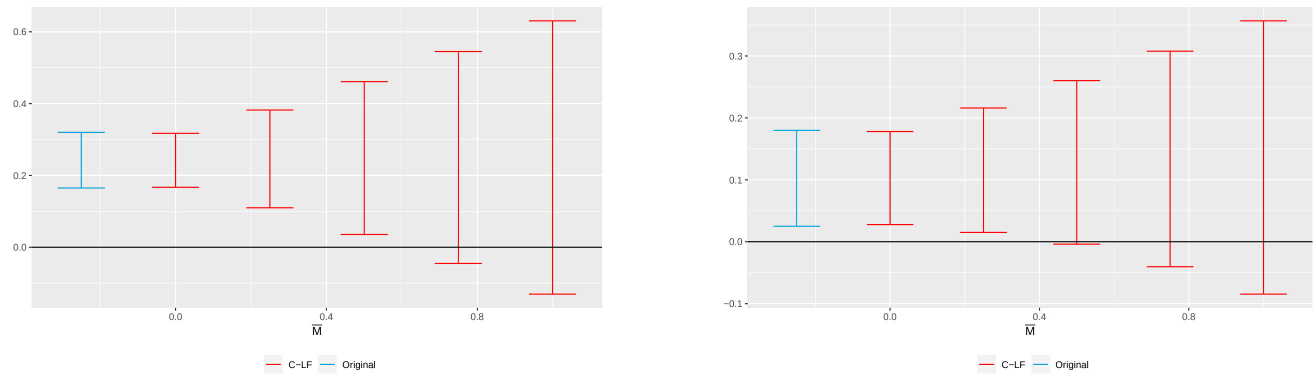



Figure A.5: Placebo Equivalence Test for the Effect of indirect connection in the BIT network on the number of traded goods

## A.6 Sensitivity Analysis




Log FDI

BIT Formation

Figure A.6: Placebo Test

## A.7 Full Tables for Mediation Analysis and Mechanism

Table A.2: The effect of BIT bridging on BITs formation

| Dependent Variable: | BIT Formation | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.012*** | | | 0.001*** | | |
| | (0.001) | | | (0.000) | | |
| log(bridge_num+1) | | 0.148*** | | | 0.016*** | |
| | | (0.004) | | | (0.001) | |
| bridge_bin | | | 0.064*** | | | 0.016*** |
| | | | (0.007) | | | (0.001) |
| lagged BIT | | | | 0.880*** | 0.874*** | 0.882*** |
| | | | | (0.002) | (0.002) | (0.002) |
| trade_log | | | | 0.002*** | 0.001*** | 0.002*** |
| | | | | (0.000) | (0.000) | (0.000) |
| dem_pair | | | | 0.001 | 0.000 | 0.001 |
| | | | | (0.001) | (0.001) | (0.001) |
| polity_gap | | | | 0.000** | 0.000*** | 0.000 |
| | | | | (0.000) | (0.000) | (0.000) |
| distance_log | | | | -0.055 | 0.056 | -0.016 |
| | | | | (0.099) | (0.095) | (0.075) |
| v2x_rule_min | | | | 0.009** | 0.009** | 0.010*** |
| | | | | (0.004) | (0.004) | (0.004) |
| member_wto_joint | | | | -0.002 | -0.002 | -0.002 |
| | | | | (0.002) | (0.002) | (0.002) |
| member_gatt_joint | | | | 0.005*** | 0.004*** | 0.005*** |
| | | | | (0.001) | (0.001) | (0.001) |
| member_eu_joint | | | | -0.031*** | -0.029*** | -0.025*** |
| | | | | (0.003) | (0.003) | (0.002) |
| agree_fta | | | | 0.005*** | 0.002 | 0.007*** |
| | | | | (0.002) | (0.002) | (0.002) |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 186,206 | 186,206 | 186,206 | 182,440 | 182,440 | 182,440 |
| $R^2$ | 0.73622 | 0.74144 | 0.71435 | 0.94177 | 0.94200 | 0.94182 |
| Within $R^2$ | 0.08155 | 0.09970 | 0.00541 | 0.79684 | 0.79765 | 0.79701 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A.3: The Effect of BIT bridging on FDI

| Dependent Variable: | Log FDI | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.095*** | | | 0.073*** | | |
| | (0.004) | | | (0.004) | | |
| log(bridge_num+1) | | 0.642*** | | | 0.440*** | |
| | | (0.035) | | | (0.035) | |
| bridge_bin | | | 0.100** | | | 0.023 |
| | | | (0.046) | | | (0.044) |
| lagged BIT | | | | 0.425*** | 0.596*** | 0.864*** |
| | | | | (0.068) | (0.068) | (0.065) |
| trade_log | | | | 0.082*** | 0.093*** | 0.112*** |
| | | | | (0.010) | (0.010) | (0.010) |
| dem_pair | | | | -0.203*** | -0.195*** | -0.148*** |
| | | | | (0.041) | (0.042) | (0.042) |
| polity_gap | | | | -0.019*** | -0.014*** | -0.011*** |
| | | | | (0.003) | (0.003) | (0.003) |
| distance_log | | | | -7.775 | -3.000 | -5.811 |
| | | | | (5.239) | (4.773) | (5.115) |
| v2x_rule_min | | | | 0.372*** | 0.367*** | 0.355** |
| | | | | (0.138) | (0.140) | (0.143) |
| member_wto_joint | | | | 0.146*** | 0.150*** | 0.151*** |
| | | | | (0.047) | (0.048) | (0.047) |
| member_gatt_joint | | | | -0.404*** | -0.464*** | -0.434*** |
| | | | | (0.059) | (0.060) | (0.061) |
| member_eu_joint | | | | 2.918*** | 3.426*** | 3.515*** |
| | | | | (0.150) | (0.147) | (0.155) |
| agree_fta | | | | 0.522*** | 0.616*** | 0.773*** |
| | | | | (0.066) | (0.067) | (0.067) |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 173,007 | 173,007 | 173,007 | 169,423 | 169,423 | 169,423 |
| $R^2$ | 0.68848 | 0.67525 | 0.66624 | 0.70040 | 0.69324 | 0.68963 |
| Within $R^2$ | 0.06683 | 0.02717 | 0.00020 | 0.09574 | 0.07416 | 0.06324 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A.4: Average Controlled Direct Effect of Indirect Connection in the BIT Network on Bilateral Investment Flow

| Dependent Variable: | Log FDI | |
|---|---|---|
| | Lagged BIT as Pre-treatment Confounder | Lagged BIT as Intermediate Confounder |
| Model: | (1) | (2) |
| *Variables* | | |
| # of BIT Bridge | | 0.077*** |
| | | (0.001) |
| bridge_num × polity_gap | | 0.001** |
| | | (0.000) |
| bridge_num × distance_log | | 0.014 |
| | | (0.009) |
| bridge_num × v2x_rule_min | | 0.013 |
| | | (0.013) |
| BIT Bridge (Binary) | 0.022 | 0.063*** |
| | (0.019) | (0.019) |
| bridge_bin × polity_gap | 0.010** | 0.011*** |
| | (0.004) | (0.004) |
| bridge_bin × distance_log | 20.616*** | 21.617*** |
| | (6.075) | (6.025) |
| bridge_bin × v2x_rule_min | -0.269 | -0.316 |
| | (0.199) | (0.201) |
| lagged BIT | 0.754*** | |
| | (0.026) | |
| trade_log | 0.117*** | 0.129*** |
| | (0.004) | (0.004) |
| dem_pair | -0.140*** | -0.123*** |
| | (0.022) | (0.022) |
| polity_gap | -0.009*** | -0.010*** |
| | (0.001) | (0.001) |
| distance_log | -6.813*** | -7.434*** |
| | (1.704) | (1.694) |
| v2x_rule_min | 0.337*** | 0.354*** |
| | (0.059) | (0.059) |
| member_wto_joint | 0.171*** | 0.174*** |
| | (0.022) | (0.022) |
| member_gatt_joint | -0.422*** | -0.386*** |
| | (0.021) | (0.021) |
| member_eu_joint | 3.445*** | 3.399*** |
| | (0.067) | (0.067) |
| agree_fta | 0.766*** | 0.844*** |
| | (0.026) | (0.026) |
| *Fixed-effects* | | |
| dyad | Yes | Yes |
| year | Yes | Yes |

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

## Table A.5: The Effect of BIT bridging on FDI

| Dependent Variable: | Log FDI | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.212*** | | | 0.157*** | | |
| | (0.031) | | | (0.029) | | |
| bridge_num × polity_gap | 0.000 | | | 0.001** | | |
| | (0.000) | | | (0.000) | | |
| bridge_num × distance_log | -0.022*** | | | -0.018*** | | |
| | (0.004) | | | (0.003) | | |
| bridge_num × v2x_rule_min | 0.100*** | | | 0.088*** | | |
| | (0.011) | | | (0.011) | | |
| log(bridge_num+1) | | 3.100*** | | | 2.127*** | |
| | | (0.201) | | | (0.209) | |
| log(bridge_num+1) × polity_gap | | 0.001 | | | 0.007** | |
| | | (0.002) | | | (0.003) | |
| log(bridge_num+1) × distance_log | | -0.376*** | | | -0.286*** | |
| | | (0.022) | | | (0.023) | |
| log(bridge_num+1) × v2x_rule_min | | 1.341*** | | | 1.403*** | |
| | | (0.067) | | | (0.079) | |
| bridge_bin | | | 4.855*** | | | 2.876*** |
| | | | (0.509) | | | (0.476) |
| bridge_bin × polity_gap | | | 0.000 | | | 0.013*** |
| | | | (0.004) | | | (0.005) |
| bridge_bin × distance_log | | | -0.662*** | | | -0.454*** |
| | | | (0.058) | | | (0.053) |
| bridge_bin × v2x_rule_min | | | 2.352*** | | | 2.401*** |
| | | | (0.144) | | | (0.169) |
| lagged BIT | | | | 0.543*** | 0.579*** | 0.806*** |
| | | | | (0.068) | (0.066) | (0.065) |
| trade_log | | | | 0.102*** | 0.112*** | 0.112*** |
| | | | | (0.009) | (0.010) | (0.010) |
| dem_pair | | | | -0.151*** | -0.110*** | -0.097** |
| | | | | (0.041) | (0.041) | (0.042) |
| polity_gap | | | | -0.019*** | -0.018*** | -0.017*** |
| | | | | (0.003) | (0.004) | (0.004) |
| distance_log | | | | -12.540 | -0.490 | -2.659 |
| | | | | (7.910) | (4.803) | (4.380) |
| v2x_rule_min | | | | -0.101 | -1.315*** | -1.149*** |
| | | | | (0.150) | (0.170) | (0.178) |
| member_wto_joint | | | | 0.120** | 0.069 | 0.122** |
| | | | | (0.047) | (0.048) | (0.047) |
| member_gatt_joint | | | | -0.300*** | -0.234*** | -0.294*** |
| | | | | (0.057) | (0.055) | (0.058) |
| member_eu_joint | | | | 2.179*** | 2.210*** | 3.151*** |
| | | | | (0.177) | (0.154) | (0.147) |
| agree_fta | | | | 0.456*** | 0.361*** | 0.644*** |
| | | | | (0.065) | (0.064) | (0.064) |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 169,423 | 169,423 | 169,423 | 169,423 | 169,423 | 169,423 |
| $R^2$ | 0.69652 | 0.69758 | 0.67924 | 0.70424 | 0.70605 | 0.69567 |
| Within $R^2$ | 0.08403 | 0.08725 | 0.03189 | 0.10735 | 0.11280 | 0.08148 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Table A.6: The Effect of BIT Bridging on BIT Formation

| Dependent Variable: | BIT Formation | | | | | |
|---|---|---|---|---|---|---|
| Model: | (1) | (2) | (3) | (4) | (5) | (6) |
| *Variables* | | | | | | |
| bridge_num | 0.016*** | | | 0.000 | | |
| | (0.004) | | | (0.001) | | |
| bridge_num × polity_gap | 0.000*** | | | 0.000 | | |
| | (0.000) | | | (0.000) | | |
| bridge_num × distance_log | 0.001** | | | 0.000*** | | |
| | (0.000) | | | (0.000) | | |
| bridge_num × v2x_rule_min | -0.016*** | | | -0.001*** | | |
| | (0.001) | | | (0.000) | | |
| log(bridge_num+1) | | 0.311*** | | | 0.028*** | |
| | | (0.030) | | | (0.005) | |
| log(bridge_num+1) × polity_gap | | -0.001** | | | 0.000 | |
| | | (0.000) | | | (0.000) | |
| log(bridge_num+1) × distance_log | | -0.017*** | | | -0.001 | |
| | | (0.003) | | | (0.001) | |
| log(bridge_num+1) × v2x_rule_min | | -0.039*** | | | -0.013*** | |
| | | (0.010) | | | (0.002) | |
| bridge_bin | | | 0.505*** | | | 0.059*** |
| | | | (0.071) | | | (0.011) |
| bridge_bin × polity_gap | | | -0.002** | | | 0.000 |
| | | | (0.001) | | | (0.000) |
| bridge_bin × distance_log | | | -0.052*** | | | -0.005*** |
| | | | (0.008) | | | (0.001) |
| bridge_bin × v2x_rule_min | | | 0.060*** | | | -0.004 |
| | | | (0.020) | | | (0.004) |
| lagged BIT | | | | 0.878*** | 0.873*** | 0.882*** |
| | | | | (0.002) | (0.002) | (0.002) |
| trade_log | | | | 0.001*** | 0.001*** | 0.002*** |
| | | | | (0.000) | (0.000) | (0.000) |
| dem_pair | | | | 0.001 | 0.000 | 0.001 |
| | | | | (0.002) | (0.002) | (0.001) |
| polity_gap | | | | 0.000*** | 0.000*** | 0.000 |
| | | | | (0.000) | (0.000) | (0.000) |
| distance_log | | | | 0.020 | 0.066 | 0.006 |
| | | | | (0.077) | (0.091) | (0.083) |
| v2x_rule_min | | | | 0.018*** | 0.026*** | 0.013*** |
| | | | | (0.004) | (0.005) | (0.004) |
| member_wto_joint | | | | 0.000 | 0.000 | -0.001 |
| | | | | (0.002) | (0.002) | (0.002) |
| member_gatt_joint | | | | 0.003** | 0.001 | 0.004*** |
| | | | | (0.002) | (0.002) | (0.001) |
| member_eu_joint | | | | -0.020*** | -0.023*** | -0.026*** |
| | | | | (0.002) | (0.003) | (0.002) |
| agree_fta | | | | 0.006*** | 0.003* | 0.006*** |
| | | | | (0.002) | (0.002) | (0.002) |
| *Fixed-effects* | | | | | | |
| dyad | Yes | Yes | Yes | Yes | Yes | Yes |
| year | Yes | Yes | Yes | Yes | Yes | Yes |
| *Fit statistics* | | | | | | |
| Observations | 182,440 | 182,440 | 182,440 | 182,440 | 182,440 | 182,440 |
| $R^2$ | 0.74028 | 0.74216 | 0.71697 | 0.94183 | 0.94205 | 0.94183 |
| Within $R^2$ | 0.09389 | 0.10046 | 0.01256 | 0.79704 | 0.79783 | 0.79705 |

*Clustered (dyad) standard-errors in parentheses*
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*