Supporting Information

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This appendix is organized as follows. Section A1 discusses the research design in greater detail. Section A2 summarizes the collection and coding of the defense cooperation agreement dataset (DCAD) and compares DCAs to other common types of defense agreements. In Section A3, I estimate a series of inferential network models, showing that the hypotheses on preferential attachment and triadic closure are also borne out by these models. Section A4 explores alternative specifications of the DCA dependent variable. In Section A5, I show that the main results are not artifacts of linear de-trending. Section A6 conducts a series of robustness checks, including alternative specifications of the network variables and additional control variables. Finally, Section A7 provides the full text of an illustrative DCA (the 2004 agreement between Sweden and Hungary).

A1 Research Design

Because network data violate the assumption of independently distributed observations,[1] many scholars recommend inferential network models, such as exponential random graph models (ERGMs) (Robins, Pattison, Kalish, and Lusher 2007), temporal ERGMs (Cranmer and Desmarais 2011; Krivitsky and Handcock 2013), stochastic actor-oriented models (SAOMs) (Snijders 1996, 2001, 2005), or latent clustering models (Ward, Siverson, and Cao 2007). However, network models require complete $N \times N$ matrices of data, which precludes the use of split samples, as required to test the informational mechanism. Thus, as noted in the main paper, I instead follow the approach of Fafchamps, Leij, and Goyal (2010) and estimate a series of carefully specified fixed-effects logistic regression models. Nonetheless, as shown in Section A3 below, the results are robust to TERGMs and SAOMs.

I estimate two equations:

$$Pr(y_{ij,t} = 1 \mid y_{ij,t-s} = 0 \text{ for all } s \geq 1) = f(\alpha_{ij,t-1}, \gamma_{ij,t-1}, \delta_{ij,t-1}, \mu_{ij}), \tag{1}$$

and

$$Pr(y_{ij,t} = 1 \mid y_{ij,t-s} = 1 \text{ for some } s \geq 1) = g(\alpha_{ij,t-1}, \gamma_{ij,t-1}, \delta_{ij,t-1}, \mu_{ij}). \tag{2}$$

In both cases, $y_{ij,t}$ is a binary indicator of whether i and j sign a DCA in year t; α_{ij} is a measure of triadic closure; γ_{ij} is a measure of preferential attachment; δ_{ij} represents exogenous dyadic and monadic influences; and μ_{ij} represents dyadic fixed effects. To avoid simultaneity bias, all regressors, including the network terms, are lagged by a year.

Eq. 1 raises an important issue. Since only first agreements are included, the observations for each ij pair take the form $y_{ij} = \{0, ..., 1\}$. Fafchamps, Leij, and Goyal (2010: 213) describe this as a "single-spell, discrete time duration model with fixed effects." Duration dependence and fixed

[1] Long (1997: 52); Greene (2003: 66, 878); Wasserman and Faust (1994: 16).

effects cannot be separately estimated. However, we are concerned with how the hazard changes in response to covariates, not how it changes over time, and the estimating equations do not include time as a regressor. As Allison and Christakis (2006) show, fixed-effects estimation of time-varying regressors is unproblematic so long as those regressors do not change monotonically.[2] To eliminate this possibility, I detrend all the variables by regressing each one on a linear time trend and dyadic fixed effects. I use the residuals from these regressions as the main variables in Eqs. 1 and 2. In Section A5 below, I show that the main results are robust to alternative detrending procedures, including quadratic, exponential, and logarithmic.[3]

Identification of this model partially depends on the temporally lagged terms. As in spatial regression, incorporating functions of the dependent variable on the right-hand side of the regression equation introduces a difficult endogeneity issue—i.e., the values of y outcomes depend reciprocally on one another (Ward and Gleditsch 2008). Temporally lagging the network terms addresses this problem, but the lagged $\alpha_{ij,t-1}$ and $\gamma_{ij,t-1}$ terms only capture network influences originating prior to year t. If network influences also occur "simultaneously" within a single year, such that a DCA signed in t influences creation of new DCAs within t, the model may be misspecified. There is no statistical test to assess this possibility. We must rely on substantive knowledge. Based on historical evidence, the possibility that a DCA will be proposed, negotiated, and signed, and will subsequently influence the proposal, negotiation, and signature of new third-party DCAs, all within the span of a single year, is extremely unlikely. DCAs are often controversial and require many years of negotiation. For example, a routine DCA between Germany and Azerbaijan was proposed in late 2004 but not signed until early 2006. Japan and South Korea have been negotiating a DCA since the mid 2000s. An agreement between Malaysia and Vietnam was proposed in 1994 but not signed until 2008. These cases are not outliers. In short, the temporal lag appropriately models the network influences.

To generate the α_{ij} and γ_{ij} network terms, I specify yearly matrices, $\mathbf{C}_t$, where $c_{ij,t} = 1$ if i and j signed a DCA in years $t-4$ through t. I thus include any DCA signed within a moving five-year window. There are two reasons for the temporal window. First, the theory emphasizes DCA signature. Network influences should have the greatest impact shortly after DCA creation, when details of institutional design become public information, and when DCA partners engage in a "public display" of mutual cooperative intent (cf. Morrow 2014). Second, as discussed further below, many of the DCAD sources do not contain full treaty texts. For these DCAs, the formal duration is unclear. Consequently, we cannot simply define $\mathbf{C}_t$ in terms whether a DCA is in force in year t. Nonetheless, for those DCAs where duration is available, the median duration is typically closer to ten years than five years (depending upon which coding of DCAs is used); insofar as the five-year window ignores the influence of DCA ties beyond the five-year mark, it almost certainly underestimates the full impact of network influences. Further, in Section A4 I re-estimate the models using actual treaty durations rather than the five-year window, with missing values set to annual medians, and the results are strongly robust to this alternative approach.

To capture the effect of triadic closure, I calculate a *two-path* statistic, defined as

[2] That is, if a given variable systematically increases or decreases over time, it will be spuriously correlated with the series of y_{ij} observations and will strongly, but artificially, predict the $y_{ij} = 1$ outcome.

[3] In principle, Eq. 2 does not require detrended measures, but detrending makes little difference in the estimates for this equation.

$$\text{Two-paths}_{ij} = \alpha_{ij} = \log\left(\left(\sum_{k=1}^{N} c_{ik}c_{kj}\right) + 1\right), i \neq j \neq k, \tag{3}$$

which, for a given i and j, is a log-transformed count, summed over k, of $i-k-j$ two-paths (Kinne 2014). I use the log transformation both because the resulting distribution would otherwise be highly skewed, and because I expect the benefits of triadic closure to exhibit decreasing marginal returns. As shown in Section A6, I also test a binary version of this measure, where $\alpha_{ij} = 1$ if i and j share any third-party ties at all, zero otherwise, and I find consistent results. In fact, I explored a wide variety of measures for triadic closure, including minimum/geodesic distances, structural equivalence, and network proximity. All versions yielded the same conclusion: when states share ties to the same third parties, they are more likely to cooperate directly—but only in the case of first DCAs. I opt for the *Two-paths* measure defined in Eq. 3 because it is a simple, intuitive operationalization, and because it consistently yields a good fit.

Operationalizing preferential attachment is slightly more complicated. First, preferential attachment involves a node-level degree statistic (i.e., a country's number of signed DCAs). Yet, because DCA ties are nondirected, each variable must enter the estimating equations symmetrically. I thus focus on *mutual degree*, or the mean degree scores of a particular i and j. Second, the count of two-paths, as defined in Eq. 3, is embedded in mutual degree. That is, if $\alpha_{ij} > 0$, then any shared two-paths between i and j will also be included in mutual degree. Since I wish to separately estimate these two effects, I define mutual degree to include only ij ties that do not involve common k third parties. Specifically, I calculate

$$\text{Mutual degree}_{ij} = \gamma_{ij} = \log\left(\frac{d_i + d_j}{2} - \alpha_{ij} + 1\right), \tag{4}$$

where d_i is the degree centrality of i, defined as $\sum_{j=1}^{N} c_{ij}, i \neq j$, and where d_j is defined analogously. Eq. 4 is thus the log-transformed mean of i and j's respective degree centrality scores, exclusive of any two-paths between them. As above, I use the log transformation both to reduce skewness and because I expect the benefits of mutual degree to exhibit decreasing marginal returns. Note that this operationalization is similar to degree-based assortativity (Newman 2002). The negative α_{ij} term allows us to cleanly separate preferential attachment and triadic closure; this is especially helpful when estimating models for the 1980s, where the relative sparsity of the network poses a risk of multicollinearity, which turn generates convergence problems. As I show in Section A6 below, the main results hold even when α_{ij} is not subtracted. I explored numerous other operationalizations of preferential attachment, including highest degree, lowest degree, and differences in degree, and the results consistently showed that as the average degree of i and j increases, their probability of signing a DCA also increases. As with *Two-paths*, the *Mutual degree* operationalization is simple, intuitive, and consistently yields a good fit.

I also include a series of additional variables, drawing upon the discussion in the main paper of exogenous sources of DCA demand. As with *Mutual degree*, any monadic covariates must enter the estimating equations symmetrically. In such cases, I take the mean of i and j's respective values.

I also explored minimum/maximum values and the "weak link" operationalization (Russett and Oneal 2001) and obtained comparable results. The exogenous variables are as follows:

- *Mean power* is the mean of i and j's log-transformed CINC scores, which are in turn derived from total and urban populations, iron and steel production, energy consumption, military expenditures, and military personnel (Singer 1987).
- *Mean GDP/capita* is the mean of i and j's log-transformed gross domestic product (GDP) per capita, in constant US dollars (Feenstra, Inklaar, and Timmer 2015).
- *Arms match* is a dummy variable that equals one if either i or j is an arms exporter while the other is an arms importer, and equals zero otherwise (Holtom, Bromley, Wezeman, and Wezeman 2013).
- *Mutual enemy* is a count of the number of militarized interstate disputes (MIDs) in which i and j fought on the same side in the past five years (Palmer, d'Orazio, Kenwick, and Lane 2015*a*).
- *Mutual terrorist threat* is the mean number of fatal terrorist attacks by foreign nationals in i and j (START 2016).
- *Mutual democracy* equals one if i and j are both democracies, as defined by Boix, Miller, and Rosato (2012).
- *UNGA ideal point diff.* is an ideal-point variant of the commonly used UNGA measure of foreign policy affinity, where larger values indicate greater disparities in foreign policy preferences (Bailey, Strezhnev, and Voeten 2015).
- *Bilateral trade* is the log-transformed dollar value, in constant US dollars, of i and j's total bilateral trade (Barbieri and Keshk 2012).
- *NATO membership* equals one if i and j are both NATO member states.
- *NATO-PfP membership* equals one if either i or j is a NATO member and the other is a NATO Partnership for Peace (PfP) member.
- *Defense pact (non-NATO)* equals one if i and j are both members of a non-NATO defense pact (Gibler 2009). Note that this measure is based on the symmetric version of the alliance data, which is necessary for the nondirected analysis.

The pooled model also includes a dummy variable to capture former colonial ties (Hensel 2014), as well as a log-transformed measure of geographic distance (Weidmann, Kuse, and Gleditsch 2010), both of which drop out in the fixed-effects models.

Figure 2 of the main paper illustrates correlations between DCA membership and a host of defense outcomes, including peacekeeping missions, joint military exercises, number of cooperative bilateral events, cooperation on the same side of MIDs, and conflict on the opposite side of MIDs. The data sources, respectively, are D'Orazio (2015*a*); D'Orazio (2015*b*); Holtom et al. (2013); Boschee, Lautenschlager, O'Brien, Shellman, Starz, and Ward (2017); and Palmer, D'Orazio, Kenwick, and Lane (2015*b*).

The main paper also explores the testable implications of the informational theory using a series of interaction models. Specifically, I interact the network influences with measures that capture bilateral mechanisms of information transfer between i and j (cf. Kinne 2013). I use the following four measures to proxy for bilateral information:

- *Shared IGO memberships* is a count of the number of intergovernmental organizations (IGOs) in which i and j share membership (Pevehouse, Nordstrom, and Warnke 2004).
- *Shared memberships in highly structured IGOs* is a count of i and j's shared membership in IGOs defined by Ingram, Robinson, and Busch (2005) as either "structured" or "interventionist." In structured IGOs, states relinquish some (minimal) sovereignty to "support IGO projects and missions" and "[o]rganizational decisions are made by formal voting," while a "bureaucracy often exists to carry out decisions" (Boehmer, Gartzke, and Nordstrom 2004: 37). In contrast, interventionist IGOs "possess clear mechanisms for coercing or influencing state behavior," which may include conflict-resolution references in their official mission statements and/or a judiciary structure (Boehmer, Gartzke, and Nordstrom 2004: 38).
- *Mutual exchange of ambassadors* is a dummy variable that equals one if i and j host one another's embassies (Bayer 2006). Because embassies often entail diplomatic corps and attachés, they offer potential for communication and interaction that does not exist with lower levels of representation, such as ministers and chargé d'affaires.
- *Shared membership in highly institutionalized military alliances* is a dummy variable that equals one if i and j share membership in any alliance that (1) provides for an integrated command among allies; (2) requires contact among armed services or military planners for coordination purposes; (3) commits the alliance members to some formal conflict settlement mechanism, such as mediation or arbitration; (4) creates an organization; and/or (5) establishes joint troop placements (Leeds, Ritter, Mitchell, and Long 2002).

A2 Collecting and coding DCA data

The main paper briefly discusses the key characteristics of DCAs. Here, I discuss those characteristics in greater detail. First, DCAs are framework treaties (Matz-Lück 2009, 2014). They describe the basic institutional contours of defense cooperation, but they leave the specifics of implementation to protocols and domestic legislation. Article IV of the 2010 DCA between Indonesia and Vietnam provides an illustrative example: "For the purpose of the implementation of this Memorandum of Understanding, the operational, administrative, and technical matters shall be subject to separate implementing arrangements to be concluded between both Parties."[4] Consequently, most of the substantive impact of DCAs occurs via separately negotiated protocols. E.g., although DCAs frequently touch upon issues of procurement and acquisition, they are not weapons contracts. Indeed, specific weaponry is virtually never cited within DCAs. Instead, DCAs outline the basic process that both sides must follow when developing contracts. The specific protocols signed by countries are diverse, covering everything from military exercises to educational exchanges to

[4] *Memorandum of Understanding between the Government of the Republic of Indonesia and the Government of the Socialist Republic of Vietnam on Strengthening of Cooperation between Defence Officials and Its Related Activities*, signed October 27, 2010, Hanoi.

joint research collaborations. The DCA provides the legal umbrella for all of these activities and is specifically cited as such within the subsequent protocols. Virtually as a rule, DCAs list each signatory's respective implementing authorities and describe basic procedures for implementation.

Second, DCAs promote cooperation on routine defense-related issues. A DCA between Sweden and South Korea provides an example of commonly covered issue areas:

> **Paragraph 2**
> *Scope and Areas of Cooperation*
>
> 1. With regard to identified areas of mutual interest, the Participants may cooperate in the following areas:
>
> a. exchange of defence related experience and information,
> b. research and development,
> c. defence industry,
> d. logistics and maintenance,
> e. military technical cooperation,
> f. military education and training,
> g. government quality assurance,
> h. military medicine and health services and
> i. other areas of cooperation, as jointly decided by the Participants.
>
> 2. When the Participants have identified a specific area of cooperation, a supplementary arrangement to this MoU will be prepared in order to develop that potential area of cooperation.[5]

Section 2.1.i of the above agreement clarifies that additional issue-areas may be brought under the agreement's umbrella, reflecting the broad scope. Section 2.2 further specifies that "supplementary arrangement[s]" will be used to implement projects, consistent with the DCA's status as a framework agreement. This agreement is a "general" DCA—the most common DCA framing—in that it self-consciously attempts to cover all the areas of defense in which signatories might cooperate. In practice, as noted in the main paper, these areas are nearly always some combination of (1) mutual consultation and defense policy coordination; (2) joint exercises, training, and education; (3) coordination in peacekeeping operations; (4) defense-related research and development; (5) defense industrial cooperation; (6) weapons procurement; and (7) security of classified information. Importantly, while the general framing is most common, states also frequently combine multiple, more narrowly defined DCAs into a single framework. For example, over the course of the 1990s and early 2000s, China and Pakistan signed a series of DCAs on defense industrial cooperation and military exchanges before consolidating their defense relations in 2008 with a general agreement. As discussed in the main paper, governments are acutely aware of the trade-off between the general and piecemeal approaches. Future work will explore the choice between these approaches more

[5] *Memorandum of Understanding between the Government of the Kingdom of Sweden and the Ministry of National Defense of the Republic of Korea concerning Cooperation in the Field of Defence,* signed June 24, 2009, Stockholm and Seoul.

rigorously. For the present analysis, I rely on robustness checks to show that, regardless of whether we focus only on general agreements or all DCAs, the same basic relationships hold.

Because DCAs address routine day-to-day defense relations, they are, in principle, accessible to any pairing of states and are not limited to historical contingencies, such as former colonies, postwar environments, nuclear-capable states, etc. That is, there are no *necessary* conditions for signing a DCA. Indeed, Sweden signed a DCA with Indonesia in late 2016, despite the latter's nonaligned status and the former's longstanding principle of neutrality.[6] This important feature distinguishes DCAs from myriad idiosyncratic agreements. For example, the US and Ukraine share agreements on denuclearization, security of radioactive material, and containment of weapons of mass destruction, but these agreements are artifacts of post-Cold War politics and Ukraine's unique nuclear history. They are not general frameworks for routine defense cooperation.

Third, DCAs include mechanisms for promoting cooperation and ensuring implementation. Joint committees, commissions, and working groups are particularly common mechanisms. A 2005 DCA between Sweden and Saudi Arabia illustrates:

> **Article 3**
>
> 1. A committee shall be established under the name (The Joint Military Committee) which shall be responsible for the follow up and development of military cooperations between the two countries and in case any obstacles that may arise regarding this MoU, and each party shall appoint his representative at a later time; the committee will meet annually in each country respectively. The committee raise its recommendations to the higher authorities in both countries to obtain approval.
>
> 2. The committee can form specialized task forces from each party to serve the military cooperation fields.
>
> 3. The committee has the right to seek assistance from experts in both countries that it consider necessary for military cooperation fields.[7]

DCAs also require signatories to develop annual defense cooperation plans, which detail summits, policy goals, exercises, exchanges, and pending contracts. A 2011 DCA between Czech Republic and Moldova illustrates:

> **ARTICLE 4**
>
> *Planning and Conduct*
>
> 1. According to the provisions of this Agreement, the Parties shall work out and approve annually bilateral cooperation plans. The annual plan of cooperation for the next year shall be worked out by 1 December of the current year.
>
> 2. The annual plan of cooperation shall be elaborated on proposals submitted by the Parties.
>
> 3. Each Party shall appoint a point of contact for each activity foreseen in the annual plan of cooperation.

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6 "Sweden, Indonesia sign defense cooperation agreement," *The Jakarta Post*, December 21, 2016.

7 *Memorandum of Understanding concerning Military Cooperation between the Government of the Kingdom of Sweden and the Government of the Kingdom of Saudi Arabia,* signed November 15, 2005, Stockholm.

4. Planning and preparation of the mutual activities may be made through military attachés of the Parties.[8]

These plans often run dozens of pages in length and provide specific details on, in some cases, hundreds of unique events.

Fourth, DCAs generally establish mutual commitments between signatories. That is, they create relatively symmetric obligations, where both parties commit to the same rules and standards. The strongest evidence for this symmetry is in the texts of the treaties themselves. For example, DCAs eschew proper nouns in favor of phrases such as "the Parties" and the "Signatories," while also heavily incorporating the language of mutuality and equality. Indeed, references to "mutuality" pervade DCAs. For example a 2007 DCA between Indonesia and Singapore refers to "friendly relations and mutual cooperation," "mutually beneficial cooperative activities," "mutual access to [...] training areas," "mutually agreed joint projects," "mutual consent of the Parties," and so on.[9] Of course, some DCAs nonetheless contain elements of asymmetry, especially when they involve major powers like the United States. As discussed below, DCAD attempts to identify cases of asymmetry. At the same time, even if agreements are fully symmetric in the formal sense, there may be asymmetries in the implementation of DCAs, rooted in power and relative capabilities (Downs, Rocke, and Barsoom 1996; Goldsmith and Posner 2005; Mearsheimer 1995). Such influences are best addressed in estimation, via the inclusion of appropriate control variables.

Fifth, DCAs are long-term agreements. The modal duration of a DCA is ten years. Some last as few as three years, while others are indefinite. While this long-term characteristic is certainly not unique to DCAs (i.e., numerous other agreement types are also long term), this durability nonetheless distinguishes DCAs from the dizzying array of short-term and one-shot protocols and contracts signed by states, which often either execute upon signing or terminate in less than a year.

Sixth, governments often sign multiple DCAs. As with duration, this characteristic is not unique to DCAs. Nonetheless, as discussed in the main paper, it offers the important benefit of allowing us to probe empirically the mechanisms behind DCAs. There are at least three reasons why states sign multiple DCAs. First, while some DCAs are indefinite, many have a fixed duration of five to ten years. When an agreement expires without renewal, continuation of the cooperative relationship requires a new agreement. Second, as discussed above and in the main paper, governments often adopt a piecemeal approach to DCAs. In such cases, agreements in one issue area may temporally precede agreements in other issue areas. Further, when states have multiple DCAs in place, they often sign a novel general DCA in order to supercede these various agreements and establish a single umbrella framework. Third, after cooperating for years or decades via a DCA, many states opt for stronger, deeper, more extensive agreements, such as DCAs that cover additional issue areas, implement more frequent contacts and joint activities, allocate more resources to joint projects, and so on. Overall, within the 1980–2010 time period, about half of the dyads that sign DCAs subsequently sign at least one more. Note that these "repeat DCAs" are *novel international agreements.* They are not merely amendments or extensions of existing DCAs. (Of course, DCAs are sometimes amended, but DCAD does not define such actions as new agreements.)

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[8] *Agreement between the Ministry of Defence of the Republic of Moldova and the Ministry of Defence of the Czech Republic concerning Co-operation in the Defence Area*, signed May 16, 2011, Prague.

[9] *Agreement between the Government of the Republic of Indonesia and the Government of the Republic of Singapore on Defence Cooperation*, signed April 27, 2007, Tampak Siring, Bali, Indonesia.

DCAs versus other types of defense agreements

The above criteria identify DCAs as a unique category of defense cooperation. Nonetheless, agreements on defense-related topics are ubiquitous. Browsing the "military matters" category of the UN Treaty Series reveals agreements on an enormous array of topics, including military cemeteries, leased bases, repatriation of prisoners of war, equipment disposal, radar stations, deployment of specific vessels, patrol aircraft, atomic information, tobacco use by military personnel, as well as more traditional agreements like strategic partnerships, status-of-forces agreements (SOFAs), nonaggression pacts, and defensive alliances. We must therefore clarify how DCAs differ from these other agreement types.

The status of DCAs as legal frameworks clearly distinguishes them from most of the agreement types cited above, which tend to adress narrow problems in one-shot fashion. Indeed, framework agreements are relatively rare. The US did sign a handful of framework agreements with close partners in the post-WWII years (Connery and David 1951; Erickson 1994; Kaplan 1980; Kolko and Kolko 1972; Scott 1951; Stambuk 1963), and European powers similarly signed a series of framework agreements with former colonies in the 1960s and 1970s (Martin 1995), but these were highly asymmetric arrangements, emphasizing bases, foreign deployments, and military aid. Most of the early bilateral framework agreements between the US and European countries were explicitly tied to NATO membership. Many of these agreements evolved over the 1960s and 1970s into standalone legal arrangements, but they retained a focus on such asymmetric concerns as basing, deployment, access, and transit—i.e., issues related to the physical presence of US military personnel on the European continent (Murphy 1991). They bear little resemblance to the more general and symmetric agreements, unencumbered by historial contingencies, that emerged in the 1980s and especially the 1990s.

While this appendix lacks the space to exhaustively map the entire universe of defense agreements, I nonetheless distinguish DCAs from the most common alternative forms of defense cooperation, including alliances, nonagression pacts, SOFAs, strategic partnerships, and confidence-building measures (CBMs). The first two of these—alliances and nonaggression pacts—have received substantial attention from political scientists (e.g., Gibler 2009; Mattes and Vonnahme 2010; Walt 1987). The definition of alliances offered by Leeds et al. (2002), which encompasses nonaggression pacts, is as follows:

> Alliances are written agreements, signed by official representatives of at least two independent states, that include promises to aid a partner in the event of military conflict, to remain neutral in the event of conflict, to refrain from military conflict with one another, or to consult/cooperate in the event of international crises that create a potential for military conflict.

The authors further clarify that "[a]lliance partners may promise to cooperate in offensive action, to refrain from attacking one another, to remain neutral in the event the other is attacked or finds itself otherwise involved in war, or to consult regarding the use of military force." That is, alliances fundamentally address questions of *conflict*—i.e., who fights, and on whose side. In contrast, as the name implies, DCAs focus exclusively on *cooperation*, and they thus impose a fundamentally different set of legal obligations than do alliances. Indeed, beyond general references to global peace and regional stability, DCAs are generally silent on questions of militarized conflict. Public officials often take great pains to emphasize this fact. For example, following the controversial signature of a DCA between China and Indonesia in 2007, the latter's defense minister, Juwono Sudarsono, publicly stated that, "We only want to improve our defense cooperation with China. We have no intention of signing a defense treaty with China."[10] With regard to a DCA with Singapore, the Indonesian president, Susilo Bambang Yudhoyono, similarly described the deal as "not a military pact."[11]

In practice, alliances sometimes spill into the issue-areas typically covered by DCAs, especially when they encourage interpersonal contacts and consultations. However, when included in an alliance, such provisions are subjected to the limited goal of mutual defense; they do not constitute umbrella legal frameworks. Further, outside of NATO, such extensive commitments appear to be uncommon. According to Leeds et al. (2002), while about half of alliances include provisions on mutual consultation, fewer than 15% of alliances require contact between personnel during peacetime. Leeds et al. (2002) also find that about 60% of alliances include provisions on "economic cooperation, protection of minorities, scientific or cultural exchange, environmental protection, etc.," but these provisions involve "non-military" issue areas, outside the domain of defense and security (Leeds 2005: 30). Issues like joint exercises, officer exchanges, procurement and acquisition, joint weapons collaborations, and defense industrial cooperation rarely fall within the direct purview of alliances, or are addressed by alliances only secondarily. In contrast, DCAs focus precisely on these issues.

Empirically distinguishing DCAs from alliances and nonaggression pacts is thus straightforward. In most cases, alliances focus on conflict and simply do not address the issue areas covered by DCAs. In those cases where an alliance includes "DCA-like" provisions, the alliance is clearly identifiable by its inclusion of common defense provisions and the subjugation of other provisions to this main goal. Accordingly, DCAD includes neither alliances nor nonaggression pacts.

SOFAs are also a well-known form of defense cooperation (Erickson 1994). SOFAs sometimes overlap with issue-areas covered by DCAs, especially with regard to personnel exchanges, consultation, working groups, and educational programs. However, SOFAs "merely define the status of [...] forces in the territory of friendly states and do not themselves authorize the presence or activities of those forces" (Erickson 1994: 139). Rather, SOFAs characteristically address issues of legal jurisdiction, such as the jurisdiction of the US military over American soldiers deployed to foreign bases. Just as SOFAs do not create foreign bases, neither do they create officer exchanges or working groups. Rather, these and other cooperative activities must be established separately, either in a novel agreement or in a separate provision of a larger treaty; the accompanying SOFA merely clarifies the legal status of personnel. There is thus no formal overlap between DCAs and SOFAs. In practice, when DCA signatories lack a separate SOFA, they often include brief SOFA provisions in the DCA itself (e.g., in order to clarify jurisdiction over personnel during joint exercises and during exchange/training programs). SOFAs are thus straightforwardly distinguished from DCAs by their singular emphasis on jurisdictional issues.

Yet another common form of defense cooperation is the strategic partnership agreement (SPA). SPAs differ from DCAs in four key ways. First, they are substantially broader than DCAs, ad-

[10] "RI Has No Intention of Concluding Defense Pact with China," *LKBN Antara*, November 8, 2007.

[11] "Extradition, defense treaties signed in Bali," *The Jakarta Post*, April 28, 2007.

dressing not only defense and military issues but economic ties, diplomatic relations, health, the environment, police agencies, and so on. Second, due to the breadth and grand ambitions of SPAs, defense-related provisions are often extremely vague. In the 2009 SPA between the US and Iraq, for example, the section on defense and security cooperation is a mere two sentences. Indeed, strategic partnerships often defer deep questions of defense cooperation to separate agreements (such as DCAs). Third, strategic partnerships often emerge from unique historical circumstances. The US agreements with Iraq and Afghanistan would not have existed without the preceding wars. Fourth, the term "strategic partner" is often put to multiple uses, even to refer to joint statements and declarations, which do not constitute legal obligations and have virtually no status in international law. Kay (2000) observes that "the United States and its potential peer competitors have rarely employed a term so extensively without a clear sense of its meaning or purpose." Consequently, the legal status of strategic partnerships is not always clear. In contrast, most DCAs are binding legal instruments.[12] Overall, the overlap between DCAs and SPAs is minimal. The simplest means of distinguishing SPAs from DCAs is to examine the language, breadth, and goals of the treaty. Agreements that invoke the language of "strategic partners," cover issue-areas beyond defense concerns, and address defense issues only superficially, are not DCAs.

Finally, as noted in the main text, DCAs bear an interesting resemblance to "confidence building measures," which were common during the Cold War. Holst (1983) defines CBMs as "arrangements designed to enhance such assurance of mind and belief in the trustworthiness of states and the facts they create," and goes on to cite diplomacy, advance notification of military procedures, and mutual constraints on movement of forces as concrete examples of CBMs. There is indeed conceptual overlap between CBMs and DCAs. For example, both emphasize confidence, trustworthiness, predictability, and reliability. Nonetheless, DCAs are not CBMs, for at least three reasons. First, DCAs are legally binding arrangements that encourage specific material outcomes, such as defense policy coordination, training, joint exercises, industry collaboration, and arms trade. While CBMs may be integrated with treaties, they need not be; indeed, the term "CBM" refers to a large basket of confidence-building practices, not to specific legal arrangements. Second, while DCAs do build trust, trust building is not the primary goal. Rather, trust is a byproduct of the relationship. Indeed, as I argue in the main paper, the sensitivity of the issue areas covered by DCAs in fact requires a nontrivial amount of ex ante trust. In contrast, as the name implies, CBMs focus heavily on improving ex post trust. Third, CBMs are a product of tension. As Holst (1983) recounts, CBMs were developed in the context of the Cold War, with a focus on avoiding surprise attacks, miscalculations, and accidental wars. Consequently, CBMs most commonly arise between adversaries. DCAs, in contrast, promote cooperation between like-minded partners in the hopes of solving shared problems and maximizing joint gains.

[12] A potential area of ambiguity involves DCAs that are explicitly titled "memoranda of understanding" (MOUs). Historically, some governments—most notably the United Kingdom—have used the term "memorandum of understanding" to denote an agreement that is "less than a treaty" (Aust 1986). However, emerging international legal practice considers MOUs, even if informal, to be "legally binding [in] nature" (McNeill 1994). The International Law Commission has observed that MOUs "are undoubtedly international agreements subject to the law of treaties" (Commission 1966). Indeed, governments typically register MOUs with the United Nations Treaty Series, and the US government publishes MOUs in its annual treaty series alongside other formal treaties. The DCA dataset thus includes MOUs. In principle, empirical analysis could distinguish the influence of memoranda-based DCAs from other DCAs.

The DCA dataset

Using the above criteria, I and a team of research assistants assembled an exhaustive dataset of all known DCAs for all countries in the world, covering the years 1980 through 2010. The data collection consisted of three sweeps. First, we consulted the two largest treaty databases, the World Treaty Index (WTI) and the United Nations Treaty Series (UNTS). The WTI, originally assembled by Rohn (1984), is perhaps the most inclusive data source, but the quality of its coverage diminishes rapidly after 1980 (though recent extensions by Bommarito, Katz, and Poast (2012) promise to soon remedy this shortcoming). The UNTS includes data on more recent years but is plagued by underreporting and by substantial lags between registration and publication (United Nations Treaty Collection 2012). These two sources contribute about 15% of the treaties in the final dataset. The second, much more extensive sweep focused on individual country publications, including official treaty series, gazettes, online databases, and unofficial records. Many of these documents are available as governmental publications or through ministry websites. However, in dozens of cases we obtained treaty information by directly contacting officials at foreign, defense, and/or legal affairs ministries. These invaluable sources provide about 60% of the observations in the final dataset. The third and final sweep focused on news archives, accessed via Factiva/Reuters wire reports and global and regional newspapers. Coders were instructed to manually search Factiva newswire and newspaper records for the 1980–2010 period using dyad-level queries and relevant keywords. Due to the risk of both type I and type II errors, we did not employ machine coding. This tertiary data source fills the gaps left from the first two sweeps, providing the remaining 25% of the dataset. A separate working paper thoroughly documents each of these steps (Kinne 2015).

The coding separates DCAs into six unique categories, as follows:

- *General*: Agreements that explicitly establish frameworks covering the entirety of their signatories' current and future defense relations. This is the most common category.
- *Defense industrial cooperation*: Agreements that establish frameworks for cooperation between public and/or private defense industries, such as inter-industry collaboration and joint projects. Although these agreements sometimes also include provisions on weapons procurement, they mainly focus on industry collaboration.
- *Procurement and acquisition*: Agreements that establish frameworks for procurement and acquisition of weapons, equipment, spare parts, and weapons-related training. These agreements are limited to procurement and typically do not include provisions on research, development, or industrial collaboration.
- *Training and exchange*: Agreements that establish frameworks for education, training, and exchange of military personnel, such as officer exchanges and advanced coursework in foreign military institutes.
- *Research*: Agreements that establish frameworks for cooperation in defense-related research, typically with an emphasis on fundamental research across the sciences, often with participation of educational institutions (e.g., universities). These agreements promote basic science rather than being limited to defense industries, and they generally contain no provisions on procurement and acquisition.

- *Joint committee*: Agreements that establish high-level recurring consultation mechanisms, such as joint working groups, bilateral committees, and military commissions, with a focus on general defense cooperation, not limited to specific issues or programs.

In coding agreements across these six categories, we developed a series of scales to assess coder confidence. *Category confidence* is a five-point scale for assessing the reliability of the assignment of DCAs to specific categories. Five indicates full confidence that the agreement has been assigned to the correct category, and one indicates zero confidence. For example, a score of five would typically correspond to an agreement where the full text is available and unequivocally identifies the issue-areas covered by the agreement, while a score of four might correspond to an agreement where the full text is unavailable but secondary sources, news reports, and treaty archives nonetheless contain sufficient information to assign a DCA to a specific category with high confidence. A score of three might correspond to an agreement where the full text is unavailable and secondary sources describe the treaty's scope only in general terms, without sufficient precision to clearly identify the correct category. A score of one typically corresponds to agreements where full texts are unavailable and secondary sources only vaguely refer to the treaty's scope, if at all.

We similarly employ a five-point scale, *Agreement confidence*, to assess the coder's confidence that (1) an agreement was signed; (2) the agreement was signed at the specified day, month, and year; and (3) the agreement is in fact a novel legal instrument. Treaties for which we have full texts nearly always receive a five on this scale, as there is little ambiguity on these questions. Agreements for which we lack full texts may also receive a five if news reports and/or other secondary sources are unambiguously clear about the agreement's status and signature date. Secondary sources that do not clearly indicate an agreement was signed, and/or are not specific about signature date, reduce confidence in the coding scheme. We further specify that any ambiguity about an agreement's legal status—i.e., whether it is in fact a legal instrument or is instead a joint statement, declaration, protocol, addendum, or amendment—requires a coding of no higher than two.

Finally, we code an *Asymmetry trigger,* which is a binary variable to indicate whether the agreement shows any evidence of asymmetry. This variable equals one if the treaty text and/or secondary sources reveal evidence of any of the following forms of asymmetry: provision of military aid from one party to the other; bases or other foreign deployments (i.e., beyond symmetric educational exchanges); explicit references to colonial legacies; differences in funding requirements for implemented programs; or differences in legal obligations in any of the core defense areas. The asymmetry trigger is especially important for identifying agreements that appear to be DCAs but are in fact idiosyncratic, context-specific treaties. Some forms of asymmetry are innocuous and would not lead to this variable being coded one, such as differences in ratification or implementation procedures.

We combined the two scales and the asymmetry trigger to generate four overall levels of confidence:

- *Level 1*: The coding is based on a full and complete treaty text, either from an original English text or from a text translated to English. The treaty text and additional supporting information—such as historical records, academic sources, news reports, press releases, gazettes, legislative records, or official treaty series—clearly indicate that the agreement was signed, and that the agreement unequivocally fits into the assigned category. This level corresponds to a category confidence of five, an agreement confidence of five, and no evidence of asymmetry (i.e., the asymmetry trigger equals zero). There is virtually no ambiguity in coding at this level.

- *Level 2*: A full text of the treaty is not available. However, the agreement is listed in an official governmental source, such as a treaty series or gazette, or in an academic source like the UNTS or WTI, and/or the treaty is extensively documented in news reports and secondary sources. Further, supporting information is readily available and clearly indicates both the treaty's date of signature and, for coding purposes, the appropriate category. This level corresponds to a category confidence of four, an agreement confidence of four, and no evidence of asymmetry (i.e., the asymmetry trigger equals zero).

- *Level 3*: A full treaty text may be available, and/or supporting information provides substantial background on the treaty, but the treaty itself contains idiosyncratic elements—such as provisions on military aid or extensive references to basing or status-of-forces issues—that differentiate the agreement from a typical DCA. Due to the nonstandard nature of these agreements, the assigned category may be unreliable. This level includes agreements where category confidence equals four or five, and agreement confidence equals four or five, but the asymmetry trigger indicates clear evidence of asymmetry.

- *Level 4*: The treaty is cited in news reports and/or official sources, but a full treaty text is not available. Supporting information is ambiguous about key characteristics of the treaty, such as its signature date, scope, degree of asymmetry, or status as a novel legal instrument. As with *Level 3* agreements, the assigned category may be unreliable. This level corresponds to a category confidence of three or lower, an agreement confidence of three or lower, and is agnostic about asymmetry (which may be difficult to assess at this level).

All agreements were coded by multiple coders. *Level 1* and *Level 2* agreements in particular showed high levels of inter-coder reliability. Given the potential ambiguities around *Level 3* and *Level 4* agreements, I do not use these agreements in the analyses (though models estimated with these data are consistent with the main results). Thus, for the results reported in the main paper, I use *Level 1* and *Level 2* agreements exclusively, combined across all six categories. However, the results are not unique to this operationalization. Below, I estimate models using only the *General* category of *Level 1* agreements—i.e., the strictest possible coding—and find precisely the same patterns as in the main results.

A3 Inferential network models

In the main paper, I rely on multiple regression models. Specifically, I use a fixed effects (FE) logit estimator, which allows me to (1) control for unobserved heterogeneity, (2) estimate models on separate subsamples of observations, and (3) employ a wide variety of post-regression tests. However, network data often require the use of more complex models. These approaches are specifically designed to not merely control for, but to directly model, the numerous dependencies that exist in network data. Importantly, because they make no assumptions about the independence of observations, inferential network models are able to estimate endogenous influences that occur "simultaneously," i.e., within a single cross-section of data. Because both preferential attachment and triadic closure are endogenous to the structure of DCA network (even if temporally lagged), they are prime candidates for a network model.

The key limitation of network models, for current purposes, is their inflexibility to sample selection. Typically, the dependent variable in a network model is not a vector of observed values, but an $N \times N$ matrix (call it $\mathbf{G}$), or a stack of $N \times N \times T$ such matrices, where N is the number of nodes in the network and T references time periods. I argue that network influences are primarily relevant for dyads that have not yet cooperated. Dyads that have cooperated at least once have less need to draw information from network ties. In multiple regression, where the unit of analysis is the dyad-year, splitting the population of dyads into those that have signed a DCA and those that have not is trivially easy. In a network model, however, this would require removing individual $\mathbf{g}_{ij}$ entries from the $\mathbf{G}$ matrix, which is generally infeasible.[13] In short, network models do not allow us to construct the placebo-like tests needed to assess causal mechanisms.

Nonetheless, inferential network models may offer a better framework for modeling endogenous network dynamics in general. I consider two such models, both of which are intended for longitudinal network data: the temporal exponential random graph model (TERGM), and the stochastic actor-oriented model (SAOM). The TERGM is an extension of the well-known exponential random graph model (ERGM) (Robins et al. 2007), allowing estimation on longitudinal data (Cranmer and Desmarais 2011; Desmarais and Cranmer 2012). I estimate three versions of the TERGM. The first, shown in the first column of Table 1, uses the same data as the pooled model in the main paper, covering the years 1990–2010. The dependent $\mathbf{G}$ matrices are defined in terms of *creation* of DCAs, such that $\mathbf{g}_{ij,t} = 1$ if i and j signed a DCA in year t, zero otherwise. The *Mutual degree* and *Two-paths* terms are defined as in the main paper, using the $\mathbf{C}$ matrix. All variables are lagged by one time period. The model also includes a "Memory" term and an "Edges" term—the TERGM equivalents of a lagged DV and a constant, respectively. In the first TERGM, the estimate for *Mutual degree* is positive and highly precise, while the estimate for *Two-paths* is positive but just shy of statistical significance. Note, however, that because inferential network models are designed for relatively stable, ongoing social relationships, a network model that considers only *creation* of new ties is likely misspecified.

In the next specification, shown in the second column of Table 1, I redefine $\mathbf{G}$ to include not just creation of DCAs, but all DCA ties in force, where missing information on DCA duration is imputed as described in Section A4 below. Thus, $\mathbf{g}_{ij,t} = 1$ if a DCA is in force between i and j in year t. Because this coding focuses on existing network ties, it is more consistent with typical inferential network models, which focus on the existence, rather than the creation or termination, of social relations. The network variables and exogenous covariates are operationalized as above. In this case, the estimated effects of both *Mutual degree* and *Two-paths* are positive and statistically significant, as expected.

Finally, as shown in the third column of Table 1, I swap the *Mutual degree* and *Two-paths* terms with two endogenous terms that are commonly employed in (T)ERGMs, and which allow us to consider "simultaneous" endogenous influences, or influences that occur within a single year (as well as prior years). The first term, *GW degree*, known as "geometrically weighted degree," is analogous to the *Mutual degree* term in that it captures the impact of mutual degree centrality on tie formation—though, as I discuss momentarily, with a slightly different interpretation. The

[13] Simply setting these entries to zero would bias estimates. Another alternative is to employ "structural zeros," where specific $\mathbf{g}_{ij}$ matrix entires are determined to be structurally impossible. However, inferential network models do not handle structural zeros well. TERGMs require that they be converted to binary values, which introduces bias. SAOMs accommodate structural zeros in principle, but large ratios of structural zeros cause estimation problems. An attempt at estimating SAOMs with structural zeros failed basic convergence diagnostics.

Table 1: Temporal exponential random graph models of DCA network

	Model 1	Model 2	Model 3
Two-paths	0.21	0.25*	
	[−0.02; 0.37]	[0.01; 0.40]	
Mutual degree	2.45*	2.19*	
	[2.27; 2.60]	[2.02; 2.35]	
GW degree ($\alpha = 0.5$)			−1.54*
			[−1.75; −1.34]
GWESP ($\alpha = 0.5$)			0.14*
			[0.06; 0.23]
Mean power	0.03*	0.04*	0.04*
	[0.02; 0.34]	[0.02; 0.25]	[0.03; 0.42]
Mean GDP/capita	0.01	0.01	0.02*
	[−0.03; 0.07]	[−0.01; 0.04]	[0.00; 0.04]
Arms match	0.28*	0.30*	0.55*
	[0.03; 0.49]	[0.11; 0.43]	[0.21; 0.73]
Mutual enemy	−0.05	−0.05	−0.00
	[−0.15; 0.05]	[−0.14; 0.04]	[−0.09; 0.08]
Mutual terrorist threat	0.01	0.02	0.01
	[−0.06; 0.04]	[−0.02; 0.04]	[−0.04; 0.02]
Mutual democracy	0.15	0.16	0.32*
	[−0.12; 0.43]	[−0.05; 0.40]	[0.14; 0.51]
UNGA ideal point diff.	−0.24*	−0.23*	−0.20*
	[−0.36; −0.12]	[−0.34; −0.15]	[−0.29; −0.14]
Bilateral trade	0.13*	0.12*	0.12*
	[0.05; 0.16]	[0.07; 0.15]	[0.02; 0.15]
NATO membership	−1.43*	−1.03*	−1.43*
	[−1.89; −1.01]	[−1.37; −0.70]	[−1.77; −1.08]
NATO-PfP membership	−0.14	−0.11	0.13
	[−0.43; 0.14]	[−0.36; 0.13]	[−0.11; 0.41]
Defense pact (non-NATO)	0.78*	0.55*	0.30*
	[0.48; 1.07]	[0.30; 0.79]	[0.10; 0.53]
Distance	−0.44*	−0.39*	−0.41*
	[−0.62; −0.34]	[−0.50; −0.33]	[−0.58; −0.36]
Former colony	0.31	0.02	0.48*
	[−0.15; 0.72]	[−0.48; 0.52]	[0.05; 0.93]
Memory (lagged DCAs)	−0.13	3.33*	3.45*
	[−0.33; 0.02]	[3.26; 3.45]	[3.37; 3.54]
Edges/density	−5.49	−1.85	1.97*
	[−6.70; 1.66]	[−2.56; 3.11]	[1.42; 10.42]
Num. obs.	283504	283504	283504

* 0 outside the confidence interval

second term, *GWESP*, or "geometrically weighted edgewise shared partners," captures the tendency of states to form ties with partners of partners and is thus analogous to the *Two-paths* term.[14] Neither term is lagged, though both are derived from a network of *existing* DCA ties, not *newly created* DCA ties.

The significantly positive estimate for *GWESP* suggests a triadic closure process, which is consistent with the arguments and evidence from the main paper. The result for *GW degree* requires more detailed discussion. As with ERGMs, TERGMs are generative models. They model the joint probability distribution of the network, where that network is assumed to be not a collection of separable dyadic observations, but a single observation drawn from a multivariate distribution. The

[14] Both terms are further discussed in Hunter (2007) and Snijders, Pattison, Robins, and Handcock (2006).

Table 2: Stochastic Actor-Oriented Models of DCA Network

	Model 1	Model 2
Two-paths	0.30^*	
	(0.05)	
Mutual degree	0.98^*	
	(0.05)	
Transitive ties		0.31^*
		(0.04)
Degree alter		0.49^*
		(0.03)
Mean power	0.22^*	0.26^*
	(0.03)	(0.03)
Mean GDP/capita	0.07	0.08^*
	(0.04)	(0.04)
Arms match	0.12^*	0.13^*
	(0.05)	(0.06)
Mutual enemy	-0.04	-0.04
	(0.03)	(0.03)
Mutual terrorist threat	-0.01	-0.01
	(0.01)	(0.01)
Mutual democracy	0.20^*	0.22^*
	(0.05)	(0.05)
UNGA ideal point diff.	-0.21^*	-0.22^*
	(0.03)	(0.03)
Bilateral trade	0.06^*	0.04^*
	(0.01)	(0.01)
NATO membership	-0.98^*	-1.19^*
	(0.12)	(0.12)
NATO-PfP membership	-0.12	-0.12
	(0.07)	(0.07)
Defense pact (non-NATO)	0.18^*	0.12
	(0.08)	(0.07)
Distance	-0.34^*	-0.37^*
	(0.03)	(0.03)
Former colony	0.13	0.19
	(0.11)	(0.11)
Density/degree	-2.32^*	-3.02^*
	(0.04)	(0.07)
Iterations (β + s.e.)	5889	5761

$^*p < 0.05$

parameter estimates indicate whether a particular local process, such as preferential attachment or triadic closure, matters in generating networks that resemble the real-world observed network. In this case, a negative estimate for the *GW degree* term yields simulated networks in which most nodes have few or no ties, and a handful of nodes have very large numbers of ties (Hunter 2007; Levy, Lubell, Leifeld, and Cranmer 2016), which is precisely the sort of skewed degree distribution associated with preferential attachment processes (Barabási and Bonabeau 2003). (In contrast, positive *GW degree* parameter estimates yield networks with more uniform degree distributions, where most nodes have at least a few partners, but no nodes are dominant hubs.) Thus, the negative estimate supports the preferential attachment hypothesis.

TERGMs are not the only available inferential network model for longitudinal data. Another approach is the stochastic actor oriented model (SAOM) (Snijders 1996; Snijders, van de Bunt, and Steglich 2010). Due to the nature of the estimation, the SAOM is best suited for networks that evolve gradually, and where the ties in the network indicate relatively stable relationships, not events. Thus, as with the TERGMs, I define the **G** matrices to include all DCAs in force, not merely creation of DCAs. I first estimate the SAOM using the same *Mutual degree* and *Two-paths* terms as in the main paper. The results, illustrated in the left-hand column of Table 2, are consistent with the hypotheses and with the multiple regression and TERGM results. In short, the DCA network shows evidence of both preferential attachment and triadic closure.

I also swap the *Mutual degree* and *Two-paths* terms for two analogous network terms, *Degree alter* and *Transitive ties*, which capture preferential attachment and closure, respectively, and which allow for a true assessment of endogenous network influence. Neither term is lagged in the traditional sense. The results, illustrated in the second column of Table 2 are once again consistent with expectations. The estimates for both effects are positive and highly significant.

The results reported in the main paper are not artifacts of multiple regression. Even when using inferential network models, I find consistently strong evidence of preferential attachment and triadic closure. While these models do not allow us to explore causal mechanisms with as much precision as multiple regression, they nonetheless provide strong corroborating evidence for the network hypotheses. At the same time, the estimates of exogenous influences are comparable to those from the main paper. For example, defense pacts, mutual democracy, and bilateral trade make DCAs more likely, while shared NATO membership and stark differences in UNGA voting makes them less likely.

A4 Alternative network and dependent variables

In the main paper, I define the **C** matrices, from which the network terms are derived, such that $c_{ij,t} = 1$ if i and j signed a DCA between t and $t-4$, inclusive. Of course, the results may be sensitive to this threshold. I thus varied the threshold and estimated additional models. For comparison, columns 3 and 4 of Table 3 show the estimates from the main paper, where **C** is defined to cover a five-year window.

In the first set of models, I redefine the **C** stack of matrices such that $c_{ij,t} = 1$ if i and j signed a DCA between t and $t-1$, inclusive. The *Mutual degree* and *Two-paths* variables are then calculated from these new matrices. Thus, this specification only counts DCAs signed in the current year or in the immediately prior year. Column 1 of Table 3 illustrates the estimates for dyads that have not yet signed a DCA, and column 2 illustrates the estimates for dyads that have signed at least one DCA. The estimates show precisely the same relationship as when **C** is defined over a five-year period. Network effects strongly encourage DCA creation for country-pairs that have no prior experience with a bilateral DCA, while they have no effect at all on country-pairs that have signed at least one DCA.

In columns 5 and 6, I redefine **C** once again, such that $c_{ij,t} = 1$ if i and j signed a DCA between t and $t-9$, inclusive. This coding covers a full 10-year period and is thus the most generous coding. Again, we observe precisely the same relationship as in the main paper. Prior to the first DCA, the estimated network effects are positive, precise, and substantively very large. After the first DCA, the estimates are insignificant or, in the case of *Mutual degree*, significantly negative. Not only do these results lend further support to the informational causal mechanisms discussed in the main

Table 3: FE logit with alternative specifications of network and dependent variables

	C = 2 years		**C** = 5 years		**C** = 10 years		**C** = actual duration		General, Level 1 DCAs	
	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs
Two-paths	0.515**	0.00313	1.249***	0.177	3.105***	-0.0832	2.376***	0.111	1.172***	-0.0533
	(0.208)	(0.202)	(0.184)	(0.154)	(0.283)	(0.156)	(0.232)	(0.165)	(0.250)	(0.536)
Mutual degree	1.508***	0.0297	3.512***	-0.653**	6.965***	-0.238	4.276***	-0.0408	3.540***	-2.729***
	(0.183)	(0.203)	(0.278)	(0.269)	(0.495)	(0.376)	(0.359)	(0.381)	(0.303)	(0.822)
Defense pact	2.174**	-1.107	2.503**	-1.127	3.238***	-1.039	2.524**	-1.146	1.568	-688.6**
	(1.003)	(0.918)	(1.089)	(0.927)	(1.224)	(0.925)	(1.226)	(0.920)	(1.322)	(273.2)
NATO	3.718**	-0.596	3.863*	-0.661	4.283*	-0.624	3.440	-0.605	3.952*	-0.0710
	(1.872)	(0.445)	(2.040)	(0.447)	(2.466)	(0.443)	(2.228)	(0.441)	(2.366)	(0.847)
NATO-PfP	2.690***	0.693**	1.957***	0.712**	1.784***	0.727**	1.843***	0.676**	2.724***	0.139
	(0.441)	(0.305)	(0.454)	(0.308)	(0.497)	(0.307)	(0.481)	(0.307)	(0.640)	(0.685)
Arms match	-0.0701	-0.630***	0.0280	-0.605**	-0.0380	-0.627***	-0.0468	-0.628***	-0.0904	0.0701
	(0.159)	(0.243)	(0.168)	(0.243)	(0.186)	(0.242)	(0.177)	(0.243)	(0.182)	(0.651)
UNGA diff.	-0.425*	0.206	-0.670**	0.212	-0.742**	0.187	-0.669**	0.218	-1.091***	0.0242
	(0.251)	(0.313)	(0.290)	(0.316)	(0.350)	(0.311)	(0.300)	(0.315)	(0.359)	(1.466)
Trade	1.238***	-0.0789	1.131***	-0.0712	1.077***	-0.0664	1.226***	-0.0841	1.048***	-0.0939
	(0.134)	(0.119)	(0.141)	(0.118)	(0.167)	(0.119)	(0.152)	(0.119)	(0.159)	(0.588)
Mutual enemy	0.450***	0.0464	0.426***	0.0512	0.0930	0.0629	0.282**	0.0380	0.459***	1.131***
	(0.127)	(0.0665)	(0.135)	(0.0673)	(0.164)	(0.0693)	(0.139)	(0.0678)	(0.159)	(0.353)
Mutual terrorism	-0.0619	-0.000392	-0.0607	-0.00281	-0.00781	-0.00289	-0.0641	0.00128	0.000411	-0.995
	(0.0449)	(0.0358)	(0.0496)	(0.0357)	(0.0542)	(0.0356)	(0.0460)	(0.0358)	(0.0658)	(0.808)
Democracy	0.00943	0.442	-0.0377	0.332	0.137	0.389	0.126	0.449	0.248	1.838
	(0.325)	(0.443)	(0.348)	(0.447)	(0.437)	(0.446)	(0.395)	(0.444)	(0.425)	(4.510)
Power	-16.50***	1.532**	-17.62***	1.510**	-18.47***	1.352*	-17.58***	1.577**	-18.43***	3.574
	(0.994)	(0.729)	(1.105)	(0.709)	(1.401)	(0.732)	(1.199)	(0.704)	(1.315)	(3.276)
GDP/cap	5.158***	1.395**	6.842***	1.214*	9.405***	1.347**	8.242***	1.392**	6.611***	-0.671
	(0.591)	(0.640)	(0.712)	(0.643)	(0.920)	(0.639)	(0.823)	(0.668)	(0.749)	(3.972)
N	6365	2517	6365	2517	6365	2517	6365	2517	5048	457
Pseudo R^2	0.402	0.035	0.480	0.041	0.591	0.036	0.528	0.036	0.496	0.261
Log-likelihood	-811.8	-548.9	-706.5	-545.8	-555.5	-548.4	-640.7	-548.7	-531.5	-63.31

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. All models include dyadic fixed effects. All variables linearly de-trended.

paper, but they also reveal that the results are not artifacts of operationalization.

In columns 7 and 8, I attempt to define the **C** matrix to reflect DCAs in force—that is, $c_{ij,t} = 1$ if a DCA is in force between i and j in year t. The difficulty with this operationalization, as noted earlier, is that full texts are unavailable for many treaties, which in turn limits our ability to determine the effective duration of these agreements. For those DCAs where duration is known, I set entries of the **C** matrix accordingly. For those DCAs where duration is not known, I set entries of the **C** matrix using the annual mean duration of known agreements, which typically varies from seven to 10 years. As the estimates in columns 7 and 8 illustrate, I continue to find an extremely significant relationship between network effects and first DCA signature, with nonexistent network effects for subsequent DCA signatures.

Finally, I consider the sensitivity of the results to stricter definitions of the DCA network. As discussed above (and in the main paper), the analysis includes both broad, multi-issue DCAs, and DCAs that focus more narrowly on one of the five other categories. This approach is appropriate because states often build comprehensive defense frameworks in piecemeal fashion, by assembling a dense patchwork of narrow agreements, rather than incorporating a single broad agreement. Nonetheless, the *general* category of DCAs is both the most ambitious and the most frequently adopted by states. Thus, if my arguments regarding network effects and causal mechanisms are correct, we should observe the same basic empirical relationship for the subset of general DCAs as for the larger sample of DCAs. To assess this possibility, I redefined the dependent variable to include only general DCAs within the level 1 coding. I further redefined the *Mutual degree* and *Two-paths* terms using this narrower coding, where $c_{ij,t} = 1$ only if i and j have signed a *general* level 1 DCA in the current year or previous four years. The results are shown in the final two columns of Table 3. The empirical results for the narrower general DCA coding are substantively identical to the results for the more inclusive coding. Network effects make the first DCA more likely, but they have either no effect or a negative effect on subsequent DCAs.

A5 Alternative detrending approaches

As discussed in Section A1 above, the FE model of first DCAs allows for potentially spurious correlations between the network variables and the dependent variable. I follow Fafchamps, Leij, and Goyal (2010) in employing a linear detrending method to ensure that the results are not driven by spurious correlations. Of course, this approach raises a new possibility: that the results are driven by linear detrending. I thus assess the sensitivity of the results to alternative detrending methods. Table 4 illustrates the results of these different methods. In the first two columns of the table, I re-estimate the main FE models using original values, i.e., non-detrended data. The next two columns show the results for linear detrending, which is the method employed in the main paper. Interestingly, detrending has a substantial impact on some of the control variables. For example, linear detrending greatly reduces the magnitude of the effect of *UNGA ideal point diff.* and renders the estimated effect of *Mutual democracy* insignificant. The impact on the *Mutual degree* and *Two-paths* network variables, however, is relatively minimal, attenuating each variable's magnitude only slightly. This basic finding holds across all of the detrending methods. I also employed quadratic, logarithmic, and exponential detrending, and in each case the estimates for the network variables retain their signs and significance—even while estimates for some of the control variables vacillate substantially. Thus, the results reported in the main paper are not artifacts of linear detrending.

Table 4: FE logit with alternative detrending procedures

	Not detrended		Linear (main paper)		Quadratic		Logarithmic		Exponential	
	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs
Two-paths	1.492***	0.175	1.249***	0.177	1.128***	0.177	1.129***	0.177	1.077***	0.177
	(0.223)	(0.154)	(0.184)	(0.154)	(0.165)	(0.154)	(0.165)	(0.154)	(0.168)	(0.154)
Mutual degree	4.922***	-0.675***	3.512***	-0.653**	2.484***	-0.658**	2.489***	-0.659**	3.022***	-0.645**
	(0.353)	(0.258)	(0.278)	(0.269)	(0.236)	(0.267)	(0.236)	(0.267)	(0.248)	(0.268)
Defense pact	3.779***	-1.157	2.503**	-1.127	1.682	-1.132	1.689	-1.132	2.026*	-1.128
	(1.202)	(0.917)	(1.089)	(0.927)	(1.117)	(0.927)	(1.117)	(0.927)	(1.041)	(0.927)
NATO	16.74	-0.691	3.863*	-0.661	3.294**	-0.679	3.297**	-0.679	3.551**	-0.678
	(1825.9)	(0.445)	(2.040)	(0.447)	(1.356)	(0.447)	(1.361)	(0.447)	(1.572)	(0.444)
NATO-PfP	1.946***	0.709**	1.957***	0.712**	2.010***	0.714**	2.009***	0.714**	1.928***	0.707**
	(0.541)	(0.309)	(0.454)	(0.308)	(0.404)	(0.308)	(0.405)	(0.308)	(0.414)	(0.307)
Arms match	0.211	-0.598**	0.0280	-0.605**	0.230	-0.599**	0.229	-0.599**	0.0857	-0.606**
	(0.192)	(0.244)	(0.168)	(0.243)	(0.159)	(0.244)	(0.159)	(0.244)	(0.159)	(0.243)
UNGA diff.	-1.617***	0.220	-0.670**	0.212	-0.772***	0.212	-0.772***	0.212	-0.692***	0.211
	(0.355)	(0.316)	(0.290)	(0.316)	(0.259)	(0.317)	(0.259)	(0.317)	(0.267)	(0.316)
Trade	1.334***	-0.0830	1.131***	-0.0712	1.389***	-0.0784	1.387***	-0.0783	1.076***	-0.0752
	(0.170)	(0.116)	(0.141)	(0.118)	(0.132)	(0.117)	(0.132)	(0.117)	(0.131)	(0.118)
Mutual enemy	0.518***	0.0526	0.426***	0.0512	0.375***	0.0544	0.376***	0.0543	0.367***	0.0567
	(0.157)	(0.0671)	(0.135)	(0.0673)	(0.124)	(0.0672)	(0.124)	(0.0672)	(0.125)	(0.0670)
Mutual terrorism	-0.0227	0.000661	-0.0607	-0.00281	-0.0189	-0.00115	-0.0189	-0.00113	-0.0659	-0.00293
	(0.0568)	(0.0357)	(0.0496)	(0.0357)	(0.0432)	(0.0356)	(0.0432)	(0.0356)	(0.0460)	(0.0357)
Democracy	0.708*	0.359	-0.0377	0.332	-0.502	0.349	-0.500	0.348	-0.0455	0.341
	(0.408)	(0.451)	(0.348)	(0.447)	(0.310)	(0.441)	(0.310)	(0.441)	(0.328)	(0.447)
Power	-12.18***	1.799**	-17.62***	1.510**	-13.46***	1.734**	-13.50***	1.734**	-12.61***	1.546**
	(1.351)	(0.885)	(1.105)	(0.709)	(0.960)	(0.782)	(0.961)	(0.781)	(0.935)	(0.736)
GDP/cap	13.99***	1.065**	6.842***	1.214*	5.762***	1.119*	5.788***	1.120*	5.625***	1.169*
	(0.943)	(0.514)	(0.712)	(0.643)	(0.615)	(0.646)	(0.616)	(0.646)	(0.636)	(0.645)
N	6365	2517	6365	2517	6365	2517	6365	2517	6365	2517
Pseudo R^2	0.619	0.041	0.480	0.041	0.400	0.041	0.401	0.041	0.411	0.040
Log-likelihood	-516.7	-545.7	-706.5	-545.8	-814.1	-545.7	-812.8	-545.7	-799.8	-545.9

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. All models include dyadic fixed effects. Detrending method indicated in column titles.

A6 Robustness checks

Finally, I consider the robustness of the results to alternative specifications of the network variables and to inclusion of additional control variables. Eq. 4 above defines mutual degree in terms of i and j's total DCA ties, minus third-party ties. The first two columns of Table 5 show the results for an alternative operationalization of *Mutual degree*, where shared two-paths is not subtracted. The estimates mirror those from the main paper. In columns 3 and 4 of Table 5, I introduce an alternative measure of triadic closure, *Two-paths dummy*, which is simply a binary measure of whether i and j share any third-party ties at all. Again, the estimates are consistent with those from the main paper.

In the main paper, the discussion of exogenous influences determines the additional non-network terms in the model. Here I consider additional variables that could plausibly be correlated with either *Mutual degree* or *Two-paths*. An important influence in this regard is the global arms trade. Many DCAs include provisions on weapons-related research and development, joint projects, procurement, acquisition, and so on. Further, Kinne (2016) shows that weapons-oriented defense agreements, or "weapons cooperation agreements" (WCAs), have a strong impact on arms trade. In the main paper, I use SIPRI global arms trade data to derive a binary "match" term, which equals one if either i or j is an arms exporter while the other is an arms importer (Holtom et al. 2013). This operationalization is meant to capture the potential attraction between i and j, where one exhibits a demand for weapons while the other exhibits a supply. But, of course, arms trade may be influential in other ways.

I thus devised a more fine-grained approach to matching exporters and importers, where I redefine the match term in a continuous fashion, again pairing exporters and importers, where higher values of the measure indicate a stronger match—i.e., pairs of countries where i or j shows high levels of exports while the other shows high levels of imports. As columns 5 and 6 of Table 5 illustrate, this measure indeed has a strong and significant impact on creation of the first DCA. Nonetheless, the estimated effects of the *Mutual degree* and *Two-paths* network variables remain virtually unchanged. I also considered a measure of total bilateral arms trade between i and j (exports plus imports, log transformed), the results for which are shown in columns 7 and 8 of Table 5. The estimated effect of this term is indistinguishable from zero. This finding in fact accords with theoretical expectations and with corresponding results from Kinne (2017). That is, bilateral ij arms trade is primarily an effect of DCAs, not a cause. The match terms, on the other hand, attempt to capture complementarity in the arms industry between i and j, which, as the theory argues, is an appropriate gauge of bilateral DCA demand. In any case, despite these various alternatives, the estimated network effects remain largely unchanged.

Adopting a different tack, I also consider the robustness of the results to the inclusion of an additional measure of institutional cooperation—namely, joint IGO membership. Using IGO data from Pevehouse, Nordstrom, and Warnke (2004) (interpolated and extrapolated to cover the temporal domain of the analysis), I included in the model a count of i and j's shared IGO memberships. The results are shown in columns 9 and 10 of Table 5. Unsurprisingly, IGO membership has a positive and significant impact on DCA creation. The more IGOs that i and j share membership in, the more likely they are to sign a first DCA. However, as with arms trade, this relationship is uncorrelated with that between DCAs and the network effects.

Table 5: FE logit estimates with additional control variables

	Alt. degree measure		Alt. triads measure		SIPRI cont.		SIPRI bilateral		IGO membership	
	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs
Mutual degree alt.	3.008***	-0.442								
	(0.266)	(0.294)								
Two-paths dummy			1.002***	0.332*						
			(0.170)	(0.195)						
Arms match alt.					0.166***	-0.0737				
					(0.0634)	(0.0856)				
Arms trade bilat.							-0.0277	0.0315		
							(0.102)	(0.0683)		
Shared IGOs									4.545***	1.276
									(1.092)	(1.251)
Two-paths	0.342*	0.245			1.247***	0.186	1.251***	0.186	1.352***	0.0720
	(0.191)	(0.186)			(0.188)	(0.155)	(0.184)	(0.154)	(0.228)	(0.197)
Mutual degree			3.538***	-0.661**	3.339***	-0.664**	3.512***	-0.683**	3.624***	-0.919***
			(0.276)	(0.264)	(0.280)	(0.270)	(0.278)	(0.269)	(0.331)	(0.329)
Defense pact	2.450**	-1.115	2.464**	-1.088	2.559**	-1.198	2.477**	-1.249	2.091*	-0.639
	(1.119)	(0.923)	(1.088)	(0.921)	(1.151)	(0.903)	(1.092)	(0.902)	(1.190)	(0.969)
NATO	3.764*	-0.626	3.496*	-0.677	3.696*	-0.679	3.871*	-0.671	1.712	-1.906***
	(2.028)	(0.445)	(2.030)	(0.448)	(2.080)	(0.446)	(2.039)	(0.446)	(2.490)	(0.719)
NATO-PfP	2.035***	0.702**	1.991***	0.715**	1.919***	0.683**	1.955***	0.672**	2.573***	0.590
	(0.458)	(0.306)	(0.453)	(0.308)	(0.462)	(0.309)	(0.455)	(0.308)	(0.612)	(0.384)
Arms match	-0.0326	-0.618**	0.0313	-0.599**					-0.0277	-0.830***
	(0.167)	(0.243)	(0.168)	(0.244)					(0.197)	(0.289)
UNGA diff.	-0.723**	0.211	-0.681**	0.206	-0.671**	0.170	-0.668**	0.182	-0.628*	0.260
	(0.287)	(0.315)	(0.290)	(0.316)	(0.293)	(0.315)	(0.290)	(0.315)	(0.335)	(0.408)
Trade	1.188***	-0.0738	1.127***	-0.0681	1.171***	-0.0878	1.131***	-0.0867	0.954***	-0.0363
	(0.141)	(0.118)	(0.140)	(0.118)	(0.145)	(0.118)	(0.141)	(0.118)	(0.166)	(0.137)
Mutual enemy	0.418***	0.0458	0.423***	0.0440	0.437***	0.0461	0.424***	0.0537	0.861***	0.101
	(0.135)	(0.0670)	(0.135)	(0.0673)	(0.137)	(0.0676)	(0.136)	(0.0674)	(0.171)	(0.0858)
Mutual terrorism	-0.0769	-0.00116	-0.0606	-0.000969	-0.0609	-0.00255	-0.0596	-0.00488	-0.0926	0.00518
	(0.0472)	(0.0356)	(0.0494)	(0.0357)	(0.0505)	(0.0353)	(0.0497)	(0.0358)	(0.0625)	(0.0382)
Democracy	-0.134	0.401	-0.0754	0.315	-0.0818	0.266	-0.0296	0.291	-0.281	0.324
	(0.359)	(0.443)	(0.348)	(0.446)	(0.362)	(0.452)	(0.348)	(0.448)	(0.406)	(0.544)
Power	-18.18***	1.625**	-17.48***	1.560**	-17.65***	1.327*	-17.63***	1.403**	-16.18***	1.395
	(1.112)	(0.713)	(1.098)	(0.702)	(1.129)	(0.705)	(1.105)	(0.702)	(1.315)	(0.887)
GDP/cap	6.975***	1.192*	6.740***	1.132*	7.055***	1.128*	6.850***	1.052	7.615***	2.180**
	(0.719)	(0.653)	(0.709)	(0.646)	(0.762)	(0.642)	(0.711)	(0.642)	(0.993)	(1.022)
N	6365	2517	6365	2517	6183	2507	6365	2517	3967	1505
Pseudo R^2	0.466	0.037	0.475	0.042	0.487	0.036	0.480	0.035	0.483	0.056
Log-likelihood	-725.0	-547.6	-712.9	-545.0	-681.8	-546.9	-706.5	-548.7	-498.0	-348.9

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. All models include dyadic fixed effects. All variables linearly detrended.

An additional set of robustness checks focuses on the appropriate specification of military capabilities. In the main paper, I use Correlates of War CINC scores to capture the multifaceted characteristics of power. CINC scores include military expenditures, military personnel, population (total and urban), iron and steel production, and energy consumption (Singer 1987), and they thus provide a comprehensive metric of power. Nonetheless, of the CINC components, expenditures and personnel are likely to be of greatest relevance to DCAs, as they reflect military size, arms markets, and potential demand for military cooperation. Given the very real possibility that degree centrality in the DCA network is correlated with other influences on countries' attractiveness as defense partners, we must empirically control for these other influences.

Yet, even with a narrow focus on expenditures and personnel, the appropriate operationalization is unclear. On the one hand, insofar as states value defense partners that are technologically sophisticated, highly capable, and willing to spend money, we should find that as measures of capabilities mutually increase, states become more likely to cooperate. On the other hand, as argued in main paper, powerful states may be wary of cooperating with other powerful states, which means mutually high levels of power should be negatively associated with defense cooperation. At the same time, militarily weak states stand to gain the most from cooperation, and they should also favor ties to powerful countries, which implies that DCA cooperation may be driven by asymmetries in power.

To assess these multiple possibilities, I calculated two versions each of military expenditures and military personnel. The first takes the mean between i and j of the (log transformed) measure, and the second takes the absolute difference between i and j. Table 6 reports the results. The results for military expenditures, shown in the first four columns of Table 6, largely mirror the results for CINC scores shown in the main paper. For the first DCA, mutually high levels of military expenditures sharply reduce the probability of i and j signing a DCA. However, for subsequent DCAs, once trust has been established, expenditures increase the probability of signing an agreement, as trustworthy countries work to leverage the capabilities of their partners. I also find a significantly positive effect for differences in military expenditures, confirming the asymmetry possibility, but only for the first DCA. The results for military personnel differ slightly. High mutual levels of personnel make a first DCA unlikely and have no effect on subsequent agreements. And as with expenditures, differences in personnel increase the probability of a first DCA but have no influence on subsequent agreements.

Importantly, across all the various robustness checks, the estimates for *Mutual degree* and *Two-paths* change very little. The network effects appear to be unique, largely uncorrelated with other determinants of DCA formation, and driven by informational mechanisms. A final potential concern is that because the exogenous influences stimulate demand for defense cooperation, the network effects may emerge only "post treatment."[15] However, I argue that system-level shifts have increased demand for DCAs across the globe; while dyad-level variations in exogenous influences affect bilateral demand, there remains a baseline level of demand for DCAs, generated by the post-Cold War security environment. Further, network influences are not strongly correlated with dyadic exogenous influences. In some cases, high levels of, say, bilateral trade precede high levels of *Two-paths* and *Mutual degree*, while in other cases the reverse is true. The FE specification, which is limited to within-unit variation, ensures that the model captures changes in these influences over time regardless of temporal sequencing. We should thus observe that the parameter estimates for the network

[15] I thank Jon Pevehouse for suggesting this possibility.

Table 6: FE logit models with additional control variables

	Mil. expenditures v1		Mil. expenditures v2		Mil. personnel v1		Mil. personnel v2		Simplified model	
	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs	First DCA	Addl. DCAs
Mil. expend. mean	-2.691***	0.451**								
	(0.240)	(0.209)								
Mil. expend. diff.			0.564***	-0.0757						
			(0.110)	(0.139)						
Mil. person. mean					-9.533***	0.540				
					(0.637)	(0.342)				
Mil. person. diff							0.400*	-0.253		
							(0.237)	(0.223)		
Two-paths	0.971***	0.243	1.001***	0.233	1.300***	0.185	1.011***	0.210	0.981***	0.309**
	(0.162)	(0.153)	(0.154)	(0.152)	(0.182)	(0.154)	(0.154)	(0.153)	(0.136)	(0.142)
Mutual degree	3.035***	-0.668**	3.034***	-0.651**	3.179***	-0.612**	3.109***	-0.621**	3.182***	-0.623**
	(0.244)	(0.268)	(0.221)	(0.268)	(0.272)	(0.269)	(0.221)	(0.269)	(0.181)	(0.253)
Defense pact	1.737*	-1.331	1.675*	-1.546*	2.127**	-1.352	1.612*	-1.623*		
	(0.958)	(0.905)	(0.919)	(0.912)	(1.030)	(0.919)	(0.921)	(0.921)		
NATO	5.693***	-0.987**	5.364***	-0.948**	3.998*	-0.727	5.089***	-0.916**		
	(1.944)	(0.433)	(1.789)	(0.435)	(2.066)	(0.451)	(1.776)	(0.436)		
NATO-PfP	2.022***	0.569*	2.536***	0.523*	2.521***	0.653**	2.563***	0.521*		
	(0.400)	(0.296)	(0.398)	(0.296)	(0.450)	(0.305)	(0.394)	(0.294)		
Arms match	0.0888	-0.573**	0.0842	-0.591**	0.287*	-0.624**	0.0274	-0.615**		
	(0.158)	(0.244)	(0.153)	(0.243)	(0.167)	(0.244)	(0.152)	(0.245)		
UNGA diff.	-0.790***	0.237	-0.788***	0.260	-0.657**	0.250	-0.848***	0.259		
	(0.255)	(0.317)	(0.226)	(0.321)	(0.284)	(0.318)	(0.221)	(0.319)		
Trade	1.179***	-0.113	1.106***	-0.128	1.103***	-0.0999	1.093***	-0.140		
	(0.134)	(0.115)	(0.121)	(0.116)	(0.136)	(0.117)	(0.120)	(0.117)		
Mutual enemy	0.382***	0.0675	0.442***	0.0639	0.353**	0.0595	0.445***	0.0533		
	(0.123)	(0.0667)	(0.115)	(0.0664)	(0.141)	(0.0666)	(0.116)	(0.0670)		
Mutual terrorism	-0.0834	0.000483	-0.105**	0.00602	-0.0388	-0.00207	-0.0955**	0.00341		
	(0.0543)	(0.0356)	(0.0522)	(0.0353)	(0.0466)	(0.0357)	(0.0446)	(0.0353)		
Democracy	0.0481	0.347	0.301	0.497	0.145	0.402	0.266	0.467		
	(0.305)	(0.452)	(0.280)	(0.455)	(0.363)	(0.449)	(0.279)	(0.451)		
GDP/capita	6.583***	1.131*	4.621***	0.777	3.958***	1.063*	5.136***	0.807		
	(0.642)	(0.632)	(0.548)	(0.623)	(0.626)	(0.641)	(0.550)	(0.618)		
N	6220	2513	6220	2513	6283	2497	6283	2497	7848	2619
pseudo R^2	0.397	0.041	0.345	0.037	0.476	0.038	0.340	0.037	0.222	0.007
Log-likelihood	-804.3	-545.3	-874.1	-547.5	-703.5	-543.8	-886.1	-544.4	-1236.5	-586.1

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors in parentheses. All models include dyadic fixed effects. All variables linearly de-trended.

terms are relatively insensitive to inclusion/exclusion of covariates. The last two columns of Table 6 illustrate the results of a simplified "rule of three" model (Achen 2002). The estimates for first DCA are positive, precise, and consistent with previous specifications. For additional DCAs, the estimate for *Mutual degree* is significantly negative, which is, again, consistent with previous expectations. The estimate for *Two-paths*, on the other hand, is positive and significant at the 5% level. However, a t-test shows that the difference in the *Two-paths* estimates between the two samples is statistically significant. That is, the impact of two-paths is significantly weaker for additional DCAs than for first DCAs, as predicted.

A7 Sample DCA

Agreement between the Government of Kingdom of Sweden and the Government of the Republic of Hungary on Defence Co-operation.

The Government of the Kingdom of Sweden and the Government of the Republic of Hungary (hereinafter jointly referred to as “the Parties”, and separately as “a Party”):

ACKNOWLEDGING the mutual interest in keeping international peace and security;

DESIRING to further strengthen the bilateral relations between the two countries;

ENDEAVOURING to promote the defence technical co-operation for their mutual benefit;

REGARDING the Agreement concluded between the Parties in Budapest, on 13 October 1995, on the Protection of Classified Military Information;

REGARDING the Memorandum of Understanding concluded between the Parties in Stockholm, on 23 November 2001, on the Lease of JAS 39 Gripen Aircrafts,

HAVE AGREED as follows:

Article 1

Purpose

1.1 The military co-operation between the Parties will be carried out on the basis of equality and mutual advantages within the frame of the present Agreement.

1.2 The Parties will implement the provisions of the present Agreement in accordance with national and international laws.

1.3 The Present Agreement will not impair the obligations of the Parties arising from other international agreements and will not infringe the interest, security or regional integrity of other countries.

1.4 The Defence Ministries of the Parties will be responsible for the implementation of the present Agreement.

Article 2

Fields of co-operation

2.1 The Parties hereby agree to co-operate, in accordance with their national laws and regulations and the international agreements signed by both Parties for:

2.1.1 organizing mutual consultations on defence and security policies;

2.1.2 exchanging information on the defence doctrines and military aspects of security policy;

2.1.3 promoting co-operation in defence sciences and technology through exchange of information, training and joint projects (including the following fields, among others: informatics, principles of organising communication, application of communication equipment, cartography, geodesy and meteorology, defence research and production, issues of economy and finance, human policy issues, protection of environment against contaminations resulting the activities of military units);

2.1.4 co-operating in military education and trainings;

2.1.5 military sciences and research, military history issues, publishing;

2.1.6 mutual cognition of defence related law and other legal aspects;

2.1.7 protection of information and documents, as well as, information security, determining the channel of information transfers;

2.1.8 logistics support of the armed forces and exchanging information on military equipment;

2.1.9 cultural and sport events;

2.1.10 collaborating in other possible spheres of defence co-operation for purposes of mutual benefits on the basis of the Parties mutual agreement.

2.2 Details of the implementation of the above co-operations and other fields of defence co-operations and their details will be stipulated by the Implementation Agreement concluded by the adequately authorised representatives of the Parties.

Article 3

Forms of co-operation

3.1 The Parties will realize their military co-operation in the following forms:

3.1.1 official visits and working meeting on each level of command and control;

3.1.2 conferences, meetings, seminars, exchanges of experiences, consultations;

3.1.3 exchange of information and documents according to concluded agreements;

3.1.4 joint military exercises;

3.1.5 education in military educating institutes and professional re-training, exchange of teachers;

3.1.6 cultural and sport events.

3.2 Other forms of military co-operation will be mutually agreed upon following the written negotiation of the Parties.

3.3 The Parties will regularly organize the meeting of their representatives on the level of the defence ministries, defence staffs, commands, service headquarters, services and branches, as well as on other command levels to strengthen mutual understanding and trust.

Article 4

Defence technology co-operation

4.1 The Parties will, within the frame of defence technology co-operation:

4.1.1 promote communication between companies and agencies committed to defence sector, as well as between defence technology associations in their respective countries;

4.1.2 facilitate dialogue between their research institutes;

4.1.3 support the development of joint projects mutually agreed upon.

4.2 Fields of the bilateral defence technology co-operation covering mutual exchange of personnel and joint projects will be separately agreed upon by the Parties.

Article 5

Protection of classified information

During the implementation of the present Agreement handling of classified information will be carried out according to the Agreement concluded between the Government of the Republic of Hungary and the Government of Kingdom of Sweden in Budapest, on 13 October 1995 on the Protection of Classified Military Information.

Article 6

Review and planning

6.1 For the purpose of promoting the implementation of principles and provisions of the present Agreement in the last quarter of the given year the Parties shall review the achievements of cooperation and agree upon the program of bilateral co-operation for the next year.

6.2 The annual programs will be co-ordinated by the competent organs of the Ministry of Defence of the Republic of Hungary and the Ministry of Defence of the Kingdom of Sweden responsible for international co-operation, involving experts if necessary.

6.3 Co-ordinations will be held alternately in the Republic of Hungary and in the Kingdom of Sweden.

6.4 On the basis of reciprocity, the host Party will cover the costs of organization and execution of the co-ordination with the exception of the costs of international travel and daily allowances.

6.5 The programs of co-operation may also be agreed upon through military diplomatic channels.

Article 7

Financial arrangement

7.1 The financing of co-operation is based on mutuality and observing the principles of the present Agreement.

7.2 The sending Party will cover the costs of international travel, accomodation, accident and health insurance.

7.3 The host Party will cover the costs of organization and implementation of the defence co-operation programs, as well as the costs of domestic travel.

7.4 The costs of the visits of sport, cultural, educational delegations will be stipulated separately on a case-to-case basis.

7.5 All other costs arising from the implementation of the present Agreement will be settled on the basis of the mutual agreement of the Parties.

Article 8

Settling of disputes

Any disputes arising from the interpretation or implementation of the present Agreement will be settled by consultations between the Parties, without referring them to any third party or tribunal.

Article 9

Implementation

The Parties may conclude further agreements of a general or a specific nature for the effective implementation of the present Agreement, according to its provisions.

Article 10

Final provisions

10.1 The present Agreement shall enter into force on the day of receiving the last notification by which the Parties notify each other through diplomatic channel that they have met internal requirements necessary for its entering into force.

10.2 The present Agreement is concluded for an indefinite period, however any Party can terminate it upon written notification sent to the other Party. This Agreement will abate six months after the receipt of such written termination notice. In case of termination the relevant provisions of the present Agreement will remain in force until all ongoing activities are finalized or all issues arising from the implementation pursuant to this Agreement are settled.

10.3 The present Agreement may be amended any time on the basis of mutual consent of the Parties. The amendments shall enter into force in accordance with paragraph 1 of this Article.

10.4 The present Agreement shall replace the Memorandum of Understanding between the Parties on Defence related Cooperation and Exchange of Views concerning certain Defence System done in Stockholm on 18th December 1995.

IN WITNESS WHEREOF, the undersigned, being duly authorized by their respective Governments, have signed and sealed the present Agreement in two copies each in Swedish, Hungarian and English languages, all being equally authentic. In case of any discrepancies in translation or interpretation, the English version will prevail.

DONE at BUDAPEST on 28 May 2004.

For the Government of the Kingdom of Sweden
Leni Björklund

For the Government of the Republic of Hungary
Ferenc Juhász

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