Appendix 1
Supplemental Descriptive Statistics and ERGM Results

Table A1.1: Descriptive statistics illustrating the effects of removing pendants on the structure of the local, regional, and multi-level networks

Descriptive statistic	Local network (pendants)	Local network (no pendants)	Regional network (pendants)	Regional network (no pendants)	Multi-level network (pendants)	Multi-level network (no pendants)
Nodes	741	320	1286	304	2027	624
Density	0.003	0.010	0.002	0.016	0.003	0.009
Average degree	2.5	3.2	2.7	4.8	3.1	5.6
Degree centralization	0.091	0.097	0.136	0.217	0.187	0.142
Average local clustering coefficient	0.090	0.227	0.039	0.173	0.054	0.188
Average path length	8.19	8.09	4.38	3.51	4.33	3.58
Small-world quotient	22.86	13.70	31.52	11.33	55.32	21.97

The decision to remove pendant nodes prior to analysis has an effect on both the descriptive statistics and ERGMs, and to assess the impacts we examined results for the local, regional, and multi-level networks with and without pendants[1]. Removing pendants from the local, regional, and multi-level networks leads to a uniform increase in density, average degree, and average local clustering coefficient, and a decrease in average path length and the small-world quotient (Table A1.1). In the case of the local and regional networks, removing pendants increases the overall degree centralization, indicating the pendants are more evenly distributed through these networks, as opposed to concentrating on one or more high-degree nodes. However, the removal of pendants in the multi-level network leads to a decrease in degree centralization, which indicates a disproportionate number of pendants providing cross-level ties are connected to a relatively small number of the same high-degree actors in the multi-level network.

Importantly, removing pendants does not fundamentally alter the interpretation of the empirical results. Closed structures are more prevalent in the local network, both with and without pendants, as evidenced by the higher average local clustering coefficient when compared with the regional network. Open structures are more prevalent at the regional level, both with and without pendants, as evidenced by the higher degree centralization when compared with the local network. The multi-level network effectively balances the closed and open structures found at the local and regional levels, respectively, as evidenced by the small-world quotient

[1] Given the large number of pendants (~1,400) in the network dataset, we did not code pendants as local or regional actors. Instead, we focus more generally on the structures that arise when pendants are included in both the local and regional networks, effectively treating pendants as a neutral category with respect to the level variable.

being greater, both with and without pendants, when compared to the local and regional networks.

Table A1.2: ERGM results illustrating the effects of removing pendants on the coefficient for anti-preferential attachment, in the absence of any other endogenous or exogenous model terms

ERGM coefficient	Local network (pendants)	Local network (no pendants)	Regional network (pendants)	Regional network (no pendants)	Multi-level network (pendants)	Multi-level network (no pendants)
Edges	-5.410*** (0.048)	-4.362*** (0.058)	-5.812*** (0.033)	-3.950*** (0.040)	-6.106*** (0.022)	-4.647*** (0.026)
Anti-preferential attachment†	-0.798*** (0.117)	-1.028*** (0.191)	-1.157*** (0.084)	-1.902*** (0.210)	-1.501*** (0.067)	-1.317*** (0.240)

*p<0.1, **p<0.05, ***p<0.01
†Decay parameter fixed at 0.3

Table A1.2 illustrates how the anti-preferential attachment (geometrically-weighted degree) coefficient in the ERGMs, in the absence of any other endogenous or exogenous model terms, changes when pendants are removed from the local, regional, and multi-level networks. These results further illustrate how geometrically-weighted degree tracks network centralization when it is the sole term included in the ERGMs. In all the networks, both with and without pendants, the anti-preferential attachment coefficient is negative, indicating a propensity for actors to form ties with relatively high-degree actors. In the case of the local and regional networks, degree centralization increases when pendants are removed from the networks (Table A1.1), and this is reflected in the anti-preferential attachment coefficient becoming more negative in the ERGMs for these networks when pendants are removed. The multi-level network becomes less centralized when pendants are removed (Table A1.1), and this change is also mirrored in the anti-preferential attachment coefficient becoming less negative in the ERGM for this network when pendants are removed. Consistent with our hypotheses, the regional and multi-level networks have larger negative coefficients than the local network on the anti-preferential attachment statistics.

Table A1.3: ERGM results illustrating the effects of removing pendants on the coefficient for shared partners, in the absence of any other endogenous or exogenous model terms

ERGM coefficient	Local network (pendants)	Local network (no pendants)	Regional network (pendants)	Regional network (no pendants)	Multi-level network (pendants)	Multi-level network (no pendants)
Edges	-6.045*** (0.039)	-5.364*** (0.068)	-6.425*** (0.027)	-4.765*** (0.055)	-6.838*** (0.021)	-5.415*** (0.036)
Shared partners†	1.458*** (0.047)	1.471*** (0.063)	1.413*** (0.037)	1.024*** (0.050)	1.648*** (0.026)	1.242*** (0.034)

*p<0.1, **p<0.05, ***p<0.01
†Decay parameter fixed at 0.3

Table A1.3 illustrates how the shared partners (geometrically-weighted edgewise shared partners) coefficient does not change substantially when pendants are removed from the local, regional, and multi-level networks. The positive coefficients indicate there is a propensity for triadic closure in all the networks, regardless of whether pendants are included or removed.

Table A1.4: Model results illustrating the interplay between within-country homophily and anti-preferential attachment for the local, regional, and multi-level networks. Pendant nodes were not included in any of the networks.

ERGM coefficient	Local network (homophily)	Local network (no homophily)	Regional network (homophily)	Regional network (no homophily)	Multi-level network (homophily)	Multi-level network (no homophily)
Anti-preferential attachment†	-2.217* (0.874)	2.348*** (0.310)	1.663* (0.772)	1.617*** (0.379)	7.535*** (0.769)	6.584*** (0.749)

*p<0.1, **p<0.05, ***p<0.01
†Decay parameter fixed at 0.3

Table A1.4 illustrates how the positive homophily effect in the ERGMs affects the coefficient for anti-preferential attachment, which has important implications as it relates to network centralization. While only the coefficient for anti-preferential attachment is displayed in the table, the ERGMs include the same suite of endogenous and exogenous variables as the ERGMs presented in the paper, and all other terms were excluded from the table here for ease of interpretation. (Note: the coefficients for anti-preferential attachment in the local, regional, and multi-level networks with homophily are identical to those in Table 2 in the text, as the models are identical.)

In the regional and multi-level ERGMs, the anti-preferential attachment coefficients remain large and positive both with and without homophily. In the local network, the anti-preferential attachment coefficient switches from negative to positive when homophily is not included in the ERGM, which indicates the propensity for actors to form ties with relatively high-degree actors in the local network is occurring among actors working within the same country. It is important to recognize degree centralization is a network-level measure, so while the local network is less centralized overall than the regional or multi-level networks, the force for centralization captured by the negative anti-preferential attachment coefficient is taking place at the sub-network level, and as a direct result of the strong homophily force between local actors from the same country in Central America. In other words, the negative coefficient on gwdegree when homophily is included in the model indicates relatively greater variance in the degree distribution within each country than at the network level, where the exogenous effect of homophily is not considered.

Table A1.5: Model results illustrating the interdependence between the anti-preferential attachment and "reported partners" variable, in the absence of any other model terms. Pendant nodes were not included in any of the networks.

ERGM coefficient	Local network	Local network	Regional network	Regional network	Multi-level network	Multi-level network
Edges	-4.362*** (0.058)	-6.604*** (0.190)	-3.950*** (0.040)	-5.399*** (0.104)	-4.647*** (0.026)	-6.345*** (0.090)
Reported partners	---	1.685*** (0.104)	---	1.554*** (0.067)	---	1.573*** (0.052)
Anti-preferential attachment†	-1.028*** (0.191)	1.390*** (0.293)	-1.902*** (0.210)	0.622 (0.320)	-1.317*** (0.240)	4.247*** (0.697)

*p<0.1, **p<0.05, ***p<0.01
†Decay parameter fixed at 0.3

Table A1.5 illustrates the interdependence between the anti-preferential attachment and "reported partners" terms in the ERGMs. Technically, this represents multi-collinearity between the anti-preferential attachment and "reported partners" variables, and understanding the relationship between these two variables is key to interpreting the anti-preferential attachment coefficient in the full ERGMs presented in the paper. When the variable capturing the effect of whether or not actors reported ties on their websites is not included alongside anti-preferential attachment, the anti-preferential attachment coefficient decreases, and becomes negative, in each of the local, regional, and multi-level networks. This indicates more network centralization and organization around high-degree nodes, and brings the anti-preferential coefficients in line with the descriptive statistics; the regional network is the most centralized and possesses the most negative anti-preferential attachment coefficient, while the local network is the least centralized and possesses the least negative anti-preferential attachment coefficient.

When the "reported partners" variable is included in the ERGMs alongside anti-preferential attachment, the coefficient on anti-preferential attachment becomes positive in each of the local, regional, and multi-level networks. Interpreted in isolation, a positive anti-preferential attachment coefficient (gwdegree) represents more decentralized networks. However, remembering that gwdegree captures the endogenous variance in the degree distribution, what the anti-preferential attachment coefficient is actually capturing is the low variance part of the degree distribution that is not represented by organizations reporting ties. That is, actors that report ties on their websites have higher average degrees (16.2 and 8.7 when regional and local actors, respectively, report ties, versus 3.5 and 2.8 when they do not), and therefore the inclusion of this exogenous variable in the models captures most of the high-degree nodes in the distribution, and reduces the variance in the degree distribution that is captured by gwdegree. For this reason, in Table A1.4 we see positive anti-preferential attachment coefficients in the regional and multi-level networks, both with and without homophily.