

ABSTRACT

There is a debate on whether or not social trust and political trust are interconnected. Using representative samples from 11 democratic countries, we conducted a network analysis of the seven types of trust derived from the Global Trust Inventory. Results showed that different types of trust grouped into two clusters that center around social and political trust, respectively, but there were also cross-cluster associations between trust in governing bodies and security institutions on the one hand, and trust in community on the other hand. Strength centrality suggested that trust in governing bodies was the most central type of trust across most countries. The link between trust in neutral (non-partisan) governmental institutions and trust in community potentially serves as the main channel connecting the flow of global trust in democratic societies.

KEYWORDS: trust, network analysis, centrality

A network analysis of global trust across 11 democratic countries

Trust is seen as a glue in modern societies that facilitates economic prosperity and political functioning (e.g., Fukuyama, 1995; Newton, 2001; Putnam, 2000; see a more critical view of trust in Warren, 1999). In this literature, there exists a conventional division between social and political trust, as they are believed to have different foundations (e.g., Uslaner, 2002; 2018) and therefore should be treated as distinct concepts. However, more recently, the interconnected nature of trust has been increasingly acknowledged: Newton, Stolle, and Zmerli (2018) argue that social and political trust are “closely tied together in a mutually reinforcing manner that underpins social harmony, economic efficiency, and democratic government” (Newton et al., 2018, p.2; see also Newton & Zmerli, 2011). Consistent with this idea, Liu and his colleagues (2018) propose a Global Trust Inventory (GTI), which captures “a system of meaning that encompasses both the sub-components of and an overall grasp of the risks of opening oneself up to a range of dependencies on others” (p. 790). Here we introduce network analysis as a relatively novel and useful tool to empirically examine the *interconnectedness* of multiple types of trust derived from the GTI.

The debates around the interconnectedness of trust classically have centered on a binary distinction between social and political trust. Social capital theorists propose a bottom-up model, where social trust and the civic associations formed among citizens is the key to improved functioning for a democratic society (e.g., Putnam, 1993; 2000). Political theorists, by contrast, propose a top-down model, where trust in formal political institutions premises a high level of social trust (e.g., Levi & Stoker, 2000; Seifert, 2018; Sønderskov & Dinesen, 2016). Despite contradicting assumptions on causal direction, these views have in common the assumption that trust is interconnected. In other words, they accept the possibility that social and political trust can influence each other. By contrast, Uslaner (2002; 2018) argues that social and political trust have fundamental differences, where the former has a moralistic

nature based on individual optimism and a sense of control, but the latter has a rationalistic (or instrumental) nature rooted in the performance of governmental institutions or officials.

This debate becomes more complicated when the social-political binary distinction is enlarged into a complex system, premised on more highly specified classifications of trust. Rothstein and Stolle (2008) distinguish trust in the representative government (i.e. elected officials) from trust in politically neutral “order institutions” that implement the law and deliver policies. Newton and Zmerli (2011) emphasise the importance of integrating particularised trust, which refers to trust within the small personally known circle of families and friends, into the trust discussion in addition to generalised trust, which refers to trust toward non-specific others. Drawing on this literature, Liu and his colleagues (2018) integrate a broad range of trust types into the Global Trust Inventory and use factor analysis to group them into seven sub-components/factors. These include three trust factors that are aligned with political trust but with more nuanced distinctions in terms of their functions (i.e., trust in representative government, trust in governing bodies, and trust in security institutions); two factors that correspond to social trust but distinguish people within the intimate circle (i.e., trust in close relations) from people with shared identity but not necessarily personally known (i.e., trust in community). In addition, two factors that capture trust in non-governmental institutions (i.e., trust in financial institutions and trust in knowledge producers) are also included. It is believed these types of trust mirror important aspects of life in a democratic society. Given that measurement structure and invariance across cultures have been established in their original study, it is the logical next step to examine how these types of trust are interconnected with one another as a complex system.

Network analysis has unique advantages in modelling the interconnectedness of trust. A network is an abstract model consisting of the entities (called nodes) and connections between entities (called edges, see Schmittmann et al., 2013). Networks have long been used

both metaphorically and empirically to study social structures (see Scott, 1988). Recently, network analysis has been increasingly applied to draw insight into the interconnectedness of different psycho-social phenomena, including psychopathology (e.g., Borsboom & Cramer, 2013), personality (e.g., Costantini et al., 2015), and political attitudes (e.g., Boutyline & Vaisey, 2017; Brandt, Sibley, & Osborne, 2019). We believe a network analysis of global trust could add unique insights in following ways: (1) network analysis can operationalise the idea of trust as a system of meaning with sub-components/factors interconnecting with one another; (2) network analysis is able to identify the factor(s) that have potentially the greatest overall influence through the provision of centrality measures (e.g., Epskamp, Borsboom, & Fried, 2018); (3) network analysis allows empirical examination on the generalisability of network structure and centrality measures across countries (Danaher et al., 2014).

We expect trust in representative government, trust in government bodies, and trust in security institutions to form a closely interconnected cluster (Hypothesis 1), as these political institutions are functionally distinct but closely collaborate in performing democratic duties (Rothstein & Stolle, 2008). We also expect trust in close relations and trust in community to form another cluster (Hypothesis 2), as these two both correspond to social trust, and trust within the intimate circle has often been theorised to facilitate trust in a broader circle of people (Newton & Zmerli, 2011; see a different view in Fukuyama, 1995; Yamagishi, 1994). We leave it as a research question whether and how these two clusters of social and political trust interconnect.

Method

Participants

The present study analysed data from the Digital Influence survey. A representative sample from 11 countries was used ($N = 11,917$, 53% female, $M_{age} = 43.76$, $SD_{age} = 15.711$).

Specifically, respondents were from Argentina, Brazil, Chile, Estonia, Italy, Poland, Spain, Germany, New Zealand, the United Kingdom, and the United States. The average sample size per country was 1083.3, ranging from 964 in Chile to 1168 in Estonia. See the detailed sampling information in Liu et al. (2018), where the same data was used to establish measurement invariance across cultures.

Measures

The 21-item Global Trust Inventory (GTI, Liu et al., 2018) was used to assess trust in different sectors of society. Participants were asked to rate their feelings of trust toward different people and organisations on a 7-point scale (1 = *do not trust at all*, 7 = *trust completely*). As a degree of measurement invariance was established for the 7-factor structure using the same data (see Liu et al., 2018), factor scores were used in the present study, including scores for representative government, governing bodies, security institutions, financial institutions, knowledge producers, community, and close relations.¹ There were very few missing values across all 21 trust items (ranging from 0.6% for trust in friends to 2.5% for trust in oil companies).

Analysis

Gaussian Graphical Models (GGM) were used to represent the network of trust based on the pooled data. Trust types were treated as nodes and regularised partial correlations were used as estimates of edge weights. Conventionally, regularisation is used to estimate a more parsimonious and interpretable network (Epskamp & Fried, 2018). In this study, the graphical LASSO (least absolute shrinkage and selection operator) in combination with the extended

¹ The 7-factor structure: Representative Government (national government, local government, and president), Governing Bodies (judiciary, election outcomes, tax system, and government surveillance agencies), Security Institutions (police and military), Financial and Corporate Institutions (banks, stock market, multinational corporations, and oil companies), Knowledge Producers (scientists and universities), Community (neighbours, ethnic group, other citizens in one's country), and Close Relations (friends, immediate family, and extended family).

Bayesian information criterion was used to determine the optimal tuning parameter for the regularised network (see Epskamp et al., 2018).

The R-package *qgraph* (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012) was used to visualise the networks. The Fruchterman-Reingold algorithm (Fruchterman & Reingold, 1991) was used to compute the layout, where the length of edges is the absolute edge weight. A thicker edge indicates a stronger relationship between two nodes. A solid edge indicates a positive relationship, while a dashed one indicates a negative relationship (see Figure 1).

Strength centrality was used as the main indicator to identify the central types(s) of trust, as previous research has shown strength centrality is more reliable than betweenness centrality and closeness centrality (Epskamp et al., 2018). Strength centrality is the sum of the weights of the significant connections (in absolute value) to the focal node. A higher strength centrality indicates that the focal node may directly influence or be influenced by other nodes to a larger extent. Betweenness centrality, closeness centrality, and network stability test were estimated and reported in supplementary materials.

A Fused Graphical Lasso (FGL; Danaher et al., 2014) was used to estimate the network of trust across 11 countries by using R-package *EstimateGroupNetwork* (Costantini & Epskamp, 2017). Compared to the conventional GGM, FGL improves network estimation by including an extra tuning parameter, which is determined by the k -fold cross-validation in our study, to regularise network similarities and differences in the joint estimation involving multiple groups (see the tutorial paper in Costantini et al., 2019).

A cross-sample variability network was estimated, which estimates the standard deviation of each edge across countries (see Rhemtulla et al., 2016). A thicker edge indicates a higher cross-country variation in the focal edge (see Figure 3).

Results

Overall network based on the pooled data

Mean scores and the correlational matrix of seven trust factors in the overall pooled sample are presented in Table 1. The overall network of global trust based on the pooled data is presented in Figure 1. There were strong links between trust in governing bodies and representative government, as well as between trust in governing bodies and security institutions. However, trust in representative government was negatively associated with trust in security institutions. Except for this unexpected negative link, this pattern is largely consistent with Hypothesis 1, where trust in neutral (non-partisan) institutions are distinct from but still closely associated with trust in representative (partisan) government (Rothstein & Stolle, 2008). The negative link may suggest a tension between security institutions and representative government. It is worth noticing that trust in financial institutions was also associated with governing bodies and security institutions, which suggests that confidence in corporate power intertwines with political evaluation in these democratic societies.

#Table 1 should be inserted here#

#Figure 1 should be inserted here#

There was a strong and positive association between close relations and community, which is consistent with Hypothesis 2 and confirms that trust in intimate circles facilitates trust in broader circles. Trust in knowledge producers is also associated with trust in community but not political institutions, which may suggest that confidence in knowledge production is rooted in trust in the civic society rather than institutionalised power.

Perhaps most importantly, there were positive associations between trust in governing bodies and security institutions on the one hand, and trust in community on the other hand. This is in line with both social capital theorists' and political theorists' claims about the interconnectedness of social and political trust. In contrast, other types of trust had weak cross-cluster associations. Particularly, trust in close relations had little direct associations with any type of political trust, and trust in representative government also had little association with any type of trust except governing bodies and security institutions. This suggests that these two are relatively independent from other types of trust.

Strength centrality (see Figure 2) suggested that governing bodies had the highest centrality, followed by community, and security institutions. Knowledge producers had the lowest. These results further confirm the central roles of trust in order institutions (but not representative government) and trust in community (but not close relations) in the overall flow of global trust.

#Figure 2 should be inserted here#

Jointly estimated networks of global trust

The jointly estimated networks of global trust across 11 countries are presented in the supplementary materials. Strength centrality is presented in Figure 2. Trust in governing bodies had the highest strength centrality in all countries except the US, where trust in security had a slightly higher strength centrality. Trust in community and trust in security institutions also had relatively high strength centrality in most countries. By contrast, trust in knowledge producers, close relations, representative government, and financial institutions had relatively low strength centrality in most countries.

The variability network is presented in Figure 3. This shows that the edges between political trust were in general highly variable across countries, with the edge between security institutions and financial institutions being the most variable. The edges between social trust were moderately variable across countries. The edges between social and political trust, in general, had low to moderate variability, except the edge between security institutions and community was highly variable.

Figure 3 should be inserted here#

Discussion

We conducted a network analysis of global trust based on representative samples from 11 democratic countries. The overall network and jointly estimated networks allowed an empirical examination of the interconnectedness of multiple types of trust in a complex system across countries. Results showed that seven types of trust were grouped into two clusters that centered around social and political trust, respectively. Largely in accord with Hypothesis 1, there was a strong and positive association between trust in representative government and trust in governing bodies, as well as trust in governing bodies and trust in security institutions. There was an unanticipated negative link between trust in representative government and trust in security institutions. In accord with Hypothesis 2, there was a moderate and positive link between trust in community and trust in close relations. Perhaps most importantly, we found positive links between trust in governing bodies and security institutions on the one hand, and trust in community on the other hand.

The present study may contribute to the trust literature by providing a more nuanced answer to the debate on the interconnectedness of social and political trust. A network

analysis based on the multidimensional measure of trust resulted in the realisation that social and political trust might be neither entirely interconnected nor completely disconnected. Instead, there is conditional interconnectedness between them, which was manifested in particular associations between certain types of trust. Given its cross-sectional nature, this study cannot speak to directionality in and of itself. But in the context of previous research, where a uni-dimensional political trust was longitudinally associated with a uni-dimensional social trust (Sønderskov & Dinesen, 2016), it is speculated that the associations might be predominantly flowing from order institutions (i.e. governing bodies and security institutions instead of representative government) to trust in community (instead of close relations). It makes sense that less politicised branches of government, charged with implementing the law or enacting social policy, might function as avenues for the extension of trust between bottom-up and top-down structures of society. Specifically, if these state institutions are conceived as effectively and impartially carrying out their duties, they encourage the norm of reciprocity either by reducing the risk of being cheated, or by acting as important moral heuristics that could “spill over” to the trust in everyday society, transcending partisan political divisions (see Freitag & Bühlmann, 2009; Rothstein & Stolle, 2008).

In contrast, trust in representative government had little association with social trust. How much one trusts the representative government is believed to have a strong partisan component (e.g., Citrin, 1974). For example, people might have very different levels of trust toward the same president depending on whether the president represents one’s political view or not. Trusting a president as well as partisan institutions probably cannot provide necessary incentives equally for all citizens, as it has a partisan component. The provision of strength centrality also confirms that trust in order institutions was more central than trust in representative government. This might have a navigational function for future research, in that trust in order institutions, particularly trust in governing bodies, should be considered as

the focal point when the research goal is to determine how to increase the overall level of trust in society.

Trust in community also had relatively high centrality and was widely associated with varying types of trust, which is in line with social capital theorists' claim that trust in a wider circle is more pivotal to large-scale modern societies than trust within a close-knit circle (e.g., Fukuyama, 1995; Putnam, 1993). Trust in close relations, in comparison, had relatively low strength centrality and limited connectivity with all types of political trust. This may seem to contradict Newton and Zmerli's (2011) findings that particularised trust (a concept similar to trust in close relations) was associated with political trust. Given that strength centrality is an aggregated measure of *direct* impacts, we speculate that trust in close relations might be associated with other types of trust *indirectly* via trust in community. In other words, trust in community might act as a bridge that allows the flow of trust from micro-level close relations to macro-level institutional powers of society.

Trust researchers used to exclusively focus on comparing levels of trust either across countries or across time. However, recent advances suggest this may not be the only thing that matters for the functioning of democracy. For example, Delhey et al. (2011) proposed the concept of "radius of trust", which assesses how wide is one's trust circle, as an additional and probably better feature of trust to predict civic attitudes and behaviours. Moreover, Wu and Wilkes (2018) examined critical trust, which refers to the ability to critically evaluate political trust toward functionally different institutions. Augmenting these efforts, we believe the interconnectedness of trust might be another important feature to evaluate trust's impact on democratic functioning.

This study has limitations. Firstly, this analysis was based on cross-sectional data: therefore, it cannot be used to infer causality. The relatively consistent findings across 11

countries could give us some confidence in the conditionally interconnected view of trust and the central role of trust in governing bodies in democratic societies. However, experiments or longitudinal studies are needed to ascertain causality. Secondly, a network of seven types of trust is not an exhaustive representation of all possible important relationships to a person in modern society. We believe the Global Trust Inventory covers some major social relations and forces, but we are open to refinement regarding the range of trust types included. Finally, we focused on the dynamics of trust in countries that share democratic political arrangements and a cultural and religious heritage of Christianity. These findings are not necessarily applicable to societies with different cultural and political characteristics, as macro-level power structures might shape the structure and dynamics of trust (e.g., Zhang et al., 2019).

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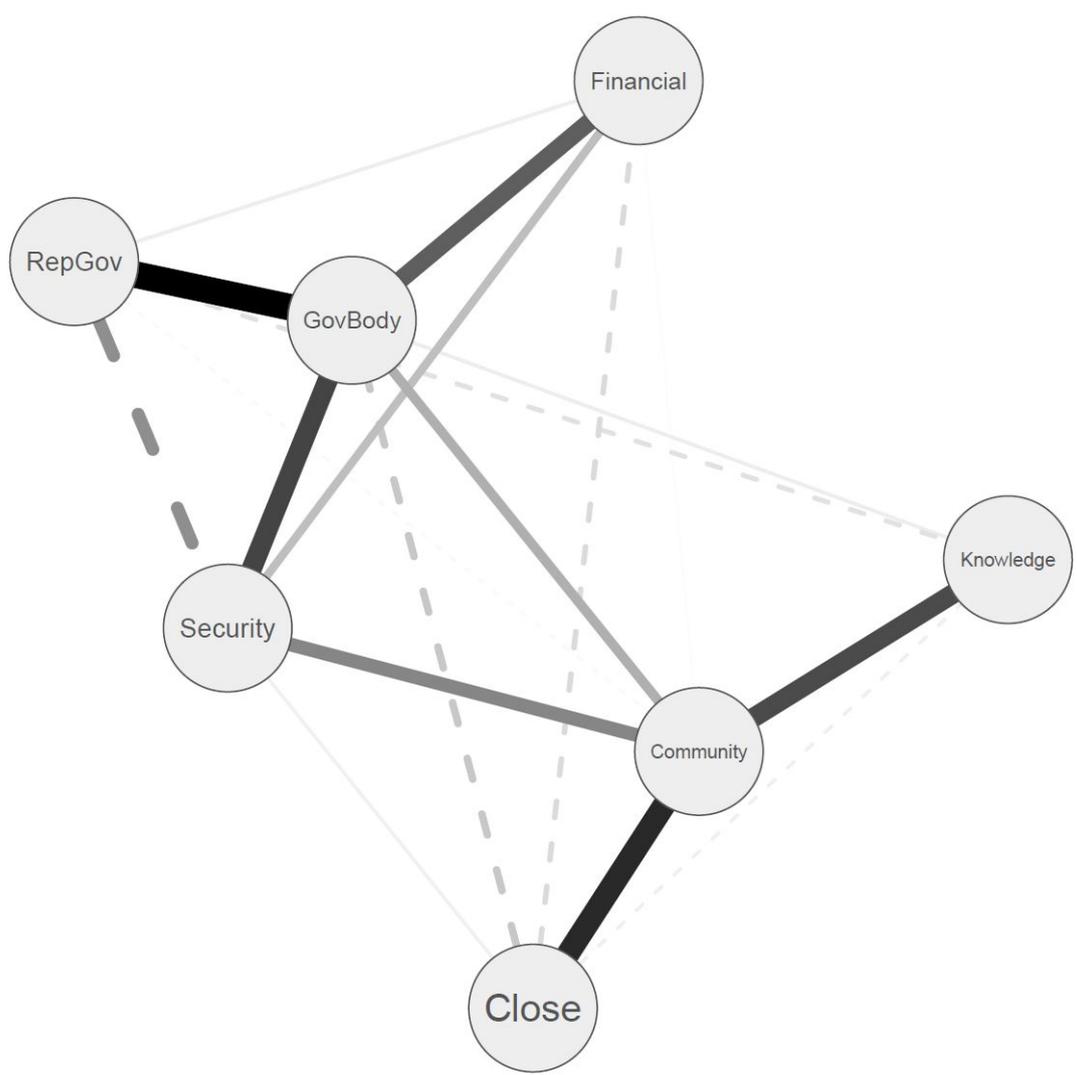
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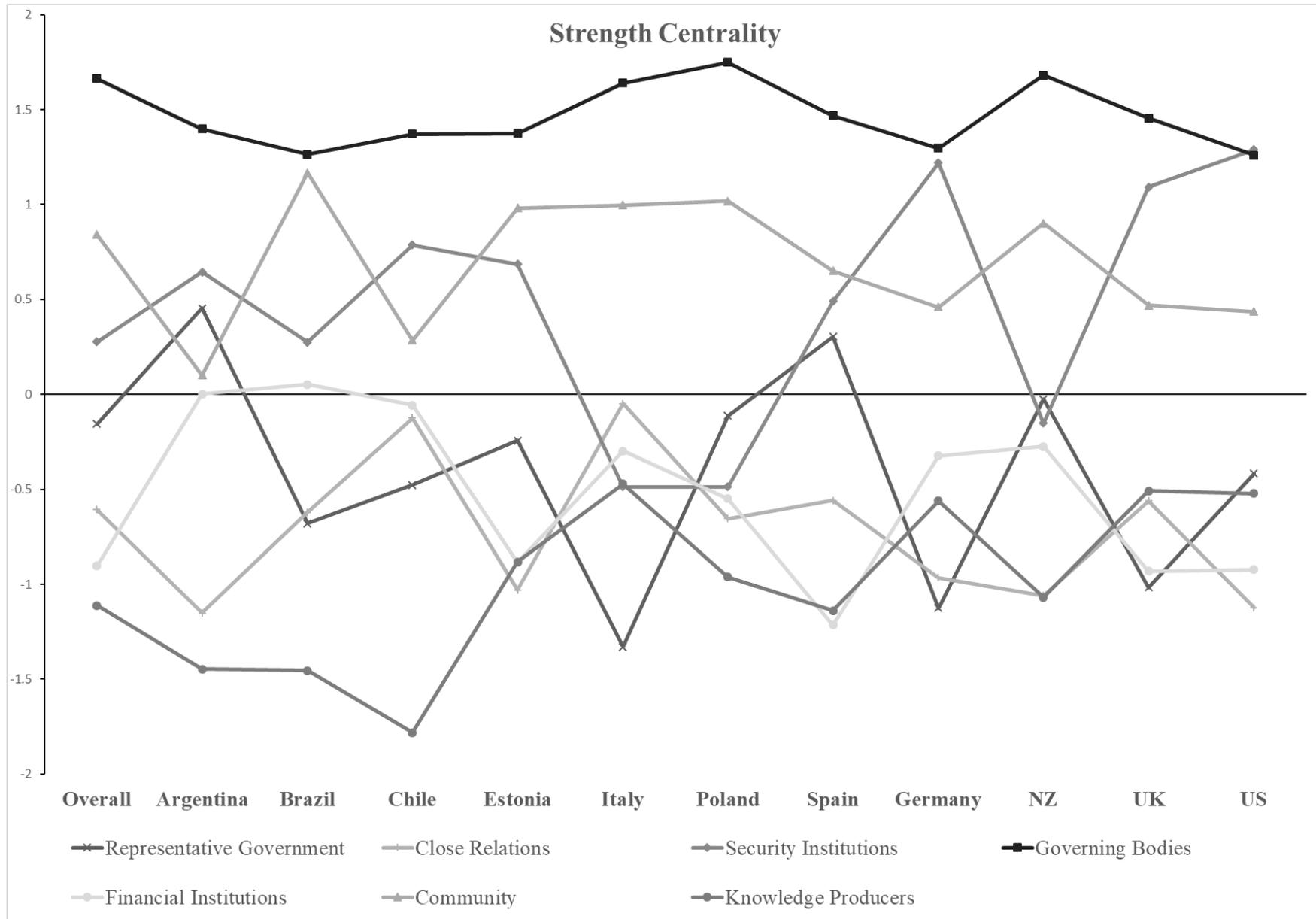
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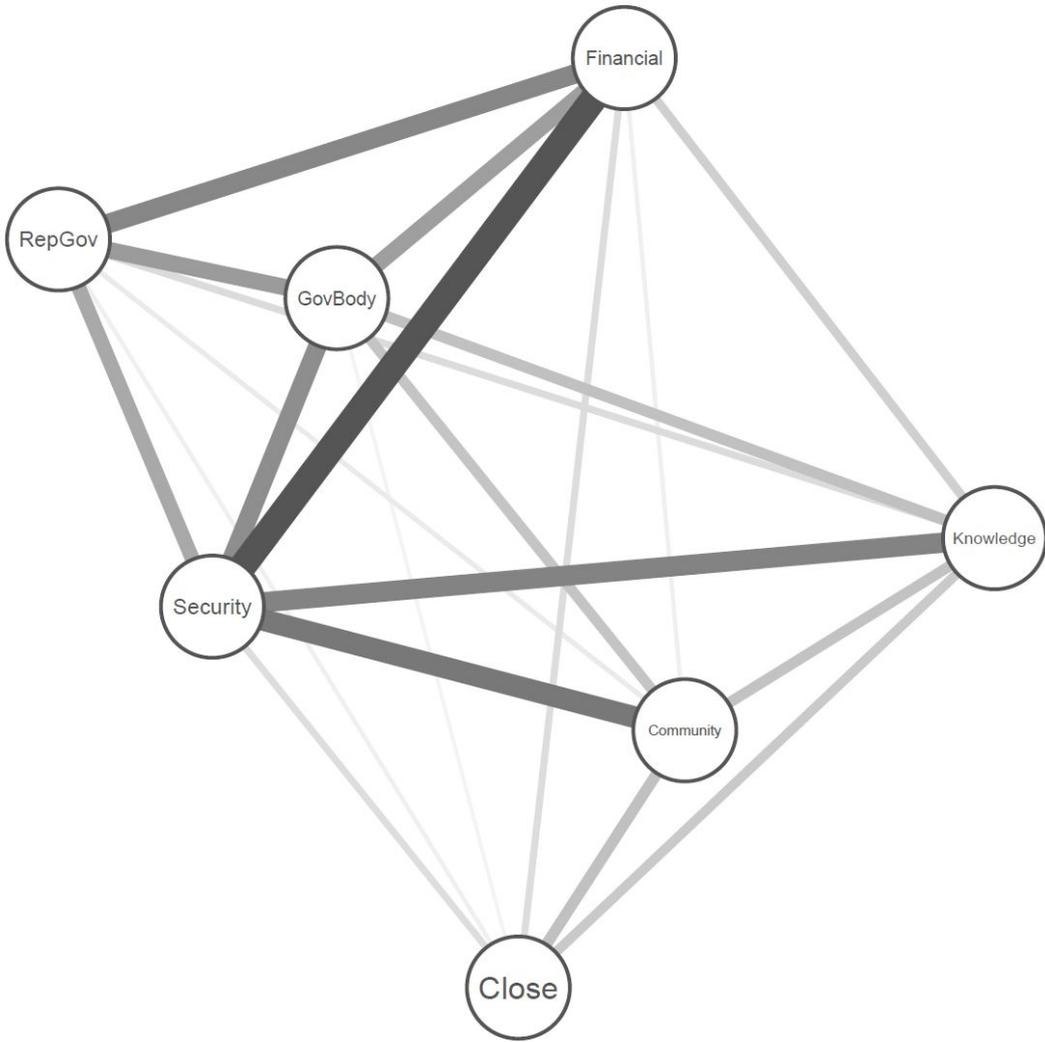
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	1	2	3	4	5	6	7
1. Representative Government							
2. Governing Bodies	.740**						
3. Security Institutions	.517**	.681**					
4. Financial Institutions	.614**	.677**	.572**				
5. Knowledge Producers	.356**	.468**	.437**	.411**			
6. Community	.494**	.621**	.593**	.524**	.573**		
7. Close Relations	.213**	.274**	.322**	.209**	.370**	.502**	
M	2.75	3.26	3.97	2.85	4.57	4.05	5.48
SD	1.40	1.41	1.56	1.20	1.42	1.19	1.10

** $p < .01$

Supplementary materials

1. Overall networks

1.1 Network centrality

Strength centrality, closeness centrality, and betweenness centrality are presented in Figure S1. All three centrality indices showed similar patterns in that trust in governing bodies (GBody) and trust in community (Comm) had relatively high centrality. The centrality index for trust in security institutions (Sct) showed some variability, where it had the highest closeness centrality, moderately high strength centrality, but low in between centrality. As betweenness centrality assesses “the number of times a specific node lies between two other nodes on their shortest connecting edge” (Epskamp, Borsboom, & Fried, 2018, p. 339), this may suggest trust in security institutions is not as central in connecting two random trust types as trust in governing bodies, which is the alternative order political institution.

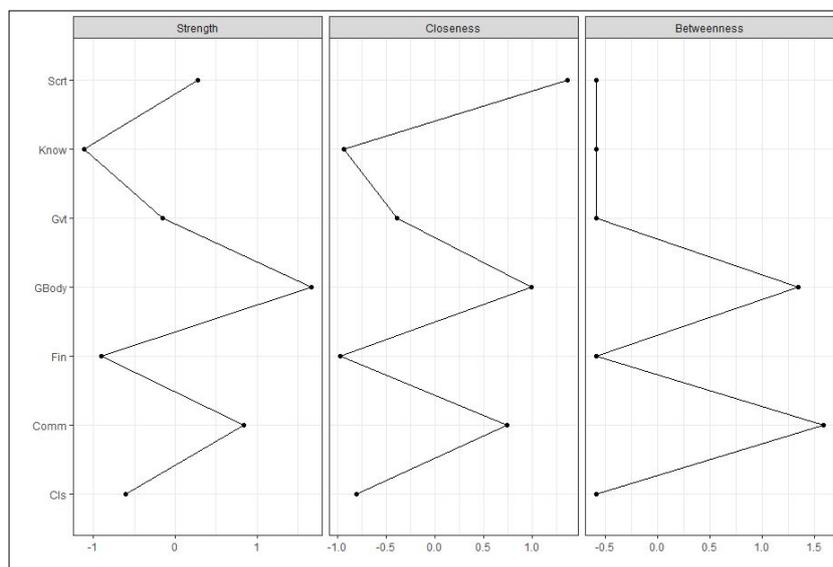


Figure S1. Centrality indices of the overall network.

1.2 Network stability

Network stability was tested by using R-package *bootnet* (Epskamp, Borsboom, & Fried, 2018). The non-parametric bootstrap was used to estimate the 95% confidence intervals of the edge weights, and the correlation-stability for strength centrality based on the case-dropping subset bootstrap was used to evaluate the stability (a value above 0.25 is considered moderate stability, while 0.5 is considered strong stability, see Epskamp et al., 2017).

Results suggested that the 95% confidence intervals were relatively small (see Figure S2) and the correlation-stability coefficient for strength centrality was 0.75, which exceeded the recommended threshold of 0.50 for a strong stability. This suggested the findings are accurate and stable.

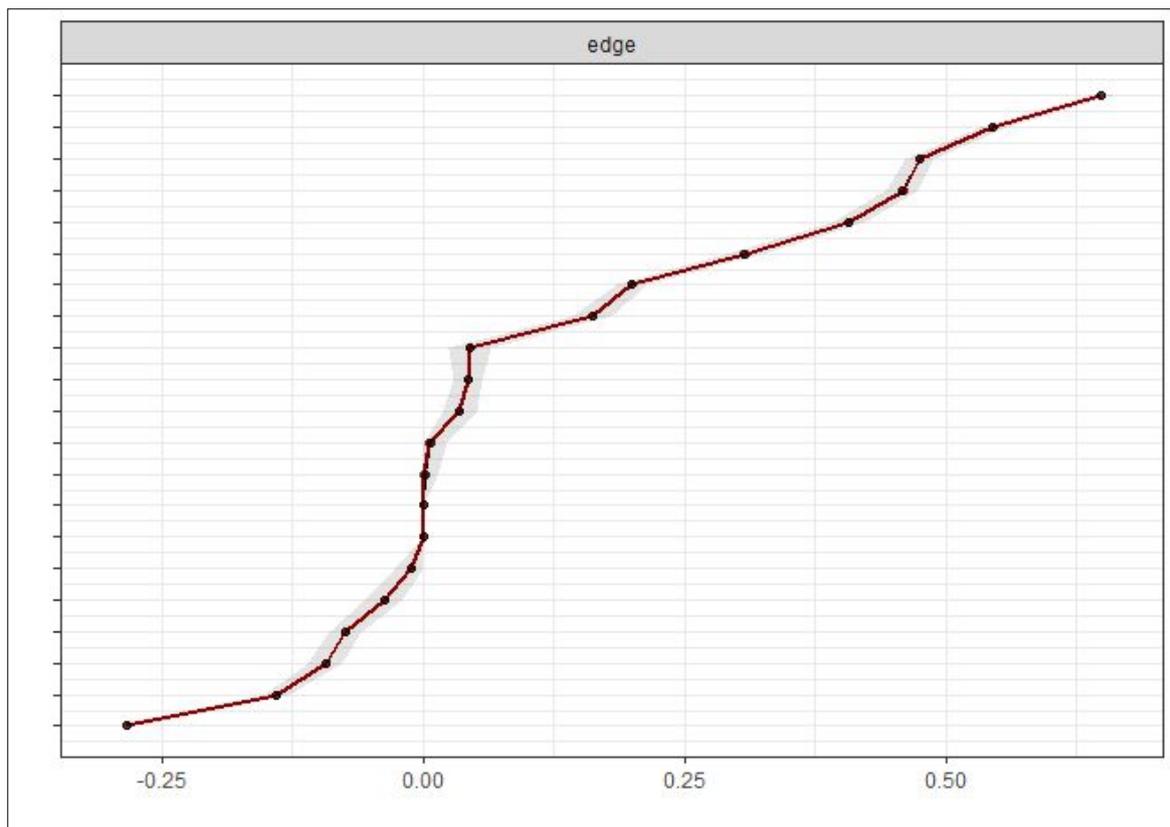


Figure S2. The bootstrapped confidence intervals of all edge weights.

2. FGL network analysis

2.1 FGL networks across 11 countries

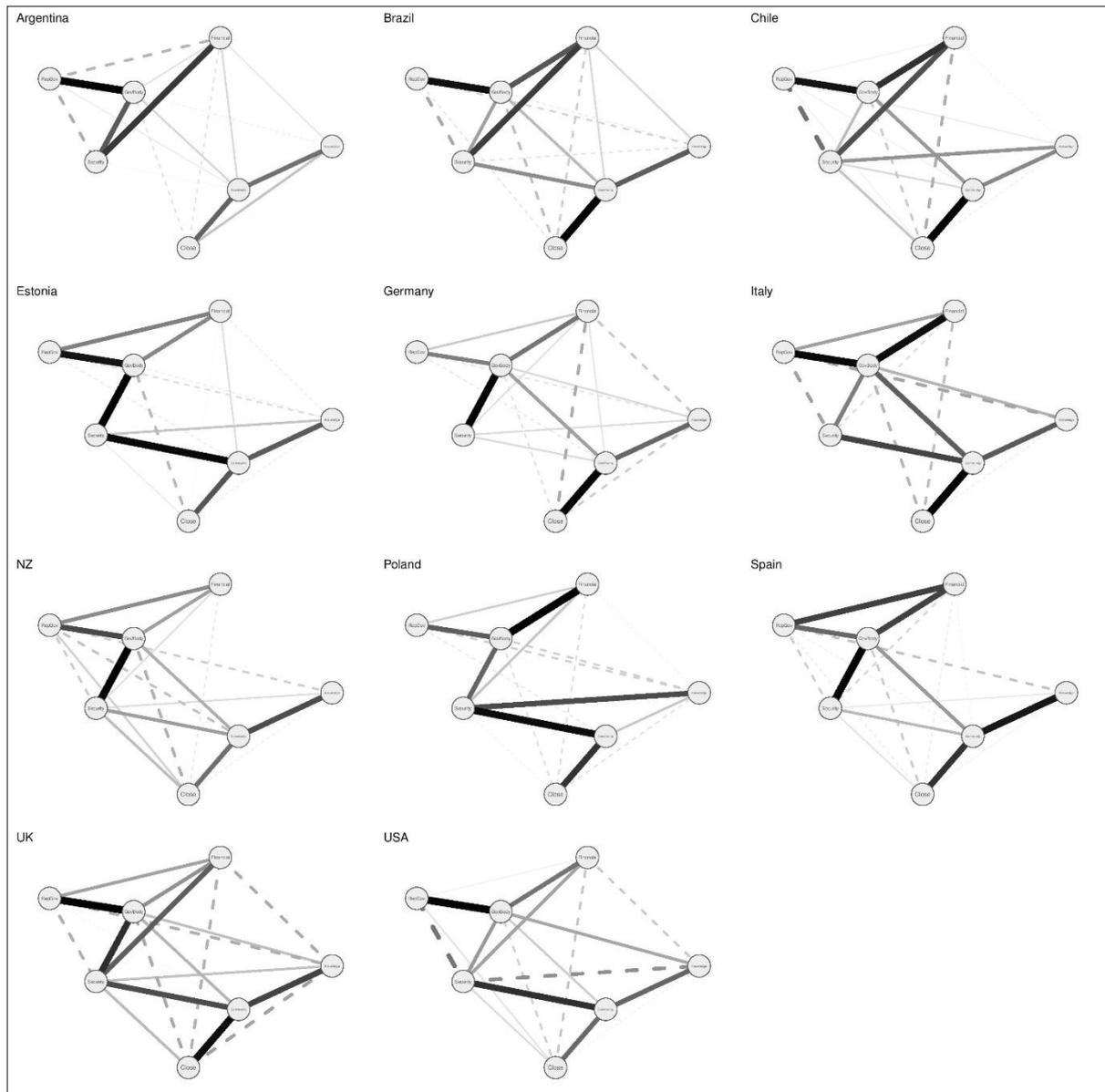


Figure S3. FGL networks across 11 countries. A thicker edge indicates a stronger relationship between two nodes. A solid edge indicates a positive relationship while a dashed one indicates a negative relationship.

2.2 Centrality index of the FGL model

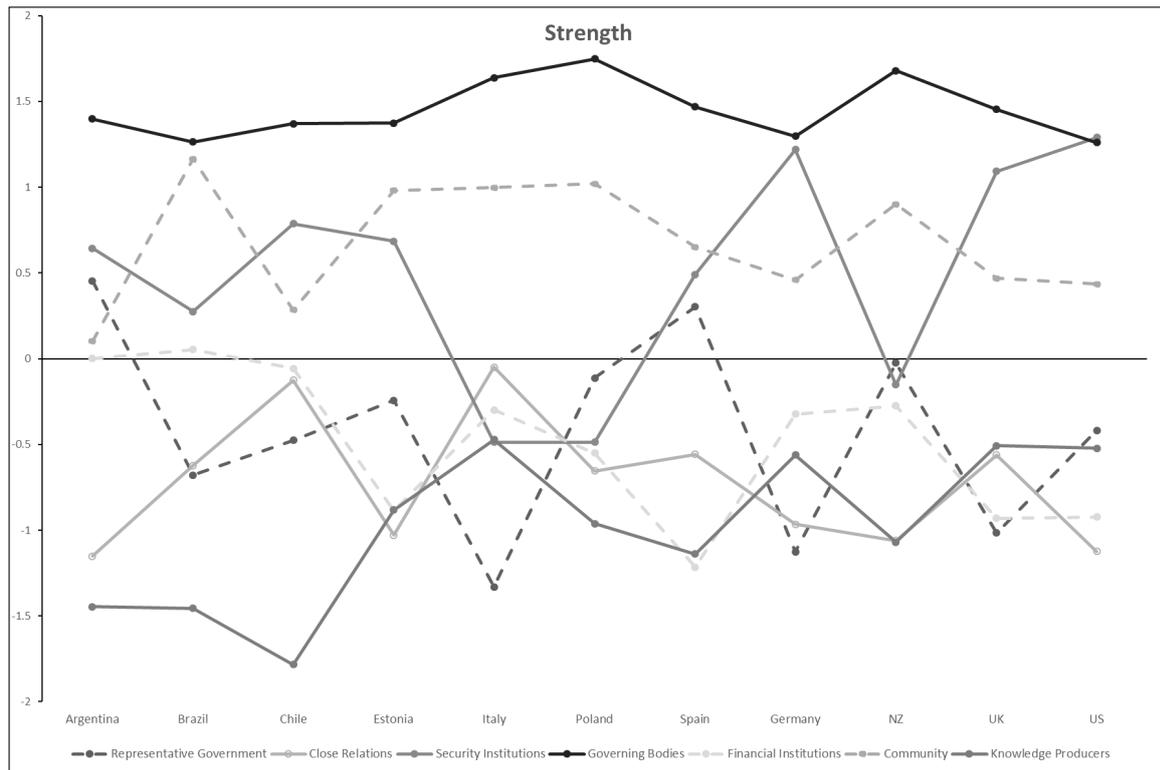


Figure S4. Strength centrality of FGL networks

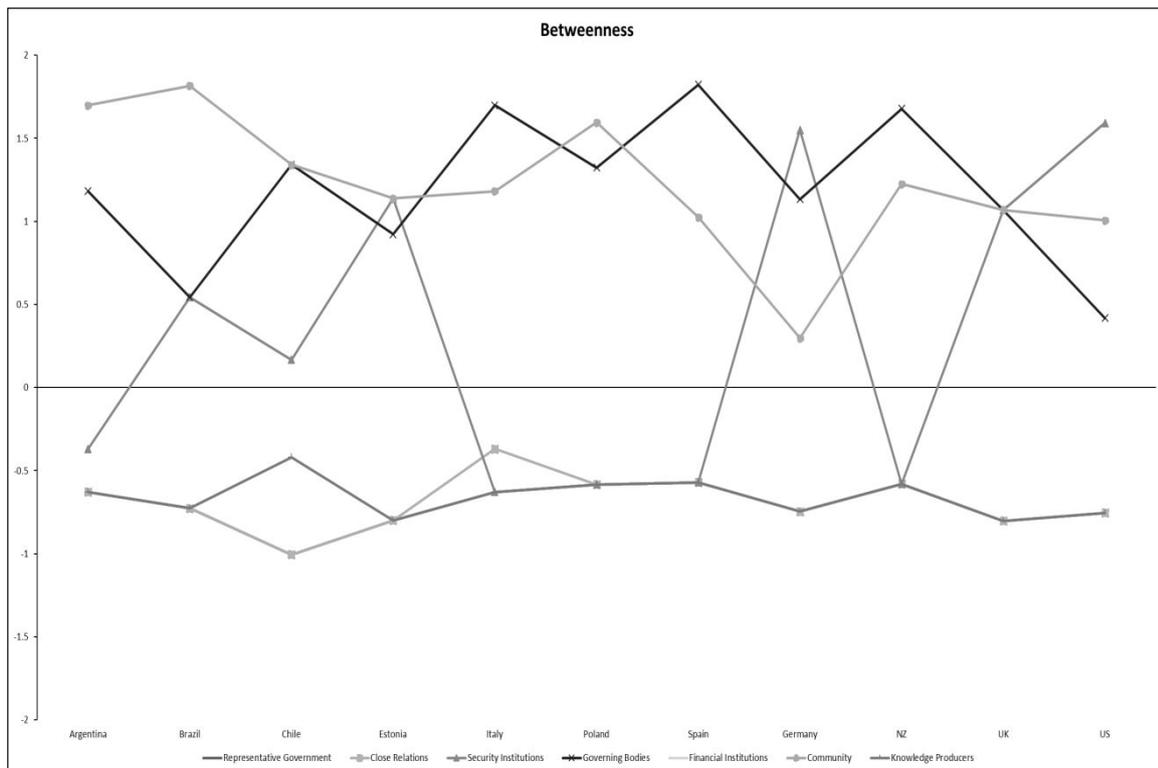


Figure S5. Betweenness centrality of FGL networks

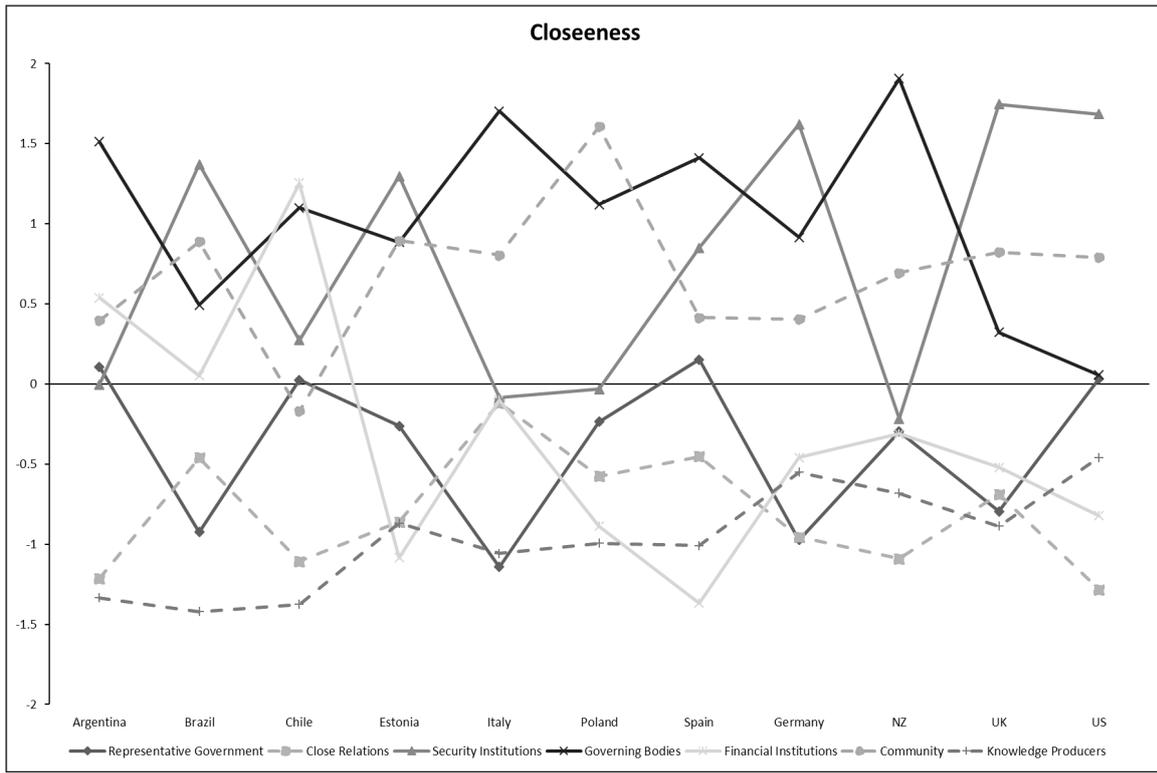


Figure S6. Closeness centrality of FGL networks

3. Alternative network analysis based on the mean scores

To ensure the robustness of our findings, an alternative network was estimated using the mean scores instead of the factor scores on the pooled overall sample. Results (Figure S7) showed a very similar network, with different types of trust grouped into two clusters centre around social and political trust, respectively, and cross-cluster associations were found between trust in governing bodies and security institutions on the one hand, and trust in community on the other hand. Centrality indices (Figure S8) suggested trust in governing bodies and trust in community had relatively high centrality, which is consistent with the findings using factor scores.

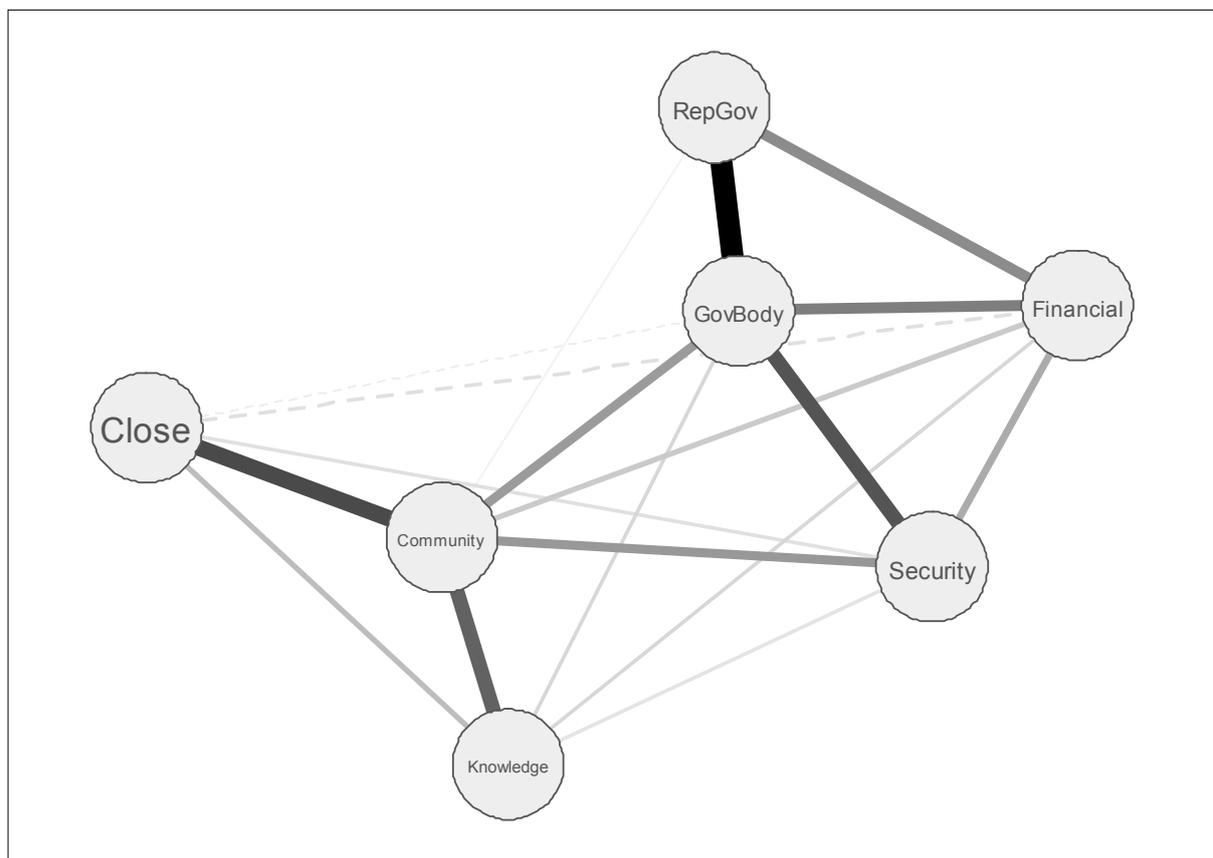


Figure S7. Overall network based on the mean scores

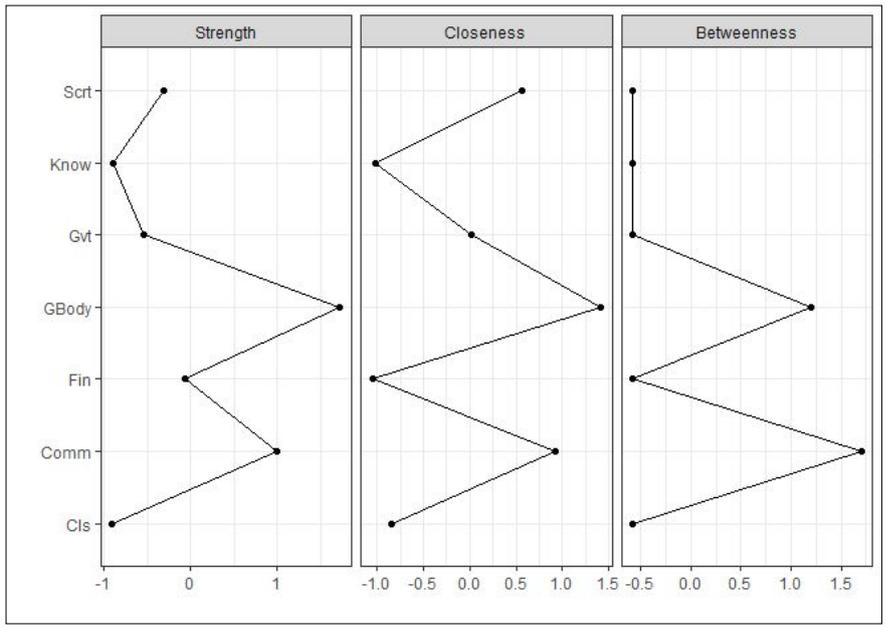


Figure S8. Centrality indices of the overall network based on the mean scores