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Measuring Mutual Dependence between State Repressive Actions

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Abstract

This study explores the relationships between state violations of different human rights. Though most quantitative studies in international relations treat different types of repressive behaviors as either independent or arising from the same underlying process, significant insights are gained by conceptualizing different human rights violations as separate but dependent processes. We present a theoretical framework for conceptualizing the mechanisms relating human rights practices and produce a novel measurement strategy based on network analysis for exploring these relationships. We illustrate high levels of complementarity between most human rights practices. Substitution effects, in contrast, are occasionally substantial but relatively rare. Finally, using empirically informed Monte Carlo analyses, we present predictions regarding likely sequences of rights violations resulting in extreme violations of different physical integrity rights.

Keywords

human rights, repression, network analysis, measurement

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> Comparative quantitative assessment of human rights is hampered by the length of the list of internationally recognized rights. Not only is the list so long that it is hard to imagine gathering adequate data without an army of researchers (the International Human Rights Covenants contain more than thirty substantive articles, encompassing at least twice as many separate rights), but the results of such a comprehensive effort would almost certainly be overwhelming and bewildering in their complexity.
>
> —Donnelly and Howard (1988, 214)

Over the last twenty years, scholars have compiled an impressive collection of human rights data (Carleton and Stohl 1985; Cingranelli and Richards 1999; Gibney and Stohl 1988; Gibney and Dalton 1996; Hathaway 2002; Poe and Tate 1994; Poe, Tate, and Keith 1999; Richards, Gelleny, and Sacko 2001). Though the need for data collection persists, sufficient progress has been made to allow researchers to address the rich complexity of these data. In this article, we offer a simple tool to help understand the mutual dependencies between different human rights practices cross-nationally. This approach contrasts with most previous approaches, which assume either that rights are independent or that they are indicators of a single latent variable. We organize our inquiry around the following question: *How does the violation of many human rights influence the violation of a single right?*

Scholars in many fields are interested in the causes and consequences of human abuses; specifically the link between health and human rights (Leiter et al. 2006; Palmer et al., 2009; Singh, Govender, and Mills 2007), the health effects of torture (Piwowarczyk, Moreno, and Grodin 2000), the psychological causes (Fiske, Harris, and Cuddy 2004; Smeulers 2004) and consequences (Silove 1999) of torture, and the political causes of human rights abuse (Cingranelli and Richards 1999; Keith 1999; Landman 2005; Landman and Larizza 2009; Poe and Tate 1994; Poe, Tate, and Keith 1999; Powell and Staton 2009; Richards, Gelleny, and Sacko 2001; Wood 2008). However, the research from these diverse fields does not directly assess the interdependent relationships among the rights that the Universal Declaration of Human Rights and the other international human rights treaties contain.[1]

Dependencies develop between different types of rights violations because repressive policy tools provide overlapping benefits to leaders and because repressive policies affect the costs of other repressive policies. The resulting decision making by leaders should display common patterns of co-occurrence between different human rights violations. We contend that this pattern can be empirically modeled and then used to aid analyses of specific rights violations. We expect that a change in the costs of repression or the constraints on the use of repression should affect the pattern of rights abuses in a specific country and cross-nationally.

In this article, we provide a general theory of interrelationships between state repressive actions and present a simple exploratory analysis designed to uncover mutual dependencies between human rights practices using graphical and statistical methods from network analysis (Wasserman and Faust 1994). Human rights scholars are aware of the important role that advocacy networks play in influencing country-

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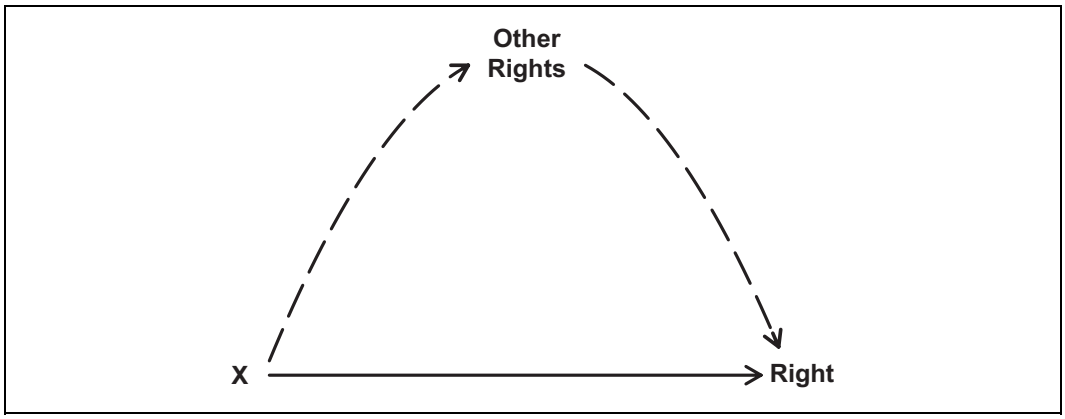

Figure 1. The causal variable *X* may affect both the specific human right under investigation and the other human rights, which in turn may affect the specific human right. We conceptualize *X* as a *cost* or *constraint*. The network variables developed in this article provide a way to model the interdependent relationships captured by this diagram.

level rights practices.[2] Though we use similar tools, the goal of our article is different. Instead of modeling nongovernmental organizations or countries within a network framework, we are modeling the rights themselves with these tools. The goal is not to characterize a literal network but to demonstrate how conceptualizing rights violations as nodes in a network leads to convenient graphical tools and data reduction techniques that simplify an otherwise complex problem. The variables we derive allow for testing of hypotheses not typically considered by human rights scholars. We wish to emphasize that models that do not account for other human rights when a specific right is the dependent variable of interest will be theoretically underspecified. Our measurement strategy allows for researchers to focus on analyzing one level of one right while accounting for the mutual dependence of the other rights to that specific right of interest. Figure 1 diagrams this relationship.

In the remainder of this article, we define two idealized patterns of human rights abuse that emerge when governments make policy choices through (1) the simultaneous use of policy tools (complements) or (2) the replacement of one policy for another (substitution). To identify the conditions under which these theoretical patterns emerge and change, we must first model the structure of the many interrelated human rights violations that occur across time and space. To accomplish this task, we adapt a novel network model (Hidalgo et al. 2007) that links together several human rights variables (Cingranelli and Richards 1999; Richards, Gelleny, and Sacko 2001), (nodes) based on the changes in the conditional probability (edges) of one right being violated, given the violation of another right. The human rights network allows us to measure the position of a country as it moves toward violations of a specific right by providing a notion of distance from one bundle of practices to another. We then use the model to provide an initial assessment of likely sequences of human rights violations over time.

In this article, we focus primarily on describing the structure of the human rights co-occurrence network and the variables derived from it. These new variables allow

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for the testing of many hypotheses related to the different types of relationships of human rights violations. To illustrate the potential of the network variables, we test for the human rights network influence on high level (extreme) violations of four physical integrity rights and, using Monte Carlo simulations, we derive the step most likely to lead to the systematic use of actions that violate these rights. The result reveals that violations in the current year are strongly influenced by violations "nearer" to that right in the human rights network and more weakly influenced by violations that are "farther" away. To conclude, we propose designs for additional tests of the relationships derived from the human rights network.

Conceptual Relationships among Human Rights

Our theoretical approach assumes that repression is a result of cost–benefit analysis on the part of the leader. State leaders make policy decisions based on the costs and constraints associated with each policy choice. Some of these policy choices violate the rights of citizens. Repression is a useful tool for a leader because it produces the benefit of mitigating one of the many possible threats to the stability of the regime (Carey 2006, 2007; Mason and Krane 1989; Poe 2004; Poe, Tate, and Keith 1999; Zanger 2000). However, repression is potentially costly since the ruler can face retribution from local actors if the repression is made public.

Different repressive tactics can be related to one another in two ways. First, if two repressive tactics address the same type of threat to the regime, those tactics may be *substitutes*. In this case, an increase in the use of one repressive tactic reduces the need for the other. For instance, since extrajudicial killing and political imprisonment can both be used to eliminate influential antigovernment activists, enhanced political imprisonment may reduce the number of killings and vice versa. However, since torture is a tactic designed for extracting information or intimidating individuals rather than eliminating them, one may not expect a similar substitution relationship between torture and extrajudicial killing.

Second, if the presence of one repressive tactic reduces the probability that another tactic is made public or dampens the retribution faced by a leader caught using the tactic, those tactics may be *complements*. For instance, repressing journalists should reduce the probability that another repressive tactic is discovered, so we might expect increased censorship to be associated with increases in other rights violations. Furthermore, since all repressive tactics can extinguish retribution against the government, many repressive tactics should reduce the probability and magnitude of retribution for other repressive tactics.

The two theoretical relationships between different repressive tactics are not mutually exclusive. Thus, the relationship between two repressive tactics may be the product of countervailing forces. The relative importance of these two forces will determine the extent of the relationship between two tactics. However, we expect the complementary relationships between repressive tactics to be more common in practice than substitution relationships for two reasons. First, as described earlier,

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we expect some complementary relationship to be present among *all* pairs of repressive tactics since they all have the capacity to dampen retribution against the government. Second, substitution relationships may be more scarce since two repressive tactics are unlikely to serve exactly the same purpose. Though two tactics may have a similar benefit, the persistence of many different tactics suggests differences in the targets and situations calling for the use of each tactic. To the extent that complementary relationships between state repressive tactics are most important, different human rights violations should be expected to cluster in time and space. This hypothesis is more consistent with the high levels of correlation observed between many existing human rights indicators (Cingranelli and Richards 1999; Schnakenberg and Fariss 2012).

The clustering or complementary relationships between physical integrity abuses is well documented in the political science literature (Cingranelli and Richards 1999; McCormick and Mitchell 1997; Poe and Tate 1994; Poe, Tate, and Keith 1999); and the clustering of these policies is captured by the political terror scale (Gibney and Dalton 1996; Gibney, Cornett, and Wood 2012; Wood and Gibney 2010) and the CIRI (Cingranelli and Richards 1999, 2012) physical integrity index, which are used throughout the quantitative political science literature.[3] To be clear, these two scales only account for relationships between the four physical integrity rights; the right not to be tortured, imprisoned for political reasons, extrajudicially killed, or disappeared. The CIRI empowerment index (Richards, Gelleny, and Sacko 2001) scales five additional rights; the right to free movement, free assembly and association, free speech, worker's rights, and freedom of religion. However, to understand how the violation of one human right influences the violation of another right among many such rights, we must think of each behavior as conceptually distinct and potentially heterogeneous in its relationship to each other right.

Our approach is theoretically linked to work on foreign policy substitution, which emphasizes the need to account for alternative policy options available to decision makers when an existing policy becomes more costly.[4] However, though this literature emphasizes one particular relationship between policy options, in which policy makers substitute one policy for another in response to new constraints, our theory emphasizes that many repressive tactics may be complementary policy options. When this is the case, we should expect the violation of one human right to increase when another right is violated. To summarize these relationships among each of the repressive tactics for which data are available, we conceptualize the system of relationships of human rights practices as a network of individual rights violations that can incorporate complementary and substitution relationships between repressive tactics.

The Human Rights Network

In social network research (Wasserman and Faust 1994), network models are constructed so that the nodes represent actors (e.g., friends, legislators) who are linked together by some relationship such as friendship or the cosponsorship of legislation

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(Bond et al. 2012; Christakis and Fowler 2008; Fowler 2006; Jones 2012; Jones et al. 2012; Settle, Bond, and Levitt 2011). Recently, international relations scholars have begun to employ methods from the social network tool kit in order to examine the relationships that structure the international state system (Cranmer, Desmarais, and Kirkland 2012; Cranmer, Heinrich, and Desmarais, forthcoming; Kahler 2009; Lupu and Traag 2013; Maoz 2009; Murdie and Davis 2012). Scholars also use network methods to link together conceptual elements such as decisions from the Supreme Court of the United States, which are connected by judicial citations (Fowler et al. 2007; Fowler and Kam 2008; Lupu and Fowler 2012). This method has also been used to model the citation network of the European Court of Human Rights (Lupu and Voeten 2012).

For our analysis of the relational structure of human rights violations, we develop a conceptual network that links together human rights (nodes) with changes in the conditional probability (edges) of one human right being violated, given the violation of another human right. We adapt our human rights network model from a model developed by Hidalgo et al. (2007) in which they analyze a network of export products linked together using a measure of conditional probability similar to the one we develop in the following.

Our model differs from the one in Hidaldo et al. (2007) in some important ways. For instance, we choose a different definition of the connections between nodes and our application is considerably less complex. Both facts make our model simpler and easier to interpret. However, the novel insight that we borrow from Hidalgo et al. is the use of network technology to analyze relationships between concepts rather than agents, countries, or cases.

Characterizing the Human Rights Network

The human rights network is constructed using information about specific human rights practice as measured by the thirteen CIRI human rights variables (Cingranelli and Richards 1999; Richards, Gelleny, and Sacko 2001). The CIRI data include the four well-known physical integrity rights (the right to remain free from torture, political imprisonment, extrajudicial killing, and disappearance),[5] the empowerment rights (the right to free association, a free press, free movement, and freedom of religion),[6] the right to electoral self determination,[7] and three variables that measure respect for women's political, economic, and social rights.[8] Each CIRI human rights variable measures the level of violation on an ordinal scale where, after reversing the scale, 0 indicates that the right is not violated, 1 indicates that the right is violated occasionally, and 2 indicates that the right is violated frequently.

We have reversed the standard coding order from the original data in order to capture greater levels of human rights violations rather than greater levels of human rights respect.[9] From each of the thirteen ordinal CIRI human rights variables, we create two binary variables. The first measures if a moderate to extreme number of violations occurred, and the second measures only if an extreme number of violations occurred. Each of these variable pairs capture moderate to extreme human

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rights violations and extreme human rights violations, respectively. We therefore create twenty-six new binary variables based on the thirteen human right variables in the CIRI data set for 195 countries from 1981 to 2006. We use the network approach to derive a unidimensional measure of mutual dependence next and use that measure to construct empirically informed Monte Carlo simulations in the next sections of the article.

With these twenty-six binary variables, we create a network variable measuring the probability of violating right i, given the violation of another right j for all countries in a year t. Formally, we define the proximity as

$$\phi_{i,j,t} = P(i = 1|j = 1) - P(i = 1|j = 0). \quad (1)$$

In words, the proximity between two rights is the change in the conditional probability of observing one right violated, given the violation of another right. The proximity values are links that connect a group of hypothetical nodes used for illustrative purposes in Figure 3 and the human right nodes in Figure 4 (we describe both of these networks in detail later). The human rights network is a systemwide characteristic; therefore, proximity values vary across years but not across countries in a given year.

We represent these new variables in an *i-j-t* array. That is, we generate a 26-by-26 adjacency matrix for each year t that we have data. Note, also that we set $\phi_{i,j,t} = 0$ when $i = j$ (Figure 2).

$$\begin{pmatrix} \phi_{1,1,t} & \phi_{1,2,t} & \cdots & \phi_{1,26,t} \\ \phi_{2,1,t} & \phi_{2,2,t} & \cdots & \phi_{2,26,t} \\ \vdots & \vdots & \ddots & \vdots \\ \phi_{26,1,t} & \phi_{26,2,t} & \cdots & \phi_{26,26,t} \end{pmatrix}$$

Figure 2. Adjacency matrix of proximity values between twenty-six binary human rights variables.

We can characterize information in each of the adjacency matrices as displayed in Table 1. Positive values in each matrix indicate the complementarity between two right levels, such that the abuse of right level i is likely to occur contemporaneously with abuses of right level j. Negative values indicate that the two rights are substitutes, so abuse of right level i is negatively related to abuse of right level j. Table 1 summarizes the proportion of negative values that we observe for each year of human rights data. Note that on average, complementary relationships between violations of right levels occur with much greater frequency than do substitutes in each year of the data. However, there are still several substitutive (negative) relationships that occur over time. On average, 97.8 percent of the right-level pairs are complements while 2.2 percent of

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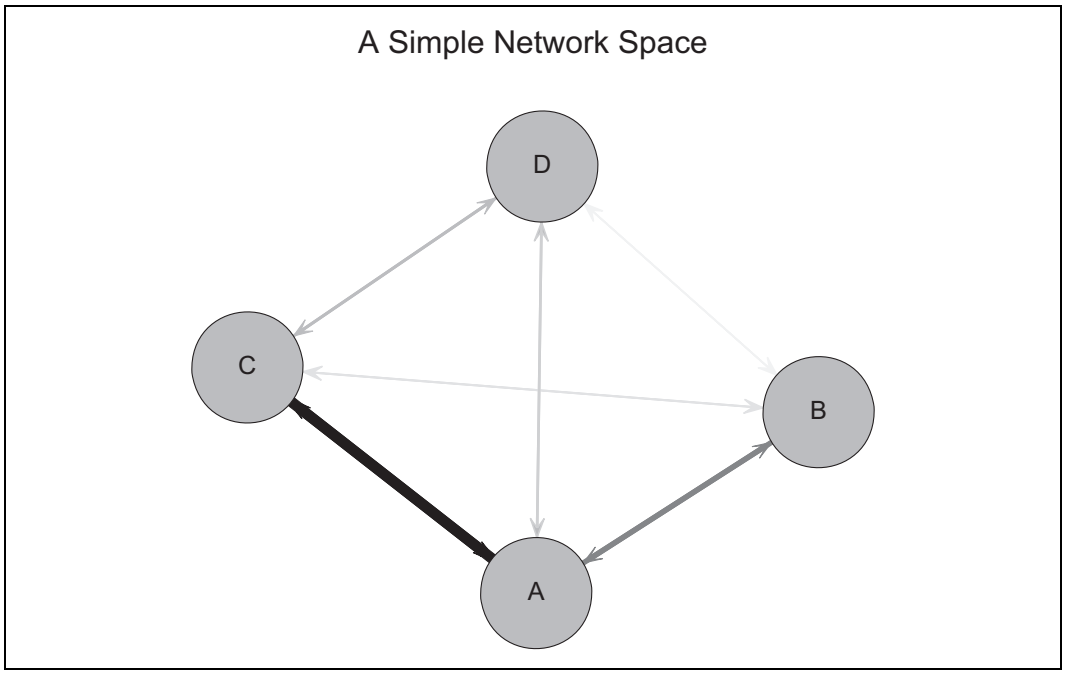

Figure 3. The proximity values (edges) link the four rights (nodes *A*, *B*, *C*, and *D*) within the network. The weight and shade of the edges correspond to the proximity value; thus, the largest, darkest edge between right A and right C represents the largest proximity value of 0.9 while the thinnest and lightest edge between right B and right D represents the smallest proximity value of 0.1. Some values in this network are symmetric while others are not. For example, the proximity value that links right C to right D and the proximity value that links right D to right C are equivalent, while the proximity value that links right A to C and proximity value that links right C to A are asymmetric. The arrows indicated the direction of the proximity relationship such that $i \leftarrow j = P(i = 1 | j = 1) - P(i = 1 | j = 0)$. The arrows do not represent causal paths.

right-level pairs are substitutes. We wish to emphasize, however, that these are system-year averages. Therefore, there may be differences in the use of complimentary and substitutive policy combinations that vary based on country characteristics.

Substitutive relationships between the extreme levels of right-level pairs are displayed in Table A1, which is located in the Appendix. The count is the number of years in which the particular right-level pair is negative and therefore, representative of substitutive relationship. Notice that none of the pairs of substitutable rights are from the same CIRI category as presented in Table 2. That is, none of the physical integrity rights are substitutes for any of the other physical integrity rights. Neither are any of the empowerment rights substitutes for any of the other empowerment rights. This pattern is consistent for the women's right levels as well. Thus, the table is consistent with evidence that supports the use of the CIRI components to create the single dimensional physical integrity index and empowerment index that are often used in the literature (Cingranelli and Richards 1999;

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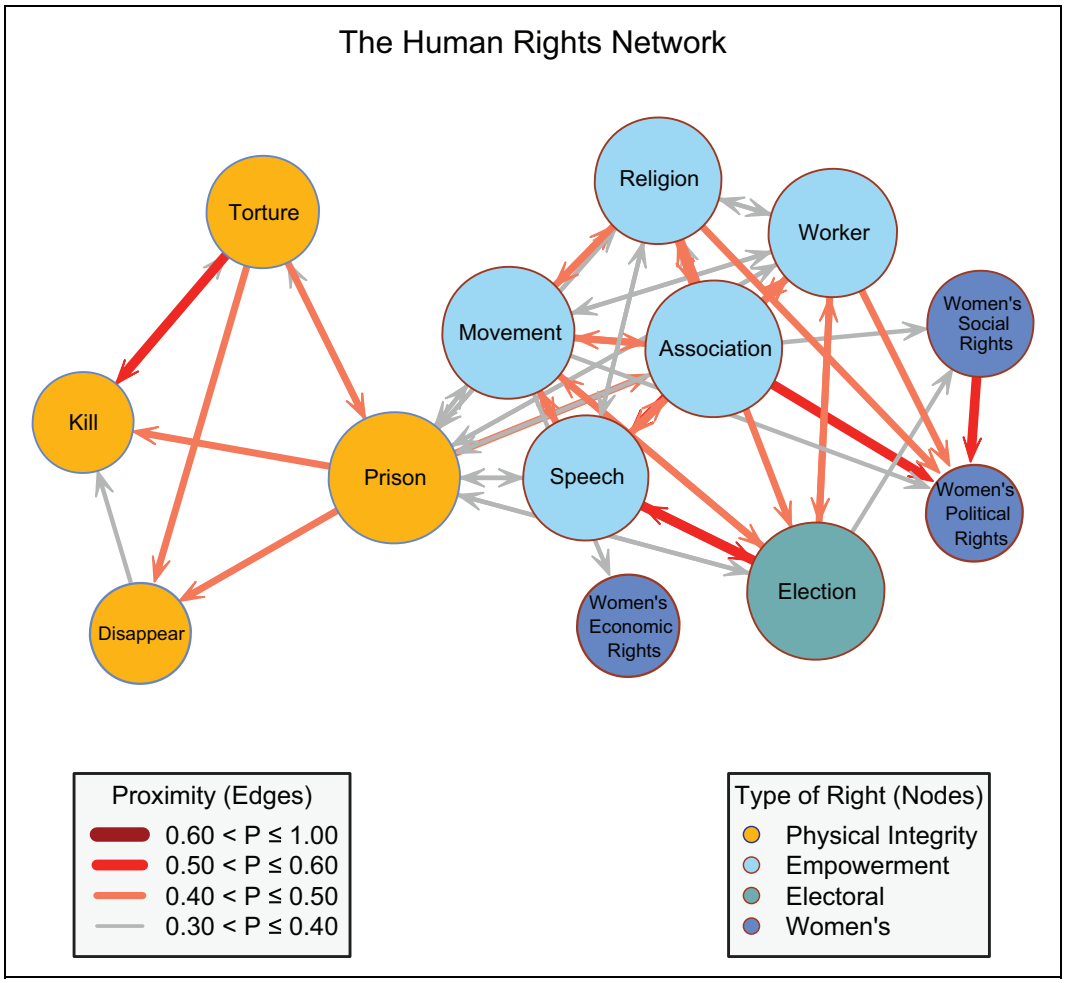

Figure 4. The human rights network, with human rights as nodes and proximity values ϕ_{ij} as edges. The plot is generated for all $\phi_{i,j,t} > 0.3$ between extreme violations in the average year. The node sizes are proportional to $\sum_j \phi_{i,j,t}$ and represent the influence of one right on all other rights in the network. The arrows should be interpreted for $i \leftarrow j$ as $P(i = 1 | j = 1) - P(i = 1 | j = 0)$. The arrows do not represent causal paths.

Landman and Larizza 2009; Richards, Gelleny, and Sacko 2001; Schnakenberg and Fariss 2012).

Synthesizing Information from the Human Rights Network

To reduce the human rights space to an easily interpretable unidimensional number, we use the system-level proximity variable defined earlier to measure the total network influence on each right within the network. We define this concept as the *connectedness* of human rights around right i for each country k in each year t:

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Table 1. Descriptive Statistics of Complementarity (+) and Substitution (−) Effects between Repressive Actions.

Year	Min ϕ	Max ϕ	Mean ϕ	Proportion of $\phi < 0$
1981	−0.064	0.795	0.290	0.018
1982	−0.074	0.809	0.281	0.028
1983	−0.095	0.830	0.273	0.034
1984	−0.140	0.826	0.274	0.017
1985	−0.106	0.805	0.275	0.022
1986	−0.207	0.881	0.281	0.034
1987	−0.137	0.803	0.274	0.040
1988	−0.210	0.825	0.274	0.049
1989	−0.077	0.813	0.295	0.031
1990	−0.063	0.778	0.295	0.003
1991	−0.016	0.823	0.315	0.003
1992	−0.223	0.828	0.296	0.022
1993	−0.209	0.848	0.272	0.015
1994	−0.236	0.868	0.276	0.049
1995	−0.101	0.845	0.286	0.015
1996	−0.053	0.858	0.295	0.012
1997	−0.015	0.834	0.320	0.006
1998	−0.014	0.860	0.327	0.003
1999	−0.196	0.873	0.310	0.012
2000	−0.054	0.863	0.316	0.012
2001	−0.234	0.876	0.306	0.025
2002	−0.497	0.882	0.303	0.028
2003	−0.154	0.869	0.311	0.022
2004	−0.178	0.856	0.288	0.025
2005	−0.221	0.890	0.284	0.031
2006	−0.186	0.874	0.253	0.028

$$\omega_{i,k,t} = \frac{\sum_{j,t} x_{j,t}\phi_{i,j,t}}{\sum_{j,t} \phi_{i,j,t}}, \tag{2}$$

where $x_i = 1$ when a country violates right i and 0 otherwise. For example, the connectedness of a country to torture is the proportion of other rights that were violated in that year weighted by the proximity of each right to torture in that year. Since the connectedness variable positions a country in the human rights network in relationship to a specific right i, values for $\omega_{i,k,t}$ are unique for each country k in each year t.[10]

A Hypothetical Network

Before describing the full network and connectedness variable, we illustrate the information that the connectedness variable captures with four hypothetical rights,

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Table 2. CIRI Human Rights Variables.

CIRI Category	CIRI Variable
Physical integrity rights	Disappearance
	Political imprisonment
	Torture
	Extrajudicial killing
Empowerment rights	Freedom of movement
	Freedom of assembly and association
	Freedom of speech
	Worker's rights
	Freedom of religion
Electoral rights	Electoral self-determination
Women's rights	Women's economic rights
	Women's political rights
	Women's social rights

Note: CIRI = Cingranelli and Richards.

A, B, C, and D. Figure 3 represents one possible visualization of this network,[11] which is generated by the hypothetical proximity values in Figure 5.

$$\begin{pmatrix} \phi_{A,A} & \phi_{A,B} & \phi_{A,C} & \phi_{A,D} \\ \phi_{B,A} & \phi_{B,B} & \phi_{B,C} & \phi_{B,D} \\ \phi_{C,A} & \phi_{C,B} & \phi_{C,C} & \phi_{C,D} \\ \phi_{D,A} & \phi_{D,B} & \phi_{D,C} & \phi_{D,D} \end{pmatrix} = \begin{pmatrix} 0 & 0.6 & 0.9 & 0.3 \\ 0.6 & 0 & 0.2 & 0.1 \\ 0.25 & 0.2 & 0 & 0.3 \\ 0.3 & 0.1 & 0.4 & 0 \end{pmatrix}$$

Figure 5. Simple adjacency matrix of proximity values between hypothetical rights.

Figure 5 displays the proximity values that link the four hypothetical rights. As with the proximity values from the human rights network, these values are a system-wide characteristic and therefore vary across years but not across states in a given year. The proximity values thus capture the system-wide change in the conditional probability of the violations of right i given the violations of right j. The connectedness value around a given right varies between 0 and 1. The connectedness of right violations to right A in the simple network for some hypothetical state is determined by the number of other rights (B, C, and D) that are violated (Figure 6).

$$\begin{pmatrix} \phi_{A,A} & \phi_{A,B} & \phi_{A,C} & \phi_{A,D} \end{pmatrix} = \begin{pmatrix} 0 & 0.6 & 0.9 & 0.3 \end{pmatrix}$$

Figure 6. Proximity values that determine the connectedness around right A.

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For example, the connectedness value around right A for state k that violates right C and right D (i.e., where $B_k = 0$, $C_k = 1$, and $D_k = 1$), is $\frac{(0 \times 0.6) + (1 \times 0.9) + (1 \times 0.3)}{0.6 + 0.9 + 0.3} = \frac{2}{3}$. The most influential rights within the space are those with the highest proximity values as this illustrative case demonstrates. However, in order for the right to be of influence for a given state, the right must be violated in that state. For example, the preceding hypothetical state does not violate right B. Thus, the proximity value that connects right B to right A is not used in the calculation of the connectedness variable. Finally, notice that the denominator in the connectedness equation above is the sum of all proximity values around right i, while the numerator is the sum of only those proximity values when country k is coded as violating right j in year t (when $x_{i,t} = 1$). Thus, the connectedness variable $\omega_{i,k,t}$ around human right i approaches 1 as the number of other human rights violations j increase in country k in year t.

Summarizing the Relationships between Rights

Figure 4 represents one of many potential visualizations of the human rights network. Since most of the relationships between the human rights variables are complementary, we use the graphs to investigate clustering of rights violations. First note that the visualization only contains thirteen human rights nodes (extreme number of violations only) while the network is created using the twenty-six binary human rights variables defined above (moderate to extreme number and extreme number of violations). This simplification facilitates discussion of the network visualization but does not alter the operationalization of the connectedness variable or the inferences drawn from the Monte Carlo simulations discussed later. Each human rights variable acts as a node within the network. Each human right node is linked to every other human right node by a proximity value $\phi_{i,j,t}$. The plot is generated for all $\phi_{i,j,t} > 0.3$ for the average year, again to illustrate the emergent structure of the relationships inherent to the network (see Figure 7 for several network plots generated from alternative proximity thresholds). The connectedness variable however is operationalized to include all proximity values and thus information about the influence of the entire network on some right level i. The node sizes are proportional to $\sum_{j,t} \phi_{i,j,t}$ and represent the influence of one right on all other rights in the network. The arrows are directional information for $i \leftarrow j$ as $P(i = 1|j = 1) - P(i = 1|j = 0)$.

Other Approaches

The network approach described above is not a statistical model and is not meant to test the hypothesis that the rights are statistically related to one another. Rather, we have presented an exploratory tool for visualizing relationships between human rights practices. We then used this network information to develop a connectedness variable $\omega_{i,k,t}$ which can then be used to test hypotheses specifically about the

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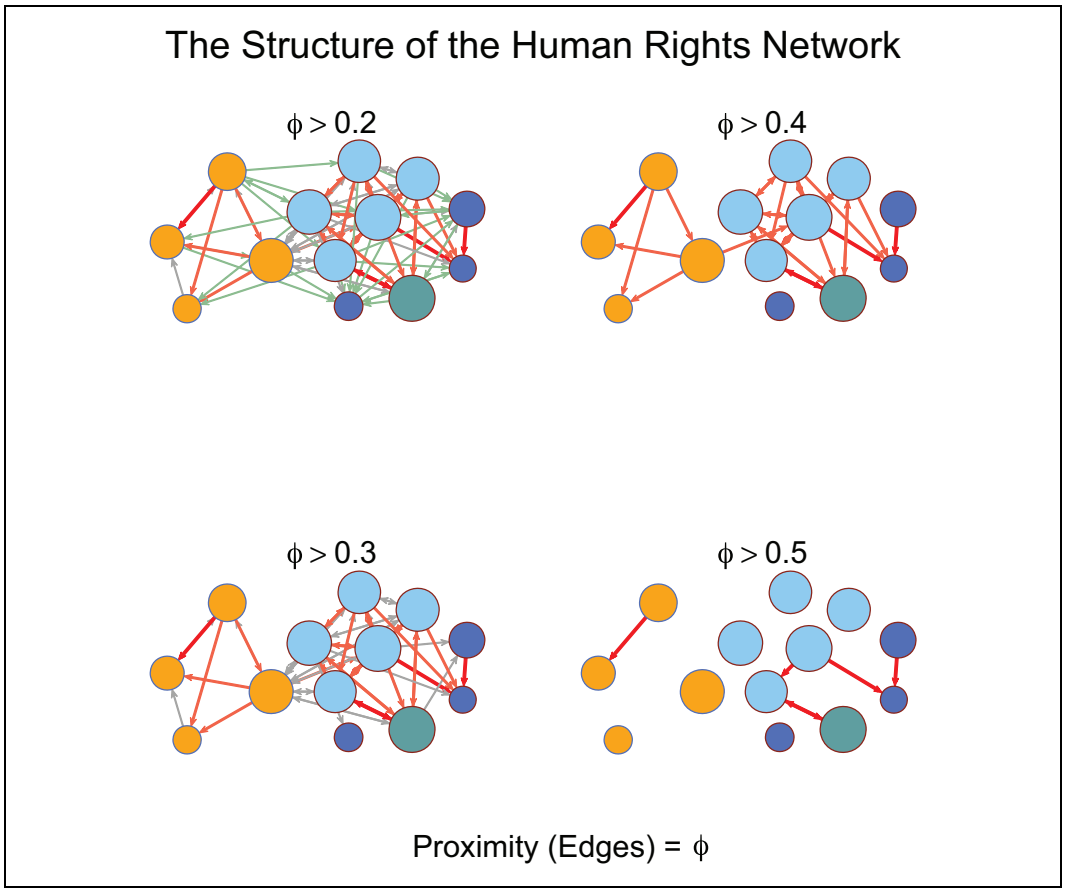

Figure 7. The four plots are generated with several proximity $\phi_{i,j,t}$ values to reveal some of the dominant linkages within the human rights network. The placement of the human rights nodes is identical to those in the network displayed in Figure 4.

interrelationship of rights abuses. Later in this article, we provide an illustration in which this measure is used in a statistical model, but a few caveats are in order for such applications.

Some readers may notice an analogy between our network approach and other methods related to factor analysis. Recently, scholars have used more sophisticated factor analytic methods (Cingranelli and Richards 1999; Landman and Larizza 2009; Richards, Gelleny, and Sacko 2001) and item response theory methods (Schnakenberg and Fariss 2012) to better measure the clustering of human rights. Though these methods are similar in terms of the process of aggregating items into a coherent measure, the methods serve distinct purposes and have different implications for the types of hypotheses that can be tested.

A scholar using factor analysis or item response theory with the CIRI components would be modeling how each variable contributed to a latent level of human rights violations.[12] The network approach demonstrated in this article serves a theoretically and methodologically distinct function when compared with this alternative approach.

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The latent variable approach assumes that the practices are indicators of a unidimensional latent variable and are independent conditional on the value of the latent variable. In contrast, the approach developed in this article assumes that the practices are conceptually distinct but related to one another because of exogenous forces. It is worth noting that these alternative approaches are not easily testable against one another, given the level of aggregation of currently available data. We consider this to be a promising and necessary avenue for future research and data-gathering efforts. In the remainder of this section, we discuss the technique used in the original Cingranelli and Richards (1999) article in order to demonstrate how our approach is conceptually distinct.

Cingranelli and Richards (1999) investigate the scaling properties of the ordinal human rights variables using a technique called Mokken scaling (Mokken 1971). Mokken scaling analysis (MSA) can be described as a nonparametric item response theory model (van Schuur 2003) and is a stochastic version of a Guttman scale, in which items measure a single latent construct and can be ordered by difficulty (Guttman 1949).

Let θ denote a latent variable of interest. Though the researcher cannot observe θ, the researcher observes several items $1, 2, \ldots, J$. Let X_{ij} denote the score of subject i on item j, a random variable with realization $x_{ij} = 0, 1, \ldots$. Also assume that each indicator has $m + 1$ categories ($m = 1$ if the indicators are dichotomous, but this article focuses on the case of $m > 1$). Since the values of the indicators are determined by the latent variable, the system can be characterized by the *item step response function* $P(X_{ij} \geq x|\theta)$ (Sijtsma and Molenaar 2002).

Mokken's model makes three important assumptions about the data. First, θ is a *unidimensional latent variable*, an assumption that can be tested using parameters from the MSA model (Cingranelli and Richards 1999; van Schuur 2003). Second, the model assumes *latent monotonicity*, which means that the item step response function is strictly increasing on θ; $\theta_a \leq \theta_b \Rightarrow P(X_{ij} \geq x|\theta_a) \leq P(X_{ij} \geq x|\theta_b)$. Finally, the model assumes *local independence*, which means that the responses depend only on θ, $P(X_{i1} = x_{i1}, X_{i2} = x_{i2}, \ldots, X_{iJ} = x_{iJ}|\theta) = \prod_{j=1}^{J} P(X_{ij} = x_{ij}|\theta)$ (van Schuur 2003).

Mokken (1971) demonstrated that under the assumptions of a unidimensional latent variable, latent monotonicity, and local independence, the proportion of "correct" answers by subject i to item j is nondecreasing in the sum of all the items. These assumptions also imply that all of the items are nonnegatively correlated across all subsets of subjects (Mokken 1971). Under these assumptions, the unweighted sum of the variables is nondecreasing in θ, a desirable feature of a measure.

Cingranelli and Richards (1999) utilize MSA to confirm the scalability of the physical integrity rights indicators. This conclusion is valuable to the quantitative human rights literature because it validates the approach of using cumulative scales of disaggregated human rights variables. Furthermore, though previous approaches to quantitative human rights measurement assumed a unidimensional latent variable, the Mokken scaling approach taken by Cingranelli and Richards (1999) allowed unidimensionality to be verified empirically.

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MSA and the other latent variable approaches (Landman and Larizza 2009; Schnakenberg and Fariss 2012) and the network approach demonstrated in this article serve theoretically and methodologically distinct purposes. The network approach developed in this article assumes that the different rights abuses are conceptually distinct but related to one another. This relationship is important if the researcher wishes to understand how some exogenous treatment affects both the right of primary interest and the other related rights.

The view that human rights behaviors arise from a single latent variable is, in most data, observationally equivalent to our current view that the concepts are conceptually distinct but complementary. However, we emphasize that the two models should be distinguished on the basis of usefulness for some particular purpose, rather than by truth value. The concepts of a ''network'' or a ''latent variable'' are simply useful abstractions for thinking about data and cannot be evaluated on the basis of truth. Our method is useful when interrelationships between human rights behaviors are of direct interest and are not useful as an overall assessment of the latent level of respect for human rights in a country.

The example given early in this article was that policy makers may cease violating a specific right after ratification of a UN human rights treaty but increase violations of some other rights. In this example, no change in the aggregate level of right violations may be observed. If this is the case, then only the network approach developed in this article will be able to test this hypothesis. We demonstrate the utility of the network approach with an analysis of extreme violations of four physical integrity rights in the next section of the article. We have selected these variables to illustrate the potential of the network approach. Many additional hypotheses can be tested using this approach but are outside the scope of this article.

Illustrations Using Physical Integrity Variables

In this section, we theorize about likely sequences of human rights violations with Monte Carlo simulations using our connectedness measure. This exercise is meant to illuminate the path a country might take from low violations of a particular right to high violations. Our approach is twofold. First, for each physical integrity right variable, we use a logistic regression model to get a sense of the influence of the connectedness measure on occurrence of high levels of violation of that right conditional on several covariates. Second, we use the logistic regression models and the co-occurrence networks to create Monte Carlo simulations that predict the step most likely to lead to extreme violations of four physical integrity rights.

The simulations rely on four logistic regression models, one for each of the four physical integrity rights. The dependent variable for each logistic regression is the presence of the most extreme level of violation of that right. The control variables used in the logistic regression models include *Gross Domestic Product (GDP) per capita*, *GDP per capita growth*, *Population Size*, *Population Growth*, *Level of Democracy*, *International war*, *Civil War*, *Military regime* and *British colonial*

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legacy. Since the main explanatory variable is lagged by one year, the control variables are also one-year lags. These data are from Poe, Rost, and Carey (2006), and detailed variable descriptions can be found in that article. We include a short description for each of these variables in the Appendix of this article. We have selected these variables to ensure that the simulations that we discuss next are generated using a plausible empirical model of human rights abuse. There are a number of additional variables that have been found to be related to human rights abuse.[13]

The main variable of interest in the regression models is the connectedness variable. Thus, the model assumes that the probability of observing an extreme violation of right i by country k in time t is

$$\begin{aligned} P(y_{i,k,t} = 1|\vartheta_i) &= \frac{1}{1 + e^{-\vartheta_i}}, \\ \vartheta_i &= \alpha_i + \beta_i \omega_{i,k,t-1} + \gamma_i M_{k,t-1} + \epsilon_{i,k,t}, \end{aligned} \tag{3}$$

where ω is the connectedness variable around the dependent variable, $y_{k,t}$. β_i is the parameter estimate of the relationship between connectedness and right level i. M is a vector of control variables lagged one year, which are described in the Appendix, and γ_i is a vector of parameter estimates for these variables. In this exercise, we are interested in dynamics rather than simply co-occurrences, so we use a one-year lag of the connectedness variable to see if states that are ''closer'' in the network to a right violation in one year are more likely to violate the right in the next year. Finally, to further address dynamics, we use a cubic spline (Beck, Katz, and Tucker 1998) or a cubic polynomial (Carter and Signorino 2010) to control for temporal dependence in the model. We estimate the model with both types of temporal variables but only display the results with the splines below since the substantive conclusions are very similar using either method. We run our statistical models in R (R Development Core Team 2011) using the Zelig library (Imai, King, and Lau 2007) for all country-years between 1981 and 2006.[14]

The full parameter estimates from the logistic regression models are displayed in Table 3. The connectedness variable strongly predicts future extreme violations in all four logistic regression models. To illustrate this effect, Figure 8 displays 99 percent confidence intervals for the probability of extreme violations of each right at various levels of network connectedness. Moving from one standard deviation less than the mean connectedness score around torture, for instance, to one standard deviation greater than the mean results in a 112 percent increase in the probability of extreme violations of torture. Note that these effects incorporate heterogeneity of influence despite using a unidimensional measure, so we predict a higher likelihood of high violations of a right when countries are violating ''nearer'' rights, even holding constant the number of other rights being violated.

To derive the step most likely to lead to the extreme violation of one of the four physical integrity rights, we conducted Monte Carlo simulations on a counterfactual data set in which nonhuman rights variables were held constant at their means and

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Table 3. Parameter Estimates for Logistic Regressions of Selected Covariates on Extreme Violations of Political Imprisonment, Torture, Extrajudicial Killing, and Disappearances.

	Prison	Torture	Killing	Disappear
Intercept	−4.37*	−4.44*	−4.44*	−1.96
	(0.73)	(0.82)	(0.82)	(1.02)
$Connectedness_{t-1}$	1.82*	1.78*	1.78*	2.24*
	(0.36)	(0.41)	(0.41)	(0.46)
Years since last event	−1.04*	−1.54*	−1.54*	−1.08*
	(0.07)	(0.14)	(0.14)	(0.13)
$Spline_1$	−0.00	−0.17*	−0.17*	−0.06*
	(0.00)	(0.03)	(0.03)	(0.01)
$Spline_2$	−0.04*	0.04*	0.04*	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
$Spline_3$	0.01*	0.00	0.00	−0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Log $population_{t-1}$	0.29*	0.32*	0.32*	0.09
	(0.04)	(0.04)	(0.04)	(0.05)
Population $growth_{t-1}$	0.02	0.06	0.06	−0.08*
	(0.02)	(0.03)	(0.03)	(0.03)
Log GDP per $capita_{t-1}$	0.02	−0.28*	−0.28*	−0.26*
	(0.04)	(0.05)	(0.05)	(0.07)
GDP per capita $growth_{t-1}$	−0.00	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
$Democracy_{t-1}$	−0.30*	0.06	0.06	0.02
	(0.04)	(0.04)	(0.04)	(0.05)
International war_{t-1}	0.32	−0.33	−0.33	−0.30
	(0.20)	(0.21)	(0.21)	(0.24)
Civil war_{t-1} *war*	0.71*	1.32*	1.32*	1.73*
	(0.13)	(0.14)	(0.14)	(0.16)
Military $regime_{t-1}$	−0.12	−0.11	−0.11	−0.17
	(0.12)	(0.14)	(0.14)	(0.18)
British colonial legacy	0.05	−0.32*	−0.32*	−0.25
	(0.11)	(0.14)	(0.14)	(0.17)
N	3,829	3,829	3,829	3,829
log *L*	−1,230.35	−959.03	−959.03	−619.10

Note. GDP = gross domestic product. Standard errors in parentheses.
*Indicates significance at $p < .05$.

human rights variables were randomly sampled from the set of all permutations of human rights scores. This method allows presentation of probabilities of the four physical integrity variables based on the distance of the nearest right that was violated in the previous year. The methods of simulation are commonly used in political science and described in King, Tomz, and Wittenberg (2000).

Figure 9 shows the simulated probabilities of extreme violations of each right as a function of the "nearest" violated right in that country in the previous year.

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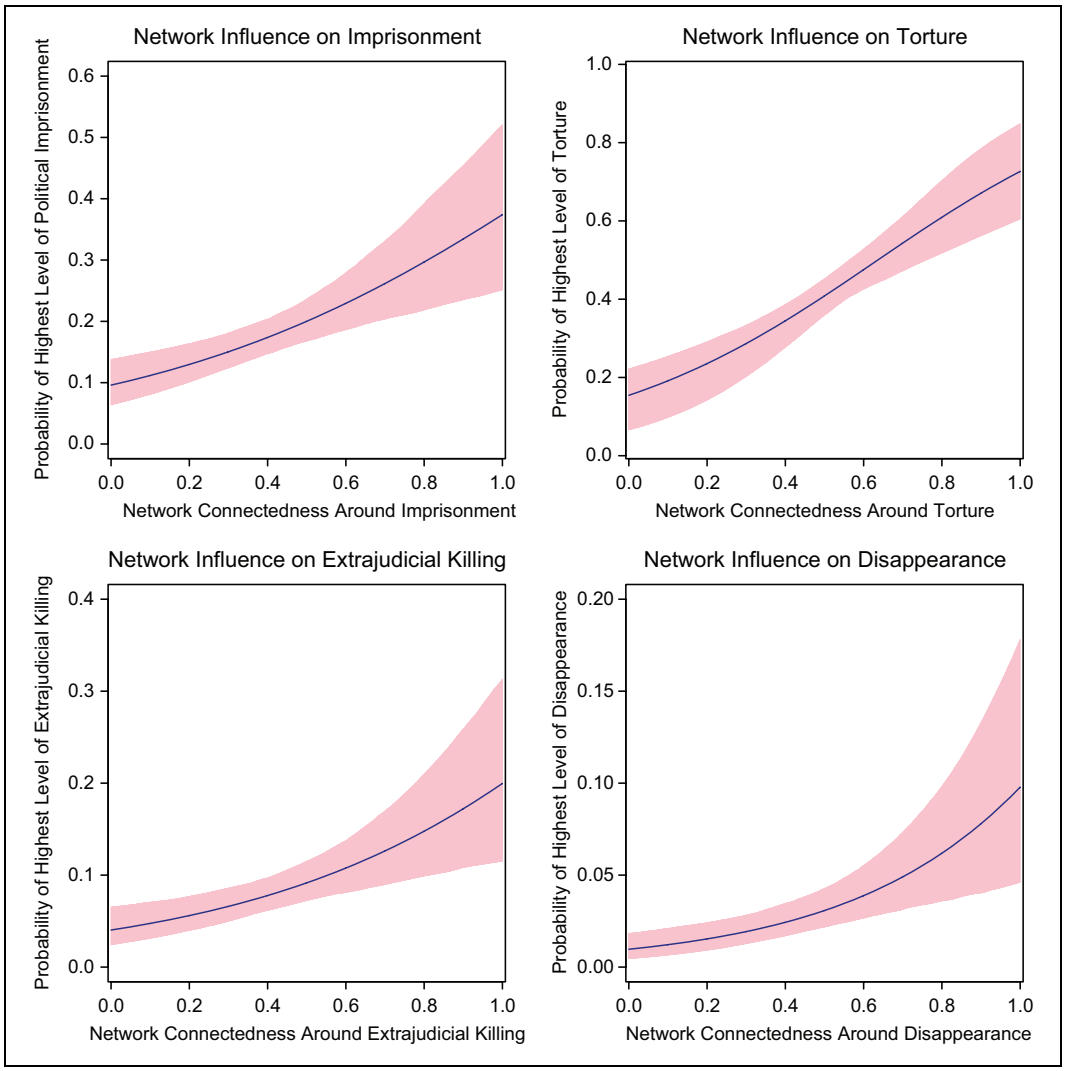

Figure 8. The expected value and 99 percent confidence intervals for the probability of extreme violations of the right over the range of possible values of connectedness.

The simulations reveal differences in the probability of extreme level of each physical integrity right when a nearby right is violated as opposed to a right that is farther from it in the network. For example, when a country engaged in extrajudicial killing (at the "moderate to extreme level") in the previous year, the probability of extreme violations of torture was 0.28, in contrast to a probability of 0.18 when the nearest violated right is freedom of association. In contrast, the step most likely to lead to the extreme violation to political imprisonment was violations of rights to freedom of movement, a variable usually not considered derived from the same latent trait as the physical integrity variables. The pattern observed for political imprisonment contrasts with the view, found in Cingranelli and Richards, that sequencing of human rights violations proceeds in a simple fashion

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through physical integrity rights as a result of latent human rights levels. The sequence leading to imprisonment appears to rely on a simple conceptual relationship between the rights; political imprisonment is the mode of enforcement for violations of rights to movement or freedom of association. This relationship corroborates the network visualizations displayed in Figures 2 and 4 in which the political imprisonment node connects the physical integrity rights abuses with the empowerment abuses.

Conclusion

In this article, we have presented a theory of interdependence between human rights behaviors and illustrated that theory with data using a network approach that allows for the measurement, visualization, and statistical analysis of the mutual dependencies between different repressive tactics. Our analysis suggests that rights violations are generally likely to co-occur and that the system of co-occurrence can be usefully represented in a low-dimensional measure. For instance, the measure can be used to illustrate how the bundle of human rights violations in a country influences likelihoods of different physical integrity abuses. For example, states that broadly violate "nearer" human rights are more likely to start torturing and less likely to quit. The simulation analysis empirically demonstrates the step most likely to lead to the widespread use of four physical integrity rights.

The goals of this article are primarily exploratory, and we hope the article inspires more systematic and detailed exploration of relationships between various rights violations. For instance, although we have provided a general framework to explain relationships between rights, we have not applied the framework to give more specific predictions for specific pairs of rights violations. We consider this to be an important and exciting area for future research. Furthermore, for reasons of simplicity and illustrative value, we have not attempted a sophisticated statistical treatment of the problem of relationships between rights and have not presented many formal hypothesis tests. More sophisticated multivariate statistical models and structural equations models building off of the approach developed in this article could be used to analyze these relationships. Finally, our network measure was constructed to be a system-wide measure in each year, although it is possible that patterns of co-occurrence of human rights violations vary considerably based on country characteristics. Though we consider the system-level variable to be intrinsically interesting as an analytical tool for characterizing repressive tools, it is straightforward to repeat our analysis on different subsets of countries for comparison.

The measures developed in this article will be of both theoretical and methodological use to scholars conducting empirical analyses of human rights practices. Scholars frequently analyze the correlates of a particular human rights practice by considering some treatment of interest and a set of control variables. Just as frequently, however, these scholars do not include other human rights practices on the

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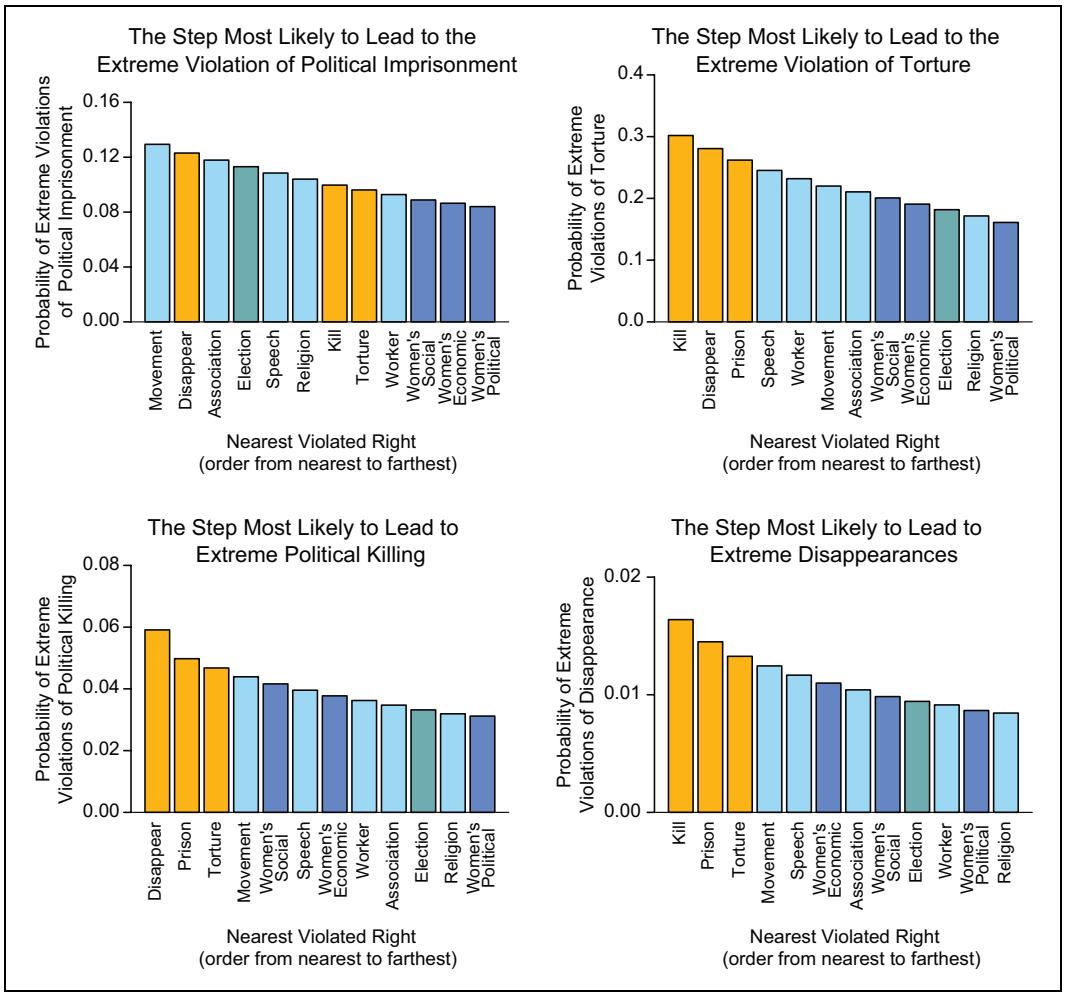

Figure 9. The probability of extreme violations of a right given the "nearest" violated right in the previous year. The x-axis is ordered by the proximity score. The information in this figure statistically confirms the pattern observed in Figure 4 and demonstrates the step most likely to lead to the extreme violation of the four physical integrity rights.

right-hand side of the equation. These relationships are not only theoretically interesting, but may be important omitted variables in studies that focus on the violation of one particular right.

Furthermore, the insights from our analysis will also likely be of use to scholars interested in the effects of human rights abuse on human health and well-being. Our results suggest that isolating the effects of torture may be a difficult endeavor since individual subjects who experience extreme levels of torture are likely to have also experienced other types of human rights abuse (Silove 1999). Scholars should therefore account for other human rights that likely precede violations of torture such as political imprisonment, extrajudicial killings, and limitations on freedom of movement in the locations that they study.

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Also, the human rights network may condition the effect of interventions (such as "naming and shaming") meant to improve human rights practices (Demeritt 2012; Keck and Sikkink 1998; Krain 2012; Meernik et al. 2012; Murdie and Bhasin 2011; Risse and Sikkink 1999). Interventions aimed at preventing torture may be more effective when fewer violations of other rights are present and ineffective when human rights are broadly violated. Researchers interested in these interventions may test interactions between our measure of network connectedness and their treatments of interest. Similarly, agencies may choose to devote resources to interventions with higher probabilities of success by focusing on countries with a few bad practices where human rights are otherwise generally respected. Analyzing such interventions by matching on previous values of network connectedness is one efficient way to control for these selection effects.

As a whole, the quantitative human rights literature will benefit from further examination of how human rights practices are related to one another by causal factors. It is our hope that other scholars will begin to account for the relationships that exist between the many different human rights.

Appendix

Substitutes

Table A1. Substitution of High-level Repressive Action *i* for High-level Repressive Action *j* (1981–2006)

Action *i*	Action *j*	Year Count
Women's political rights	Torture	14
Torture	Women's political rights	14
Women's political rights	Extrajudicial killing	11
Extrajudicial killing	Women's political rights	11
Women's political rights	Disappearance	7
Disappearance	Women's political rights	7
Freedom of religion	Disappearance	6
Disappearance	Freedom of religion	6
Women's social rights	Disappearance	5
Freedom of religion	Extrajudicial killing	4
Women's political rights	Political imprisonment	4
Political imprisonment	Women's political rights	4
Disappearance	Women's social rights	4
Extrajudicial killing	Freedom of religion	4
Freedom of assembly and association	Disappearance	3
Disappearance	Freedom of assembly and association	3

(continued)

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Table A1. (continued)

Action *i*	Action *j*	Year Count
Women's social rights	Extrajudicial killing	2
Electoral self-determination	Disappearance	2
Women's economic rights	Disappearance	2
Disappearance	Electoral self-determination	2
Disappearance	Women's economic rights	2
Freedom of movement	Women's political rights	2
Extrajudicial killing	Women's social rights	2
Women's political rights	Freedom of movement	2
Freedom of movement	Disappearance	1
Worker's rights	Disappearance	1
Women's economic rights	Torture	1
Women's social rights	Torture	1
Women's economic rights	Freedom of assembly and association	1
Women's economic rights	Freedom of speech	1
Disappearance	Worker's rights	1
Women's social rights	Worker's rights	1
Freedom of assembly and association	Women's economic rights	1
Freedom of speech	Women's economic rights	1
Torture	Women's economic rights	1
Torture	Women's social rights	1
Worker's rights	Women's social rights	1
Disappearance	Freedom of movement	1

Covariates

Descriptions for the variables used in the model presented in the main sections of this article were taken from Poe, Rost, and Carey's (2006) article. For theoretical justifications for these variables, see the work by Poe and Tate (1994) and Poe, Tate, and Keith (1999) in addition to the short descriptions from the following citations:

Gross Domestic Product (*GDP*) *per capita* is measured using the natural log of the country's GDP in constant US dollars (1995) and reported per capita. *GDP per capita growth* is measured as the yearly percentage change in GDP per capita. *Data source:* World development indicators (The World Bank 2009) and some missing values are taken from US Energy Information Administration (2009). Since economic scarcity tends to increase tension and threats to the regime, nations with higher GDP and GDP growth are expected to be less likely to engage in repression (Poe and Tate 1994).

Population Size is the natural log of a state's population estimate and *Population growth* is measured as the yearly percentage change in population. *Data source:* World development indicators (The World Bank 2009) and some

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missing values are taken from Fearon and Laitin (2003). Increased population and population growth are expected to be positively associated with repression, consistent with previous findings (Henderson 1991; Poe and Tate 1994; Poe, Tate, and Keith 1999).

Level of Democracy is measured using the Freedom House Political Rights scale. *Data source*: Freedom House (2009) and Poe, Rost, and Carey (2006) reverse the scale of this variable. The result is a scale ranging from 1 (*most democratic*) to 7 (*least democratic*). Less democratic countries are expected to torture more frequently, so the effect of this variable is predicted to be positive (Henderson 1991; Poe and Tate 1994; Richards, Gelleny, and Sacko 2001).

International War: This variable is coded 1 for participation in an interstate war or intervention in a civil war, 0 otherwise. *Data source:* Uppsala Armed Conflict Data set (Gleditsch et al. 2002; Harbom, Melander, and Wallensteen 2008).

Civil War: This variable is coded 1 for civil war or intermediate conflict, 0 otherwise. *Data source:* Uppsala Armed Conflict Data set (Gleditsch et al. 2002). The most recent update (version 4-2008) to these data was conducted by Harbom, Melander, and Wallensteen (2008).

Military Regime: This variable is coded 1 from the moment of a military coup until the military regime ceded government power, 0 otherwise. *Data source:* Data are taken from several sources, including Madani (1992), *The Political Handbook of the World* (various years; see, e.g., Banks and Muller 1998) and the Central Intelligence Agency (CIA; 2004).

British colonial legacy: This variable is coded 1 if country was a British colony, 0 otherwise. *Data source:* Poe, Tate, and Keith (1999) and the CIA (2004).

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Authors' Note

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Declaration of Conflicting Interests

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Notes

1. For a complete discussion of the origins and definitions of all of the rights in the Universal Declaration of Human Rights, see Donnelly (2003) and Donnelly and Howard (1988).
2. See, for example, early theoretical work (Keck and Sikkink 1998; Korey 2001; Risse and Sikkink 1999) and more recent applied work that in some cases uses network analytic tools (Bell, Clay, and Murdie 2012; Murdie and Davis 2012; Murdie and Bhasin 2011).
3. For reviews of the current state of the quantitative human rights literature, see Landman (2004, 2005); for reviews of the early quantitative human rights literature, see Poe (1990, 1991).
4. For reviews of the foreign policy substitution literature, see Bennett and Nordstrom (2000); Cioffi-Revilla and Starr (1995); Morgan and Palmer (2000); Moore (2000); Most and Starr (1984, 1989); Palmer and Bhandari (2000), Palmer, Wohlander, and Morgan (2002); Regan (2000); and Starr (2000). For reviews of the relationship between the literature on foreign policy substitution and the literature on human rights, see Fariss (2010), Poe (2004), and Rottman, Fariss, and Poe (2009).
5. For a complete theoretical discussion of these rights, see Carleton and Stohl (1985); Cingranelli and Richards (1999); Gibney and Stohl (1988); Gibney and Dalton (1996); Landman and Larizza (2009); Poe (2004); Poe and Tate (1994); Poe, Tate, and Keith (1999); and Poe et al. (2000).
6. On empowerment rights, see Richards, Gelleny, and Sacko (2001).
7. On the right to electoral self-determination, see Richards and Gelleny (2007a).
8. On women's human rights, see Poe, Wendel-Blunt, and Ho (1997) and Richards and Gelleny (2007b).
9. Most of the Cingranelli and Richards (CIRI) variables are coded on a three-point ordinal scale. Since it is necessary for our analysis that variables be on the same scale, we recode the three women's rights variables from a four-point scale to a three-point scale, so that we can consistently compare each human right in the network. We do so for each of these variables by combining the two highest levels of respect (level 3 and level 2 into a single level 2 category). We make similar changes to the freedom of religion and freedom of movement variables that are dichotomous. For these variables, we recode level 1 as level 2 and then reverse code the variable.
10. Each value of $\phi_{i,j,t}$ is calculated for each year in the CIRI data set. Thus, $\omega_{i,k,t}$ is a unique country-year value and differs for each individual right. For example, the *connectedness* value will be different if the analysts models extreme levels of torture as a dependent variable compared to another dependent variable such as extreme levels of political imprisonment. Finally, we note that the connectedness variable ω is not calculated with the ϕ value where $i = j$, so that the measure does not consider a right to influence itself.
11. All graphs are generated using the Kamada and Kawai (1989) algorithm, which is implemented in the Social Network Analysis library (Butts 2008, 2010) in R (R Development Core Team 2011).

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12. The connection between these measurement models and the assumption of a latent variable giving rise to the indicators is more explicit in item response theory. The theory behind principle components analysis, for example, is based on the atheoretical idea of simply finding a variance maximizing linear combination of the indicators. Thus, our comments in this section apply most directly to Mokken scaling analysis and other item response theoretic approaches. However, we note that authors who have applied methods such as principle components analysis discuss them as if the first factor measures a unidimensional trait.
13. See, for example, Davenport (2009) and Davenport and Armstrong (2004).
14. Each of the variables in the statistical model contained missing values. Missing values were imputed using Amelia II (King et al. 2001). We also include several additional variables to improve the imputation model. We include the POLITY IV data version 2006 (Marshall, Jaggers, and Gurr 2003) and the Correlates of War Composite Index of National Capability data version 3.02 (Singer 1987; Singer, Bremer, and Stuckey 1972).

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