9

The social and institutional structure of corruption: some typical network configurations of corruption transactions in Hungary

Zoltán Szántó[1], István János Tóth[2] and Szabolcs Varga[3]

In the first part of the Chapter four ideal-typical corruption transactions are explicated in terms of the principal-agent-client model: bribery and extortion are described as two different types of agent-client relationship, while embezzlement and fraud as two different types of principal-agent relationship. The main idea is to describe these elementary corruption transactions as simple directed graphs. The next Section of the Chapter takes into consideration different kinds of possible motivations (such as the reduction of risks or transaction costs) of the principals, agents and clients, in order to embed their corruption transactions in various kinds of personal, business, political and other institutional networks.

In the second part of the Chapter some typical and stable network configurations are presented, based on a recent empirical corruption research carried out in Hungary. Certain corruption cases (such as party financing or granting of permit) are analyzed in details, and are described as complex and multiple networks. The Chapter concludes in showing some signs of the evolution of corruption networks in Hungary in terms of the number of actors, of the complexity of network configurations, of the level of personal or institutional embeddedness, and of the multiplicity of relationships.

[1] Institute of Sociology and Social Policy, Corvinus University of Budapest, Budapest, Hungary – email: zoltan.szanto@uni-corvinus.hu

[2] Institute of Economics Hungarian Academy of Sciences, Budapest, Hungary – email: tothij@econ.core.hu

[3] Institute of Sociology and Social Policy, Corvinus University of Budapest, Budapest, Hungary – email: szabolcs.varga@uni-corvinus.hu

9.1 Introduction[4]

The study consists of two main parts. In the first one, the concept and ideal-types of corruption are defined. The various types of elemental corruption transactions are differentiated in terms of the principal-agent-client model, illustrating them through directed graphs. During the course of this process, we distinguish two subtypes of both the agent-client relationship and the principal-agent relationship: bribery and extortion in the former case, embezzlement and fraud in the latter case. To conclude part one, we attempt to delineate the motivational mechanisms that encourage participants in corruption scenarios to embed their transactions in various types of personal, business, political and other institutional networks. With the help of these networks, those involved are often able to decrease the transaction costs and risks associated with the corrupt dealings.

In the second part of this Chapter, the social and institutional embeddedness of a few typical Hungarian corruption transactions is discussed, also illustrating these through multiplayer, complicated, multiplex graphs. Here, we will supplement the ideal-typical models of corruption with the concepts of the hidden principal, the broker, and the hidden role. Through the latter, we wish to demonstrate that those involved in corrupt transaction may, in certain scenarios, behave differently than would be expected based on their roles. Our previous research[5] has shown that, in corruption transactions, the most common corruption risks are associated with permit/license acquisition and inspection, the acquisition and use of EU funds, public procurement, as well as the buying and selling of government- and local government-owned real estate (Alexa et al., 2008; Szántó et al., 2011). Thus, we present networks of this type in the form of case studies. Our discussion is concluded with a short summary.

9.2 The concept and ideal-types of corruption

International literature offers numerous definitions for the concept of corruption[6]. This is partly due to the fact that – because of its historical-

---

[4] The study was done at the Corruption Research Center of the Institute of Sociology and Social Policy at Corvinus University Budapest. The research which served as the basis of the study was conducted by: university students Hilda Kinga Balázs, Kinga Bartis, Tünde Cserpes, Márk Tamás Fülöp, Gergely Lukácsházi, Annamária Márkus, Erna Miskolczi and Orsolya Vajda, as well as doctoral student Szabolcs Varga. The research was lead by university professor Zoltán Szántó and principal scientific contributor István János Tóth. The research was supported by TÁMOP 4.2.1.B-09/1/KMR-2010-0005 project.

[5] Alexa et al. (2008), Szántó et al. (2011).

[6] The word corruption (Latin: *corrumpo*) originally means to break, to destroy.

cultural nature and its versatile character – the phenomenon is a rather difficult one to describe in general terms. The situation is further complicated by continuously ongoing debates between experts in an effort to reach consensus on a general definition (see for example Lambsdorff, 2007, pp. 15-20). The creation and acceptance of a general definition is made difficult by a number of factors. For one thing, the term stands for a number of distinct, but related, phenomena. Moreover, differences become apparent even when examining the issue from the legal and cultural perspectives of a given country[7], as well as when exploring the common concept of corruption and its effects on public interest. All this is further differentiated by the fact that the term can comprise the definitions of those with involvement and vested interest in corruption, as well as those who are actively fighting against it (Gardiner, 2009).

In spite of the debated questions, however, of the widely known definitions often referred to by social scientists, Nye's take certainly warrants mentioning. According to Nye (2008, p. 284), "corruption is behaviour which deviates from the formal duties of a public role because of private-regarding (personal, close family, private clique) pecuniary or status gains; or violates rules against the exercise of certain types of private-regarding influence." In contrast, Klitgaard (1991) argues that we can only speak of corruption if the individual places her/his personal interest in an unpermitted manner above the causes (or persons) that s/he is otherwise meant to serve[8]. In the opinion of Rose-Ackerman (1978, 1999, 2006), corruption appears in the simultaneous presence of both wealth and the power of the state. It is markedly characterized by a willingness to employ forbidden (financial) means to influence the decision process. She regards the corruption transaction between a private person (or private company) and the government as its most common form, where the corruptor, in return for a bribe, obtains an unlawful (financial or other) advantage from the corrupted public officer. Similarly to the aforementioned examples, Lambsdorff stresses a number of important attributes in relation to corruption in the definition he utilizes in his research. In accordance with this, corruption – at first take – is "the misuse of public power for private benefit" (Lambsdorff, 2007, p. 1).

These various definitions seem to share some common attributes, which

---

[7] Here, there is emphasis not only on the word legal, but also on the word country: as a result of historical, cultural and other differences, there is considerable variance between corruption phenomena and – following from this – the general concepts of corruption in the individual countries.

[8] Klitgaard (1991) presents the various forms of this, drawing on examples from different sectors, in reference to the initiators of the corruption.

comprise the substantive factors in the innumerable manifestations of the phenomena. These characteristic features – with the inclusion of Lasswell's (1930) points – can be summed up as follows:

- a corrupt transaction can only take place if at least two parties are involved (be it a person, a community or an institution);
- the premeditated and conscious decision of the parties to participate in the transaction is also a basic condition;
- the intent to exert influence with the aim of obtaining a personal advantage is an integral element of corruption – in other words, there is a pursuit of self-interest, where personal objectives are placed, in case of political corruption, above public interest, and in case of economic corruption, above the owner's interest[9];
- and, finally, breaking the rules (forbidden, illegal, unauthorized activities) is also a significant feature.

As, in our research, Lambsdorff's definition seemed the most productive for our purposes, we will also rely on this in our present analysis. This definition is based on the principal-agent-client model of modern political and institutional economics[10]. The model is grounded in rational choice theory: its actors consider the expected benefits and cost of their options and choose the alternative which promises to yield the highest net benefit. In the model, the agent (*e.g.*, an official who issues construction permits) is entrusted with power by the principal (*e.g.*, local government). During this process, the principal (i) delegates certain tasks to the agent, (ii) determines the formal rules according to which the tasks are to be performed, and (iii) offers remuneration to the agent for completing the tasks, who, in return, (iv) remains loyal to the principal, which means s/he performs the tasks in accordance with the rules that have been laid out. The agent will respond to the client's needs within the specified framework (vi), for example, an application for a construction permit (v). These relationships are illustrated in Figure 9.1 by directed graphs, in accordance with the numbering in the text above.

Corruption takes place when one of these players (in most cases the agent) breaks the rules out of self-interest, thereby hurting the interest of the other players (in most cases the interest of the principal and/or the client). The objective of the principal is to motivate the agent to perform an

---

[9] The meaning of "public interest" has been, and continues to be, a debated question, but we will not problematize this here.

[10] See Lambsdorff (2007, pp. 62-65). For other applications of the principal-agent-client model to corruption see for example: Klitgaard (1991), Szántó (1999), Andvig and Fjeldstad (2000).
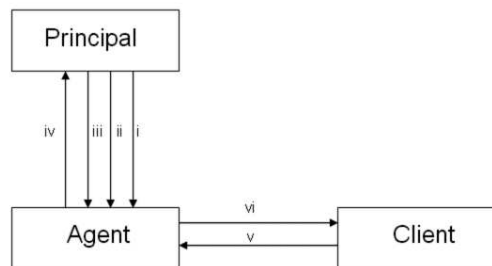
Figure 9.1 The principal-agent-client graph.

optimal amount of productive activity and an optimal amount of unproductive – in other words, corrupt – activity. The fundamental problem of the actors originates from the information asymmetry, which is an inherent characteristic of the relationships between those involved[11]. This roughly means that, in the examined scenario, the level of awareness is considerably different for the individual parties. This produces a situation which those actors who are in possession of private information can opportunistically exploit to their advantage in an opportunistic manner. The agent, for example, is a lot better informed than the principal about the details of transactions involving the client.

Based on information asymmetry between actors, four ideal-types of corruption can be distinguished in the principal-agent-client model (Lambsdorff, 2007, pp. 18-19), which can be represented using directed graphs. It seems an obvious step to differentiate, within these four pure types, two subtypes of corruption relationships, between the principal and the agent on the one hand, and between the agent and the client on the other – and based on this, distinguish between bribery (A), extortion (B), embezzlement (C), and fraud (D). Klitgaard (1991, p. 50) refers to the former two types as external corruption and to the latter two as internal corruption.

(A) In the case of *bribery*, the client – as the initiator of the corruption transaction – acts as the briber and offers a bribe to the agent. In return, the client procures an advantage in an illicit manner (for example, obtains an unauthorized permit or avoids the disadvantageous consequences of a legal transgression), which s/he could not do otherwise. This type of interaction is shown in Figure 9.2, where the illustration of the original relationship is supplemented with the graphs representing the bribe and the procurement of an unlawful advantage.

---

[11] For the concept of information asymmetry see *e.g.*, Rasmusen (1989, pp. 193-226). On the analysis of the negative political effects of informational asymmetry see Szántó (2009).
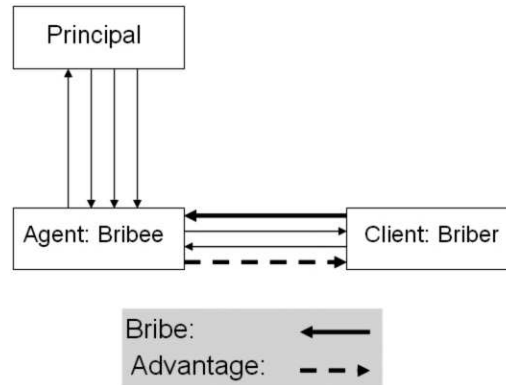
Figure 9.2 (A) Bribery graph.

(B) *Extortion* occurs when the agent (extorter) – as the initiator of the corruption transaction – uses his/her power to coerce money (or other benefit) out of the client (extortee). The client must pay for the service (or for speeding the procedure), for which s/he would otherwise be legally entitled to. The agent, however, exerts threats, coercion or even aggression in order to get the client to pay. This scenario is illustrated by Figure 9.3, where the threat and the path of the extorted sum are shown by directed graphs.
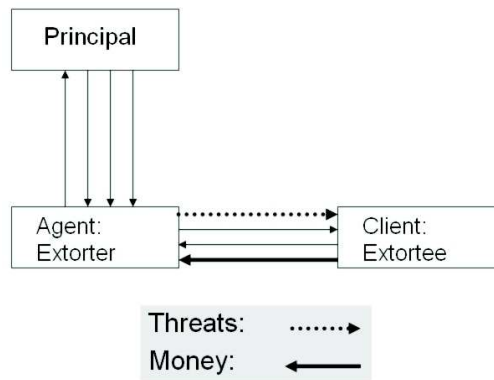

Figure 9.3 (B) Extortion graph.

(C) We examine two corruption scenarios within the framework of the principal-agent relationship. One of these is *embezzlement* or *misappropriation*. This is an action initiated by the agent (embezzler), whereby s/he (partially or wholly) appropriates the asset or the right of disposal entrusted to her/his care, and disposes of these as her/his own. In this transaction,

the agent (embezzler) inflicts a loss on the principal. Figure 9.4 shows the graph of embezzlement and financial advantages.
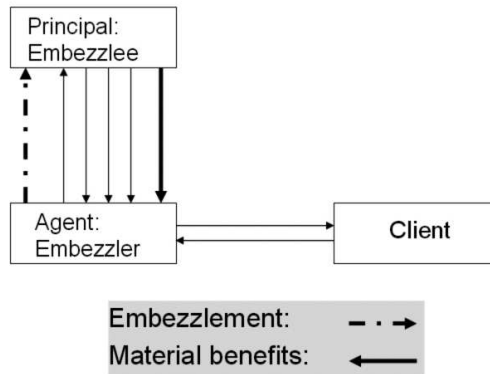

Figure 9.4 (C) Embezzlement graph.

(D) The fourth ideal-type of corruption is *fraud*, where the agent, by increasing the information asymmetry, employs hidden action to obtain an advantage. Alternatively, the agent can also actively conceal information from the principal (for example, by forging documents, manipulating information, or other methods). Figure 9.5 shows the graph of manipulating information and obtaining financial advantage.
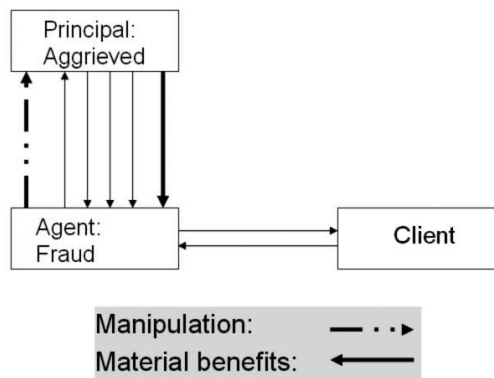

Figure 9.5 (D) Fraud graph.

Thus, these are the ideal-types of corruption that we accept and work with in our research. Naturally, there are numerous other possibilities for classification in relation to the phenomenon. One of these (Lambsdorff, 2007, p. 20) entails an examination of whether it is the briber or the bribee

that obtains a greater advantage during the transaction. This is largely dependent on which party has a stronger bargaining position. If the briber realizes a greater advantage, this is referred to as "clientelist" corruption. If, on the other hand, the corruption transaction results in greater advantage for the bribee, we speak of "patrimonial" corruption. Another possibility is to distinguish between petty and grand corruption, where the differentiation is based on the size of the bribe. Political and administrative corruption are differentiated based on whether the dominant actors are politicians or public officers.

Now let us take a look at the possible motivating factors that prompt actors to embed their corruption transactions in personal and institutional networks (Granovetter, 2007). Corruption transactions hide risks. Carrying them through successfully involves various types of costs. While in case of bribery and extortion, it is the client and the agent (and/or brokers) who bear the risk, in embezzlement and fraud scenarios, it is primarily the agent (and/or hidden principal). Monitoring and realizing corruption transactions, obtaining and processing the required information, as well as the bargaining, decisions and coercion associated with such undertakings carry substantial transaction costs. The more efficient the institutions are in detecting and sanctioning corruption and the more severe the expected punishment if caught, the greater the incurred costs[12]. These two factors also considerably influence the amount of transactions cost. At the same time, the greater the expectable advantage, the more likely corruption will occur. As we have every reason to assume that the actors in corruption transactions are capable of gauging the risks and estimating the costs, we can likely expect that they will attempt to minimize these using all means at their disposal, thereby increasing the net profit produced by the transactions. Of these means, it would seem advisable to consider the establishment, maintenance and expansion of various types of networks. From this point on, we will differentiate between two basic network forms. We will regard cases where the participants of corruption transactions embed their corrupt dealings in *interpersonal* networks separately from those where the transactions are embedded in *institutional* (business, contractual, political, etc.) networks.

In the second half of the study, based on the above outlined four ideal-types, we make an attempt to sketch out typical corruption networks. We supplement the simple, three-actor graphs – as previously mentioned – with new actors (hidden principal, broker), hidden roles and new network

---

[12] These correlations in connection with corruption can be articulated based on the traditional microeconomic model of crime (Becker, 1968).

contents (personal and institutional relationships). The latter signify the social and institutional structure – and embeddedness – of corruption transactions (Granovetter, 2007). In our discussion, we first describe a specific case (based on media sources and interview experiences), then we use graphs to sketch out multiplayer, multiplex corruption networks.

9.3 A few typical corruption networks in Hungary

As we have seen when outlining the various ideal-types, corruption transactions, in the simplest scenarios, occur between two actors. Corruption transactions between the agent and the client are typically based on a personal relationship of an occasional (or regular) nature. The other subtype of transactions involving only a few actors is when an institutional relationship (also) develops between the two parties. In the second typical scenario, the corruption transaction is embedded in a multiplayer network where we can often assume the existence of various personal and institutional relationships between the agent and the client prior to the transaction. It is primarily these relationships that make the corruption transaction possible and pave the way for its repeated occurrence between the same actors. One of the upcoming examples (case number one) shows this situation: the parking inspectors, in a corruption scenario initiated by parking car owners, share in the resulting corruption fee with their superiors. The other type is when the corruptive, or corrupt, agent uses a broker company for both transferring and withdrawing the corruption fee. We will be taking a closer look at such a scenario in the second case study, in which, when a company requests permission from the authorities, it is "advisable" for it to contract the expert recommended by the authorities, for instance, in order to prepare a specific impact assessment.

In light of all of this, it seems wise to draw a line between the various types of corruption transactions, based on the number of actors and the type of embeddedness. In the process, we make our way from simpler transactions with fewer actors and interpersonal embeddedness to more complex affairs, connecting many actors with embeddedness at the institutional level. Two intermediate possibilities between these scenarios are corruption transactions involving a few players at the institutional level and multiple players at the personal level. These pure types are summarized and illustrated through examples in Table 9.1. Personal and institutional embeddedness appear side by side in the majority of real-life situations, and, thus, in empirical research, it makes sense to consider them together.

Type of embeddedness			
		Personal	**Institutional**
Number of actors	**Few**	*e.g.*, At the border, a familiar customs officer turns a blind eye to customs offences in return for a bribe.	*e.g.*, A company files for a permit with a state office and is "required" to contract a specified expert for preparing an impact assessment.
	Many	*e.g.*, Familiar parking inspectors, in return for a bribe, turn a blind eye to regular customers' failure to pay the parking fee.	*e.g.* Real estate management by local government, where assets are regularly sold under market value.

Table 9.1 *Pure types of corruption transactions involving few actors and many actors with embeddedness at the interpersonal and institutional level.*

Based on our previous research[13], it is safe to state that, in Hungary, between 2001 and 2009, the ratio of multiplayer, network-based corruption transactions showed a growing tendency (see Figure 9.6). The graph clearly demonstrates that reports by online news portals on cases of suspected corruption indicate that the ratio of transactions suggesting the existence of corruption networks doubled during the examined time period.

These studies make it possible to define typical corruption networks. Since the basic model of corruption gives a good description of two-actor, one-time corruption transactions, on the following pages, primarily multiplayer, chain-like corruption transactions will be analyzed from a perspective of interpersonal and institutional embeddedness. Four cases will be outlined, followed by a graph showing the various types of corruption networks implied by these concrete examples:

---

[13] In the course of this research, in addition to interviewing company heads, we completed the content analysis of 8 Internet news portals for the time period between January 1, 2001 and December 31, 2009 (Szántó et al., 2011). Of the articles available through online sources, we gathered and analyzed in detail those that discussed cases of suspected of corruption. We collected cases of corruption in Hungary exclusively. The articles were systematized by arranging news of the same transactions into "corruption cases". We noted the main characteristics of these cases and coded them in accordance with the various features of corruption transactions. In the examined time period, the topic of corruption comprised the subject of continuous public discourse. Over 3,500 articles made it into the database, based on which 548 different cases of suspected corruption were identified and analyzed during the examined time period.
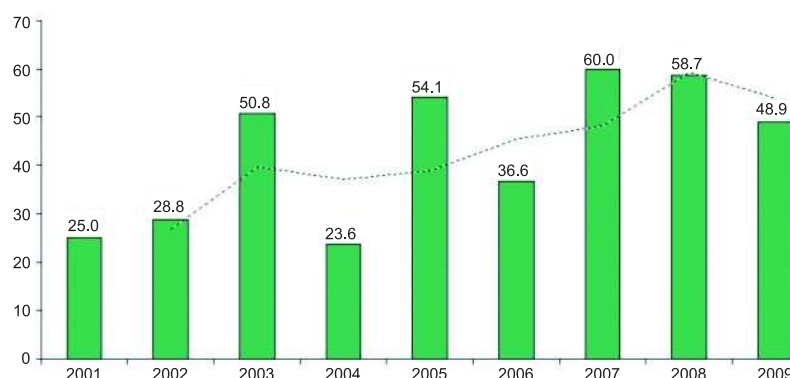
Figure 9.6 Ratio of occurrence of multiplayer, chain-like corruption cases in the media, 2001-2009, % (548 cases of suspected corruption).

1. Case number one: interpersonal embeddedness of inspection-related corruption;
2. Case number two: interpersonal and institutional embeddedness of corruption related to the acquisition of permits with broker;
3. Case number three: interpersonal and institutional embeddedness of hidden principal corruption related to local government real estate purchase;
4. Case number four: interpersonal and institutional embeddedness of corruption related to the use of EU funds.

9.3.1 Bribery and extortion network

Case number one: personal embeddedness of corruption relating to inspections[14]

In the center of Budapest, parking fees are charged *pro rata*. The maximum parking time is three hours. After this, a new parking ticket must be purchased. Alternatively, the parking time can also be extended by making a mobile phone call. The parking meters are operated, on the authority of the local governments, by a number of private companies per district, who also collect the parking fees. The collected sum is then shared by the parking company and the local government according to a given ratio. How much parking fee is to be paid and which areas should be reserved for paid parking is determined by the local government. While, prior to the introduction of parking fees, many who had business in the inner districts

[14] *Source*: articles accessible through the internet.

chose to get there by car – thus using up all the free parking spaces – after the new measures took effect, there was a decreased demand for parking spaces, and it was more likely that one would find parking spaces, albeit for a relatively high fee. These regulations work well for vehicle owners who only occasionally need to access the inner districts by car for some odd errand, and manage to take care of their business in less than three hours. The initiators of these regulations, however, did not take into consideration that those entrepreneurs, business and restaurant owners who continue to drive to these areas provide a continuous stream of parking revenue. The employees of the parking company inspect the vehicles and, in case of exceeded parking time limit or failure to pay the parking fee, impose a fine five times the three-hour parking fee. As paying the parking fee every three hours would require close attention and a considerable loss of time on part of the entrepreneurs who regularly park in the inner districts, not to even mention that a monthly parking pass would be extremely costly, it was worth bribing the parking inspectors, so that they would not check the parking ticket and would not impose a fine. In exchange for this, payments were made to them in cash, weeks, even months, in advance. It sufficed to place a note on the windshield of the car to instruct inspectors as to which shop to pick up the parking fee – or bribe – in. In return, they did not document a failure to pay the parking fee. In time, this type of bribery became such a common and widespread practice that it made sense for parking inspectors to share in the corruption profit with the head of the parking company. Finally, an entire corruption network was created: from the clients to the parking inspectors, to their boss, who shared in the corruption profit. Corruption tariffs were determined for given areas and the head of the parking company regularly demanded a certain sum from the bribes collected by the inspectors, threatening to expose them if failing to do so.

In this example, corruption developed through personal relationships[15]: since the driver of the vehicle frequently parked in the same area, which constituted the inspection zone of a few parking inspectors, personal relationships unavoidably developed between the parties during the inspection and fining process. Consequently, corruption resulted from a kind of individual "bargaining". Those involved found a mutually beneficial solution

---

[15] In this example, corruption was brought about by the incorrect pricing of paid parking. If the rule makers had differentiated between the two groups of consumers – regular parkers and irregular parkers – and made possible the purchasing of a yearly parking pass with some sort of a discount for the latter, a situation conducive to corruption would have had less of a (or no) chance of developing.

for avoiding the payment of fines. In our interpretation, this is bribery: the transaction was initiated by the client, or the driver of the parking vehicle. Through personal relationships, the corruption transaction became a general and predictable practice. During repeated transactions, the inspectors recognized the given entrepreneur's vehicle, for which, in the absence of a valid parking ticket, they did not impose a fine. Instead, once a week (or month), they sought the driver out for the bribe. A different type of personal relationship came into play when the head of the parking company became aware of this phenomenon. After a while, the company head also demanded a share of the bribe, in return for not exposing the already existing corruption network. In this scenario, the original principal (the company head) abandons his/her primary role for that of the hidden agent, while the inspectors suddenly find themselves in the role of the hidden client, as their boss, in the role of the hidden agent, applies extortion in coercing them to provide him with a share of the bribe[16].
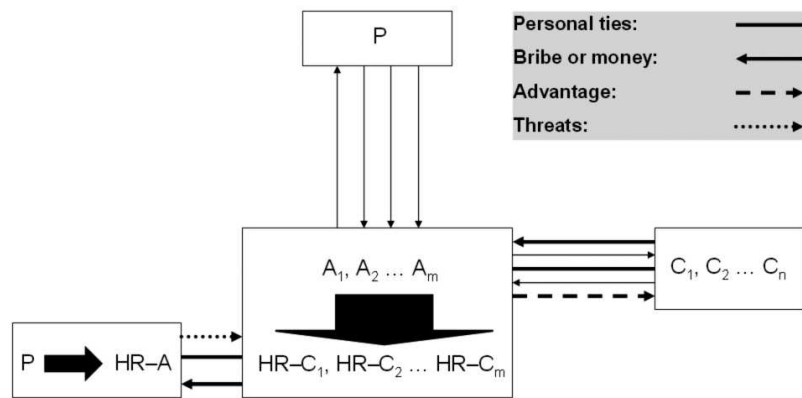
Figure 9.7 Graph of networked bribery and extortion. Notation: P = principal (head of parking company); $A_1, A_2, \ldots, A_m$ = agents (parking inspectors); $C_1, C_2, \ldots, C_n$ = clients (vehicle drivers frequently parking in the same place); the box at the bottom left illustrates the principal switches roles = practices extortion upon the agents in a hidden agent role ($HR-A$: hidden role – agent); the largest box shows the agents switch roles = in a hidden client role, in response to the extortion, they pay a share of the bribe ($HR-C$: hidden role – client).

Figure 9.7 outlines the above situation with the help of graphs. It simultaneously illustrates the bribery between the parking inspectors and the

---

[16] The entire transaction was uncovered because an extorted inspector was unwilling to cooperate with his superior. He refused to hand over a certain amount of the corruption money, and was consequently fired. Afterwards, he reported the incident to the police and made a disclosing statement exposing the entire operation.

vehicle drivers, and the extortion between the company head and the parking inspectors. The presence of a personal relationship between the agents and the clients, as well as between actors that transform from principal to hidden agent and from agent to hidden client, is an important condition for the development of this type of corruption network[17].

9.3.2 Extortion network

Case number two: personal and institutional embeddedness of corruption related to obtaining permits with broker[18]

In Hungary the construction of wind power plants requires 15 to 30 different permits and/or licenses. This number changes depending on the number of partner authorities whose collaboration is required by the environmental protection authority in order to issue a so called environmental license. Investors need to obtain this license in order to submit a request to the Hungarian Energy Office in response to a tender for expanding wind power plants capacities (Tóth, 2010). The time required to obtain this license can be 1 to 2 years, depending on the amount of money and energy the investor is willing to devote to expediting the process. The path of the submitted requests can be tracked between the various offices and expedited through a series of corruption transactions. Our interviews have shown that, in this type of corruption transaction, the license issuing body is usually the initiator, which makes this extortion. The submitted request arrives on the desk of a representative of the issuing authority. When the investor enquires about the status of the case, the agent initiates a meeting with the client – a representative of the investor – to take place in the office. The objective of this meeting is to clarify the details of the proposed project, the formal and contentual errors in the license application and the scheduling of the necessary modifications. During the discussion, the official suggests that an impact assessment should be conducted in order to obtain the license. The objective of the assessment would be to examine the effects of the project in question on the immediate natural environment – the surrounding animal and plant life. The investor is also informed that in the interest of expediting the license acquisition process, a certain Company X should be hired to prepare the assessment. Our interviewees gave accounts

---

[17] A more complex corruption network can develop if there are additional employees in charge of monitoring the activities of the parking inspectors, thus wedged between the latter and the head of the company. Similarly to – or in cooperation with – the company head, they can also extort the corrupt parking inspectors, threatening to expose their practices.

[18] *Source*: interviews conducted by the authors.

of various impact assessment topics: the effects of the wind power plant on flying invertebrates (*e.g.*, flies), the effects of the wind power plant on the migration paths of tree frogs, the effects of the wind power plant on the surrounding forest biota, etc. The client is put in a difficult situation: s/he would not like to miss the Hungarian Energy Office's application deadline, so it would be advisable to expedite the license acquisition process. The recommended company is thus commissioned to conduct the impact assessment study. General experience shows that once the completed impact assessment is attached to the license request, approval follows within a few days, enabling the investor to move on to the next phase of the process.

In the above mentioned corruption scenario, Company X appears between the agent and the client as the agent's broker, who facilitates the concealment of the corruption transaction in two different ways. On the one hand, no direct financial transaction takes place between the agent and the client, on the other, the payment of the corruption fee (in the form of payment for the completed impact assessment) and the provision of the corruption gain take place at different times. It is possible, that the agent only receives the corruption fee long after the provision of the corruption gain (issuing the license). While, in case of personal affiliation, this means a payment into the pocket, in an institutional relationship, this transfer takes place based on a contract signed between the agent and the broker. These two factors serve to conceal the corruption transaction and considerably decrease the risk of getting caught. All this is made possible by the utilization of a broker. The defining momentum here is the presence of a preexistent relationship between the agent and the broker, which precedes the establishment of a connection with the client. This relationship is usually personal, but it can also become institutionalized: for instance, the agent may have partial ownership of the company that conducts the impact assessment. If, however, a personal connection exists between the agent and the broker, the broker can be a close friend or acquaintance of the agent. It is also possible that the agent has a relative as partial owner of Company X. Thus, this type of corruption is embedded in personal and institutional relationships. In the absence of these, the corruption transaction cannot take place. The personal or institutional relationships which exist between the agent and the broker can, of course, be established independently from the corruption, for other reasons. It is also possible, however, that they were formed in order to facilitate extortion transactions. In this case, the agent (or a family member, acquaintance, etc.) may set up a company expressly to use it to receive the corruption fee. This, in turn, can result in a solidifi-
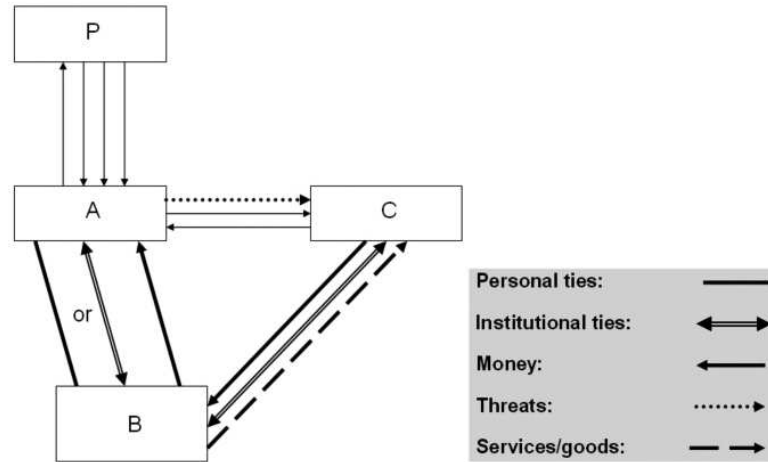
Figure 9.8 Graph of networked extortion. Notation: *P* = principal (license/permit issuing body); *A* = agent (official of license/permit issuing body); *C* = client (investor applying for a license/permit); *B* = broker (Company X hired to prepare an impact assessment report).

cation of the corruption network, as embedded in institutional and/or personal relationships. The agent can also extort a corruption fee from the next client in a similar manner, with a low risk of getting caught. In the course of this activity, the transaction costs that arise with the establishment of the network are recovered. The corruption network that is sketched out by this specific example (Figure 9.8) can, according to what we have gathered from our interviews, be considered as typical, often coming into existence in other areas of economic life in connection with the acquisition of other types of permits and licenses. Thus, in this situation, the network of connections, in comparison to the ideal-typical scenario of extortion, extends to a broker, while also becoming embedded in personal and institutional relationships. Another possible interpretation of this situation is that the role of the broker is aimed at bridging the "structural hole" of corruption between the agent and the client (Burt, 2005).

9.3.3 Embezzlement network

Case number three: personal and institutional embeddedness of hidden principal corruption in connection with real estate purchase by the local government[19]

---

[19] *Source*: interviews conducted by the authors.

An internationally owned company group in Hungary wanted to sell one of its office buildings, but they could not find a buyer. Someone at the company came up with the idea that the local government may be interested. A representative from the company contacted the local government and offered to sell them the aforementioned property for X amount of money. The leader of the financial committee of the local government responded: "Why do not you sell it for 10% more? Then we will buy it." The company representative did not understand the question at first. Later, it became clear to him that he was to get 10% of the increased purchase price to the head of the financial committee in cash. It also became apparent later that this was no simple corruption transaction: the head of the financial committee was backed by the treasurers of the two (competing) parties, which constituted the majority of the municipality, who had agreed that, if the seller brought the 10% to the local government office in cash, the body of representatives of the local government would vote in favor of signing the purchase agreement. And this is exactly what happened. The company representative withdrew the money from a foreign account opened expressly for this purpose and delivered the agreed upon sum to the local government office at the specified time. The financial representatives of the two parties counted the money, after which the body of representatives approved the purchase. In order to complete the payment transaction, the company had to have funds set aside for the so called "below the line" expenses. In reference to this, the company representative explained: "corruption requires the existence of a certain infrastructure".

In the above case, the role of the principal, agent, and client can be illustrated by introducing – next to the principal (the person in charge at the local government: the mayor), the agent (the person in charge of the financial committee by designation of a party), and the client (the representative of the company selling the real estate) – the treasurers of the two political parties, or the hidden principals, into the Equation (see Figure 9.9). Although, here, the corruption appears to consist of a two-actor, one-time transaction, it is not. Firstly, the transfer of the corruption fee in cash already presumes that the corruptive company has the required background: a foreign bank account is opened in order to make the payment of the corruption money. Secondly, it is not really the number one leader of the local government that stands behind the agent as principal, but the hidden principals, in the person of the political party representatives. Thus, the transaction presupposes unique relationships on both sides. In the case of the client, in response to the corrupt proposition, "below the line" funds are set aside.
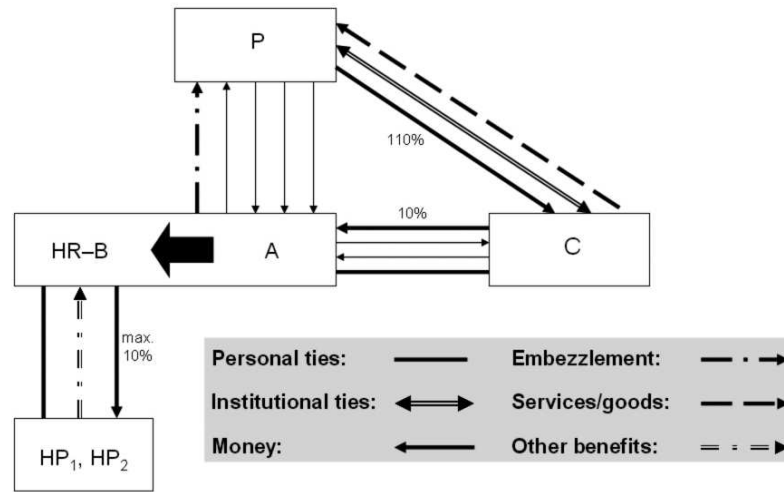
Figure 9.9 Graph of networked embezzlement. Notation: P = principal (mayor); A = agent (head of the financial committee of the local government); C = client (real estate seller); $A-HR-B$ = the agent switches roles: in the role of a hidden broker gets max. 10% to the "hidden principals" ($HR-B$: hidden role – broker); HP_1, HP_2 = hidden principals (treasurers of the political parties).

In the case of the agent, belonging to a political party preceded the transaction. In fact, it was probably this very circumstance which prompted the corruption transaction[20]. As, in the examined example, the client sells the real estate to the agent for 10% more; thus an institutional connection is established. The client, however, gets this 10% difference in the purchasing price through her/his personal connections to the agent, who, in the meantime, has switched roles, and passes the money on to the hidden principals (presumably in return for a brokerage commission or other advantage) as the hidden agent of the parties. All of this comprises the complex pattern of embezzlement, as generated by party financing[21].

[20] In a more sophisticated model, the agent already has a broker through whom the money makes its way to the hidden principal. The broker is none other than a social organization or foundation with close ties to the hidden principal, or even a company owned by the hidden agent. In this scenario, the client is coerced by the principal to sell a service to the broker for less than the market rate. The corruption fee – profit from purchasing the service at a submarket price – is then collected by the hidden principal. This model presupposes a more complex network of institutional relationships. The broker, who plays a key role in minimizing the risk of getting caught for the transaction, is of equal importance to both the agent and the hidden principal.

[21] Embezzlement often manifests in conjunction with bribery. This is also evidenced by the fact that, during criminal proceedings of this type, from a standpoint of investigation strategy, these two cases are usually handled together (Ibolya, 2010).

9.3.4 Fraud network

Case number four: personal and institutional embeddedness of corruption in connection with the use of EU funds[22]

The ABC institution has won a grant of tens of millions of Euro for a project aimed at analyzing and monitoring different labor market processes. The system had to be set up in two years, and it was this amount of time that the institution had to spend the grant, which proved to be a great challenge in itself. This objective was accomplished by the leaders of the institution by purchasing and paying for studies which had already existed prior to the start of the project, but were only known in small professional circles. In addition, they employed hundreds of external experts without them doing any actual work and bought services (*e.g.*, research) that were not closely related to the original objectives of the project. The resulting background studies and analyses were mostly useless in terms of realizing the original goals. Nor did the project materialize in accordance with the initial aims. While the realization process could hardly be considered successful from a professional standpoint, from a financial perspective, everything progressed according to regulations. Partners, when needed, were selected through public procurement, contracts were signed, the performance was documented, performance certificates were issued prior to payment.

When it comes to the use of EU grants, it is in the interest of the agent (project implementer) from the beginning to exaggerate the budget as much as possible, in other words, to make as many investments and buy as many services – which are only loosely related to the initial objectives – as possible. This interest may perversely coincide with the interest of the authorities that make decisions about, and monitor, the project to not waste any funds granted by the EU. Rather, the objective is to "fill them with the appropriate professional content", thereby increasing the country's "absorption capacity". For these authorities, it is easier – or it carries smaller specific transaction costs – to organize and manage a large-scale project than many smaller ones which, in total, requiring the same amount of funds as the latter. The agent then launches the project with his or her attention primarily focused on the scheduled spending of the allocated amount, with the realization of the original goals being only of secondary importance. The controlling authority chiefly monitors the observation of deadlines and scheduled spending. The effective use of funds demands that the agent

---

[22] *Source*: interviews conducted by the authors.

(project implementer) has the appropriate personal and institutional relationships, in order to gain access to those quasi-performances that, to some extent, fit the announced objective, and make the spending of the project fund and, thus, the "successful" completion of the project possible. During the implementation process, it is not necessary to resort to bribery, but the system of mutual aid – logrolling – is a widespread phenomenon, and this is what facilitates the "successful" completion of the project. The experts and institutions (clients) selected by the agent aid the project implementer (the agent) in finding work and other sources of funding in other areas, for example, in other EU projects. To the controlling authority (or even to the EU), everything seems to be in order: the grant was spent, the project was realized, the expenses were conducted and the financial report was completed by the book – except that the original goal was not realized. In this respect, the act of fraud manifests in the relationship between the EU (and the taxpayers of the EU) and the project-launching and controlling authority, on the one hand, and between this authority and the implementing institution on the other. The agent (the implementer of the project), in this context, can also act in accordance with the interests of a hidden principal, when transferring a part of the handled EU funds to a colleague, an expert, or a subordinate organization, in return for some quasi-performance. The hidden principal can be a private company, a political party, or a state institution (see Figure 9.10). The establishment of this kind of fraud network is made possible by personal connections between the agent and the hidden principal, the relationship between the agent and the clients who act as the hidden broker, as well as the institutional (contractual) affiliation between the latter and the hidden principal. As a unique feature of the relationship between the agent and the brokers, it is in this context that the contractual arrangements are made for performances that are more or less irrelevant from the standpoint of the original project goals, whereby brokers are significantly overpaid in return for quasi-performances. At the same time, the brokers, during the process of fulfilling the conditions of the contractual agreement with the hidden principal, are satisfied with a smaller compensation. Thus, in case of hidden party financing, for instance, remuneration for the kind of expert work that is important to the party can come from the EU project.
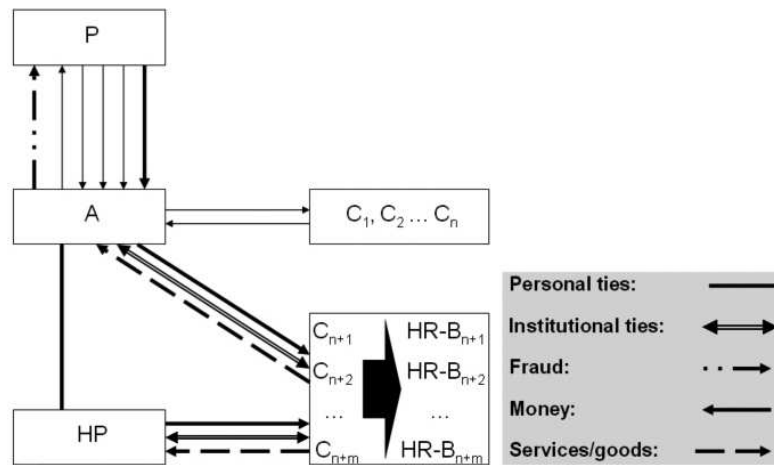
Figure 9.10 Graph of networked fraud. Notation: *P*: principal (authority announcing the call for projects); *A*: agent (implementer of the project); $C_1, C_2, \ldots, C_n$: clients (experts and institutions realizing the original objectives of the project); $C_{n+1}, C_{n+2}, C_{n+m}$: quasi-clients (clients involved in the fraud); $HR - B_{n+1}, HR - B_{n+2}, HR - B_{n+m}$: the quasi-clients switch roles and cater to the needs of the hidden principal in the role of the hidden agent ($HR - B$: hidden role – broker); *HP*: hidden principal (*e.g.*, private company, political party, or state institution).

9.4 Conclusion

We examined the phenomenon of corruption by focusing on the relationship networks between the actors. In our analysis of corruption, we took the principal-agent-client model as our point of departure, and it was also based on this that the subtypes of corruption were identified: bribery, extortion, embezzlement, and fraud. Specific cases were discussed to supplement the models with the various types of relationships between the actors, as well as the new actors of corruption networks: the brokers and the hidden principals. Moreover, in a number of cases, we also took into account the hidden roles of those involved in the transaction. By this we meant that, as the corruption network develops, some of the actors abandon their original roles and assume new ones (hidden agent, hidden client, and hidden broker). We differentiated between two basic kinds of relationships: personal and institutional. On the other hand, we also made a distinction between two different subtypes based on the number of actors: few-actor and multi-actor relationships.

We demonstrated four possible corruption networks, based on data ob-

tained from interviews and internet news sources. These scenarios were analyzed according to the four basic corruption types. During this process, we took into account the interpersonal and institutional embeddedness of the different types of corruption networks, illustrating these in multiplex graphs. Based on our research experience, the formation and embedding of these typical network configurations can be expected to occur primarily due to a decrease in the transaction costs and risks associated with carrying through corruption transactions.

In light of all this, one of the important conclusions we can draw from our research is that, while corruption transactions can be traced back to a few well-defined, basic types, the presented cases, which can be considered typical, demonstrate the complexity of the manifesting corruption networks and the multiplicity of relationships between the involved players. In a more complicated corruption transaction, for example, both the agent and the client can have a broker; in other words, the payment of the bribe does not take place between the actual actors, but through the brokers. In some cases, the agents, following their own interests, may initiate extortion or fraud, or may accept the bribe offered by the client. In other cases, however, the hidden relationship network is shaped by the interests of the hidden principals, in which personal and institutional intertwinings also play a role.

What could explain the multiplicity and complexity as well as the growing number of players and roles, as demonstrated by these examples? In answering this question, we stress the influence of two factors:

1. Every corruption transaction comes into being when the given regulatory and institutional conditions are present. These regulatory and institutional frameworks – which already exist prior to the transaction – fundamentally influence how the concrete transaction manifests. In other words, it is the institutional embeddedness and regulatory environment of corruption that determines the framework of its realization. Brokers cannot be utilized, nor can the bribe be "transferred", in bribery during a roadside check. It follows from the situation that this is a simple (didactic) relationship, where the bribe is slipped into the police officer's pocket. If a business venture applies for a license, brokers can enter into the transaction, so that it can also be realized through institutional relationships (*e.g.*, selling and purchasing services or goods between ventures).

2. On the other hand, the realization of corruption is also influenced by the actors' calculations in reference to the transaction: how big is the risk

of getting caught, what is the punishment if that happens, and what is the expected benefit (or profit) if the corruption is realized? In this regard, we can consider the formation of the various types of corruption networks as the result of these calculations. Multiplayer corruption scenarios that are grounded in institutional relationships carry higher transaction costs than simple setups involving only a few parties. At the same time, through the first mentioned type of transaction, the risk of getting caught can be reduced for all involved. Through the utilization of brokers, for example, collecting the bribe can separate in time from the provision of the service, and, in fact, by availing themselves to the broker(s)'s services, the original actors can conceal their corrupt transactions as legitimate dealings.

Bibliography

Abbott, A. 1995. Things of Boundaries. *Social Research*, **62**, 857–882.

Adams, J. D., Black, G. C., Clemmons, J. R., and Stephan, P. E. 2005. Scientific teams and institutional collaborations: evidence from U.S. universities. *Research Policy*, **34**, 259–285.

Afgan, N. H., Carvalho, M. G., Pilavachi, P. A., and Martins, N. 2007. Evaluation of natural gas supply options for south east and central Europe. Part 1: indicator definitions and single indicator analysis. *Energy Conversion and Management*, **48**, 2517–2524.

Agency for Toxic Substances and Disease Registry. 2007. *Case studies in environmental medicine (CSEM) nitrate/nitrite toxicity.* `www.atsdr.cdc.gov/csem/nitrate/nitrate.html`.

Aksnes, D. W. 2006. Citation rates and perceptions of scientific contribution. *Journal of the American Society for Information Science and Technology*, **57**, 169–185.

Albanese, D., Merler, S., Jurman, G., Visintainer, R., and Furlanello, C. 2009. *MLPY Machine Learning PY.* `http://mloss.org/software/view/66/`.

Albert, R., and Barabási, A.-L. 2002. Statistical mechanics of complex networks. *Reviews of Modern Physics*, **74**, 47–97.

Albert, R., Jeong, H., and Barabási, A.-L. 2000. Error and attack tolerance of complex networks. *Nature*, **406**, 378–381.

Albert, R., Albert, I., and Nakarado, G. L. 2004. Structural vulnerability of the North American power grid. *Physical Review E*, **69**, 103–107.

Alcácer, J., and Gittleman, M. 2006. Patent citations as a measure of knowledge flows: the influence of examiner citations. *The Review of Economics and Statistics*, **88**, 774–779.

Alexa, N., Bárdos, R., Szántó, Z., and Tóth, I. J. 2008. Corruption risks in the business sector. Integrity system country study (part two). *Transparency International*.

Ali, S. N., Young, H. C., and Ali, N. M. 1996. Determining the quality of publications and research for tenure or promotion decisions: a preliminary checklist to assist. *Library Review*, **45**, 39–53.

Allard, A., Noël, P.-A., L., Dube, and Pourbohloul, B. 2009. Heterogeneous bond percolation on multitype networks with an application to epidemic dynamics. *Physical Review E*, **79**.

Allesina, S., and Bodini, A. 2004. Who dominates whom in the ecosystem? Energy flow bottlenecks and cascading extinctions. *Journal of Theoretical Biology*, **230**, 351–358.

Allesina, S., Bodini, A., and Bondavalli, C. 2006. Secondary extinctions in ecological networks: bottlenecks unveiled. *Ecological Modelling*, **194**, 150–161.

Allesina, S., Bodini, A., and Pascual, M. 2009. Functional links and robustness in food webs. *Philosophical Transactions of the Royal Society of London - Series B: Biological Sciences*, **364**, 1701–1709.

Amaral, L. A. N. 2005. Novel collaborations within experienced teams lead to best research outcomes. *Annals of Vascular Surgery*, **19**, 753–754.

Amaral, L. A. N., and Ottino, J. 2004. Complex networks: Augmenting the framework for the study of complex systems. *European Physical Journal B*, **38**, 147–162.

Amaral, L. A. N., and Uzzi, B. 2007. Complex systems–a new paradigm for the

integrative study of management, physical, and technological systems. *Management Science*, **53**, 1033–1035.

Amaral, L. A. N., Scala, A., Barthélémy, M., and Stanley, H. E. 2000. Classes of small-world networks. *Proceedings of the National Academy of Sciences U.S.A.*, **97**, 11149–11152.

Amenta, E., Carruthers, B., and Zylan, Y. 1992. A hero for the aged? The Townsend Movement, the political mediation model, and U.S. old-age policy, 1934-1950. *American Journal of Sociology*, **98**, 308–339.

Andrews, K.T., and Edwards, B. 2005. The organizational structure of local environmentalism. *Mobilization*, **10**, 213–234.

Andvig, J. C., and Fjeldstad, O.-H. 2000. *Corruption. A review of contemporary research. NUPI Report No. 268*. Tech. rept. Oslo: Norwegian Institute of International Affairs. Also published as CMI Report R 2001:7.

Ansell, C. 2003. Community embeddedness and collaborative governance in the San Francisco Bay Area Environmental Movement. Pages 123–144 of: *Social Movements and Networks*. Oxford University Press.

Armstrong, E.A. 2005. From struggle to settlement: the crystallization of a field of lesbian/gay organizations in San Francisco, 1969-1973. Pages 161–187 of: *Social Movements and Organizations*. Cambridge University Press.

Aronowitz, S., and Bratsis, P. 2002. *Paradigm Lost: State Theory Reconsidered*. University of Minnesota Press.

Arrighi, G., and Silver, B. J. 1999a. Conclusion. Pages 271–289 of: *Chaos and Governance in the Modern World System*. University of Minnesota Press.

Arrighi, G., and Silver, B. J. 1999b. Introduction. Pages 1–36 of: *Chaos and Governance in the Modern World System*. University of Minnesota Press.

Arrighi, G., and Silver, B. J. 2001. Capitalism and world (dis)order. *Review of International Studies*, **27**, 257–279.

Ashby, W. R. 1960. *Design for a Brain: The Origin of Adaptive Behavior*. Chapman & Hall.

Babchuk, N., Bruce, K., and George, P. 1999. Collaboration in sociology and other scientific disciplines: a comparative trend analysis of scholarship in the social, physical, and mathematical sciences. *The American Sociologist*, **30**, 5–21.

Baker, W. E. 1992. The network organization in theory and practice. Pages 397–429 of: *Networks and Organizations*. Harvard Business School Press.

Balachandran, S., Kogut, B., and Harnal, H. 2010 (February). *The probability of default, excessive risk, and executive compensation: a study of financial services firms from 1995 to 2008. Available at SSRN: http://ssrn.com/abstract= 19145*. Tech. rept. Columbia Business School Research Paper.

Balirwa, J. S., Chapman, C. A., Chapman, L. J., Cowx, I. G., Geheb, K., Kaufman, L., Lowe-McConnell, R. H., Seehausen, O., Wanink, J. H., Welcomme, R. E., and Witte, F. 53. Biodiversity and fishery sustainability in the Lake Victoria Basin: an unexpected marriage? *BioScience*, **2003**, 703–715.

Ball, F., Mollison, D., and Scalia-Tomba, G. 1997. Epidemics with two levels of mixing. *The Annals of Applied Probability*, **7**, 46–89.

Balthazard, P., Potter, R. E., and Warren, J. 2004. Expertise, extraversion and group interaction styles as performance indicators in virtual teams: how do perceptions of IT's performance get formed? *ACM SIGMIS Database*, **35**, 41–64.

Bandura, A. 1977. *Social Learning Theory*. General Learning Press.

Barabási, A.-L. 2003. *Linked: How Everything is Connected to Everything Else and What it Means for Business and Everyday Life*. Cambridge: Plume.

Barabási, A.-L., and Albert, R. 1999. Emergence of scaling in random networks. *Science*, **286**, 509–512.

Barabási, A-L., Jeong, H., Néda, Z., Ravasz, E., Schubert, A., and Vicsek, T. 2002. Evolution of the social network of scientific collaborations. *Physica A*, **311**, 590–614.

Barringer, B. R., and Harrison, J. S. 2000. Walking a tightrope: creating value through interorganizational relationships. *Journal of Management*, **26**, 367–403.

Barsade, S. G., Ward, A. J., Turner, J. D. F., and Sonnenfeld, J. A. 2000. To your heart's content: a model of affective diversity in top management teams. *Administrative Science Quarterly*, **45**, 802–836.

Bascompte, J. 2007. Networks in ecology. *Basic and Applied Ecology*, **8**, 485–490.

Baum, J. A. C., and Oliver, C. 1991. Institutional linkages and organizational mortality. *Administrative Science Quarterly*, **36**, 187–218.

Baum, J. A. C., McEvily, B., and Rowley, T. 2007. Better with age: the longevity and the performance implications of bridging and closure. *Rotman School of Management, University of Toronto*, **Working paper n. 1032282**.

Bebchuk, L. A., and Grinstein, Y. 2005. The growth of executive pay. *Oxford Review of Economic Policy*, **21**, 283–303.

Bebchuk, L. A., and Spamann, H. 2010. Regulating bankers' pay. *Georgetown Law Journal*, **98**, 247–287.

Becker, G. S. 1968. Crime and punishment: an economic approach. *Journal of Political Economy*, **76**, 169–217.

Bennani-Chraïbi, M., and Fillieule, O. 2003. *Résistances et Protestations dans les Sociétés Musulmanes.* Presses de Sciences Po.

Bettencourt, L. M. A., Lobo, J., Helbing, D., Kühnert, C., and West, G. B. 1995. Explaining the level of bridewealth. *Current Anthropology*, **35**, 311–316.

Bettencourt, L. M. A., Lobo, J., Helbing, D., Kühnert, C., and West, G. B. 2007. Growth, innovation, scaling, and the pace of life in cities. *Proceedings of the National Academy of Sciences U.S.A.*

Bodini, A. 1990. What is the role of predation on stability of natural communities? A theoretical investigation. *Biosystems*, **26**, 21–30.

Bodini, A. 1998. Representing ecosystem structure through signed digraphs. Model reconstruction, qualitative predictions and management: the case of a freshwater ecosystem. *Oikos*, **83**, 93–106.

Bodini, A. 2000. Reconstructing trophic interactions as a tool for understanding and managing ecosystems: application to a shallow eutrophic lake. *Canadian Journal of Fisheries and Aquatic Sciences*, **57**, 1999–2009.

Bodini, A., and Bondavalli, C. 2002. Towards a sustainable use of water resources: a whole-ecosystem approach using network analysis. *International Journal of Environment and Pollution*, **18**, 463–485.

Bodini, A., Giavelli, G., and Rossi, O. 1994. The qualitative analysis of community food webs: implications for wildlife management and conservation. *Journal of Environmental Management*, **41**, 49–65.

Bodini, A., Bellingeri, M., Allesina, S., and Bondavalli, C. 2009. Using food web dominator trees to catch secondary extinctions in action. *Philosophical Transactions of the Royal Society of London - Series B: Biological Sciences*, **364**, 1725–1731.

Bolton, P., and Dewatripont, M. 2005. *Contract Theory.* MIT Press.

Bondavalli, C., Bodini, A., Rossetti, G., and Allesina, S. 2006. Detecting stress at the whole ecosystem level. The case of a mountain lake: Lake Santo (Italy). *Ecosystems*, **9**, 768–787.

Borgatti, S. P., and Foster, P. 2003. The network paradigm in organizational research: a review and typology. *Journal of Management*, **29**, 991–1013.

Borgatti, S. P., Everett, M. G., and Freeman, L. C. 2002. *Ucinet for Windows: Software for Social Network Analysis*. Analytic Technologies, Harvard.

Borner, K., Maru, J. T., and Goldstone, R. L. 2004. The simultaneous evolution of author and paper networks. *Proceedings of the National Academy of Sciences U.S.A.*, **101**, 5266–5273.

Börner, K., Contractor, N. S., Falk-Krzesinski, H. J., Fiore, S. M., Hall, K. L., Keyton, J., Spring, B., Stokols, D., Trochim, W., and Uzzi, B. 2010. A multi-level systems perspective for the science of team science. *Science Translational Medicine*, **2**, 49cm24.

Boser, B. E., Guyon, I. M., and Vapnik, V. N. 1992. A training algorithm for optimal margin classifiers. Pages 144–152 of: *Proceedings of the 5th Annual Conference on Computational Learning Theory*. New York, NY, USA: ACM Press.

Bowers, R. V. 1937. The direction of intra-societal diffusion. *American Sociological Review*, **2**, 826–836.

Bowler, P. J., and Morus, I. R. 2005. *Making Modern Science: A Historical Survey*. Chicago: University of Chicago Press.

BP. 2008. *BP Statistical Review of World Energy 2008*. Tech. rept. British Petroleum.

Brass, D. J., Galaskiewicz, J., Greve, H. R., and Tsai, W. 2004. Taking stock of networks and organizations: a multilevel perspective. *Academy of Management Journal*, **47**, 795–817.

Braudel, F. 1973. *Capitalism and Material Life, 1400-1800*. Harper and Row.

Brauer, F. 2005. The Kermack McKendrick epidemic model revisited. *Mathematical Biosciences*, **198**, 119–131.

Breiger, R.L. 1974. The duality of persons and groups. *Social Forces*, **53**, 181–190.

Brown, J. R. 2000. Privatizing the university–the new tragedy of the commons. *Science*, **290**, 1701–1702.

Bunker, R. J. 2006. *Networks, Terrorism and Global Insurgency*. Routledge: London and New York.

Burstein, P., and Linton, A. 2002. The impact of political parties, interest groups, and social movement organizations on public policy. *Social Forces*, **75**, 135–169.

Burt, R. S. 1987. Social contagion and innovation: cohesion versus structural equivalence. *American Journal of Sociology*, **92**, 1287–1335.

Burt, R. S. 1992. *Structural Holes: The Social Structure of Competition*. Harvard University Press.

Burt, R. S. 1999. The social capital of opinion leaders. *Annals of the American Academy of Political and Social Science*, **566**, 37–54.

Burt, R. S. 2005. *Brokerage and Closure: An Introduction to Social Capital*. Oxford University Press.

Burt, R. S. 2008. Information and Structural Holes: Comment on Reagans and Zuckerman. *Industrial and Corporate Change*, **17**, 953–969.

Callaway, D. S., Newman, M. E. J., Strogatz, S. H., and Watts, D. J. 2000. Network robustness and fragility: percolation on random graphs. *Physical Review Letters*, **85**, 5468–5471.

Camerano, L. 1880. Dell'equilibrio dei viventi mercé la reciproca distruzione. *Atti della Reale Accademia della Scienze di Torino*, **15**, 393–414.

Camerer, C., and Knez, M. 1996. Coordination, organizational boundaries and fads in business practices. *Industrial and Corporate Change*, **5**, 89–112.

Campbell, J. L. 2005. Where do we stand? Common mechanisms in organizations and social movement research. Pages 41–68 of: *Social Movements and Organizations*. Cambridge University Press.

Cardona, J., and Lacroix, C. 2008. *Chriffres Clés: Statistiques de la culture*. Paris: La Documentation française.

Carroll, W. K., and Ratner, R. S. 1996. Master framing and cross-movement networking in contemporary social movements. *Sociological Quarterly*, **37**, 601–625.

Carruthers, B. G., and Halliday, T. 1998. *Rescuing Business: The Making of Corporate Bankruptcy Law in England and the United States*. Oxford University Press.

Castells, M. 1996. *The Rise of the Network Society*. Blackwell.

Çetin, T., and Oguz, F. 2007. The reform in the Turkish natural gas market: A critical evaluation. *Energy Policy*, **35**, 3856–3867.

Ceballos, G., and Ehrlich, P. R. 2002. Mammal population losses and the extinction crisis. *Science*, **296**, 904–439.

Chandler, T. 1987. *Four Thousand Years of Urban Growth*. St. David's University Press.

Chang, C.-C., and Lin, C.-J. 2001. *LIBSVM: a library for support vector machines*. Software available at http://www.csie.ntu.edu.tw/~cjlin/libsvm.

Chaudhuri, K. N. 1978. *Trading World of Asia and the English East India Company*. Cambridge University Press.

Cheit, R. E., and Gersen, J. E. 2000. When businesses sue each other: An empirical study of state court litigation. *Law & Social Inquiry*, **25**, 789–816.

Chen, L. L., Blumm, N., Christakis, N. A., Barabási, A.-L., and Deisboeck, T. S. 2009. Cancer metastasis networks and the prediction of progression patterns. *British Journal of Cancer*, **101**, 749–758.

Christakis, N. A., and Fowler, J. H. 2009. *Connected: The Surprising Power of our Social Networks and how they Shape our Lives*. Little Brown and Co.

CIA. 2008. *The World Factbook*. Potomac Books.

Clark, H. H., and Wilkes-Gibbs, D. 1986. Referring as a collaborative process. *Cognition*, **22**, 1–39.

Clark, R. A., and Goldsmith, R. E. 2005. Market mavens: psychological influences. *Psychology and Marketing*, **22**, 289–312.

Cohen, J. E. 1994. Lorenzo Camerano's contribution to early food web theory. Pages 351–359 of: *Frontiers in Mathematical Biology, Part V: Frontiers in Community and Ecosystem Ecology*. Springer-Verlag.

Cohen, J. E., Briand, F., and Newman, C. M. 1990. *Community Food Webs: Data and Theory*. Springer–Verlag.

Cohen, M. D., and Bacdayan, E. 1994. Organizational routines are stored as procedural memory: evidence from a laboratory study. *Organization Science*, **5**, 554–568.

Cohen, R., Erez, K., Ben-Avraham, D., and Havlin, S. 2000a. Resilience of the Internet to Random Breakdowns. *Physical Review Letters*, **85**, 4626–4628.

Cohen, S., Brissette, I., Skoner, D., and Doyle, W. 2000b. Social integration and health: the case of the common cold. *Journal of Social Structure*, **1**, 1–7.

Cohen, W., and Levinthal, D. 1994. A fortune favors the prepared firm. *Management Science*, **40**, 227–251.

Coleman, J., Katz, E., and Menzel, H. 1957. The diffusion of an innovation among physicians. *Sociometry*, **20**, 253–270.

Collins, R. 1998. *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge: Harvard University Press.

Compas, B. E., David, A., Haaga, F., Keefe, F. J., Leitenberg, H., and Williams, D. A. 1998. Sampling of empirically supported psychological treatments from health psychology: smoking, chronic pain, cancer, and bulimia nervosa. *Journal of Consulting and Clinical Psychology*, **66**, 89–112.

Contractor, N. S. 1994. New approaches to organizational communication. Pages 39–65 of: Kovacic, B. (ed), *New Approaches to Organizational Communication*. SUNY Press.

Contractor, N. S. 2009. The emergence of multidimensional networks. *Journal of Computer-Mediated Communication*, **14**, 743–747.

Contractor, N. S., Monge, P., and Leonardi, P. 2011. Multidimensional networks and the dynamics of sociomateriality: bringing technology inside the network. *International Journal of Communication*, **5**, 1–20.

Corden, W. M., and Neary, J. P. 1982. Booming sector and de-industrialisation in a small open economy. *Economic Journal*, **92**, 825–848.

Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R. V., Paruelo, J., Raskin, R. G., Sutton, P., and van den Belt, M. 1997. The value of the world's ecosystem services and natural capital. *Nature*, **387**, 253–260.

Coyle, D. 2011. *The Economics of Enough: How to Run the Economy as If the Future Matters*. Princeton University Press.

Cronin, B., Shaw, D. D., and La Barre, K. 2003. A cast of thousands: Coauthorship and subauthorship collaboration in the 20th century as manifested in the scholarly journal literature of psychology and philosophy. *Journal of American Society for Information Technology*, **54**, 855–871.

Csárdi, G., and Nepusz, T. 2006. The igraph software package for complex network research. *InterJournal*, **Complex Systems**, 1695. `http://igraph.sf.net`.

Csermely, P. 2008. Creative elements: network-based predictions of active centres in proteins, cellular and social networks. *Trends in Biochemical Sciences*, **33**, 569–576.

Csermely, P. 2009. *Weak Links: The Universal Key to the Stability of Networks and Complex Systems*. Springer Verlag.

Cummings, J. N., and Kiesler, S. 2007. Who works with whom? Collaborative tie strength in distributed interdisciplinary projects. In: *Third International e-Social Science Conference*.

Dalton, R. 1994. *The Green Rainbow: Environmental Groups in Western Europe*. Yale University Press.

Dalton, R. 2008. *Citizen Politics*. 5th edn. CQ Press.

de Solla Price, D. J. 1963. *Little Science, Big Science-and Beyond*. New York: Columbia University Press.

Degenne, A., and Forsé, M. 1999. *Introducing Social Networks*. Sage.

Dekker, A. H. 2007. Realistic social networks for simulation using network rewiring. Pages 677–683 of: *International Congress on Modelling and Simulation*.

Della Porta, D. 1995. *Social Movements, Political Violence and the State*. Cambridge University Press.

Dempster, A. P., Laird, N. M., and Rubin, D. B. 1977. Maximum likelihood from incomplete data via the EM algorithm. *Journal of the Royal Statistical Society, Series B*, **39**, 1–38.

Derényi, I., Farkas, I., Palla, G., and Vicsek, T. 2004. Topological phase transitions of random networks. *Physica A*, **334**, 583–590.

Devezas, T. 2001. The biological determinants of long wave behavior in socioeconomic growth and development. *Technological Forecasting and Social Change*, **68**, 1–57.

Devezas, T., and Modelski, G. T. 2008. The Portuguese as system-builders: technological innovation in early globalization. Pages 30–57 of: *Globalization as Evolutionary Process: Modeling, Simulating, and Forecasting Global Change*. Routledge.

Dewey, J. 1998. The pattern of inquiry. Pages 169–179 of: *The Essential Dewey, Volume 2: Ethics, Logic, Psychology*. Indiana University Press.

Di Battista, G., Eades, P., Tamassia, R., and Tollis, I. G. 1999. *Graph Drawing: Algorithms for the Visualization of Graphs*. Prentice Hall.

Diani, M. 1995. *Green Networks. A Structural Analysis of the Italian Environmental Movement*. Edinburgh University Press.

Diani, M. 2002. Network analysis. Pages 173–200 of: *Methods of Social Movement Research*. University of Minnesota Press.

Diani, M., and Bison, I. 2004. Organizations, coalitions, and movements. *Theory and Society*, **33**, 281–309.

DiMaggio, P. J., and Powell, W. W. 1983. The iron cage revisited: institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, **48**, 147–160.

DiPrete, T. A., Eirich, G., and Pittinsky, M. 2010. Compensation benchmarking, leapfrogs, and the surge in executive pay. *American Journal of Sociology*, **115**, 1671–1712.

Dunbar, R. I. M. 2005. Why are good writers so rare? An evolutionary perspective on literature. *Journal of Cultural and Evolutionary Psychology*, **3**, 7–22.

Dunne, J. A., Williams, R. J., and Martinez, N. D. 2002a. Food-web structure and network theory: The role of connectance and size. *Proceedings of the National Academy of Sciences U.S.A.*, **99**, 12917–12922.

Dunne, J. A, Williams, R. J., and Martinez, N. D. 2002b. Network structure and biodiversity loss in food webs: robustness increases with connectance. *Ecology Letters*, **5**, 558–567.

Dunne, J. A, Williams, R. J., and Martinez, N. D. 2004. Network structure and robustness of marine food webs. *Marine Ecology Progress Series*, **273**, 291–302.

Easley, D., and Kleinberg, J. 2010. *Networks, Crowds, and Markets: Reasoning About a Highly Connected World*. Cambridge University Press.

Ebenman, B., and Jonsson, T. 2005. Using community viability analysis to identify fragile systems and keystone species. *Trends in Ecology and Evolution*, **20**, 568–575.

Edmondson, A. 1999. Psychological safety and learning behavior in work teams. *Administrative Science Quarterly*, **44**, 350–383.

EEGA. 2008. *Major Gas Pipelines of the Former Soviet Union and Capacity of Export Pipelines*. Tech. rept. East European Gas Analysis. `www.eegas.com/fsu.htm`.

EIA. 2008. *Country Analysis Briefs*. Tech. rept. Energy Information Administration. `www.eia.doe.gov/emeu/cabs`.

English, J. F. 2005. *The Economy of Prestige: Prizes, Awards, and the Circulation of Cultural Value*. Cambridge: Harvard University Press.

Erdös, P., and Rényi, A. 1959. On random graphs. *Publicationes Mathematicae*, **6**, 290–297.

Erdös, P., and Rényi, A. 1960. On the evolution of random graphs. *Publications of the Mathematical Institute of the Hungarian Academy of Sciences*, **5**, 17–61.

Erikson, E., and Bearman, P. 2006. Foundations for global trade: the structure of English trade in the East Indies. *American Journal of Sociology*, **112**, 195–230.

Espinosa-Romero, M. J., Gregr, E. J., Walters, C., Christensen, V., and Chan, K. M. A. 2009. Representing mediating effects and species reintroductions in Ecopath with Ecosim. *Ecological Modelling*, **222**, 1569–1579.

Estes, J. A., and Palmisano, J. F. 1974. Sea otters: their role in structuring nearshore communities. *Science*, **185**, 1058–1060.

Etzkowitz, H., Kemelgor, C., Neuschatz, M., Uzzi, B., and Alonzo, J. 1994. The paradox of critical mass for women in science. *Science*, **266**, 51–54.

EU. 2002. *EU Green Paper: Towards a European Strategy for the Security of Energy Supply*. Tech. rept. European Commission.

Eurostat. 2008. *Energy - Yearly Statistics 2006, Edition 2008. Theme: Environment and energy Collection: Statistical books*. Tech. rept. European Union.

Evans, J. A. 2008. Electronic publication and the narrowing of science and scholarship. *Science*, **321**, 395–399.

Fafchamps, M., Goyal, S., and van der Leij, M. J. 2010. Matching and network effects. *Journal of the European Economic Association*, **8**, 203–231.

Fahlenbrach, R., and Stulz, R. M. 2011. Bank CEO incentives and the credit crisis. *Journal of Financial Economics*, **99**, 11–26.

Falconi, A. M., Guenfoud, K., Lazega, E., Lemercier, C., and Mounier, L. 2005. Le Contrôle social du monde des affaires: une étude institutionnelle. *L'Année Sociologique*, **55**, 451–484.

Falk-Krzesinski, H. J., Börner, K., Contractor, N. S., Fiore, S. M., Hall, K. L., Keyton, J., Spring, B., Stokols, D., Trochim, W., and Uzzi, B. 2010. Advancing the science of team science. *Clinical and Translational Sciences*, **3**, 263–266.

Falk-Krzesinski, H. J., Contractor, N. S., Fiore, S. M., Hall, K. L., Kane, C., Keyton, J., Klein, J., Spring, B., Stokols, D., and Trochim, W. 2011. Mapping a research agenda for the science of team science. *Research Evaluation*, **20**, 143–156.

Faulkender, M., and Yang, J. 2010. Inside the black box: the role and composition of compensation peer groups. *Journal of Financial Economics*, **96**, 257–270.

Feick, L. F., and Price, L. L. 1987. The market maven: a diffuser of marketplace information. *The Journal of Marketing*, **51**, 83–97.

Fernandez-Mateo, I. 2007. Who pays the price of brokerage? Transferring constraint through price setting in the staffing sector. *American Sociological Review*, **72**, 291–317.

Festinger, L., and Schachter, S. 1950. *Social Pressures in Informal Groups: A Study of Human Factors in Housing*. Harper.

Figyelő. 2002. Kétszázak klubja 2001. In: *Figyelő Top 200*.

Fiore, S. M. 2008. Interdisciplinarity as teamwork how the science of teams can inform team science. *Small Group Research*, **39**, 251–277.

Fitzgerald, F. S. 1993. The Crack Up. Page 122 of: Wilson, E. (ed), *The Crack Up*. New York: New Directions.

Flanagin, A. J., Stohl, C., and Bimber, B. 2006. Modeling the structure of collective action. *Communication Monographs*, **73**, 29–54.

Flemming, R. B. 1998. Contested terrains and regime politics: thinking about America's trial courts and institutional change. *Law & Social Inquiry*, **23**, 941–965.

Fortunato, S. 2010. Community detection in graphs. *Physics Reports*, **486**, 75–174.

Freeman, L. C., Borgatti, S. P., and White, D. R. 1991. Centrality in valued graphs: A measure of betweenness based on network flow. *Social Networks*, **13**, 141–154.

Friedkin, N. E. 2004. Social cohesion. *Annual Review of Sociology*, **30**, 409–425.

Fruchterman, T. M., and Reingold, E. M. 1991. Graph drawing by force-directed placement. *Software - Practice and Experience*, **21**, 1129–1164.

Fulk, J., Flanagin, A., Kalman, M., Monge, P. R., and Ryan, T. 1996. Connective and communal public goods in interactive communication systems. *Communication Theory*, **61**, 60–87.

Fulk, J., Heino, R., Flanagin, A., Monge, P., and Bar, F. 2004. A test of the individual action model for organizational information commons. *Organization Science*, **15**, 569–585.

Gabaix, X., and Landier, A. 2008. Why has CEO pay increased so much? *The Quarterly Journal of Economics*, **123**, 49–100.

Galdwell, M. 2000. *The Tipping Point*. New York: Little Brown and Company.

Gamson, W. 1961. A theory of coalition formation. *American Sociological Review*, **26**, 373–382.

Gardiner, J. A. 2009. Defining corruption. Pages 25–40 of: Heidenheimer, A. J., and Johnston, M. (eds), *Political Corruption: Concepts and Contexts*, 5th edn. Transaction Publishers, New Brunswick, New Jersey.

Gasch, A. P., Spellman, P. T., Kao, C. M., Carmel-Harel, O., Eisen, M. B., Storz, G., Botstein, D., and Brown, P. O. 2000. Genomic expression programs in the response of yeast cells to environmental changes. *Molecular Biology of the Cell*, **11**, 4241–4257.

George, E., Chattopadhyay, P., Sitkin, S. B., and Barden, J. 2006. Cognitive underpinnings of institutional persistence and change: a framing perspective. *Academy of Management Review*, **31**, 347–365.

Gergely, G., Derényi, I., Farkas, I., and Vicsek, T. 2005. Uncovering the overlapping community structure of complex networks in nature and society. *Nature*, **435**, 814–818.

Gerlach, L. 1971. Movements of revolutionary change. Some structural characteristics. *American Behavioral Scientist*, **43**, 813–836.

Gerlach, L. 2001. The structure of social movements: environmental activism and its opponents. Pages 289–310 of: *Networks and Netwars: The Future of Terror, Crime, and Militancy*. Rand.

Gerstner, L. V. 2002. *Who Says Elephants Can't Dance?* Harper Business, New York.

Giddens, A. 1994. *The Constitution of Society*. Polity Press.

GIE. 2008a. *Storage Map - Information by point*. Tech. rept. Gas Infrastructure Europe. `http://www.gie.eu/maps_data/availablecapacities.asp`.

GIE. 2008b. *The European Natural Gas Network (Capacities at cross-border points on the primary market)*. Tech. rept. Gas Infrastructure Europe. `http://www.gie.eu/maps_data/capacity.asp`.

Girvan, M., and Newman, M. E. J. 2002. Community structure in social and biological networks. *Proceedings of the National Academy of Sciences U.S.A.*, **99**, 7821–7826.

Glenn, J. K. 1999. Competing challengers and contested outcomes to state breakdown: the velvet revolution in Czechoslovakia. *Social Forces*, **78**, 187–211.

Goldenberg, J., Libai, B., and Muller, E. 2001. A complex systems look at the underlying process of word-of-mouth. *Marketing Letters*, **12**, 211–223.

Gordon, R. J., and Dew-Becker, I. 2008. *Controversies about the rise of American inequality: a survey*. Tech. rept. National Bureau of Economic Research Cambridge, Massachusetts, USA.

Gould, R. V. 1991. Multiple networks and mobilization in the Paris Commune. *American Sociological Review*, **56**, 716–729.

Gould, R. V. 2003. *Collision of Wills: How Ambiguity about Social Rank Breeds Conflict*. University of Chicago Press.

Granovetter, M. 1973. The strength of weak ties. *American Journal of Sociology*, **78**, 1360–1380.

Granovetter, M. 1978. Threshold models of collective behavior. *American Journal of Sociology*, **83**, 1420–1443.

Granovetter, M. 2005. Business groups and social organization. Pages 429–450 of: *Handbook of Economic Sociology*. Princeton University Press.

Granovetter, M. 2007. The social construction of corruption. In: Nee, V., and Swedberg, R. (eds), *On Capitalism*. Stanford University Press.

Green, S., and Green, K. 1996. *Broadway Musicals Show by Show*. 5th edn. Milwaukee: Hal Leonard.

Gruhl, D., Liben-Nowell, D., Guha, R., and Tomkins, A. 2004. Information diffusion through blogspace. *SIGKDD Explorations Newsletter*, **6**, 43–52.

Guimerá, R., Uzzi, B., Spiro, J., and Amaral, L. A. N. 2005. Team assembly mechanisms determine collaboration network structure and team performance. *Science*, **308**, 697–702.

Gulati, R., and Gargiulo, M. 1999. Where do interorganizational networks come from? *American Journal of Sociology*, **104**, 1439–1493.

Hackman, J. R., and Katz, N. 2010. Group behavior and performance. Pages 1208–1251 of: Fiske, S. T., Gilbert, D. T., and Lindzey, G. (eds), *Handbook of Social Psychology*, 5th edn. New York: Wiley.

Hahn, M. W., and Kern, A. D. 2005. Comparative genomics of centrality and essentiality in three eukaryotic protein-interaction networks. *Molecular Biology and Evolution*, **22**, 803–806.

Halbeisen, R. E., and Gerber, A. P. 2009. Stress-dependent coordination of transcriptome and translatome in yeast. *PLoS Biology*, **7**, e105.

Hall, B. H., Jaffe, A., and Trajtenberg, M. 2001. The NBER patent citations data file: lessons, insights and methodological tools. *National Bureau of Economic Research*, **Working Paper No. 8498**.

Hall, B. H., Jaffe, A. B., and Trajtenberg, M. 2005. Market value and patent citations. *RAND Journal of Economics*, **36**, 16–38.

Hannan, M. T., and Freeman, J. H. 1977. The population ecology of organizations. *American Journal of Sociology*, **82**, 929–964.

Hargreaves Heap, S., Hollis, M., Lyons, B., Sugden, R., and Weale, A. 1992. *The Theory of Choice. A Critical Guide*. Blackwell.

Harrison, D. A., Price, K. H., and Bell, M. P. 1998. Beyond relational demography: time and the effects of surface- and deep-level diversity on work group cohesion. *Academy of Management Journal*, **41**, 96–107.

Hartwell, L. H., Hopfield, J. J., Leibler, S., and Murray, A. W. 1999. From molecular to modular cell biology. *Nature*, **402**, 47–52.

Hayek, F. A. 1945. The use of knowledge in society. *American Economic Review*, **35**, 519–530.

Heckman, J. J. 1976. The common structure of statistical models of truncation, sample selection and limited dependent variables and a simple estimator for such models. *Annals of Economic and Social Measurement*, **5**, 475–492.

Heckman, J. J. 1979. Sample selection bias as a specification error. *Econometrica*, **47**, 153–161.

Hellman, J., and Kaufmann, D. 2001. Confronting the challenge of state capture in transition economies. *Finance & Development*, **38**, 31–35.

Hellman, J., Jones, G., and Kaufmann, D. 2000. Seize the state, seize the day: state capture, corruption and influence in transition. *World Bank Policy Research*, **Working Paper No. 2444**.

Herman, I., Melançon, G., and Scott Marshall, M. 2000. Graph visualization and navigation in information visualisation. *IEEE Transactions on Visualization and Computer Graphics*, **6**, 24–43.

Hethcote, H. W. 1989. Three basics epidemiological. *Biomathematics*, **18**, 119–144.

Hethcote, Herbert W. 2000. The Mathematics of Infectious Diseases. *SIAM Review*, **42**(4), 599–653.

Heydebrand, W., and Seron, C. 1990. *Rationalizing justice: The Political Economy of Federal District Courts*. SUNY Press.

Higashi, M., Burns, T. P., and Patten, B. C. 1989. Food network unfolding: an extension of trophic dynamics for application to natural ecosystems. *Journal of Theoretical Biology*, **140**, 243–261.

Hinds, P. J., Carley, K. M., Krackhardt, D., and Wholey, D. 2000. Choosing work group members: balancing similarity, competence, and familiarity. *Organizational Behavior and Human Decision Processes*, **81**, 226–251.

Holling, C. S. 1986. The resilience of terrestrial ecosystems: local surprise and global change. Pages 292–317 of: *Sustainable Development of the Biosphere*. Cambridge University Press.

Hollingshead, A. B. 1997. Retrieval processes in transactive memory systems. *Personality and Social Psychology*, **74**, 659–671.

Hollingshead, A. B. 1998. Communication, learning, and retrieval in transactive memory systems. *Journal of Experimental Social Psychology*, **34**, 423–442.

Holmgren, Å. J. 2006. Using graph models to analyze the vulnerability of electric power networks. *Risk Analysis*, **26**, 955–969.

Holstege, F. C., Jennings, E. G., Wyrick, J. J., Lee, T. I., Hengartner, C. J., Green, M. R., Golub, T. R., Lander, E. S., and Young, R. A. 1998. Dissecting the regulatory circuitry of a eukaryotic genome. *Cell*, **95**, 717–728.

Huang, M., Huang, Y., Ognyanova, K., Margolin, D., Shen, C., and Contractor, N. S. 2010. The effects of diversity and repeat collaboration on team performance in distributed nanoscientist teams. In: *Academy of Management Annual Conference*.

Huffaker, D. 2010. Dimensions of leadership and social influence in online communities. *Human Communication Research*, **36**, 593–617.

Ibolya, T. 2010. A hűtlen kezelés bizonyítása [Proving embezzlement]. *Rendészeti Szemle*, **10**, 82–94.

IEA. 1998. *Caspian Oil and Gas.* Tech. rept. International Energy Agency, Paris, France.

IEA. 2005. *Natural Gas Information 2005.* Tech. rept. IEA/OECD Paris.

IEA. 2007. *World Energy Outlook 2007.* Tech. rept. OECD/IEA, Paris.

IEA. International Energy Agency, Paris, France. *Energy balances of OECD countries 1960-2005.* Tech. rept. 2007.

Jackson, B. A. 2006. Groups, networks, or movements: a command-and-control-driven approach to classifying terrorist organizations and its application to Al Qaeda. *Studies in Conflict and Terrorism*, **29**, 241–262.

Jacobs, J. 1969. *The Economy of Cities.* Random House.

Jacobs, J. 1983. The Economy of Regions. In: *Third Annual E. F. Schumacher Lecture, Mount Holyoke College, South Hadley.*

Jacobs, J. 1992. *Systems of Survival: A Dialogue on the Moral Foundations of Commerce and Politics.* Random House.

Jehn, K. A., Northcraft, G. B., and Neale, M. A. 1999. Why differences make a difference: a field study of diversity, conflict, and performance in workgroups. *Administrative Science Quarterly*, **44**, 741–763.

Jenkins, M. 2003. Prospects for biodiversity. *Science*, **302**, 1175–1177.

Jeong, H., Tombor, B., Albert, R., Oltvai, Z. N., and Barabási, A.-L. 2000. The large-scale organization of metabolic networks. *Nature*, **407**, 651–654.

Jeppesen, E., Kristensen, P., Jensen, J. P., Søndergaard, M., Mortensen, E., and Lauridsen, T. 1991. Recovery resilience following a reduction in external phosphorous loading of shallow, eutrophic Danish lakes: duration, regulating factors and methods for overcoming resilience. *Memorie Istituto Italiano Idrobiologia*, **48**, 127–148.

Johnston, H., and Snow, D. A. 1998. Subcultures and the emergence of the Estonian nationalist opposition 1945-1990. *Sociological Perspectives*, **41**, 473–497.

Jones, B. F. 2005. The burden of knowledge and the 'death of the renaissance man': is innovation getting harder? *National Bureau of Economic Research*, **Working Paper No. 11360**.

Jones, C., Hesterly, W. S., and Borgatti, S. P. 1997. A general theory of network governance: exchange conditions and social mechanisms. *Academy of Management Review*, **22**, 911–945.

Jordán, F. 2009. Keystone species and food webs. *Philosophical Transactions of the Royal Society of London - Series B: Biological Sciences*, **364**, 1733–1741.

Jordán, F., Liu, W., and Wyatt, T. 2005. Topological constraints on the dynamics of wasp-waist ecosystems. *Journal of Marine Systems*, **57**, 250–263.

Kadushin, C., Ryan, D., Brodsky, A., and Saxe, L. 2005. Why it is so difficult to form effective community coalitions. *City and Community*, **4**, 255–275.

Kaplan, S. 2008. Are U.S. CEOs overpaid? *The Academy of Management Perspectives*, **22**, 5–20.

Kaplan, S. N., and Rauh, J. 2010. Wall Street and Main Street: what contributes to the rise in the highest incomes? *Review of Financial Studies*, **23**, 1004–1050.

Karl, T. L. 1997. *The Paradox of Plenty: Oil Booms and Petro-States.* University of California Press.

Katona, G., and Mueller, E. 1955. A study of purchase decisions. Pages 30–87 of: Clark, L. H. (ed), *Consumer Behavior: The Dynamics of Consumer Reaction.* New York University Press.

Katz, B. 2010. City centered. *Time*, **21**, 1–4.

Katz, E. 1996. Diffusion research at Columbia. Pages 61–70 of: Dennis, E. E., and Wartella, E. (eds), *American Communication Research: The Remembered History*. Lawrence Erlbaum Associates.

Katz, E., and Lazarsfeld, P. F. 1955. *Personal Influence: The Part Played by People in the Flow of Mass Communications*. New York: Free Press.

Katzenback, J. R., and Smith, D. K. 1993. *The Wisdom of Teams*. New York: Harper Business.

Kaufmann, D., and Kraay, A. 2007. On measuring governance: framing issues for debate. In: *Roundtable on Measuring Governance Hosted by the World Bank Institute and the Development Economics Vice-Presidency of The World Bank*.

Kaufmann, D., Kraay, A., and Mastruzzi, M. 2009. Governance matters VIII: aggregate and individual governance indicators, 1996-2008. *World Bank Policy Research*, **Working Paper No. 4978**.

Kempe, D., Kleinberg, J., and Tardos, É. 2003. Maximizing the spread of influence through a social network. Pages 137–146 of: *Proceedings of the 9th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*.

Kenis, P., and Knoke, D. 2002. How organizational field networks shape interorganizational tie-formation rates. *Academy of Management Review*, **27**, 275–293.

Khanna, T., and Rivkin, J. W. 2001. Estimating the Performance Effects of Business Groups in Emerging Markets. *Strategic Management Journal*, **22**, 45–74.

Kim, H., and Bearman, P. S. 1997. The structure and dynamics of movement participation. *Social Forces*, **62**, 70–93.

Kim, J., Kogut, B., and Yang, J.-S. 2011. *CEO pay, fat cats, and best athletes*. Tech. rept. Columbia Business School.

Klein, N. 2008. *The Shock Doctrine: The Rise of Disaster Capitalism*. Knopf.

Klitgaard, R. 1991. *Controlling Corruption*. University of California Press.

Knoke, D. 1990. *Political Networks*. Cambridge University Press.

Kogut, B., and Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, **3**, 383–397.

Kondoh, M. 2003. Foraging adaptation and the relationship between food-web complexity and stability. *Science*, **299**, 1388–1391.

Kontopoulos, K. 1993. *The Logics of Social Structure*. Cambridge University Press.

Korcsmáros, T., Kovács, I. A., Szalay, M. S., and Csermely, P. 2007. Molecular chaperones: the modular evolution of cellular networks. *Journal of Biosciences*, **32**, 441–446.

Kovács, I. A., Palotai, R., Szalay, M. S., and Csermely, P. 2010. Community landscapes: a novel, integrative approach for the determination of overlapping network modules. *PLoS ONE*, **7**, e12528.

Krackhardt, D. 1987. Cognitive social structures. *Social Networks*, **9**, 109–134.

Krackhardt, D. 1990. Assessing the political landscape: structure, cognition, and power in organizations. *Administrative Science Quarterly*, **35**, 342–369.

Krempel, L., and Plumper, T. 2003. Exploring the dynamics of international trade by combining the comparative advantages of multivariate statistics and network visualization. *Journal of Social Structure*, **4**, 1–22.

Kruyt, B., van Vuuren, D. P., de Vries, H. J. M., and Groenenberg, H. 2009. Indicators for energy security. *Energy Policy*, **37**, 2166–2181.

Kuhn, T. S. 1970. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.

Kuran, T. 1987. Preference falsification, policy continuity and collective conservatism. *The Economic Journal*, **97**, 642–665.

Kynge, J. 2007. *China Shakes the World: a Titan's Rise and Troubled Future – and the Challenge for America*. New York: Houghton Mifflin.

Lambsdorff, J. G. 2007. *The Institutional Economics of Corruption and Reform Theory, Evidence and Policy*. Cambridge University Press.

Lammers, J. C., and Barbour, J. B. 2006. An institutional theory of organizational communication. *Communication Theory*, **16**, 356–377.

Larson, J. R., Christensen, C., Abbott, A. S., and Franz, T. M. 1996. Diagnosing groups: charting the flow of information in medical decision-making teams. *Journal of Personality and Social Psychology*, **71**, 315–330.

Lasswell, H. D. 1930. Bribery. In: Seligman, E. R. A. (ed), *Encyclopedia of Social Sciences*, vol. II. New York.

Laumann, E., and Knoke, D. 1987. *The Organizational State*. Wisconsin University Press.

Lawless, W. F., Rifkin, S., Sofge, D., Hobbs, S. H., Angjellari-Dajci, F., and Chaudron, L. 2010. Conservation of information: reverse engineering dark social systems. *Structure and Dynamics: eJournal of Anthropological and Related Sciences*, **4**.

Lawrence, P., and Lorsch, J. 1967. Differentiation and integration in complex organizations. *Administrative Science Quarterly*, **12**, 1–30.

Lazarsfeld, P. F., Berelson, B., and Gaudet, H. 1948. *The People's Choice: How the Voter Makes Up His Mind in a Presidential Election*. New York: Columbia University Press.

Lazega, E. 1992. *Micropolitics of Knowledge: Communication and Indirect Control in Workgroups*. Aldine de Gruyter.

Lazega, E. 1994. Les conflits d'intérêts dans les cabinets américains d'avocats d'affaires : concurrence et auto-régulation. *Sociologie du Travail*, **36**, 315–336.

Lazega, E. 2003. *Networks in Legal Organizations: On the Protection of Public Interest in Joint Regulation of Markets*. Wiarda Institute Publications.

Lazega, E. 2009. Theory of cooperation among competitors: a neo–structural approach. *Sociologica*, **1**, 1–34.

Lazega, E. 2011. Four and half centuries of new (new) law and economics: legal pragmatism, shadow regulation, and institutional capture at the Commercial Court of Paris. In: de Vries, U., and Francot-Timmermans, L. (eds), *Law's Environment: Critical Legal Perspectives*. The Hague: Eleven International Publishing.

Lazega, E., and Mounier, L. 2002. Interdependent entrepreneurs and the social discipline of their cooperation: structural economic sociology for a society of organizations. In: *Conventions and Structures in Economic Organization: Markets, Networks, and Hierarchies*. Edward Elgar Publishers.

Lazega, E., and Mounier, L. 2003. Interlocking judges: on joint external and self–governance of markets. Pages 267–296 of: *Research in the Sociology of Organizations*. Emerald Group Publishing Limited.

Lazega, E., Mounier, L., Snijders, T., and Tubaro, P. in press. Norms, status and the dynamics of advice networks. *Social Networks*, **in press**.

Lazer, D., and Friedman, A. 2007. The network structure of exploration and exploitation. *Administrative Science Quarterly*, **52**, 667–694.

Lazer, D., Pentland, A., Adamic, L., Aral, S., Barabási, A.-L., Brewer, D., Christakis, N., Contractor, N. S., Fowler, J., Gutmann, M., Jebara, T., King, G., Macy, M., Roy, D., and Van Alstyne, M. 2009. Social science: computational social science. *Science*, **323**, 721–723.

Lehner, J. 2010. A physicist solves the city. *NYT Magazine*.

Leitner, Y. 2005. Financial networks: contagion, commitment, and private sector bailouts. *The Journal of Finance*, **60**, 2925–2953.

Lengauer, T., and Tarjan, R. E. 1979. A fast algorithm for finding dominators in a flowgraph. *ACM Transactions on Programming Languages and Systems*, **1**, 121–141.

Lester, R. K., and Piore, M. J. 2004. *Innovation: The Missing Dimension*. Harvard University Press.

Levins, R. 1974. The qualitative analysis of partially specified systems. *Annals of New York Academy of Science*, **231**, 123–138.

Levins, R. 1995. Preparing for uncertainty. *Ecosystem Health*, **1**, 47–57.

Levy, S. F., and Siegal, M. L. 2008. Network hubs buffer environmental variation in Saccharomyces cerevisiae. *PLoS Biology*, **6**, e264.

Liljeros, F., Edling, C. R., Amaral, L. A. N., Stanley, H. E., and Åberg, Y. 2001. The web of human sexual contacts. *Nature*, **411**, 907–908.

Lincoln, J. R., Gerlach, M. L., and Ahmadjian, C. L. 1996. Keiretsu networks and corporate performance in Japan. *American Sociological Review*, **61**, 67–88.

Lochner, S., and Bothe, D. 2009. The development of natural gas supply costs to Europe, the United States and Japan in a globalizing gas market-Model-based analysis until 2030. *Energy Policy*, **37**, 1518–1528.

Lofland, J. 1996. *Social Movement Organizations*. Aldine de Gruyter.

Loreau, M., Naeem, S., Inchausti, P., Bengtsson, J., Grime, J. P., Hector, A., Hooper, D. U., Huston, M. A., Raffaelli, D., Schmid, B., Tilman, D., and Wardle, D. A. 2001. Biodiversity and ecosystem functioning: current knowledge and future challenges. *Science*, **294**, 804–808.

Luciani, G. 2004. *Security of Supply for Natural Gas Markets: What is it and what is it not?* Tech. rept. 119.04. FEEM. `http://www.feem.it/userfiles/attach/Publication/NDL2004/NDL2004-119.pdf`.

MacArthur, R. H. 1955. Fluctuation of animal populations and a measure of community stability. *Ecology*, **36**, 533–536.

Macaulay, S. 1963. Non-contractual relations in business: A preliminary study. *American Sociological Review*, **28**, 55–67.

Mahajan, V., and Peterson, R. A. 1985. *Models for Innovation Diffusion (Quantitative Applications in the Social Sciences*. Newbury Park, CA: Sage.

March, J., and Simon, H. 1958. *Organizations*. Wiley.

Marsden, P. V. 2005. Recent developments in network measurement. Pages 8–30 of: *Models and Methods in Social Network Analysis*. Cambridge University Press.

Marshall, P. J. 1993. *The East India Company: A history*. Longman.

Martinez, N. D., Hawkins, B. A., Dawah, H. A., and Feifarek, B. P. 1999. Effect of sampling effort on characterization of food-web structure. *Ecology*, **80**, 1044–1055.

Marwell, G., Oliver, P. E., and Prahl, R. 1988. Social networks and collective action – a theory of the critical mass. *American Journal of Sociology*, **94**, 502–534.

Mavrakis, D., Thomaidis, F., and Ntroukas, I. 2006. An assessment of the natural gas supply potential of the south energy corridor from the Caspian Region to the EU. *Energy Policy*, **34**, 1671–1680.

May, R. M. 1973. *Complexity and Stability in Model Ecosystems*. Princeton University Press.

May, R. M. 2006. Network structure and the biology of populations. *Trends in Ecology and Evolution*, **21**, 394–399.

Mayntz, R. 2003. New challenges to governance theory. Pages 27–40 of: *Governance as Social and Political Communication*. Manchester University Press.

McAdam, D. 2003. Beyond structural analysis: toward a more dynamic understanding of social movements. Pages 281–298 of: *Social Movements and Networks*. Oxford University Press.

McCann, K. S. 2000. The diversity-stability debate. *Nature*, **405**, 228–233.

McDonald, K. 2002. From solidarity to fluidarity: social movements beyond 'collective identity'. The case of globalization conflicts. *Social Movement Studies*, **1**, 109–128.

McEvedy, C., and Jones, R. 1978. *Atlas of World Population History*. Penguin.

McIntosh, W. V., and Cates, C. L. 1997. *Judicial Entrepreneurship: The Role of the Judge in the Marketplace of Ideas*. Greenwood Press.

McPherson, M., and Smith-Lovin, L. 2002. Cohesion and membership duration: linking groups, relations and individuals in an ecology of affiliation. *Advances in Group Processes*, **19**, 1–36.

McPherson, M., Smith-Lovin, L., and Cook, J. M. 2001. Birds of a feather: homophily in social networks. *Annual Review of Sociology*, **27**, 415–444.

McVoy, E. C. 1940. Patterns of diffusion in the United States. *American Sociological Review*, **5**, 219–227.

Melián, C., and Bascompte, J. 2002. Complex networks: two ways to be robust? *Ecology Letters*, **5**, 705–708.

Melucci, A. 1996. *Challenging Codes*. Cambridge University Press.

Merton, R. K. 1968. The Matthew Effect in Science. *Science*, **159**, 56–63.

Merton, R. K. 1973a. *The Sociology of Science*. Chicago: University of Chicago Press. Pages 545–550.

Merton, R. K. 1973b. *The Sociology of Science*. Chicago: University of Chicago Press.

Metcalfe, B., and Linstead, A. 2003. Gendering teamwork: re-writing the feminine. *Gender, Work & Organization*, **10**, 94–119.

Meyer, D. S., and Corrigall-Brown, C. 2005. Coalitions and political context: U.S. movements against war in Iraq. *Mobilization*, **10**, 327–344.

Meyer, J. W., and Rowan, B. 1991. Institutionalized organizations: formal structure as myth and ceremony. Pages 41–62 of: Powell, W. W., and DiMaggio, P. J. (eds), *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press.

Mihalik, Á., and Csermely, P. 2011. Heat shock partially dissociates the overlapping modules of the yeast protein-protein interaction network: a systems level model of adaptation. *PLoS Computational Biology*, **7**, e1002187.

Milgram, S. 1967. The small-world problem. *Psychology Today*, **2**, 60–67.

Mizruchi, M. S., and Galaskiewicz, J. 1993. Networks of interorganizational relations. *Sociological Methods and Research*, **22**, 46–70.

Mizruchi, M. S., and Stearns, L. B. 1988. A Longitudinal study of the formation of interlocking directorates. *Administrative Science Quarterly*, **33**, 194–210.

Modelski, G. T. 1987. *Long Cycles in World Politics*. Seattle: University of Washington Press.

Modelski, G. T. 2000. What causes K-waves. *Technological Forecasting and Social Change*, **68**, 75–80.

Modelski, G. T. 2001. World system evolution. In: Denemark, R., Friedman, J., Gills, B., and T., Modelski G. (eds), *World-System Evolution: The Social Science of Long-Term Change*. Routledge.

Modelski, G. T., and Thompson, W. R. 1996. *Leading Sectors and World Powers: The Coevolution of Global Economics and Politics*. Columbia University Press.

Monge, P. R., and Contractor, N. S. 2003. *Theories of Communication Networks*. Oxford University Press.

Montoya, J. M., and Solé, R. V. 2002. Small world patterns in food webs. *Journal of Theoretical Biology*, **214**, 405–491.

Montoya, J. M., Pimm, S. L., and Solé, R. V. 2006. Ecological networks and their fragility. *Nature*, **214**, 259–493.

Moody, J. A., and Douglas, R. W. 2003. Structural cohesion and embeddedness: a hierarchical concept of social groups. *American Sociological Review*, **68**, 103–127.

Moreno, J., and Jennings, H. 1937. Statistics of social configurations. *Sociometry*, **1**, 342–374.

Moreno, J. L. 1934. *Who shall survive?: A new approach to the problem of human interrelations*. Nervous and Mental Disease Publishing Co., Washington, USA.

Navarrete, S. A., and Menge, B. A. 1996. Keystone predation and interaction strength: interactive effects of predators on their main prey. *Ecological Monographs*, **66**, 409–429.

Nelson, R. R., and Winter, S. G. 1983. *An Evolutionary Theory of Economic Change*. Boston: Bellknap.

Newman, M. E. J. 2001. The structure of scientific collaboration networks. *Proceedings of the National Academy of Sciences U.S.A.*, **98**, 404–409.

Newman, M. E. J. 2003. The Structure and function of complex networks. *SIAM Review*, **45**, 167–256.

Newman, M. E. J. 2004. Coauthorship networks and patterns of scientific collaboration. *Proceedings of the National Academy of Sciences U.S.A.*, **101**, 5200–5205.

Newman, M. E. J. 2006. Modularity and community structure in networks. *Proceedings of the National Academy of Sciences U.S.A.*, **103**, 8577–8582.

Newman, M. E. J., and Girvan, M. 2004. Finding and evaluating community structure in networks. *Physical Review E*, **69**, 026113.

Newman, M. E. J., and Watts, D. J. 1999. Scaling and percolation in the small-world network model. *Physical Review E*, **60**, 7332–7342.

Newman, M. E. J., Watts, D. J., and Strogatz, S. H. 2002. Random Graph Models of Social Networks. *Proceedings of the National Academy of Sciences U.S.A.*, **99**, 2566–2572.

Noack, A. 2007. Energy models for graph clustering. *Journal of Graph Algorithms and Applications*, **11**, 453–480.

Noack, A., and Rotta, R. 2009. Multi-level algorithms for modularity clustering. Pages 257–268 of: *SEA '09: Proceedings of the 8th International Symposium on Experimental Algorithms*. Springer-Verlag.

Nonaka, I., and Takeuchi, H. 1995. *The Knowledge-Creating Company*. Oxford University Press, New York.

Norris, P. 2003. *Democratic Phoenix*. Cambridge University Press.

Nye, J. S. 2008. Corruption and political development: a cost benefit analysis. Pages 281–300 of: Heidenheimer, A. J., and Johnston, M. (eds), *Political Corruption*. Transaction Publishers.

Nyírő, A., and Szakadát, I. 1993. *Politika Interaktív CD-rom*. Budapest: Aula.

Obstfeld, D. 2005. Social networks, the tertius iungens orientation, and involvement in innovation. *Administrative Science Quarterly*, **50**, 100–130.

Oka, R. C., and Chapurukha, M. K. 2008. Archaeology of trading systems, part 1: towards a new trade synthesis. *Journal of Archaeological Research*, **16**, 339–395.

Oka, R. C., Chapurukha, M. K., and Vishwas, D. G. 2009. Where others fear to trade: modeling adaptive resilience in ethnic trading networks to famines, maritime warfare and imperial stability in the growing Indian Ocean economy, ca. 1500-1700 CE. Pages 201–232 of: *The Political Economy of Hazards and Disasters*. Altamira Press.

Olcott, M. B. 2004. *International Gas Trade in Central Asia: Turkmenistan, Iran, Russia and Afghanistan*. Tech. rept. Working Paper #28. Stanford Institute for International Studies. http://www.rice.edu/energy/publications/docs/GAS_InternationalGasTradeinCentralAsia.pdf.

Oliver, P. E., and Myers, D. J. 2003. Networks, diffusion, and cycles of collective action. Pages 173–204 of: Diani, M., and McAdam, D. (eds), *Social Movements and Networks*. Oxford: Oxford University Press.

Ouchi, W. G. 1980. Markets, bureaucracies and clans. *Administrative Science Quarterly*, **25**, 129–141.

Pagani, G. A., and Aiello, M. 2011. *The power grid as a complex network. Available online at: http://arxiv.org/abs/1105.3338v1*.

Paine, R. T. 1969. A note on trophic complexity and community stability. *American Naturalist*, **103**, 91–501.

Paine, R. T. 1980. Food webs, linkage interaction strength, and community infrastructure. *Journal of Animal Ecology*, **49**, 667–685.

Palla, G., Derényi, I., Farkas, I., and Vicsek, T. 2005. Uncovering the overlapping community structure of complex networks in nature and society. *Nature*, **435**, 814–818.

Palla, P., Barabási, A.-L., and Vicsek, T. 2007. Quantifying social group evolution. *Nature*, **466**, 664–667.

Palotai, R., Szalay, M. S., and Csermely, P. 2008. Chaperones as integrators of cellular networks: changes of cellular integrity in stress and diseases. *IUBMB Life*, **60**, 10–18.

Pascual, M., and Dunne, J. A. 2006. *Ecological Networks: Linking Structure to Dynamics in Food Webs*. Oxford University Press.

Pastor-Satorras, R., and Vespignani, A. 2001. Epidemic spreading in scale-free networks. *Physical Review Letters*, **86**, 3200–3203.

Pavan, E. 2012. *Ties (In)Formation and Communication. Online and Offline Collaboration in the Internet Governance Forum Space*. Lanham: Rowman & Littlefield.

Pavlopoulos, G. A., Wegener, A. L., and Schneider, R. 2008. A survey of visualization tools for biological network analysis. *BioData Mining*, **1**, 12.

Pelletier, C., and Wortmann, J. C. 2009. A risk analysis for gas transport network planning expansion under regulatory uncertainty in Western Europe. *Energy Policy*, **37**, 721–732.

Peuhkuri, T., and Jokinen, P. 1999. The role of knowledge and spatial contexts in biodiversity policies: a sociological perspective. *Biodiversity and Conservation*, **8**, 133–147.

Pfeffer, J., and Salancik, J. 1978. *The External Control of Organizations*. New York: Harper and Row.

Piattoni, S. 2010. *The Theory of Multi-level Governance*. Oxford University Press.

Pimm, S. L., Lawton, J. H., and Cohen, J. E. 1991. Food web patterns and their consequences. *Nature*, **350**, 669–674.

Pimm, S. L., Raven, R., Peterson, A., Ekercioglu, C. H., and Ehrlich, P. R. 2006. Human impacts on the rates of recent, present, and future bird extinctions. *Proceedings of the National Academy of Sciences U.S.A.*, **103**, 10941–10946.

Pincus, S. C. A. 2005. *England's Glorious Revolution 1688-89: A Brief History with Documents*. St. Martin's Press.

Pirani, S., Stern, J., and Yafimava, K. 2009. *The Russo-Ukrainian gas dispute of January 2009: a comprehensive assessment*. Tech. rept. NG 27. Oxford Institute for Energy Studies.

Pizzorno, A. 1978. Political exchange and collective identity in industrial conflict. Pages 277–298 of: *The Resurgence of Class Conflict in Western Europe*. Holmes and Meier.

Pizzorno, A. 2008. *Rationality and Recognition*. Cambridge University Press.

Podolny, J. M., and Page, K. L. 1998. Network Forms of Organization. *Annual Review of Sociology*, **24**, 57–76.

Poole, M. S., and Contractor, N. S. 2011. Conceptualizing the multiteam system as a system of networked groups. Pages 193–224 of: Zaccaro, S. J., Marks, M. A., and DeChurch, L. A. (eds), *Multiteam Systems: An Organizational Form for Dynamic and Complex Environments*. Routledge Academic.

Poole, M. S., and DeSanctis, G. 1992. Microlevel structuration in computer-supported group decision-making. *Communication Research*, **19**, 5–49.

Poole, M. S., McPhee, R. D., and Seibold, D. R. 1982. A comparison of normative and interactional explanations of group decision-making: social decision schemes versus valence distributions. *Communication Monographs*, **49**, 1–19.

Poole, M. S., Seibold, D. R., and McPhee, R. D. 1996. The structuration of group decisions. Pages 114–146 of: Hirokawa, R., and Poole, M. (eds), *Communication and Group Decision Making*. Sage.

Postmes, T., Spears, R., and Lea, M. 2000. The formation of group norms in computer-mediated communication. *Human Communication Research*, **26**, 341–371.

Powell, W. 1990. Neither markets nor hierarchy: network forms of organization. *Research in Organizational Behavior*, **12**, 295–336.

Powell, W. W., White, D. R., Koput, K. W., and Jason, O.-S. 2005. Network dynamics and field evolution: the growth of interorganizational collaboration in the life sciences. *The American Journal of Sociology*, **110**, 1132–1205.

Proulx, S. R., Promislow, D. E., and Phillips, P. C. 2005. Network thinking in ecology and evolution. *Trends in Ecology and Evolution*, **20**, 345–353.

Provan, K. G., and Kenis, P. 2007. Modes of network governance: structure, management, and effectiveness. *Journal of Public Administration Research and Theory*, **18**, 229–252.

Provan, K. G., Fish, A., and Sydow, J. 2007. Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management*, **33**, 479–516.

Puccia, C. J., and Levins, R. 1985. *Qualitative Modelling of Complex Systems: An Introduction to Loop Analysis and Time Averaging.* Harvard University Press.

Puska, P., and Uutela, A. 2000. Community intervention in cardiovascular health promotion: North Karelia, 1972-1999. Pages 73–96 of: Schneiderman, N., Speers, M. A., Silva, J. M., Tomes, H., and Gentry, J. H. (eds), *Integrating Behavioral and Social Sciences With Public Health.* Baltimore: United Book Press, American Psychological Association.

R Development Core Team. 2010. *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria. `http://www.R-project.org`.

Ramasco, J. J., Dorogovtsev, S. N., and Pastor-Satorras, R. 2004. Self-organization of collaboration networks. *Physical Review E*, **70**, 036106.

Rasmusen, E. 1989. *Games and Information: An Introduction to Game Theory.* Blackwell Publising Ltd.

Ravasz, E., Somera, A. L., Mongru, D. A., Oltvai, Z. N., and Barabási, A.-L. 2002. Hierarchical organization of modularity in metabolic networks. *Science*, **297**, 1551–1555.

Reagans, R., and Zuckerman, E. W. 2001. Networks, diversity, and productivity: the social capital of corporate R&D teams. *Organization Science*, **12**, 502–517.

Reichardt, J., and White, D. R. 2007. Role models for complex networks. *European Physical Journal B*, **60**, 217–224.

Reymond, M. 2007. European key issues concerning natural gas: Dependence and vulnerability. *Energy Policy*, **35**, 4169–4176.

Robins, G., Pattison, P., and Wang, P. 2006. Closure, connectivity and degrees: new specifications for Exponential Random Graph ($p*$) Models for directed social networks. *Unpublished manuscript. University of Melbourne.*

Robins, G., Pattison, P., and Wang, P. 2007. An introduction to Exponential Random Graph ($p*$) Models for social networks. *Social Networks*, **29**, 173–191.

Rogers, E. 2003. *Diffusion of Innovations.* Free Press, New York.

Rootes, C. 2003. *Environmental Protest in Western Europe.* Oxford University Press.

Rose-Ackerman, S. 1978. *Corruption A Study in Political Economy.* Academic Press.

Rose-Ackerman, S. 1999. *Corruption and Government Causes, Consequences, and Reform.* Cambridge University Press.

Rose-Ackerman, S. 2006. *International Handbook on the Economics of Corruption.* Edward Elgar.

Ruef, M., Aldrich, H. E., and Carter, N. M. 2003. The structure of founding teams: homophily, strong ties and isolation among U.S. entrepreneurs. *American Sociological Review*, **68**, 195–222.

Rutherford, S. L., and Lindquist, S. 1998. Hsp90 as a capacitor for morphological evolution. *Nature*, **396**, 336–342.

Ryan, B., and Gross, N. C. 1943. The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology*, **8**, 15–24.

Saavedra, S., Reed-Tsochas, F., and Uzzi, B. 2008. Asymmetric disassembly and robustness in declining networks. *Proceedings of the National Academy of Sciences U.S.A.*, **105**, 16466–16471.

Sampat, B. 2005. *Determinants of Patent Quality: An Empirical Analysis.* New York: Columbia University.

Sander, L. M., Warren, C. P., Sokolov, I. M., Simon, C., and Koopman, J. 2002. Percolation on heterogeneous networks as a model for epidemics. *Mathematical Biosciences*, **180**, 293–305.

Sartori, G. 1970. Concept misformation in comparative politics. *American Political Science Review*, **64**, 1033–1052.

Sassen, S. 1991. *The Global City: New York, London, Tokyo.* Princeton University Press.

Sassen, S. 2000. *Cities in a World Economy.* Pine Forge Press.

Sassen, S. 2009. Bridging the ecologies of cities and of nature. In: *The New Urban Question – Urbanism Beyond Neo-Liberalism. The 4th International Conference of the International Forum on Urbanism (IFoU).*

Schaeffer, S. E. 2007. Graph Clustering. *Computer Science Review*, **1**, 27–64.

Schelling, T. C. 1978. *Micromotives and Macrobehavior.* New York: W. W. Norton.

Schilling, M. A., and Steensma, H. K. 2001. The use of modular organizational forms: an industry level analysis. *Academy of Management Journal*, **44**, 1149–1168.

Schumpeter, J. 1942. *Capitalism, Socialism and Democracy.* Harper and Brothers.

Schumpter, J. A. 1934. *The Theory of Economic Development.* Cambridge, Mass: Harvard University Press.

Schwab, A., and Miner, A. S. 2008. Learning in hybrid-project systems: The effects of project performance on repeated collaboration. *Academy of Management Journal*, **51**, 1117–1149.

Schweitzer, F., Sornette, D., Vespignani, A., Fagiolo, G., Vega-Redondo, F., and White, D. R. 2009a. Economic networks: the new challenges. *Science*, **325**, 422–425.

Schweitzer, F., Sornette, D., Fagiolo, G., Vega-Redondo, F., and White, D. R. 2009b. Economic networks: what do we know and what do we need to know? *Advances in Complex Systems*, **12**, 407–422.

Scotti, M. 2008. Development Capacity. Pages 911–920 of: Jørgensen, S. E., and Fath, B. D. (eds), *Ecological Indicators. Vol. [2] of Encyclopedia of Ecology.* Elsevier, Oxford.

Seibold, D. R., and Meyers, R. A. 2007. Group argument: a structuration perspective and research program. *Small Group Research*, **38**, 312–336.

Sewell, W. H. J. 1992. A theory of structure: duality, agency and transformation. *American Journal of Sociology*, **98**, 1–29.

Shalizi, C. 2011. Do city economies scale with population? *Carnegie Mellon University*, **12**.

Shawe-Taylor, J., and Cristianini, N. 2004. *Kernel methods for pattern analysis.* Cambridge University Press.

Shea, S., and Basch, C. E. 1990. A review of five major community-based cardiovascular disease prevention programs. Part I: rationale, design, and theoretical framework. *American Journal of Health Promotion*, **4**, 203–213.

Shirkani, N. 2008. *Egyptian gas flows to Israel.* Tech. rept. Upstream Online. `www.upstreamonline.com/live/article150348.ece`.

Sőti, C., Sreedhar, A. S., and Csermely, P. 2003. Apoptosis, necrosis and cellular senescence: chaperone occupancy as a potential switch. *Aging Cell*, **2**, 39–45.

Simas, R. 1988. *The Musicals No One Came to See: A Guidebook to Four Decades of Musical-Comedy Casualties on Broadway, Off Broadway and in Out-Of-Town Tryout, 1943-1983.* New York: Garland.

Simmel, G. 1898. The persistence of social groups. *American Journal of Sociology*, **3**, 662–698.

Simmel, G. 1964. *Conflict and the Web of Group Affiliations.* New York: Free Press.

Simon, H. A. 1959. Theories of decision-making in economics and behavioral science. *American Economic Review*, **3**, 253–283.

Smith, D. A., and White, D. R. 1992. Structure and dynamics of the global economy: network analysis of international trade 1965-1980. *Social Forces*, **70**, 857–894.

Smith, J. 2005a. Building bridges or building walls? Explaining regionalization among transnational social movement organizations. *Mobilization*, **10**, 251–270.

Smith, J. 2005b. Globalization and transnational social movement organizations. Pages 226–248 of: *Social Movements and Organizations*. Cambridge University Press.

Solomonoff, R., and Rapoport, A. 1951. Connectivity of random nets. *Bulletin of Mathematical Biology*, **13**, 107–117.

Somers, M. R. 1994. The narrative constitution of identity: a relational and network approach. *Theory and Society*, **23**, 605–649.

Sørensen, E., and Torfing, J. 2007. *Theories of Democratic Network Governance*. Edward Elgar.

Sorenson, O., Rivkin, J. W., and Fleming, L. 2006. Complexity, networks and knowledge flow. *Research Policy*, **35**, 994–1017.

Spicer, A., McDermott, G. A., and Kogut, B. 2000. Entrepreneurship and privatization in Central Europe: the tenuous balance between destruction and creation. *Academy of Management Review*, **25**, 630–649.

Spufford, P. 2002. *Power and Profit: The Merchant in Medieval Europe*. Thames and Hudson.

Spufford, P. 2006. From Antwerp to London: the decline of financial centres in Europe. *De Economist*, **154**, 143–175.

Stark, C., Breitkreutz, B. J., Chatr-Aryamontri, A., Boucher, L., Oughtred, R., Livstone, M. S., Nixon, J., van Auken, K., Wang, X., Shi, X., Reguly, T., Rust, J. M., Winter, A., Dolinski, K., and Tyers, M. 2011. The BioGRID Interaction Database: 2011 update. *Nucleic Acids Research*, **39**, D698–D704.

Stark, D. 1996. Recombinant property in East European capitalism. *American Journal of Sociology*, **101**, 993–1027.

Stark, D. 2009. *The Sense of Dissonance: Accounts of Worth in Economic Life*. Princeton University Press.

Stark, D., and Bruszt, L. 1998. *Postsocialist Pathways: Transforming Politics and Property in East Central Europe*. Cambridge University Press.

Stark, D., and Vedres, B. 2006. Social times of network spaces: network sequences and foreign investment in Hungary. *American Journal of Sociology*, **111**, 1367–1412.

Stasser, G., Stewart, D. D., and Wittenbaum, G. M. 1995. Expert roles and information exchange during discussion: the importance of knowing who knows what. *Journal of Experimental Social Psychology*, **31**, 244–265.

Stern, J. 2002. *Security of European natural gas supplies: the impact of import dependence and liberalization*. Tech. rept. 36 pp. Royal Institute of International Affairs, London. `www.isn.ethz.ch/isn/Digital-Library/Publications/Detail/?id=99313&lng=en`.

Stern, J. 2006. Natural gas security problems in Europe: the Russian-Ukrainian crisis of 2006. *Asia-Pacific Review*, **13**, 32–59.

Stokols, D., Hall, K. L., Taylor, B. K., and Moser, R. P. 2008. The science of team science: overview of the field and introduction to the supplement. *American Journal of Preventive Medicine*, **2**, S77–S89.

Strang, D., and Meyer, J. W. 1993. Institutional conditions for diffusion. *Theory and society*, **22**, 487–511.

Strang, D., and Soule, S. 1998. Diffusion in organizations and social movements: from hybrid corn to poison pills. *Annual Review of Sociology*, **24**, 265–290.

Streeck, W., and Schmitter, P. C. 1985. Community, market, state – and associations? The prospective contribution of interest governance to social order. *European Sociological Review*, **1**, 119–138.

Swedberg, R. 1993. Non-contractual relations in business: a preliminary study. *Journal of Institutional and Theoretical Economics*, **149**, 204–209.

Sydow, J., Schreyögg, G., and Koch, J. 2009. Organizational path dependence: opening the black box. *Academy of Management Review*, **34**, 689–709.

Szalay, M. S., Kovács, I. A., Korcsmáros, T., Böde, C., and Csermely, P. 2007. Stress-induced rearrangements of cellular networks: consequences for protection and drug design. *FEBS Letters*, **581**, 3675–3680.

Szántó, Z. 1999. Innovation. *The European Journal of Social Sciences*, **4**, 629–632.

Szántó, Z. 2009. Kontraszelekció és erkölcsi kockázat a politikában [Adverse selection and moral hazard in politics]. *Közgazdasági Szemle*, **6**, 563–571.

Szántó, Z., Tóth, I. J., Varga, S., and Cserpes, T. 2011. A korrupció típusai és médiareprezentációja Magyarországon (2001-2009) [Types of corruption and their media representation in Hungary (2001-2009)]. *Belügyi Szemle*, **11**, 1–38.

Thevenot, L. 2001. Organized complexity: conventions of coordination and the composition of economic arrangements. *European Journal of Social Theory*, **4**, 405–425.

Thomas, P. 2006. The communication rights in the information society (CRIS) campaign. Applying social movement theories to an analysis of global media reform. *Gazette*, **68**, 291–312.

Thye, S. R., Yoon, J., and Lawler, E. J. 2002. The theory of relational cohesion: review of a research program. *Advances in Group Processes*, **19**, 139–166.

Tilly, C. 1984. *Big Structures, Large Processes, Huge Comparisons*. Russell Sage Foundation: New York.

Tilly, C. 1996. *The Contentious French: Four Centuries of Popular Struggle*. Cambridge: Harvard University Press.

Tilly, C. 2005. *Identities, Boundaries and Social Ties*. Paradigm.

Tilly, C., and Tarrow, S. 2007. *Contentious Politics*. Paradigm.

Tondera, D., Grandemange, S., Jourdain, A., Karbowski, M., Mattenberger, Y., Herzig, S., Da Cruz, S., Clerc, P., Raschke, I., Merkwirth, C., Ehses, S., Krause, F., Chan, D. C., Alexander, C., Bauer, C., Youle, R., Langer, T., and Martinou, J. C. 2009. SLP-2 is required for stress-induced mitochondrial hyperfusion. *EMBO Journal*, **28**, 1589–1600.

Tóth, I. J. 2010. *A szélerőművek engedélyeztetésének labirintusa [Obtaining wind power plant permits]*.

Trajtenberg, M. 1990. A Penny for Your Quotes: Patent Citations and the Value of Innovations. *RAND Journal of Economics*, **21**, 172–187.

Turchin, P. 2003. *Historical Dynamics: Why States Rise and Fall*. Princeton University Press.

Turchin, P. 2005. Dynamical feedbacks between population growth and sociopo-
     litical instability in agrarian states. *Structure and Dynamics*, **1**, 49–69.
Turchin, P. 2006. *War and Peace and War: The Rise and Fall of Empires*. Pi Press.
Turchin, P. 2009. A theory for formation of large empires. *Journal of Global History*,
     4, 191–217.
Turchin, P. 2010. Warfare and the Evolution of Social Complexity: A Multilevel-
     Selection Approach. *Structure and Dynamics*, **4**, 222–238.
Turchin, P., and Nefedov, S. 2009. *Secular Cycles*. Princeton University Press.
Tversky, A., and Kahneman, D. 1974. Judgment under uncertainty: heuristics and
     biases. *Science*, **185**, 1124–1131.
Ulanowicz, R. E. 1986. *Growth & Development: Ecosystems Phenomenology*.
     Springer Verlag, New York.
Ulanowicz, R. E. 1997. *Ecology, the Ascendent Perspective*. Columbia University
     Press.
Ulanowicz, R. E. 2009. *A Third Window: Natural Life beyond Newton and Darwin*.
     Templeton Press.
Ulanowicz, R. E., Heymans, J. J., and Egnotovich, M. S. 2000. Network analysis of
     trophic dynamics in South Florida Ecosystems, FY 99: the Graminoid Ecosys-
     tem. *Annual Report to the United States Geological Service Biological Resources
     Division University of Miami Coral Gables, FL 33124.*
Useem, M. 1980. Corporations and the corporate elite. *Annual Review of Sociology*,
     6, 41–77.
Uzzi, B. 1997. Social structure and competition in interfirm networks: the paradox
     of embeddedness. *Administrative Science Quarterly*, **42**, 35–67.
Uzzi, B., and Spiro, J. 2005. Collaboration and creativity: the small world problem.
     American Journal of Sociology, **111**, 447–504.
Van Der Vegt, G. S., Bunderson, J. S., and Oosterhof, A. 2006. Expertness diversity
     and interpersonal helping in teams: why those who need the most help end
     up getting the least. *Academy of Management Journal*, **49**, 877–893.
Van Dyke, N., and McCammon, H. 2010. *Social Movement Coalitions*. University
     of Minnesota Press.
Walgrave, S., and Rucht, D. 2010. *The World Says No to War: Demonstrations Against
     the War in Iraq*. University of Minnesota Press.
Wallerstein, I. 1974. *The Modern World-system. Vol. 1. Capitalist Agriculture and
     the Origin of the European World-economy in the Sixteenth Century*. Academic
     Press.
Wang, P., Sharpe, K., Robins, G. L., and Pattison, P. E. 2009. Exponential Random
     Graph ($p*$) Models for affiliation networks. *Social Networks*, **31**, 12–25.
Wang, S., Szalay, M. S., Zhang, C., and Csermely, P. 2008. Learning and innovative
     elements of strategy update rules expand cooperative network topologies.
     PLoS ONE, **3**, e1917.
Ward Jr., J. H. 1963. Hierarchical grouping to optimize an objective function.
     Journal of the American Statistical Association, **58**, 236–244.
Watts, D. J. 1999. Networks, dynamics and the small-world phenomenon. *Ameri-
     can Journal of Sociology*, **105**, 493–527.
Watts, D. J. 2003. *Six Degrees: The Science of a Connected Age*. New York: W. W.
     Norton.
Watts, D. J., and Strogatz, S. H. 1998. Collective dynamics of 'small-world' net-
     works. *Nature*, **393**, 440–442.

WEC. 2007. *2007 Survey of Energy Resources*. Tech. rept. World Energy Council, London.

Wegner, D. M. 1987. Transactive memory: a contemporary analysis of the group mind. Pages 185–208 of: *Theories of Group Behavior*. Springer-Verlag.

Weick, K. E. 1992. *The Social Psychology of Organizing*. Addison–Wesley, Reading.

Weisser, H. 2007. The security of gas supply – a critical issue for Europe? *Energy Policy*, **35**, 1–5.

Weitzman, M. L. 1998. Recombinant growth. *Quarterly Journal of Economics*, **113**, 331–360.

Wellman, B. 1979. The community question: the intimate networks of East Yorkers. *American Journal of Sociology*, **84**, 1201–1231.

Wellman, B., and Gulia, M. 1999. Net surfers don't ride alone: virtual community as community. Pages 331–367 of: *Networks in the Global Village*. Westview Press.

Westman, W. E. 1990. Managing for biodiversity. *BioScience*, **30**, 26–33.

Wheeler, S., Mann, K., and Sarat, A. 1988. *Sitting in judgment: the sentencing of white collar criminals*. Yale University Press.

White, D. R. 2009a. *Dynamics of Human Behavior (Cohesion and Resistance). Encyclopedia of Complexity and Systems Science*. Springer-Verlag.

White, D. R. 2009b. *The evolution of the medieval world economic network, and the Chinese link. Central European University, June Conference on "The Unexpected Link Using network science to tackle social problems", organized by Balazs Vedres & Marco Scotti, Inauguration of the CEU Center for Network Sciences. Powerpoint:* `http://intersci.ss.uci.edu/wiki/ppt/economic_networksCEU09.ppt` *– Old world city systems and economic networks 950-1950: how the growth and decline of cities and the rise and fall of city-size hierarchies is related to the network structure of intercity connections.*

White, D. R., Tambayong, L., and Kejžar, N. 2008. Oscillatory dynamics of city-size distributions in world historical systems. Pages 190–225 of: *Globalization as Evolutionary Process: Modeling, Simulating, and Forecasting Global Change*. Routledge.

White, D. R., Scott, D. W., Tolga, O., and F., Ren. 2011. *Exploratory causal analysis for networks of ethnographically well-studied populations*.

White, H. 1998. *Advances in Econometric Theory: The Selected Works of Halbert White*. Edward Elgar.

White, H. 2004. *New Perspectives in Econometric Theory: The Selected Works of Halbert White, Volume 2*. Edward Elgar.

White, H. C., Boorman, S. A., and Breiger, R. L. 1976. Social structure from multiple networks. I. Blockmodels of roles and positions. *American Journal of Sociology*, **81**, 730–780.

Williams, K. Y., and O'Reilly, C. A. 1998. Demography and diversity in organizations: a review of 40 years of research. Pages 77–140 of: *Research in Organizational Behavior*. JAI Press.

Wuchty, S., Jones, B., and Uzzi, B. 2007. The increasing dominance of teams in production of knowledge. *Science*, **316**, 1036–1039.

Yenikeyeff, S. M. 2008. *Kazakhstan's Gas: Export Markets and Export Routes*. Tech. rept. NG 25. Oxford Institute for Energy Studies. `http://www.offnews.info/downloads/oxford_energy_kazakhstan_nov08.pdf`.

Yinger, M. J. 1960. Contraculture and subculture. *American Sociological Review*, **25**, 625–635.

Zald, M. N., and McCarthy, J. D. 1980. Social movement industries: competition and cooperation among movement organizations. *Research in Social Movements, Conflict and Change*, **3**, 1–20.

Ziman, J. M. 1994. *Prometheus Bound*. Cambridge: Cambridge University Press.

Zucker, L. G. 1991. The role of institutionalism in cultural persistence. Pages 83–107 of: Powell, W. W., and DiMaggio, P. J. (eds), *The New Institutionalism in Organizational Analysis*. University of Chicago Press.