The Emergence of Corporate Networks in Germany and the United States 1896 - 1938

Part A: Control, coordination, interests

Part B: Comparative structural analysis

Paul Windolf
Department of Sociology
Universit of Trier
54286 Trier
Germany

windolf@uni-trier.de
Phone: ++49-651-2012703
Fax: ++49-651-2013933

Summary

In the late nineteenth century, a relatively dense network was created among companies by the directors who sat on the Boards of the large public corporations. This study examines these interlocking directorates of large corporations for the period between 1896 and 1938 in Germany and the United States. Corporate networks served several purposes: they developed into a medium of self-control in managerially run companies; they became an instrument of bank control in capital-intensive companies; furthermore, they were institutions to regulate competition in the age of mass production. In Germany, the density and centralization of the corporate network increased parallel to the growing degree of cartelization within the economy (cooperative capitalism). In the United States, the density of the network decreased in relation to the extent that antitrust laws were enforced (competitive capitalism). A number of structural differences between Germany and the United States are evident. In Germany we find a greater percentage of multiple interlocks, strong bank control (credit financing), and a greater degree of *intra*sectoral ties among corporations (cartel). Moreover, the corporate network is focused on certain key individuals (big linkers) far more than it is in the United States. The study presented here outlines the emergence of an important institution of organized capitalism. Its purpose has been to control and coordinate business, and its structural framework has remained relatively stable up to the present. Even the structural *differences* that developed between Germany and the United States prior to 1938 have remained stable until now.

Part A: Control, coordination, interests

1. Organized capitalism[1]

In the late nineteenth century, a relatively dense network arose among companies, a network linking major public corporations and the financial sector. The Board of Directors (BoD), in which the directors from banks and other big businesses met, was not a passive supervisory body but often played an active role in important entrepreneurial decisions.[2] In many big corporations, the BoD became an exchange for "relational contracting": Bank directors sitting on the BoD acted as brokers for major business transactions and headed up negotiations over fusions and company takeovers.[3] Important information was communicated through the network to which outsiders were not privy. By way of the corporate network, managers obtained "tacit knowledge" about their colleagues in other companies, to whom they granted loans or awarded contracts. Although the network did not replace the market, it developed alongside of it as an important economic institution of emerging "organized capialism."[4]

Until the last third of the nineteenth century, the family was a central institution for coordinating transactions and mobilizing resources. Leading personnel in firms comprised primarily of family members, and the family often served as the "lender of last resort." As big businesses emerged, they destroyed the organizational framework of the family business. The complex transactions between large corporations could no longer be managed through family relations.[5] In conjunction with emergence of major public corporations, the network emerged as a new institution, the purpose of which was to coordinate transactions, supervise management, and facilitate the social integration of the economic elite (Useem 1984; Koenig et al. 1979).

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[2] "… the general American rule [was] that the board of directors had exclusive power over all matters of general corporate business " (Karjala 1979: 213). Even though the directors of the German supervisory board had no direct executive management functions, they often interfered with the decision making process of the management board (Hommelhoff 1987: 84). Cf. Wixford (1995: 263); Feldman (1998: 43); Gall (1995: 40-43).

[3] For more on the term "relational contracting," see Dore (1987: 174-76). Case studies which illustrate "relational contracting" are given in Carosso (1970); Kramer (1964). For Germany, see Wellhöhner (1989); Reckendrees (2000).

[4] In the United States, the term used is either "corporate economy" or "corporate capitalism" (Hannah 1983; Sklar 1988). The difference between "organized" and "corporate" capitalism lies in the different economic institutions that developed in the late nineteenth century in Germany and in the United States (some of which will be analyzed in the following sections). For purposes of uniformity, the term "organized capitalism" will be used here in connection with both countries. The term "organized capitalism" was first used by Hilferding (1915); see also Wehler (1974).

[5] "The modern type of 'industrial' occupational structure … must be segregated from the kinship system. Its primary characteristic is a system of universalistic-specific-affectively neutral achievement-oriented roles" (Parsons 1951: 177-78). An analogous argument also applies to the corporate network.

As a means to coordinate business transactions, the corporate network spread throughout the entrepreneurial world, thereby *supplanting family ties*. To a great extent, the corporate network emancipated itself from ascriptive relations (family, ownership).[6] At the same time, it became increasingly professionalized (managers held college degrees) and legally regulated. In German corporate law, for example, the rights and responsibilities of directors and the relations between the management board and the supervisory board were stipulated by legislation. The corporate network became an important element of the modernization process that "organized" or more specifically "rationalized" late nineteenth-century capitalism (Weber 1969).

The analysis presented in the following sections concentrates on three functions that the corporate network performed, namely, the control function (section 2), the regulation of competition (section 3), and the creation of social capital (section 4).

The analysis of these three functions will demonstrate that the corporate network helps create an opportunity structure in which various interests can be pursued. To begin with, the network serves to define and assert *collective* interests, which involves the control of management (code of business ethics) and the regulation of competition. The corporate network is supposed to constrain opportunism and regulate anarchic competition. However, the network can also degenerate into an "old-boys' network." Should this occur, the corporate network then becomes no more than an exclusive social circle in which social capital is accumulated in order to pursue "special interests" (Olson 1965: 141).

From the perspective of the prisoners' dilemma, we can say that the introduction of the corporate network creates an institution that facilitates cooperation among rational players. However, the perseverance of special interests (defection) is the probable outcome, cooperation the improbable one. The analysis will show which *structural characteristics* of the corporate network increase the probability that "cooperation" occurs. Olson (1982: chapter 2) argues with respect to special interest coalitions that the more *encompassing* the interest organization, the less parochial its view is. An analogous argument can be applied to the network. For instance, the German corporate network was more "encompassing" than the US-network in the sense that only a small proportion of German firms were "isolated" (see Table 2 below, line 3 and 4; 1928 and 1938).

[6] In companies in which management control had prevailed (diffused ownership), many members of the BoD no longer represented any interests of the owners (Berle and Means 1997).

2. The Control Function of the Corporate Network

Moral Capital

In large stock companies with thousands of shareholders, the relationship between owners and managers is typically burdened with a "principal-agent" problem. Compared with shareholders, managers have access to more information and expertise. They control the stock companies, whereas the owners only supply capital and carry risk.[7] Therefore, the supervision of management becomes one of the most important problems of the stock company. An initial thesis posited here is that the corporate network of the late nineteenth century developed into an important supervisory body. The control function previously exercised through ownership was replaced by social control through peer groups.

The corporate network comprises groups of managers who know each other and often appoint one another to the BoD of each other's companies. The denser the network and the more discerning the selection of new members become, the more homogeneous the social profile of the members and the stronger their adherence to a common set of norms become. The members of the corporate network are guided by principals of business ethics that corporate law attempts to make legally binding.[8]

Adherence to these norms constitutes a public good, and all companies would benefit if the members of corporate networks would uphold the standards of business ethics. Yet, each and every member is subject to the constant temptation to use fraud, balance sheet falsification, and corruption (opportunism) to their own advantage.[9] The corporate network – if understood as a system of overlapping social groups – provides a *social infrastructure* within which adherence to the norms can be monitored. In this sense, the members produce a public good that is referred to here as the "moral capital"[10] of the network. Processes of socialization are initiated in which the members are obligated to be the standard-bearers of business ethics.[11]

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[7] The principal-agent problem is a consequence of role differentiation between managers (control, expertise) and capitalists (financing, risk-taking). On this point, see Schumpeter (1954: 555-56, 645) and Eisenhardt (1989).

[8] See Sect. 249 of the German corporate law (*Aktiengesetz* of 1897): "The members of the supervisory board are to apply the sound judgment of a conscientious businessman in fulfilling their obligations" (author's translation). With regard to the United States, see Dodd (1932). The "*ehrbare Kaufmann*" (honest businessman) or the "trustee" are examples of models of business ethics.

[9] For more on the term "opportunism," see Williamson (1985: 30, 64-67): "self-interest seeking with guile."

[10] "Capital is accumulated labor, either in the material form or in the internalized, incorporated form" (Bourdieu 1983: 183, author's translation). Fukuyama (1995: 154-55) speaks of the "moral community."

[11] Georg von Siemens, the director of the Deutsche Bank, used his private wealth to reimburse customers for a portion of great sums of money they lost because they had purchased Northern Pacific Railroad bonds in 1883. "…in this early phase of shareholder banks, the employed bank managers also perceived themselves as both morally and

It is widely known that the managers of big stock companies exert a great influence on the appointments made to the BoD of their respective firms.[12] What interest do they have in turning the BoD into a *strong* supervisory body that curbs their autonomy? In other words, why is the collective good "control" even produced in the corporate network? To answer this question, we turn to a comparison of the stock market and the "market for lemons," otherwise known as the used car market.

In the used car market, there exists a great asymmetry of information between the car buyers (who know next to nothing about the used cars) and the car dealers (who know a great deal about them). Therefore, the temptation of opportunism in this market is particularly great. Akerlof (1970: 495) has shown that the information asymmetry forces prices to sink continually so that the market eventually collapses: "Bad cars drive good cars out of the market." Carried to its logical end, Akerlof's argument means that no market for used cars could exist. However, the car dealers have found a simple remedy to the problem: limited-time guarantees. The guarantee is a car dealer's commitment not to sell "lemons" (credible commitment).

The relationship between small investors and managers is also characterized by a strong asymmetry of information. The many scandals and stock market crises of the late nineteenth century dramatically demonstrated to the investing public that many "lemons" are sold on the stock market.[13] As a consequence, stock prices spiral downward and the public is less and less willing to buy stock at all.

The rotating presence of high-level executives in the supervisory bodies of the big stock companies can be interpreted as each firm's guarantee to uphold the standards of business ethics and not to cheat investors. The managers, who perform such control functions in the BoD, vouch for one another and thereby put their own reputation on the line (credible commitment.)[14]

This mechanism can explain why managers accept the creation of a BoD as a strong supervisory body restricting their autonomy. An effective mutual control increases the

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personally responsible bankers of the old school" (Gall 1995: 67, author's translation). J.P. Morgan had sat on the board of directors of Northern Pacific since 1883 and forced the resignation of CEO Villard. "I certainly have no desire to be burdened with all this trouble, but there I am, representing interests which cannot be shirked" (Strouse 1999: 240). See also, Carosso (1970: 38).

[12] In Germany, the management board usually suggests candidates for the supervisory board at the general stockholders' meeting. In the United States, the CEO controls the "proxy machine."

[13] Perrow (2002: 141-159) points to the business scandals in the United States in the late 19th century; a critical view in Mahoney (2003). For Germany see Fiedler (1999a).

[14] DeLong (1991: 205) shows that the stock price of companies where J. P. Morgan or one of his partners were sitting on the BoD was approximately 30 percent higher than that of comparable firms. He attributes this to "monitoring" and "trust": Morgan fulfilled the control function (monitoring) and the investors were also convinced that he did (trust). Another example supporting this thesis is that the BoD of Enron in 2000/2001 had no CEO from a Fortune 500 company, only "dummies." See Windolf (2004).

"moral capital" of the corporate network and sends a signal to the financial markets that the "moral hazards" of the stock company are under control.[15]

In the next section, we will look at banks as a collective actor with a strong self-interest in monitoring stock companies.

Financial Capital

Corporate networks are a part of a comprehensive system of coordination and control to which major industrial firms, financial institutions, and interest organizations belong. Hilferding (1915: 322) named this institutional system "organized capitalism." He understood this to be an economic order characterized by a high degree of centralization, institutional interlocking and the monopolization of markets.

In this system, banks represented an entrepreneurial rationality that they attempted to superimpose over all corporations by way of the controlling bodies of the stock companies. Two questions arise: what was the nature of this type of "rationality"? What interests did the banks have in assuming the costs of control?

Organized capitalism is based on predictability, continual profit-earning, the bureaucratization of large plants, and the replacement of charismatic entrepreneurship with scientific management. Only if economic transactions are "rationalized" in this way, can banks guarantee reliable and continual financing of big companies and capital-intensive mass production. Banks must be able to convince potential investors that the entrepreneurial risks will remain calculable and that they are in a position to control any irrational forms of speculation and "moral hazard" that may arise.

Investors must be convinced that the industrial system is not just another type of gambling casino before they will be willing to invest in stocks and bonds offered by the banks. Therefore, it is argued here that banks acted out of self-interest when they monitored and supervised those companies to whom they had awarded loans or whose bonds and shares they had sold to their customers. One of the most important control instruments was the presence of bank directors in the BoD of the large stock companies. In this way, banks became important actors in corporate networks.

Another thesis maintains that German banks have exercised this control more intensively than have U.S. banks and, therefore, have held a far more important position in the corporate network. The differences between the United States and Germany can and will be explained in the next section by pointing out the different corporate finance techniques that have been used by the large firms in each country (bank credit versus stock market).

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[15] This argument is a special application of the general market signaling theory (Spence 1974). For large corporations in Germany a similar argument is developed in Fohlin (1999).

Bank Control: Comparing Germany and the United States

Although the thesis still remains controversial, many studies have largely proven that German industrial companies were financed to no small degree by bank loans whereas in the United States corporations mainly acquired the financial backing they needed through stocks and bonds sold on the capital markets.[16] Gerschenkron emphasizes that (in Germany) banks link themselves *over the long term* to companies by giving them credit and thereby become "co-entrepreneurs."[17] Hilferding (1955: 435) also emphasizes this function. He maintains that the banks, who controlled the use of the funds they loaned, attempted to keep managers from taking large risks or from threatening the company's existence through speculation.

The Schumpeterian type of entrepreneur, who introduces *radical* innovations[18] and thus takes great risks, had only a slim chance of obtaining the necessary financing through bank *credit* in Germany. If the banks were to become this entrepreneur's creditors, they would have to shoulder great risks (and thereby threaten their existence) but would earn no more than a limited amount of the extra profit garnered by their innovative customer.[19]

Equity capital, loans, and bonds are not only different techniques to finance companies, they are three distinct financial *institutions* that offer investors and creditors different control mechanisms, that contain various forms of "bonding,"[20] and that lead to different distributions of entrepreneurial risk.

In an industrial system that is primarily financed through share capital and bonds, the banks act only as financial *intermediaries*. The entrepreneurial risk is shouldered *directly* by the shareholders and investors. Should a company go bankrupt, the reputation of the investment bank involved is tarnished, but the bank itself does not suffer any direct financial loss. In an industrial system that is primarily financed by bank credit, the banks become co-entrepreneurs and directly shoulder a part of the risk.

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[16] Tilly (1982, 1986, 1998); Lehmann (1996: 127). For the United States see Calomiris und Ramirez (1996: 59).

[17] "[German banks] were also a substitute for entrepreneurial deficiencies. From their central vantage points of control, the banks participated actively in shaping the major – and sometimes even not so major – decisions of the individual enterprises" (Gerschenkron 1968: 137).

[18] See the distinction between "radical" (US) and "incremental" (Germany) innovation systems (Hall and Soskice 2001: 38-39).

[19] "...penalties would accrue to debtholders in the event of failure and [high profits] would be captured by equity should the project succeed" (Williamson 1988: 578).

[20] "Bonding" is a term used to describe the relationship between owners/creditors (principals), on the one hand, and managers/debtors (agents), on the other. Trust, information asymmetry, incentive, and risk distribution are terms that further define this relationship. See Eisenhardt (1989).

The following comparison serves as an example to show how German banks were in a position, thanks to their relatively large size, to help finance corporations through large loans.

Table A1 (appendix) compares balance sheet data for 1913/14 from each of the big banks and the major steel companies. At the time, the largest steel company in Germany was the Friedrich Krupp AG; in the United States it was the U.S. Steel Corporation. The largest bank in Germany was the *Deutsche Bank*; its counterpart in the United States was the *National City Bank of New York*. The equity capital of the Deutsche Bank was approximately equal to that of Krupp AG (250: 215), while the equity capital of the U.S. Steel Corporation was nearly thirty-five times higher than that of National City Bank. The funded debt taken on by U.S. Steel Corporation directly from the capital market was nearly two and a half times higher than the bank deposits of the National City Bank. Bank deposits at the Deutsche Bank equaled one billion Reichsmark (M), a sum that was nearly ten times higher than the total amount of credit given Krupp (105.6 million Reichsmark).[21]

At the beginning of the twentieth century, the *concentration* of the industrial sector was much higher than that of the financial sector in the United States. U.S. Steel Corporation held about 50 percent of the American steel market and its assets (balance sheet total) amounted to about $1.8 million. The financial sector, however, was *fragmented* and the activities of financial institutions (e.g., branch banking) were confined to the state level.[22] In 1914, the largest American bank in New York had equity capital totaling no more than $25 million. American investment banks were financial intermediaries that procured share capital and bonds for the large corporations. The banks themselves would not have been able to cover the capital needs of U.S. Steel from their own resources.

The exemplary comparison of data shows that the concentration of the German banking sector ran parallel to that of the industrial sector and that the banks were in a position, at least technically, to lend a significant amount of credit to German firms.[23]

Because so much of their money was invested in industrial corporations, German banks deemed it necessary to exert control over them, more than the U.S. banks did over the firms whose bonds and shares they had floated.[24] Therefore, as a rule, representatives of German banks sat on company supervisory boards. Hilferding is cor-

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[21] In comparison, the J.P. Morgan Bank had about $ 175 million in deposits in 1913, Kuhn & Loeb had over $ 17.3 million. The Deutsche Bank had 8607 employees in 1914, while J.P. Morgan had 11 partners and a staff of 150 persons in 1913. Source: Historische Gesellschaft der Deutschen Bank (www.bankgeschichte.de/index_02_02.html); Carosso (1970: 89-91).

[22] Cf. the history of the Bank of Italy: “Prohibited under the provisions of the McFadden Act from adding additional branches to his Bank of Italy system outside of San Francisco, Giannini now embarked on the creation of a new state-chartered branch banking system … “ (Bonadio 1994: 110).

[23] Hardach (1995: 918) points out that the *Reichsbank* had supported “the restriction of competition in the banking sector by way of concentration and cartelization” (author’s translation).

[24] German banks represented not only “patient capital” but also “controlling capital” and thereby reduced the principal-agent problem.

rect in asserting (1955: 117) that, *over the long run*, banks become tied to the fate of companies to which they loan money. However, this assertion more accurately describes the relationship between banks and corporations in Germany than in the United States.

Within the corporate network, the big German banks were able to coordinate their actions. Usually they were willing to assume the costs of monitoring corporate management. Bank control therefore became a collective good "produced" in the corporate network.

Roe (1994) has argued that the fragmented structure of the financial sector in the United States should not be attributed to economic factors, but to political decisions. The establishment of branch banking was subject to a series of legal restrictions that prevented expansion and consolidation within the banking sector.[25] The intention of the Glass-Steagall Act (1933) was also to further restrict the power of the banks by forcing the separation of commercial and investment banking. On the whole, the fragmented structure of the U.S. banking system hindered an efficient control within the corporate network.

Even in Germany, banks often did not monitor the corporations effectively. The problems facing such control mechanisms are well illustrated in the bankruptcy case of the Norddeutsche Wollkämmerei, a wool combing works, in 1931.

Jacob Goldschmidt was a partner of the *Danat Bank*, one of the six largest German banks at the time. In cooperation with the *Dresdner Bank*, the *Danat Bank* was the most important creditor of the *Norddeutsche Wollkämmerei* in Bremen. In May 1931, Goldschmidt learned that the director general of the *Wollkämmerei,* Carl Lahusen, had manipulated the company's balance sheets to make it look as if this combing works only carried a debt of 45 million Reichsmarks instead of the actual 145 million Reichsmarks (Feldmann 1995: 294). In July 1931, the *Danat Bank* was forced to close its doors and the *Wollkämmerei* declared bankruptcy. Perhaps this did not come as a surprise to some in the banking sector. "When [the *Wollkämmerei]* asked for a new loan in 1927 in order to expand its business, the company was turned down by Jeidels from the *Berliner Handelsgesellschaft*, because he was dubious about the stormy expansion of the *Wollkämmerei.*"[26] Lahusen then turned to Goldschmidt and received a loan from the *Danat Bank*. In 1931, the bank lost 50 million Reichsmarks in the bankruptcy of the *Wollkämmerei.* The bank itself had equity capital totaling only 60 million.

Bank control had failed, obviously. Yet one important fact should not be overlooked: Jacob Goldschmidt had *not* been represented on the supervisory board of the *Wollkämmerei*, but Carl Lahusen had sat on the supervisory board of the *Danat Bank*. In

[25] "The National Banking Act of 1863 made no mention of branch banking whatsoever, and this omission was construed by the Comptroller, the Treasury and the Supreme Court as a prohibition" (Johnston 1983: 1). The McFadden Act (1927) explicitly prohibited this and spelled out the specifics in detail (Roe 1994: 94). For more on the Glass-Steagall Act, see Macey (1984).

[26] Born (1967: 74). Otto Jeidels was a partner of the *Berliner Handelsgesellschaft*, another of the six largest banks in Germany.

this case, the creditor had not been monitoring the debtor; instead it had been almost the other way around.[27]

Two conclusions can be drawn from this case. First, bank control is weakened by competition among banks. The critical parameter of competition is not so much the interest rate but *risk*. Risk cannot be precisely measured. Therefore, competition often forces banks to assume high credit risks. Only in a coordinated banking system[28] can effective control be exerted. Unlimited competition among banks can lead to a dangerous accumulation of "lazy credit" that would destabilize the system as a whole. Competition among banks was greater in the United States than it was in Germany. Thus it can be assumed that bank control was less intensive in the United States.

Second, control is hampered within the corporate network when a debtor (exposed to the temptation of opportunism) can influence his creditor bank over the BoD. Many more executives from industrial enterprises sat on the BoD of the U.S. banks than did on the supervisory boards of German banks. Thus we can assume that the window of opportunity for debtor-opportunism was larger in the United States (see Table 5, line 7).

Theses on control within the corporate network (in general)

● The greater the density of the corporate network and the smaller the percentage of isolated companies are, the stronger social integration becomes within the network and the greater the *opportunities* for control.

● The greater the centralization of the network and the more unequal the distribution structure of the contacts/directorships, the greater the chances are for individual managers to gain a reputation and authority as controllers (see Table 4, Gini-coefficients).

● The greater the percentage of *directed* interlocks, the greater the percentage of managers who have their own power base as executive manager/CEO in the network (autonomy of the controllers).

Theses on bank control

● The greater the percentage of industrial enterprises in which a banker sits on the BoD, the more intensive is bank control (bank interlocks, cf. Table 5, line 10).

● The percentage of German industrial firms with a banker on the supervisory board is higher than in the United States. The German bankers are often the chairmen of

[27] In 1928, the supervisory board of the Danat Bank comprised 52 individuals (including Fritz Opel). It would not be reasonable to maintain that Lahusen had exerted "influence" on the Danat Bank. But he did have access to all available information and could coordinate his strategy with the CEOs of other debtor-companies also represented on the supervisory board of the Danat Bank.

[28] Compare this with the term "regulated competition" discussed in the next section.

the supervisory boards; U.S. bankers are rarely chairman in the BoD of an industrial concern (cf. Table 5, line 12).
● The number of industrial executive managers who hold a seat on the BoD of a U.S. bank is higher than the number of industrial executives who sit on the supervisory boards of German banks (cf. indegree/outdegree, Table 5, line 7).

3. Regulated Competition

This section studies the role that corporate networks play in the regulation and control of market competition. In addition, it will be shown that different institutional solutions were found for this problem in Germany and the United States.

Companies competing for a market, would earn higher profits if they coordinated their actions among themselves (Olson 1965: 9-11). However, this kind of "regulated competition" is a public good, one produced only under certain conditions.[29] The corporate network, the cartel, and the trust are three various institutional forms in which market actors can coordinate their actions and control competition in the market. The decision in favor of one of these three institutions can be explained by economic as well as by cultural factors. Both an economic and a cultural explanation are outlined in the following sections.

The economic factors

The outstanding characteristic of mass production is the continual increase in capital intensity.[30] Before a unit of output can be produced, increasingly large investments in technical equipment and assets need to be financed. Translated into the language of business management, this means that fixed costs represent an increasing percentage of the total costs. Fixed costs are those that have to be paid no matter if production takes place or not. Blast furnaces, rolling mills, and chemical plants are examples of types of industrial production operating with great capital intensity and consequently high fixed costs.

The higher the fixed costs, the more inflexible a company becomes and the more difficult it is to react to business cycles. [31] Companies producing with high capital intensity cannot reduce or stop production during a crisis because they would otherwise be strangled by their high fixed costs. Often, large corporations react by

[29] "… people of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices" (Smith1979: 232). The problem is, however, that it is not enough just to "meet." Price agreements (cartels) need an institutional guarantee, otherwise they become a victim of the prisoners' dilemma. A. Smith did not take into consideration the consequences of *opportunism*.
[30] Capital intensity (k) is defined as the average capital investment per work place (K/A≡k).
[31] An important aim of the investment bankers working on refinancing bankrupt American railways was "to reduce fixed charges" (Carosso 1970: 36).

lowering prices in the hopes of expanding their market share during the crisis and thereby of stabilizing production at a high level.[32] Since all of their competitors find themselves in a similar predicament, they react in a similar way and the result is a ruinous price war, during which the prices spiral downward and the losses suffered by all of the companies involved rise.

There is another important factor. From the end of the nineteenth century until the middle of the twentieth century, American industry produced with a greater capital intensity than did German industry. The United States was the first to develop mass production and to introduce it everywhere with Taylorism and Fordism. Thus, U.S. companies suffered from the dilemma posed by fixed costs far more than German companies did. Aggregated data on capital intensity since 1935 are available and show that the average capital intensity of the U.S. economy was three to five times higher than that of the German economy. A comparison of the two previously mentioned steel companies confirms this finding. In 1914, the average capital intensity of Krupp AG was $1,202, while in 1907 that of U.S. Steel was $4,021 – in other words, approximately 3.3 times greater.[33]

Mass production increases capital intensity; capital intensity increases the percentage of fixed costs; a higher percentage of fixed costs makes mass production necessary – even more so in economically depressed times. Such economic logic makes the organization and control of markets imperative. Unregulated competition among big corporations in the age of mass production is not possible over a long period of time. There are various solutions to this dilemma, namely, corporate networks, cartels, and trusts.

Lamoreaux (1985) shows that the dilemma of high fixed costs is an important explanation for the "Great Merger Movement" in the United States at the beginning of the twentieth century. Between 1895 and 1904, about 65 trusts (consolidations) were established and registered. Smaller companies merged into these trusts, which together often represented a market share of over 70 percent.[34] Thus, competition was not "regulated" by the trusts, but abolished for the most part. If Germany could be called the "land of cartels" at the beginning of the twentieth century, then the United States was the "land of trusts."[35]

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[32] As long as a company can produce within the scope of decreasing marginal costs, it makes economic sense to lower prices in order to be able to expand production. This argument is presented in detail by Lamoreaux (1985: 46-62).

[33] Source for aggregated economic data on capital intensity: D'Adda und Scorcu (2002: 14, Fig. 8). Sources for US-Steel Corp.: Tangible assets = 676 Mio. US-$ (revised estimate, Strouse 1999: 406); Number of employees (1907) = 168.127 (Wardley 1999: 107, Table 3). Sources for Fried. Krupp AG: Tangible assets: ∑paid-up capital + funded debt + bank credits = 409 Mio. M. (Handbuch der Deutschen Aktien-Gesellschaften 1914/1915, Vol. II, pp. 336-339). Number of employees (1914) = 81,001 (Gall 2000: 371); Exchange rate: 1 US-$ = 4,20 Mark (1914). Own computation.

[34] Lamoreaux (1985: 3); cf. Nelson (1959).

[35] The trust was the most important, yet not the only form of market coordination in the United States. Firms also negotiated complex forms of cartel agreements (Stevens 1913).

Cultural Factors

Marx and the scholars of the Historical School agreed that market competition creates an anarchic system. In the linguistic usage at the time, the word 'anarchy' did not imply complete lawlessness, but the unlimited freedom of each individual to do as he pleased with his life and his property. "Since anarchy represents the total sovereignty of the individual, the logical consequence is the demand for absolute liberty over private property for each member of society" (Diehl 1923: 277). Cornelius Vanderbilt defended dubious competitive practices before an investigative committee by asking "Can't I do what I want with my own?" (Josephson 1995: 71). This is the standpoint of "free competition."

In Germany, the historical school propagated ideas that emphasized collective values and control of market competition: "I have always pointed out the flip side of all this economic freedom and particularly the ruthless and exaggerated competition. I have been emphasizing for quite some time that economic freedom is a blessing only in certain areas, that only moderate *regulated competition,* varied here and there, stimulates [the economy]…" [36] The cartel - the most common form of market regulation in Germany - abolished the "absolute liberty over private property" and thereby ran counter to the Anglo-Saxon tradition of "possessive individualism" (Macpherson 1962).

Schumpeter's definition (1928: 482) of the entrepreneur as a charismatic "leader in the world of business" can also be integrated into this context. In this definition, Schumpeter clearly borrows from Weber's concept of charismatic rule. For Weber, charisma is basically "irrational" and incalculable.[37] Therefore, the two factors that create the anarchic elements found in the market and make it essentially incalculable are the unlimited individual liberty allowed in market competition and the charismatic rule of the entrepreneur.

Organized capitalism represented a new form of economic order in which overarching forms of cooperation were to make the market *calculable and controllable*. Trade associations, cartels, trusts, and – last but not least – the corporate network were instruments that were to help transform the anarchy of liberal, competitive capitalism into the rational order of organized capitalism. The corporate network was part of that "iron cage" in which charismatic entrepreneurship was to be rationalized. In the place of charismatic entrepreneurs such as Henry Ford or Alfred Krupp (who

[36] Schmoller (1906: 249); author's translation and emphasis. Gustav Schmoller was a prominent scholar of the Historical School in Germany.

[37] Charismatic authority is "specifically irrational in the sense of being foreign to all rules" (Weber 1964: 181, author's translation).

were never a part of a corporate network)[38] came professional managers who made sure that anarchic competition was replaced by regulated competition.[39]

Both the economic and the cultural explanations clearly point out the differences existing between the United States and Germany. At first, U.S. companies struggled more with the problem of high fixed costs than did German firms. That is why they had a greater interest in market regulation. At the same time, cultural values strongly endorsed individual liberty and free competition. Economic constraints and cultural values were pulling the country in opposite directions and therefore led to paradoxical results.

Because American companies found no institutional basis for milder forms of market regulation (cartels) in common law,[40] they were forced to resort to semi-monopolistic forms of consolidation (trusts). These represented a massive encroachment on free competition and individual liberty and prompted the political apparatus to mobilize against them (Progressive Movement). As a result, the markets in the United States became even *more regulated* than in Germany (antitrust laws). The cartels formed by German companies became fairly stable because the government gave cartels a legal framework in which to exist. Here, economic constraints and cultural values were pulling in the same direction and, therefore, supported decentralized, *corporatist* forms[41] of regulated competition. These ideas will be spelled out in more detail in the following sections.

Cartels

The cartel has a federal structure. The member firms retain their legal and economic independence and they can cancel the cartel agreement. Because of its decentralized structure and its internal interest heterogeneity, the cartel is permanently faced

[38] In 1914, the Ford Motor Co. was isolated; in 1928 and 1938 it was only linked to one other big company (outdegree). In 1896 the Krupp company was isolated; in 1914 it was linked to only four other companies. As a comparison, Guaranty Trust (the American company with the greatest centrality in 1914) was linked to 50 companies; Western Union Telegraph Co. with 38 companies. The Germany company with the greatest centrality in 1914 was AEG, which was linked then to 82 companies (actor degree centrality).

[39] The chairman of U.S. Steel Corporation, Elbert H. Gary, invited the managers of the American steel industry to dinner on a regular basis. Testifying before an investigative committee, Gary declared: “We have come together so that competition should be honorable, decent, and reasonable, as opposed to bitter, hostile, destructive competition such as used to exist” (Laidler 1931: 47-48). These forms of market regulation were illegal in the United States and were investigated by a *Committee on Investigations of the U.S. Steel Corp.* In Germany such forms of regulation could be spelled out contractually within the framework of cartels.

[40] “Morgan’s effort to get the western [rail]roads to cooperate to everyone’s advantage achieved little or nothing. They failed to honor the gentlemen’s agreement that they had ratified at the New York meeting …” (Carosso 1970: 30).

[41] A system of interest representation is called 'corporatist', if it allows the *autonomous* regulation of economic interests of a social group. This definition overlaps, but is not coterminous with the concept of 'neocorporatism' (Schmitter 1974).

with the threat of dissolution. Therefore, it cannot survive without help from the state. Starting in 1897 in Germany, suits could be filed in court over cartel agreements.[42] Chandler (1990) interprets the *Reich Court* decision of 1897 as being the track switch that sent Germany in the direction of "cooperative capitalism", while the Sherman Act of 1890 sent the United States in the direction of "competitive capitalism".

A cartel is not a monopoly. The collective control by the members of the cartel prevents any *single* company from creating a monopoly.[43] Prices are often dictated by the weaker members of the group. With regard to the overall economy, the cartel is not a very efficient economic instrument because it delays the ousting of less productive companies from the market. The cartel illustrates the corporative character of a *community* of interests, whose ideology dates back to the Middle Ages and the right of subsistence granted every member (Böhm 1948).

Price and quota cartels abolish price competition, and the most productive companies can make great profits. However, the cartel does not exclude competition with regard to innovation and quality (Schmoller 1906: 253). Companies belonging to the steel cartel invested relatively large sums in research and development. They were very aware that technological advantage was the only thing that could ensure a company's survival should the cartel fall apart. The cartel guaranteed the exclusion of price competition for a *limited* period of time. Companies thus used this relatively secure time span to plan and invest in elaborate and costly technical innovations.[44] In a sense, the cartel established a private planned economy.[45]

Trusts

The trust tends to lead to the centralized monopoly under a uniform leadership. Often it was organized in the form of a holding. The member companies lost not only their economic autonomy, but also their legal autonomy. Between 1880 and 1900, trusts were organized in many industrial sectors of mass production and controlled, as a

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[42] Reich Court decision of 5 Feb. 1897. Cf. Chandler (1990: 47-49, 393-95). Böhm (1948) blamed the Reich Court for making a value judgement in its ruling concealed behind a pseudo-economic reasoning. The Court clearly defended the *collective* interests of the cartel members and constrained *individual* liberty and free market competition.

[43] Supporters of cartels argued that a prohibition of cartels would lead in Germany to the introduction of trusts modeled on those of the United States. See the speech by E. Kirdorf (Gelsenkirchner Bergwerks AG) in *Verhandlungen des Vereins für Socialpolitik* 116 (1906), p. 287.

[44] C. Bosch (CEO of *I.G. Farbenindustrie*) has been attributed the remark that "the I.G. is not here for the shareholders but in order to conduct research and development" (Plumpe 1990: 160, author's translation).

[45] *Bergrat* Gothein (*Reichstag* member) accused the coal syndicate that it did not foresee the threatening economic crisis of 1901 in time and attempted to soften the blow by sinking prices. This is a case in which a private association is made responsible for deficits in the macro-economic regulation of the entire economy. Source: *Kontradiktorische Verhandlungen über Deutsche Kartelle*, vol. 1, Steinkohlen und Koks. Berlin 1903: F. Siemenroth, p. 86.

rule, between 75 – 90 percent of the market. About the sugar trust, Jones (1922: 20) writes:

"The centralized control provided for in the agreement made it possible for the trustees to dismantle those refineries that were poorly located, and to build new works at strategic points. Obviously it made no difference to the former owners of a given plant whether or not that plant was operated, since they received a certain percentage of the profits earned by all the companies."[46]

Trust management could close down inefficient plants without having to fear the resistance of the previous owners. With regard to this centralized control, the trust was superior to the cartel.

However, the trust supports Marx's thesis that capitalist competition develops facets that lead to its own eradication, namely, monopolies. In the United States, the government reacted to the advancing monopolization of the country's markets by introducing antitrust laws and court jurisdiction over company mergers. The following quote illustrates the complex process initiated against trusts by the legislative and judicial branches of government (Jones 1914: 181-83).

"In 1902 Mr. Hearst[47] filed a petition with the Interstate Commerce Commission (ICC) to secure the dissolution of the anthracite coal combination. Mr. Hearst had endeavored to persuade the Attorney General of the United States to institute proceedings under the Sherman Anti-Trust Act, but having failed in this, he addressed the ICC… The ICC began the taking of testimony in April, 1903, but was much hampered in its investigation by the refusal of the officers of the railroads and their subsidiary coal companies to provide the [relevant documents]… and by their refusal to answer certain questions as to the fixing of prices. Upon the refusal of the defendants to comply with its order the Commission took the case to the Circuit Court… The Circuit Court held (1903) that the contracts and questions called for had no reference to transportation…. An appeal was taken under the expediting act of 1903, directly to the Supreme Court. This court, in a decision rendered 1904, reversed the findings of the lower court. … The ICC thereupon reopened its case. It took much testimony, and continued to conduct investigations, even as late as 1906."

Such complicated legal action took place in many U.S. courts following the passage of the Sherman Act.[48] It drastically increased the transaction costs of a market that first had to be created by governmental regulation. What thus becomes clear is that the competitive market does not itself create a spontaneous, self-regulating order; it is instead a political *construction*. The market must be reconstituted anew by way of permanent control and state intervention.

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[46] Unlike a member of a trust, the individual cartel member did care a great deal whether his factory produced or not because cartel quotas were based on its previous level of production.
[47] William Randolf Hearst (1863-1951) was a member of the U.S. House of Representatives (1903-07) who fought against the "trustification" of the American economy. He had no board seat in companies included in our data set of 1914. He held only one directorship in both of the years 1928 and 1938 at Hearst Consolidated Publications; this firm was 'isolated' in our data set of 1928 and 1938 (actor degree centrality = 0). W.R. Hearst's name is almost synonymous with "yellow journalism" – an example of unregulated competition among newspapers.
[48] Cf. Tables 3.1 and 3.2 in Fligstein (1990: 79-80).

The model of *regulated competition* is based on the concept of corporatism. It does not propagate state control, but the autonomous control by the market actors themselves within a community of interests. Premodern forms of community, subsistence, and equality have been transported into the modern industrial society and embodied in specific institutions of market regulation.

The concept contains a normative and an analytical component. The *normative* component holds that cooperation, consensus, and community are more highly valued than competition and unrestricted property rights. The *analytical* component is expressed in the idea that the payoff for cooperation[49] is greater than any cost to the general welfare incurred by allocative inefficiency (restriction of competition).

The practice of interlocking directorates arose complementarily to the cartel. By having representatives of the various corporations sit on each other's supervisory boards, the practice strengthened the integration of the cartel members. During the course of a cartel agreement, conflicts of interest could be negotiated and contractual changes worked out within the corporate network.

In the United States, free competition – as opposed to regulated competition – was the model favored politically. Therefore, the political agenda was dominated by a campaign against any institution hindering free competition in the markets. This is why interlocking directorates also fell into political disfavor. Brandeis (1995: 76) expressed his condemnation of interlocking directorates with the following statement:

"For even more important than efficiency[50] are industrial and political liberty; and these are imperiled by the Money Trust. Interlocking directorates must be prohibited, because it is impossible to break the Money Trust[51] without putting an end to the practice [of interlocks] in the larger cooperation."

Interlocking directorates between competing corporations were prohibited by the Clayton Act of 1914. In the eyes of the public, the corporate network appeared to be a suspicious institution in a market regulated by antitrust laws. Therefore, the network gradually lost its control power and became an old boys' network: "Board members are typically recruited from among friends and acquaintances of current directors" (Davis and Mizruchi 1999: 215).

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[49] The reward for cooperation is to be interpreted within the context of the prisoners' dilemma: the *sum* of the payoffs that two players receive *together* is greater when both cooperate.

[50] Brandeis does indeed recognize that unrestricted competition can be inefficient.

[51] Belonging to the "Money Trust" were, in particular, the large New York (investment) banks and insurances. These were highly interlocked with one another and controlled the U.S. financial market. At the heart of the "Money Trust" was the investment bank of J. P. Morgan. Table 5, line 2/col. 2 (US) shows that the 49 American financial institutions included in our data set of 1914 were interlocked on average with 1.33 other banks/insurances (intrasectoral interlocking).

The “principal-agent” problem between managers and owners worsened in large U.S. corporations for two reasons. First, the separation of ownership and control was much further advanced than in Germany. In the large “Berle-Means”-corporation, the owners (small investors) could not exert any control, and managers were able to pursue their special interests fairly freely. Second, U.S. managers could also escape control through their peers in the corporate network because the network was condemned politically.[52] Therefore, compared with Germany, managers of large American public corporations were controlled less by company owners or the CEOs of other corporations.

In sum, two theses are asserted:
● In Germany, the corporate network was influenced by strong *intra*sectoral relations, that is, a great percentage of relations occurred between companies *within* the same economic sector (parallel to the cartels). Compared with Germany, intrasectoral relations in the United States were weaker for two reasons. First, they were legally prohibited. Second, they were not necessary in those sectors that were (nearly) monopolized by trusts.[53]
● In Germany, the density of corporate networks increased parallel to the increasing cartelization of the economy. In the United States, the network density began to decrease after 1914 as a reaction to the antitrust laws and numerous court cases. The legal risk associated with interlocking directorates increased in the United States (cf. Figure 1 below).

4. Social Capital

In this section, social capital is defined as the *opportunity* open to an individual to mobilize the resources of other people (in a relationship not based on market exchange) to his or her own advantage.[54] Bourdieu defined the term in this sense when he used it in his studies of the French elite.[55] The graduates of elite universities create closed social circles. Within these circles, members exchange information and ensure that high status positions are filled only with alumni. From this point of view social capital is an instrument for social closure (Parkin 1974).

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[52] It could also be argued that the strengthening of management control was an unintended consequence of the Sherman/Clayton Act.
[53] The argument propagated by Chandler (1977) that the “invisible hand” of the market is replaced by the “visible hand” of managers in large corporations is true particularly for the trusts.
[54] There are numerous definitions of social capital that cannot be discussed here (Kadushin 2004). First, social capital can be defined as a characteristic of the *social structure*. Then it is identified with trust, norm fulfillment and cooperation. (In section 2, the term “moral capital” was introduced to underscore this aspect.) Second, at the micro-level social capital can be defined as a resource used by rational egoists to attain their special interests. In many social relationships these two aspects cannot be separated *empirically*.
[55] „Le capital social est l’ensemble des ressources actuelles ou potentielles qui sont liées à la possession d’un *réseau durable de relations* plus or moins institutionnalisées d’interconnaissance et d’interreconnaissance » (Bourdieu 1980 : 2).

In corporate networks, social capital can be mobilized in this way to advance special interests. “With a little help from my banker,” for example, I might receive information about a competing company that is in financial trouble and is about to be sold.[56]

In order to mobilize social capital, it is first important that I know person B (in order to be able to ask for a favor). Even more decisive is that B knows me, for only then can B be willing to pass on information, offer jobs or contracts, or grant credit. The corporate network is made up of a selective public, which enables its members to *observe the behavior of other network members*. B can observe the decisions I make, how I act in a crisis situation, and whether I am immune to “moral hazards.” Likewise, I am able to obtain the same information about B. Therefore, social capital reduces information asymmetries and diminishes uncertainty.

Paul Silverberg, one of the most prominent business leaders during the interwar period in Germany, sat on 25 supervisory boards in 1928, including those of Demag, the Deutsche Bank, the Metallgesellschaft, RWE, and others. Oscar Schlitter, CEO of the Deutsche Bank, sat on 32 supervisory boards that same year. Silverberg and Schlitter were on eleven of the same boards, meaning that they met each other roughly twenty-two times a year and could monitor each other. As a result, board meetings are forums in which managers can gain “tacit knowledge” about their peers.

The following example illustrates the way in which J.P. Morgan used the corporate network of his investment bank in order to capitalize on the resources of other people to the benefit of his bank’s own interests.

“J.P. Morgan (or a partner), a director of the New York, New Haven & Hartford Railroad, causes that company to sell to J.P. Morgan & Co. an issue of bonds. J.P. Morgan & Co. borrow the money with which to pay for the bonds from the Guaranty Trust Company, of which Mr. Morgan (or a partner) is a director. J.P. Morgan & Co. sell the bonds to the Penn Mutual Live Insurance Company, of which Mr. Morgan (or a partner) is a director. The New Haven spends the proceeds of the bonds in purchasing steel rails from the U.S. Steel Corporation, of which Mr. Morgan (or a partner) is a director. The U.S. Steel corp. spends the proceeds of the rails in purchasing electrical supplies from the General Electric Company, of which Mr. Morgan (or a partner) is a director….” (Brandeis 1995: 72).

At first glance, this quote can be interpreted as a revelation of how special interests are pursued. The corporate network is part of a corruptible Money Trust; it threatens the free market and thus political democracy. Morgan’s network illustrates a typical form of “relational contracting” from which outsiders are excluded. Thanks to their privileged position, insiders can accrue large profits. That is why Brandeis comes to the conclusion (1995: 76) that “interlocking directorates must be prohibited.”

Yet, the quote could also support the idea that networks are efficient institutions complementing the market, that they reduce transaction costs, that information can be more quickly and more precisely disseminated within the network than in anonymous

[56] At the end of the nineteenth century, a differentiated market for corporate control did not exist either in the United States or in Germany. The purchase or sale of companies occurred more or less exclusively over social contacts in the corporate network.

markets (Uzzi 1990). The quote reminds us of the Say's Law: supply creates its own demand. On the free market, the balance between supply and demand can only be reached over the long term. Within the corporate networks, such a balance can be more quickly achieved through negotiations on the collective level. Morgan's business partners know each other, trust one another, and can therefore keep the economic machine running with lower transaction costs. In this sense, trust and economic efficiency become characteristics of the network that Morgan and his partners built and that remained a stable institution for decades, independent of any one individual. "…a group within which there is extensive trustworthiness and extensive trust is able to accomplish much more than a comparable group without that trustworthiness and trust" (Coleman 1988: 101).

This demonstrates how vague and ambivalent the concept of social capital really is. The ambivalence arises from the tension between individual and collective interests. With regard to the corporate network, it is argued here that the more comprehensive and dense the corporate network is and the more "visible" (prominent) the major actors are, the greater are the chances that "universalistic" interests will be represented, not particularistic ones. [57]

5. Methodological Problems of Corporate Network Analysis

Empirically, it is very difficult to discover the conditions under which social capital is mobilized in corporate networks and if it is indeed mobilized at all. At the micro-level, social capital is defined as the opportunity to mobilize the resources of other people. Often it cannot be determined whether or not this opportunity is indeed used. In the following sections, it will be first shown that every ego network is the result of a double selection and, therefore, both individual and organizational interests are pursued in the relationships. Furthermore, it will be argued that the structure of the network as a whole cannot be controlled by any organization. Thus, it can only be interpreted as an "opportunity structure."

Double Selection

Table 1 represents the ego networks of George F. Baker (First National Bank, New York) and of Walther Rathenau (AEG, Berlin) in 1914. Baker held twelve seats in the corporate network, Rathenau nineteen. The table lists the firms on whose Boards Baker and Rathenau sat.[58] The column "degree" shows the number of companies with which each of these respective firms was interlocked. For example, Guaranty Trust was interlocked with fifty other U.S. firms. This means that Baker could reach

[57] Borrowing from the term "bounded rationality" (Simon 1972) one could introduce the term "bounded universalism". In comprehensive and dense corporate networks, there is a *chance* to realize interests that tend to be "universalistic."

[58] Only part of the ego network of Walther Rathenau is shown, namely the twelve companies with the highest *degree*.

these fifty companies over path length 2. The Rütgerswerke AG was interlocked with sixty-five other companies, meaning that Rathenau could reach them also over path length 2.

Insert Table 1 here.

An ego network is the result of double selection. On the one hand, corporation A selects various individuals to sit on its BoD. These people can accept or decline the offer. On the other hand, individuals try to get themselves selected as directors on the board of attractive corporations. The corporations can accept or reject these advances.[59]

The concept of double selection maintains that in every relationship, both *individual* interests and the interests of *organizations* are pursued. For example, person A attempts to get elected to the BoD of corporation X, because such a position would serve this person's career interests. Corporation X elects person A because management hopes to be able to reduce the resource dependency of the organization. Our data set reveals the companies on whose BoD person A sits; these are the companies which are interlocked through this person. It is possible that both the individual and the organization achieve their goals. It is also conceivable that only the personal career goals of person A are achieved, whereas the corporation is forced to admit that A hurt the business interests of the firm more than helped them.[60]

Were ego networks used to pursue personal (career) interests or an organization's business interests? In the case of Walther Rathenau, who held seats on the boards of companies that were almost all in the electrical industry, it is obvious that the corporation interests of AEG were the determining ones (see Table 1). In the case of Sewell L. Avery, who held eight positions in the US-network in 1938, the question is not as easy to answer. In any case, the following combination of board seats does not necessarily reflect company interests: U.S. Gypsum, Montgomery Ward (retail), Armour Co. (food), Northern Trust (bank), People's Gas, Light & Coke (utility), Pullman Inc., Pure Oil Co., U.S. Steel Corp. At U.S. Gypsum, Avery was an executive manager (and shareholder); at Montgomery Ward he was chairman of the board, while at each of the other companies he only held a seat on the BoD.[61]

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[59] Case studies prove, first, that bankers wanted to grant firms credit only if the banks were given a seat on the company's supervisory board and, second, that the companies often refused outright to do this. See, for example, Wixforth (1995: 149, 182-3, 193).

[60] Paul Silverberg points out that a member of the supervisory board may not represent any *external* interests, but only the interests of the company on whose supervisory board he sits. "I have never known a bank director serving as a supervisory board member of a corporation to represent the interests of his bank" (Schubert und Hommelhoff 1987: 208, Protokolle der Verhandlungen, author's translation). Naturally, this is a "heroic" standpoint.

[61] "The rugged individual of this period, however, was Sewell Avery, Chairman of the Board of Montgomery Ward. There had been a stockholders' revolt against him because of the

The comparison of the ego networks of Walther Rathenau and of Sewell Avery demonstrates that individual and organizational interests overlap in the corporate networks and often conflict with one another.

Structural Analysis

Although the structure of every ego network is determined by the decision of single individuals and organizations, the structure of the *entire* network cannot be controlled by an individual or a company. In 1928, the corporate network created among 377 companies in Germany comprised a total of 12,374 relationships (see Table 2, line 6). The *structure* of these relationships – meaning, the density, the degree of centralization, and the redundancy of the network (percentage of multiple ties) – lay beyond the control of any one person or organization. The structure was influenced by the legal framework (Clayton Act, Reich Court decisions), economic constraints (fixed costs), and cultural value patterns (a traditional preference for community). The analysis presented in the empirical part of this paper is a structural analysis of the *entire corporate network*.

We can compare the corporate network to a railroad network. A graphic illustration of the network would show which "places" (companies) were linked to one another and which ones remained isolated, meaning they had no "train station." The interests advanced in the corporate network can be thought of as the trains running on the railroad network. We can examine the structure of the railroad network with the methods of network analysis and display the structural differences between the German and the U.S. networks. Unfortunately, we cannot use our data-gathering method to determine which trains were traveling on the network's tracks.

In other words, we cannot determine whether social capital was successfully mobilized or whether the individual actors failed to achieve their own aims. The empirical description is difficult not the least because each relationship involves several actors pursuing different if not contradictory interests.[62]

Our data set for Germany and the United States contains 38,786 relationships. It is not possible to examine all of these relationships and determine the type of interests being pursued in each case. Nor is it possible to take a sample from the grand popu-

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deficit Montgomery Ward had had in 1932, and even more so, because of the contracts that he had made between Montgomery Ward and the U. S. Gypsum Company. These contracts brought a great amount of business to U. S. Gypsum and Avery had a large financial interest in U. S. Gypsum. Fortunately for Avery, 1933 showed a profit for Montgomery Ward and at the annual meeting he was re-elected to the Board by a large majority." Source: http://www.redlandsfortnightly.org/vroman78.htm (January 2005).

[62] Each case of personnel interlocking involves two companies (A and B) and an individual who creates an interlock between A and B by way of the BoD.

lation of ties owing to the nature of the historical source material, which can only be used within the framework of case studies.[63]

This methodological dilemma leads to three conclusions:

(1) The following analysis does not examine the interests that were actually pursued by various actors in the corporate network, it studies the *opportunity structures*. The corporate network offers the *chance* to stabilize cooperation among rational egoists; it offers the *chance* to exert control within an interlocked peer group and to penalize infringements of ethic principles. The more comprehensive the scope and the greater the density of a corporate network, the greater the chances become to achieve cooperation based on universalistic performance criteria.

(2) Certain assumptions about the structure of the corporate network can be derived from the arguments presented so far. First, if banks were important agents of control, then it would have to be proven that they held a key position in the network (centrality index). If German banks maintained a strong interest in controlling the dispersal of credit, then they should have been represented in more companies than U.S. banks were, relatively speaking. Therefore, the question examined here is whether these above-mentioned arguments are compatible with the structural characteristics of the corporate network. This structural analysis is the main focus of the empirical part of this paper.

(3) The structure of interlocks is to a degree “public,” meaning that it is more or less known who sits on what Board. However, the interests pursued in the network are not “visible.” That is why corporate networks feed the fires of legend-building and conspiracy theories. For example, Brandeis maintains that the U.S. Steel Corporation acquired its supply of electricity from General Electric just because J. P. Morgan was sitting on the boards of both of these corporations at the time. Using our data set, we were able to recreate the ego network of J. P. Morgan and his partners, including all of the relationships listed by Brandeis. Although we can reconstruct the “railroad network” for Morgan & Co., we cannot say what “trains” were running over the rails, and neither could Brandeis except in a few cases. The assertions Brandeis makes are not false. We know from case studies that the network of relationships created by J. P. Morgan was able to fulfill many interests that Brandeis denounced.[64] Still, we must attribute a significant part of what has been written about networks to political

[63] Even today, a sample would not solve the problem because members of any BoD would refuse to cooperate – for legal reasons, among others.
[64] The protocols of the Pujo Committee, which Brandeis (1995) used, and the protocols of another investigative committee inquiring into the financial scandal of the 1929 crash on Wall Street (Pecora 1968) supply information on the interests pursued in the networks. But this material can only be derived from case studies that are not representative.

folklore. Many of the assertions made by Brandeis (Money Trust) and Hilferding (rule of the banks) fall under this rubric.[65]

[65] See also Kotz (1978), Mintz and Schwartz (1987: 19-20), who revive the concept of bank power in the United States and explicitly refer to Hilferding.

Section B: Comparative structural analysis

6. The size and border of the corporate network

The age of "organized capitalism" was shaped by the emergence of big corporations, the spread of mass production, and the scientific approach to production techniques. The following analysis concentrates on the structure of interlocking directorships among such *large* corporations.[66]

Our selection process was based on published lists of the largest corporations in Germany and the United States.[67] The company sample varies over time – that is, less than 30 percent of the companies included in the sample are in it for the entire period of 1896 to 1938. Such substitution can be explained by the growth process during this period and by the fusions and company takeovers that often took place. In comparing the structure of the corporate network in the years 1896, 1914, 1928, 1933, and 1938, it must be taken into consideration that the analysis applies to the *largest* companies in each respective year, but that only a small proportion of the sample (less than 30 percent) covers the *same* companies in each year.

From the standpoint of inferential statistics, the term "sample" is imprecise. Stated more accurately, the sample covers the *total population* of the major companies in each of these years. The hypotheses and conclusions formulated here apply *only* to this group of companies. It is not assumed that a similar network structure can be found among smaller (family) businesses.

The borders of the corporate network are set relatively arbitrarily by the list of the big corporations. The corporate network extends beyond the big corporations to include

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[66] There are a number of historical studies on interlocking directorates: Fiedler and Lorentz (2003) examined interlocks among major German corporations for the period between 1927 and 1950; Fohlin (1999) and Ziegler (1998) analyzed the interconnections between banks and industrial companies: Eulenburg (1906) examined the type of directors sitting on the supervisory board of the 1,000 largest German corporations for 1905 (proportion of bankers, engineers, etc.). For the United States, Mizruchi (1982) submitted a study on interlocks among the 100 largest U.S. companies during 1904-1974, while Roy (1983) used a sample of 374 U.S. companies to do the same for the period between 1886 and 1905. These studies are not discussed here in any detail because these samples of companies do not directly correspond with our comprehensive survey of the total population of the largest firms in each country. However, the results all reveal the same general tendencies: Fiedler and Lorentz (2003) point out the decline of interlocks in Germany after 1928. Mizruchi (1982: 105-106) has shown that interlocks in the United States drop off after 1914. Fohlin (1999: 313) proves the increasing number of interlocks among banks and industrial concerns prior to WWI. The study presented here provides us for the first time with a *comparative* analysis of interlocking directorates among the big corporations in Germany and the United States.

[67] See list of sources in Appendix II. It should be noted that in this article, only *interlocking directorates* will be analyzed, and the term "network" is meant to refer exclusively to these interlocks among big businesses. Due to the lack of data, capital networks (cross shareholdings) among companies cannot be examined.

smaller private banks and family enterprises. However, these relations are not included in this study (Laumann et al. 1983).

For several U.S. insurance companies, names are available of *all* of the firms, large and small, with whom these insurances were linked via their directors in 1938.[68] New York Life Insurance had twenty-five directors[69] who sat on the BoD of a total of 169 other companies, among which were 27 banks, 57 industrial enterprises, and 16 other insurance companies. However, in our data set, New York Life Insurance only has a *degree* of 26, meaning that this insurance was linked to twenty-six of the 409 major companies included in our study of 1938. Thus, we cover only about 15 percent of the interlocks that this insurance actually had. Although this is probably an extreme case, we use it here to point out that the corporate network extended beyond the realm of big corporations.

Insert Table 2 here

Table 2 (line 1) lists the number of big corporations included in each year of the study (=N). Line 3 notes the percentage of isolated firms, that is, those companies that did not have any interlocking directorates with other big corporations. In 1896, this figure is still relatively high in Germany (26.4 percent, col. 5), but it drops throughout the period and is only at 4.2 percent by 1938. In the United States, this same calculation of isolated companies remains between 8-10 percent, except when it peaks in 1914 with the relatively high value of 20.2 percent.

Line 4 records the percentage of firms that had a *degree* between 1 and 2. These companies held a marginal position in the network because they were only interlocked with one or two other firms. When these *weakly linked* companies are added to the isolated ones, the percentage they represent in Germany equals 55.2 in 1896 and 25.4 in 1914. In the United States, the percentage for these same years was 28.5 and 41.3, respectively. Not until 1928 did the corporate network in Germany become “comprehensive” in the sense that approximately 90 percent of the companies were relatively well integrated into it. In the United States, the share of isolated and marginal firms remained constant in 1928 and 1938 at about 27 percent. If we imagine the corporate network as a sequence of concentric circles with diminishing density, then the U.S. companies making up this 27 percent created an outer, poorly integrated ring. The hub of the concentric circles comprises the companies listed in Table 3.

[68] Source: TNEC, Public Resolution No. 113, Part 4, Life Insurance, S. 1558-1562 (Exhibit No. 262).
[69] Herbert Hoover was one of them. He had only one Board-position in our data set (New York Life Insurance). “relational contracting”:

Isolated and marginal companies share three characteristics: they are among the smallest of the big companies; they are still family-owned businesses during this period;[70] and they are involved in business sectors not considered to be part of the second Industrial Revolution (e.g. lumber, textiles, and foodstuffs). The fact that family-owned firms in particular were marginalized in the network is evidence to support the argument that the corporate network was an institution of the emerging managerial capitalism.

Line 5 shows that the average number of members on management boards and supervisory boards in Germany increased from 7.9 persons in 1896 to 21.7 persons in 1928, only to drop to 15 by 1938. In the United States, the average size of the BoD also increased, although less dramatically, from 13.3 to 16.5 persons. The larger a company's boards were, the greater were the *opportunities* it offered to establish interlocking directorates.

The difference between Germany and the United States can be highlighted for 1928 by the following calculation. On average, the BoD[71] of an American company had 17.5 members, in Germany the supervisory board and the management board together had 21.7 members. The difference is 4.2 positions. The number of companies included in the study (N) is 377 in Germany and 369 in the United States. I chose the smaller N: 369 x 4.2 ≈ 1,550. Because of their larger boards, major German corporations had about 1,550 *additional* positions through which companies could become interlocked.

7. Redundancy, density, and centrality

Line 6 of Table 2 shows the total number of interlocks (directed and undirected) that existed between companies in each of the years examined. Among the 156 *linked* companies (= n) in Germany in 1896, the total number of interlocks equaled 513; in 1928 there existed a total of 12,374 interlocks among 366 linked companies.

Often companies linked to one another shared not just one but several directors. Line 8 indicates the percentage of interlocks that were multiple ones. In Germany, the percentage of multiple interlocks rises from 20.3 (1896) to 36.2 (1928); in the United States, the percentage decreases from 28.6 (1900) to 22.8 (1938). Multiple interlocks can be interpreted from two perspectives. If company A wishes to obtain information about company B, it is sufficient when both companies are linked through a single individual. All other interlocks are considered redundant because it is assumed that any additional person will only obtain the same information about company B as the

[70] In 1914 the US-firms *Firestone Tire & Rubber* and *Jones & Laughlin Steel* were "isolated" family firms. In Germany the family-firms *Gebrüder Stollwerck* and *Röchling'sche Eisen- und Stahlwerke* were isolated. On the management/supervisory board of *Röchling* we only find family members. *Johnes & Laughlin* had (at least) 7 family members on its Board (Board size: 16 directors).

[71] This number includes the members of the BoD and the top executive managers who are not board members.

first individual. From this perspective, multiple interlocks are an indication of the *redundancy* in a network (Burt 1992: 18).

Multiple interlocks can also be interpreted as indicators of control. This is assumed to be the case when company A delegates several members of its management board to the supervisory board of company B, particularly when company A is a bank with several directors sitting on the supervisory board of a (debtor) company.[72] In such cases it appears to be true that the greater the percentage of multiple interlocks, the more intense the control.

Without additional information it is not possible to decide whether a high percentage of multiple interlocks in Germany should be interpreted as an indicator of greater redundancy or of a more intense degree of control.[73] Yet there should be no doubt that the *opportunities* to exert control were definitely far more numerous in Germany. This assumption is supported by the fact that the other indicators used in this analysis (density and centrality) also point to a greater degree of control in Germany.

An important structural characteristic is the density of the network, understood as the ratio of actual interlocks to possible ones. Figure 1 maps out the development over time and the difference between the two countries. In Germany, the density of the corporate network rises continually until 1928 (10.8 percent) then drops back down to 7.0 percent by 1938. In the United States, the density is at first greater than in Germany, yet after 1914 it diminishes continually. In both 1928 and 1938, the network density is 4.3 times greater in Germany than it is in the United States.

Insert Figure 1 here

If the density of the corporate network is interpreted as an indicator of the “mass” of social capital, then German managers had more social capital at their disposal. Compared with U.S. managers, they were able to contact (and control) *directly* more colleagues in other companies through the network. In Germany, the density increased parallel to the growing cartelization of the economy.[74]

Line 9 records the average number of interlocks per firm. This indicator acts in a manner similar to density. In 1900 an American company maintained an average of

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[72] In Germany, 55.6 % of all interlocks that the banking sector *as a whole* held in industrial enterprises were multiple interlocks (see Table 6, Panel C, 1928).

[73] One reason for redundancy can also be that several people in the network attempt to hold seats on as many supervisory boards as possible in order to earn the bonuses linked with these. The network then serves as a pension fund for older managers. On this point, see Loeb (1902: 13). With the data available to us, we cannot distinguish ‘pensioners’ from professional multiple directors.

[74] Feldenkirchen (1988) shows that the cartelization of the German economy increased continually during the interwar period. See also Pohl (1979: 214).

6.34 interlocks (directed and undirected), while in Germany the average was only 2.42 interlocks. By 1914, the average number of interlocks per company in Germany had risen to 9.54, while U.S. firms averaged only 6.05 interlocks. After this, the number of interlocks per company in Germany rose to figures equaling three to four times those for American companies.

The number of interlocks per firm only represents an average and therefore does not offer any information on the distribution structure. To demonstrate this problem, we turn to Table 3.

Insert Table 3 here

Table 3 lists the ten firms in Germany and the United States with the greatest centrality in 1928.[75] The column labeled "degree" shows the number of companies with which each firm was linked (either through directed or undirected interlocks).

RWE had interlocks with 157 other companies, while the *Gelsenkirchener Bergwerksverein* was linked to 155 others (from the group of 377 firms studied for 1928). Guaranty Trust had 51 ties to other companies (from a total of 369).

Table 3 clearly highlights two significant differences. First, the top ten German companies had on average 3.5 times as many contacts to other big corporations as did American companies. Second, the composition of the groups differs. In the United States, six financial enterprises (banks and insurances) were among the top ten; in Germany, only two. Three German firms were part of the coal and steel industry; in the United States, not one.

Although financial enterprises had the greatest number of contacts in the United States (while in Germany industrial enterprises topped the list), this did not mean they had more contacts than German banks. Of the three German banks with the greatest centrality among financial institutions, only one made the top ten. Still, these three banks had 2.6 times as many contacts as the three American banks that actually topped the US-list.[76] It appears as if the interlocks in the United States served primarily as an instrument of *bank control*. However, in Germany one of the

[75] The numbers found in the column labeled *degree* refer to the *actor degree centrality* for each company (Wasserman and Faust 1994: 178). The matrix was dichotomized. Therefore, *degree* can be interpreted as the number of companies with which company A is linked. What is not taken into consideration is the centrality of the companies with which A is linked. On this point, see Mintz and Schwartz (1985: 261-271). It would only make sense to consider the centrality of firms with which company A is linked if the interlocks of the path length 2 were to be studied (the friends of friends). However, this is not the case here. Interests that were pursued through interlocks of the path length 2 are even more difficult to determine empirically.

key functions of the corporate network, in addition to bank control, was the coordination of the markets (regulated competition).

When we extend the group of the firms with the greatest centrality from the *top ten* to include the entire *top 10 percent* and ask what percentage of all interlocks pertained to this latter group, a relatively constant finding results (Table 2, line 11). The companies making up the top 10 percent cumulated about 30 percent of all interlocks in each of the years studied both in Germany as well as in the United States. This accumulation of interlocks can be interpreted as an indicator for the degree of "inequality" (centrality) in the corporate network. It has been taken into consideration here that the absolute density of the network in Germany from 1928 to 1938 is markedly higher than in the United States. In other words, the distribution of social capital was "unequal" in a manner similar to Germany, but the German companies possessed definitely *more* social capital.

Directed Interlocks

Whereas undirected interlocks arise "accidentally" in several cases, we can assume that directed interlocks result in each case from a process of double selection: the company selects a director, the director selects a company. The structure of directed interlocks clearly throws more light on the motives and interests of the corporate network actors.

A few characteristics have already been pointed out in the analysis of the entire corporate network. Starting in 1928, the percentage of directed multiple interlocks in Germany was definitely greater than in the United States (Table 2, line 14). When several executive managers from one company simultaneously held seats on the supervisory board of another company, we can be relatively certain that the intent was to monitor that firm. Furthermore, the number of directed interlocks per German firm is clearly higher starting in 1928 (1938: 1.8 times as great; line 15, col. 9). The German corporate network included more managers who were executive managers in a major corporation and therefore possessed their own base of power. By 1938, each big corporation "controlled" on average 3.20 other big corporations.[77]

Another indicator of the control function is the centralization of the network of directed interlocks.[78] The centralization index for the *outdegree* (line 16) indicates how much the corporate network of directed interlocks is concentrated on a (relatively) few *Sender* firms. The centralization index for the *indegree* (line 17) indicates how much

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[76] Guaranty Trust, Chase, Bankers Trust: ∑ 146 contacts; *Deutsche Bank, Discontogesellschaft, Danat* ∑373 contacts (degree).

[77] "Control" is not to be understood here as the majority of votes on the supervisory board, but in the sense of a "credible commitment": the executive board members of big corporations who sit on the supervisory boards of other firms place their reputations at risk and can be expected to fulfill their roles as *whistle blowers*.

the network of directed interlocks is concentrated on a (relatively) few *Receiver* companies. Starting in 1914, the centralization index for the *outdegree* in Germany is clearly larger than for the *indegree*. This means that a (relatively) small group of companies sent executive managers to a (relatively) large number of receiver companies. In the United States, the difference between *outdegree* and *indegree* is definitely smaller. This comparison of differences also points out that the German corporate network contained more opportunities to exert control.

Directors and Mandates

Line 18 of Table 2 lists the number of directors who held a position as (executive) manager and/or as director in a big corporation in each year of the study. Line 19 shows the total number of positions that these people held. The number of positions is greater than the number of persons because many directors held several mandates.[79] We refer to these persons as "multiple directors." Only such multiple directors are of interest for the corporate network because these are the only people who actually create the network among corporations by way of their multiple mandates. Yet, as line 21 shows, there were only a relatively small number of managers and directors who held several mandates. The figure varies from 14.8 percent (Germany, 1896, col. 5) to 25.9 percent (Germany, 1938, col. 9).

This relatively small group of multiple directors holds a high percentage of positions within the corporate network (line 22). The structural differences identified earlier are also noticeable here: the percentage of positions held by multiple directors increases steadily in Germany from 30.6 to 55.3, while in the United States the percentage drops from 36.1 to 30.9 (line 22, cols. 1 and 4). Starting in 1928, more than half of the positions in the German corporate network were held by people who had gone through the selection processes of *several* companies. The fact that they held many mandates leads us to assume that they were considered acceptable "controllers" for many firms.

Useem (1984) referred to multiple directors as *Big Linkers* and argued that these people were particularly important for the corporate network. Based on the numerous mandates that they held in various firms, these people tended often to represent the interests of "capital" as a whole. *Big Linkers* in the United States included J. Pierpont Morgan, Jacob Schiff, and Albert H. Wiggin;[80] in Germany, Georg von Siemens, Emil

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[78] The *group degree centralization* was calculated; cf. Wasserman and Faust (1994: 178f.).

[79] The following figures were compiled for the period between 1896 and 1938: Germany – persons ∑16,615; positions ∑25,650; on average 1.54 mandates per person. United States – persons ∑15,914: positions ∑20,037; on average 1.26 mandates per person. The term "position" is used in connection to organizations (corporations), while the term "mandate" is used in connection to persons (directors).

[80] Big linkers are not immune to moral hazards as the example of A.H. Wiggins shows. The Chase National Bank was a member of a pool of bankers who tried to stabilize the stock market during the panic of October 1929. At the same time A.H. Wiggin, CEO of the Chase

Rathenau, and Paul Silverberg. By way of their mandates, these men created an economic elite whose access to influence in the big corporations was not based primarily on ownership but on technical competence, bureaucratic power, and (in a few cases) on personal charisma.[81]

After 1914, a growing percentage of the positions within the corporate network in Germany were occupied by people who held ten or more mandates at a time. By 1938 this represented 10.9 percent of all positions (line 23, col. 9). This figure was significantly lower in the United States for it did not exceed 1 percent. When we compare line 11 with line 23, we can conclude the following: the unequal distribution of contacts among *organizations* remained relatively stable between 1896 and 1938, and there were no significant differences between Germany and the United States (ca. 30 percent of the contacts fell to the companies of the top 10 percent). The unequal distribution of mandates among *persons* increased in Germany between 1896 and 1938, far more so than in the United States.

The distribution structure can be analyzed more closely with the help of the Gini coefficient. Here the coefficient is used to indicate the *unequal distribution* of contacts among companies (degree), or the unequal distribution of mandates among multiple directors (directorships). In the first case, we want to know how centered the network is around a few *big corporations*. In the second case, the question is how concentrated the network is on a few *people*.

Insert Table 4 here

Table 4 enables us to reach the following conclusions. First, it confirms the findings from Table 2. The mass of social capital (contacts) available to corporations is unequally distributed among companies in Germany and the United States, but the degree in inequality does not vary between the countries.

It is also true that the corporate network in both countries is heavily *organization-centered*. The Gini coefficient for contacts is always greater than that for mandates. This means that contacts between companies are more unequally distributed than

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National Bank, was short-selling the stock of his bank thereby driving the stock price of this bank further down. Wiggins gained several million dollars in this operation. Wiggin is the top big linker in the US-network in 1914 (15 mandats) and in 1928 (15 mandats). Due to his disloyal behavior during the 1929 stock market crisis, Wiggin was discharged from the Chase National Bank after 1930. Yet, in 1938 he was still the top big linker and held the most mandates in the American corporate network (11, including American Locomotive; Western Union Telegraph; New York, New Haven & Hartford Railway). Cf. Pecora (1968: 154-160); Carosso (1970: 207-209, 303-305, 346-349).

[81] Examples of the deep respect extended to J. P. Morgan within the network can be found in De Long (1991: 215).

are mandates between directors.[82] This finding is plausible: An organization can maintain more contacts than an individual can.

Yet it is also true that mandates in Germany were more unequally distributed than those in the United States. In this respect, the German corporate network was more *person-centered*. In other words, there were significantly more actors in Germany who held many mandates and were "prominent" in the network. Schumpeter called the entrepreneur the "leader in the business world" in an essay written in 1928. The 1937 reform of stock corporation law was based on this "leader principle." [83] Probably the structure of the German corporate network was also influenced by these cultural and political traditions.

Decline in Density, 1928-1938

The network density in Germany did not increase steadily. On the contrary, it began to decrease after 1928 from 10.8 percent (1928) to 6.66 percent (1933). This decline can be attributed first to the legal regulation affecting the corporate network. In September 1931, an amendment to the German corporate law was passed in which the size of supervisory boards was limited to a maximum of thirty positions. The number of mandates that a person could hold at a time was restricted to twenty.

As a result of the legal regulation, the average size of supervisory boards in Germany shrank from 21.7 positions (1928) to 15.0 (1938). This lowered the number of positions through which interlocking was possible in the corporate network by approximately 2,419 positions.[84] Which directors were then "dismissed" as a consequence? It can be shown that the percentage of persons holding only *one* position in the network dropped by 38 percent in the period from 1928 to 1938. Yet the percentage of *Big Linkers* who held four or more positions in the corporate network only decreased by 16.3 points. This clearly demonstrates that the corporations reduced the size of their supervisory boards primarily at the cost of those individuals who had only held *one* mandate and were therefore meaningless for the network.

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[82] The number of contacts among companies (actor degree centrality) was chosen as the indicator for unequal distribution. Since the number of contacts linked to a mandate cannot be precisely determined among directors by empirical means, mandates were selected. For example, rarely were all members present (= contacts) at board meetings. TNEC has published attendance data for a total of 125 BoD meetings at Metropolitan Life Insurance (New York) for the years 1929-1938. From this data we learn that, on average, 62.5 % of the directors were present. Source: TNEC, Public Resolution No. 113, Part 4 Life Insurance (Washington, 1939), p. 1529. To my knowledge, no comparable study exists on attendance at supervisory board meetings in Germany.

[83] The management board "became unconditionally the sole, responsible head of the corporation …" (Schubert 1984: 5, author's translation).

[84] See Table 2, line 5. In 1938, 361 firms were included in our data set. 361x(21.7-15.0) ≈ 2,419.

The following calculations illustrate the impact that the amendment to the corporate law had on the number of interlocks: Jacob Goldschmidt (Danat Bank) had forty-seven mandates in forty-seven different big corporations in 1928. Through Goldschmidt, these forty-seven corporations became a clique,[85] and he created a total of 2,162 (47 x 46) interlocks. A cutback to twenty mandates reduced the number of the interlocks to 420 (21 x 20), which represented a loss of around 80 percent.[86]

The decline cannot be attributed solely to the legal regulation. In 1933, we know longer find Jacob Goldschmidt, who was Jewish, in the network.[87] His absence meant the elimination of 2,161 interlocks. Paul Silverberg, also Jewish, held twenty-five positions in the network in 1928, but emigrated to Switzerland in 1933. This also eliminated 600 (25 x 24) interlocks. In all, the number of interlocks dropped between 1928 and 1938 from 12,374 to 6,967 – a reduction of 43.7 percent. The expulsion and elimination of Jewish bankers and entrepreneurs who had played an important role within the corporate network explains a significant part of this reduction.

Summary

- In Germany the corporate network developed into a comprehensive instrument of control that facilitated the cooperation among "rational egoists." Starting in 1928, less than 10 percent of the firms were isolated or marginal. This percentage was notably higher in the United States (1928, ca. 27 percent).
- As of 1914, the density and number of interlocks per firm were as much as four times greater in Germany than they were in the United States. The "mass" of social capital and the control opportunities were also greater.
- Redundancy (multiple interlocks) in the German corporate network was significantly greater than it was in the American network. I interpret this greater redundancy, the greater density, and the greater centralization of the German corporate network as indicators of a higher intensity of control.
- Whereas financial enterprises were the most important actors in the United States, in Germany both banks and industrial enterprises had access to many contacts. Not only was bank control an important function of the German corporate network, so too was the coordination of market processes.
- In both countries the corporate network was organization-centered, that is, companies were more prominent than directors. However, it has also been shown that the unequal distribution of mandates in Germany was far more

[85] A "clique" is defined as a network configuration in which each actor is linked to every other actor. The density in a clique equals 1 (100%), that is, all possible interlocks are actually established.
[86] The number of ties created by a multiple director can be computed as follows: N*(N-1); N: number of positions in different firms. If the number of positions is reduced by k, then, the number of ties is reduced by: [N*(N-1)]-[(N-k)*(N-1-k)]=k(2N-k-1).
[87] Jacob Goldschmidt emigrated to the United States.

predominant than in the United States. The corporate network in Germany – much more so than in the United States – was dominated by a small group of prominent *Big Linkers*.

- The decline in the number of interlocks in Germany after 1928 can be explained, for one, by legal regulation (limitation of the size of supervisory boards and the number of mandates) and, for another, by the elimination of important Jewish entrepreneurs and bankers.

8. Bank control

Toward the end of his analysis of "finance capital," Hilferding (1955: 445) tempers the hypothesis about the "rule of banks over industry" and speaks of a "personal union." He writes that the spheres of industrial, commercial, and financial capital, which had once been distinctly separate from one another, had now all come under the joint command of high finance, in which the leaders of industry and banking were united in a close "personal union." It is this "personal union" that is the topic of the following analyses.

In Table 5, the interlocks existing between the financial sector and industrial enterprises[88] are examined. The table is limited exclusively to *directed* interlocks, of which three types are listed: interlocking directorates within the banking sector (bank to bank, intrasectoral interlocks, lines 1 and 2); those in which bank directors were linked to industrial enterprises (lines 3 and 4); and – in the opposite direction – those in which industrial managers were linked to banks (lines 5 and 6). We refer to the *number* of bankers who sat on the boards of industrial companies as the *outdegree* and the number of industrial managers who sat on the boards of banks as the *indegree*.

Insert Table 5 here

The number of interlocks within the banking sector (intrasectoral interlocks) increases in Germany from 0.33 per bank (1896, line 2) to 2.1 (1928) and then drops again to 1.4 (1938). In the United States, the greatest number of intrasectoral interlocks were to be found in 1914. On average, the forty-nine banks included in the study had 1.33 links to other banks (line 2, col. 2). The Pujo Committee referred to the interlocks among financial institutions as the *Money Trust*. The Clayton Act of 1914 prohibited interlocking directorates among competing enterprises (e.g. among banks). Table 5 (U.S., lines 1 and 2) shows that the number of such interlocks was indeed reduced, but that they still continued to be "cultivated" after 1914. The following example illustrates such a "case."

The Temporary National Economic Committee (TNEC) held hearings in December 1939 on the concentration of power and price agreements in the financial sector. One of the issues the committee studied was the so-called "library agreement" of 1920, an agreement between the two investment banks Kidder, Peabody & Co and J. P. Morgan & Co. over a cartel.[89] All bonds and shares (capital increases) from A.T.& T. were to be taken over exclusively by two groups of investment banks, which agreed on quotas among themselves under the leadership of Kidder & Peabody or Morgan: "Kidder, Peabody was to manage New England, J. P. Morgan was to have the management of the rest of the country. …the New York group took 70 percent, the New England group took 30 percent. In turn, the New York group divided up its 70 percent in the following fashion: J. P. Morgan & Co. got a 20 percent interest in all future purchases of A.T.& T. securities …The First National Bank got a 10 percent interest. The City Bank got a 10 percent interest; Kuhn, Loeb & Co., a 10 percent interest; Lee, Higgison & Co., a 5 percent interest; Guaranty Trust, 5 percent; and the Bankers Trust, 5 percent." The committee members particularly objected to the heading of a table in which the quotas were listed: "Proprietary Interests American Telephone & Telegraphy Company." Mr. Nehemkis, the chairman of the committee, interpreted this wording in the sense of "property rights": the participating banks viewed A.T. & T. as their private hunting grounds and were determined to run all competition out of this territory. Our data set shows that in 1914 there were eight directed and six undirected interlocks between the banks participating in the "library agreement."

There were also attempts to "regulate" competition in the United States. The banks involved in the "library agreement" defended themselves by arguing that the risk they shouldered by purchasing the A.T. & T. securities could only be distributed in this manner (consortium). Moreover, the "library agreement" was said to prevent a renewed outbreak of hostilities among the banks over distribution. Thus, the *consensus yield* was relative high in this case.

Let us now turn to the directed interlocks between banks and industrial enterprises (*outdegree*). In 1928, the fifty-nine German banks included in the study had a total of 426 supervisory board mandates in industry (line 3, col. 3). Each bank had an average of 7.2 interlocks to industry. That same year, the sixty-two American banks in the study had a total of 258 positions in the BoD of industrial firms. Each American bank had an average of 4.2 interlocks to industry. A comparison of the average number of bank-to-industry interlocks for the entire period leads to the finding that, as of 1914, German banks had significantly more mandates in industrial firms on average than did U.S. banks.

In examining bank control over industry, we must first ask what percentage of large industrial corporations had a banker sitting on their boards of directors. As is shown in Figure 2, the figure for Germany rises from 25.3 percent (1914) to 59.4 percent (1928) and then drops again to 48.4 percent. In the United States, the figures rise steadily between 1900 and 1938 from 32.5 percent to 46.1 percent. Only in 1928 does this figure lie clearly below the value calculated for Germany. This is one of the first indications that directed bank interlocks in the United States and Germany were nearly equal in importance.

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[88] In this section, companies that do not belong to the financial sector are all labeled as "industrial enterprises." Therefore, even companies in the service sector and transportation business fall into this category.

[89] Source: TNEC 1940, Part 23, p. 12211, Exhibit No. 1673.

Insert Figure 2 here

If only *one* bank representative sits on the BoD, it is hardly possible to speak of bank control. Figure 2 shows the percentage of industrial firms with three or more bankers on their boards. These percentages are notably smaller. In most years, the figures are less than 10 percent, and in the United States they are often higher than in Germany. The only year that shows distinctly different findings is 1928.

Bank representatives holding positions on the supervisory boards of German industrial firms often held the position of chairman or vice chairman. In 1896 this was the case in 13.7 percent of the companies, and by 1938 this figure had risen to 24.8 percent (line 12). The percentages of industrial companies in which American bankers held the seat of chairman or (vice) president are much lower. In 1900 the figure was 2.5 percent, and it rose to 10.2 percent by 1938. In summary, we can say that the percentages of companies with a banker on the supervisory board or BoD in Germany and the United States, respectively, were quite similar (line 10), but that the German bankers held more powerful positions on the supervisory boards (line 12).

Indegree/Outdegree

With the help of structural analysis it is possible to show that banks not only exerted influence on industrial firms through the BoD, but that the exertion of influence also occurred in the opposite direction, especially in the United States. Line 7 of Table 5 indicates the ratio of *indegree* to *outdegree*. In this case, the number of mandates held by industrial executives on the BoD of banks (*indegree*) is divided by the number of mandates held by bankers in the BoD of industrial firms (*outdegree*). The *indegree* is an indicator of the influence that industry had on banks, and the *outdegree* is an indicator for the influence that banks had on industry. In 1900, the *indegree/outdegree* quotient (in percent) in the United States is 54.1, meaning that for every two mandates held by bankers on the boards of industrial firms there was one mandate held by an industrial manager on the BoD of a bank. Therefore, the nature of the relationship between banks and industry in the United States was not one of unilateral control but can be more accurately described as one of mutual dependency (personal union). The following example illustrates the problems connected to a high *indegree*.

Tarr (1966) examined several banks in Chicago that declared bankruptcy between 1893 and 1905. He discovered that local entrepreneurs sitting on the BoD of banks (*indegree*) actually "plundered" the banks: "In 1893, the Chemical National Bank failed and subsequent examination revealed that most of its funds had been loaned to its directors and stockholders, often on poor security or signature alone."… [In December 1905] "the Chicago National, the Home Savings, and the Equitable Trust Company had failed." Cause for the bankruptcy was "…Walsh's grossly excessive loans to his own enterprises and those of his banks' directors" (Tarr 1966: 451). Walsh was the CEO of these three banks.

In Germany, the *indegree/outdegree* quotient was significantly lower, although it did increase between 1896 and 1938. In 1914, it equaled 15.8 percent. By 1938, it had reached 30.6 percent. The data presented in line 7 offers evidence proving that the link between the *Danat Bank* and the *Norddeutsche Wollkämmerei* was no exception. When taken into consideration that German banks granted large loans to industrial firms quite often, it becomes clear that the presence of industrial executives on the supervisory boards of German banks posed an even greater problem than it did in the United States.

I interpret *indegree*/*outdegree* quotients as a structural indicator measuring the chances that debtor opportunism has of succeeding: the greater this quotient, the greater the influence of (potential) debtors on the banks. That is not to say that all debtors are opportunists. What is being analyzed here are only opportunity structures.

Multiple Interlocks

Structural analysis also shows that it was rather rare for a bank to send several (executive) managers to sit on the BoD of an industrial firm. In industrial enterprises in which several bankers did have a mandate for the BoD, these bankers usually came from *different* banks. The presence of several bankers on the BoD does not convey the influence of any individual bank, but rather the collective control of a bank consortium.

Insert Table 6 here

In part A of Table 6, the percentages of directed multiple interlocks found and discussed in Table 2 (line 14) are again listed. Part B (banks) shows that the banks – as opposed to “all companies” – are more cautious about sending several (executive) managers to sit on the BoD of a single firm. This holds true for both the United States and Germany (compare line 1 with 3; line 2 with 4).

For example, of the 426 interlocks between banks and industrial firms existing in Germany in 1928, thirty-six of these were multiple ones (8.5 percent). These thirty-six interlocks were established because individual banks sent two or more of their executives to the same company. This percentage is, however, definitely lower than the percentage of all multiple interlocks for all big corporations (15.3 percent).

When we group all banks under the general rubric of “financial sector” – representing this business sector as a whole and not each individual bank (part C) – another picture emerges. The percentage of multiple interlocks turns out to be much greater because each respective group of banks (consortia) sent their representatives to the *same* industrial firm.

For example, in 1900 there were 122 directed interlocks between the American financial sector and industrial companies (*outdegree*). Fifty-six of these interlocks were multiple ones (45.9 percent), meaning that in these cases each group of banks sent their representatives to the very *same* company.

Insert Table 7 here

Table 7 shows that seven bank representatives from six different banks sat on the BoD at Northern Pacific Railway in 1900 (J. P. Morgan & Co. sent two partners). That same year, the BoD of Western Union Telegraph also included seven bank executives from six different banks.[90] The number in parentheses after each of the names indicates how many mandates each banker held in the U.S. corporate network in 1900. The number in parenthesis following each of the (investment) banks indicates the number of companies with which these banks were linked by way of interlocks (number of contacts).

The data presented in Tables 6 and 7 shows that companies were not exposed to the influence of one bank, but that "control" was exerted in each case through a group of banks (consortia). This finding supports the argument put forth by Mintz and Schwartz (1985: 13f.), who maintain that industrial corporations were usually influenced by a group of banks and seldom by just one bank.

Big Linkers

The top *Big Linkers* found in Germany and the United States were analyzed for each of the years included in this study. These were the people who had the most mandates in the system of interlocking directorates of the big corporations (Table 5, line 16). These people possessed the most contacts and held the key positions in the corporate network. Table 5 (part B) lists the percentage of these top *Big Linkers* who were the CEO/president of a bank (line 13), who were the CEO/president of an industrial firm (line 14), and who only held the position of (non-executive) director in several big corporations of the network (line 15). In Germany, the share of bank executive managers among the top *Big Linkers* drops from 46.4 percent in 1896 to 31.6 percent as of 1938. Correspondingly, the share of executive managers from industrial firms rises from 14.3 to 28.9 percent. This illustrates that the importance of bankers decreases among the *Big Linkers* while that of industrial managers increases. In the United States, the development over time is not uniform. Between

[90] Note 11 ## indicates one reason why so many bankers sat on the BoD of Northern Pacific. In 1900, Western Union Telegraph had twenty-five external directors on its board, of which seven were bankers and eight CEOs of railways. The selection criteria appear to be quite obvious in this case: the bankers acted as financial intermediaries in the expansion of one of the (then) forerunners on the technological front and the railroad companies were some of Western Union's most important customers. Among the railroad directors were the three sons of Jay Gould. See Josephson (1995: 205-207).

1928 and 1938, the percentage of bankers drops significantly (from 40 to 22.9) and the percentage of CEOs from industrial firms rises slightly (from 37.1 to 40).

Summary

- In the United States and Germany, a relatively dense corporate network existed between banks and industry. Starting in 1914, about half of Germany's companies had at least one bank executive sitting on its supervisory board. The share of American firms with a banker on the BoD was somewhat lower (43 – 46 percent). The data demonstrates the importance of bank control in the big corporations of both countries.
- This does not mean that banks "ruled over" industrial firms. In 1928, 18 percent of the industrial firms in Germany had more than three bankers on their supervisory boards. This figure dropped to 7.6 percent by 1938. On the BoDs in the United States, the corresponding figures were under 10 percent almost each year.
- However, German bankers had more opportunities to influence industrial companies because these bank executives held the position of chairman of the supervisory board more often than they did in the United States. In 1938, this was the case in nearly a fourth of the companies.
- When the group of top *Big Linkers* is considered as a whole, it becomes evident that the influence of bankers shrank during the period under study, whereas the influence of industrial executives on the boards of other companies grew.
- The high percentage of industrial managers on the boards of directors of American banks (*indegree*/*outdegree*) posed a problem. This structure of interlocking directorates increased the danger of bankruptcy among banks because the debtor was able to influence the creditor bank (moral hazard).

9. Intra- and intersectoral density

Interlocking directorates at the intrasectoral level serve to regulate competition among potential competitors. In the United States, this type of interlocking was legally prohibited by the Clayton Act (1914). In Germany, however, a decision handed down by the Reich Court (1897) legalized cartels, and thus intrasectoral interlocks could develop complementarily to cartels. In this section, we examine the hypothesis that the density of the *intra*sectoral network increases in Germany after 1914 while it decreases in the United States.

Intersectoral interlocks are advantageous to the pursuance of a variety of interests. They can be used as an instrument to coordinate vertical integration. In this case, functional interdependencies among companies are coordinated and controlled

through the BoD.[91] Then intersectoral interlocks become the first step taken in the direction of creating a vertically integrated firm. In Tables 8 and 9, we consider the idea that business sectors in which economic relations are determined by functional interdependencies possess a particularly high degree of intersectoral interlocking (e.g. coal and steel; electrical industry and utilities; banks and insurances).[92]

Insert Tables 8 and 9 here

The companies were grouped into the categories listed in Tables 8 and 9 for each year. Business sectors with fewer than five companies were excluded. The density within each business sector was then calculated (intrasectoral density, matrix diagonals). The interlocks existing among companies of different business sectors are found above or below the diagonals (intersectoral density). Since the density was calculated for *all* interlocks (directed and undirected), the matrix is not symmetrical.[93]

The lines and columns in the matrices were then reorganized (permuted) in order to identify the areas with very high and very low density.[94] The business sectors 1-7 create a "block" in Table 8 (above left) with relatively high degrees of density; sectors 11-17 (below right) create a block with relatively low degrees of density. In Germany, the electrical industry, coal and steel industries, chemical industry, mechanical engineering, the shipping companies and banks create a "strategic" block with higher degrees of intra- and intersectoral density. The sectors of stone and glass, food, precision mechanics, paper, and textiles create a block with relatively low density. In the block with higher density are found the capital-intensive companies of mass production, which are densely linked with one another and with the banks.[95]

On the one hand, we find forms of market coordination that correspond to the model of regulated competition and support cartels. On the other, some sectors have strategic alliances that act as a functional equivalent to vertical integration. Examples are the high density existing between the iron and steel industry and mining (line 2, col. 4), mechanical engineering and the iron and steel industry (highest density in line

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[91] The term "resource dependency" (Pennings 1980) is imprecise and therefore avoided here. During periods of crisis, companies are dependent on banks in order to survive. In times of economic upswing, "the big banks woo the favor of industry, but not the other way around." Source: speech by E. Kirdorf, Verhandlungen des Vereins für Socialpolitik 116 (1906), p. 285 (author's translation).

[92] For example, U.S. banks maintained a relatively high degree of interlocking directorates with insurances (0.09). For investment banks, insurances were important refinancing institutions.

[93] Intrasectoral density was computed as follows: number of ties/(N^2); intersectoral density: number of ties/[N*(N-1)].

[94] Block-model analysis was used to identify 0-blocks/1-blocks (Wasserman und Faust 1994: 394-97).

[95] However, Table 8 also shows that the transitions are fluid and that the blocks cannot be clearly separated.

6), and electrical power plants (electricity production) and both shipping companies (transportation) and mining, respectively (power plants/energy, line 9, cols. 3 and 4).

It is also interesting to note that the banking sector is relatively well linked to all other sectors (line 7, col. 7), but does not have the highest average density over all sectors (line/col.: Ø).

Intrasectoral density was relatively high in Germany, but in many cases it was not the dominant form of interlocking. In 1896 and 1914, intersectoral ties (strategic alliances) were often stronger than intrasectoral ones (cartels). Therefore, this evidence supports the argument that the intrasectoral density of the corporate network was very high in Germany. Yet at the same time it shows that the network worked neither exclusively nor even predominantly on behalf of direct market coordination (cartels). It fulfilled many functions and was open for the pursuance of various interests. As has been pointed out repeatedly, it offered an opportunity structure.

In the case of the United States, we did not succeed in distinguishing sectors with the highest or the lowest density (1/0 blocks) by permuting the lines and columns of Table 9. Compared with Germany, the density as a whole was significantly lower and only a few strategic alliances can be found (e.g. utilities and electrical power plants, line 4, col. 1). It appears that vertical integration in the United States occurred primarily through fusions (centralization), whereas it Germany it often took the form of decentralized alliances (corporate network).

Horizontal and vertical integration appear to have taken place within each country along similar “cultural” patterns. In the United States, the trust was the dominant form of organization for horizontal integration, while in Germany it was the cartel (federal structure). For vertical integration, concerns/combines and strategic alliances (corporate network) were important in Germany whereas company mergers (centralization) were more prevalent in the United States.[96]

One significant development is that the intrasectoral network in several business sectors still displayed the highest density fourteen years after the passage of the Clayton Act in 1914. These sectors included the electrical power plants, the railways, and the electrical industry. Because intrasectoral ties involved legal risks in the United States, it can be assumed that the economic advantage of market

[96] Fligstein (1990) argues that the type of mergers (horizontal/vertical) was strongly influenced by anti-trust law and the way it was enforced. Cf. Laidler (1931).

coordination (consensus yield) was more highly valued than the risk of a court-imposed penalty.[97]

A so-called pattern matrix is presented in Table A2 of Appendix 1. The pattern matrix is an instrument used to formalize hypotheses on the structure of corporate networks. Three hypotheses are specified in this table. The first states that intrasectoral density is very high in Germany and the United States, that is, the companies grouped together in a sector each create a clique (density = 1; each company is linked to every other in the group). Second, the intersectoral density is very weak in comparison. It is assumed that this density hovers very close to zero in most cases. Third, banking is the sector linked the closest to all other sectors. The density of this linkage is hypothetically set at 0.5. Thus, the pattern matrix quantifies the hypothesis of a high intrasectoral density and that of bank power. With the help of the matrix correlation, we can determine the extent to which the structure of the empirical density matrices[98] corresponds to this pattern matrix. Table 10 shows the correlation coefficients (Pearson) for Germany and the United States for each of the years studied.

Insert Table 10 here

According to the hypotheses presented in the theoretical section of this paper, we might have expected the network matrices for Germany to correspond more closely to the pattern matrix than those for the United States. However, as Table 10 shows, the correlations until 1914 were higher for the United States. What is also striking is that the correlations for the United States tend to decrease between 1900 and 1938. In 1938, the coefficient is only 0.273. From this we can surmise that the Clayton Act was a deterrent and that bank power on the whole tended to be on the decline. In Germany, the development headed in the opposite direction: the correlations tend to increase between 1896 and 1938. For 1938, the coefficient is 0.488. This indicates an increasing degree of cartelization in the German economy, including the banks.

Summary

- In Germany the intrasectoral density was relatively high and increased steadily between 1896 and 1938. Therefore, the corporate network was used – parallel to the cartels – as an instrument to coordinate the market (regulated competition).
- The relatively high intersectoral density in Germany between several sectors of heavy industry (coal, steel, chemical, mechanical engineering) indicates that

[97] Seldom did the courts impose fines. Usually they just demanded that the forbidden interlocking directorates were truly terminated. The risks to the companies lay in the high court costs and the loss of reputation. See Miller (1997).
[98] The structure for 1928 is presented as an example in Tables 8 and 9.

the corporate network was used as a substitution of vertical integration or became the precursors of a vertical concern/combine.

- German banks were very well interconnected to the sectors of heavy industry, although they did not have the highest average density when compared with other business sectors.
- In 1914, the structure of intra- and intersectoral networks was fairly similar in Germany and the United States (cf. Table 10). After this year, the countries diverged in their development. While intrasectoral density declined in the United States, it increased in Germany.
- In Germany, strategic groups can be identified (1-blocks) that are relatively densely linked with and mutually dependent on one another. In the United States, we do not find any blocks of high density. In many sectors, the coordination function was internalized (vertical fusions).

10. Conclusion

Control and Cooperation

The network of big corporations was an important element in the system of economic institutions that developed in the late nineteenth century and provided a solution for specific problems of emerging organized capitalism. In the big stock corporations, ownership control was replaced by mutual supervision exercised by managers sitting on each other's supervisory boards or boards of directors. The corporate network defused the principal-agent problem in large managerially run companies.

The structural analysis showed that the corporate network could be used as an efficient instrument of control, particularly in Germany. The structural characteristics included the high density of interlocks, the low number of isolated companies, multiple interlocks, and the high percentage of managers who were executive directors in a big corporation and "controllers" in another one (directed interlocks).

Furthermore, the corporate network was a control instrument for banks, which shouldered a high risk by extending investment credit to companies, thereby linking their existence to the "long-term fate" of the industrial firm. Especially in Germany, the corporate network defused the problem of debtor opportunism. Until 1928, the share of big companies in which a bank was represented on the supervisory board was more than 50 percent; in the United States, this figure was only somewhat lower (figure 2). The analysis also showed that the banks did not "rule over" the industrial companies. The banks were credit-givers (Germany) or financial intermediaries (United States), and they acted in these capacities to force companies to pursue

"rational" entrepreneurial policy. The banks were important actors in the process of "rationalizing" capitalism.[99]

In the early stages of mass production and of an increasing capital intensity (fixed costs), uncontrolled competition among big companies was dysfunctional. The corporate network provided an institutional framework in which market processes could be coordinated and competition regulated. The empirical analysis has shown that intrasectoral density was relatively high in Germany and developed parallel to cartels. The fact that intersectoral density in Germany was relatively strong also proves that the corporate network was used as a substitute for vertical integration or served as a precursor of a vertical concern/combine.

Stability of Institutions

Figure 1 contains the two key comparative dimensions of this analysis. The first question deals with the way in which the network structures change over time. The second examines the structural differences that can be found between Germany and the United States.

In Germany, the corporate network was expanded after the First World War parallel to the increasing cartelization of the economy. In the Unites States, it was demolished step by step in the wake of the passage and enforcement of antitrust laws. These two historical lines of development – the strengthening of "cooperative capitalism" on the one side, and the development of "competitive capitalism," on the other – can be followed down to the present (Chandler 1990). In the period following the Second World War, the corporate network was expanded even further in Germany and used as the functional equivalent for the legally prohibited cartels, whereas it continued to be weakened and dismantled in the United States.[100]

According to Abelshauser (2001: 504), "obviously, the German social system of production, complete with most of its components, was established more than 100 years ago and has since withstood all attempts aimed at fundamentally changing it." This statement can also be applied to the corporate network. The trends in each country shown in Figure 1 and the difference between Germany and the United States have remained stable up to the present.

The Market as a Social Construction

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[99] This does not preclude the possibility that some bankers, like some industrial managers, pursued with "an absolute lack of scruples" their own personal interests in enrichment. But what is being emphasized here is the analysis of "system rationalities."

[100] See the comparative structural analysis for the present in Windolf (2002, ch. 2). Davis and Mizruchi (1999) show that U.S. banks have lost their key position within the corporate network.

Hayek (1963: 7) defines the market as a “spontaneous order”, but this order is not stable over time. It is exposed to the danger either of degenerating into anarchic competition or eradicating itself through a monopoly. The historical analysis presented here has shown that market orders are the product of a deliberate political and social construction.

As a result of their historical development, the United States and Germany have produced two different market orders. In the United States, we have seen the creation of a competitive order in which the state must intervene on a permanent basis in order to maintain the “equilibrium” of the order. From the perspective of free competition, corporate networks are dysfunctional institutions. Therefore, they have been politically condemned and judicially persecuted as often as have cartels and trusts. I have argued that this specific market order, the basis of which is grounded in the tradition and values of “possessive individualism” can explain the dismantling of the corporate network in the United States.

Germany has witnessed the institutionalization of a corporative market order, which – without any major intervention by the state – is left to the autonomous regulation of the market actors themselves. The main institution of this market order is the cartel, in which the market is controlled through a “corporation” of producers. The corporate network develops parallel to the cartel and strengthens its potential to control and coordinate the market. I have argued that the increasing density and centralization of the corporate network in Germany is rooted in premodern traditions in which collectiveness is valued more highly than individual “property rights.”

References

Abelshauser, Werner (2001): Umbruch und Persistenz: Das deutsche Produktionsregime in historischer Perspektive. Geschichte und Gesellschaft 27: 503-523.

Akerlof, George (1970): The Market for 'Lemons': Quality, Uncertainty and the Market Mechanism. Quarterly Journal of Economics 84: 488-500.

Berle, Adolf und Means, Gardiner (1997) [1932]: The Modern Corporation and Private Property. New Brunswick: Transaction Publishers.

Böhm, Franz (1948): Das Reichsgericht und die Kartelle. Ordo 1: 197-213.

Bonadio, Felice (1994): A.P. Giannini: Banker of America. Berkeley: University of California Press.

Born, Karl Erich (1967): Die deutsche Bankenkrise 1931. München: Piper.

Bourdieu, Pierre (1980): Le capital social. Actes de la recherche en sciences sociales 31: 2-3.

Bourdieu, Pierre (1983): Ökonomisches Kapital, kulturelles Kapital, soziales Kapital. Pp. 183-198 in: Reinhard Kreckel (Ed.), Soziale Ungleichheiten. Göttingen: Schwartz (Soziale Welt, spezial issue no. 2).

Brandeis, Louis (1995) [1914]: Other People's Money and How the Bankers Use It. New York: St. Martin's Press.

Bunting, David (1987): The Rise of Large Corporations, 1889-1919. New York: Garland Publ.

Burt, Ronald (1992): Structural Holes. Cambridge: Harvard University Press.

Calomiris, Charles und Ramirez, Carlos (1996): The Role of Financial Relationships in the History of American Corporate Finance. Journal of Applied Corporate Finance 9: 52-71.

Carosso, Vincent (1970): Investment Banking America: A History. Cambridge: Harvard University Press.

Chandler, Alfred (1977): The Visible Hand. Cambridge: Harvard University Press (Belknap).

Chandler, Alfred (1990): Scale and Scope. Cambridge: Belknap/Harvard University Press (Belknap).

Coleman, James (1988): Social Capital in the Creation of Human Capital. American Journal of Sociology 94 (Supplement): S95-S120.

D'Adda, Carlo und Scorcu, Antonello (2002): On the Time Stability of the Output-Capital Ratio. University of Bologna: Department of Economics (Working Paper).

Davis, Gerald und Mizruchi, Mark (1999): The Money Center Cannot Hold: Commercial Banks in the U.S. System of Corporate Governance. Administrative Science Quarterly 44: 215-239.

DeLong, J. Bradford (1991): Did J.P. Morgan's Men Add Value? Pp. 205-236 in: Peter Temin (Ed.), Inside the Business Enterprise. Chicago: The University of Chicago Press.

Diehl, Karl (1923): Anarchismus. Pp. 276-292 in: Handwörterbuch der Staatswissenschaften, Vol. 1. Jena: Verlag Fischer.

Dodd, E. Merrick (1932): For Whom Are Corporate Managers Trustees? Harvard Law Review 45: 1145-1163.

Dore, Ronald (1987): Taking Japan Seriously. Stanford: Stanford University Press.

Eisenhardt, Kathleen (1989): Agency Theory: An Assessment and Review. Academy of Management Review 14: 54-74.

Eulenburg, Franz (1906): Die Aufsichtsräte der deutschen Aktiengesellschaften. Jahrbücher für Nationalökonomie und Statistik III. Folge, Bd. 32: 92-109.

Feldenkirchen, Wilfried (1988): Concentration in German Industry 1870-1939. Pp. 113-146 in: Hans Pohl (Ed.), The Concentration Process in the Entrepreneurial Economy Since the Late 19th Century. Stuttgart: Steiner (Zeitschrift für Unternehmensgeschichte, special issue no. 55).

Feldman, Gerald (1995): Die Deutsche Bank vom Ersten Weltkrieg bis zur Weltwirtschaftskrise 1914-1935. Pp. 138-314 in: Lothar Gall et al. (Eds.), Die Deutsche Bank 1870-1995. München: Beck.

Feldman, Gerald (1998): Hugo Stinnes: Biographie eines Industriellen 1870-1924. München: Beck.

Fiedler, Martin (1999a): Business Scandals in the Weimar Republic. European Yearbook of Business History 2: 155-178.

Fiedler, Martin (1999b): Die 100 größten Unternehmen in Deutschland nach der Zahl ihrer Beschäftigten: 1907, 1938, 1973 und 1995. Zeitschrift für Unternehmensgeschichte 44: 32-66.

Fiedler, Martin und Lorentz, Bernhard (2003): Kontinuitäten in den Netzwerkbeziehungen der deutschen Wirtschaftselite zwischen Weltwirtschaftskrise und 1950. Pp. 51-74 in: Volker R. Berghahn et al. (Eds.), Die deutsche Wirtschaftselite im 20. Jahrhundert. Essen: Klartext-Verlagsges.

Fligstein, Neil (1990): The Transformation of Corporate Control. Cambridge: Harvard University Press.

Fohlin, Caroline (1999): The Rise of Interlocking Directorates in Imperial Germany. Economic History Review 52: 307-333.

Fukuyama, Francis (1995): Trust. New York: Free Press.

Gall, Lothar (1995): Die Deutsche Bank von ihrer Gründung bis zum Ersten Weltkrieg. Pp. 1-137 in Lothar Gall et al. (Eds.), Die Deutsche Bank 1870-1995. München: Beck.

Gall, Lothar (2000): Krupp: Der Aufstieg eines Industrieimperiums. Berlin: Siedler.

Gerschenkron, Alexander (1968): Continuity in History and Other Essays. Cambridge: Belknap Press.

Hall, Peter and Soskice, David (2001): An Introduction to Varieties of Capitalism. Pp. 1-70 in: Peter Hall and David Soskice (Eds.), Varieties of Capitalism. Oxford: Oxford University Press.

Hannah, Leslie (1983): The Rise of the Corporate Economy. London: Methuen (rev. 2nd ed.).

Hardach, Gerd (1995): Zwischen Markt und Macht: Die deutschen Banken 1908-1934. Pp. 914-938 in: Wilfried Feldenkirchen et al. (Eds.), Wirtschaft, Gesellschaft, Unternehmen, 2. Teilband. Stuttgart: Franz Steiner.

Hayek, Friedrich (1963): Kinds of Order in Society. New Individualist Review 3: 3-12.

Hilferding, Rudolf (1955) [1910]: Das Finanzkapital. Berlin: Dietz.

Hilferding, Rudolf (1915): Arbeitsgemeinschaft der Klassen? Der Kampf 8: 321-329

Hommelhoff, Peter (1987): Machtbalancen im Aktienrecht. Pp. 71-100 in: Werner Schuber and Peter Hommelhoff (Eds.), Die Aktienrechtsreform am Ende der Weimarer Republik. Berlin: de Gruyter.

Johnston, Verle (1983): The McFadden Act: A Look Back. Federal Reserve Bank of San Francisco, August 19: 1-3.

Jones, Eliot (1914): The Anthracite Coal Combination in the United States. Cambridge: Harvard University Press.

Jones, Eliot (1922): The Trust Problem in the United States. New York: Macmillan.

Josephson, Matthew (1995) [1934]: The Robber Barons. New York: Harcourt Brace.

Kadushin, Charles (2004): Too Much Investment in Social Capital? Social Networks 26: 75-90.

Karjala, Dennis (1979): The Board of Directors in English and American Companies Through 1920. Pp. 204-226 in: Norbert Horn and Jürgen Kocka (Eds.), Recht und

Entwicklung der Großunternehmen im 19. und frühen 20. Jahrhundert. Göttingen: Vandenhoeck & Ruprecht.

Kocka, Jürgen and Siegrist, Hannes (1979): Die hundert größten deutschen Industrieunternehmen im späten 19. und frühen 20. Jahrhundert. Pp. 55-122 in: Norbert Horn and Jürgen Kocka (Eds.), Recht und Entwicklung der Großunternehmen im 19. und frühen 20. Jahrhundert. Göttingen: Vandenhoek und Ruprecht.

Koenig, Thomas et al. (1979): Models of the Significance of Interlocking Corporate Directorates. American Journal of Economics and Sociology 38: 173-186.

Kotz, David (1978): Bank Control of Large Corporations in the United States. Berkeley: University of California Press.

Kramer, Helen (1964): Harvesters and High Finance: Formation of the International Harvester Company. Business History Review 38: 283-301.

Laidler, Harry (1931): Concentration of Control in American Industry. New York: Thomas Crowell.

Lamoreaux, Naomi (1985): The Great Merger Movement in American Business, 1895-1904. Cambridge: Cambridge University Press.

Laumann, Edward et al. (1983): The Boundary Specification Problem in Network Analysis. Pp. 18-34 in: Ronald Burt and Michael Minor (Eds.), Applied Network Analysis. Beverly Hills: Sage.

Lehmann, Karin (1996): Wandlungen der Industriefinanzierung mit Anleihen in Deutschland, 1923/24 -1938/39. Stuttgart: Steiner.

Loeb, Ernst (1902): Das Institut des Aufsichtsrats, seine Stellung und Bedeutung im deutschen Aktienrecht und der deutschen Volkswirtschaft. Jahrbücher für Nationalökonomie und Statistik, III. Folge 23: 1-29.

Macey, Jonathan (1984): Special Interest Groups Legislation and the Judicial Function: The Dilemma of Glass-Steagall. Emory Law Journal 33: 1-40.

Macpherson, Crawford (1962): The Political Theory of Possessive Individualism. Oxford: Oxford University Press.

Mahoney, Paul (2003): The Origins of the Blue-Sky Laws: A Test of Competing Hypotheses. Journal of Law and Economics 46: 229-251.

Miller, Gale (1997): Interlocking Directorates and the Antitrust Laws. The Colorado Lawyer 26: 243-255.

Mintz, Beth und Schwartz, Michael (1985): The Power Structure of American Business. Chicago: University of Chicago Press.

Mizruchi, Mark (1982): The American Corporate Network 1904-1974. Beverly Hills: Sage.

Nelson, Ralph (1959): Merger Movements in American Industry 1895-1956. Princeton: Princeton University Press.

Olson, Mancur (1965): The Logic of Collective Action. Cambridge: Harvard University Press.

Olson, Mancur (1982): The Rise and Decline of Nations. New Haven: Yale University Press.

Parkin, Frank (1974): Strategies of Social Closure in Class Formation. Pp. 1-18 in: Frank Parkin (Ed.), The Social Analysis of Class Structure. London: Tavistock.

Parsons, Talcott (1951): The Social System. New York: Free Press.

Pecora, Ferdinand (1968) [1939]: Wall Street under Oath. New York: A.M. Kelley Publishers.

Pennings, Johannes (1980): Interlocking Directorates. San Francisco: Jossey-Bass.

Perrow, Charles (2002): Organizing America. Princeton: Princeton University Press.

Plumpe, Gottfried (1990): Die I.G. Farbenindustrie AG. Berlin: Duncker & Humblot.

Pohl, Hans (1979): Die Entwicklung der Kartelle in Deutschland und die Diskussionen im Verein für Socialpolitik. Pp. 206-235 in: Helmut Coing and Walter Wilhelm (Eds.), Wissenschaft und Kodifikation des Privatrechts im 19. Jahrhundert, Bd. IV. Frankfurt: Klostermann.

Reckendrees, Alfred (2000): Das Stahltrust-Projekt. München: Beck.

Reitmayer, Morten (1999): Bankiers im Kaiserreich. Göttingen: Vandenhoeck & Ruprecht.

Roe, Mark (1994): Strong Managers, Weak Owners: The Political Roots of American Corporate Finance. Princeton: Princeton University Press.

Roy, William (1983): The Unfolding of the Interlocking Directorate Structure of the United States. American Sociological Review 48: 248-257.

Schmitter, Philippe (1974): Still the Century of Corporatism? The Review of Politics 36: 85-131.

Schmoller, Gustav (1906): Das Verhältnis der Kartelle zum Staate. Schriften des Vereins für Socialpolitik 116: 237-271.

Schubert, Werner and Hommelhoff, Peter (1987): Die Aktienrechtsreform am Ende der Weimarer Republik: Die Protokolle der Verhandlungen im Aktienrechtsausschuß des Vorläufigen Reichswirtschaftsrats. Berlin: de Gruyter.

Schubert, Werner (1984): Hundert Jahre Modernes Aktienrecht. Berlin: de Gruyter.

Schumpeter, Joseph (1928): Unternehmer. Pp. 476-487 in: Handwörterbuch der Staatswissenschaften, Bd. 8. Jena: Verlag Fischer.

Schumpeter, Joseph (1954): History of Economic Analysis. New York: Oxford University Press.

Simon, Herbert (1972): Theories of Bounded Rationality. Pp. 161-176 in: C.B. McGuire and Roy Radner (Eds.), Decision and Organization. New York: Elsevier.

Sklar, Martin (1988): The Corporate Reconstruction of American Capitalism, 1890-1916. Cambridge: Cambridge University Press.

Smith, Adam (1979 [1776]: The Wealth of Nations. Baltimore: Penguin.

Spence, Michael (1974): Market Signaling. Harvard: Harvard University Press.

Stevens, William (1913): A Classification of Pools and Associations Based on American Experience. American Economic Review 3: 545-575.

Strouse, Jean (1999): Morgan: American Financier. New York: Random House.

Tarr, Joel (1966): J.R. Walsh of Chicago: A Case Study in Banking and Politics, 1881-1905. Business History Review 40: 451-466.

Tilly, Richard (1982): Mergers, External Growth, and Finance in the Development of Large-Scale Enterprise in Germany, 1880-1913. Journal of Economic History 42: 629-658.

Tilly, Richard (1986): German Banking, 1850-1914: Development Assistance for the Strong. Journal of European Economic History 15: 113-152.

Tilly, Richard (1998): Universal Banking in Historical Perspective. Journal of Institutional and Theoretical Economics 154: 7-32.

Useem, Michael (1984): The Inner Circle. London: Oxford University Press.

Uzzi, Brian (1990): The Sources and Consequences of Embeddedness for the Economic Performance of Organizations. American Sociological Review 61: 674-698.

Wardley, Peter (1999): The Emergence of Big Business: The Largest Corporate Employers of Labour in the United Kingdom, Germany and the United States c. 1907. Business History 41: 88-116.

Wasserman, Stanley und Faust, Katherine (1994): Social Network Analysis. Cambridge: Cambridge University Press.

Weber, Max (1964): Wirtschaft und Gesellschaft, Erster Halbband. Köln: Kiepenheuer & Witsch.

Weber, Max (1969): Die protestantische Ethik. München: Siebenstern.

Wehler, Hans-Ulrich (1974): Der Aufstieg des Organisierten Kapitalismus und Interventionsstaates in Deutschland. Pp. 36-57 in: Heinrich August Winkler (Ed.), Organisierter Kapitalismus. Göttingen: Vandenhoeck & Ruprecht.

Wellhöner, Volker (1989): Großbanken und Großindustrie im Kaiserreich. Göttingen: Vandenhoeck & Ruprecht.

Williamson, Oliver (1985): The Economic Institutions of Capitalism. New York: Free Press.

Williamson, Oliver (1988): Corporate Finance and Corporate Governance. Journal of Finance 43: 567-591.

Windolf, Paul (2002): Corporate Networks in Europe and the United States. Oxford: Oxford University Press.

Windolf, Paul (2004): Corruption, Fraud, and Corporate Governance: A Report on Enron. Pp. 141-158 in: Anna Grandori (Ed.), Corporate Governance and Firm Organization. Oxford: Oxford University Press.

Wixforth, Harald (1995): Banken und Schwerindustrie in der Weimarer Republik. Köln: Böhlau.

Ziegler, Dieter (1998): Die Aufsichtsräte der deutschen Aktiengesellschaften in den zwanziger Jahren. Zeitschrift für Unternehmensgeschichte 43: 194-215.

Appendix I: Tables
Insert Tables A1 and A2 here.

Appendix II: Sources
A. Lists for the largest firms
Germany 1896-1938:
Fiedler (1999b); Kocka and Siegrist (1979); Chandler (1990: 638-732).
USA 1900-1938:
Bunting (1987: 133-224); Chandler (1990: 638-732); Wardley (1999). Additional list for 1928: Berle und Means (1997); for 1938: TNEC: The Distribution of Ownership in the 200 Largest Nonfinancial Corporations. Washington 1940: US-Government Printing Office (Monograph No. 29).

B. Source for names of members of the Board of Directors (US) and management/supervisory board (Germany)
Germany 1896-1938:
Handbuch der deutschen Aktiengesellschaften (Hoppenstedt), Vol. 1 (1896); Vol. 18 (1914); Vol. 33 (1928); Vol. 38 (1933); Vol. 43 (1938).
Names of owners/managers of family firms (closely held corporation) were found in:
Allgemeine Deutsche Biographie und Neue Deutsche Biographie. Berlin April 2003: Duncker & Humblot (CD-ROM).
Große Jüdische National-Biographie. Nendeln/Liechtenstein 1979: Kraus Reprint (Hg.: S. Wininger).
Private bankers in: Reitmayer (1999).

USA 1900-1938:
The Manual of Statistics (Stock Exchange Hand-Book), New York: The Manual of Statistics Co.
Years 1901, 1915.
Moody's Manual of Railroads and Corporation Securities. New York: Poor's Publishing Co.
Years 1900-1901; 1914-15; 1928-29; 1938-39.
Poor's Manual of Public Utilities. New York: Poor's Railroad Manual Co.
Years 1914-15, 1928-29, 1938-39
Poor's Manual of Industrials. New York: Poor's Railroad Manual Co.
Years 1900-1901; 1914-15; 1928-29; 1938-39.
Rand McNally Bankers Directory (Bankers Blue Book). New York: Rand McNally Co.
Years 1900-1901; 1914-15; 1928-29; 1938-39.

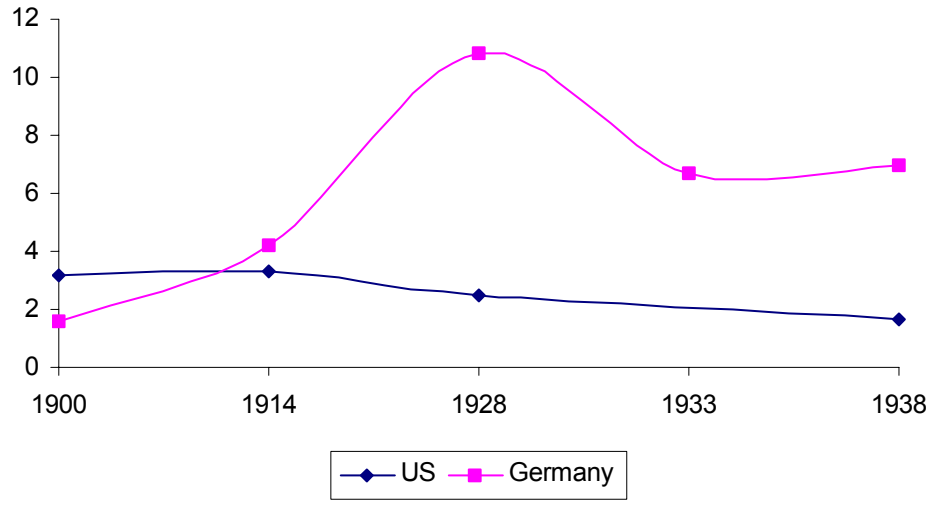
C. Additional Sources:
- Reichsamt des Innern: Kontradiktorische Verhandlungen über Deutsche Kartelle. Berlin 1903-06: Franz Siemenroth.
- House Subcommittee of the Committee on Banking and Currency (Pujo Committee)**:** Investigation of Financial and Monetary Conditions in the United States (Money Trust Investigation). Washington 1912-13: Government Printing Office.
- Temporary National Economic Committee (TNEC): Investigation of Concentration of Economic Power: Hearings. Washington 1940: Government Printing Office.

Paul Windolf

The Emergence of Corporate Networks in Germany and the United States 1896 – 1938

List of Figures and Tables

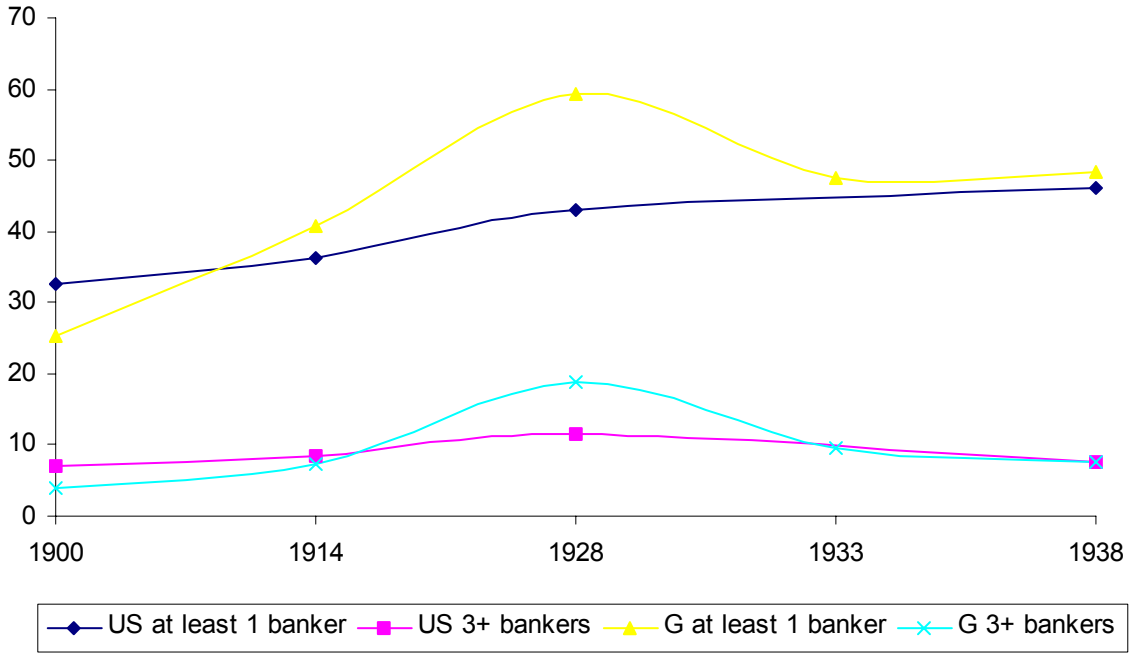
Figure 1: Density (%) United States – Germany
1896 - 1938



Data for Figure 1: Table 2, line 10

Figure 2: Percentage of Companies with Banker on Board of Directors

United States - Germany 1896 - 1938



Data for Figure 2: Table 5, lines 10 and 11.

Table 1: Ego Networks

US 1914 **George F. Baker**	**degree**	**Germany 1914** **Walther Rathenau**	**degree**
Guaranty Trust NY	50	*AEG (VV)*	85
First National Bank NY (CEO)	40	Strassenbahn Hannover	72
Mutual Life of NY	37	Rütgerswerke AG	65
Erie Ry.	31	Felten & Guillaume Carlswerk AG	61
United States Steel Corp.	30	Elektro-Treuhand AG	54
A. T. & T. Co.	26	Mannesmannröhren-Werke	53
Northern Pacific Ry.	25	Gesell. elektrische Unternehmungen	48
New York Central Ry.	22	Berliner Electricitätswerke	46
National Biscuit	22	Elektricitäts-AG (Lahmeyer)	44
Reading Ry.	21	Berliner Handels-Gesellschaft	43
Lehigh Valley	19	Elektrochemische Werke	34
Pullman Co.	19	Schlesische AG für Bergbau/Zink	33

G.F. Baker was CEO of the First National Bank of New York; he held 12 directorships in the network.
Degree: actor degree centrality of firms in which G.F. Baker was director.

Walther Rathenau was CEO of the AEG; he held a total of 19 directorships in the network.

Table 2: Structure of Networks in the United States and Germany

	US				Germany				
	1900	**1914**	**1928**	**1938**	**1896**	**1914**	**1928**	**1933**	**1938**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Size of network									
(1) Number of firms (N)	249	242	369	409	212	323	377	405	361
(2) Connected firms (n)	226	193	329	375	156	292	366	389	346
(3) Isolated firms (%)	9.2	20.2	10.8	8.3	26.4	9.6	2.9	4	4.2
(4) Degree 1-2 (%)	19.3	21.1	16.3	19.6	28.8	15.8	2.9	5.9	6.9
(5) Ø size of BoD	13.3	14.4	17.5	16.5	7.9	12.7	21.7	15.7	15
B. Directed + undirected interlocks									
(6) Number of interlocks	1579	1466	2538	2091	513	3081	12374	8177	6967
(7) Dichotomized	1128	1094	1955	1615	409	2314	7891	5711	4798
(8) Multiple interlocks (%)	28.6	25.4	23.0	22.8	20.3	24.9	36.2	30.2	31.1
(9) Interlocks per firm	6.34	6.05	6.88	5.11	2.42	9.54	32.8	20.2	19.3
(10) Density (%)	3.2	3.34	2.49	1.64	1.61	4.23	10.8	6.66	7
(11) Percentage top-10% firms	33.3	31.3	29.6	30.6	29.2	32.3	27.7	28.7	28
C. Directed interlocks									
(12) Number of interlocks	468	395	812	715	136	438	1416	1222	1156
(13) Dichotomized	410	352	726	654	129	405	1200	1029	984
(14) Multiple interlocks (%)	12.4	10.9	10.6	8.5	5.1	7.5	15.3	15.8	14.9
(15) Interlocks per firm	1.88	1.63	2.2	1.75	0.64	1.36	3.76	3.02	3.2
(16) Degree centralization (out)	0.08	0.11	0.06	0.05	0.07	0.13	0.22	0.22	0.24
(17) Degree centralization (in)	0.07	0.08	0.03	0.03	0.04	0.04	0.05	0.03	0.04
D. Directors and positions									
(18) All directors	2535	2784	5113	5482	1342	2976	5174	3867	3256
(19) All positions	3317	3495	6459	6766	1665	4112	8169	6303	5401
(20) Multiple directors	417	389	770	807	198	532	1112	975	843
(21) Multiple directors (%)	16.4	14	15.1	14.7	14.8	17.9	21.5	25.2	25.9
(22) Positions of multiple dir.	36.1	31.5	32.8	30.9	30.6	40.6	50.3	54.1	55.3
(23) 10+ directorships (%)	*0.6*	*1.1*	*0.6*	*0.2*	-	*3.9*	*11.6*	*10.2*	*10.9*
(24) 5-9 directorships (%)	*8.9*	*7.2*	*6*	*3.6*	*3.9*	*9.3*	*11.4*	*13*	*13.6*
(25) 2-4 directorships (%)	*26.6*	*23.2*	*26.2*	*27.1*	*27.4*	*27.4*	*27.3*	*30.9*	*30.8*

Notes to Table 2

If two firms share a director in common the link created between both firms is called *interlocking directorate* (interlock).
If an executive manager of firm A sits on the Board of Directors of firm B as a non-executive/external director, this link is called *directed (primary) interlock* between firms A and B.
If two firms share a non-executive/external director, this connection is termed *undirected (secondary) interlock*.

Line 1: Number of largest firms in the sample in each country (= N).
Line 2: Connected firms (= n); only firms with ties to other firms in the sample are counted.
Line 3: Percentage of isolated firms: (N-n)/N * 100.
Line 4: Percentage of firms with connections to only one or two other firms in the sample (degree 1-2).
Line 5: US: average size of Board of Directors + top executive managers; Germany: average size of Supervisory Board + Management Board.
Line 6: Number of interlocks in the full network (directed + undirected interlocks).
Line 7: Number of directed + undirected interlocks in the dichotomized matrix.
Line 8: Percentage of multiple interlocks in the full network: (line 6 - line 7)/line 6 * 100.
Line 9: Interlocks per firm: (line 6)/N
Line 11: Density of the full network: [(directed interlocks + 2*undirected interlocks)]/[N*(N-1)]. Figure gives percentage of realized interlocks with respect to potential links in the *dichotomized* matrix. Potential links: [N*(N-1)].
Line 12: Number of directed interlocks.
Line 13: Number of directed interlocks in the dichotomized matrix.
Line 14: Percentage of multiple directed interlocks (line 12 - line 13)/line 12 * 100.
Line 15: Number of directed interlocks per firm: Line 12/N
Line 16: Freeman's group degree centralization measure (outdegree).
Line 17: Group degree centralization (indegree).
Line 18: US: Number of Board directors + top executive managers; Germany: Number of members of the Supervisory + Management Board.
Line 19: Number of positions held by directors counted in line 18.
Line 20: Number of *multiple* directors with two or more positions in the network.
Line 21: Multiple directors as percentage of all directors: Line 20/Line 18 * 100.
Line 22: Percentage of positions held by multiple directors.
Line 23: Percentage of positions held by directors with 10 or more directorships in the network.
Line 24: Percentage of positions held by directors with 5-9 directorships in the network.
Line 25: Percentage of positions held by directors with 2-4 directorships in the network.
∑line 23 + line 24 + line 25 = 100%

Table 3: Ten Most Central Firms 1928

Firms US	Sector	degree	Firms Germany	Sector	degree
Guaranty Trust	Bank	51	RWE	Power Station	157
Chase National Bank	Bank	49	Gelsenkirch. Bergwerk	Steel/coal	155
Bankers Trust	Bank	46	A.E.G.	Electrical Indus.	151
General Electric	Electrical Indus.	45	Deutsche Bank	Bank	148
Western Union Tel.	Communication	41	Deutsche Lufthansa	Airline	143
New York Trust	Bank	38	Allianz & Stuttgarter	Insurance	141
Mutual Life of NY	Insurance	37	Vereinigte Stahlwerke	Steel	134
Bklyn. Manh. Transit	Public Transp.	34	Linke-Hofmann-Werke	Mechanical Eng.	130
Equitable Trust	Bank	33	Phoenix AG	Steel/coal	128
Metropolitan Life	Insurance	33	VIAG	Conglomerate	125

Degree: actor degree centrality

Table 4: Gini Coefficients - Contacts and Directorships

	1900/1896	1914	1928	1933	1938
Contacts					
US	.498	.514	.474	——	.472
Germany	.475	.530	.459	.456	.444
Directorships					
US	.227	.225	.204	——	.171
Germany	.177	.274	.353	.324	.329

Contacts: actor degree centrality *(firms)*.
Directorships: Number of positions held by *individuals* (multiple directors only). The Gini coefficient is a standard inequality index (maximum = 1). It measures the degree of inequality in the distribution of contacts among firms (respectively, the inequality in the distribution of directorships among individuals).

Table 5: Bank Control in the Network

United States	**1900**	**1914**	**1928**	1933	**1938**
	(1)	(2)	(3)	(4)	(5)
A. Directed interlocks					
(1) Banks to Banks	41	65	52		29
(2) Interlocks per bank	0.89	1.33	0.84		0.38
(3) Banks to industrials (outdegree)	122	137	258		262
(4) Interlocks per bank	2.7	2.8	4.2		3.4
(5) Industrials to banks (indegree)	66	71	166		140
(6) Interlocks per bank	1.4	1.4	2.8		1.8
(7) Indegree/outdegree (%)	54.1	51.8	64.3		53.4
(8) Number of banks (= N)	46	49	62		77
(9) Industrials with banker (BoD)	66	70	132		153
(10) Industrials with banker (%)	32.5	36.2	43.0		46.1
(11) Industrials with 3+ bankers (%)	6.9	8.3	11.4		7.5
(12) Banker as chairman/president (%)	2.5	2.1	8.5		10.2
B. Big Linker					
(13) Percentage CEO/president bank	33.3	40.0	40.0		22.9
(14) Percentage CEO/president industrial	30.3	20.0	37.1		40.0
(15) Only BoD (non-executive) (%)	36.4	40.0	22.9		37.1
(16) Number of *Big Linkers (= N)*	33	35	35		35
(17) Average number of directorships	6.8	6.7	7.2		6.1

Germany	**1896**	**1914**	**1928**	**1933**	**1938**
A. Directed interlocks					
(1) Banks to banks	10	41	123	94	68
(2) Interlocks per bank	0.33	0.87	2.1	1.6	1.4
(3) Bank to industrials (outdegree)	76	207	426	296	252
(4) Interlocks per bank	2.5	4.4	7.2	5.2	5.4
(5) Industrials to banks (indegree)	12	30	114	67	77
(6) Interlocks per bank	0.4	0.63	1.9	1.2	1.6
(7) Indegree/outdegree (%)	15.8	14.5	26.8	22.6	30.6
(8) Number of banks (= N)	30	47	59	57	47
(9) Industrials with banker (BoD)	46	113	189	165	152
(10) Industrials with banker (%)	25.3	40.9	59.4	47.4	48.4
(11) Industrials with 3+ bankers (%)	3.8	7.2	18.9	9.5	7.6
(12) Banker as chairman of supervisory bd.	13.7	14.5	23	22	24.8
B. Big Linker					
(13) Percentage CEO bank	46.4	38.9	31.6	31.6	31.6
(14) Percentage CEO industrial	14.3	11.1	18.4	23.7	28.9
(15) Supervisory board positions only (%)	39.3	50	50	44.7	39.5
(16) Number of *Big Linkers* (= N)	28	37	38	38	38
(17) Average number of directorships	4.9	9.7	18	14.6	13.5

Notes to Table 5

Only *directed* (primary) interlocking directorates are analyzed in Table 5.

Line 1: Number of interlocks between financial institutions (banks); intrasectoral bank interlocks (bank → bank)

Line 2: Number of intrasectoral interlocks per bank Line 1/Line 8.

Line 3: Number of interlocks between banks and industrials (outdegree; bank → industrial).

Line 4: Number of interlocks to industrials per bank Line 3/Line 8.

Line 5: Number of interlocks between industrials and banks (indegree; industrial → bank).

Line 6: Number of interlocks to banks per bank: Line 5/Line 8.

Line 7: (Line 5/Line 3)* 100. (Indegree as a percentage of outdegree).

Line 8: Number of banks in the sample.

Line 9: Number of industrials with at least one banker sitting on its board.

Line 10: Percentage of industrials with at least one banker sitting on its board: (Line 9/(Line 1 in Table 2 - Line 8 in Table 5)*100.

Line 11: Percentage of industrials with 3 or more bankers sitting on its board.

Line 12: US: Percentage of industrials that have a banker as (vice) chairman/president; Germany: Percentage of industrials that have a banker as (vice) chairman of the supervisory board.

Line 13: Percentage of top *Big Linkers* who are CEO of a financial institution.

Line 14: Percentage of top *Big Linkers* who are CEO of an industrial.

Line 15: US: Percentage of top *Big Linkers* who only hold positions as non-executive directors; Germany: Percentage of top *Big Linkers* who only hold positions on supervisory boards (no management board position).

Line 16: Number of top *Big Linkers* included in the analysis.

Line 17: Average number of positions held by top *Big Linkers* in the network.

Table 6: Directed Multiple Interlocks

	1896/1900	1914	1928	1934	1938
A. All firms					
(1) US (%)	12.4	10.9	10.6	—	6.4
(2) Germany (%)	5.1	7.5	15.3	15.8	14.9
B. Banks					
(3) US (%)	10.7	7.3	9.3	—	8.0
(4) Germany (%)	7.9	5.3	8.5	8.4	4.0
C. Financial sector					
(5) US (%)	45.9	48.9	48.8	—	41.6
(6) Germany ((%)	39.5	45.4	55.6	44.3	39.7

Panel A shows the percentage of multiple interlocks between any two firms.
Panel B shows the percentage of multiple interlocks between a single bank and a single industrial firm.
Panel C shows the percentage of multiple interlocks between the financial sector and a single
industrial firm.

Table 7: U.S. Bankers on the Board of Directors of Industrial Firms (1900)

Northern Pacific Ry.		Western Union Telegraph	
Walter Oakman (4)	Guaranty Trust Co. of NY (35)	Louis Fitzgerald (5)	Mercantile Trust Co. (36)
James Stillman (9)	National City Bank, NY (34)	James Stillman (9)	National City Bank, NY (34)
D. Willis James (3)	U.S. Trust Company of NY (33)	Samuel Sloan (5)	National City Bank, NY (34)
Charles Steele (10)	J. P. Morgan & Co. (22)	J. P. Morgan (8)	J. P. Morgan & Co. (22)
Robert Bacon (8)	J.P. Morgan & Co. (22)	Jacob H. Schiff (8)	Kuhn, Loeb & Co. (7)
Dumont Clarke (4)	American Exch. Nat. Bank (18)	Charles Lanier (6)	Winslow, Lanier & Co. (5)
George F. Baker (8)	First National Bank, NY (9)	Edward Perkins(2)	Importers & Traders Nat. Bank (5)

Figures in parentheses: Individuals = number of directorships; firms = actor degree centrality (contacts).

Table 8: Intra- and Intersectoral Density - Germany 1928

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Ø	N
1 Electrical industry	0.58	0.46	0.40	0.37	0.27	0.33	0.23	0.23	0.22	0.19	0.26	0.13	0.10	0.15	0.06	0.11	0.09	**0.24**	**12**
2 Steel	0.46	0.59	0.31	0.46	0.31	0.41	0.22	0.17	0.18	0.20	0.19	0.13	0.10	0.13	0.09	0.09	0.05	**0.24**	**37**
3 Shipping companies	0.40	0.30	0.53	0.32	0.39	0.28	0.28	0.30	0.24	0.17	0.15	0.13	0.17	0.10	0.06	0.18	0.05	**0.24**	**6**
4 Mining	0.38	0.46	0.33	0.42	0.26	0.32	0.20	0.24	0.25	0.10	0.15	0.14	0.10	0.08	0.09	0.09	0.05	**0.21**	**34**
5 Chemical industry	0.27	0.29	0.39	0.24	0.40	0.23	0.21	0.23	0.15	0.15	0.14	0.15	0.14	0.09	0.15	0.06	0.05	**0.20**	**22**
6 Mechanical engineering	0.32	0.39	0.28	0.31	0.23	0.31	0.22	0.15	0.12	0.12	0.14	0.14	0.10	0.09	0.08	0.08	0.08	**0.19**	**25**
7 Banks	0.25	0.24	0.28	0.22	0.24	0.24	0.29	0.16	0.12	0.12	0.19	0.13	0.16	0.11	0.09	0.08	0.09	**0.18**	**59**
8 Oil/Gas	0.24	0.17	0.30	0.24	0.22	0.16	0.14	0.40	0.09	0.08	0.12	0.10	0.12	0.06	0.09	0.09	0.05	**0.16**	**9**
9 Power stations	0.21	0.17	0.24	0.24	0.15	0.13	0.10	0.08	0.41	0.14	0.11	0.06	0.05	0.06	0.06	0.07	0.04	**0.14**	**55**
10 Department stores	0.17	0.21	0.17	0.09	0.15	0.10	0.11	0.06	0.14	0.58	0.07	0.08	0.09	0.00	0.08	0.06	0.04	**0.13**	**5**
11 Automobile	0.25	0.19	0.14	0.15	0.14	0.14	0.16	0.12	0.11	0.09	0.17	0.09	0.10	0.16	0.09	0.06	0.09	**0.13**	**11**
12 Stone/glass	0.13	0.13	0.13	0.14	0.15	0.14	0.12	0.10	0.06	0.08	0.09	0.09	0.14	0.11	0.08	0.06	0.02	**0.10**	**10**
13 Food	0.10	0.10	0.16	0.10	0.14	0.10	0.14	0.13	0.05	0.08	0.10	0.14	0.07	0.09	0.07	0.04	0.04	**0.10**	**25**
14 Precision mechanics	0.15	0.12	0.10	0.08	0.09	0.09	0.09	0.06	0.06	0.00	0.16	0.11	0.08	0.00	0.12	0.02	0.10	**0.08**	**7**
15 Lumber	0.06	0.09	0.06	0.09	0.14	0.08	0.08	0.09	0.06	0.13	0.09	0.08	0.07	0.12	0.00	0.05	0.06	**0.08**	**6**
16 Public transport	0.11	0.09	0.18	0.09	0.06	0.08	0.07	0.09	0.10	0.09	0.07	0.05	0.04	0.03	0.06	0.14	0.02	**0.08**	**20**
17 Textiles	0.10	0.05	0.06	0.05	0.05	0.08	0.08	0.06	0.04	0.06	0.09	0.02	0.04	0.11	0.06	0.02	0.10	**0.06**	**17**
Ø	**0.25**	**0.24**	**0.24**	**0.21**	**0.20**	**0.19**	**0.16**	**0.16**	**0.14**	**0.14**	**0.13**	**0.10**	**0.10**	**0.09**	**0.08**	**0.08**	**0.06**		
N	**12**	**37**	**6**	**34**	**22**	**25**	**59**	**9**	**55**	**5**	**11**	**10**	**25**	**7**	**6**	**20**	**17**		**∑ 360**

Figures in the diagonal give *intra*sectoral density (directed + undirected interlocks); figures off-diagonal give *inter*sectoral density. Ø: Average density over all sectors (unweighted); N= number of firms in each sector.

Table 9: Intra- and Intersectoral Density – United States 1928

Sector	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Ø	N
1 Power stations	0.72	**0.04**	0.03	0.23	0.05	0.03	0.01	0.01	0.03	0.02	0.01	0.04	0.02	0.01	0.01	0.00	0.01	0.00	**0.07**	**15**
2 Banks	**0.04**	**0.05**	0.08	**0.05**	**0.09**	**0.08**	**0.06**	**0.09**	**0.05**	**0.05**	**0.06**	**0.05**	**0.06**	**0.05**	**0.02**	**0.04**	**0.06**	**0.02**	**0.06**	**46**
3 Railways	0.03	**0.07**	0.16	0.04	0.04	0.12	0.04	0.07	0.06	0.04	0.02	0.03	0.03	0.01	0.00	0.02	0.00	0.00	**0.04**	**39**
4 Utilities	0.22	**0.05**	0.04	0.16	0.03	0.05	0.01	0.02	0.10	0.02	0.00	0.01	0.02	0.01	0.00	0.01	0.00	0.00	**0.04**	**20**
5 Electrical industry	0.06	**0.07**	0.04	0.03	0.13	0.05	0.08	0.04	0.02	0.02	0.03	0.02	0.04	0.02	0.03	0.04	0.03	0.00	**0.04**	**10**
6 Communication	0.04	**0.07**	0.10	0.05	0.05	0.00	0.04	0.08	0.05	0.05	0.03	0.03	0.04	0.02	0.02	0.00	0.02	0.00	**0.04**	**8**
7 Automobile	0.01	**0.04**	0.04	0.01	0.06	0.04	0.06	0.04	0.02	0.04	0.05	0.05	0.03	0.03	0.01	0.05	0.01	0.00	**0.03**	**17**
8 Insurance	0.02	**0.08**	0.07	0.01	0.03	0.08	0.04	0.06	0.04	0.03	0.03	0.02	0.02	0.01	0.02	0.01	0.00	0.03	**0.03**	**16**
9 Public transport	0.03	**0.04**	0.07	0.09	0.02	0.08	0.02	0.04	0.08	0.05	0.07	0.05	0.01	0.01	0.02	0.01	0.00	0.00	**0.04**	**10**
10 Food	0.02	**0.03**	0.05	0.02	0.03	0.04	0.04	0.03	0.04	0.03	0.05	0.04	0.02	0.02	0.02	0.01	0.02	0.01	**0.03**	**26**
11 Mechanical engin.	0.02	**0.05**	0.02	0.01	0.03	0.03	0.05	0.04	0.05	0.05	0.04	0.03	0.02	0.03	0.02	0.01	0.01	0.00	**0.03**	**15**
12 Chemical industry	0.03	**0.03**	0.03	0.01	0.02	0.03	0.05	0.02	0.04	0.03	0.03	0.02	0.03	0.02	0.02	0.01	0.01	0.00	**0.02**	**23**
13 Steel/metal	0.02	**0.06**	0.04	0.02	0.05	0.04	0.04	0.02	0.01	0.02	0.02	0.03	0.02	0.01	0.01	0.03	0.01	0.00	**0.02**	**29**
14 Oil/Gas	0.01	**0.04**	0.01	0.01	0.02	0.02	0.03	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.00	0.01	0.00	0.00	**0.02**	**21**
15 Lumber	0.00	**0.02**	0.00	0.00	0.02	0.02	0.01	0.02	0.01	0.02	0.02	0.02	0.01	0.00	0.02	0.00	0.02	0.05	**0.01**	**11**
16 Stone/glass	0.01	**0.02**	0.03	0.02	0.04	0.00	0.08	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.00	0.00	0.02	0.00	**0.02**	**7**
17 Department stores	0.02	**0.05**	0.02	0.00	0.03	0.02	0.01	0.02	0.00	0.02	0.01	0.01	0.01	0.00	0.02	0.02	0.00	0.00	**0.02**	**6**
18 Textiles	0.00	**0.01**	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	**0.01**	**5**
Ø	**0.07**	**0.05**	**0.05**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.04**	**0.03**	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.02**	**0.01**	**0.01**	**0.03**	
N	**15**	**46**	**39**	**20**	**10**	**8**	**17**	**16**	**10**	**26**	**15**	**23**	**29**	**21**	**11**	**7**	**6**	**5**		**∑ 324**

Notes: See Table 8.

Table 10: Correlation with Pattern Matrix

	1900	1914	1928	1933	1938
US	.473	.315	.309	——	.273
Germany	.393	.301	.344	.457	.488

Figures give Pearson's correlation coefficient; $\alpha \leq 0.001$ for all coefficients.

Table A1: Balance Sheet Data in Comparison (1914)

	Paid-up Capital in Mill.	**Deposits/ Assets** in Mill.	**Funded debt** in Mill.	**Bank-credits** in Mill.
Deutsche Bank AG Berlin	250.0 M	1028.7 M Deposits*	-	-
Friedrich Krupp AG Essen	215.0 M	616.4 M Assets#	51.2 M	105.6 M
National City Bank New York	25.0 $	256.9 $ Deposits**	-	-
US Steel Corporation	868.6 $	1792.2 $ Assets#	627.0 $+	++

Balance sheet data refer to the financial year 1913/14.
Assets = Balance sheet total
* Deposits 899 Mill. + Deposits of other banks 129.7 Mill. = 1,028.7 Mill. Mark (*Deutsche Bank*).
** Individual deposits 169.4 Mill. $ + 87.5 Mill $ deposits of banks = 256.9 Mill. $ deposits (*National City Bank*).
+ Funded debt 442.4 $ + other bonded debt 184.6 Mill. $ = 627.0 funded/bonded debt *(US Steel*).
++ On the liabilities side of the balance sheet of the *US Steel Corp.* no bank credits were listed for the financial year 1914.
Source for National City Bank and US Steel Corp.: The Rand-McNally Bankers' Directory. July 1914. p. 696; Manual of Statistics 1915. p. 150-53; 843-850. Source for Deutsche Bank and Krupp: Handbuch der Deutschen Aktien-Gesellschaften 1914/15; Vol. I. pp. 36-40; Vol. II. pp. 336-39.
Exchange rate 1913: 1 US-$ = 4.20 Mark (Source: Manual of Statistics 1901. p. 269).

Table A2: Pattern-Matrix

Sector	**1**	**2**	**3**	**4**	**...**	**10**	**11**	**12**
1 Food	**1**	0	0	0	0	0	0	**0.5**
2 Textiles	0	**1**	0	0	0	0	0	**0.5**
3 Lumber	0	0	**1**	0	0	0	0	**0.5**
4 Chemical Ind.	0	0	0	**1**	0	0	0	**0.5**
....	0	0	0	0	**1**	0	0	**0.5**
10 Steel/metal	0	0	0	0	0	**1**	0	**0.5**
11 Mining	0	0	0	0	0	0	**1**	**0.5**
12 Banks	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**1.0**

Hypotheses: Intrasectoral density =1.
Intersectoral density of banks with all other sectors = 0.5.
Intersectoral density=0 (except: banks).