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The Role of the Universal Banks in the Financing of  
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**ECONOMICS DEPARTMENT**

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**BADIA FIESOLANA, SAN DOMENICO (FI)**

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# Financial Capitalism in Pre-World War I Germany: The Role of the Universal Banks in the Financing of German Mining Companies 1906-1912

Marco Becht  
*European University Institute*  
*Florence, Italy*

Carlos Ramírez  
*Harvard University*  
*Cambridge, Mass.*

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## Abstract

This paper compares two similar samples of mining and steel corporations in pre-WWI Germany. One sample consists of corporations that were affiliated to one or more of the *Großbanken*, the German "Great Banks", the other of companies that had to rely on other sources of finance. Statistical analysis conducted in the framework of a linear fixed effects model indicates that non *Großbanken* affiliated companies were liquidity constrained. In addition to the empirical analysis the paper sets out the structure of German corporate control as it was laid down in the trade law reform of 1884, and gives a brief summary of the development of the mining and steel industry in Imperial Germany.

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"The banks attend an industrial undertaking from its birth to its death, from promotion to liquidation, they stand by its side whilst it passes through the financial processes of economic life, whether usual or unusual, helping it and at the same time profiting from it."

[Jeidels (1905), page 50]

"Iron and steel rule the world."

[German proverb]

## Introduction

Imperial Germany experienced an impressive takeoff in industrial growth from around 1880 to the decade before World War I. Its mining and steel industry, for example, overtook that of England by the 1880s and was only second in mining output to the United States on the eve of World War I. Authors like Gershenkron (1962), Tilly (1967, 1986), and Kocka (1978) have argued that this takeoff in production and output was helped tremendously by the institutional organisation of the German banking system. The so called "Great Banks", or *Großbanken*, had a strong influence in the corporate governance of their clients and facilitated the channelling of funds for improvements and expansions. Other researchers, however, disagree with this contention. In particular, Neuberger and Hughs (1966) argue that the Great German Banks contributed little, if anything, to industrial growth.

In a world of perfect information and no agency costs, firms can borrow and invest optimally; liquidity has no effect on the investment decision. In a classic paper, Franco Modigliani and Merton Miller (1958), showed under what conditions financial structure becomes irrelevant for real investment decisions. Jorgenson (1971) has provided an extensive survey of the theory of investment behaviour, distinguishing between classical, neoclassical, accelerator and Q models, - models of investment demand. Assuming perfectly elastic supply, Modigliani-Miller (M-M) applies to all of them. More recently, the classical models of demand have been combined with models of imperfectly elastic

supply and rationing. These, can be motivated in many ways<sup>2</sup>, but they all predict that liquidity matters.

Early empirical studies ignored the effect of financial factors on the investment decision and concentrated on testing rival theories in a representative agent, Modigliani-Miller framework<sup>3</sup>. In subsequent work, many authors moved away from this restrictive framework, taking into account the heterogeneity of firms and financial structures. A particularly clear summary and an excellent example of this approach has been provided by Fazzari, Hubbard and Petersen (1988). This paper follows their approach<sup>4</sup> and investigates the assertion that the *Großbanken*, the German “Great Banks” played a role in the financing of German industry that was not dissimilar to that of the House of Morgan in the United States [De Long (1991), Ramírez (1992)] and the post-WW2 *keiretsu* and pre-WW2 *zaibatsu* in Japan [Hoshi, Kashyap, Scharfstein (1990), Hoshi, Kashyap, Scharfstein (1991)]. It uses *a priori* information to divide a sample into a M-M group and a liquidity constrained group. Concentrating on the mining and steel industry, one of the most important industries in size and, in international comparison, one of the pre-WW1 German successes in growth, the paper hopes to add another piece of evidence to a recent new view of the quantitative history of comparative financial capitalism and empirical work that does not use the Modigliani - Miller theorem everywhere.

Section I gives an outline of what was special about the “Great Banks”, their business strategy and their development. Section II briefly reviews the main components of German corporate structure, as set out in the reform to the *Handelsgesetzbuch* (HGB), the German trade law, of 1884. This is important because corporate control takes a somewhat different form from the United States or Japan and played an important part in the evolving relationship between the “Great Banks” and industry. Also, the HGB set out minimum reporting standards that had to be respected by all corporations and provide the basis for the balance sheet data underlying the analysis. Section III investigates the nature of the relationship between the “Great Banks” and industry. It argues

<sup>2</sup> Two examples are credit rationing [Jaffee and Russell (1976), Stiglitz and Weiss (1981)] and agency costs [Jensen (1986)].

<sup>3</sup> Much of this literature is summarised in Jorgenson (1971).

<sup>4</sup> Fazzari, Hubbard and Petersen (1988) use a consumption inspired “rich and poor” criterion to sort firms, *a priori*, into a liquidity constrained and an unconstrained group. This is the main weakness of their paper; see the discussion by Alan Blinder and Christopher Sims in the same Brookings volume.



that the decisive link was through members of the *Großbankens'* management or board of governors who were placed on the board of industrial customers. We call this a board of governors or *Aufsichtsrat* link. Section IV takes a closer look at the industry under study, mining and steel, as well as describing the companies used in the analysis. Section V uses the *Aufsichtsrat* link and tries to derive a quantitative measure for determining the affiliation of industrial enterprises to one of the banking groups. It also discusses the transformation of the original German income statements into broader categories with English labels and the subsequent transformation of the broader accounting categories with English labels into the appropriate free cash flow and investment measures. Section VI presents the econometric model and results. Section VII discusses the results and Section VIII concludes. Two appendices discuss the construction of the regressors from the original balance sheet data and the effect of an important outlier, the *Oberschlesische Kokswerke und Chemische Fabriken*, (*Oberschlesische Kokswerke*) on the regression results.

## I. The Great German Banks

In Germany, banking influence started through the financing and reorganisation of railroads, which were a big business after 1850. Tilly (1986) points out that private bankers were represented in the railroad management committees as early as 1830s.

*"Bankers not only underwrote the issue of railroad securities but also managed the companies' current accounts; and to insure their investments they occupied key positions in the management..."*

[Tilly, (1986), p. 119]

Although railroad financing provided a stepping stone for the development of finance capitalism in Germany, it wasn't until the rise of big business and organised capitalism in the 1870s that firmly established the role of the *Großbanken* in the financing and management of industrial corporations. Kocka (1978) characterises this period of German growth as one in which

*"[t]he main trends included the growth of large scale business through internal expansion and mergers; the increasing separation of ownership and control; the diversification of large concerns through internal expansion or by mergers; the cartelization of German industry, and the rise of shareholding banks."*

The liberal laws of 1870 allowed flexible rules regarding the issue of new securities, in particular share capital. The establishment of joint-stock companies was an important way in which the banks could influence their client enterprises. The panic of 1873 only reinforced this trend of banking influence over corporations because, after the panic and the subsequent economic downturn investors became more cautious about securities and banks served as guardians of their corporate clients' share capital.<sup>5</sup> The period of liberalism quickly disappeared and was replaced by one with more restraint. The Corporate Law of 1884 marked a significant change in the evolution of the German corporation and, Tilly (1986) maintains, increased the *Großbanken* influence over the industrial corporation. By raising the minimum size of shares that corporations must issue, the law forced companies to search for powerful banks that could float a security issue. In addition, it increased the time lag between the establishment of the company and its first listing in the stock exchange in order to weed out weak companies before they were actually listed. Furthermore, the law strengthened the influence of the supervisory board (*Aufsichtsrat*) over the management of the corporation. Since bank executives were members of this board this automatically meant that the banks had a greater influence over the company's internal decisions.

## II. Corporate Control in Imperial Germany

The German corporation, as defined in the *Handelsgesetzbuch* (HGB) of 1884 had three main agents: Executive or management (*Vorstand*), a Board of Supervisors (*Aufsichtsrat*) and the General Meeting of Shareholders (*Aktionäre, Generalversammlung*). The relationship between these three actors was regulated by writing separate sections<sup>6</sup>, stipulating respective privileges and duties, for each of the three groups. From the HGB, these are summarised in Table I7.

<sup>5</sup>See Tilly (1986).

<sup>6</sup> Actually, there are only two sections. The supervisory board was supposed to act on behalf of the shareholders, so they share one section of the law.

<sup>7</sup> For a short, accurate and effective summary of the main institutional features of the German corporation and the relationship between industry and the *Großbanken*, see Whale (1930), Chapter II. Whale was writing for a British audience and was acquainted with several German banking personalities, including Otto Jeidels. A recent and very informative collection of sources that trace the political and legal discussions that lead to the reform of 1884, the text of the law of 1870 and 1884 as well as commentaries on the impact of the



**Table I.A: The Agents of Corporate Control in Imperial Germany**  
(entries are very free summaries of the original legal text, not translations)

Agent	Legal Position	HGB Article	Para
Aufsichtsrat (supervisory board)	in cases where shareholders ask for an independent investigation the <i>Aufsichtsrat</i> (AR) has the right to be heard by the appointing court	222a	2
	the AR is appointed by the annual general meeting (AGM) of the shareholders by a majority vote	224 (191)	(1)
	the AR must be reappointed at least every five years	224 (191)	(3)
	the AR can be released from its duties at any time by a 3/4 majority in the AGM	224 (191)	(4)
	the AR supervises the <i>Vorstand</i> in all administrative matters and with the aim of keeping itself informed about all affairs of the company	225	1
	the AR can request the <i>Vorstand</i> to provide copies or access to the companies' books and other papers.	225	1
	the AR has to call an AGM "if the best interest of the company requires it"	225	2
	other duties of the AR can be laid down in the company's constitution	225	3
	the members of the AR can not transfer their duties to other persons	225	4
	members of the AR may not be directors or employees of the company	225a	1
	when a director leaves the management of the corporation, the AGM must relieve him from his duties before he can be elected as a member of the AR	225a	2

reform after 100 years, in a lawyer's perspective, has been provided by Schubert and Hommelhoff (1985).

**Table I.B: The Agents of Corporate Control in Imperial Germany**  
*(entries are very free summaries of the original legal text, not translations)*

Agent	Legal Positions	HGB Article	Para .
Vorstand			
(directors)	the directors represent the corporation in all business and legal matters.	227	1
	the board of directors can consist of one or more persons, be shareholder(s) or not	227	2
	directors can be fired at any time, but may have the right to be adequately compensated.	227	3
	the directors are obliged to observe the limitations imposed upon their business operations by the corporation's constitution and the resolutions of the AGM	231	1
	directors may not, without special permission, run a private business.	232	
	the board of directors, unless otherwise stipulated in the corporation's constitution, calls the AGM	236	1
	an AGM must be called "if the interests of the company require it"	236	2
	the board of directors must ensure that written records of company accounts are kept	239	1
	the directors must publish, at the most six months into the new business year, a balance sheet, a profit and loss account as well as a report on the development and conditions of the corporation; these documents, together with the remarks of the AR, must be presented to the AGM.	239	2
	when losses are larger than half of the par value, the directors must call an AGM	240	1
	the directors must declare bankruptcy when the company can no longer make regular payment or the value of total debt, in any one year, is larger than the value of total assets.	240	2
	in cases where shareholders ask for an independent investigation the <i>Vorstand</i> has the right to be heard by the appointing court	222a	2
	has to give access to all documents required by independent accountants appointed by a court on behalf of shareholders	222a	3



**Table I.C: The Agents of Corporate Control in Imperial Germany**  
*(entries are very free summaries of the original legal text, not translations)*

Agent	Legal Position	HGB Article	Para
Aktionäre (shareholder)	owns a share of the assets of a corporation corresponding to shareholding.	216	1
	can not ask the company to refund the par value of the shares as long as the company operates	216	2
	merely has a claim on profits and only if explicitly stated in the <i>Gesellschaftsvertrag</i>	216	2
	may not be charged or paid interest	217	1
	may exercise rights, particularly those relating to conduct of business, the balance sheet and the distribution of profits, by voting at the annual general assembly	221	1
	shareholder who hold together shares that represent more than 10% of par value and held those shares for more than six months can ask the responsible court (at the place of incorporation) to appoint independent accountants to look into any dealings of the company that are no older than two years	222a	1
	a minority representing 20% of total par value can call a general assembly or place particular items on the agenda of the AGM; if the directors or the <i>AR</i> do not respond to these measures, the minority shareholders can appeal to the legal authorities at the place of incorporation for permission to act themselves; the corporation's constitution can set a percentage lower than 20%.	237	
	the AGM can appoint auditors to check the balance sheet	239a	1

A vital aspect of the law, not included in the table, were the penal articles in Section IV. They have one common theme, -- the truth. Directors and supervisory board members who sought to mislead the shareholders, in their speeches at the AGM, through publications or, indeed, through false numbers in the balance sheets, could, at best, get a fine, worse, go to prison and, in the extreme, lose their civic rights (HGB, articles 249, 249a-d).

Many details are not directly regulated by the law that provides for them to be set out in the corporation's constitution (*Gesellschaftsvertrag*)<sup>8</sup>. Some contemporary commentators argued that it was important what was not regulated by the HGB (Jeidels (1905), page 145). For example, a member of the AR need not own shares in the company and, since there are no legal restrictions, the same person can sit on the supervisory boards of many companies.

The legislators intended the shareholders, through the annual general meeting, to be the most powerful institution inside the corporation. As the ultimate owners of the corporation, shareholders were thought to deserve ultimate control. The institution of the *Aufsichtsrat* was intended to look after shareholders' interests and provide professional supervision of management on behalf of the shareholders. In practice, the law of 1884 gave the *Aufsichtsrat* more *de facto* power than the legislators must have intended. In Staub's authoritative commentary of the HGB, it is argued that the *Aufsichtsrat*, provided it could find the necessary 3/4 majority in the AGM, could alter the corporation's constitution in such a way that "in this way the directors could be, as far as their internal position is concerned, more or less, not altogether, reduced to the executive arm of the *Aufsichtsrat*." (König *et al.*, 1906, p. 838). The position of the *Aufsichtsrat* was further strengthened by the apparent lack of attendance by the smaller shareholders. Saling's *Börsenpapiere* (1909, p. 102) comment that "all shareholders are strongly recommended to attend the annual general meeting in person. Shareholders should obviously have good knowledge of the law and the corporation's constitution; unfortunately this is

<sup>8</sup> For example, the *Gesellschaftsvertrag* might stipulate general guidelines for the distribution of profits. To be specific, in 1905 Bayer & Co. the well known chemical company and today No. 51 of the Forbes Foreign 500, distributed profits as follows: At least 5% of profits to reserve fund, from the remainder extraordinary depreciation, reserves and retained earnings, 4% of the former dividends, the remainder is dividend minus 6% of the remainder for the *Aufsichtsrat*, (Saling's (1906/07), page 1115). The constitution could be altered by the annual general meeting by a three quarter majority. These provisions became important when deciding how to define a measure of "liquidity".



not always the case. Furthermore, the very low attendance of most annual general meetings bears witness on the indolence of many shareholders who put their faith into the hands of a very few, who not always have the best interest of all shareholders in mind."

### III. The Relationship between the "Great Banks" and Industry

The focus of this paper is on contrasting the financing of *Großbanken* affiliated industrial enterprises with those who, for one reason or another, did not form part of the nexus. In similar studies on the House of Morgan, De Long (1991) and Ramírez (1992) could rely on the reports of the Pujo Committee (1913a, 1913b), which had compiled a list of Morgan affiliated companies in 1910-11 (compare De Long (1991), Table 6.3). For Japan, Hoshi, Kashyap and Scharfstein (1990, 1991) rely on the classification provided by Nakatani (1984). More recent authors, for example Garcia and Yafeh (1992), use the sophisticated point scales of Dodwell Marketing Consultants (1984). To determine what is the appropriate procedure for Imperial Germany, a discussion of the general nature of the business relationship between banks and industry, as it is suggested by contemporary sources like Jeidels (1905) and Riesser (1907), might be in order.

There are mainly three ways in which a bank and an industrial corporation can interact. First, a company might conduct its daily business through a current account it holds with one or more banks. This is known as *Kontokorrentkredit* and was common practice in Imperial Germany. Second, banks served as an important link to external financial markets. For untraded corporations, banks typically helped to float the company on the stock exchange. In the case of an traded corporations, banks underwrote the issuance of new equity or long term debt. The third, and most important interaction mechanism is the appointment of a bank officer to the supervisory board of a client corporation, with or without taking a direct stake in the company.

The *Großbanken* offered all of the above mentioned services and often undertook to monopolise their business relationship with any one company<sup>9</sup>. Lending, emissions, direct investment and supervisory board members helped the bank to monitor and, in many cases influence decision making in the industrial enterprise. Nevertheless, Jeidels (1905) carefully distinguishes

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<sup>9</sup> Jeidels (1905), page 122.



between monitoring, in the sense of information gathering, and direct influence on a corporation's business decisions. The current account business was important for monitoring in the sense of information gathering, but it provided little or no direct influence over the decisions of management [Jeidels (1905)]<sup>10</sup>. Given the legal framework provided by the HGB, the most powerful levers a bank could apply were the annual general meeting and the *Aufsichtsrat*.

There were many ways of influencing the annual general meeting. First, the bank could take a direct stake in corporations. Jeidels (1905) research of annual reports revealed that only two banks, the Darmstädter Bank before 1900 and the A. Schaafhausener Bankverein in and after 1900, published the names of the companies in which they had, even though these reports did not publish the size of these stakes. From the evidence Jeidels was able to gather, he concludes that long term direct investments were uncommon.

*"On the whole [we must conclude that] direct stakes in industrial enterprises were not a common common form of relationship between a Großbank and industry. Direct stakes are an addition to other [more powerful ways], a means to an end."*

[Jeidels (1905), page 121]<sup>11</sup>.

Obtaining a temporary majority in the annual general meeting was not difficult for the *Großbanken*; - because of the low attendance by small shareholders, say 50% of par value, and through voting shares that were entrusted to the banks by

<sup>10</sup> In some cases, the banks could use debt to influence the decisions of management. Jeidels (1905) himself quotes a letter from Dresdner Bank addressed to the management of the Nordwestmitteldeutsche Zementsyndikat: "According to your announcement published in the 'Reichsanzeiger' we see the possibility that the annual general meeting taking place at the end of this month, might pass resolutions that might be conducive to introducing changes in your business that are not in our interest. For this reason, and to our regret, we have to announce that we must cancel the agreed credit facility and we have to ask you to pay back the money you have already received until the end of this month. However, if the aforementioned annual general assembly takes the decisions we favour, and passes resolutions that guarantee that these decisions will be upheld in the future, we shall be happy to negotiate a new credit." [Jeidels (1905), page 126].

<sup>11</sup> However, he provides several examples where one or more of the Great Banks bought a temporary majority in a corporation they sought to dominate, particularly to place their own directors on the *Aufsichtsrat*. Jeidels mentions the example of the Phönix AG, a large mining and steel corporation, that had to decide whether to join the German steel cartel or not. The Schaafhausener Bankverein thought the Phönix should join, bought a majority stake before the annual general meeting and the Phönix joined. According to Jeidels (1905, page 111), the bank did not keep the shares. In 1901, the Dresdner Bank acted similarly when it bought a majority and placed two directors on the board of the Vereinigte Königs- und Laurahütte.

stock market investors (*Depotstimmrecht*) own possession of 10% of par value and 16% of par value through the *Depotstimmrecht* could already bring a majority<sup>12</sup>. Jeidels arguments make sense; direct investment in industrial enterprises involves risk which the banks avoided<sup>13</sup>. To secure their loans and influence corporations they could use the direct investments of industrial groups that were very close to them. In this way they could exert power but did not have to assume the additional risk.

Placing bank directors or members of the bank's *Aufsichtsrat* onto the boards of corporations was common practice and the most effective route of influencing managerial decisions of affiliated corporations. Agreement on this point ranges from socialists like Rudolf Hilferding (1910)<sup>14</sup> to Staub's commentary of the HGB and academically inclined bankers like Riesser and Jeidels.

*"Daily business, equity issues and the presence of bankers on the Aufsichtsrat can be viewed as three spheres with different diameters and importance: In the widest circle there are those companies that have a current account with the bank, with or without a credit facility. The next closer circle is formed by those companies whose first or new equity was issued by the bank. The third and closest contains those where the bank has a say in the Aufsichtsrat."*

[Jeidels, (1905), page 109]

Unless a firm did current account business with one and only one of the "Great Banks", the current account alone would not provide the bank with the opportunity to look behind the facades of a firm that might have been

<sup>12</sup> Buying voting rights was not a (legal) option. Article 249e HGB threatens shareholders "who has been given or promised special favours in return for voting in a particular way will be fined ten to 30 Marks but no less than 1000 Marks." Article 249f HGB too is very explicit: "Those who vote shares owned by others without their approval will be fined ten to thirty Marks, but no less than one thousand Mark. The same applies to those who borrowed shares from another and those who lent them." Having people sign over voting rights without receiving cash payments (but maybe the right to deposit ones shares in a banks' vaults for free) was not illegal.

<sup>13</sup> Indeed, this is another argument put forward by Jeidels himself. He gives examples of Creditbanks that had large stakes in industrial enterprises and were severely damaged by the chain of bankruptcies in 1873. In particular, he cites the Essener Kreditanstalt that had a policy of direct investment in industry. After a severe setback in 1873 and many subsequent problems, the management declared in 1897 that "we have come to the conclusion that we should refrain from all foundation or share speculation and concentrate on the current account and commission based equity business." [Jeidels (1905), page 101].

<sup>14</sup> Tom Bottomore, who wrote the introduction to the English translation of Hilferding's book, cites one of Hilferding's contemporaries, the editor of the Vienna socialist magazine "Der Kampf" (!) who calls it "the unwritten last book of Marx *Kapital*".



constructed like one of Potemkins' villages. Having a banker on the *Aufsichtsrat* would provide the bank with knowledge about all of the firms' decision making process and all internal affairs. This serves as our *a priori* motivation for the existence of a tighter liquidity constraint among firms not affiliated to one of the *Großbanken*. In section VI we discuss in more detail our quantitative measure of *Großbanken* affiliation.

#### IV. Mining and Steel

The industrial classification considered here is "Berg- und Hüttenwerke", mining and smelting works. In the principal data source, *Saling's Börsenpapiere*, this includes coal mining of all kinds, iron ore mining, pig-iron, raw iron and steel production as well as salt and gypsum mining. While the former can be considered a well integrated industry, the last two are really quite separate and were excluded from the present analysis. From scanning the available company information, the industry comprised specialised corporations as well as "mixed" establishments. The industry also featured several powerful cartels that, notably in the case of the mining and steel cartels, caused severe conflicts of interest to both the banks and the mixed corporations.

Imperial Germany had three major mining districts, distinct in industrial organisation, ownership structure and "industrial culture". The traditional mining regions were, the Ruhr valley (*Ruhrgebiet*) and Upper Silesia (Oberschlesien); rapidly expanding newcomers were Lorraine (Elsass-Lothringen) and the Saar (*Saargebiet*). Upper Silesia mainly featured state owned businesses or mining, smelting and processing plants that were founded by local gentry. As early as the 1770s, Frederick the Great had realised the military importance of silesian iron and coal and in 1779 he put the Graf von Reden in charge of the whole district<sup>15</sup>. Hence, the main initiative for development of the area came from the Prussian government. Eventually the large landowners caught on and started to develop their own mining and smelting activities. The *Oberschlesische Eisenbahnbedarfs A.G.*, the *Vereinigte Königs- und Laurahütte*, the *Oberschlesische Eisenindustrie A.G.*

<sup>15</sup> Pounds and Parker (1957) argue that Frederick's "purpose was to cast guns for the use of the Prussian army, and the closer to the Austrian border they were made, the shorter would be the distance, he assumed, they would have to be transported". [Pounds and Parker (1957), page 299.]

and the *Kattowitzer A.G.* were all started by powerful landowners. Towards 1913, Upper Silesia produced coal, iron-ore, pig-iron, steel, finished and semi-finished products, often in large, vertically integrated operations.

The Ruhr was very different from Upper Silesia. It had high quality coal deposits, but no iron-ore, it was in a densely populated area and it was close to an established mining and iron and steel industry in the Siegerland<sup>16</sup>. Also, it had a long time tradition of bourgeois entrepreneur capitalism and financing from private banking houses like Deichmann and Oppenheim. It is no coincidence that Cologne (with Darmstadt) is considered the birthplace of the German Creditbanks. Indeed, one of the main purposes of the A. Schaafhausener Bankverein, founded 1848, was the financing of the local mining and steel industry [Donaubauer, (1988), Pohl (1982)].

After the Franco-Prussian war of 1870 and the Treaty of Frankfurt, the Lorraine, Alsace and the Saar were annexed by Prussia and thereby became part of the newly formed Imperial Germany<sup>17</sup>. The Lorraine featured very large iron-ore deposits, the so called *minette*, the Saar had rich coalfields. Both regions featured and developed a powerful smelting and pig-iron industry<sup>18</sup>. Benham (1934), gives the following breakdown of pig-iron and steel output between the different regions:

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<sup>16</sup> Many of the Ruhr's most successful industrialists came from the traditional mining regions: Hoesch, Thyssen and Poensgen from the Eifel-Aachen, Piepenstock, Harkort and Römheld from the Sieg-Lahn-Dill area. [Pounds and Parker (1957)].

<sup>17</sup> Some historians argue that the 1871 borders were drawn to make the iron-ore deposits of the *minette* fall to Germany; others argue that too little was known about the importance of these deposits at the time and the shape of the border line can be explained in strategic terms alone.

<sup>18</sup> The Grand Duchy of Luxembourg formed part of the German customs union and was dominated by German corporations. Hence it is often included in mining and steel statistics for Lorraine and the Saar.



**Table 2: German Iron and Steel Output 1913 by Region**  
(in thousands of tons)

	Pig Iron	Steel
Germany (1922 frontiers)	10,904	12,182
Polish Upper Silesia	625	1,050
Lorraine	3,864	2,286
Saar	1,371	2,080
Totals	16,674	17,598

*Source: Benham (1934), p. 18*

In international comparison, the German mining and steel industry was very successful. In 1870, England's real output in pig-iron was 4.3 times larger than that of Germany, it produced nearly twice as much steel, 3.8 times as much iron-ore and 3.3 times as much coal. Indeed, England was also ahead of the United States, producing 3.6 times as much pig-iron, four times as much steel and mining 3.7 times as much coal and five times as much iron-ore. Taking Britain as the benchmark, the subsequent pre-WW1 growth of German steel, pig-iron and iron-ore output was impressive, the growth of US for all four commodities formidable. By 1913, Germany had become the second largest producer of steel, pig-iron and iron-ore. England was still ahead, although only marginally, in coal mining.

**Figure 1.A: Pig-Iron Output in tons ( $10^6$ )**

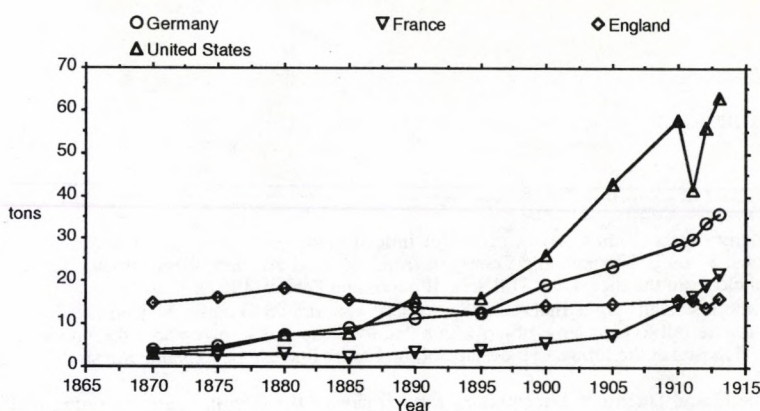


Figure 1.B: Steel Output in tons ( $10^6$ )

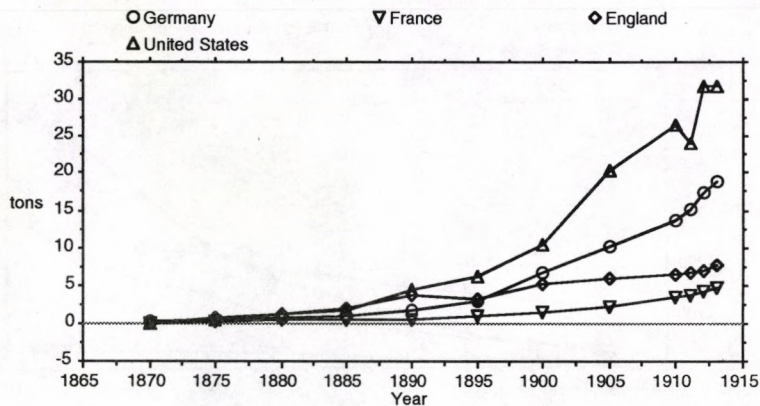


Figure 1.C: Iron Ore Output in tons ( $10^6$ )

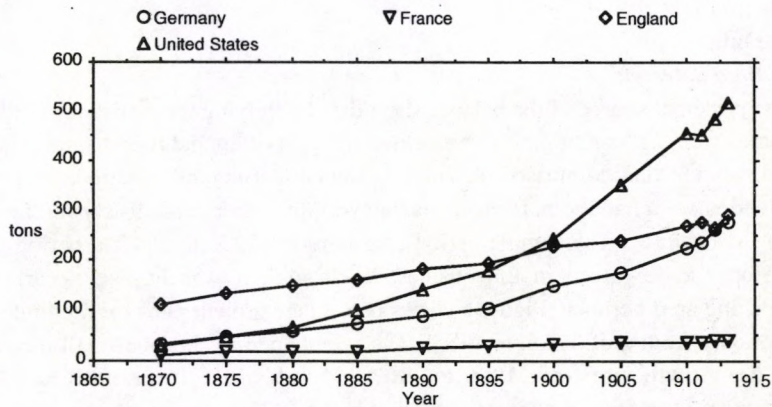
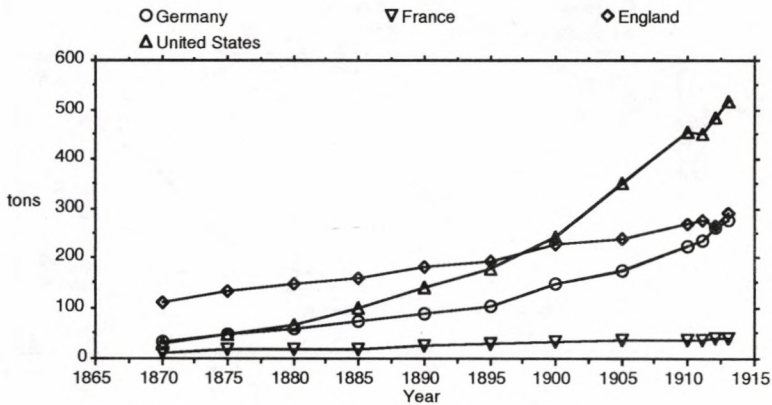




Figure 1.D: Coal Output in tons ( $10^6$ )



Source: Müssig (1929), *Eisen und Kohlen Konjunktoren*, 4. Auflage. Augsburg. Selbstverlag

## V. Data

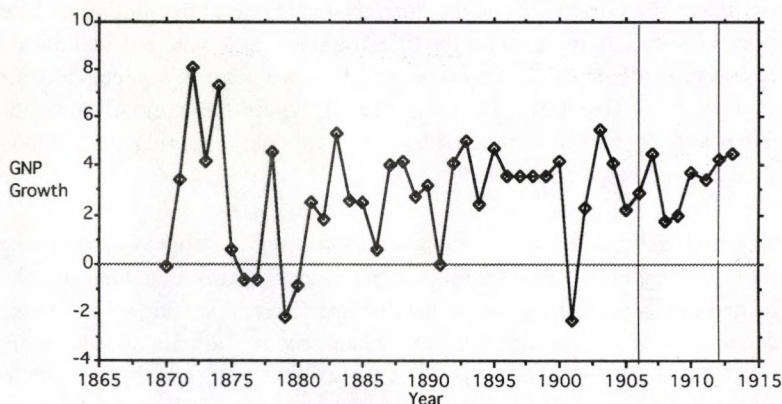
### A. Data Selection

The principal source of the balance sheet data underlying the statistical analysis comes from *Saling's Börsenjahrbücher*, a digest of annual reports and related information that comprised all publicly traded German corporations and was intended as "a handbook for bankers, lawyers and other capitalists", and famed for its accuracy. The sample period considered is 1906 to 1912, a period that featured a downturn in the business cycle and, it was hoped, a variance inducing credit crunch. Figure 5 shows percentage growth rates for the Imperial economy from unification to WW1. The sample period shows a small increase in the growth rate from 1906 to 1907 and a decrease from 1907 to 1909. Compared to previous swings, for example the 1901 recession, the fluctuations appear mild but turned out to be sufficient.

*Saling's Börsenjahrbücher* report a total of 92 mining corporations that were traded on the German Stock Exchanges between 1906 and 1912. Hence, they already represent a subsample of all German mining corporations. From this

sample of 92, we selected 29 and since they all have total assets in excess of 1 million Marks must be considered large, even for corporations<sup>19</sup>.

**Figure 5: German GNP Growth 1870-1913 at 1913 Prices, %**



Source: Hoffmann (1965), Table 224, pp. 785

The analysis crucially hinges on the classification into affiliated and non-affiliated companies. This was performed by using an *Aufsichtsrat* criterion. One of the requirements of the HGB was that the names of a corporation's directors and *Aufsichtsräte* should be made public, and Saling's diligently reports them, together with the title and the affiliation of each member. Scanning the list of names for each corporation in the sample, we looked for *Aufsichtsräte* who either featured the title "Bankier" or were directly associated with the name of one of the six *Großbanken*. While the latter gave a clear affiliation criterion, the former did not always list the bank the "Bankier" was associated with. To resolve this issue, we used a second publication, the *Adressbuch der Direktoren und Aufsichtsräte* that provides a mapping from names to banks and corporations. For the final sample of 29, the resulting *Aufsichtsrat* affiliations are listed below.

<sup>19</sup>In practice, we scanned the 92 companies in Saling's, comparing total assets and indicators for *Großbanken* affiliation. From the companies that appeared affiliated we selected the smallest in terms of total assets. We then tried to match these with non-affiliated companies of roughly the same size. Short of collecting data on all 92 companies (for the larger sample of all corporations - available from the *Handbuch der Aktiengesellschaften* - one can not test the Q model), we felt this was the best we could do in 5 x 5 working days and a 9.00-16.30 time constraint imposed by the Frankfurt a.M. resources.



Unfortunately, the procedure set out above is not sufficiently accurate; some *Großbanken* emissaries were not bankers but came from industry, especially if they came from the *Aufsichtsrat* of a *Großbank*. It appears that a directorship was more like a title for Saling's and industry directors who sat on the *Aufsichtsrat* of a *Großbank* and the *Aufsichtsrat* of one of the mining and steel corporations do not appear with the title "Bankier" and were not identified as *Großbanken* affiliated<sup>20</sup>. To get around this problem, this paper draws on related work by Becht and De Long (1993), where the same classification problem appeared for a sample of 632 corporations, rendering the "manual" method applied here impossible.

Fortunately, Saling's features three main indices; one matching a corporation's name to the respective Saling's volume page number, two, matching the place of incorporation to a Saling's page number and, three, matching a Director's or *Aufsichtsrat*'s name to a page number. Taking any one volume of Saling's, this allows the (almost) exact matching of a list with the names and page numbers of all *Großbanken* directors and *Aufsichtsräte* to a list of all corporations and page numbers<sup>21</sup>. This was done for the year 1914 and the resulting (few) extra cases were added to Table 2. A complete list with all *Aufsichtsrat* members and *Großbanken* directors who sat on the boards of mining corporations can be found in Becht and De Long (1993).

<sup>20</sup>In the case of *Großbank* directors, the bank's name appears in parentheses after person's name; in the case of industrialists the name of the industrial corporation appears instead.

<sup>21</sup>The list with names is matched to the list of corporations, dropping multiple name matches. The resulting file has the same number of records as the corporation file. The director page number appears in one column, the corporation page number in another. If the match proceeds smoothly, the corporation page number column is identical to the page column in the corporation file. The director page column consists of page numbers and missing values. A simple condition that transforms missing values into a non-affiliation code (a zero) and page numbers into an affiliation code (if record > 0 write 1) will yield the desired classification. All said, there is a caveat; Saling's reports the page number a directors name is printed on and also reports the page a corporation's name is printed on. Although the director list appears first thing after the name, it can go onto the next page. Also, some small corporations can start on the same page. In these (rare) cases some manual checking is required.

**Table 2: Banker Presence on Board of Sample Companies**

Company	Bank Affiliation	1	2	3	4
Anhaltsche Kohlenwerke	Gebr. Arons	1	0	0	0
Annener Gusstahlwerk	Nationalbank für Deutschland	1	1	0	0
Arenberg'sche AG für Bergbau	None	0	0	0	0
Bismarkhütte	Nationalbank für Deutschland	1	1	0	0
Buderus'sche Eisenwerke	Mitteldeutsche Kreditbank	1	0	0	0
Concordia Bergbau	Deutsch. Effekt. u. Wechsel Bank	1	0	0	0
Bergwerks AG Consolidation	None	0	0	0	0
Deutsch Österreichische Bergwerks AG	Dresdner Bank	1	1	1	1
Donnersmarckhütte	Deutsche Bank	1	1	1	1
Duxer Kohlenverein	None	0	0	0	0
Eintracht Braunkohlenwerke	Mitteldeutsche Kreditbank	1	0	0	0
Eisenwerk Kraft, AG	A. Schaaffhaus. Bankverein	1	1	1	1
Eschweiler Bergwerksverein	None	0	0	0	0
Essener Bergwerks-Verein König Wilhelm	None	0	0	0	0
Essener Steinkohlenbergwerke A-G	Arons & Walter	1	0	0	0
Gelsenkirchener Bergwerks A-G	Disconto Gesellschaft	1	1	1	1
Grube Leopold Eddewitz A-G	Nationalbank für Deutschland	1	1	1	1
Georgs Marien Bergwerk u. Hüttenverein	Osnabrücker Bank	1	1	1	0
Gusstahlwerk Witten	Oppenheim	1	0	0	0
Hagener Gusstahlwerke	Bergisch Märkische Bank Hagen	1	1	1	0
Harkort'sch Bergwerke, Gotha	Gebr. Richter	1	0	0	0
Hasper Eisen u. Stahlwerke	None	0	0	0	0
König Marienhütte A-G	None	0	0	0	0
Kölner Bergwerks Verein, Altenessen	None	0	0	0	0
Königsborn A.G. für Bergbau	None	0	0	0	0
Mühlheimer Bergwerks-Verein	Dresdner Bank	1	1	1	1
Oberschlesische Eisenbahn-Bedarfs AG	Deutsche Bank	1	1	1	1
Oberschlesische Eisenindustrie	Schlesinger-Trier & Co., Nationalbank für Deutschland	1	1	0	0
Oberschlesische Kokswerke und Chemische Fabriken	Schlesischer Bankverein	1	1	1	0

*Source: Saling's Börsenpapiere (1908), Adressbuch der Direktoren und Aufsichtsräte (1908)*

There are several problems with the proposed classification. One, some of the smaller banks were actually controlled by one of the six *Großbanken*. Two, the



classification was done for one year, a cross-section, but is used for grouping a panel; some units of observations might have changed affiliation status over time<sup>22</sup>. Third, many would argue that the *Aufsichtsrat* criterion might not be a precise measure of affiliation. Although an *Aufsichtsrat* position provided complete information for the bank (compare article 225 HGB), other forms of monitoring might have been sufficient for lifting a liquidity constraint from a corporation. With reference to the opening quote from Jeidels, Whale (1930) argues that "the connection [between banks and firms] has its beginning as a rule not in an act of promotion, but in a current account relation. As this develops the bond will probably be tightened by *Aufsichtsrat* representation, and, as occasionally arises, capital transactions - conversion into a company, raising of fresh capital, issues of bonds, reconstructions, etc. - will be undertaken by the bank on behalf of its customer. At this stage still, however, the current account relation retains its primary importance. In the first place, as a continuous relation and one which gives the bank an insight into most of the customer's money transactions, it provides much of the data required for estimating the risk involved in the intermittent capital transactions. This, at any rate, is the case if each customer deals exclusively with one bank, as is insisted upon by the banks so far as is within their power." [Whale (1930), page 52].

We believe, however, that the *Aufsichtsrat* criterion is sufficiently reliable to measure bank monitoring and the relative ease for obtaining funds in external capital markets. After all, we are not claiming the *Aufsichtsrat* criterion per se adds liquidity or value, but that it is correlated with the probably unmeasurable and unobservable characteristics that would constitute the true measure of affiliation. Moreover, in the absence of data on current account (*Kontokorrent*) business, the *Aufsichtsrat* criterion is the only reliable and quantifiable measure available.

Nevertheless, to feel more confident about these issues we perform sensitivity analysis with respect to the classification criterion. The first classification

<sup>22</sup>For example, let zero represent non-affiliated and 1 affiliated. Our methodology rules out important sequences like (0,0,0,0,1,1,1). A switch from zero to one can occur for two reasons; one, a *Großbank* places an *Aufsichtsrat* on an industrial corporations board directly, two, the *Großbank* buys a smaller bank who has an *Aufsichtsrat* on the corporation's board. Both cases are important and, if our reasoning is correct, should provide evidence for the removal of a liquidity constraint. Although we do not have statistical evidence for this, the 19th century sources suggest that (1,1,1,1,1,1,1) and (0,0,0,0,0,0,0) were indeed the typical runs, especially for relatively more mature corporations. Hence, our cross-section criterion might not be too restrictive.

(column 1, Table 2) considers all corporations that had any banker or bank emissaries, private or corporate, on their supervisory board as affiliated. The second classification (column 2) is more restrictive and excludes the private bankers. The third classification excludes the *Nationalbank für Deutschland*, since it was not considered a *Großbank*.<sup>23</sup> The fourth is the narrowest definition and excludes all *Aufsichtsrat* members that were not sent directly from one of the six "Great Banks", including those sent by minor banks in one of the *Großbanken* banking groups. We feel most confident in the first and the last classification; we do not really know how far the power of the *Großbanken* extended into the rest of the banking world and what effect the presence of a *Großbanken* friendly private banker on a mining corporations board would have.

A second, and almost equally important issue is the quality and type of balance sheet data found in *Saling's*. In Appendix I we transcribe a representative balance sheet with an English translation of its items. Note that it is much more detailed than, for example, an American balance sheet<sup>24</sup>. On the assets side (compare Table I.1 in Appendix I.), the balance sheet includes separate accounts for plant and equipment, cash and liquid securities (such as bank accounts, bonds, and paper assets), accounts receivable, and inventories. The liabilities side of this company includes the par value of common equity stock and of preferred stock. The mining company in this example did not issue any long term debt, and so the rest of the items are mostly reserves, retained earnings, and other items. In the example, the *Consolidierte Alkali-Werke* (compare Table I.1. in Appendix I) reported a total net earnings available for distribution (NEAD) of M1.97 million, of which 73% will be paid out as dividends (M. 1.44 mill), 14% will go to pay the management and the *Aufsichtsrat*, and the rest (13%) will go into the different reserve accounts. Once dividends and management are paid, the appropriate categories in the liabilities side go on the credit side; Cash and Bank Deposits go on the debit side.

<sup>23</sup>However, the *Nationalbank für Deutschland*, at least as far as the mining and steel industry is concerned, used the same kind of business strategy as the *Großbanken*.

<sup>24</sup>Alexander and Archer's *European Accounting Guide* describes today's items in the German companies financial statement. Since today's reporting standards are based on a law that is based, without many modifications, on the HGB reform of 1884, these also apply to the 1906-1912 balance sheets.



For each of the selected companies we aggregated the original balance sheet items into broader categories. This has the advantage of making the different companies comparable, it allows us to focus on the financial aspects of the balance sheet and, through aggregation, minimises the number of missing values. A sample of our "stencil balance sheet" and the exact mapping from the originals to this aggregated version are provided in Appendix I.

## VI. The Econometric Model and Results

### *The Investment Equation Specification*

We fit investment equations for the Q-Model with possible liquidity effects. The equations are set up in the framework of the least squares dummy variable model (or linear fixed effects model<sup>25</sup>) imposing homogeneity restrictions across time on the intercepts and slopes and across firms for the slopes within the affiliated and non affiliated groups. We do not impose homogeneity on the intercepts across firms, thus allowing for a degree of firm heterogeneity. Following Hoshi, Kashyap, and Scharfstein (1990,91) we also use year dummies to control for macro-economic shocks<sup>26</sup>. In total, we ran eight regression, dividing the sample into *Großbanken* affiliated and non-affiliated firms four times, -- corresponding to the four different affiliation criteria set out in the previous section.

The selected regression specification takes the following form :

$$\frac{I_{it}}{K_{i,t-1}} = \alpha_0 + \alpha_1 + \beta_1 \frac{F_{it}}{K_{i,t-1}} + \beta_2 \frac{S_{it}}{K_{i,t-1}} + \alpha_3 \frac{Q_{it}}{100} + \gamma_t + \varepsilon_{it} \quad \begin{matrix} i = 1, 2, \dots, 29 \\ t = 1, 2, \dots, 7 \end{matrix}$$

where:

<sup>25</sup>Compare Judge *et. al.* (1985) page 518, Hsiao (1986) page 29 or Greene (1990) page 482, amongst others, for a textbook treatment.

<sup>26</sup> Most econometrics packages that explicitly estimate the linear fixed effects model partition out the cross-sectional fixed effects, often with the option of having them recovered. The main reason for partitioning out the fixed effects is the size of the (X'X) matrix when the number of individuals becomes at all large. With our modest sample size, we preferred to create our own firm dummies and use standard OLS routines. This has the advantage of giving us access to the full range of residual diagnostics available for the standard case, including leverage plots. Creating the fixed effects manually has the disadvantage (advantage?) that one needs to carefully adjust the list of dummies for the various group regressions. We hope that standard software will soon provide the full range of diagnostics for the fixed effects model; after all it is just OLS.

- $I_{it}$  = gross investment of company  $i$  at time  $t$ ; measured as the change in the gross value of depreciable assets (plant and equipment).  
 $K_{it-1}$  = last period's gross value of assets.  
 $F_{it}$  = net earnings available for distribution (NEAD) plus nominal allowances (mostly depreciation), subsequently labelled as "cash".  
 $S_{it}$  = stock of short term securities; measures the amount of liquid assets available for quick sales at the beginning of the period (cash plus short term financial securities.)  
 $Q_{it}$  = the market value of common equity stock divided by its book value. Thus, our definition of  $Q$  does not follow the standard interpretation in the literature which is the market value of the firm relative to its replacement cost. Because of insufficient data on the market value of debt we could only approximate "Tobin's  $Q$ " with what we should be calling strictly speaking "Common Equity  $Q$ ". Scaled to conform with the scale of the other variables.  
 $\alpha_0$  = intercept  
 $\alpha_i$  = (N-1) firm specific fixed effects  
 $\gamma_t$  = (T-1) year dummies

For the details of the variable construction, see Appendix I.



### Estimation Results

All regression results are summarised in Tables 3.A and 3.B as well as in Figures 5.A,B and C. The Tables and the Figures report the regression results by degree of affiliation. The total number of records in the data set was 203, seven years and 29 companies. Several records were lost; 29 due to first differencing and another 35 due to missing values in at least one of the variables<sup>27</sup>. This leaves 139 records for analysis. After performing detailed residual analysis we excluded the *Oberschlesische Kokswerke* with company ID 29. Using leverage plots (see Appendix) we decided to exclude *Oberschlesische Kokswerke* for the following reasons: (1) It is a company with more leverage than any other company in our (small) sample and totally dominates the results. (2) The full name *Oberschlesische Kokswerke und Chemische Fabriken* (Upper Silesian Cokeries and Chemical Plants) suggests that it is quite different from the companies in the rest of our sample and that it might be misclassified. At any rate, inclusion of *Oberschlesische Kokswerke* does not really alter our results. For the cash flow (liquidity) coefficient, including *Oberschlesische Kokswerke* suggests that cash flow matters for affiliated companies, but less so the closer one moves to the "core" affiliation regime 4 and less than for the non-affiliated companies. Our main findings for non-affiliated companies, that the flow measure of liquidity matters is unaffected since the *Oberschlesische Kokswerke* do not enter the non-affiliated sample in classifications 1,2 and 3. Hence, our main results use 133 records. Tables 3.A and 3.B include the results without exclusion of the *Oberschlesische Kokswerke* Figures 5.A, 5.B and 5.C do not.

Figure 5.A plots the regression coefficients for cash flow, short term securities and "Q" against the four affiliation criteria. The dark markers represent the affiliated sample, the white markers the non-affiliated sample. The lower part of the chart shows the change in the number of records in each class across regimes and the *Aufsichtsrat* group in each class. From left to right, the affiliated sample goes from the widest possible "affiliation" criterion to the "core" of companies with direct *Großbanken* presence in a company's *Aufsichtsrat*. The non-affiliated sample moves from free of any banker presence to the presence of anybody but an *Aufsichtsrat* from one of the *Großbanken* directly. Moving from left to right, the affiliated sample shrinks from 96, 56 and 38 to 29 records, the non-affiliated sample grows from 37, 77

<sup>27</sup>We assume observations are missing at random (as opposed to missing completely at random) and use available case analysis; compare Rubin (1976) and Little and Rubin (1989).

and 95 to 104 records. For the affiliated sample, short term assets have a positive influence on investment, that rises when the companies with an *Aufsichtsrat* sent by private banks are excluded, but falls as one moves to the "core" of closely affiliated *Großbanken* companies. In contrast, the effect of cash flow moves from having a small positive influence on investment to no effect and becomes negative for the samples that contain the "most affiliated" companies, at least according to the *Großbanken* criterion. Figures 5.B and 5.C provide a picture of the standard errors on the coefficients of the affiliated regression and the non-affiliated regressions respectively. Even with the large standard errors on Q and the cash flow coefficients for the affiliated samples, we feel that these regressions, for this industry, time period and sample, provide evidence that liquidity matters for *Großbanken* affiliated firms. In contrast, firms that are very close to the "core" of *Großbanken* influence and knowledge can invest in bad times. For the non-affiliated companies, no matter how they were defined, cash flow always has a positive effect on investment.



**Table 3.A: Regression Results for Affiliated Samples**  
(*Oberschlesische Kokswerke* with ID 29; reference in last column)

	Class 1	Class 2	Class 3	Class 4	Class 1	Class 2	Class 3
Cash Flow/Ass	<b>0.1620</b>	<b>-0.0048</b>	<b>-1.4046</b>	<b>-1.5160</b>	<b>0.2966</b>	<b>0.2254</b>	<b>0.1075</b>
ST Ass/Ass	0.2920	0.4801	0.6208	0.7525	0.1864	0.2408	0.2963
	<b>0.4666</b>	<b>1.8453</b>	<b>1.3200</b>	<b>0.8488</b>	<b>-0.0879</b>	<b>-0.1253</b>	<b>-0.1099</b>
	0.2811	0.6997	0.7539	0.9698	0.1316	0.1780	0.2356
Tobin's Q/100	<b>0.2171</b>	<b>0.2127</b>	<b>0.4695</b>	<b>1.2586</b>	<b>0.2146</b>	<b>0.3537</b>	<b>0.5607</b>
	0.1117	0.2116	0.3924	0.6913	0.1144	0.1868	0.4706
Rank D. Mat.	26	19	16	14	27	20	17
Deg. Freed.	70	37	22	15	75	42	27
No. records	96	56	38	29	102	62	44
SSR	2.8052	1.7584	1.0025	0.8202	3.4494	2.7643	2.2451
Var. Res.	0.0401	0.0475	0.0456	0.0547	0.0460	0.0658	0.0832
Sq. mult. corr.	0.3529	0.4827	0.5553	0.6208	0.3323	0.3451	0.2634
F-statistic	1.5271	1.9177	1.8317	1.8891	1.4359	1.1650	0.6035
Lev. of sign.	0.9146	0.9537	0.9041	0.8806	0.8851	0.6701	0.1465

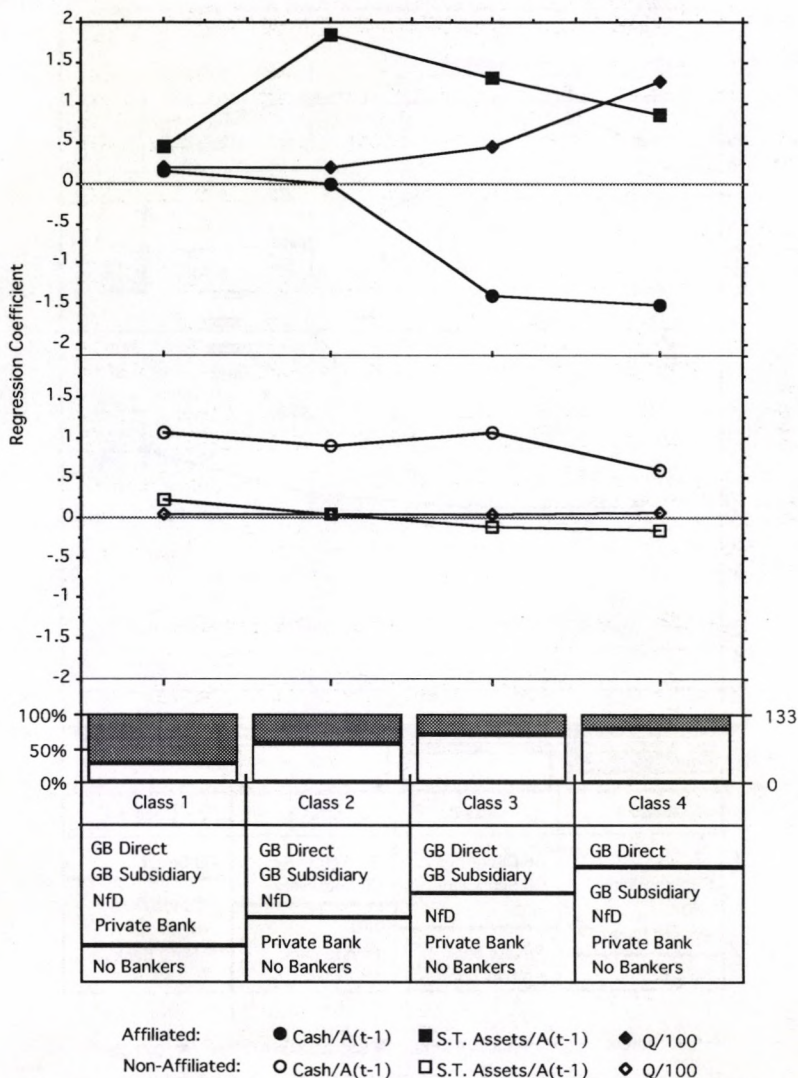
The first four columns show the regression results for the four classification criteria excluding the *Oberschlesischen Kokswerke*. This firm swaps affiliation between Class 3 and 4. Hence, inclusion adds three extra column to this table. The F-Statistic comes from a test of the full firm and year effects model against a model with just the intercept.

**Table 3.B: Regression Results for Non-Affiliated Samples**  
(*Oberschlesische Kokswerke* with ID 29; reference in last column)

	Class 1	Class 2	Class 3	Class 4	Class 4
Cash Flow/Ass	<b>1.0478</b>	<b>0.8905</b>	<b>1.0478</b>	<b>1.0490</b>	<b>0.5953</b>
	0.4379	0.2500	0.2152	0.2078	0.1394
ST Ass/Ass	<b>0.2275</b>	<b>0.0412</b>	<b>0.0014</b>	<b>0.0117</b>	<b>-0.1604</b>
	0.2199	0.1523	0.1439	0.1389	0.0900
Tobin's Q/100	<b>0.0406</b>	<b>0.0514</b>	<b>0.0389</b>	<b>0.0400</b>	<b>0.0607</b>
	0.0515	0.0393	0.0387	0.0375	0.0418
Rank D. Mat.		15	55	25	28
Deg. Freed.		22	22	70	82
No. records		37	77	95	110
SSR	0.5006	1.0649	1.3975	1.4710	2.1136
Var. Res.	0.0228	0.0194	0.0200	0.0191	0.0258
Sq. mult. corr.	0.6320	0.5403	0.5947	0.5867	0.5214
F-statistic	2.6983	30.0787	4.2796	4.2033	3.3090
Lev. of sign.	0.9819	0.9996	1.0000	1.0000	1.0000

The first four columns show the regression results for the four classification criteria excluding the *Oberschlesischen Kokswerke*. This firm swaps affiliation between Class 3 and 4. Hence, inclusion adds one extra column to this table. The F-Statistic comes from a test of the full firm and year effects model against a model with just the intercept.

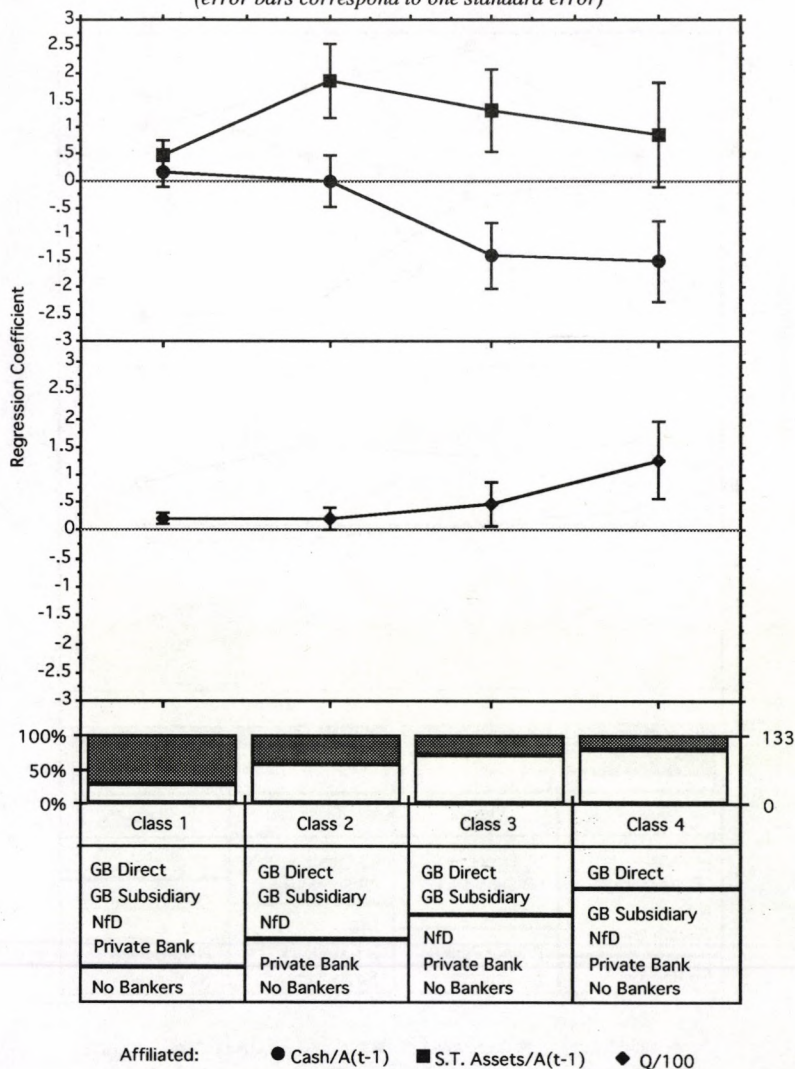
**Figure 5.A: Sensitivity of Regression Coefficients on Classification Criterion**  
(sample excludes Oberschlesische Kokswerke; 133 records were used in total)



The Figure plots the regression coefficients against the degree of Großbanken affiliation. Affiliation is defined according to the Aufsichtsrat criterion; this is given in the bottom box. As a rule, black means affiliated, white means non-affiliated. The bar chart in the middle gives the proportions of the sample (number of records) in each group. .

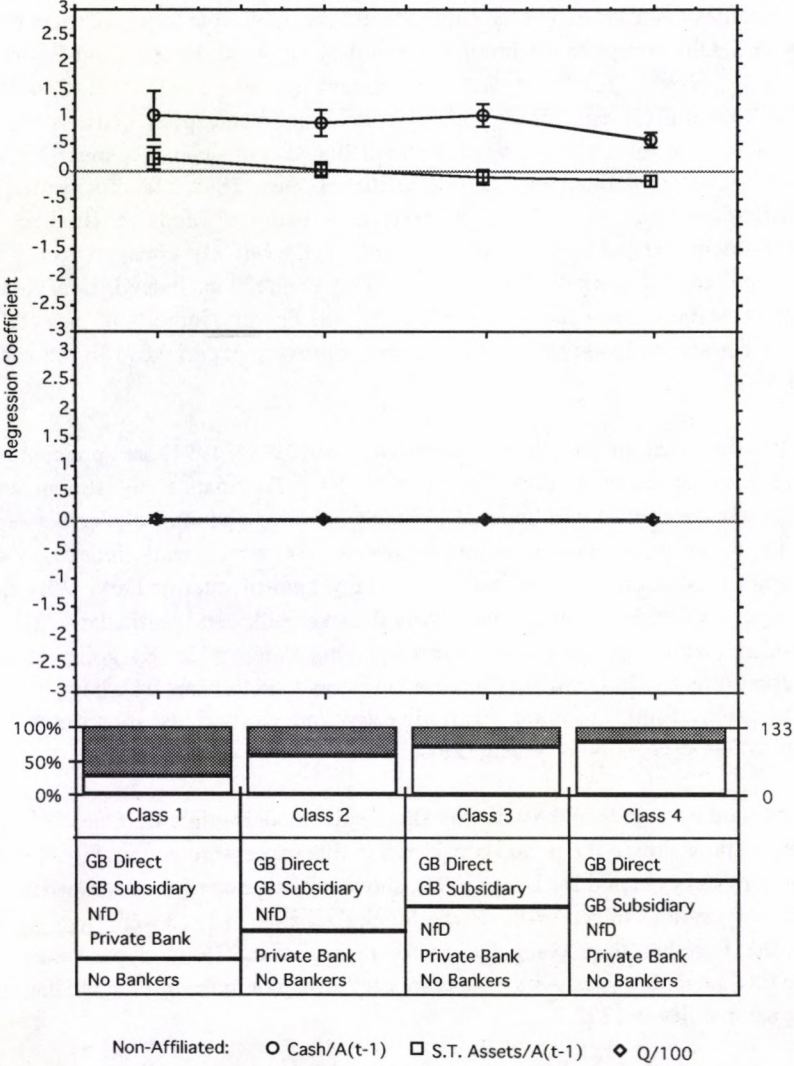


**Figure 5.B: Regression Coefficients and Standard Errors for Affiliated Samples**  
(error bars correspond to one standard error)



The Figure plots the regression coefficients against the degree of Großbanken affiliation. Affiliation is defined according to the Aufsichtsrat criterion; this is given in the bottom box. As a rule, black means affiliated, white means non-affiliated. The bar chart in the middle gives the proportions of the sample (number of records) in each group. .

Figure 5.C: Regression Coefficients and Std. Errors. Non-Affiliated Samples  
(error bars correspond to one standard error)



The Figure plots the regression coefficients against the degree of Großbanken affiliation. Affiliation is defined according to the Aufsichtsrat criterion; this is given in the bottom box. As a rule, black means affiliated, white means non-affiliated. The bar chart in the middle gives the proportions of the sample (number of records) in each group.



## VI. Interpretation of the Results

Previous explanations of the importance of cash flow for non affiliated companies from Japan and the United States are applicable to the German case as well. One interpretation brought forward by Hubbard, Fazzari, and Petersen (1988), Hoshi, Kashyap and Scharfstein (1990, 1991) and Schaller (forthcoming) among many others, is the imperfect capital markets view: Because of asymmetric information non-affiliated companies face much higher costs of external financing than do affiliated ones. Thus, a company that is affiliated to one of the *Großbanken* uses external funds to finance its investment expenditures because it could get relatively cheaper access to external capital markets through its banking connection. Indeed, in a young corporate bond market reputation effects will be very important, especially after a wave of bankruptcies like the one Germany experienced in the early 1870s'.

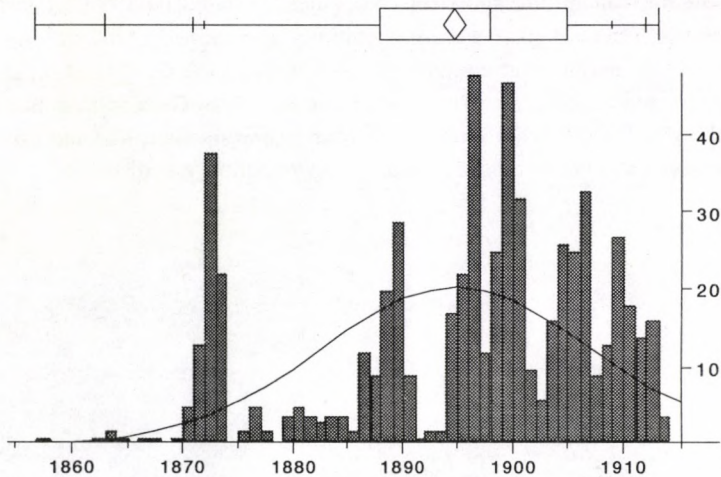
We believe that the models of Douglas Diamond (1984, 1991) are applicable to German corporate finance before WW-I<sup>28</sup>. To finance investment and expansion, a company in Imperial Germany did have a genuine choice between going to the stock market, to issue equity or debt, or to a bank. Indeed, stock market regulations did not even require any kind of intermediary. Why did companies decide to finance investment through banks, and particularly "Great Banks" (with great power) instead of staying independent by going to the market directly. In Diamond's models, investors lend to firms who have built a reputation. Banks monitor firms directly and can act as substitutes for reputation, especially for young firms.

We found two kinds of reasons why Diamonds' models might fit. One, corporations during the period considered in this paper were young. Figure 6., taken from Becht and De Long (1993), shows a histogram of the years when 632 corporations traded on the Berlin Stock Exchange in 1913 were first traded. Together, these companies represent more than 97% of all par values on the Exchange that year. As the superimposed Box plot indicates, the median of the sample lies in 1898.

---

<sup>28</sup>We did not endorse Diamond's models immediately and without reservations. After all, why should models developed with securitisation and the United States in the late 20th century apply to German industrial finance in the early 20th century?

**Figure 6.: Age Profile of Corporations traded on Berlin Exchange 1913**



Source: Becht and De Long (1993)

Two, the industrial bond market was thin and the only paper traded were bonds issued by a *Großbank* on behalf of a corporation. In addition to the *Großbanks* stamp of approval, these bonds were often secured by a mortgage, despite the fact that under German bankruptcy laws investors holding bonds were served before everybody else. In his authoritative handbook, Obst (1913) writes: “The bond (*Schuldverschreibung*) of industrial firms has developed because some firms obtained very large bank loans. These were so large that the banks, in order to avoid tying up large proportions of their assets, divided these loans into smaller pieces and resold them.” [Obst (1913), page 562].

## VII. Conclusion

We concentrate this study of corporate finance in Imperial Germany on the mining industry because of its historical importance in the understanding of the economic development of Germany. It was shown that from 1870 to 1913, the German mining industry grew from very modest levels, to overtake the British Empire and take second place behind the United States at the eve of WWI. Gershenkron (1962) emphasised the institutional aspects of the German capital markets in understanding this rapid economic development. This paper has tried to provide some evidence suggesting that the Imperial Germany’s “*Großbanken*” seem to have helped the development of the mining industry by



alleviating the impact of capital market imperfections. We have tried to do so by showing that mining and steel companies affiliated with one of Imperial Germany's "Great Banks" were not liquidity constrained. Although one can never be sure about what would have been without the *Großbanken*, at least one is tempted to speculate whether the rapid growth of German steel had to do with the way large corporations in both countries were controlled and financed. We have not investigated how growth in either country was distributed.

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## Appendix I

This Appendix describes the data collection effort and the transformation of the original balance sheets as found in *Saling's Börsenpapiere* into a common "stencil" balance sheet that provides a certain degree of aggregation and comparability. It aims to make our procedure as transparent as possible. It is hoped that after reading this Appendix, anybody who has access to *Saling's* should be able to reproduce or extend our results. In this spirit the data we collected are available upon request.

### 1905 Balance Sheet of Konsolidierte Alkali-Werke (Stock Exchange Name: Westeregeln Alkali-Werke)

ID	Aktiva (Assets)		ID	Passiva (Liabilities)	
A1	Bergbau-Konzession (mining rights)	3600000	P1	Aktienkapital (total par value of common stock)	8400000
A2	Schachtbau (shaft construction)	231988	P2	Prioritäts Aktien (preferred stock)	4000000
A3	Grundstücke (property)	204556	P3	Kapital Reserven (capital reserves)	1240000
A4	Gebäude (buildings)	1867719	P4	Reserve Fond (reserve fund)	1389148
A5	Maschinen u. Dampfkessel (machines and steam containers)	908316	P5	Dispositions Fond (??? fund)	5000
A6	Utensilien und Geräte (misc. equipment and instruments)	171665	P6	Kaut. Wechsel (short term bills)	300000
A7	Eisenbahn (railway)	236244	P7	Kautionen (guarantees)	11000
A8	Wasserwerk (water-works)	26265	P8	Pensions Fond (pension fund)	633216
A9	Effluviu Konto (??? account)	1	P9	Annuitäten Konto (annuities)	200000
A10	Mobilien (mobile assets)	1	P10	Kreditoren (accounts payable)	761832
A11	Pferde und Wagen (horses and cars)	1	P11	Dividende (Dividends payable)	1440000
A12	vorausbez. Versicherungen (paid in advance insurance)	37137	P12	rückgestellte Div. (retained dividends)	5043
A13	Kaution (Surety or safe pledge securities)	495372	P13	Genussscheine (Good profit bill ?)	311
A14	Kautions Wechsel (proceeds from guarantees)	11000	P14	z. bes. Reserve (to special reserve)	100000
A15	Wertpapiere (bonds and other paper assets)	1831782	P15	Direktoren Tantieme und Beamten Gratifikation (direktros and managment fees)	163382
A16	Hypotheken (mortgages)	21750	P16	Tantieme des Aufsichtsrats (AR fees)	114521
A17	Beteiligungen (stocks in other companies)	4990457	P17	Jubiläums Arbeiter Spende (anniversary worker bonus)	100000
A18	Kassa (cash)	3875	P18	Vortrag (Undivided surplus for the year)	38389
A19	Bankguthaben (bank accounts)	2426459			
A20	sonstige Debitoren (accounts receivable)	1065858			
A21	Bestände (inventories)	771396			
	<i>zusammen</i>	18901842			18901842

Source: *Saling's Börsenjahrbuch (1905/06)*

**Sources and Uses of Income Account of Konsolidierte Alkali-Werke**  
*Stock Exchange Name: Westeregeln Alkali-Werke*

	Sources of Income		Loss	
G1	Vortrag (Balance Forward)	52009		
G2	Zinsen (interest income)	102953		
G3	Mieten und Pacht (rents and leases)	8702		
G4	Dividende (Dividend Earnings)	100940		
G5	Bergwerksbetrieb (Mining Operations)	1971162		
G6	Fabrikate (Manufacturing Operations)	1193323		
G7	<i>zusammen</i> (Total Sources )	3429089		
	Uses of Income			
G8	Generelle Unkosten (General Expenses)	331854		
G9	Abschreibungen (depreciation)	1120632		
G10	<i>bleibt Reingewinn</i> (Net Earnings available for distribution, NEAD)	1976603		

*Source: Saling's Börsenjahrbuch (1905/06)*



**Table IB: Variable Construction for Regression Equations**

Item No.	Mnemonic	Name	Definition
1	Cash	Cash	A18, A19
2	STSec	Short Term Securities	A15
3	AcctRec	Accounts Receivable	A20
4	Invento	Inventories	A21
5	DepAs	Depreciable Assets	A1-A11
6	TotAs	Total Assets	
7	ParValue	Par Value of Common Stock	P1
8	Vorz.-Aktien	Par Value of Pref. Stock	P2
9	BDebt	Bank Debt	*
10	Bonds	Bonds	*
11	Mortgage	Mortgages	*
12	OthDebt	Other Debt	P6,P10
13	Reserve	Reserves	P3,P4
14	RetErn	Retained Earnings	P18
15	Dividend	Dividends	P11
16	Grat	To Management	P15
17	AR	To Aufsichtsrat	P16
19	Gewinn	Net Earnings before distribution	G7
20	Deprecia	Depreciation	G9
21	Reingewinn	Net Earnings available for Distribution	G10
22	Sales		**
18	Price	Share Price	**
23	DivRate	Dividend Rate	
24	Assets	Assets before Depreciation	see bottom
25	MarktVal	Market Value	7 x 18
26	BookVal	Book Value	7 + 14
27	TobinsQ	Equity Q	25/26
28	STAssets	Short Term Assets	1 + 2
29	Liquidity	Liquidity	21+20-Δ3
30	Invest	Investment	Δ24
		* : item not in example	
		** : not taken from balance sheet (if available)	
		$Assets_t = Dep. Assets_t + \sum_{i=0}^t Dep_i$	

### *Missing Values*

Since we collected the data set ourselves we had to decide how to code missing values. After some reflection, we decided to be "tough" and code all variables that had no numerical information in the balance sheet as missing. For example, consider the case of the inventory variable. In five out of the seven years a company reports positive inventories in a range between M400,000 and M2,000,000, in the remaining two years the balance sheets contain no separate information on inventories. Should one assume that there were no inventories that year and enter a zero, or declare the data point missing? We decided to declare all such points as missing. The only exception are debt variables. If a company did not report any bank debt or mortgages, we entered a zero. Hence, the variables with item No's 9,10,11, and 12 in Table I.B have zero missing values.



### Appendix III.

This Appendix shows leverage plots corresponding to the regression results reported in the text and an analysis of the effects of excluding the *Oberschlesische Kokswerke*.

Initially, we fitted regressions including all companies and were puzzled to find the results that are reported in columns 5,6 and 7 of Table 3.A and column 5 of Table 3.B. Exploratory data analysis, had alerted us to the possible presence of important outliers (or, depending how one looks at this, very influential observations). Proceeding to diagnostics, we looked at leverage plots. The leverage plots used here come from JMP®, a program that implements the work of Sall (1990), who has provided formulas for drawing leverage plots when imposing general linear hypotheses on the coefficients of a regression. In the case where one imposes a zero restriction on one coefficient at a time, these are identical to the more limited *partial-regression residual leverage plots* of Belsley, Kuh, and Welsch (1980) implemented, for example, in SPSS™. Leverage plots or partial regression plots use residuals that are computed as the difference between the observed dependent variable and the predicted dependent variable when the *i*th independent variable is excluded and the residuals from the *i*th independent variable when it is compared to the predicted value from the regression leaving out the *i*th independent variable.

The horizontal line in the Figures is the mean of the values on the vertical axis. The vertical distance between any point this mean line corresponds to the residual from the restricted regression. For the confidence intervals, it turns out that when the slope parameter (the regression coefficient) is significantly different from zero, both confidence lines will cross the horizontal line. When the horizontal line is the asymptote, the test the null hypothesis of zero influence is inconclusive, when the confidence lines do not cross at all, it is rejected. Points far out on the horizontal axis will be the ones with a lot of *leverage*; they have a strong influence on the slope of the regression coefficients. Again, see Sall (1990), Belsley, Kuh, and Welsch (1980) and the JMP® User's Manual, especially Appendix A, for details.

Inspection of the leverage plots in the first column of Figures III.A and III.B reveals that the *Oberschlesische Kokswerke* (and *Chemische Fabriken*) has exert a lot of leverage on the coefficients of the liquidity (cash flow) and short

term securities coefficient. Excluding *Oberschlesische Kokswerke* drives the regression coefficient for liquidity (class 2, affiliated) from 0.2254 to -0.0048 and for short term assets from -1.253 to 1.8453. An inspection of the leverage plots reveals why. The combination of influential points on the right and to the left of the centre of the scatter twists the regression line around and, in both cases, changes the sign of the regression coefficient. The estimates of the coefficient on Q are hardly affected since the observations on *Oberschlesische Kokswerke* hardly have any leverage. The plots also reveal other interesting facts. The main suspect from exploratory, bivariate scatters (not reported) was Eisenwerk Kraft 1911. In the leverage plot, it turns out that this point is an outlier, in the sense that it produces a large residual, but that it does not have much leverage. Indeed, the coefficient on short term securities in the classification 2 and 3 equation excluding *Oberschlesische Kokswerke* (III.A, III.B, column 2, middle) is hardly affected by the exclusion of Eisenwerk Kraft 1911 since Grube 1910 and Bismarckhütte 1912 have about the same degree of leverage.



Fig. III.A: Leverage Plots for Classification 2 with and without Oberschlesische Kokswerke

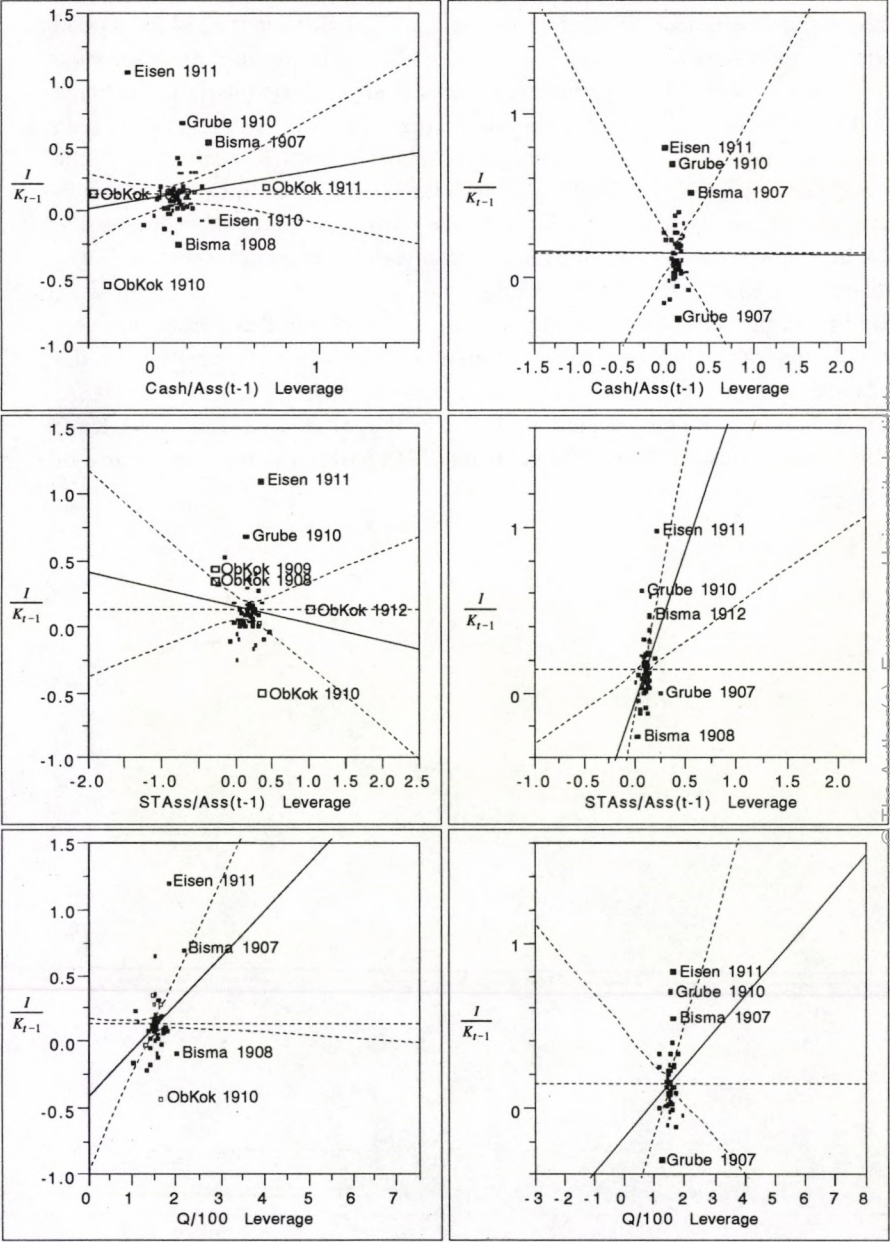
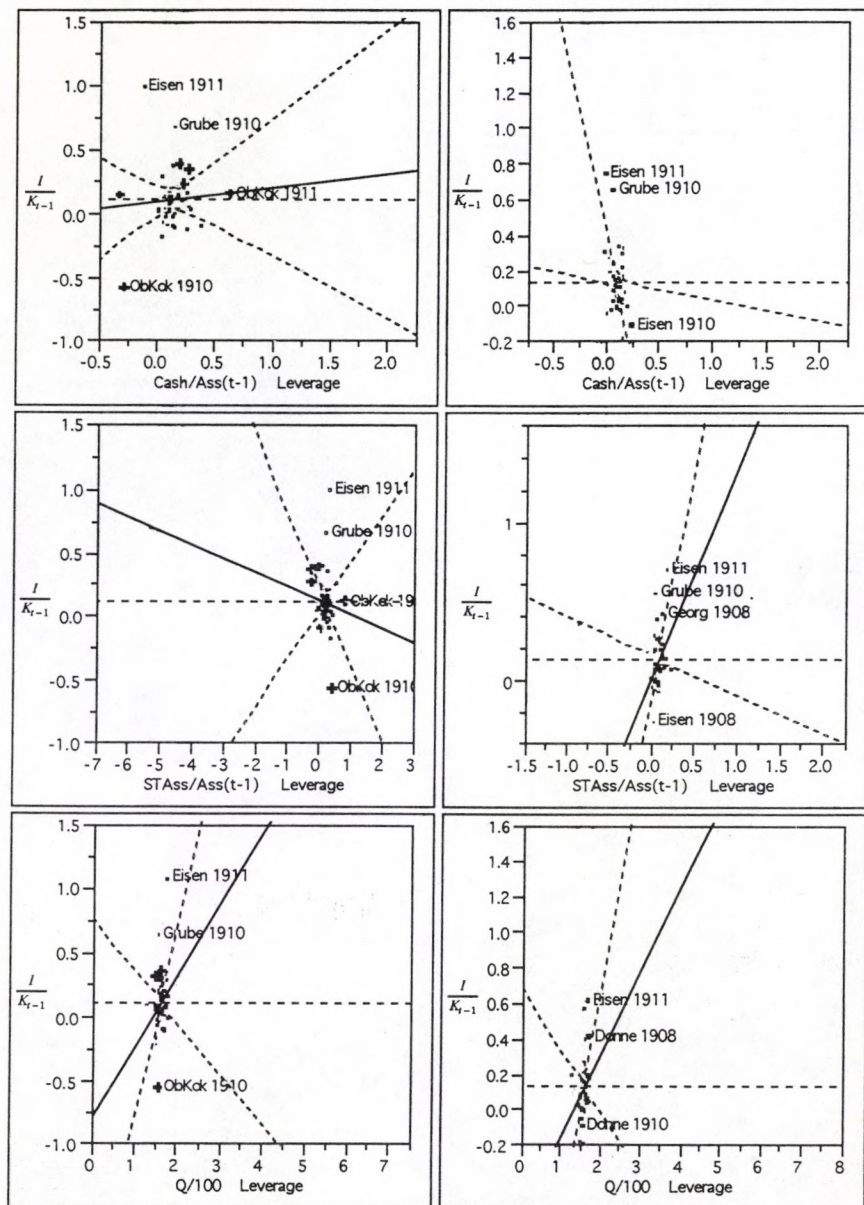


Fig. III.B: Leverage Plots for Classification 3 with and without Oberschlesische Kokswerke









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