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Carsten Burhop[‡]

Abstract

In this article, we evaluate underpricing of initial public offerings (IPOs) at the Berlin Stock Exchange between 1870 and 1896. In contrast to modern data, first day returns were extraordinary low and averaged less than five percent, even during the speculative period of the early 1870s. Moreover, standard underpricing theories based on asymmetric information, signalling mechanisms, or litigation risk cannot explain underpricing. In contrast to modern markets, the past market return had a negative influence on initial returns. Finally, we show that cash-flow relevant information contained in the corporate charter were readily factored in the first market price. Thus, the historical capital market differed from today's market, but seems to have been efficient.

JEL-Classification: N 23; N 43; G 18

Keywords: Initial public offerings; Financial history; Germany pre-1913

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I. Introduction

Positive first-day returns of initial public offerings (IPOs) are a stylized fact of modern securities markets. They were, for example, reported for the U.S. (Ritter and Welch, 2002), the U.K. (Derrien and Kecskes, 2007), Germany (Ljungqvist, 1997), Japan (Isobe et al., 1998), and France (Biais et al., 2002). During the last three decades, mean underpricing was substantial, averaging about 15 percent in the U.S., Germany, and France. Thus issuers left a large amount of money on the table and thereby increased the cost of equity finance for them. Not only the occurrence of positive mean initial returns, but also the fluctuations of initial returns over time are noteworthy. First-day returns of IPOs averaged, for example, more than 50 percent in the internet bubble of the late 1990s, but below ten percent in the early 1990s. Beyond short-run fluctuations, we have some evidence of a secular trend in the size of initial returns. In particular, Chambers and Dimson (2008), Tinic (1988), and Simon (1989) showed that mean underpricing was less than ten percent during the roaring twenties at the London Stock Exchange and New York Stock Exchange. Furthermore, Weigt (2005) and Burhop (2006) documented that mean initial returns were around five percent at the Berlin Stock Exchange between the 1880s and World War I. In addition, even during speculative periods – e.g., during the early 1870s and during the late 1920s – mean initial returns were in the single digits. These findings indicate that the underpricing phenomenon changed substantially over time. Thus, the question arises whether underpricing theories can explain initial returns in different markets and periods.

Consequently, we confront the historical data with standard underpricing theories. More specifically, using an unique data set of 180 IPOs undertaken at the Berlin Stock Exchange between 1870 and 1896, we show that initial returns were zero during the hot market of the early 1870s and less than five percent thereafter; this confirms earlier findings by Weigt (2005) and Burhop (2006). Yet, our new data set is much more comprehensive. In particular, Weigt's (2005) data set is restricted to IPOs of long-living corporations, i.e., firms surviving from the IPO until 1913. Moreover, Weigt (2005) tested Rock's (1986) classical underpricing theory, but cannot find a significant relationship between firm size, firm age and underpricing, i.e., she does not support Rock's theory. Nevertheless, Weigt (2005) is an important contribution, since she conducted the first and only test of underpricing theories using historical data on a global scale. Burhop (2006), on the other hand, has a randomly collected data set at hand, but did not exploit it to test underpricing theories; he focuses on the historical-institutional development of the German IPO market.

The current paper extends the available analyses substantially, confirms Weights' (2005) conclusions, and yields five new results. First, we reject Rock's (1986) theory which states that asymmetric information among first investors is a reason for underpricing, i.e., information asymmetries among well-informed and badly informed investor groups were unimportant. Second, we do not find evidence in support of Carter and Manaster's (1990) hypothesis of a negative correlation between quality of the lead underwriter and initial returns. Third, signalling theories based on asymmetric information between issuer and first investor (e.g., Grinblatt and Hwang, 1989; Welch, 1989; Allen and Faulhaber, 1989) are rejected, i.e., we reject the hypothesis of costly

underpricing in exchange for the smoother placement of seasoned equity offerings (SEOs). Fourth, stricter liability rules for incorporators and underwriters introduced in 1884 did not affect underpricing and we therefore cannot support Hughes and Thakor's (1992) litigation model of underpricing. Fifth, we detect a negative relationship between past market returns and underpricing, thereby contradicting studies using modern data (Loughran and Ritter, 2004; Lowry and Schwert, 2004). Finally, we find evidence that first investors readily accounted for potentially cash-flow relevant rules contained in the corporate charter. The risk of a transfer of cash-flow rights from the shareholders to the incorporators was punished with a substantial amount of money left on the table by the issuer. Therefore, we show that information was readily factored into equity prices and give support to the efficient market hypothesis put forward for the historical German stock market by Weigt (2005) and Baltzer (2006, 2007).

The remaining parts of the paper are organized as follows. Section II presents stylized facts about the development of the German stock market during the late 19th and early 20th century as well as details about the legal environment. Section III contains a selective review of underpricing theories and derives the estimation approach. The following Section IV describes the data; the econometric analysis is presented in Section V. The final Section VI concludes the paper.

II. The German IPO market in the late 19th century

During the period of industrialisation, universal banks played a major role in the German economy: they facilitated its 'take-off', they provided loans to the modern industrial firms, and they monitored industrial corporations. Close bank-industry relationships ameliorated liquidity constraints of industrial firms and thereby made investment easier and supported industrial growth.¹ Nevertheless, bank loans were only one way to ensure the financing of an industrial enterprise. Self-financing of investments using retained profits was significant in Imperial Germany. By far the most important source of capital was equity. Share capital accounted for more than half of the assets of Germany's industrial corporations until World War I (Fohlin, 2007: 174).

Equity finance can be raised by firms via IPOs and thereafter via SEOs. In particular, a thriving market for IPOs enables corporations to tap new sources of finance. Moreover, by diversifying its sources of finance, a firm becomes independent of one key financier, e.g. a bank. From the financier's point of view, shares are more liquid than loans. Furthermore, holding a diversified portfolio of shares is less risky than holding a loan portfolio. Finally, a well-developed stock market can be – at least in the long run – a driving force behind economic growth.

As early as the 1840s, a stock market had emerged in Germany. However, until 1861 incorporation was heavily restricted by law in nearly all German states, and thus the number of listed corporations was rather small. The enactment of free incorporation during the 1860s in some smaller German states culminated in the enactment of free incorporation in the North-German

1 The relevance of joint-stock credit banks for Germany's industrialisation is still debated. An excellent review of the literature is provided by Fohlin (2007).

federation, including Prussia, in 1870. Finally, free incorporation became possible in all German states after the creation of the German Empire in 1871.²

The following period of promotion (*Gründerjahre*) of the early 1870s was one of the key events of the economic history of the German Empire, with more than 400 IPOs within three years. The period of promotion was followed by the promotion crisis (*Gründerkrise*) between 1873 and 1878. During this period, 225 corporations were de-listed from the stock exchange, nearly exclusively caused by weak performance, and only 19 firms were newly listed on the market (Baltzer, 2007). Despite this substantial crisis, the 1870s saw a substantial net gain of listed corporations. Between 1879 and the enactment of Germany's first Stock Exchange Act in 1897, another 218 corporations went public, followed by 500 IPOs until World War I. Thus, 1,178 firms were newly listed at the German stock market within four decades, more than the 957 IPOs undertaken in Germany between 1949 and 2006 (Sapusek, 2000; Deutsche Börse).³

The booming IPO market of 1870-73 was caused by a set of factors, e.g., the introduction of free incorporation, the optimistic public mood after the formation of the German Empire in 1871, and the substantial indemnity paid by France after the Franco-Prussian War of 1870-71. It is very likely that only the combination of these factors caused the boom of the IPO market during the early 1870s (Baltzer, 2007). The promotion crisis, in turn, was related to the weak rights of first investors under the 1870 corporate law. As a result, the crisis was the key motivation for the major corporate law reform act in 1884 (Engel, 1875; Oechelhaeuser, 1876; Deutscher Reichstag, 1884; Burhop, 2004; Weigt, 2005; Baltzer, 2007).

In particular, the 1884 corporate law reform changed the rules of incorporation substantially.⁴ This set of rules was important for first investors, since other regulations were either voluntary – like the listing rules of the stock exchanges – or enacted later – like the Stock Exchange Act in 1897. Before the enactment of free incorporation in 1870, most states – in particular Prussia – audited incorporation. Only firms with a verifiable contribution to social welfare received the Royal concession necessary to incorporate. Moreover, joint-stock companies were supervised by civil servants. In general, only very respectable entrepreneurs incorporated and publicly listed companies were of a relatively high standard.⁵ Enactment of free incorporation implied that the audit of incorporation was handed over from a civil servant to a shareholder body, the supervisory board. However, the first supervisory board of a corporation was appointed by the incorporators, not by the first investors. Consequently, the incorporators audited the incorporation. This feature of the corporate law was changed in 1884. Since then, an audit committee of the chamber of commerce checked the incorporation and published a report (Ring, 1909; Wolff, 1915: 37,

2 The small city states Hamburg and Bremen never limited incorporation. Baden, Lübeck, Oldenburg, Saxony, and Württemberg introduced free incorporation in 1861 (Hopt, 1980).

3 All IPOs in the current sample are going-public of German firms.

4 Renaud (1875) and Gareis (1880) are textbook treatments of the corporate law. Lotz (1890), Pflieger and Gschwindt (1897), Thiwissen (1900), and Wolff (1915) review the working of the German IPO market during the late 19th and early 20th century.

5 Baltzer (2007) showed that the survival probabilities of joint-stock companies incorporated before 1870 was significantly larger than the survival probability of corporations founded after 1870.

76). In addition, the complete corporate charter had to be published in the newspaper of the central government, the *Reichsanzeiger*, from 1884 onwards, whereas before only parts of the charter – the law did not prescribe which parts – had to be published, but without specifying the type of publication. After 1884, therefore potential investors could inspect the governance rules or the rules laid down for the distribution of profits more easily. This was an important piece of information, since many charters contained special rights for the incorporators (*Gründerrechte*), e.g., a profit share, membership in the supervisory board for several years, or subscription rights in case of an SEO. Most of these incorporators rights transferred cash-flow rights from the shareholders to the incorporators and are thus important for firm valuation.

Furthermore, liability of incorporators and underwriters were strengthened after 1884. First of all, the reform act constituted the legal person of the incorporator, an important pre-condition for any litigation. Moreover, the 1884 law prescribed that underwriters and their comrades (*Gründergenossen*) – e.g., the underwriter – were liable for a fair and truthful incorporation. Before 1884, the underwriter – for example – was only liable for explicit advice given to a certain investor, but not liable for information given in a prospectus or advertisements. After 1884, the incorporator as well as the underwriter were liable for such information, if the corporation was listed within two years after incorporation (Pfleger and Gschwindt, 1897: 126, 202; Thiwissen, 1900: 17, 43; Heim, 1910).⁶

Finally, the face value of shares was substantially increased to exclude the lower strata of the population from share ownership. Between 1870 and 1884, the minimum face value of a share was 300 Mark and only 40 percent of it had to be paid-up before the IPO.⁷ Thus, the minimum investment to buy one share was 120 Mark, since offerings below par were interdicted. This compares to an annual per capita income of about 400 Mark during the period. The 1884 corporate law increased the minimum face value of a share to 1,000 Mark and an IPO was only possible for fully-paid up shares. Thus, the minimum investment increased by factor eight.

Jointly and severally, the 1884 corporate law reform act improved the information available to potential investors, it increased the liability of incorporators and of underwriters and it excluded lower strata of the population from a direct investment into shares.⁸ It is in question, if the reform addressed problems visible in first day returns before 1884 and if the reform achieved its targets.

In contrast to the regulation of IPOs, the issuing process remained similar over time. A group of investors – the promoters or incorporators – joined forces to establish a new joint stock company. In most cases, the incorporators bought an existing firm and changed its legal form. In some cases, however, only a business plan was presented to potential investors, and money was

6 The 1897 Stock Exchange Act extended the period of liability to five years after the IPO.

7 The owner of the share had the obligation to pay the call on demand.

8 Knowledge about first investors is nearly non-existing since there was no need to publish these data. It seems that even the smallest first investors invested a substantial amount of money. For example, Burhop (2004: 91, 98) shows that 76 (26) investors participated in the IPO of the Internationale Bank (Frankfurter Bankverein) and that the smallest investors bought shares with a face value of 30,000 (17,000) Mark. Pohl (1984: 42) listed the names of the 76 participants in the IPO of Deutsche Bank.

collected to start this new business. Afterwards, the joint-stock company was incorporated and the shares offered to investors via an underwriter.⁹ The IPO itself was typically organized in three steps. First, the price for the issue and the risk-sharing were negotiated between issuer and underwriter. Then the appropriate offering price, the underwriting fee, and the distribution of the issue within an underwriting syndicate were negotiated. Third, the shares were actually sold either by the introduction to the market or by public subscription (Lotz, 1890: 41; Pflieger and Gschwindt, 1897: 108).¹⁰ In case of an introduction to the market, the underwriter applied for the admission of shares at the stock market. Afterwards, the underwriter sold the shares by and by at the stock market over a longer period. In the case of public subscription, the underwriter appealed to its customers in newspapers or by notifications to subscribe for the new shares at a fixed price within a certain period of time. After the period of subscription was over, the bank distributed the new shares to the customers (Thiwissen, 1900: 54; Wolff, 1915: 262). As an example, we include the prospectus of the IPO of “Actien-Gesellschaft Weser”, a large shipyard from Bremen. The prospectus states that the assets, staff, and technical knowledge of the privately-owned shipyard C. Waltjen & Co. was acquired by the new joint-stock company and that the business should be continued. Moreover, the prospectus lists the names of the supervisory and executive board members and announced that one fifth of the share capital was on offer for public subscription at par value. This indicates that most shares were allocated in advance to blockholders. Potential investors could register their demand during a two day period at seven banks in six German cities. At the time of subscription, two percent of the potential investment had to be deposited at the underwriter. In case of oversubscription, the underwriters could arbitrarily allocate the shares to the investors. Seven days after the end of the subscription period, the shares were allocated to the investors.

III. Theory and Econometrics

Theoretical and empirical investigations of the underpricing phenomenon using modern data are in abundant supply (Ritter and Welch, 2002, review the literature). However, the most recent theories mostly require data, that are not readily observable by the econometrician and often unavailable in an historical setting. For example, the optimal IPO mechanism proposed by Biais et al. (2002) requires information about the supply and demand for a certain issue; the model proposed by Green (2007) requires knowledge about the distribution of the issue between institutional and retail investors. Given the limitations of the historical data, we focus on traditional theories. Nonetheless, we offer the most comprehensive study of the underpricing phenomenon

9 Our knowledge about the structure of the underwriter market is very limited. At least 161 banks were underwriters between 1870 and 1896. The three largest underwriters – Preußische Bodencreditactienbank, S. Bleichröder, and Disconto-Gesellschaft – had a market share of slightly more than five percent each. The market share of the four large D-Banks – Deutsche Bank, Dresdner Bank, Disconto-Gesellschaft, and Darmstädter Bank – was about nine percent. Thus, the IPO market was quite dispersed and the large universal banks did not dominate the business.

10 The ability to reach retail customers was very important. Burhop (2004: 235-237) shows that even Germany’s central government was not able to place government bonds without using the retail distribution network of banks.

using historical data and thereby shed light on the structural (in-)stability of the underpricing phenomenon and its causes over time.

The classical paper by Rock (1986) suggests that asymmetric information about the quality of an IPO among different groups of investors can induce underpricing.¹¹ If the demand from the group of informed investors is insufficient to buy the whole issue, uninformed investors will have to be attracted. Informed investors only buy high-quality issues, whereas uninformed investors buy a mix of high- and low-quality issues. Realizing this, uninformed investors have to be compensated by offering them all issues at a lower price.

Since the set of information available to specific investors is unobservable for the econometrician, tests of Rock's (1986) hypothesis add the assumption of a negative correlation between the size of an issue, the age of the newly listed corporation, and underpricing. The economic intuition behind this argument goes as follows: large and old firms produce more information than small and young firms. Therefore, more information is available for all investors, the problem of asymmetric information among different groups of investors becomes less important, and underpricing declines.

Generally, Rock's hypothesis is supported using modern U.S. data (Kennedy et al., 2006; Michaelis and Shaw, 1994). Yet, the evidence for the modern German market is not as clear-cut. On the one hand, Ljungqvist (1997) reports a positive and significant correlation between the size of an IPO and initial returns. On the other hand, Wasserfallen and Wittleder (1994) cannot find a statistically significant relationship. Turning to the available historical evidence, Weigt (2005: 154), using data for the Berlin Stock Exchange for the period 1882-1913, did not find a significant relationship between the size of the IPO, the age of the firm, and initial returns.

We employ several proxies for investor's information: The size of the new issue (i.e., number of shares offered times the offering price), the age of the corporation (i.e., number of months between incorporation as joint-stock company and going public), a dummy variable taking the value one if the firm existed as a commercial partnership before becoming a joint-stock company, and the minimum investment (i.e., the face value of one share times the offering price times the fraction of capital paid in). Rock's model predicts a significantly negative relationship between these four variables and underpricing.

The size of the issue and the age of the corporation are often employed proxies, whereas the two other variables need justification. If a firm existed as a commercial partnership before becoming a joint-stock company, the number of months since incorporation underestimates firm age. Thus, the dummy variable also captures information about firm age. The main concept underlying

11 Moral (1914: 47-49) speculates that asymmetric information between investors and underwriters and asymmetric information between different types of investors was relevant for underpricing. In particular, underwriters did not exactly know the market demand. Moreover, they wanted to keep their reputation and therefore offered shares at a price below the fair value. This was known at the stock market by some investors. These speculative investors subscribed the IPO. Then, speculative investors sold to the fundamentalist at the fair value in the secondary market.

Rock's model is asymmetric information among different groups of investors. The higher the offering price of a share, the more wealth-constrained investors are excluded from the offering. Therefore, the remaining investors are more homogenous with respect to their wealth and this should reduce underpricing. Moreover, increasing the minimum face value of a share was a major component of the corporate law reform and we thereby test if this part of the reform influenced underpricing.

An important extension of Rock's (1986) hypothesis was proposed by Carter and Manaster (1990). They hypothesised that the quality of the lead underwriter is an important signal for investors. A high quality of the lead underwriter signals a high quality of the issue, a view shared by observers from the early 20th century (Moral, 1914: 43; Jeidels, 1905: 128, 163). Thus, we expect a negative correlation between underpricing and the quality of the lead underwriter. Empirical evidence using U.S. data from the 1980s supported this hypothesis, whereas U.S. data from the 1990s did not. Therefore, the relationship between underwriter reputation and initial returns varied over time, but an investigation using historical data is still unavailable. We address this gap by including a measure of underwriter quality – the share of a bank in the Imperial Loan Syndicate (*Reichsanleihenconsortium*) – into the regression.¹²

Another theoretical explanation of the underpricing phenomenon is based on asymmetric information between issuer and first investor. In particular, if the issuer knows more about the issue than the investor, a classic lemons problem emerges and the issuer should underprice the IPO to signal its quality. In particular, high-quality IPOs should use costly underpricing as a signal and they are more likely to take the money back from the table later on by having larger SEOs (Grinblatt and Hwang; Welch, 1989; Allen and Faulhaber, 1989). However, most empirical studies using modern U.S. and German data reject this signalling model (Kennedy et al., 2006; Michaely and Shaw, 1994; Wasserfallen and Wittleder, 1994). Studies based on historical data to test the time-stability of the phenomenon are unavailable. Our measure of SEO activity is the size of SEOs placed during five years after the IPO divided by the size of the IPO.

Furthermore, we incorporate the market sentiment hypothesis. Contemporaries hypothesised that the general economic and political climate, as well as the liquidity of the financial market, influenced the success of IPOs (Lotz, 1890: 44; Moral, 1914). Empirical studies using modern U.S. and German data also support a positive correlation between past performance of the stock market and initial returns (Loughran and Ritter, 2004; Lowry and Schwert, 2004; Ljungqvist, 1997). Moreover, Weigt (2005: 154) reports a positive correlation between the performance of a stock market index during the year preceding the IPO and initial returns for her sample of IPOs of long-living firms. We measure market performance by the return of the historical DAX-30 calculated by Ronge (2002) during the year preceding the IPO.

Moreover, we account for a special feature of the historical capital market, the incorporators' rights (*Gründerrechte*). They allocated cash-flow rights from the shareholders to the incorpora-

12 Only the most prestigious joint-stock credit banks and private banking houses were members of the consortium, and the membership was several times adjusted. See Reitmayer (1999).

tors. This can affect underpricing since the extent of the cash-flow rights transfer is not known at the time of going public, thereby increasing the uncertainty regarding the fair firm value. For example, if incorporators have subscription rights in case of an SEO, the right only has a value if a SEO takes place. The value of the right then depends on the share price of the corporation at the time of issue, the fraction of shares allocated to the incorporators, and the subscription price of the incorporators.¹³ Thus, we expect a positive relationship between initial returns and the incorporators rights dummy as a compensation for higher uncertainty about the firm value and for the expected transfer of shareholder value to the incorporators.

Finally, we include a dummy variable taking the value one for all issues after the reform of the 1884 corporate law reform act. This dummy variable accounts for all changes of the post-reform period compared to the pre-reform period not covered by the above mentioned variables. For example, the 1884 corporate law increased the litigation risk for incorporators and underwriters in case of fraudulent IPOs. If litigation is possible, incorporators and underwriters would prefer positive initial returns since this indicates that the offering price was fair. However, the dummy variable also takes up all unobserved characteristics, whose impact on underpricing differs between the two sub-periods, e.g., differences in the quality of the firms going public or differences in the fraction of shares kept by the incorporators.

In summary, we estimate the following regression:

$$IR_i = c + \beta_1 x_i + \beta_2 DAX_i + \beta_3 DAX_i \Delta 1884_i + \beta_4 Change_i + \beta_5 Rights_i + \beta_6 \Delta 1884_i + \varepsilon$$

The dependent variable IR_i measures the ‘first-day’ return of IPO i in percentage points. The empirical investigation in Section V mainly employs the first return observed during the first five days after the official going public. This seems reasonable given the lower speed of information processing at historical stock markets. Moreover, we employ true first-day returns in a control regression, but did not find any difference in the results. The vector of x_i of firm-specific explanatory variables accounts for observable characteristics attached to IPO i . In particular, x_i includes the size, the age, the minimum investment, the quality of the lead underwriter, and the size of SEOs. Furthermore, we include the return of the DAX-30 blue chip index during the year preceding the IPO as a control variable. This control variable is also interacted with a dummy variable taking the value of one if the going public occurred after the corporate law reform. Moreover, the dummy variables $Change_i$, $Rights_i$, and $\Delta 1884_i$ take the value of one if the firm existed as a private firm before becoming a joint-stock company, if incorporators’ rights were announced at the time of the IPO, and if the going public of firm i occurred after the corporate law reform. The results are presented in Section V.

13 A common rule was the allocation of half the new shares at par value to the incorporators.

IV. Data

A register of all IPOs undertaken by German corporations at German stock exchanges was constructed using various contemporary sources. In doing so, we were faced with the same information problems as contemporary investors. Our data set is therefore much more comprehensive for the period after 1884, since the availability of information improved significantly after the corporate law reform. Nevertheless, we cover a reasonable number of IPOs for the 1870s and we could not reject the hypothesis of randomness using a non-parametric randomisation test.¹⁴

For the period 1882-1896, the names of all newly listed corporations, their initial share capital, the name of the lead underwriter, the offering price, the first market price, and the date of going public were taken from Börsenenquetekommission (1892), Christians (1893), and Saling's Börsen-Jahrbuch (various years).¹⁵ For the period 1870-1881, the names of newly listed corporations and their year of going public were available from van der Borgh (1883). Information on initial capital, the name of the lead underwriter, the offering price, and the date of going public were collected from Saling's Börsen-Jahrbuch (1875, 1882/ 83), Meyer (1873), and *Berliner Börsenzeitung*. The first market price was taken from *Berliner Börsenzeitung*. Supplementary information on the amount of SEOs undertaken during the first five years after the IPO and the face value of a share were collected from Saling's Börsen-Jahrbuch. Finally, using this source, two dummy variables were constructed. The first dummy variable takes the value of one if the IPO was the going public of a formerly privately-owned company. The second dummy variable indicates if the incorporator had preferential rights anchored in the corporate charter.

The register of German IPOs sold between 1870 and 1896 contains 647 firms: 489 for the period 1870-84, and 158 for the period 1884-96. Our final data set consists of 180 firms: 87 for the period 1870-84, and 93 for the period 1884-96.¹⁶ First, we removed 123 corporations from the register, since nearly no information was available for these IPOs. Most of these firms were never quoted in the *Berliner Börsenzeitung*. Therefore, it is very likely that the IPOs were undertaken at a regional stock exchange.¹⁷ Second, we excluded 87 IPOs for which the issuing price is not known. In most of these cases, shares were introduced to the market and sold by and by at the Berlin Stock Exchange. Third, 252 IPOs were removed from the sample since we could not observe the first market price within five days after the formal introduction at the Berlin Stock Exchange.¹⁸ The remaining sample includes 180 IPOs with a first-day market value of about 735

14 The results of the test are available upon request.

15 Saling's Börsen-Jahrbuch is a stock market annual, which was published annually from 1880 onwards. Moreover, it was irregularly published during the 1870s. For IPOs undertaken between 1892 and 1896, the first market price was in some cases derived from the *Berliner Börsenzeitung*, the leading financial daily.

16 This is a small number of observations compared to studies using modern U.S. data, which usually rely on several thousand observations. However, our sample has about the same size as the sample used by Ljungqvist (1997) to analyse the modern German IPO market.

17 The name of the corporation often reveals information about the location of the corporation. If a stock exchange existed in that location, it is reasonable to assume a listing at the regional stock exchange.

18 Using IPOs with the first market price observed more than five days after the formal introduction to the market could result into less precise statistical results since we cannot adjust for market returns due to the unavailability of a daily stock market index.

million Mark.¹⁹ The face value of the share capital in our sample equals about 40 percent of the face value of the shares of all firms going-public between 1870 and 1896.

Table 1 presents descriptive statistics of our sample. Initial returns were calculated as

$$IR = \left(\frac{P_{\text{first}} - P_{\text{offering}}}{P_{\text{offering}}} \right) * 100.$$

The mean initial return between 1870 and 1896 was – compared to modern data – quite low and averaged only 2.5 percent. Initial returns were nearly zero before 1884 and about 4.4 percent during 1884-96. Moreover, only 58 percent of all issues had a positive first-day return during the pre-1884 era, whereas about 91 percent of the issues displayed positive initial returns during the post-reform era.

Some characteristics of the new issues were similar in both sub-periods: most firms were privately owned before the IPO – i.e., they only changed their legal form –, the fraction of corporations undertaking an SEO within five years after the IPO was around one quarter before and after 1884, and the mean size of an IPO was about four million Mark.²⁰ Some characteristics, however, did change. After the reform, almost no corporation granted incorporators' rights, whereas half of the corporations did so before 1884. In addition, the minimum investment necessary to buy one share increased from 380 Mark to 1,352 Mark, i.e., from one time to more than three times the annual per capita income. Moreover, the period between incorporation and going public lengthened substantially from 15.1 to 25.4 months. Finally, the average reputation of the lead underwriter increased after 1884, but remained on a very low level: The large and well-known joint-stock credit banks as well as the leading private banking house were largely inactive on the IPO market. Nonetheless, comparing the point estimates of the variables outlined in Table 1 in view of their standard deviations suggest that the changes from the pre- to the post-1884 period was modest. Only the changes in the mean minimum investment and the granted of special cash-flow (incorporators) rights changes substantially.

19 This compares to a stock market capitalisation of about 3.8 billion Mark in 1880 (van der Borcht, 1883).

20 Moreover, the cumulative abnormal returns were most likely negative on average, before and after 1884. Our measure of CAR is the stock price at the end of the second year, plus dividend payments during this period, divided by the first market price and less the return of the historical DAX-30 over the same period. This shows a CAR of 15 percent for the pre-1884 issues, and a CAR of -11 percent of the post-1884 issues.

Table 1: Descriptive Statistics

	All observations	pre-1884 observations	post-1884 observations
Mean initial return	2.49 % (9.14 %)	0.49 % (11.92 %)	4.37 % (4.73 %)
Median initial return	1.92 %	0.63 %	3.25 %
Share of observations with initial return > 0	75.0 %	57.5 %	91.4 %
IPO Size (in 1,000 Mark)	4,083 (4,857)	4,103 (5,426)	4,064 (4,325)
Mean minimum investment (in Mark)	883 (753)	380 (748)	1,352 (347)
Share of firms changing legal form	70.6 % (45.7 %)	60.9 % (49.1 %)	79.6 % (40.5 %)
Share of corporations with incorporator's rights	25.6 % (43.7 %)	49.4 % (50.3 %)	3.2 % (17.8 %)
Share of corporations with SEO within 5 years after IPO	23.9 % (42.8 %)	23.0 % (42.3 %)	24.7 % (43.4 %)
Average quality of the lead underwriter	1.9 % (4.6 %)	1.6 % (4.1 %)	2.3 % (4.9 %)
Time since incorporation (in months)	20.4 (73.8)	15.1 (44.6)	25.4 (93.2)
Number of observations	180	87	93

Source: see Text. Standard deviation in parentheses.

V. Econometric analysis

In this section, we test if the theories outlined in Section III explain underpricing on an historical stock market and we evaluate whether the 1884 corporate law reform had a measurable impact on initial returns. Tables 2 and 3 present our results. We start with two regressions using the whole sample and a dummy variable capturing possible shifts between the two sub-periods using standard OLS and weighted OLS (Table 2). Moreover, Table 3 presents two stability checks by restricting the sample to observations with a first-day return instead of using the first return during a five-day window after the official introduction to the market and by using a Tobit-model to account for censoring.

Turning first to Table 2, we note that the variables in the model are jointly significant and the model explains about 20 percent of the variance, a magnitude comparable to studies using data from the modern German capital market. Moreover, all variables accounting for problems of asymmetric information among different groups of investors are insignificant: size, age, minimum investment, and the fact that a firm already existed as a private enterprise before the going

public did not matter for initial returns.²¹ Thus, we confirm the result presented by Weigt (2005: 154): She reported an insignificant relationship between size and age of an IPO, on the one hand, and underpricing at the Berlin Stock Exchange between 1882 and 1913, on the other.

Furthermore, we cannot support Carter and Manaster's (1990) theory of a significant role of underwriter quality on initial returns. The coefficient has the expected sign – high-quality underwriters signal the high-quality of an IPO and thereby reduce underpricing – but is insignificant. Moreover, we cannot support the various signalling theories put forward by Grinblatt and Hwang (1989), Welch (1989), and Allan and Faulhaber (1989). Signalling the high-quality of an IPO by the issuer to the investors by offering the new issue at a comparatively low price – resulting in high initial returns – and taking the money back from the table by large SEOs later on, seems not to work in 19th century Germany, since the regression coefficient is insignificant.

From an economic and statistical point of view, we report a substantial influence of the past market performance on underpricing: A one percentage point increase of the DAX-30 blue chip index during the year preceding the IPO resulted into a decrease of underpricing of about 25 percentage points. Thus, the sign of the coefficient is in contrast to findings for modern markets (e.g., Loughran and Ritter, 2004; Lowry and Schwert, 2004; Ljungqvist, 1997). Yet, during the post-1884 period, the coefficient is still significantly negative, but the magnitude of the effect is now tiny.

Finally, and as expected, incorporators rights (i.e., the shift of cash-flow rights from shareholders to incorporators) have a significantly positive effect on initial returns. Firms having such a regulation in their charter left about 8.1 percentage points more money on the table than other firms.

21 Including only one of these three variables in the regression did not affect the results.

Table 2: Initial returns, firm characteristics, and the legal reform

	Dependent variable: Initial return in percentage points			
	OLS		weighted OLS	
	Coefficient	p-value	Coefficient	p-value
Constant	3.824	0.325	2.358	0.301
Size (in million Mark)	0.029	0.846	0.243	0.011
Time since incorporation (in months)	-0.016	0.170	-0.011	0.584
Minimum investment (in Mark)	0.002	0.121	0.001	0.113
Change in legal form dummy (equals one if firms existed as a private firm before IPO)	-2.126	0.187	-1.752	0.135
Underwriter reputation	-3.480	0.773	-19.999	0.091
SEO in percent of IPO over five years	0.470	0.554	1.401	0.094
DAX return, year preceding IPO	-25.016	0.017	-16.269	0.001
DAX return, year preceding IPO*Post-1884	24.994	0.017	16.247	0.001
Incorporator's rights dummy (equals one if charter prescribed incorporator's rights)	8.107	0.002	2.987	0.049
Post-1884 dummy (equals one if going public was after corporate law reform)	-0.561	0.811	0.536	0.765
Number of observations	180		180	
F-Test (p-value)	0.000		0.000	
adjusted R ²	0.197		0.253	

Method: OLS using corrected for heteroscedasticity in model 1; LS weighted by size in model 2. First price within five days after public offering.

Furthermore, the post-1884 dummy is insignificant. This indicates that the legal reform had no additional effects on underpricing or that the effects captured by this variable offset each other: the higher litigation risk of underwriters and incorporators should increase underpricing, whereas the broader scope and higher quality of information presented to investors should decrease underpricing.

Some noteworthy results emerge if we compare the standard OLS results with the weighted OLS results, using the size of an IPO as weight. Giving more weight to larger issues leads to weakly significant coefficients for underwriter reputation and SEO activity and both have the correct sign: high-quality underwriters reduced underpricing; larger issues tend to took the money back from the table using larger SEOs. Moreover, the coefficient measuring the impact of incorporators rights is now much smaller, indicating that incorporators rights were more important for smaller issues. However, these results depend on a special weighting procedure for the observations and should be interpreted with a grain of salt.

Table 3: Initial returns, firm characteristics, and the legal reform - Stability tests

	Dependent variable: Initial return in percentage points			
	OLS		Tobit	
	Coefficient	p-value	Coefficient	p-value
Constant	3.918	0.329	5.528	0.021
Size (in million Mark)	-0.007	0.966	-0.063	0.721
Time since incorporation (in months)	-0.007	0.669	-0.020	0.256
Minimum investment (in Mark)	0.002	0.151	0.002	0.117
Change in legal form dummy (equals one if firms existed as a private firm before IPO)	-3.018	0.104	-2.391	0.096
Underwriter reputation	-1.426	0.926	-7.106	0.691
SEO in percent of IPO over five years	0.179	0.843	0.488	0.531
DAX return, year preceding IPO	-23.439	0.025	-26.195	0.000
DAX return, year preceding IPO*Post-1884	23.426	0.025	26.167	0.000
Incorporator's rights dummy (equals one if charter prescribed incorporator's rights)	8.653	0.001	7.370	0.000
Post-1884 dummy (equals one if going public was after corporate law reform)	0.658	0.784	-1.695	0.418
Number of observations	151		180	
LM test [df] for Tobit			86.57 [11]	
ANOVA based fit measure			0.041	
F-Test (p-value)	0.000			
adjusted R ²	0.203			

Method: Model 1-OLS using corrected for heteroscedasticity, with first price within five days after going public. only observations with first price at the first day. Model 2: Tobit regression, using all observations

Table 3 presents two additional stability tests. The regressions underlying the results presented in Table 2 rely on all IPOs with a first market price observed within five days after the official introduction to the stock market. The delay between the official introduction and the first quotation might be problematic, for example if trades occurred before the first price appeared in the newspaper. Therefore, we restrict the sample to the 151 (out of 180) cases with the first market price observed on the day of the official introduction to the market. Yet, this does neither affect the significance levels nor the magnitudes of the coefficients: Only the past return of the stock market index and the provision of incorporators rights in the corporate charter affect underpricing.

The second stability check employs a Tobit regression framework to account for possibly censored initial returns. The descriptive statistics presented in Table 1 show that about three quarters of all IPOs had a positive initial return. However, the specification test rejects the censoring hypothesis. Moreover, the coefficients as well as the magnitudes of the coefficients are similar to the standard OLS estimates.

VI. Conclusion

IPOs were the blood of early capital markets. Nonetheless, until the work by Weigt (2005), IPOs on the 19th century German stock market were not subject to quantitative research. This paper contributes to this research by investigating the relationship between firm fundamentals, corporate law, and underpricing of initial public offerings at the Berlin Stock Exchange between 1870 and 1896. In particular, we evaluate potential problems of asymmetric information between issuers and investors as well as among different groups of investors and possible effects of institutions on underpricing.

It turns out that the pattern of initial returns changed substantially over time. More specifically, mean initial returns were zero during the early 1870s, whereas initial returns were positive on average from the 1880s onwards. Despite this ‘obvious’ change in underpricing, we fail to find a measurable effect of the corporate law reform enacted in 1884 to counter problems of incorporation and of initial public offerings. Moreover, the standard set of underpricing theories based on asymmetric information among investors (Rock, 1986), on asymmetric information between issuer and investor (Grinblatt and Hwang, 1989; Welch, 1989, Allan and Faulhaber, 1989), and on signalling via high-quality underwriters (Carter and Manaster, 1990) do not explain underpricing on historical markets. During the late 19th century, underpricing was driven by the past performance of the general stock market and by cash-flow relevant provisions in corporate charters. The latter findings indicate that financial markets were efficient during period under investigation, since available information was rapidly reflected in market prices. Moreover, the finding that underwriter quality was unimportant for underpricing of IPOs sheds some doubt on the thesis that large joint-stock credit banks dominated the German financial business during the late 19th century.

IV. Beilage der „Berliner Börsen-Zeitung“ Nr. 154.

Dienstag, den 3. April 1872.

P R O S P E C T
der
Actien-Gesellschaft „Weser“
in Bremen.

(Gesellschaft zum Bau eiserner Schiffe, Dampfschiffe,
Dampfmaschinen, Maschinentheile etc.)

[17175-6] (1)

Der Zweck der Gesellschaft ist nach § 1 der Statuten folgender:
Der Neubau und die Reparatur von Schiffen, Fahrzeugen, Fahrwerken, Maschinen und Maschinentheilen aller Art, die Anlage und der Betrieb von Werften, Trockendocks, Keesschmieden, Eisen- und Metallgießereien und andern verwandten Anstalten, die Erwerbung und Verwertung der für die Gesellschaftszwecke dienlichen Grundstücke und Etablissements, der Schiffahrtbetrieb, sowie die Verwaltung, Verwendung und thunlichste Nutzbarmachung des Gesellschaftsvermögens.
Die Gesellschaft hat die in Bremen belegene, renommirte Maschinenfabrik, Giesserei und Anstalt zum Bau eiserner Schiffe von C. Waltjen & Co. käuflich erworben und mit dem bisherigen Eigenthümer und ihren Technikern ein Arrangement gemacht, demzufolge dieselben ihre Kräfte, Kenntnisse und Erfahrungen zur Verfügung stellen, und bezweckt dieselbe weiter auszudehnen.
Das Grundcapital der Gesellschaft beträgt

Ein und Einhalb Millionen Thaler,

im 30 Thaler-Fuss,

eingetheilt in 7500 Actien à 200 Thaler, welche bereits sämtlich gerechnet sind.
Den Vorstand bilden die Herren:

A. G. Mosle, Vorsitzender.

Cornelius Bechtel.

W. Ang. Finke.

Richard Fritze.

Friedr. Achelis.

Rud. Feuerstein, stellvertretender Vorsitzender.

L. Knoop.

Joh. G. Lohmann.

C. T. Melchers.

Herren:
Geo. S. Gruner.

Joh. Herm. Niemann.

Carsten Waltjen.

D. H. Wätjen.

Gustav Rohte.

Bezugnehmend an vorstehenden Prospect, offeriren wir hiermit von der obengenannten Summe von 1,500,000 Thalern

300,000 Thaler im 30 Thaler-Fusse

in 1500 Actien à 200 Thaler

mit vorläufig 10% Einzahlung zum Pari-Course. — Anmeldungen darauf werden am

Freitag, den 5. und Sonnabend, den 6. April a. 5c.

in Bremen bei der Bremer Bank,

in „ bei der Bremer Filiale der Deutschen Bank, A-G,

in Berlin bei der Deutschen Union-Bank, Unter den Linden 78,

in Cöln bei dem A. Schaaffhausen'schen Bank-Verein,

in Crefeld bei den Herren Gebr. Molenaar,

in Hamburg bei der Hamburger Filiale der Deutschen Bank, A-G,

in Hannover bei dem Herrn M. J. Frensdorff, Provincial-Disconto-Gesellschaft,

in den üblichen Geschäftsstunden entgegengenommen.

Bei der Zeichnung sind 2% in baar (Thlr. 4. par Actie) oder in, der betreffenden Zeichenstelle genügenden, Werthpapieren als Caution zu deponiren, welche bei Uebernahme der Bezugscheine verrechnet oder zurückgegeben werden.

Im Falle der Ueberzeichnung bleibt Reduction vorbehalten.
Ueber die erste Einzahlung von 10%, welche am 13. April a. c. an der Zeichenstelle zu leisten, wird in Bezugscheinen, die auf Namen lauten, quittirt.

Exemplare der Statuten der Gesellschaft können bei den Zeichenstellen abgefordert werden.

Bremen, März 1872.

Das Consortium.

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