

WILCO LEGIERSE

The Timing and Pricing of Initial Public Offerings

Evidence from the Low Countries



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Evidence from the Low Countries**

De timing en prijsstelling van eerste publieke uitgiftes
Bewijs uit de Lage Landen

Thesis

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Foreword

Eleven years ago, after completing my PTO-studies at the Erasmus University, Abe de Jong suggested to work together to get my master thesis on Dutch stock IPOs published. I was honoured and excited at the same time and we started enthusiastically. In April 2013 I presented a first draft of this paper at the annual conference of the Economic History Society at the University of York where we received great feedback. In May 2013 Abe presented an improved version at the Eurhistock Conference at the University of Antwerp and again we received good feedback. In May 2021 we reached our objective when the paper was published in *European Review of Economic History*. The published version is presented in chapter 2.

During the conference in Antwerp Abe and I were approached by Marc Deloof with an interesting idea. He proposed to expand the subject of the first paper with bond IPOs and to use Belgian historical data. The three of us worked together and the result is presented in chapter 3.

Around that time, Abe suggested that with a third paper I could aim for a PhD in finance. We agreed that this third paper had to be on IPO underpricing. In the summer of 2018, after reading many papers on this subject, I came up with the idea to investigate the determinants of the offering method and its effect on underpricing of Dutch IPOs in the Interbellum. The result of this investigation is presented in chapter 4.

In August 2016 Abe went to work for one year at Monash University in Melbourne, Australia and decided in 2018 to go to work there for a longer period. This did not affect his mentoring. On the contrary, the time difference between Australia and Europe worked in our advantage. We could now work shifts: every question I emailed him in the evening had been answered by the

time I woke up the next morning. This really speeded things up. I thank Abe for his great support and mentoring and Peter Roosenboom for being a co-promotor and for his comments and feedback.

Eleven years is a long time. What started as a joint work on a publication, ended up in a dissertation. This was only possible with the great support of my wife, Annelies. I cannot thank her enough.

Wilco Legierse

Zoetermeer, December 5, 2021

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1 Introduction

After a strong increase in the second half of the 19th century, the number of firms that listed their shares on the Amsterdam Stock Exchange peaked at an all-time high in the beginning of the 1930s. Despite a revival from time to time, this number has declined since then. The influx of new listings is apparently insufficient to compensate for delistings due to takeovers, bankruptcies, mergers and privatizations. In contrast, the Dutch economy has grown by more than a factor 100 since 1930 (source: CBS)¹ and the number of domestic firms increased by a factor 10 to a total of 1.9 million (source: Rijksverzekeringsbank and CBS).² A decrease in the number of listed firms is also observed in other countries, for example in Belgium (Van Nieuwerburgh *et al.*, 2006) and in the US and the UK (Stulz, 2019)³, so that the decline in the number of listings in the Netherlands cannot simply be attributed to a changing role of the Amsterdam Stock Exchange in international capital markets.

The transition from a private to a public firm by means of an Initial Public Offering (IPO), is a watershed event (Lowry *et al.*, 2017). By going public a firm gains access to a new financial source but at the same time has to go through a certification process (Fjesme *et al.*, 2021a) and to deal with stock market regulations during its entire public life. Once the decision is

¹ Not corrected for inflation. GDP in 1930 comes from Tweehonderd jaar statistiek in tijdreeksen 1800-1999 (CBS, 2001), chapter 9. CBS provided a file with the data. GDP in 2020 comes from Statline and is accessible via CBS

<https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84087NED/table?ts=1638105608604>

² In 1930 a total of 183,389 firms were registered at the Rijksverzekeringsbank. The number of firms in 2020 comes from Statline, 4th quarter 2020 via

<https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81589NED/table?ts=1637864097826>

³ While Van Nieuwerburgh *et al.* (2006) study the period 1830 – 2000, the data in Stulz (2019) covers the period 1975 - 2018.

made to apply for a listing, the board of directors of a firm has to decide on many things, such as the volume of the issue, when to apply, how to price the offering and which method to use for offering shares to investors prior to the listing.

Many aspects that are related to this transition have been studied extensively, but mainly for US-markets and in recent periods of time. Papers document the characteristics of issuing firms (e.g., Chemmanur and Fulghieri, 1999), their motives (e.g., Pagano *et al.*, 1998), the fluctuations in IPO volume (e.g., Lowry, 2003) and the timing of the application (e.g., Baker and Wurgler, 2002 and Pástor and Veronesi, 2005). In this thesis, these aspects are investigated, but with a different approach and using historical data for the Netherlands and Belgium.

A persistent phenomenon with regard to the pricing of IPOs is that the share price at the end of the first trading day is on average substantially higher than the price at which the share was previously offered to investors. This phenomenon, known as underpricing, causes firms to *leave money on the table* because the market apparently values the shares higher than the firm. According to various models (e.g., Rock, 1986), shares are deliberately offered to investors for a price below market value, but why firms do this is one of the biggest puzzles surrounding IPOs (Lowry *et al.*, 2017). One possible explanation is that underpricing is dependent on the method that is used for offering shares to investors prior to the listing (e.g., Baron, 1982) and this thesis examines whether this is the case for Dutch IPOs.

In chapter 2 the characteristics of the issuing firms, their motives to apply for a listing and the timing of their application, especially the clustering

of IPOs in hot markets, is analyzed for Dutch non-financial firms that received a listing on the Amsterdam Stock Exchange between 1876 and 2015. This chapter is published in *European Review of Economic History* in 2021 under the title “What causes hot markets for equity IPOs? An analysis of initial public offerings in the Netherlands, 1876 – 2015”. In chapter 3 the motives for and the timing of stock IPOs are investigated in more detail. This chapter mainly focusses on whether the issue of a firm’s stock IPO is complemented by their bond IPO or whether these two financing instruments are substitutes and if the motives and timing of the application of these instruments are affected by changing stock market regulations. To this end, the IPOs of stock and bonds are studied that are issued by non-financial domestic firms in Belgium between 1839 and 1935, a period in which drastic changes in regulations took place. In chapter 4 the determinants for the offering method and its effect on the level of underpricing are examined for Dutch non-financial firms in the Interbellum years, a period with presumably low levels of information asymmetries between issuing firms, financial intermediaries and investors. In the remaining part of this introduction the analyses of these aspects and their main results are described in more detail.

1.1 What causes hot markets for equity IPOs?

A vibrant market for public equities can facilitate and drive economic growth (Van Nieuwerburgh *et al.*, 2006) and in order for public markets to grow within a country's financial system, new listings are essential. It is therefore important to understand which firms apply for a listing, what their motives are and what determines the clustering of stock IPOs in time in so-called hot markets. These aspects are investigated in chapter 2 of this thesis with data

of 1,263 stock IPOs of Dutch non-financial firms that received a listing between 1876 and 2015.

It is generally known that the number of stock IPOs fluctuates over time and that periods can be characterized as so-called hot and cold markets with respectively many and few IPOs (among others Ibbotson and Jaffe, 1975). In the literature on economic history, the fluctuations and hot markets have been studied typically over a short period of time which often have specific characteristics (among others Burhop *et al.*, 2011). Hot IPO markets have also been studied in the financial literature, but mainly over relatively short and recent periods of time for the US market (among others Ritter and Welch, 2002). Some researchers claim that firms use the proceeds of IPOs to finance investment opportunities and because these opportunities vary with the business cycle, the number of IPOs fluctuates with them (see Choe *et al.*, 1993; Lowry, 2003; Pástor and Veronesi, 2005). Other theoretical drivers for IPOs are time-varying market conditions. The uncertainty of investors about the value of an IPO leads to adverse-selection costs which negatively affects the proceeds. Since this uncertainty varies in time, the number of IPOs fluctuates with it. As a consequence, IPO waves are preceded by high market returns (see Pástor and Veronesi, 2005; Banerjee *et al.*, 2013) and periods with negative market conditions are avoided (Choe *et al.*, 1993; Pástor and Veronesi, 2005; Banerjee *et al.*, 2013). The third theoretical driver is timing. According to this theory firms time their stock issue to coincide with favorable market conditions and is the clustering in time for example linked to a temporary overvaluation proxied by the stock market level (see Lucas and McDonald, 1990; Lerner, 1994; Pagano *et al.*, 1998; Banerjee *et al.*, 2013).

In chapter 2 of this thesis the causes of the fluctuation in stock IPOs and their clustering in hot markets are investigated. Unlike the existing financial literature and the literature on economic history, we use two complementary methods for our research. We first use an econometric model, based on Ordinary Least Squares regressions, to determine if the aforementioned theoretical drivers explain the fluctuation in the number of Dutch IPOs and their clustering in hot markets. In a second step we use an in-depth historical analysis to infer the causes of the hot markets that our model does not explain. Based on the econometric model, we find evidence that economic growth is a strong driver for IPOs, an indication that a motive for IPOs is to finance growth opportunities. We do not find a significant relation with the interest rate, a first indication that stock IPOs are not related to bonds. This relation is investigated further in chapter 3. In addition, we find that the number of IPOs throughout the entire period is strongly positively related to the stock market return in the year prior to the listing, an indication that IPOs are timed to coincide with periods with investors' enthusiasm, and negatively related to the volatility of this return, an indication that periods with great uncertainty among investors are avoided. We find no support for the claim that IPOs are timed on the basis of a temporary overvaluation, indicated by a high stock market level. Moreover, we find evidence that the role of the Amsterdam Stock Exchange in the Dutch capital market influences the number of IPOs.

The econometric model explains about 50 per cent of the fluctuation in the number of IPOs and five of the eight observed hot IPO markets. With detailed contextual descriptions, supported by views of contemporaries in the financial press, we find that the essential drivers of the three unexplained hot

markets are industry-specific. The firms that went public in these hot markets had either high capital needs which were unrelated to the overall economy or used a window of opportunity in which investors were optimistic about their industry in combination with lower listing requirements.

1.2 Going Public

The research in chapter 3 of this thesis is an extension of that in chapter 2. In this chapter, we specifically focus on whether IPOs of stocks and bonds are related, and whether the motives and timing of the application of these two financial instruments are affected by regulatory changes. As for stock IPOs, it is known that also the number of bond issues fluctuates over time (among others Becker and Ivashina), but the literature on these fluctuations is not as extensive as for stock IPOs. Hale and Santos (2008) find that firms time bond IPOs to avoid recession periods but that there is no timing outside these periods. Becker and Ivashina (2014) find that monetary policy and changes in the supply of bank credit are also relevant because bank loans are an alternative for bond issues and Pour (2017) finds effects of information asymmetry on the timing of bond IPOs.

Stock and bond issues can be substitutes or complements and how a firm chooses between equity and debt is hotly debated. The trade-off theory predicts that firms prefer to increase their debt with bond issues as long as the tax advantage of debt outweighs the costs of financial distress. The alternative pecking-order theory predicts that bond issues are preferred to receive the highest proceeds due to the information premium investors require for stock issues (Myers, 1984). Baker and Wurgler (2002) claim that firms time their IPO to coincide with favorable market conditions and because the market conditions for stocks and bonds do not change in sync,

preferences for a stock and bond issue differ over time. Glushkov *et al.* (2018) find evidence that firms are more likely to go public with debt than with equity if they have assets that are better suited for a financial statement analysis and if they are backed by venture capital or a private equity firm.

We are aware of only two papers examining the effect of regulatory changes on fluctuations in the number of stock IPOs. Gao *et al.* (2013) find that the reduction in the number of IPOs in the US between 2001 and 2012 cannot be explained by tighter regulation, such as the Sarbanes-Oxley Act of 2002, and that a reduction of the regulatory burden on small firms did not increase the number of IPOs of these firms. Cattaneo *et al.* (2015) study all 879 Italian IPOs from the unification of Italy in 1861 until 2011 and conclude that easing regulation does not increase the number of IPOs. To our knowledge no recent paper has examined the effect of regulatory changes on fluctuations in the number of bond IPOs.

For our research, we take a historical approach and link IPOs of stocks and bonds, two financial instruments which are usually dealt with separately in the existing literature. The data comes from IPOs issued in Belgium between 1839 and 1935, a period that provides an opportunity to study the effects of an abrupt and drastic relaxation of stock market regulations in 1873. During this period, Belgium was one of the most industrialized countries in the world (measured by industrial production per capita) and the Brussels Stock Exchange was one of the world's leading stock exchanges (Buelens, 2001). It also was a period with poor investor protection, no tax distortions and a period with significant changes in the overall monetary situation. For our analysis, we construct a dataset of 922 stock and 387 bond IPOs that are issued by 943 domestic non-financial firms

with their main activities in Belgium. We start with an analysis of the number of stock and bond IPOs separately. For this we use time-series regression models with economic, timing and institutional explanatory variables, for the full period and for two subperiods 1839-1872 and 1873-1935. This allows us to examine the effects of the change in 1873. We then use a 3SLS model (Zellner and Theil, 1962) to test the interaction between stock and bond IPOs, to determine whether they are substitutes, complements, or unrelated.

Our key findings are that in a well-developed securities market, IPOs of stocks and bonds are timed to benefit from favorable market conditions and that the number of IPOs fluctuate with the business cycle. We also find that firms prefer to first issue stock, especially in expansive phases of the economy. We find no evidence for claims that IPOs of stocks and bonds are complementary or substitutes, but we do find support for the finding of Gao *et al.* (2013) and Cattaneo *et al.* (2015) that easing regulation does not directly lead to an increase in the number of IPOs. However, it is likely that the drastic easing of stock market regulations in 1873, triggered an economic development in Belgium that led to a booming IPO market in the following decades.

1.3 Determinants of the offering method and its effect on underpricing

Whether to use the services of an underwriter for offering shares to investors prior to a listing, has recently attracted the attention of the financial media with the direct listings of unicorns such as Spotify and earlier with the Dutch Auction used for the IPO of Google.⁴ The debate in the financial literature

⁴ For example “Spotify goes for gutsy direct listing on stock exchange – here are the winners and losers”, THE CONVERSATION, Academic rigour, journalistic flair, April 4, 2018, via

on the benefits of having an IPO underwritten, is rooted in studies on underpricing of the 1980s (for example Beatty and Ritter, 1986). The assumption in these studies is that privately held information by the parties involved in the equity market, is the main cause of underpricing. One of the fundamental models that tries to explain underpricing is, according to Lowry *et al.* (2017), the ‘winner’s curse’ model (Rock, 1986). This model focusses on information asymmetry between the issuing firm and investors and links underpricing with investors’ uncertainty of the market value of the shares and with the homogeneity of the group of investors. Because an underwriter can act as an information producer, helping to reduce the adverse impact of this asymmetry, the underpricing of underwritten IPOs is lower (Chemmanur and Fulghieri, 1994). However, underwriting is expensive (Goergen *et al.*, 2006) and because underwriters have valuable reputations to protect and this reputation is damaged every time they inaccurately price an issue (Beatty and Ritter, 1986), reputable underwriters engage in underwriting contracts with less risky firms.

In the interwar period in the Netherlands, it was not uncommon for firms to go public without using the services of an underwriter. Also, direct listings were a regular occurrence. According to Renooij (1951) the choice of having an IPO underwritten depended on the risk that was associated with the issue. A firm opted for a non-underwritten IPO if the risk of the failure of the issue could be borne by the firm or when the firm could not find an underwriter because of excessively high risk associated with the issue. This is interesting because these criteria are quite similar to modern day criteria

<https://theconversation.com/spotify-goes-for-gutsy-direct-listing-on-stock-exchange-here-are-the-winners-and-losers-94209>

(see Chemmanur and Fulghieri, 1994) while the level of information asymmetry in the Interbellum was probably low due to long-term relationships between firms and banks (Van den Broeke, 1988; Jonker, 1989) and investors, and the presumed absence of uninformed investors.⁵ This raises the questions of how well contemporary theories can explain the choice of the offering method in the Interbellum and what the effect is of this choice on underpricing. To answer these questions, 167 stock IPOs that were issued in the period 1918-1939 in the Netherlands by non-financial domestic firms are studied in chapter 4 of this thesis.

The results of the study show that the fraction of the volume of the IPO that was offered to investors prior to the listing, is the main determinant for the choice of the offering method. The smaller this volume is, the more firms use a non-underwritten offering. This finding has two implications. First, firms may take the risk of a failure of the issue into account when deciding on the offering method. With smaller offerings, this risk can be borne more easily by the firm itself. Second, the costs associated with underwriting could also be relevant for the offering method. Because the total cost for an underwritten contract makes up a large portion of the amount raised (Goergen *et al.*, 2006), an underwritten contract seems less suitable for small volumes.

The results of the study also show that the level of underpricing was relatively low, on average six percent, and that the level for the individual

⁵ The higher the offering price of one share, the more wealth-constrained investors are excluded (Burhop, 2010). As a result, the price of a share is a proxy for the homogeneity of the group of investors. Because the nominal value of one share was NLG 1,000, and a weekly salary of a dock worker in 1930 was NLG 35.42, the group of investors was more homogenous than today and probably consisted only of wealthy and experienced investors. Salary via: CBS <https://www.historisch.cbs.nl/detail.php?id=117382485>

IPOs is unrelated to firm characteristics, the offering method, the reputation of the underwriter and the volume of the offering or the issue. Underpricing mainly fluctuated with stock market returns and volatility in the year prior to the listing. This implies that information asymmetries in the equity market were not determinative for the level of underpricing. It may also imply that offering prices were consistent with their economic values and that any overvaluation was only temporarily, attributed to a speculative appetite of investors.

1.4 Acknowledgement

Chapter 2 is based on joint work with Abe de Jong. We thank Carsten Burhop, David Chambers, Ton de Graaf, Marc Deloof, Joost Jonker, Christopher Meissner (the editor of *European Review of Economic History*), two anonymous reviewers, Peter Roosenboom and participants of the Economic History Society Annual Conference (University of York) and the Eurhistock Conference (University of Antwerp) for their comments and discussions. Chapter 3 is based on a joint work with Marc Deloof and Abe de Jong. We thank Peter Roosenboom and Gertjan Verdickt for helpful comments and Frans Buelens for his comments on the description of the institutional setting of Belgium and for providing the raw data. Chapter 4 is entirely my own work. I thank Abe de Jong and Peter Roosenboom for comments and feedback.

2 What causes hot markets for equity IPOs?

2.1 Introduction

In economic history, the role and development of public capital markets is an important topic (Michie, 2006). These public markets are crucial for funding firm investment and growth, in addition to private capital that is provided, among others, by banks (Levine and Zervos, 1998). At the same time public capital markets are accessible to all investors, from small retail investors to large institutions (Merton and Bodie, 1995). Public capital markets grow when firms decide to go public. For a country's financial system, a vibrant market for public equities is important to facilitate efficient allocation of capital and opt-out options for entrepreneurs. To make an initial public offering (IPO) is an important decision for firms and is considered to be a driving force for a firm's development by getting access to public capital markets. An interesting phenomenon is a hot IPO market, which arises because IPOs cluster in time (Lowry, 2003). In this chapter we aim to understand the growth of public capital markets through the occurrence of IPOs in hot markets.

Recently, several economic and financial historians have investigated IPOs in specific institutional settings and eras. In particular, the UK market has been thoroughly investigated. The seminal paper by Chambers and Dimson (2009) has documented the UK IPO market in most of the 20th century and measures underpricing as a metric for market efficiency. The authors show that over the century underpricing has increased, from 3.8% in 1917-1945 to 9.2% in 1946-1986. Chambers (2009) further investigates the post-1945 IPO market and demonstrates several market failures, which explain the increased underpricing. In further contributions to the

understanding of the UK IPO market, Chambers studies the effects of self-regulation by the London Stock Exchange (Chambers, 2010, Burhop, Chambers, and Cheffins, 2014). In a series of three studies for the London Stock Exchange, Fjesme, Galpin, and Moore study an earlier period, starting in the late 19th century. They find that the exchange plays a vital role in funding old and new firms and industries (Fjesme *et al.*, 2019), that the exchange was effective in screening firms that were admitted or rejected (Fjesme *et al.*, 2021a), and that the networks of directors contribute to better IPO outcomes Fjesme *et al.* (2021b).

The result for the UK that early public markets were remarkably efficient, is confirmed in studies for the German market. Burhop (2010) finds for the Berlin Stock Exchange between 1870 and 1896 average underpricing to be less than 5%. Fohlin (2010) confirms that investors in Germany's new stock issues in the 1880s experienced low spreads. Also, Lehmann-Hasemeyer and Streb (2016) show that innovative firms in the period 1892-1913 could rely on the Berlin stock market as a financing source and faced low underpricing. Lehmann (2014) attributes the efficiency of the early market to competition among a small group of banks and tight underwriting regulation, keeping fees low. Burhop and Lehmann-Hasemeyer (2016) document for 1913 the importance of regional markets, in addition to the Berlin Stock Exchange, for smaller companies. It is interesting that few studies exist for the early US market. An exception is Wright (2002), who studies the period 1781–1861 and again shows that unregulated IPO markets can function efficiently. In the finance literature, US IPOs have been studied over relatively short and recent periods of time (see Ibbotson, 1975; Ritter and Welch, 2002; Lowry, 2003). We are aware of one paper on Italy, where

Cattaneo, Meoli, and Vismara (2015) study all 879 Italian IPOs from the unification of Italy in 1861 until 2011, and conclude that tighter regulation improves IPO survival rates.

The literature on the history of IPOs reveals that already in the 19th century highly efficient markets for new equity existed in Western Europe and the US. While the existing studies demonstrate that IPOs have played an important role in funding companies and were an efficient instrument to attract capital, little is known about the determinants of fluctuations over time in IPOs. In this chapter, we study IPOs in the Netherlands over a long period of 140 years. IPOs on the Amsterdam Stock Exchange in 1876-2015 were highly clustered and fluctuated widely from 49 offerings in the years 1917 and 1920, to years without any issues such as 1976 and 1977. We aim to understand fluctuations in the number of IPOs and in particular the clustering of IPOs in hot markets. We define a hot market as a year in which the three-year moving average of the number of IPOs is in the highest quartile of the data set (following Helwege and Liang, 2004).

We explain the yearly fluctuations in the number of IPOs by using two complementary analyses. We first use econometric modelling and estimate a time series regression to determine whether the fluctuations in the number of IPOs can be explained by time-varying economic and market variables that are considered to be drivers of the number of IPOs and clustering in time according to literature. Obviously, this model can only predict part of the time-series variation in the number of IPOs. We thus use the model to predict the number of IPOs and then compare predictions with the actual number of issues. As a result, we can define hot periods that were predicted by the fundamentals in our model, but also hot periods that were

not predicted by the model. We conduct an in-depth descriptive analysis to explain the hot markets that cannot be explained by our econometric model.

We find evidence with our time-series model that economic growth is a strong driver of IPOs, consistent with previous studies using recent data (Lowry, 2003; Pástor and Veronesi, 2005). Next, we find that the number of IPOs depends on time-varying market conditions. Throughout the whole period, the number of IPOs is strongly positively related to stock market past returns and negatively associated with the volatility in stock market returns, which indicates uncertainty. We find no support that IPOs are timed based on a temporary overvaluation, indicated by a high stock market level. Finally, we find evidence that the size of the stock exchange positively affects the number of IPOs. The model can explain about fifty per cent of the variation in the number of IPOs.

We observe eight hot markets, where the number of IPOs (three-year moving average) is in the upper quartile of the distribution. Five of these hot markets can be explained by our time series model, mainly because these are years with high GDP growth and increasing stock prices. With further descriptive analyses we try to understand the other three hot markets that our model fails to explain. The main reason for this is that our model assumes that the fluctuations are driven by general economic and market conditions that affect all industries in the same way. Jain and Kini (2006) argue that this is not the case: hot markets can be dominated by a specific industry. Another reason is that our model does not consider the effect of institutional changes. To overcome these limitations, we infer additional causes of hot markets from detailed contextual descriptions. We find evidence that industry-specific aspects and institutional shifts are essential drivers of hot markets.

The increasing role of firms active in the Dutch East Indies in the Dutch and global economy at the end of the 19th and beginning of the 20th century led to several years with hot IPO markets. Also, the third industrial revolution in the fourth quarter of the 20th century led to a hot IPO market. The preference of investors for information technology-based firms in combination with lower entry requirements for a listing also triggered years with hot markets.

Our contribution to the economic and financial history literature on IPOs is that we focus on the determinants of IPOs, rather than the pricing and the role in the funding of firms. We show that general economic factors such as growth and financial market conditions, as well as industry-specific capital needs, explain the number of IPOs over time. Our work contributes to previous work that primarily focused on the efficiency of the IPO market by addressing the question of why firms decide to go public. In further research, we hope that research will continue on this path by comparing IPO firms with private firms to explain IPO determinants at the firm level. We also hope that subsequent research will apply our methods in other settings in order to facilitate comparative studies.

2.2 Background

2.2.1 Going public

Firms use long-term capital to finance investment opportunities and future growth. Because there are more opportunities in an upswing of the business cycle, the demand for long-term capital is higher than in a contraction phase. As a consequence, IPO volume and the number of IPOs vary with the business cycle. Using recent US data, Lowry (2003) finds that changes in firms' demand for capital explain a substantial portion of the variation in IPO

volume. It should be noted that historical research has found that stock market funding is not a necessary condition for economic growth (Jansson, 2018). Clustering of IPOs also occurs when firms time equity issues based on favorable market conditions in order to receive the highest proceeds (Baker and Wurgler, 2002). The market value of stock increases when stock prices rise, and the market value of bonds increases when interest rates drop. Pástor and Veronesi (2005) present and empirically test a model in which the number of IPOs fluctuates by time variation in market conditions. They find, again for a sample of recent US IPOs, that the number of IPOs is related to the business cycle via time variation in expected aggregate profitability and that IPO waves are preceded by high market returns since the cash flow expectations of investors go up. In addition, they find that negative market conditions for equity issues are also determinative, so that in periods with high market uncertainty, investors are reluctant to participate in IPOs.

A hot IPO market is characterized in the literature by an unusually high volume of offerings, severe underpricing, frequent oversubscription and a high participation of retail investors, in a specific period. According to Helwege and Liang (2004) there is not much difference between the dominant industries in hot and normal markets, indicating that hot markets are driven by overall market conditions. Other authors have noted that firms tend to go public in waves, with many firms in the same industry going public around the same time. According to Pagano, Panetta, and Zingales (1998), Italian firms at the end of the 20th century issued an IPO in times when the market-to-book ratio of listed firms of the same industry is high, and Lowry (2003) states, based on late-20th century US data, that because the positive sentiment among investors for certain IPOs is more valuable for firms in the

same industry, hot markets may be dominated by a specific industry. In addition, technological developments normally do not arrive at a constant pace and are not distributed equally over all industries, which could also be a cause that hot markets may be dominated by a specific industry (Pástor and Veronesi, 2005).

2.2.2 The Dutch economy

Since the end of the nineteenth century, the Dutch economy went through three phases (Smits *et al.*, 1999). The first phase is the so-called first industrial revolution. Being a country of traders, the opening of the Suez Canal in 1869 was of great importance as it reduced the journey by sailboat between the Dutch East Indies and the Netherlands. With the opening of the *Nieuwe Waterweg* in 1872 and the *Noordzeekanaal* in 1876, canals that connect the harbours of Rotterdam and Amsterdam with the North Sea, respectively, large ships from all over the world could now enter these harbours. The port of Rotterdam became a hub for the transit of goods towards Germany, the UK and the US. Many of these goods came from the Dutch East Indies. With the gradual abolishment of the so-called *Cultuurstelsel* in 1870, the monopoly of the Dutch Government to invest in and trade with the Dutch East Indies, was lifted. This attracted many Dutch entrepreneurs to start a firm, and from the end of the 19th century the number of firms active in the Dutch East Indies grew spectacularly.

In 1913, the 2nd industrial revolution started with the widespread use of electricity. The role of the Dutch East Indies in the economy was still increasing but temporarily interrupted by the First World War. However, being neutral during this war turned out to be very profitable. When the war had ended, the production capacity was still in place, and since this was not

the case in the surrounding countries, growth opportunities were high in a booming economy. Like in the First World War, the Dutch government tried to stay neutral during the Second World War. However, in May 1940 Germany invaded the Netherlands, and this occupation lasted until May 1945. The Second World War had a devastating effect on the Dutch economy, and GDP decreased in this period with more than 50 per cent; much of the infrastructure was destroyed. After the war and the independence of Indonesia, the government developed a plan to change the structure of the industries from an agriculture-orientated into an industrial-orientated economy (Van Zanden, 1997). This triggered an era of modernisation. The 3rd phase of the industrial revolution started in the Netherlands in the 1980s when ICT became a dominant technology and most Dutch firms are in the commercial services sector (Sluyterman, 2003).

2.2.3 The Dutch capital market and the Amsterdam stock exchange

In May 1876, a new era started for the Amsterdam Stock Exchange with the establishment of the *Vereeniging voor den Effectenhandel*. Its goal was to create a stock market that was only accessible for members in order to bring structure and regularity into trading and to better look after the interest of investors (De Vries, 1976). Until then, the stock market at the *Groote Koopmansbeurs* was sometimes chaotic as a result of the unlimited access of public and traders. The prices for which securities were traded were often unclear, which frequently gave suspicions of fraud. At the start in 1876 the *Vereeniging* had 286 members and in the first year the total number of members already grew to 465 (De Vries, 1976). The *Vereeniging* drew up rules for trade and published daily prices, and in 1903 listing requirements

and a vetting process were formalized (De Jong and Röell, 2006). In 1876, the main listings on the Amsterdam stock exchange were from foreign government bonds and stocks and bonds of Dutch and foreign railway companies and banks.

The stock exchange was built on self-regulation, as from the end of the 19th century the Dutch government had a *laissez faire* approach for the economy. The government regarded it best to abstain from intervening and let market forces work freely. Exchange-listed firms were *naamloze vennootschappen*, i.e., corporations, and the only limitation was that a Royal approval was needed to start a limited liability firm (Westerhuis and De Jong, 2015). To have its shares listed, the issuing firm needed the services of one of the members of the *Vereeniging voor den Effectenhandel* (De Vries, 1976, page 147). The application for the listing needed to be filed by one of these members within 24 hours after a notice was published in a national paper, stating that subscriptions for the shares will be accepted and that a request for a listing of the shares would be submitted. Together with the application the member had to hand over several documents, including the prospectus of the issue and the firm's articles of association, balance sheet, income statement and the latest annual report. In order to have a price published in the *Officieele Prijscourant* (the official price current), the volume of the issue needed to be at least 500,000 Guilders and 25% of the placed capital. The exchange did not impose minimum size criteria.

Between 1890 and 1918 the banking system in the Netherlands expanded rapidly (Jonker, 1996). When the *prolongatiemarkt* (on-call market) became obsolete in the late 1920s, more deposits flowed to commercial banks and these banks began to develop industrial finance,

coupled with accelerating their move into branch banking (Jonker, 1996). Dutch banks were underwriters of new issues, usually in a consortium in which one of the participating banks takes on the role of lead underwriter. In the late 19th and early 20th century this consortium usually bought the shares from the issuing firm, offered these shares to investors and listed the shares on the stock exchange. Later on, this consortium only acted as a conduit (De Jong and Röell, 2006). It should be noted that in the Netherlands there were no restrictions on combining commercial and investment banking, unlike the Glass-Steagall Act of 1933 in the US. By 1913, the Netherlands had one of the largest stock markets, when compared to GDP, in the world. Rajan and Zingales (2003) find a ratio of stock market capitalization to GDP of 0.56, which is higher than the US (0.39) and Germany (0.44), but below the UK (1.09) and Belgium (0.99). The banking sector was relatively small with deposits/GDP at 0.22, while the US has 0.33, Germany 0.53, the UK 0.10 and Belgium 0.68).

The liberal vision of the government changed when the government regulated the stock exchange with the Stock Exchange Law in 1914.⁶ The influence of the government increased even more during the Great Depression, and since then the Dutch economy can be considered a coordinated market economy in which the government played an important role (Sluyterman, 2003). The Royal approval that limited liability firms needed was replaced in 1928 by a statement of no objection by the Minister of Justice. With a law reform in 1928 the rules on disclosure of information

⁶ The state of emergency that arose as a result of the First World War, led to the Stock Exchange Law of 1914. With this law, the stock exchange was placed under the supervision of the Minister of Finance. Although this law initially had a temporary character, it turned out to be of very long duration in practice.

also changed. The legal position of investors was strengthened and the liabilities of the management of the issuing firm and its underwriter were enlarged in case of omissions in the prospectus (Van Lutterveld, 1933). In the meantime, with a sharp downturn in the economy in the early 1920s many banks ran into severe difficulties and withdrew themselves from industrial financing (Sluyterman, 2003, Colvin *et al.*, 2015).

Between 1876 and the early 1930s the number of listed securities increased dramatically, for which the obsolescence of the *prolongatiemarkt*, the most important system within the Dutch credit system in the beginning of the 20th century, gave an extra impulse. Since that period, the listings on the Amsterdam Stock Exchange reflect the most important sectors of the Dutch economy. The number of listed firms active in the Dutch East Indies grew every year. Rajan and Zingales (2003) report for the Netherlands in 1938 a market capitalization to GDP ratio of 0.74.

After the Second World War, the stock exchange was an important source of funding.⁷ The Amsterdam stock Exchange expanded between 1953 and 1976 and globalized between 1976 and 1985 (De Vries, 1976). From the commercial code introduced in 1838 onwards, the dominant vehicle for companies had been the *naamloze vennootschap*, because this was the only corporate form to offer limited liability. However, in 1971 a new company form was introduced: the private limited liability company (*besloten vennootschap*), for which no special approval was needed. Due to this, many

⁷ Due to the general panic caused by the German invasion of the Netherlands, the stock exchange in Amsterdam was closed from May 10, 1940 until July 15, 1940 and active trading was limited from December 8, 1941 until December 16, 1941 when the war broke out in the Far East. On September 5, 1944 trade came to a halt due to war activities in the south of the Netherlands and it took until January 7, 1946 before any trade could take place. On April 1, 1947 all limitations on trading were lifted (De Vries, 1976).

firms changed into private companies and newly founded companies chose in most cases not for a limited liability form. In the meantime, the listing requirements for the Amsterdam Stock Exchange are similar to other exchanges: a minimum float of at least 25 per cent, a value of shareholders' equity in excess of 10 million Guilders, and a track record of at least five years (De Jong *et al.*, 2014).

From the 1960s onwards, banks had become larger due to mergers, which was considered to be a risk by the central bank, *De Nederlandse Bank* (DNB). To mitigate this risk, guidelines used by DNB were converted into legislation in 1978. In 1990, legislation on banks was eased when Dutch legislation was aligned with EU-guidelines. As a consequence, the main banks merged into three dominant banks (ABN-Amro, ING Bank and Rabobank) and became global banks.

In the final quarter of the 20th century the stock market seems to lose its importance for the Dutch economy. Rajan and Zingales (2003) observe a market capitalization to GDP ratio of only 0.19 in 1980 and the number of listings decreases. However, the listed firms in the latter part of the 20th century are much larger and include some of the world's largest multinationals, such as Royal Dutch-Shell, Unilever, and Philips. After a surge in stock prices the market capitalization to GDP ratio is 2.03 in 1999. In addition to the large firms, the exchange is also aiming to attract smaller new firms: on the 28th of January 1982, the Official Parallel Market started with 11 listed firms and because this second-tier market had lower entry requirements the number of listings grew in the next years mainly with small firms.⁸ The intention was that these firms would grow and subsequently be

⁸ Officiële Prijscourant January 28, 1982.

included in the official listing. However, not much came of that. As of October 1st, 1994, no new firms were admitted and the majority of the firms that were already listed were transferred to the official listing.⁹ At that time Amsterdam Exchanges was the fifth largest stock exchange in Europe and the ninth largest in the world.¹⁰ On March 24th, 1997 the first firm got listed on the *Nieuwe Markt Amsterdam Exchanges* (NMAX), which was a new market for smaller firms.¹¹ In 2000, Amsterdam Exchanges merged with the stock exchanges of Brussels and Paris into EuroNext and in 2007 EuroNext merged with the New York Stock Exchange.¹²

2.3 Data

In this section the main sources of the data are described, as well as our variables. We define a year with a hot market as a year in which the three-year moving average of the number of IPOs is in the highest quartile of the data set, following Helwege and Liang (2004).¹³

The time series for the number of stock IPOs per year is constructed as follows. The number of IPOs from 1903 to 2005 is based on the *Gids bij de Officiële Prijscourant*. For the IPOs for which the issue date is unknown, the year of the IPO is assumed to be the first year that a firm is mentioned in this yearly publication. To determine which firms were introduced from 1876

⁹ “Bijna alle fondsen van Parallelmarkt naar grote beurs”, Trouw, September 29th, 1994.

¹⁰ Annual Report Amsterdam Exchanges, 1997.

¹¹ Officiële Prijscourant March 24th, 1997. The NMAX merged with Euro.NM, the European platform for young dynamic firms, in October 1997. At the end of 1998, Euro.NM contained the NMAX in Amsterdam, Le Nouveau Marché in Paris, Die Neuer Markt in Frankfurt and Euro.NM Belgium in Brussels. Listings on the NMAX ended in 2004 and in November 2006 another tier for smaller firms was established: Alternext Amsterdam. This platform was also unsuccessful in the Netherlands and ended in 2014.

¹² Annual Report Amsterdam Exchanges, 1998.

¹³ Interestingly, there is no equivalent of a hot market for years with low numbers of IPOs. The notion of such a "cold" market is problematic, because the number of IPOs cannot be negative. This implies that outliers can only be found on the upside. We thank an anonymous referee for pointing this out.

until 1903, the listings published in the *Nieuw Algemeen Effectenblad* or *Officiële Prijscourant* at the end of December of a year is compared with the listings published at the end of December in the previous year. The same is done to determine the number of IPOs for the years 1946-1949, because the *Gids bij de Officiële Prijscourant* was not published. For 1945 no data is available. The data for 2006-2015 is taken from the database *Review and Analysis of Companies in Holland* (REACH) and EuroNext. IPOs on the Official Parallel Market (between 1982 and 1994) and on the NMAX, (between 1997 and 2004) are based on data provided by EuroNext.¹⁴ IPO-dates are from the *Gids bij de Officiële Prijscourant*, *Nieuw Algemeen Effectenblad*, *Officiële Prijscourant* and EuroNext. Each IPO from a Dutch firm is classified in an industry and sector according the *Standaard Bedrijfs Indeling* (CBS, 2008).

In our study IPOs of financial firms (banks, insurance companies, real estate firms, and investment funds) are excluded because in our economic model we focus on explanatory variables that relate to non-financial firms. For example, the GDP growth relates much more to activities in industrial, trade and service activities, than financial intermediation. Also, financial variables such as stock returns and interest rates affect the funding of non-financials in a straightforward way, that does not apply to, for example, banks and investment funds. Although we omit financial firms, it would be very interesting to conduct a similar analysis for financial firms.

We expect that fluctuations in number of stock IPOs are positively related to fluctuations in the business cycle, which is proxied by GDP growth.

¹⁴ Our time series contains 58 IPOs that were listed on the Official Parallel Market and 16 on the NMAX.

The time series for this is based on data from CBS.¹⁵ Since debt is an alternative for a stock issue, we expect a positive relation between the fluctuation in the number of stock IPOs and the long-term interest rate. Next to the long-term interest rate we add the yield curve, or interest rate structure, as a variable. The yield curve is the spread between the interest rates on bonds with different maturities. Its slope is supposed to predict the development of future short-term interest rates (Estrella and Hardouvelis, 1991). According to the expectation's theory, a rolling investment in short-term bonds is a perfect substitute for a single investment in a long-term bond, for the same period. According to this theory the yield curve represents investors' expectations of future interest rates and is the current long-term interest rate (minus a liquidity premium) considered to be the average of the successive expected short-term interest rates (see Omondi, 2016). In the situation where the long-term interest rate is higher (lower) than the short-term interest rate, investors' expectation is that the future short-term interest rate will rise (decline), causing future bond prices to decrease (increase). We therefore expect that the number of stock IPOs is positively related to the yield curve. The short-term interest rate is defined as the interest rates for debts with a

¹⁵ Our time series for GDP is based on Tweehonderd jaar statistiek in tijdreeksen 1800-1999 (CBS, 2001), chapter 9. We received the file with the data and used column 17. For the missing values in this time series in the years 1914 until 1922 the yearly mutations in the for consumer index corrected National Income are used from 111 jaar statistiek in tijdreeksen 1899-2010 (CBS, 2010), table 7a, page 86, Nationaal Inkomen netto marktprijzen and table 17, page 180, consumenten-prijnsindex, and aligned with the other data. The value for 1930 and 1969 is calculated as the average value of the previous and the next year. For the missing values of 1940 until 1949 the values of the changes in the Net Domestic Product of the same years (column 16 in the data file from CBS) are used and aligned with the other data. From 1995 up and including 2015 the data from Statline is used and aligned.

maturity of one year or less.¹⁶ The long-term interest rate is defined as the interest rates for debts with a maturity of more than one year.¹⁷

We expect that the number of stock IPOs is positively related to the growth in the stock market level and negatively related to the volatility in this percentage of growth as a proxy for market uncertainty. We proxy the level of stock market prices by a time series for an equity index.¹⁸ Since the increase of the stock market index is partially caused by inflation (Lerner, 1994), we use an index that is deflated by the purchasing power of the Dutch Guilder or Euro.¹⁹ The yearly return in the stock market index is calculated by dividing the yearly absolute growth in stock level by the absolute value of the level from the previous year. The volatility is calculated as the variance over the past two years and the year itself. For both the return and volatility we use the original values (not corrected for inflation) of the stock market level. We add the variable stock market development because this affects the allocation of financial resources. Since firms have several means to obtain

¹⁶ Our time series for the short-term interest rate from 1876 until 1996 is based on Tweehonderd jaar statistiek in tijdreeksen 1800-1999, column 2, page 101 (CBS, 2001). The interest rate for 1914 is calculated as the average interest rate from 1913 and 1915. For the years 1996, 1997 and 1998 the interest rate of the Aibor (DNB Statistisch Bulletin March 2000, page 70, Aibor Twelve months) is used and for the years 1999 until 2016 the interest rate of the Euribor (DNB Statistisch Bulletin, Euribor Twelve months) is used.

¹⁷ Our time series for the long-term interest rate from 1876 until 1996 is based on Tweehonderd jaar statistiek in tijdreeksen 1800-1999, column 1, page 101 (CBS, 2001). The missing interest rate for 1945 is calculated as the average interest rate from 1944 and 1946. For the years 1996 until 2016 the interest rate for Dutch 10-year Government Bonds (DNB Statistisch Bulletin, Kapitaalmarkt-rentevoeten, most recent ten years) is used.

¹⁸ Our time series for stock market level is from 1899 until 2010 based on 111 jaar statistiek in tijdreeksen 1899-2010, table 16b, page 172 (CBS, 2010). The index from 1899 is in this time series set to 100. The values for 1945 and 1946 are calculated via linear interpolation. For the years 1876 until 1889 the values from Index Aandelen: De Algemene Banken en het Effectenbedrijf 1860 – 1914 (Geljon, 2005, Attachment 5) are used. The index from 1860 is in this time series set to 100. This time series is aligned with the first one. The data from 2010 until 2016 comes from the all Share Index Nederland (DNB, 2016) and aligned.

¹⁹ Our time series for inflation from 1876 until 2011 comes from the International Institute of Social History, value of the Guilder/Euro on www.iisg.nl. The time series from 2011 until 2016 comes from CBS.

finance, more firms will publicly issue stock when stock markets become more important in a country's capital market. An indicator of the importance is the ratio of the number of publicly traded domestic firms, whose stock is publicly traded in a domestic stock exchange to the country's population in millions (Rajan and Zingales, 2003). We therefore expect that the number of stock IPOs is positively related to this ratio.²⁰

2.4 Methods

In order to explain yearly fluctuations in the number of IPOs and especially the causes of hot markets, we first develop a time-series regression model with the number of offerings as our explained variable. We thus run time-series regression models to explain the number of IPOs and apply three-year moving average values of the explanatory variables for the two years before the IPO and the year of the IPO. We also use yearly values with a lag of one year in a robustness check. Since we have no data for the size of the IPOs, we cannot perform a robustness check with the IPO volume. When time series are non-stationary, there is a heightened risk of spurious regressions and the regression estimators are likely to be adversely affected (Dougherty, 2007). To overcome this problem, Lowry (2003) and Pástor and Veronesi (2005) de-trend the time series of IPOs by deflating the number of IPOs in a

²⁰ Our time series for the total number of listed funds on the stock market in Amsterdam from 1876 to 1898 is based the Nieuw Algemeen Effectenblad from the end of December of each year. The data from 1898 until 1889 and from 1941, 1943 and 1945 are based on the database from Record Management & Archives from NYSE EuroNext. The data from 1900 until 1962 comes from the annual report from the Amsterdam stock exchange of 1961. The value for 1940 comes from Een Eeuw vol Effecten (De Vries, 1976, page 126) and the values of 1942 and 1944 are calculated via linear interpolation since no data is available for those years. The data from 1962 until 1998 comes from several annual reports from the Amsterdam stock exchange and from 1998 to 2005 from the Officiële Prijscourant from the end of December of each year. The data from 2005 until 2016 come from the EuroNext Factbook 2011 and 2015. The time series for the inhabitants of the Netherlands from 1876 to 1998 is based on Tweehonderd jaar statistiek in tijdreeksen 1800-1999, chapter 2, page 14, table 2, column 1. From 1998 until 2016 the data is used from Statline Bevolking kerncijfers (CBS, 2016).

certain period by the number of public firms at the end of the previous period. Because the correlogram of the first order autocorrelation of our IPO time series shows no signs of a non-stationarity and because we added the number of listed funds per million inhabitants as a variable to our model, we do not de-trend. In addition, Dickey-Fuller Generalized Least Squares tests are performed (Elliot, Rothenberg and Stock, 1996) to verify stationarity. The results show that the null hypothesis of a unit root in the time series of the natural log of one plus the number of stock IPOs is rejected for lags 1-3 at the 1% level.

The time-series regression allows us to estimate the relevance of economic, market and institutional variables on the fluctuation of stock IPOs. The time series of the IPOs obviously has a first order autocorrelation and therefore we use Newey-West estimators (Newey and West, 1987) instead of a standard linear regression model. We use the natural log of the values for the time series for stock market level and for the number of IPOs. In summary, the OLS-model for the number of IPOs in year t is:

$$LN(1+NO\ IPO)_t = Constant + \beta_1 GDP\ GROWTH_{t-t-2} + \beta_2 INTEREST\ RATE_{t-t-2} + \beta_3 YIELD_{t-t-2} + \beta_4 STOCK\ INDEX_{t-t-2} + \beta_5 STOCK\ RETURN_{t-t-2} + \beta_6 STOCK\ VOLATILITY_{t-t-2} + \beta_7 NO\ FUNDS_{t-t-2} + \varepsilon_t$$

The explained variable $NO\ IPO_t$ is the natural log of one plus the number of stock IPOs in year t . This variable is regressed on the values of the explanatory variables for growth in Gross domestic Product ($GDP\ GROWTH_{t-t-2}$), long-term interest rate ($INTEREST\ RATE_{t-t-2}$), spread between the long-term and short-term interest rate ($YIELD_{t-t-2}$), natural log of the stock

market index level ($STOCK\ INDEX_{t-t-2}$), stock market return ($STOCK\ RETURN_{t-t-2}$), volatility in stock market return ($STOCK\ VOLATILITY_{t-t-2}$), and number of funds, representing the level of development of the Amsterdam stock exchange ($NO\ FUNDS_{t-t-2}$).

This model does not fully explain the number of IPOs. Therefore, we confront the actual number of stock IPOs per year with the predicted number of IPOs from our model, in the second part of our analysis. By identifying periods in which the differences between predicted and actual numbers are large, we investigate whether additional period-specific motivations for an IPO emerge. Here, our approach adds detailed context and narratives. A key source for this analysis is Delpher, a repository of digitized newspapers. We use key words searches to find discussions among contemporaries about IPO activity.

2.5 Descriptive statistics

In Table 2.1, Figure 2.1 and Figure 2.2 we describe our data set. The data shows that the number of IPOs clusters in time, but also in industries as depicted in Figure 2.2.

Figure 2.1 has the number of listed funds (for both stocks and bonds) on the Amsterdam Stock Exchange. Figure 2.2 shows that from the start in 1876, the number of IPOs increases and in the years around the First World War the number of IPOs reaches its maximum in 1917 and 1920. The large number of IPOs in the earliest years are consistent with patterns in other countries. For example, Van Nieuwerburgh *et al.* (2006) show similar findings in Belgium and Campbell *et al.* (2021) mention that in the UK between 1829 and 1929 thousands of companies were listed. Recessionary periods are also clearly visible, see for example the low number of IPOs in

the early 1930s. Another noticeable fact is that IPOs of firms active in agriculture emerge after 1880, but disappear in the 1950s. These are firms that are mainly active in the Dutch East Indies. In Table 2.1 we provide descriptive statistics.²¹ Our data contains in total 1,263 stock IPOs. Table 2.1 shows that the number of IPOs in a given year is nine on average. The mean GDP growth is 2.6 per cent and the average interest rate and yield are 4.4 per cent and 0.8 per cent, respectively. Periods with high interest rates are in the last decades of the twentieth century. Overall, these descriptive statistics are in line with the developments of the Dutch economy and stock market.

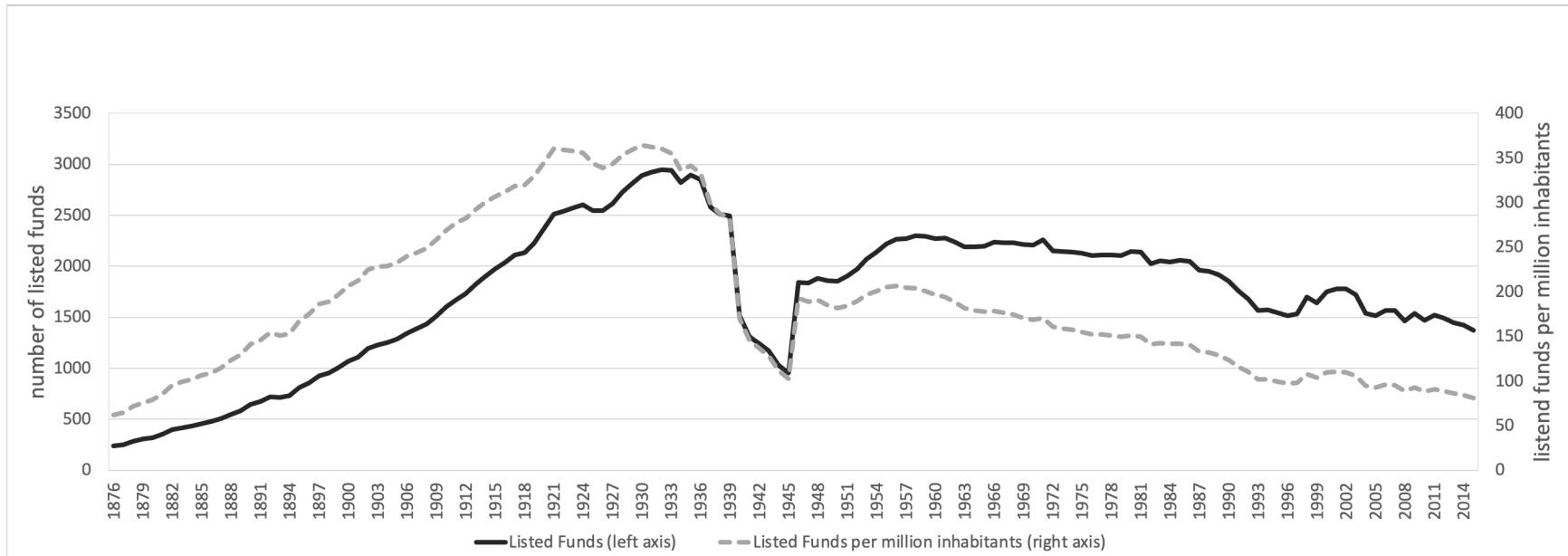
²¹ We have capped growth in GDP for our time series regression model at the 5th and 95th percentile of the raw data to prevent that the unusual high growth and decline rates in GDP around the First and Second World War influences our model too much. We have not removed other outliers or capped variables. We have investigated the correlations between the variables of the data and conclude that multicollinearity is not an issue.

Table 2.1: Descriptive statistics

Period/Statistic	NO. IPO	NO. IPO (2 nd tier)	GDP GROWTH	INTEREST RATE	YIELD	STOCK INDEX	STOCK RETURN	STOCK VOLATILITY	NO. FUNDS	NO. INHABITANTS	INFLATION RATE
1876-1890	81	0	0.7	3.7	0.2	70.4	-0.1	0.001555	414	4.21	-1.0
1891-1905	187	0	2.2	3.0	-0.1	90.2	3.0	0.002069	968	5.05	0.1
1906-1920	355	0	3.3	3.9	0.4	119.6	0.9	0.007818	1817	6.23	5.1
1921-1935	146	0	2.6	4.1	1.2	57.1	-6.4	0.021546	2726	7.74	-3.9
1936-1950	93	0	2.3	3.2	2.0	80.5	8.7	0.035901	1794	9.25	5.6
1951-1965	153	0	4.7	4.0	1.6	239.9	10.2	0.039324	2187	11.29	3.0
1966-1980	45	0	3.7	7.0	0.2	356.9	3.5	0.052096	2168	13.44	6.1
1981-1995	112	58	2.2	6.9	0.2	1150.6	13.3	0.043569	1877	14.85	2.4
1996-2015	91	16	1.9	3.8	1.2	4163.0	6.8	0.047220	1567	16.34	1.9
Average	9	0.5	2.6	4.4	0.8	826.7	4.5	0.028590	1719	10.05	2.1
St.deviation	9.1	2	3.6	1.6	1.3	1460.6	17.8	0.038104	686	4.29	4.5
Minimum	0	0	-5.1	0.7	-3.6	28.0	-51.5	0.000034	238	3.86	-14.8
5th percentile	0	0	-5.1	2.8	-1.0	51.8	-21.0	0.000236	416	4.20	-4.4
25th percentile	2	0	0.4	3.2	-0.2	77.9	-4.1	0.002566	1337	6.01	0.0
Median	6	0	2.9	3.9	0.8	116.5	3.1	0.01128	1837	9.42	2.1
75th percentile	13	0	5.1	5.0	1.7	423.8	11.5	0.046492	2201	14.23	3.8
95th percentile.	24	3	8.6	7.8	2.6	4398.6	36.9	0.097113	2812	16.49	9.3
Maximum	49	14	8.6	9.1	3.8	6195.0	68.0	0.202275	2947	16.98	16.0

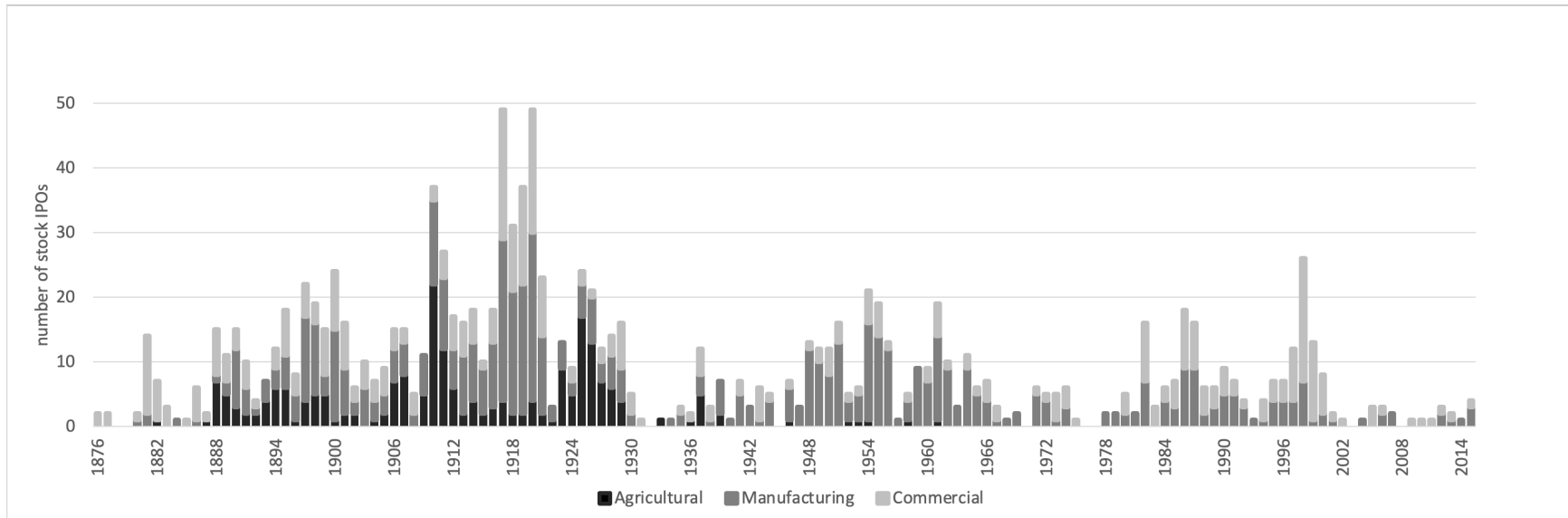
This table presents descriptive statistics for 15-year periods (20 years for 1996-2015) and the full sample. NO. IPO is the number of IPOs, while 2nd tier refers to the subset that is listed on the secondary market; GDP GROWTH is the annual growth in gross domestic product; INTEREST RATE is the long-term interest rate; YIELD is the spread between the long-term and short-term interest rate; STOCK INDEX is the stock market index level of the Amsterdam stock exchange; STOCK RETURN is the annual return in the stock index; STOCK VOLATILITY is variance of the stock market return; NO. FUNDS is the number of listed funds; NO. INHABITANTS is the number of inhabitants of the Netherlands; and INFLATION RATE is the annual rate of inflation. The main sources are the *Gids bij de Officiële Prijscourant* and *Tweehonderd jaar statistiek in tijdreeksen 1800-1999*; all other sources are defined in paragraph 2.3.

Figure 2.1: Number of listed securities



This figure shows for the Amsterdam Stock Exchange the number of listed stocks and bonds (black solid line, left axis) and the number of listed stocks and bonds per million inhabitants of the Netherlands (grey dashed line, right axis). The main sources are the *Gids bij de Officiële Prijscourant* and *Tweehonderd jaar statistiek in tijdreeksen 1800-1999*; all other sources are defined in paragraph 2.3.

Figure 2.2: Time series of IPOs



This figure shows for the Amsterdam Stock Exchange the number of IPOs per year for agriculture (black), manufacturing (dark grey) and commercial activities (light grey). The source is the *Gids bij de Officiële Prijscoûrant*.

2.6 Time series regression model

In Table 2.2 the outcome of our regression is presented with the three-year moving average values of the explanatory variables. The regression is done in three steps. We first include the variables for general economic conditions and estimate the effect on the number of IPOs. In subsequent models we add the stock market variables and the number of funds. We find that GDP growth is significantly positive related to the number of IPOs, in all three models. This is according to our expectation and supports the literature that the proceeds of IPOs are used to finance growth and investment opportunities. The level of the interest rate is significantly related to the number of IPOs, but only in the 1st and 2nd models. Once the number of funds is added, the interest rate becomes insignificant. The yield is not related to the number of IPOs.

Stock market returns and volatility are significantly related to the number of IPOs, and both with the expected sign. The positive effect for stock market return is an indication that issuers time their IPO. This is supported by the result that the number of IPOs is strongly negatively related to the volatility in stock market return, an indication that periods with high uncertainty among investors are avoided. These findings are in line with the findings of Pástor and Veronesi (2005) and Choe *et al.* (1993). The stock market level is not statistically significant. The level of development of the stock exchange, proxied by the number of funds, is significantly positively related to the number of IPOs, which is in line with our prediction based on the findings of Rajan and Zingales (2003).

The explanatory power of our model, measured by the R^2 , increases from 0.24 to 0.49 in the last step. This means that our model explains almost 50 per cent of the fluctuations in the number of IPOs. To check the validity of our results, we perform several robustness checks. The results are presented in Table 2.3.

In the 1st robustness check, we lag all variables by one year. This way we do not include information from the year of the IPO, because all explanatory variables are measured over year $t-1$, until $t-3$. The results are similar, except that GDP GROWTH becomes insignificant once the variable for stock market development is added.

Table 2.2: Determinants of the number of IPOs

	(1)	(2)	(3)
	LN(1+	LN(1+	LN(1+
	NO. IPOs)	NO. IPOs)	NO. IPOs)
Constant	2.28***	2.49***	0.23
	(0.000)	(0.002)	(0.828)
GDP GROWTH	15.91***	13.76***	9.10**
	(0.000)	(0.000)	(0.017)
INTEREST RATE	-16.08**	-9.36*	-4.84
	(0.019)	(0.051)	(0.319)
YIELD	-10.39	-1.30	-4.62
	(0.268)	(0.896)	(0.555)
STOCK INDEX		-0.07	0.23
		(0.697)	(0.209)
STOCK RETURN		2.33***	2.97***
		(0.000)	(0.000)
STOCK VOLATILITY		-10.99***	-11.15***
		(0.003)	(0.001)
NO. FUNDS			0.004***
			(0.007)
Observations	140	140	140
R-squared	0.24	0.39	0.49
Adjusted R-squared	0.22	0.36	0.46

This table presents OLS regressions explaining the natural logarithm of 1 plus the number of IPOs in a year (t). The explanatory variables are averaged over three years ($t-2$ until t). GDP GROWTH is the annual growth in gross domestic product; INTEREST RATE is the long-term interest rate; YIELD is the spread between the long-term and short-term interest rate; STOCK INDEX is the natural log of the stock market index level of the Amsterdam stock exchange; STOCK RETURN is the annual return in the stock index; STOCK VOLATILITY is the variance of the stock market return; and NO. FUNDS is the number of listed funds per million inhabitants. The main sources are the *Gids bij de Officiële Prijscourant* and *Tweehonderd jaar statistiek in tijdreeksen 1800-1999*; all other sources are defined in Section 3. We present regression coefficients and p -values based on Newey-West (1987) corrected standard errors. Significance levels are denoted with *** for 1%, ** for 5% and * for 10%.

In the 2nd robustness check we remove the IPOs from firms that are active in the Dutch East Indies. The reason is that we use growth in GDP as a proxy for economic growth, only based on GDP in the Netherlands. However, for firms active in the Dutch East Indies it is not likely that the number of IPOs has a strong relation with the growth in GDP of the motherland. Again, the results are quite

similar to the regression described above, except that the level of stock market development is not significant anymore.²²

In the 3rd robustness analysis, we capture timing decisions that are based on information with a shorter horizon. We regress the natural log of the number of IPOs with the yearly values with a lag of one year. The results show that the same variables are significant as in the regression in Table 2.2 with the three-year moving average. The R-squared, however, is lower. In the fourth and final robustness check, we use the unscaled number of IPOs, instead of the log specification. Again, the results are quite similar except for the fact that GDP is not significant anymore.

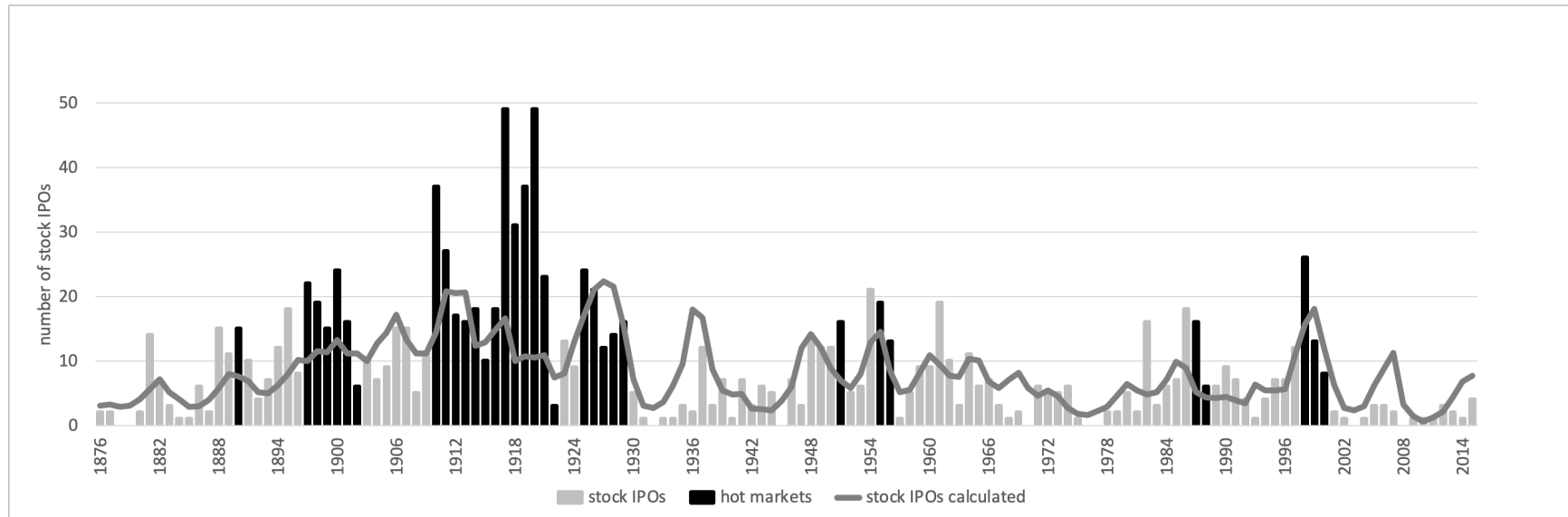
²² We conduct an additional robustness analysis (results are available upon request), where we include the economic development in the Dutch East Indies in our model. We use Van der Eng's (1992) time series of Indonesian GDP for the years 1880-1989 to construct an additional variable, which is GDP growth in Indonesia. The influence of the growth of the Indonesian economy only applies to the years before the Second World War, because after the Japanese occupation in 1942, no new IPOs for colonial companies are introduced and at the end of the War in 1945 Indonesia was declared independent, a status that was recognized by the Dutch government in 1949. We add this variable GDP growth in Indonesia to Model (3) in Table 2 and estimate our model for the period 1883-1941. The average of this variable is 0.72% with a standard deviation of 2.06%; the variable ranges between -4.99% and 5.11%. The results shows that the GDP growth in Indonesia is not a significant factor. However, the correlation with GDP growth in the Netherlands is 0.53, which explains the reduction in significance level of GDP growth in the Netherlands.

Table 2.3: Robustness analyses

Explained variable Lag structure Sample	Natural log IPOs									Absolute number IPOs		
	Three-year average, lag 1 year			Three-year average			Yearly, lag 1 year			Three-year average		
	All IPOs			Without IPOs from Dutch East Indies			All IPOs			All IPOs		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	LN(1+ NO. IPOs)	NO. IPOs	NO. IPOs	NO. IPOs
Constant	2.40*** (0.000)	2.91*** (0.001)	0.78 (0.516)	1.62*** (0.000)	1.37* (0.062)	0.13 (0.906)	2.31*** (0.000)	2.66*** (0.000)	1.45** (0.036)	11.78*** (0.000)	10.50 (0.145)	-17.57 (0.201)
GDP GROWTH	10.73*** (0.002)	8.31*** (0.008)	3.92 (0.284)	13.85*** (0.000)	11.47*** (0.000)	8.91** (0.028)	10.30*** (0.000)	9.25*** (0.001)	7.27** (0.018)	109.78*** (0.001)	93.41*** (0.004)	35.60 (0.421)
INTEREST RATE	-15.89** (0.031)	-9.27* (0.071)	-4.83 (0.356)	-6.69 (0.295)	-0.89 (0.836)	1.60 (0.748)	-14.19** (0.039)	-5.47 (0.305)	-6.27 (0.184)	-120.22** (0.021)	-57.63 (0.322)	-1.38 (0.983)
YIELD	-7.78 (0.416)	0.94 (0.925)	-2.25 (0.779)	-0.46 (0.963)	7.40 (0.424)	5.57 (0.494)	-5.82 (0.425)	-1.92 (0.805)	-5.12 (0.447)	-40.24 (0.661)	48.77 (0.696)	7.56 (0.930)
STOCK INDEX		-0.13 (0.479)	0.14 (0.500)		0.035 (0.822)	0.20 (0.305)		-0.109 (0.156)	0.015 (0.874)		0.06 (0.967)	3.75* (0.085)
STOCK RETURN		2.97*** (0.000)	3.57*** (0.000)		2.67*** (0.000)	3.02*** (0.000)		1.63*** (0.000)	1.81*** (0.000)		13.64*** (0.005)	21.57*** (0.001)
STOCK VOLATILITY		-11.87*** (0.008)	-12.00*** (0.007)		-9.92*** (0.006)	-10.01*** (0.004)		-7.37** (0.013)	-8.02*** (0.009)		-91.61** (0.032)	-93.64** (0.016)
NO. FUNDS			0.004** (0.023)			0.002 (0.163)			0.003* (0.065)			0.055** (0.017)
Observations	139	139	139	140	140	140	139	139	139	140	140	140
R-squared	0.14	0.34	0.43	0.18	0.36	0.40	0.19	0.35	0.41	0.13	0.22	0.38
Adjusted R-squared	0.12	0.31	0.40	0.17	0.33	0.37	0.17	0.32	0.37	0.11	0.18	0.35

This table presents OLS regressions. In models (1) to (3) we explain the natural logarithm of 1 plus the number of IPOs in a year (t) and the explanatory variables are averaged over three years (t-3 until t-1). In models (4) to (6) we explain the natural logarithm of 1 plus the number of IPOs excluding IPOs by firms active in Indonesia in a year (t) and the explanatory variables are averaged over three years (t-2 until t). In models (7) to (9) we explain the natural logarithm of 1 plus the number of IPOs in a year (t) and the explanatory variables are measure over one year (t-1). In models (10) to (12) we explain the number of IPOs in a year (t) and the explanatory variables are averaged over three years (t-3 until t-1). GDP GROWTH is the annual growth in gross domestic product; INTEREST RATE is the long-term interest rate; YIELD is the spread between the long-term and short-term interest rate; STOCK INDEX is the natural log of the stock market index level of the Amsterdam stock exchange; STOCK RETURN is the annual return in the stock index; STOCK VOLATILITY is the variance of the stock market return; and NO. FUNDS is the number of listed funds per million inhabitants. The main sources are the *Gids bij de Officiële Prijscurant* and *Tweehonderd jaar statistiek in tijdreeksen 1800-1999*; all other sources are defined in Section 3. We present regression coefficients and *p*-values based on Newey-West (1987) corrected standard errors. Significance levels are denoted with *** for 1%, ** for 5% and * for 10%.

Figure 2.3: Time series IPOs: actual and predicted



This figure shows for the Amsterdam Stock Exchange the number of IPOs per year in bars. The years with hot markets (a year in which the three-year moving average of the number of IPOs is in the highest quartile of the data set) are in black, while non-hot markets are in grey. The grey line represents the predicted number of IPOs as explained by model (3) in Table 2; the explained values are obtained by filling out the values for explanatory variables in the model with regression estimates. The source is the *Gids bij de Officiële Prijscourant* and authors' calculations.

Table 2.4: Overview of hot markets

(1) Actual hot market years	(2) Explained hot market years	(3) Hot market years, not explained
1890	none	1890
1897–1902	1900–1902	1897–1899
1910–1922	1910–1919	1920–1922
1925–1929	1925–1929	none
1951	none	1951
1955–1956	1955–1956	none
1987–1988	none	1987–1988
1998–2000	1999–2000	1998

This table shows for the Amsterdam Stock Exchange in column (1) all years with hot markets (a year in which the three-year moving average of the number of IPOs is in the highest quartile of the data set). In column (2) the hot years from column (1) are included in case the explained number of IPOs as explained by model (3) in Table 2 would also be classified as hot (the explained values are obtained by filling out the values for explanatory variables in the model with regression estimates). In column (3) all years from column (1) are reported that are not in column (2); these are years that are not predicted to be hot years. The source is the *Gids bij de Officiële Prijscourant* and authors' calculations.

We conclude that the 3rd model in Table 2.2 is a good model to explain the number of IPOs. In the next step, we use the model to predict the number of IPOs in a given year. This prediction represents the number of IPOs based on fundamentals such as GDP growth and stock returns. In other words, if only the explanatory variables would explain the IPO fluctuations, then these are the number of IPOs we expect to observe. The solid line in Figure 2.3 represents the predicted number of IPOs. Figure 2.3 also shows the actual number of IPOs in bars, where the hot markets – defined as in Helwege and Liang (2004) as years in which the three-year moving average is in the highest quartile – are shown in black bars and the other years are in grey. In total, we have 33 years with hot IPO markets. We observe that the predicted number of IPOs (the solid grey line) fluctuates with the actual number, but not perfectly. Table 2.4 presents eight periods with years that have a hot IPO market. The first hot market occurs in 1890. When we predict the number of IPOs for 1890, we do not find a number in the highest quartile. Therefore, 1890 is a hot market that cannot be explained by economic fundamentals. The next hot market starts in 1897 and ends in 1902. Of

these six years, our model can explain the last three years, but the other three years remain unexplained. We define years in which the predicted hot markets from our model coincide with actual hot markets, the explained hot market. Other years with a hot market are unexplained hot market years. Of the 33 hot market years, as many as 22 are explained by the model, while another 11 remain unexplained. Since we aim to explain all hot markets, the years with the unexplained hot markets are the focal points for our in-depth historical analysis in the next section. Table 2.5 presents an overview of the IPOs per industry for each of the eight periods with hot markets and for the entire period.

2.7 In-depth historical analysis

In this section we give a description of the years with hot markets and aim to infer the causes of the unexplained hot markets from the historical context.

2.7.1 Hot market 1890: the emerging Dutch East Indies

The hot market in 1890 is not explained by our model. The total number of IPOs in this year is 15 and eleven IPOs are from so-called free-standing companies (Wilkins, 1998): eight were active in the Dutch East Indies, two in South Africa and one in Germany. The year 1890 was the first year in which the *Cultuurstelsel* for the cultivation of sugar in the Dutch East Indies was completely abolished. As mentioned earlier, this abolishment was a trigger for the foundation of many new firms that were active in the Dutch East Indies and since 1881 the number of IPOs from firms active in the Dutch East Indies on the Amsterdam stock exchange increased every year. In the second half of the 19th century, the main source of finance for Dutch firms was retained earnings, supplemented with contributions by members of the founding families and closely connected wealthy individuals (De Jong and Röell, 2006). For the free-standing companies, especially for the firms active in the Dutch East Indies, these resources of finance were not available (Gales and Sluyterman, 1998). The firms that issued an IPO in 1890 were relatively young at the time of their IPO (average of 1.4 years), making them risky and active in a region with uncertain prospects. Next to this, the Dutch East Indies had hardly a stock market of its own and the banks in the Dutch East Indies were unwilling to provide firms with capital as they were still struggling to survive the 1884 sugar crisis. For these reasons, many of these firms turned to the Amsterdam Stock Exchange for finance.

2.7.2 Hot markets 1897-1902: intensifying world trade

The first three years of this period with hot markets are not explained by our model. The total number of IPOs in this period is 102 containing 44 IPOs of firms active in the Dutch East Indies, of which 17 were active in agriculture, 19 in manufacturing and eight in commercial services. From the manufacturing firms in the Dutch East Indies, 16 of them were active in mining.

From the total number of IPOs in this period 22 IPOs are by firms active in the sector transport. This period can be characterized by the increasing role of the Dutch East Indies in the Dutch economy and lies within a longer period with an intensifying world trade due to the increasing number of countries that used the gold standard, which introduced fixed exchange rates with a great part of the world.²³ In this period the abolishment of the *Cultuurstelsel* in the Dutch East Indies was nearly completed. This abolishment led to the founding of many new agricultural firms but also, triggered by the spectacular growing demand on the world markets at the end of the 19th century, of firms active in the oil and mining industry. The Dutch East Indies were also important for domestic firms. Because of the small home market, many domestic firms were at that time export orientated (Sluyterman, 2003). For the Dutch textile industry, the largest industry in the Netherlands at that time (measured by the number of employees), the Dutch East Indies and Asia were the most important export markets. The Dutch harbours were trade centres for the Western world (Sluyterman, 2003), which gave an impulse to the Dutch shipping industry and to firms active in loading, unloading and the storage of goods. By the end of the 19th century, the sentiment of investors to invest in free-standing companies active in the Dutch East Indies had also changed. Investors were reluctant towards investments in these firms, in previous years, but in 1897 the sentiment towards firms active in the Dutch East Indies became positive.²⁴

²³ Between 1870 and 1913 the average rate of growth of merchandise exports was worldwide 3,4 percent per year (Maddison, 2006), much higher than between 1820 and 1870.

²⁴ Annual Report Vereeniging voor den Effectenhandel, 1897.

Table 2.5: Industry distribution of IPOs in hot markets

Sector	code SBI	1876-2015	1890	1897-1902	1910-1922	1925-1929	1951	1955-1956	1987-1988	1998-2000
Agriculture and fishing:										
Agriculture, forestry and fishing	01-03	222	3	19	66	47	0	0	0	0
Manufacturing and construction:										
Exploration of and services for the expl. of oil, gas and minerals	06-09	84	5	31	14	2	0	0	0	1
Production of beverage, food, tobacco, shoes, textile and clothing	10-15	171	4	7	59	8	5	7	2	1
production of timber, paper and cardboard	16-17	24	0	0	7	1	1	2	0	0
Printing and reproduction of recorded media	18	5	0	0	0	0	0	1	0	0
Production of coke oven, chemical, rubber and pharm. products	19-23	82	0	4	19	5	0	1	1	3
Production of metal products (no machines)	24-25	61	0	4	10	3	3	3	3	1
Production of computers and electrical and electronic equipment	26-27	41	0	0	9	3	0	2	3	1
Production and repair of machines, cars and other goods	28-33	102	0	1	32	2	3	8	2	3
Production and exploration of electricity, gas, water and waste	35-39	18	0	3	9	0	0	0	0	0
civil and commercial construction	41-43	29	0	0	9	0	1	2	0	0
Commercial services										
Trade (wholesale and retail sale)	45-47	140	0	7	54	9	1	5	3	1
Transport over water, land, by air, including storage and services	49-52	125	3	22	34	1	0	1	2	0
Mail and couriers	53	4	0	0	1	0	0	0	0	1
Lodging, restaurants and bars	55-56	12	0	1	3	0	0	0	1	0
Publishers, production of movies and broadcasting of radio and tv	58-60	20	0	0	1	0	1	0	0	2
Telecommunication, ICT and services for ICT	61-63	52	0	0	0	0	0	0	2	29
Financials	64-66	0	0	0	0	0	0	0	0	0
Real estate	68	45	0	3	8	4	1	0	1	0
Legal services, accountancy, tax consultants and holdings	69-70	7	0	0	0	0	0	0	1	0
Architects, engineers and technical design and services	71	4	0	0	0	0	0	0	0	0
Investigate and development, commercial and market research	72-73	1	0	0	0	0	0	0	0	0
Other commercial services	74-82	14	0	0	0	2	0	0	1	4
Total		1,263	15	102	335	87	16	32	22	47

This table shows the industry distribution for the Amsterdam Stock Exchange with the total number of IPOs and the number of IPOs in each of the eight hot markets (years in which the three-year moving average of the number of IPOs is in the highest quartile of the data set). The source is the *Gids bij de Officiële Prijscourant*.

2.7.3 Hot markets 1910-1922 and 1925-1929: the stock market integrates into the economy

The hot markets in the period 1910-1922 are predicted by our model, except for the years 1920, 1921 and 1922. The period between 1910 and 1929 can be characterized by three aspects. First, the trends from the previous period with hot markets continue. The role of the Dutch East Indies in the Dutch and global economy was still increasing, only temporarily interrupted by the First World War when transport from and to the Netherlands was blocked (Sluyterman, 2003). Second, because the Netherlands was neutral during the First World War, its position in trade increased (Sluyterman, 2003). Third, due to the *laissez-faire* approach of the Dutch government the Amsterdam Stock Exchange became more important for capital markets. Although almost the entire period between 1910 and 1929 consists of hot markets, the distribution of IPOs over the industries varied enormously, as shown in Table 2.5. In the beginning and end of this period agricultural firms (mainly active in the Dutch East Indies) were dominant but almost absent in the period from the First World War until the mid-1920s. In contrast, the number of IPOs peaked in 1917 and 1920 to an all-time high, mainly by firms active in manufacturing and in commercial services.

2.7.4 Hot markets 1951 and 1955-1956: modernization

The hot market in 1951 is not predicted by our model, while the one in 1955-1956 is. The total number of IPOs in 1951 is 16, of which 13 IPOs are by industrial firms. The total number of IPOs in 1955 and 1956 is 32 from which 26 IPOs came from firms active in manufacturing, while none of these 48 firms was active in the Dutch East Indies, because on the 17th of August 1945 the independent state of Indonesia was proclaimed and the Dutch retreated in 1949. A typical characteristic of the Dutch industrial firms in the first half of the 20th century is that these firms were family firms that made little use of capital markets and banks. These firms funded activities mainly through internal financing, which was possible due to the government's low wage policy (De Jong *et al.*, 2010).²⁵ However, after the Second World War family firms were considered to be out of date. In the spirit of modernisation, these firms were considered to be too small and inefficient since they were not run by highly skilled managers (Sluyterman, 2003). Due to increasing export and growing domestic consumption the Dutch manufacturing industry reached its maximum capacity in the mid of the 1950s. The growth of industrial production stagnated after

²⁵ Annual Report Vereeniging voor den Effectenhandel, 1955.

a long period of expansion because the possibilities to further improve the utilization rate of the existing equipment were becoming increasingly limited.²⁶ The unemployment was low and in some industries there was a shortage of labour.²⁷ As a consequence, wages rose which lead to increasing costs which influenced the competitiveness of the Dutch manufacturing industry on European and world markets.²⁸ In order to be able to compete, investments were needed to replace obsolete machineries. This was especially the case for the textile industry (Sluyterman, 2003) which lost an important export area with the independence of Indonesia. The family capital was considered to be insufficient and as a consequence, many family firms turned into a limited liability structure in the 1950s and went public.²⁹

2.7.5 Hot markets 1987-1988: a window of opportunity

In total there were 22 IPOs in these two years and these hot markets are not predicted by our model. However, the year 1988 is defined as a hot market because of the high number of IPOs in 1986 (18) and 1987 (16); therefore, these are the years of interest for our in-depth analysis. In total there were 34 IPOs in these years, while the number of IPOs from ICT-related firms is eleven, five from firms active in hardware production and six from firms active in services. In the early 1980s the Netherlands was in a deep economic recession and the short-term interest rate was at a record high. Due to budget cuts, low inflation, productivity improvements and a decrease of the short-term interest rate, the economic tide changed.³⁰ Equity investments became popular among retail investors in the mid-1980s, especially for listed investment funds.³¹ Together with the capital from institutional investors who had made huge profits on their investments in government bonds, the investments from retail investors lead to a high amount of capital that flooded to the stock markets. In addition to this the Amsterdam Stock Exchange had also attracted the attention of foreign investors, who had noticed that Dutch stocks were undervalued.³² This led to a bull market that ended on October 19th 1987, Black Monday. The period with high stock market returns and positive sentiment among investors was a fertile era for IPOs. Investors were particularly positive about investments in local Dutch firms, caused by a strong decline in the value of the US Dollar, which

²⁶ Annual Report De Nederlandsche Bank, 1955, page 19.

²⁷ Annual Report Vereeniging voor den Effectenhandel, 1954.

²⁸ Annual Report Vereeniging voor den Effectenhandel, 1955.

²⁹ Annual Report Vereeniging voor den Effectenhandel, 1955.

³⁰ Wassenaar agreement on 24th of November 1982.

³¹ 120 Jaar Beurshandel In Vogelvlucht, Stichting Vereniging voor de Effectenhandel, 1998, page 26.

³² "Damrak brak alle records", De Telegraaf, 31st of December 1985.

had a negative effect on the profits measured in Dutch Guilders of international firms.³³ In the early 1980s, the application and use of electronics and personal computers became widespread. So-called high-tech firms, that made or traded in hardware or software, were founded and especially these high-tech firms were popular among investors. Partly due to the start of the Official Parallel Market, the number of IPOs of these firms increased significantly and stock prices rose sharply.³⁴

2.7.6 Hot markets 1998-2000: the internet bubble

These series of hot markets are predicted by our model, except for the year 1998. In total there were 47 IPOs, only ten from industrial firms and 37 from firms active in commercial services. From these 37 IPOs, 29 were ICT firms. Retail investors accounted for about 35 per cent of trading in 1986³⁵, but after the crashes in 1987 and 1989, they had almost disappeared from the Amsterdam Stock Exchange. In the late 1980's, a steering group was formed under the name *Amsterdam International Financieel Centrum*, headed by central bank president Duisenberg. The task for this group was to come up with recommendations to position the Amsterdam Stock Exchange as strongly as possible on the international financial markets and on March 16, 1989 their report 'Amsterdam: Financial Gateway to Continental Europe' was presented to the Minister of Finance.³⁶ Almost all of the recommendations were successively implemented. The first was to try to limit the use of takeover defences and the second was to lower transaction costs by creating more competition between stock brokers and banks and to lower taxes. In addition, the Amsterdam Stock Exchange changed their trading system in 1994. In the new Trading System Amsterdam (TSA) the wholesale and retail segments were separated for large and small transactions which provided more real-time information to retail investors. In 1995 the Amsterdam Stock Exchange noticed that the retail investor was back.³⁷ In 1996 approximately 700,000 retail investors were active in the Netherlands and this number grew to more than 1.5 million in the year 2000 (Smit, 2010). To attract more listings the Amsterdam stock exchange established in 1997 a second tier, NMAX, which had lower entry requirements than the first official tier. In 1998 these entry requirements were lowered even further which was particularly favorable for young firms.

³³ "Iets hogere dollarkoers blijft onder 1,80 gulden", Nederlands Dagblad, 31st of December 1987.

³⁴ 120 Jaar Beurshandel In Vogelvlucht, Stichting Vereniging voor de Effectenhandel, 1998, page 30.

³⁵ 120 Jaar Beurshandel In Vogelvlucht, Stichting Vereniging voor de Effectenhandel, 1998, page 30.

³⁶ Annual Report De Nederlandsche Bank, 1989.

³⁷ 120 Jaar Beurshandel In Vogelvlucht, Stichting Vereniging voor de Effectenhandel, 1998, page 30

Investors, both institutional and retail, were particularly interested in IPOs of firms active in ICT. The IPOs of these firms were a great success based on a believe that ICT, and especially the internet, would radically change the way of living and that firms from the so-called "New Economy" had a bright future ahead of them in which they would make exceptional profits. The interest from investors was amplified by intense media coverage which created very optimistic assumptions about the fundamental value of these firms.³⁸ In the year 2000 the stock market crashed and the IPO of World-Online at the beginning of that year is exemplary for ICT-related IPOs in this period. This IPO was oversubscribed many times and attracted a great deal of attention from investors and media. However, it soon became clear that the expectations for this firm were not realistic (De Jong *et al.*, 2014).

2.8 Conclusions

In this chapter we analyse fluctuations in the yearly number of IPOs and the causes of hot markets in the Netherlands over the long period from 1876 up until 2015. As Morck and Yeung (2011) describe, understanding complex economic phenomena requires econometric analyses, complemented with historical analyses. Numerous influences are at work simultaneously in different areas such as economics and politics and it would be naive to think that we can unravel the causes of hot IPO markets with simple regression models, especially over the long period we investigate. Both our approaches, econometrics and in-depth historical analysis, have strengths and weaknesses and we agree with Morck and Yeung (2011) that these strengths make both methods complementary.

What does our study contribute to our knowledge of Dutch economic history and the historical development of capital markets? First, we find that several drivers of new equity funding were persistent over the 140 years. The fluctuations in the number of IPOs can partially be explained by a set of economic and market variables that influence IPOs over the full period. Economic growth, stock market returns and stock market volatility are strong drivers of the number of IPOs. Equity seems to be issued to finance growth and investment opportunities and windows of opportunity are used with enthusiastic investors, and periods with high uncertainty about investors' sentiment are avoided. In addition, we find strong evidence that the importance of the stock market for capital markets, measured by the number of listed funds per million inhabitants,

³⁸ Normally-used methods for valuation were considered to be inappropriate for these firms.

is an important driver for hot markets. Second, we find that in specific years, hot markets cannot be explained by econometric modelling, because the IPOs are dominated by specific industries. Third, our study also shows that the roles of corporate law, securities regulation and government control are fairly limited. Although the roles of legislation and government intervention are important in the process of IPOs, they hardly affect the number of IPOs in our study.

Finally, we also call for further research. Similar to Van Nieuwerburgh *et al.* (2006) for Belgium and Campbell *et al.* (2021) for the UK, we find that the late 19th century and early 20th century witnessed very large numbers of new listings, including many smaller firms. While our study can partially explain these large numbers, a further investigation into the specific period is warranted and this should be done in a comparative analysis of various markets.

3 Going Public

3.1 Introduction

It is well-known that the number of initial public offerings (IPOs) of stocks varies over time (Ibbotson and Jaffe, 1975) and that similar fluctuations occur in bond issues (Becker and Ivashina, 2014; Pour, 2017). In this chapter, we aim to explain the fluctuations over time of these two financing instruments by extending the research into the motives and timing of IPOs in chapter 2. We first consider stock and bond IPOs separately but also investigate the interactions between these two forms of financing and study if the motives and timing of these issues are affected by changes in the institutional setting.

In the modern finance literature, stock IPOs are studied over relatively short and recent time periods with a stable institutional setting (see Ibbotson, 1975; Ritter and Welch, 2002; Lowry, 2003) and is the fluctuation in the number of IPOs explained by changes in economic and market conditions and stock market liquidity (Lowry, 2003; Banerjee *et al.*, 2013; Hanselaar *et al.*, 2019). The literature on fluctuations in the number of bond IPOs is not as extensive. Hale and Santos (2008) find that firms time bond IPOs to avoid recessionary periods, but that no timing takes place outside these periods. Becker and Ivashina (2014) find that monetary policy and changes in bank-credit supply are also relevant because bank loans are an alternative for bond issues and Pour (2017) finds effects of information asymmetry on the timing of bond IPOs.

Stock and bond issues can be substitutes or complements and how a firm chooses between debt and equity is hotly debated. According to the so-called trade-off theory, firms will prefer debt issues as long as the tax advantage of debt outweighs the costs of financial distress. According to the alternative pecking-order theory, which builds on information asymmetries between issuers and investors, bond issues are preferred to receive the highest proceeds due to the information premium investors require for stock issues (Myers, 1984). In addition, Baker and Wurgler (2002) find that firms time their IPO to coincide with favorable market conditions and because these conditions do not change synchronously for stocks and bonds, preferences for a stock and bond IPO differ over time. Glushkov *et al.* (2018) find that firms are more likely to go public through debt than through equity when they have assets that are more amenable to financial statement analysis and when they are backed by a venture capital or private equity firm.³⁹

³⁹ Glushkov *et al.* (2018) investigate how firms that go public through a bond IPO are different from those that go public through a stock IPO. While this research question is obviously related to what we do in this study, it is not the focus of our study.

In the past years, historians have investigated IPOs in specific institutional settings and eras. Chambers and Dimson (2009) document the UK IPO market over the 20th century and find that underpricing has increased, from 3.8% in 1917-1945 to 9.2% in 1946-1986. Subsequent studies document market efficiency and the consequences of self-regulation by the London Stock Exchange (Chambers, 2009; Chambers, 2010; Burhop, Chambers, and Cheffins, 2014). Fjesme, Galpin, and Moore (2019, 2021a and 2021b) study the same exchange in an earlier period, from the late 19th century. For the early German market, Burhop (2010) finds that at the Berlin Stock Exchange between 1870 and 1896 the average underpricing was below 5% (see also, Fohlin, 2010; Lehmann-Hasemeyer and Streb, 2016; Lehmann, 2014; Burhop and Lehmann-Hasemeyer, 2016).

Papers that have studied the effect of institutional changes on stock IPOs focus on IPO underpricing (Akyol *et al.*, 2014; Chambers and Dimson, 2009; Burhop, 2010), post-IPO survival rates (Burhop *et al.*, 2011; Espenlaup *et al.*, 2016), long-term performance (Boubaker *et al.*, 2017) and firm characteristics (Takahashi and Yamada, 2015). We are aware of only two papers investigating the effect of institutional changes on fluctuations in the number of stock IPOs. Gao *et al.* (2013) find that the reduction in the number of IPOs in the US between the years 2001 and 2012 is not explained by tighter regulation, such as the 2002 Sarbanes-Oxley Act. They also find that a reduction of the regulatory burden on small companies, did not increase the number of IPOs by small companies. Cattaneo *et al.* (2015) study all 879 Italian IPOs from the unification of Italy in 1861 until 2011. Their main finding is that easing regulation does not increase the number of IPOs. We are not aware of any recent paper that has studied the effect of regulatory changes on fluctuations in the number of bond IPOs.

While economic and market variables continuously fluctuate over time, institutional changes can occur at a specific moment in time as a result of political and judicial decisions. Abrupt changes provide an opportunity to investigate whether the motives and timing of stock and bond IPOs differ in the period after the change from the period before. Because such an abrupt and drastic change took place in Belgium in 1873, with a dramatic relaxation of stock market regulations, we do our research with Belgian stock and bond IPOs that were issued between 1839-1935. At the start of this period, Belgium was the second most industrialized country in the world after the UK (measured by industrial output per capita) and still ranked third in 1913, directly behind the US and the UK (Bairoch, 1982). The Brussels Stock Exchange (BSE) grew strongly and by the end of the period it belonged to the top ten stock markets in the world (Buelens, 2001).

Belgium at the time was characterized by very poor investor protection (Tienrien, 1933) and up until the First World War, there were no tax advantages associated with debt financing.⁴⁰ We end in 1935 when Belgian capital markets, in the wake of the Great Depression, were strongly affected by the introduction of a series of new regulations that resulted, among others, in the prohibition of multiple voting rights, a forced split-up of universal banks, the introduction of supervision of security issues by a bank commission, the obligation for firms to provide a detailed prospectus when publicly issuing stocks or bonds, and the prohibition for banks to own stock or bonds from other firms for a longer period than six months. These regulations had a major impact on IPOs: the number of IPOs dramatically decreased after 1935 and did not pick up again until the 1980s.

For our analysis, we construct a dataset of 922 stock and 387 bond IPOs, for 943 domestic firms with their main activities in Belgium. We start with analyses of the number of stock and bond IPOs separately. We use time-series regression models with economic, timing and institutional explanatory variables, for the full period 1839-1935 and for two sub-periods 1839-1872 and 1873-1935, which is before and after the major deregulations of 1873. Next, we test with a 3SLS model based on Zellner and Theil (1962), the interaction between stock and bond IPOs, to establish whether they are substitutes, complements, or unrelated.

Our main findings are that in a well-developed securities market, stock and bond IPOs are timed to benefit from favorable market conditions and are used to finance future growth. We also find that firms prefer to first issue stock, especially in expansionary phases of the business cycle. We do not find that stock and bond IPOs are complementary or substitutes, but we do find support for the finding of Gao *et al.* (2013) and Cattaneo *et al.* (2015) that easing regulation does not immediately increase the number of IPOs. However, the easing of regulation that took place in Belgium in 1873 may have instigated an economic development that led to a booming IPO-market in the following decades.

We contribute to the existing literature on fluctuations in stock and bond IPOs by studying a unique period covering almost a century, starting in the first half of the 19th century, containing two well-defined sub-periods with specific characteristics. This approach allows us to investigate the effect of institutional changes. To the best of our knowledge, we are also the first to study simultaneously the determinants of stock and bond IPOs. Our study results lead to a better

⁴⁰ Coyle and Turner (2013) find that in the UK investor protection did not influence bond markets in the nineteenth and twentieth century, but that developments were mainly driven by inflation and taxation.

understanding of when firms go public and what the effects are of institutional changes. Our results are robust and of interest to markets and regulators today.

3.2 Institutional setting Belgium, 1839-1935

Prior to the period that we investigate, there were some important changes in the institutional setting that paved the way for the rapid modernisation of Belgium. The first is the abolishment of the craft-guilds in the period when Belgium was part of the French Republic (1792-1799). These craft-guilds were founded in the Middle Ages, and the French government considered the lack of competition caused by these craft-guilds the reason that the economic development of France was lagging that of the UK (Brouwer Ancher, 1895). Other important institutional changes were the founding of the BSE in 1801 and the introduction of the limited liability firm in 1807 (De Clerq, 1992). Finally, an important change took place when the Treaty of London was signed on April 19, 1839. With this treaty, the Netherlands recognized the independence of Belgium, which ended a unstable economic situation since the separation of Belgium in 1830. The period that we study contains well-defined sub-periods which are describe in detail hereafter. Table 3.1 gives an overview of their characteristics.

Table 3.1: Institutional setting per period

	1839-1872	1873-1913	1920-1935
Governmental interference	Coordinated	Liberal	Liberal
Protection investors	Poor	Poor	Poor
Tax advantage for debt	No	No	Minor
Securities market development	Start-up	Emerging	Mature
Leading in financing industries	Banks	Securities market	Securities market
Monetary situation	Stable	Stable	Highly unstable

This table present the main institutional characteristics per period in Belgium.

3.2.1 Government control (1839-1872)

Belgium was one of the first nations on the European continent to industrialize (Van der Wee and Verbreyt, 1999) based on the presence of natural resources like coal, ore, water and wood (Buelens, 2001). It was common that industrial firms granted prolonged credit to their customers (Chlepner, 1943). However, banks were dominant in financing industrial activity and two large banks dominated the sector: the Société Générale and the Banque de Belgique (Van Nieuwerburgh *et al.*, 2006). These were mixed banks, which collected deposits and invested in industrial firms. In addition, they were authorized to issue bank notes until 1850 (Chlepner, 1943). The financial crisis in the year 1848 demonstrated the risk of a mixed banking system when savers withdrew their deposits. Because these deposits were invested in industrial firms, many banks were unable to pay out their savers and almost went bankrupt. Banks could only continue with support from the government (Witte *et al.*, 2005). Next to the BSE there were other exchanges in Belgium, of which the most important one was located in Antwerp, but the BSE became the major exchange in Belgium for stocks and bonds. The overall monetary situation in Belgium was stable in this period because of the Gold Standard. The Belgian Franc (BEF) was a stable currency and there was little or no inflation (Ugolini, 2012).

Until 1865, the government had a tight grip on the Belgian economy and the BSE. Interest rates were capped at 6 per cent by law (Buelens, 2001). It was also very difficult to set up a limited liability firm as government approval was needed, which was seldom granted (Annaert *et al.*, 2012). Government approval was also needed to get a listing on the BSE (Annaert *et al.*, 2011). Because of the tight governmental grip, the BSE could not keep up with the dynamics in the real economy. The number of listed firms was small and the industry concentration on the BSE did not reflect the concentration of the economy (Annaert *et al.*, 2012). Share prices tended to be very high, which made shares illiquid and limited the accessibility of the BSE for retail investors (Buelens, 2001).⁴¹ In this period, there were no dividend taxes, almost no corporate taxes, and therefore no tax advantages for debt (Deloof and Van Overfelt, 2008).⁴² Investor protection was weak. While limited liability firms were obliged to make an annual financial statement until 1841 this statement was only shared with shareholders at the general shareholders meeting. To get access to this

⁴¹ The average price per share was between 500 and 1,000 BEF while the average salary for a worker was 1.5 BEF per day in the year 1846.

⁴² Firms paid two percent tax on all revenues to the financiers (Belgian Law of 22 January 1849, Art. 3 and Belgian Law of 5 July 1871, Art. 12, referenced in Deloof and Van Overfelt 2008).

meeting, an investor needed to own at least five shares of 1,000 BEF, which at the time was a substantial investment (Moortgat *et al.*, 2017). From the year 1841 onwards, firms were required to disclose the annual financial statement to the public, but as there were no rules on the content of this statement, this requirement was not very helpful for investors (Moortgat *et al.*, 2017). The Belgian economy was characterized by a liberalisation between 1865 and 1873, as part of an economic movement across Europe which considered that it was best that governments abstained from intervening in markets and let market forces work freely. From 1865 onwards interest rates could be freely determined (Annaert *et al.*, 2011) and from 1867 anyone was allowed to conduct a brokerage business or to establish a stock market or a bank without the need for a governmental approval or supervision (Chlepner, 1943).

3.2.2 Liberalisation (1873-1913)

The economic liberalisation started in 1865 and was completed with the law of 1873 that freed-up the founding of limited liability corporations (Annaert *et al.*, 2011). This liberalization led to an enormous development of banking and financial operations (Chlepner, 1943), and by 1913 Belgium had reached a level of financial development that in relative terms was higher than that of the US (Rajan and Zingales, 2003). With many new listings on the BSE, the industrial concentration of listed firms decreased. The downside of the liberalisation was that investors had little protection against all kinds of abuse and in the first decades of the liberalisation many fraud cases occurred (Théate, 1905; Buelens, 2001).

Because neighbouring countries of Belgium gradually introduced corporate taxes and dividend taxes, Belgium became a European tax haven attracting foreign investors that started to incorporate financing vehicles in Belgium that were listed on the BSE (Annaert *et al.*, 2012). A first small change in corporate taxation was introduced in 1913 but it took until 1919 - 1921 for more major tax changes.⁴³

After the changes in legislation in 1865 and 1873, the stock market became very important and Belgian banks played a crucial role in stock market listings. They provided loans, which were reimbursed by the sale of new securities on the stock market, or they invested in shares of young firms which were sold once the firm became profitable, either directly to investors or via an IPO (Van der Valk, 1932). Banks typically formed a syndicate with stock brokers and other financiers,

⁴³ The initial 2 percent tax on all revenues to the financiers was raised in 1913 to 4 percent (Buelens, 2001).

either acting as an intermediary and selling the securities directly to the public, or by buying the securities themselves and then selling them to the public. The banks and the stock brokers sold the securities to their customers with ‘unbridled’ publicity (Théate, 1905), where the Société Générale and later the Banque de Bruxelles, which became the main competitor of the Société Générale after the First World War, could use their extended network of local branches. The banks sometimes kept an equity stake in these firms, but the main goal of the bank was generally to sell the shares at a profit and make the firm a regular customer of the bank (Chlepner, 1943). Many firms were listed immediately after their foundation (Annaert *et al.*, 2012). After the bankruptcy of the Banque de Belgique in 1885, the Société Générale was the only major bank left in Belgium before the First World War, with about a dozen medium-sized banks and 50 small banks from which the most important banks were in possession of substantial securities portfolios (Chlepner, 1943).

From 1873 onwards, the annual financial statements from limited liability firms had to be controlled and approved by supervising directors, and the general shareholders meeting became open for all shareholders (Moortgat *et al.*, 2017). Although the annual financial statements were published in the Official Gazette of the Belgium government (Buelens, 2001), this did not improve investor’s protection much since the control by the supervising director was often very weak (Théate, 1905), and the content of the financial statements was not specified.

3.2.3 Interbellum years (1920-1935)

The BSE was closed during the First World War. After the war, up to one third of the Belgian industry was destroyed, a substantial part of Belgian investments abroad was permanently lost due to the Russian revolution in 1917, Belgium faced a tremendous loss of purchasing power for its currency, and it had a high governmental debt (Annaert *et al.*, 2011). However, the BSE recovered relatively quickly (Buelens, 2001). The BSE saw a wave of IPOs after the war, for a large part from family and colonial firms, and the number of listed firms peaked at an all-time high in the 1920s (Buelens, 2001). In the 1920s fiscal legislation changed significantly due to the increasing need for finance of the Belgian government. A progressive scaled corporate tax was introduced from 2 to 10 per cent for profits above 48,000 BEF and profits made with investments in bonds, stock and savings were taxed at 10 per cent (Buelens, 2001).

The overall monetary situation in Belgium in this period can be characterised as highly unstable. After a suspension of the Gold Standard during the war, which was needed to allow governments to create deficits to finance war activities, countries began to introduce the Gold

Standard again in the 1920s. The BEF devaluated several times, first in 1926 and later in 1935. The BEF stabilized after the devaluation in 1926, which introduced a short period in which exports flourished and the Belgian industry expanded greatly (Chlepner, 1943). The Gold Standard however prevented governments from implementing counter-cyclical policies (Eichengreen, 1995) and this became particularly a problem during the depression that began in 1929. On March 31st, 1935 the gold weight of the BEF was again reduced by 28 per cent (Chlepner, 1943). However, the currency was linked to gold again and when other European countries left the gold standard in 1936, Belgium remained the only European country with a Gold Standard based currency (Chlepner, 1945). With the devaluation of the BEF in 1935, the monetary and banking upheaval that started in 1930 stopped and capital that had fled the country began to be repatriated (Chlepner, 1943). Triggered by the financial crisis of the late 1920s and its effect on financial markets and the banking industry, which was severely disrupted in the early 1930s, new legislations were introduced in 1934 and 1935 which tightened the regulation for the BSE and banks. This started a period, which would last for several decades, in which the role of the BSE in financing Belgian industries dramatically decreased (Buelens, 2001). These measures included a ban on mixed banks, which were forced to split up. It was forbidden for any bank to own stocks or bonds issued by other firms for a longer period than 6 months (Chlepner, 1943).

3.3 Determinants of stock and bond IPOs

In this section we present an overview of factors that are expected to determine the number of IPOs.

3.3.1 Timing

The number of stock IPOs tends to increase in expansionary phases of the business cycle because there are more promising investment opportunities (Lowry, 2003). We therefore expect that the number of stock IPOs is positively related to GDP growth, a proxy for the business cycle. However, firms can finance promising investment opportunities by using either equity or debt. We therefore expect that the number of bond IPOs is also positively related to economic growth.

The market timing theory of Baker and Wurgler (2002) posits that firms time their IPO to coincide with favorable market conditions. The assumption in this theory is that markets are inefficient due to systematic biases from irrational investors and that rational managers use temporary mispricing to time their issues. The market value of stock is high when the profits investors expect are high which causes stock prices to rise and the market value of bonds is high

when interest rates are low. The empirical implication is that stock issues are expected to be positively related to the valuation of assets quoted on a stock market (Lucas and McDonald, 1990, Lerner, 1994, Pagano *et al.*, 1998, Banerjee *et al.*, 2013) and to stock market returns (Lucas and McDonald, 1990, Pástor and Veronesi, 2005, Banerjee *et al.*, 2013). Also, firms avoid issues in periods with high volatility in stock market returns (Choe *et al.*, 1993, Pástor and Veronesi, 2005, Banerjee *et al.*, 2013). The effects of prices, returns and volatility also apply to bond issues. An additional empirical implication for bond issues is that a negative relation is expected with the long-term interest rate (Graham and Harvey, 2001).

Another timing variable for investors is the yield curve, which is the spread between the interest rates on bonds and their different maturities. Its slope is supposed to predict the development of future short-term interest rates (Estrella and Hardouvelis, 1991). According to the expectations-theory the yield curve presents investors' expectations of future interest rates and is the current long-term interest rate (minus a liquidity premium) considered to be the average of the successive expected short-term interest rates for the same period (see Omondi, 2016). In case the long-term interest rate is higher (lower) than the short-term interest rate, investors' expectation is that the future short-term interest rate will rise (decline), causing future bond prices to decrease (increase). The implication is that we expect that the number of bond IPOs are negatively related to the yield spread.⁴⁴

Moore (1983) confirms the positive relation between stock issues and profits for a sample of US firms between 1946 and 1970, and the negative relation between bond issues and interest rates, but indicates that this has implications for how these issues are related to the business cycle. When profits are expected to rise in an upswing, stock prices increase. At the same time the interest rates rose, caused by an increasing restriction in the supply of money, which lowered the market value of bonds. The empirical result is that in the US post-war economy, a shift towards stock issues and away from bond issues occurred during a business upswing and an opposite shift occurred in a contraction phase of the business cycle. Choe *et al.* (1993) finds for a more recent US sample that firms issue relatively more equity than debt during expansionary phases of the business cycle because they are faced with lower adverse selections costs. Therefore, we introduce a nuance

⁴⁴ The long-term interest rate and the yield could affect the maturity of a bond. However, we have no data on coupon rates and maturities so we were not able to investigate this.

in how stock and bond IPOs are related to economic growth and expect that relatively more stock IPOs are issued than bond IPOs during periods of economic growth.

3.3.2 Institutional change

In this chapter we specifically focus on the role of the government as regulator in securities markets. The necessity and effectiveness of regulation in securities markets is an ongoing discussion. Some economists state that in a perfect efficient and well-developed market, regulation is superfluous, because such a market is self-regulating. Others state that some level of regulation is needed to correct market failures in order to have financial stability (e.g., Peltzman, 1976), and a third group argues that the level of regulation and the role of the regulator depends on the stage of the development of the securities market (e.g., Stiglitz, 1993). In reality all securities markets in the western world have some kind of regulation and according to Stigler (1964) this is “to increase the portion of truth in the world and to prevent or punish fraud”.

Regulation of securities markets serves two goals. The first is to protect investors by decreasing the information asymmetry between investors, issuers and underwriters (Cattaneo *et al.*, 2015) allowing investors to make confident and informed investment decisions for which correct and material information is fundamental (Latimer and Maume, 2014). The second goal is to eliminate an unfortunate allocation due to a market failure (Peltzman, 1976). Hall and Soskice (2001) identify two ideal types of governmental interference. The first ideal type is a liberal market economy in which the government takes a *laissez faire* approach and only sets minimal rules and laws to ensure a fair and transparent market in which firms and investors coordinate their activities through markets. The second ideal type is an economy in which the government not only sets rules and laws, but also intervenes in coordination activities. In a liberal market economy, firms rely less on long-term banking loans and more on public capital markets. In a coordinated market, based on strong relations with suppliers of finance, bank loans are used more (see also, De Jong *et al.*, 2010).

In our study the liberalisation of the Belgian economy and the easing of regulations for the BSE between 1865 and 1873 are the most important institutional changes. We define the period before 1873 as a coordinated market and the period after 1873 as a liberal market economy and are especially interested in the effect of these quite abrupt changes on the number of IPOs.

3.4 Data and methodology

The purpose of our analysis is to determine the drivers of the fluctuation in the number of stock and bond IPOs. We first aim to find the drivers of the number of initial public stock and bond offerings separately. For this we use OLS-regression models. In a next step we investigate whether stock and bond IPOs are complements or substitutes by applying 3SLS-regression models (Zellner and Theil, 1962). In the final step we measure whether firms issue relatively more equity than debt during expansionary phases of the business cycle.

The main source for our data is a database from the Studie Centrum voor Onderneming en Beurs (SCOB) of the University of Antwerp, which holds all archives of the BSE.⁴⁵ This database contains data for all stock and bond issues of all listed firms. Firms are categorized into industries and a selection is made between domestic and foreign firms active in Belgium or abroad. In this chapter we focus on domestic firms, mainly active in Belgium. In the period covered in this study many non-Belgian firms were listed on the BSE, especially before the First World War. We chose not to include them in this study, because the reasons for their listing in Brussels were often unrelated to underlying economic conditions, such as the comparative tax advantage of being listed in Belgium rather than in their home country. We have data on the number of IPOs for the full period. In the First World War the BSE was closed and no new issues were placed. For the 1883-1935 period we also observe the volume of money raised with equity IPOs.⁴⁶ All variables and sources are included in Table 3.2.

GDP is calculated based on the value added at current market prices in million BEF. GDP growth (*GDP Growth*) is the yearly increase in GDP. The yearly stock market level (*Stock Index*) is calculated with the monthly total returns, where the level for the 31st of December 1835 is set to 100. We correct the stock market level for inflation (Lerner, 1994). The stock market return (*Stock Returns*) is the annual percentage change of the market index, before inflation correction. The stock market volatility (*Stock Volatility*) is calculated as the variance in stock market return, using three years of data.⁴⁷ Both stock market return and volatility are proxies for changes in market conditions (Pástor and Veronesi, 2005) and for this reason not corrected for inflation. The yearly bond market

⁴⁵ See <http://www.scob.be>

⁴⁶ We have no volume data for bond IPOs and only data for the period 1883-1935 for stock IPOs.

⁴⁷ Pástor and Veronesi (2005) defines market volatility as the monthly standard deviation of daily market returns within the month of the IPO and Choe *et al.* (1993) defines market volatility as the daily market return variance measured over the 60 trading days prior to the beginning of the month of the stock offering.

Table 3.2: Variables and sources

Variable	Abbreviation	Source
Number of stock initial public offerings from non-financial domestic firms	Stock IPOs	SCOB database
Number of stock initial public offerings, including financials	Stock IPOs Fin	SCOB database
Volume of initial public stock offerings, corrected for inflation (in Belgian Francs, 1883 values)	Stock IPOs Vol	SCOB database
Number of bond initial public offerings from non-financial domestic firms	Bond IPOs	SCOB database
Number of bond initial public offerings, including financials	Bond IPOs Fin	SCOB database
Annual inflation rate	Inflation	SCOB database
Number of equity securities quoted at the BSE per million of inhabitants of Belgium	Stock Securities	SCOB database
Number of bond securities quoted at the BSE per million of inhabitants of Belgium	Bond Securities	SCOB database
Number of inhabitants of Belgium	Population	Goossens (1993)
Growth in gross domestic product	GDP Growth	Historical National Accounts Database
Level of BSE stock market index based on total returns, where the level for the 31st of December 1835 is set to 100, corrected for inflation.	Stock Index	SCOB database
Annual return in the level of BSE stock market index based on total returns, before correction of inflation	Stock Returns	SCOB database
Three-year volatility in annual returns of BSE stock market index based on total returns	Stock Volatility	SCOB database
Level of BSE bond market index based on total returns, where the level for the 31st of December 1837 is set to 100, corrected for inflation	Bond Index	SCOB database
Annual return in the level of BSE bond market index based on total returns, before corrected for inflation	Bond Returns	SCOB database
Three-year volatility in annual returns of BSE bond market index based on total returns	Bond Volatility	SCOB database
Annual yield-to-maturity for Belgian perpetual government bond	Interest	SCOB database
Spread between long and short interest rates	Yield	SCOB database, Price lists, Newspapers, National bank Belgium
Number of newly founded firms in Belgium	Foundation	Frère (1951), Kruispuntbank van Ondernemingen
Number of newly founded firms in Belgium, financial firms included	Foundation Fin	Frère (1951), Kruispuntbank van Ondernemingen
Total amount of savings at Belgium banks	Deposits	Mitchell (2007)

This table presents variables, abbreviations and sources.

level (*Bond Index*) is calculated based on total returns, where the level for the 31st of December 1837 is set to 100. Like for stock we correct this level for inflation. The bond market return (*Bond Returns*) is the annual percentage change of the market index, before inflation correction and the bond market volatility (*Bond Volatility*) is calculated as the variance in stock market return, using three years.

The long-term interest rate (*Interest*) is calculated as the annual yield of a perpetual government bond which was listed on the BSE from 1831 until 2013. The yield (*Yield*) is calculated as the spread between the long-term and short-term interest rate, where the short-term interest rate is calculated based on the commercial paper rate (1833-1940). The commercial paper rate for 1832-1918 is taken from the official quotation lists of the Antwerp Stock Exchange (published on a daily basis until 1883) as well as from the newspapers *Journal du Commerce d'Anvers*, *L'Avenir*, *Moniteur des Intérêts Matériels* and *Het Handelsblad*. For the period 1920-1935, we take data from the commercial paper rate from the National Bank of Belgium.⁴⁸ The data for the number of listed securities comes from the SCOB-database and the data for the population comes from Goossens (1993).

Stock and bond market development may affect the allocation of financial resources and typically change incrementally. Since firms have several means to obtain finance, more firms are assumed to issue stock or bonds when equity or bond markets become more important in a country's capital market. The level of development of markets can be measured in several ways (see for an overview Van Nieuwerburgh *et al.*, 2006). Rajan and Zingales (2003) measure stock market development by the ratio of the number of domestic firms whose equity is publicly traded in a domestic stock exchange to a country's population in millions. Our measures (*Stock Securities* and *Bond Securities*) are closely related to this. Instead of listed firms we use the number of listed securities, i.e., stocks or bonds. We expect that the number of stock (bond) IPOs is positively related to the ratio of the number of listed stocks (bonds) of Belgian domestic firms relative to the population of Belgium in millions of inhabitants.

To control for multicollinearity and autocorrelation, we measure correlations between our variables for the first 16 lags. Although variables with a high first order autocorrelation are best suited to predict future values, these variables also make linear regression models less suitable. As

⁴⁸ Sources are: (1) National Bank of Belgium, 1929. *Statistiques Economiques Belges 1919-1928*. Bulletin d'Information et de Documentation. April, 1-85; and (2) National Bank of Belgium, 1950. *De Nationale Bank van België 1850-1950*. Tijdschrift voor Documentatie en Voorlichting. 25 (3), 63-178.

expected, our variables that represent absolute levels have a high first order autocorrelation and the variables that represent growth or decline rates do not. The IPO time series also have high first order autocorrelations. We therefore do not use a standard OLS-model but use Newey-West estimators (Newey and West, 1987). When time series are non-stationary there is a heightened risk of spurious regressions and the regression estimators are likely to be adversely affected (Dougherty, 2007). To overcome this problem some papers detrend their time series. However, we see no need for detrending.⁴⁹ In addition, Dickey-Fuller Generalized Least Squares tests are performed (Elliot, Rothenberg and Stock, 1996) to verify stationarity. The results show that the null hypothesis of a unit root in the time series of the natural log of one plus the number of stock IPOs is rejected for lags 1-3 at the 1% level and for the natural log of one plus the number of bond IPOs at a 10% level. Since the IPO-process is time consuming we assume that a firm's decision to go public is based on information that is available in the year prior to the year of the listing.⁵⁰ We use the following model, or variations thereof, for our regressions:

$$\begin{aligned} \ln(1 + \text{Stock IPOs}_t) = & \text{Constant} + \beta_1 \text{GDP Growth}_{t-1} + \beta_2 \ln(\text{Stock Index}_{t-1}) + \\ & \beta_3 \text{Stock Returns}_{t-1} + \beta_4 \text{Stock Volatility}_{t-1} + \beta_5 \text{Interest Rate}_{t-1} + \beta_6 \text{Yield}_{t-1} + \\ & \beta_7 \text{Stock Securities}_{t-1} + \beta_8 \text{Post 1873}_t + \beta_9 \text{Post 1920}_t + \varepsilon_t \end{aligned}$$

The dependent variable *Stock IPOs_t* is the natural log of one plus the number of equity IPOs in year *t*. This variable is regressed on the growth of GDP (*GDP Growth_{t-1}*), the natural log of the stock or bond market level (*Stock Index_{t-1}*), stock or bond market return (*Stock Returns_{t-1}*), volatility in stock or bond market return (*Stock Volatility_{t-1}*), the long-term interest rate (*Interest Rate_{t-1}*), the spread between the long- and short-term interest rate (*Yield_{t-1}*) and the total number of publicly traded domestic equity or bond securities per million of inhabitants (*Stock Securities_{t-1}*). Finally, we include two dummy variables, one for the institutional change that was completed in 1873 (*Post 1873_t*) and one that marks the start of a period with a highly unstable monetary situation (*Post 1920_t*). Both dummy variables have the value of one in the mentioned year and onwards. We conduct our analysis for the entire period, but also for sub-periods to capture the influence of

⁴⁹ Lowry (2003) and Pástor and Veronesi (2005) detrend their time series of IPOs by deflating the number of IPOs in a certain period by the number of publicly listed firms at the end of the previous period. Since we add a similar variable to our regression (the number of listed securities per million of inhabitants) we see no need for additional detrending.

⁵⁰ Today the IPO-process takes approximately twelve months (source: Public Listing on NYSE EuroNext, 2012).

changes in the institutional setting. For bond IPOs we use a similar model. We perform an additional analysis with this model for the period 1883-1935 using stock IPO proceeds as the dependent variable and compare the results with those from the number of stock IPOs. Because stock and bond IPOs may be complements or substitutes, we use a three-stage-least-square (3SLS) regression (Zellner and Theil, 1962) to determine how stock and bond IPOs are related.

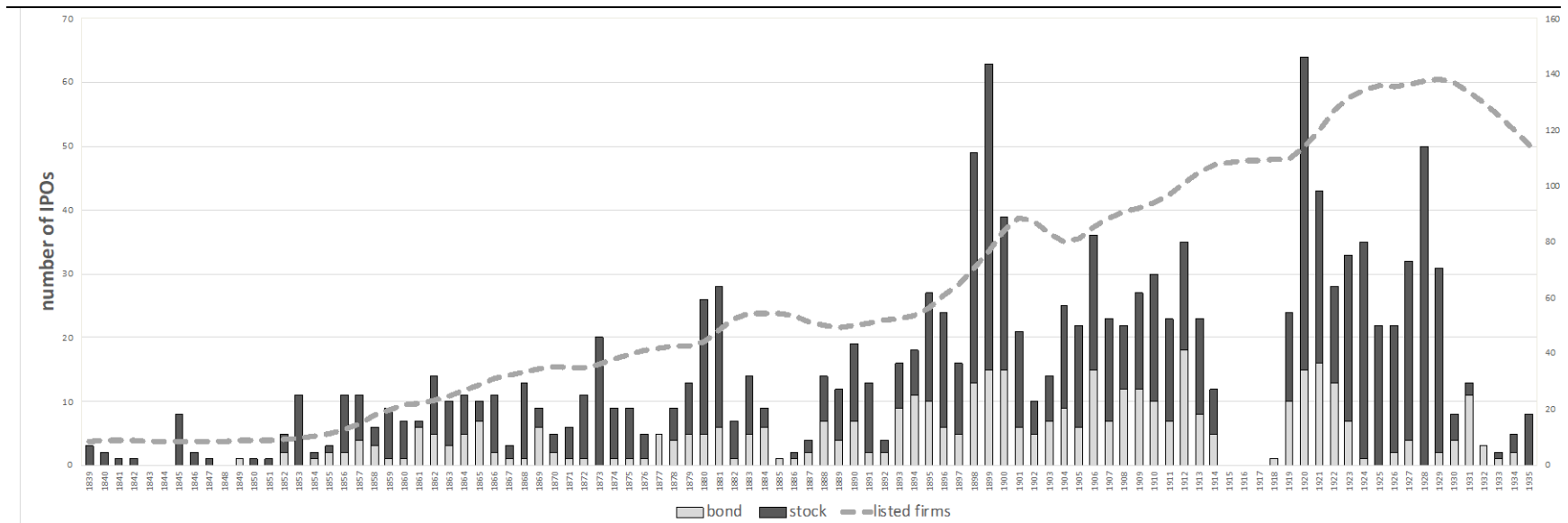
3.5 Results

In this section we present the descriptive statistics, analyses and robustness checks.

3.5.1 Descriptive statistics

From 1839 to 1935 in total 943 Belgian domestic non-financial firms issued 922 stock and 387 bond IPOs. From these firms, 556 firms only issued a stock IPO, 21 firms only issued a bond IPO and 366 firms issued both types during our investigation period. From the firms that issued both types, 197 firms issued first a stock IPO, 19 firms issued first a bond IPO and 150 firms issued both types simultaneously, i.e., within the same month. Figure 3.1 presents the time series of stock and bond IPOs and the three-year moving average of the number of securities (stock plus bonds) per million of inhabitants. The descriptive statistics of the raw data are in Table 3.3. The descriptive statistics in Panel A of Table 3.3 show that we have an average of 9.51 firms per year seeking a quotation at the BSE with a stock IPO and 3.99 with a bond IPO. The average inflation rate is 3.1 per cent, GDP growth is 4.4 per cent and the long-term interest rate 4.1 per cent. We observe in Figure 3.1 that the 1873 changes are followed by a higher number of IPOs. Moreover, in periods with many stock IPOs we also observe more bond IPOs: the correlation between the two series is as high as 0.63. Panel B shows that the average number of IPOs in the period 1873-1935 is indeed much higher, both for stock and bonds, than in the period 1839-1872.

Figure 3.1: Development of initial public offerings, 1839-1935



This figure presents the number of bond and stock initial public offerings on the Brussel Stock Exchange from 1839 until 1935. The grey (black) bars are the number of bond (stock) offerings (left axis) and the dashed line is the three-year moving average of the number of securities (stock plus bonds) per million inhabitants (right axis). Source: SCOB database.

Table 3.3: Data descriptives statistics

Panel A: Full sample						
	Average	Standard deviation	Number of Observations	25th percentile	50th percentile	75th percentile
Stock IPOs	9.51	10.21	97	2	6	15
Stock IPOs Fin	10.51	11.48	97	2	6	16
Stock IPOs Vol (mln)	63.9	90.5	46	16.9	40.8	77.9
Bond IPOs	3.99	4.10	97	1	3	6
Bond IPOs Fin	4.15	4.24	97	1	3	7
GDP Growth	0.044	0.131	97	-0.020	0.021	0.058
Stock Index	1076.712	894.900	97	328.329	681.938	1696.765
Stock Returns	0.063	0.168	97	-0.009	0.034	0.128
Stock Volatility	0.021	0.038	97	0.002	0.005	0.218
Stock Securities	45.111	30.325	97	19.627	36.325	71.814
Bond Index	719.734	564.530	97	245.618	534.927	1077.854
Bond Returns	0.046	0.050	97	0.025	0.042	0.062
Bond Volatility	0.0024	0.0056	95	0.0001	0.0004	0.0022
Bond Securities	17.563	12.593	97	7.176	16.259	28.153
Interest Rate	0.041	0.009	97	0.033	0.041	0.047
Yield	-0.004	0.011	97	-0.010	-0.004	0.001
Foundation	119.632	136.046	76	10	47	180
Foundation Fin	343.868	545.437	97	14	108	360
Deposits	2260.356	1329.771	61	1043.208	2199.53	3112.981
Inflation	0.031	0.154	97	-0.041	0.010	0.061
Population	6,019,080	1,325,484	97	4,738,321	5,904,527	7,407,391

Table 3.3: Data descriptives (continued)

Panel B: Sub-periodes				
	1839-1872		1873-1935	
	Average	Standard deviation	Average	Standard deviation
Stock IPOs	3.059	2.881	12.984	11.048
Stock IPOs Fin	3.471	3.662	14.302	12.452
Stock IPOs Vol (mln)	-	-	63.9	90.5
Bond IPOs	1.529	1.846	5.317	4.369
Bond IPOs Fin	1.559	1.894	5.556	4.500
GDP Growth	0.036	0.066	0.049	0.156
Stock Index	246.747	119.662	1524.63	806.710
Stock Returns	0.055	0.132	0.068	0.186
Stock Volatility	0.016	0.031	0.024	0.042
Stock Securities	14.676	6.163	61.537	24.931
Bond Index	196.067	84.676	1002.349	508.039
Bond Returns	0.046	0.050	0.046	0.051
Bond Volatility	0.003	0.004	0.002	0.006
Bond Securities	3.903	4.543	24.935	8.777
Interest Rate	0.046	0.004	0.038	0.010
Yield	-0.004	0.0089	-0.0065	0.0110
Foundation	9.059	4.572	192.857	135.494
Foundation Fin	10.676	5.068	523.686	605.720
Deposits	-	-	2260.356	1329.771
Inflation	0.012	0.0965	0.042	0.177
Population	4554096	293399.5	6809707	928679.8

This table presents the descriptive statistics of the raw data for the full period (Panel A) and for 1839-1872 compared to 1873-1935 (Panel B). For each variable we present average, standard deviation and the 25th, 50th and 75th percentiles of the annual values in Panel A and average and standard deviation in Panel B. All variables are defined in Table 3.2.

3.5.2 Determinants of initial stock offerings

We start with a regression analysis for stock IPOs. The results of the regression are presented in Table 3.4. The fit of the model is good, with the R^2 between 52 and 68 per cent.

Table 3.4: Determinants of initial public stock offerings

	(1)	(2)	(3)	(4) 1839-1872	(5) 1873-1935
GDP Growth	2.984*** (0.000)	3.182*** (0.000)	3.202*** (0.000)	0.207 (0.858)	3.342*** (0.000)
Ln(Stock Index)	1.458*** (0.000)	1.484*** (0.000)	1.494*** (0.000)	3.246*** (0.002)	1.527*** (0.000)
Stock Returns	1.226*** (0.001)	0.887** (0.030)	1.010** (0.015)	-0.261 (0.795)	1.156*** (0.003)
Stock Volatility	0.019 (0.996)	-1.376 (0.549)			
Interest Rate	27.617 (0.173)	3.294 (0.895)			
Yield	-0.712 (0.906)	-9.173 (0.341)			
Post 1873		1.679 (0.650)	0.220 (0.481)		
Post 1920		1.742** (0.014)	1.583*** (0.003)		1.563*** (0.004)
Stock Securities	-0.032*** (0.000)	-0.050*** (0.000)	-0.049*** (0.000)	-0.189** (0.018)	-0.050*** (0.000)
Constant	-7.582*** (0.000)	-6.362*** (0.001)	-6.303** (0.000)	-13.551*** (0.002)	-6.313*** (0.000)
Observations	97	97	97	34	63
R^2	0.603	0.676	0.670	0.519	0.604

This table presents OLS regressions explaining the log value of one plus the number of stock initial offerings, with Newey-West-corrected $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. All results are for 1839-1935, unless indicated. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

In the full period 1839-1935 we find that the log-scaled number of stock IPOs is positively and significantly influenced by *GDP Growth*. We also find that the stock exchange index and stock returns have a positive and significant effect on the number of IPOs. These results imply that there were more IPOs in periods of economic growth and when the stock market performed well. Interestingly, while the 1873 dummy has a positive coefficient, this coefficient is not statistically significant. This suggests that the liberalization in 1873, which abolished the requirement of

government permission to set up a limited liability firm, did not directly affect the number of IPOs. However, the 1873 reforms may have had an *indirect* effect on IPOs by stimulating economic development and facilitating future growth.⁵¹ While *GDP growth* is not significantly related to the number of stock IPOs before 1873 (column (4)), it is strongly and positively related to the number of IPOs after 1873 (column (5)). The differences in the results between the two periods supports the finding of Van Nieuwerburgh *et al.* (2006) that there was a stronger link between the BSE and the Belgian economy after 1873. We also find that the level of development of the BSE is significantly and negatively related to the number of IPOs before and after 1873, which indicates that more new equities are listed when the market is smaller relative to the number of inhabitants.

The dummy variable $Post\ 1920_t$ that marks the beginning of the ‘Roaring Twenties’ is significant in every model. There are two explanations for this. First, the hunt for “real value” (Chlepner, 1943). Increasing wages, both in real and monetary terms, brought a new class of investors to the BSE and high inflation led to a shift from fixed income investments to stocks. Both banks and retail investors invested heavily in industrial securities and because of this the BSE was during the 1920s almost always in a state of excitement, usually bullish (Chlepner, 1943). Second, the First World War casted its shadow in the media years before its outbreak in 1914. Coverage of an impending increase in war in the newspapers leads to the postponement of IPOs to mitigate war risks (Verdickt, 2020). As a result, the variable $Post\ 1920_t$ marks the end a period with few to no IPOs since the early 1910s and the start of a period with many IPOs.

Our tests rely on the number of IPOs, but the size of IPO issues may vary over time. We have information about the issue size for equities for the period 1883-1935. We thus conduct a test by replacing the number of equity IPOs by the natural log of the total volume in BEF, corrected for inflation. Because there is one extreme observation in 1928 – the firm Union Chimique Belge – that represents 15 per cent of the total volume, we report results with and without this issue in Table 3.5.

⁵¹ In this respect, it is also interesting to note that after the 1873 liberalizations, the number of limited liability companies set up each year in Belgium strongly increases (Frère, 1951), and the correlation between IPOs and new limited liability companies becomes stronger. The correlation increases from 0.56 for the 1839-1872 period to 0.66 for the 1874-1914 period (own calculations with the number of new limited liability companies in each year based on Frère, 1951).

Table 3.5: Determinants of volume of initial public stock offerings

	(1) Ln(Stock IPOs Vol)	(2) Ln(Stock IPOs Vol) (without outlier)	(3) Ln(1+Stock IPOs)
GDP Growth	2.730** (0.016)	2.726** (0.016)	3.675*** (0.000)
Ln(Stock Index)	1.580*** (0.007)	1.564*** (0.008)	1.759*** (0.000)
Stock Returns	1.765** (0.043)	1.592* (0.066)	1.019*** (0.003)
Stock Volatility	-3.122 (0.444)	-3.400 (0.405)	-2.746 (0.160)
Post 1920	0.899 (0.223)	0.895 (0.225)	1.720*** (0.001)
Stock Securities	-0.017 (0.361)	-0.017 (0.364)	-0.050*** (0.000)
Constant	-7.448** (0.028)	-7.327** (0.031)	-8.005*** (0.000)
Observations	46	46	53
R ²	0.565	0.546	0.647

This table presents OLS regressions explaining the log volume of initial offerings (1), the log volume of initial offerings without an outlier (2) and the log value of one plus the number of initial offerings (3) in the period 1883-1935, with Newey-West-corrected $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

Again, we find in Table 3.5 that *GDP Growth* and the stock market index and returns are main determinants. To allow a better comparison with the results for the number of IPOs we tested these models also for the 1883-1935 window. These results are also presented in the in Table 3.5. *GDP Growth*, stock market level and returns and the post 1920 dummy are here significant at 1% level. Remarkably, although the number of IPOs increases significantly after 1920, the volume does not. In addition, the number of equity securities is statistically significant negatively related to the number of IPOs (at the 1% level), this is not the case for the volume.

3.5.3 Determinants of initial bond offerings

The results for bond IPOs are presented in Table 3.6. Again, the fit of the model is good, with the R^2 between 38 and 53 per cent, but less compared to stock IPOs. A higher *GDP Growth* has a significant positive impact on bond IPOs, indicating that there are more bond IPOs in expansionary phases of the economy. Also, bond IPOs seem to be timed. In times when the valuation of bonds is high and the volatility in the bond returns is low.

Table 3.6: Determinants of initial public bond offerings

	(1)	(2)	(3)	(4)	(5) 1839-1872	(6) 1873-1935
GDP Growth	2.482*** (0.001)	1.222* (0.085)	2.117*** (0.002)	2.255*** (0.001)	0.334 (0.811)	2.192*** (0.005)
Ln(Bond Index)	1.282*** (0.000)		0.841** (0.024)	0.925*** (0.006)	2.377*** (0.000)	0.655 (0.116)
Bond Return	0.665 (0.718)		0.285 (0.873)			
Bond Volatility	-28.453** (0.035)		-35.381** (0.018)	-29.274*** (0.005)	-34.737* (0.058)	-23.242* (0.063)
Interest Rate		-73.274*** (0.001)	-33.561 (0.236)	-30.038 (0.219)	-8.896 (0.764)	-47.726* (0.058)
Yield		-9.697 (0.328)	-11.195 (0.305)			
Post 1873	-0.574 (0.107)	-0.525 (0.265)	-0.725 (0.128)	-0.647 (0.115)		
Post 1920	1.245* (0.053)	0.803 (0.349)	1.524** (0.048)	1.349* (0.059)		1.270 (0.110)
Bond Securities	-0.049* (0.070)	0.023 (0.291)	-0.028 (0.302)	-0.0312 (0.254)	-0.145*** (0.007)	-0.017 (0.630)
Constant	-5.761*** (0.000)	3.951*** (0.000)	-1.954 (0.508)	-2.553 (0.311)	-10.566*** (0.000)	-1.039 (0.720)
Observations	94	97	94	94	31	63
R ²	0.472	0.432	0.495	0.483	0.531	0.375

This table presents OLS regressions explaining the log value of one plus the number of initial bond offerings, with Newey-West-corrected $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. All results are for 1839-1935, unless indicated. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

As expected, a higher interest rate has a significant negative impact on bond IPOs over the full period, but only if the bond market variables are left out. This is because the correlation between the natural log of the bond market index and the long-term interest rate is high and negative. When the interest rate is high the valuation of bonds is low. In model (3) we include both the bond index and interest rate and conclude that the bond index effect dominates the interest rate effect.

When we distinguish between the subperiods 1839-1872 and 1873-1935 in columns (5) and (6), we find that *GDP Growth* is only significantly related to bond IPOs in the period after 1873. This is an indication that, as for stock, there was also a stronger link between the BSE and the Belgian economy after 1873 for bonds.

3.5.4 Interdependence of stock and bond IPOs

So far, we have regressed stock and bond IPOs separately. Of course, these two financing instruments may interact, either by being complements (positive relation) or as substitutes (negative relation). We have seen already that the correlation for the log values is large and positive.⁵² However, this may be caused by factors that determine both stock and bond IPOs, and we thus have to control for these determinants in a 3SLS model. The outcome of our 3SLS-regression is presented in Table 3.7 (full period) and Table 3.8 (sub-periods). With these models the R^2 for stock increase to 74 per cent while the best model for bonds has a R^2 of 43 per cent. The results confirm the earlier main findings for the determinants of stock and bond IPOs. There are more IPOs in expansionary phase of the business cycle (especially after 1873) and IPOs are timed to coincide with favorable market conditions. The results also show that the number of stock and bond IPOs are not significantly related. In other words, these two financing instruments are not interdependent although the correlation between the natural logs of the number of stock and bond IPOs is relatively high. This is also the case for the two sub-periods as presented in Table 3.8.

⁵² Period 1839-1935: 0.6305, Period 1839-1872: 0.5069 and Period 1873-1935: 0.5302.

Table 3.7: 3SLS for determinants of initial public stock and bond offerings

	(1)		(2)	
	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)
Ln(1+Stock IPOs)		-1.143 (0.372)		-0.111 (0.451)
Ln(1+Bond IPOs)	0.249 (0.371)		0.140 (0.485)	
GDP Growth	2.558*** (0.001)	2.763*** (0.002)	2.804*** (0.000)	2.781*** (0.001)
Ln(Stock Index)	1.298*** (0.000)		1.319*** (0.000)	
Stock Returns	1.378** (0.012)		1.351*** (0.004)	
Stock Volatility	-1.563 (0.389)			
Ln(Bond Index)		1.136*** (0.004)		1.148*** (0.002)
Bond Return		0.683 (0.653)		
Bond Volatility		-30.279* (0.051)		-20.754 (0.116)
Interest Rate	15.641 (0.446)	-27.514 (0.197)		-29.038 (0.130)
Yield	-6.762 (0.376)	-13.145 (0.125)		
Post 1873	0.267 (0.323)	-0.746** (0.019)	0.222 (0.336)	-0.650** (0.035)
Post 1920	1.441*** (0.003)	1.816*** (0.001)	1.485*** (0.000)	1.607*** (0.000)
Stock Securities	-0.045*** (0.000)		-0.044*** (0.000)	
Bond Securities		-0.0445* (0.065)		-0.045** (0.050)
Constant	-6.204*** (0.0000)	-3.588 (0.179)	-5.552*** (0.000)	-3.611 (0.145)
Observations	94	94	94	94
R ²	0.738	0.412	0.704	0.416
Chi ²	238.80	84.87	208.49	85.16
P-value	0.0000	0.0000	0.0000	0.0000

This table presents 3SLS regressions explaining the log value of one plus the number of initial offerings, with $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. All results are for 1839-1935. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

Table 3.8: Sub-period 3SLS for determinants of initial public stock and bond offerings

	(1)		(2)	
	1839-1872		1873-1935	
	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)
Ln(1+Stock IPOs)		-0.234 (0.498)		-0.037 (0.820)
Ln(1+Bond IPOs)	-0.211 (0.539)		0.224 (0.225)	
GDP Growth	-0.045 (0.980)	0.952 (0.568)	2.745*** (0.000)	2.385** (0.012)
Ln(Stock Index)	3.521*** (0.001)		1.290*** (0.000)	
Stock Returns	0.094 (0.926)		1.544*** (0.002)	
Ln(Bond Index)		2.881*** (0.000)		0.724 (0.105)
Bond Volatility		-33.055 (0.439)		-16.755 (0.286)
Interest Rate		-28.271 (0.637)		-50.331** (0.036)
Post 1920			1.468*** (0.000)	1.411*** (0.004)
Stock Securities	-0.198*** (0.007)		-0.043*** (0.000)	
Bond Securities		-0.182*** (0.006)		-0.024 (0.394)
Constant	-14.758*** (0.001)	-11.903** (0.025)	-5.321*** (0.000)	-1.210 (0.696)
Observations	31	31	63	63
R ²	0.422	0.426	0.702	0.345
Chi ²	32.73	32.03	133.53	41.39
P-value	0.0000	0.0000	0.0000	0.0000

This table presents 3SLS regressions explaining the log value of one plus the number of initial offerings, with $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

3.5.5 IPOs and the business cycle

Finally, we investigate in more detail how stock and bond IPOs are related to the business cycle.

To be more precise, we investigate whether firms issue relatively more equity than debt during years with positive versus negative economic growth. We present our results in Table 3.9, which shows the proportion of stock IPOs in the total number of IPOs.

Table 3.9: Economic growth and fraction of stock IPOs in total IPOs

Period	Expansion years	Contraction years	All years
1839-1935	72.6% (64)	62.0% (33)	70.4% (97)
1839-1872	64.1% (26)	78.6% (8)	66.7% (34)
1873-1935	73.8% (38)	60.1% (25)	70.9% (63)

This table presents the percentage of IPOs that are stock IPOs during years in which the economy expanded (positive GDP growth) or contracted (negative GDP growth) and overall. The number of years is mentioned in parentheses.

Over the full period, 70.4 per cent of the IPOs is a stock IPO, and thus 29.6 per cent are bond IPOs. The relative number of stock IPOs does not differ much between the early period (66.7 per cent stock) and the later period from 1873 onwards (70.9 per cent stock). However, in the eight contraction years in the period 1839-1872, firms issued much more equity (78.6 per cent), compared to 64.1 per cent in the expansion years. Clearly, in the early period, equity was relatively more attractive for firms in the years with economic decline. This effect reverts in the second period, after the deregulations. Now, in the 25 contraction years the fraction of equity issues is only 60.1 per cent, compared to 73.8 per cent in the expansion years. This implies that after 1873 stock issues have become less attractive in years of economic decline, compared to bond issues.

3.5.6 Robustness analyses

We conduct a number of additional analyses to check the robustness of our findings. Because the IPO-process is time consuming we so far have assumed that a firm's decision to go public is based on information that is available in the year prior to the year of the listing. A firm's sense of value could be based more on its internal perspective than on information from public markets (Ritter and Welch, 2002). This means that sudden changes in the value of listed firms are not immediately absorbed and that firms therefore adjust their capital structure with a delay. As a robustness test, we therefore take the three-year moving average of the values of the explanatory variables for the two years before the IPO and the year of the IPO. The results, which are reported in Table 3.10 (see appendix), confirm our main findings.

IPOs of domestic financial firms are excluded from our dataset because of intrinsic differences in the nature of their operations and accounting information with non-financial firms (see Pagano *et al.*, 1998). However, in the SCOB data we also have a set of financial firms headquartered in Belgium. We find 97 additional stock IPOs and 16 bond IPOs from 99 different

firms. We perform robustness tests by including these firms and again find our results to be robust. These results are presented in Table 3.11 (see appendix).

The more firms are founded, the more IPOs are to be expected. To control for the number of foundations we perform a robustness check in which we add the variable *Foundations*. The results are presented in Table 3.12 (see appendix). We only have data for the number of foundations of non-financial domestic firms until 1914, see columns (1), but a complete time series including financials, see column (2). We constructed these time series by aligning the time series from Frère (1951) and “Kruispuntbank van Ondernemingen”, a database of the Belgian government.⁵³ The results again support our earlier main findings.

Bank loans are an alternative financing channel that could function as a complement or substitute for a for public bond. We therefore perform a final robustness check in which we add a variable to control for the development and importance of the banking sector: *Deposits*. The data for deposits is available from 1876 onwards in Mitchell (2007). The results are presented in Table 3.13 (see appendix). The results also support our main findings and show that the number of bond IPOs is not related to the importance of the banking sector.

3.6 Conclusions

New listings are important for investors, firms, and for a country’s economic development. For investors who want to hold a diversified portfolio, it is important that new firms find their way to the securities market. For young, risky and innovative firms with a limited track record, it is often difficult to obtain sufficient bank finance or to finance their growth with retained earnings. Securities markets provide them with access to finance and in that way facilitate and drive economic growth (Van Nieuwerburgh *et al.*, 2006).

In this chapter, we investigate the timing of stock and bond IPOs. We do this for a period with an institutional environment that is very different from today and was characterized by dramatic economic and regulatory changes. In addition, we examine whether stock and bond IPOs are complements or substitutes. Our findings for a setting in which the securities market is well developed, support the results from modern-day studies. Stock and bond IPOs are mainly used to finance future growth. Moreover, issues are timed to coincide with favorable market conditions, and relatively more stock than bond IPOs are issued in expansionary phases of the business cycle.

⁵³ see <https://economie.fgov.be/en/themes/enterprises/crossroads-bank-enterprises>

We also find evidence that the backlog in the number of IPOs due to political uncertainties prior to the First World War, was made up once these uncertainties were resolved in 1919.

Our conclusions support Gao *et al.* (2013) and Cattaneo *et al.* (2015) in that lessening the governmental grip on securities markets does not immediately increase the number of IPOs. However, the easing of regulation that took place in Belgium between 1865 and 1873 did start a process for economic development that led to a booming IPO-market in the following decades.

Appendix: Additional results of robustness checks

Table 3.10: 3SLS for determinants of initial public stock and bond offerings, with three-year averages

	(1) 1839-1935		(2) 1839-1872		(3) 1873-1935	
	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)
Ln(1+Stock IPOs)		0.009 (0.949)		-0.366* (0.074)		0.035 (0.833)
Ln(1+Bond IPOs)	0.204 (0.403)		-0.403 (0.333)		0.140 (0.517)	
GDP Growth	3.396*** (0.004)	2.866** (0.032)	2.724 (0.321)	3.078 (0.237)	3.686*** (0.002)	2.406 (0.108)
Ln(Stock Index)	1.355*** (0.000)		4.551*** (0.003)		1.542*** (0.000)	
Stock Returns	2.921*** (0.000)		0.781 (0.615)		2.819*** (0.001)	
Ln(Bond Index)		0.888* (0.084)		3.398*** (0.010)		0.477 (0.431)
Bond Volatility		-30.492* (0.080)		-39.826 (0.490)		-15.637 (0.446)
Interest Rate		-36.357 (0.135)		-72.342 (0.289)		-58.671* (0.055)
Post 1873	0.243 (0.278)	-0.663** (0.029)				
Post 1920	1.410*** (0.000)	1.358*** (0.005)			1.455*** (0.000)	1.115** (0.030)
Stock Securities	-0.048*** (0.000)		-0.265*** (0.007)		-0.051*** (0.000)	
Bond Securities		-0.0312 (0.326)		-0.245*** (0.005)		-0.009 (0.824)
Constant	-5.874*** (0.001)	-2.098 (0.544)	-19.351*** (0.003)	-12.229 (0.179)	-6.665*** (0.001)	0.311 (0.941)
Observations	93	93	30	30	63	63
R ²	0.757	0.474	0.523	0.426	0.708	0.375
Chi ²	241.70	84.61	39.30	39.42	148.75	37.36
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

This table presents 3SLS regressions explaining the log value of one plus the number of initial offerings, with $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are three-year averages. All variables are defined in Table 3.2.

Table 3.11: 3SLS for determinants of initial public stock and bond offerings, with financial firms included

	(1) 1839-1935		(2) 1839-1872		(3) 1873-1935	
	Ln(1+Stock IPOs Fin)	Ln(1+Bond IPOs Fin)	Ln(1+Stock IPOs Fin)	Ln(1+Bond IPOs Fin)	Ln(1+Stock IPOs Fin)	Ln(1+Bond IPOs Fin)
Ln(1+Stock IPOs Fin)		-0.091 (0.495)		-0.431 (0.167)		-0.018 (0.905)
Ln(1+Bond IPOs Fin)	0.066 (0.743)		-0.378 (0.252)		0.127 (0.493)	
GDP Growth	3.088*** (0.000)	2.662*** (0.001)	-0.140 (0.941)	1.317 (0.456)	3.166*** (0.000)	2.241** (0.013)
Ln(Stock Index)	1.472*** (0.000)		3.126*** (0.002)		1.474*** (0.000)	
Stock Returns	1.281*** (0.009)		0.611 (0.493)		1.378*** (0.008)	
Ln(Bond Index)		1.125*** (0.002)		2.908*** (0.000)		0.697* (0.096)
Bond Volatility		-21.055 (0.101)		-40.820 (0.287)		-17.119 (0.251)
Interest Rate		-32.164* (0.086)		-57.524 (0.246)		-53.471** (0.019)
Post 1873	0.147 (0.544)	-0.617** (0.040)				
Post 1920	1.576*** (0.000)	1.611*** (0.000)			1.583*** (0.000)	1.402*** (0.003)
Stock Securities	-0.0481*** (0.000)		-0.149** (0.035)		-0.048*** (0.000)	
Bond Securities		-0.0455** (0.040)		-0.183*** (0.006)		-0.023 (0.378)
Constant	-6.199*** (0.000)	-3.355 (0.161)	-13.165*** (0.003)	-10.416** (0.037)	-6.172*** (0.000)	-0.910 (0.755)
Observations	94	94	31	31	63	63
R ²	0.685	0.451	0.371	0.322	0.670	0.381
Chi ²	199.95	94.58	32.14	29.38	125.05	46.66
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

This table presents 3SLS regressions explaining the log value of one plus the number of initial offerings (financials included), with $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

Table 3.12: 3SLS for determinants of initial public stock and bond offerings, controlling for foundations

	(1) 1839-1914		(2) 1839-1935	
	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)
Ln(1+Stock IPOs)		0.119 (0.412)		-0.133 (0.397)
Ln(1+Bond IPOs)	-0.270 (0.515)		0.111 (0.578)	
GDP Growth	1.764 (0.204)	0.171 (0.878)	2.984*** (0.000)	2.982*** (0.001)
Ln(Stock Index)	1.440*** (0.007)		1.322*** (0.000)	
Stock Returns	1.222* (0.073)		1.220** (0.012)	
Ln(Bond Index)		2.084*** (0.000)		1.172*** (0.002)
Bond Volatility		10.331 (0.644)		-20.807 (0.113)
Interest Rate		42.070** (0.042)		-27.932 (0.142)
Post 1873	0.025 (0.940)	-0.765*** (0.001)	0.246 (0.287)	-0.6000* (0.054)
Post 1920			1.094*** (0.007)	1.207** (0.021)
Stock Securities	-0.046** (0.011)		-0.047*** (0.000)	
Bond Securities		-0.104*** (0.004)		-0.053** (0.032)
Ln(Foundation)	0.003* (0.055)	0.001 (0.168)		
Ln(Foundation Fin)			0.0004 (0.166)	0.0004 (0.203)
Constant	-5.853** (0.016)	-11.811*** (0.000)	-5.513*** (0.000)	-3.740 (0.133)
Observations	73	73	94	94
R ²	0.593	0.703	0.704	0.410
Chi ²	122.88	184.29	212.18	84.41
P-value	0.0000	0.0000	0.0000	0.0000

This table presents 3SLS regressions explaining the log value of one plus the number of initial offerings, with $P > |t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

Table 3.13: Determinants of initial public stock and bond offerings, controlling for deposits

	(1)	(2)	
	1876-1935	1876-1935	
	Ln(1+Bond IPOs)	Ln(1+Stock IPOs)	Ln(1+Bond IPOs)
Ln(1+Stock IPOs)			-0.001 (0.998)
Ln(1+Bond IPOs)		0.197 (0.407)	
GDP Growth	2.235*** (0.010)	2.826*** (0.001)	2.350** (0.014)
Stock Index		1.300*** (0.000)	
Stock Returns		1.559*** (0.003)	
Bond Index	0.792* (0.088)		0.668 (0.306)
Bond Volatility	-24.235** (0.043)		-18.664 (0.242)
Interest Rate	-40.935 (0.146)		-48.081* (0.055)
Post 1920	1.418* (0.066)	1.500*** (0.000)	1.383** (0.043)
Stock Securities		-0.045*** (0.000)	
Bond Securities	-0.020 (0.607)		-0.025 (0.366)
Ln(Deposits)	-0.0001 (0.597)		-0.00003 (0.827)
Constant	-1.926 (0.557)	-5.259*** (0.001)	-0.855 (0.841)
Observations	60	60	60
R ²	0.363	0.699	0.357
Chi ²		125.48	38.67
P-value		0.0000	0.0000

This table presents OLS (1) and 3SLS regressions (2) explaining the log value of one plus the number of initial offerings, with $P>|t|$ values (in parentheses) and significance levels denoted with *** for 1%, ** for 5% and * for 10%. The explanatory variables are one-year lagged. All variables are defined in Table 3.2.

4 Determinants of the offering method and its effect on underpricing

4.1 Introduction

A persistent phenomenon with respect to the pricing of stock IPOs is that on average the market price at the end of the first trading day is substantially higher than the offering price. This phenomenon, known as underpricing, was reported in the UK as early as 1929 (The Economist, July 27 in Chambers and Dimson, 2009) and seems to be of all markets and times. For example, the first-day returns of IPOs on the Berlin Stock Exchange between 1870 and 1896 was on average 5 per cent (Burhop, 2010), on the London Stock Exchange during the 1920s approximately 10 per cent (Chambers and Dimson, 2009) while Ritter and Welch (2002) report that underpricing in the US was 19 per cent for IPOs between 1980 and 2001. Due to underpricing issuing firms leave *money on the table* and why firms are willing to do this is one of the biggest puzzles surrounding IPOs (Lowry *et al.*, 2017).

Several models attempt to explain underpricing and most of these models assume that information asymmetry between the issuing firm, financial intermediary and investors is the main cause of underpricing. According to these models, IPOs are deliberately underpriced to entice uninformed investors to subscribe to the offering (Rock, 1986), to reward informed investors for sharing their valuation and interest during the bookbuilding phase (Benveniste and Spindt, 1989), to signal the issuing firm's quality (Allen and Faulhaber, 1989) or to reduce the likelihood of a lawsuit in case the market price falls below the offering price (Tiniç, 1988). The models of Baron (1982) and Benveniste and Spindt (1989) link underpricing with the method for offering shares to investors prior to their listing. The two most commonly used methods are based on a fixed price. With the first method, the issuing firm offers its shares to investors with the assistance of a financial intermediary that does not purchase any shares but agrees to maximize its efforts to sell as many shares as possible prior to the listing. With this self-placement method, the proceeds are not guaranteed and the issuing firm bears the risk if the issue is not successful. US Best-Effort and UK Placing are examples of contracts between the issuing firm and the financial intermediary for this method. With the second method, known as underwritten, the financial intermediary purchases the shares from the issuing firm at a discounted price and sells these shares to investors. The financial intermediary charges no fee, its profit and costs are covered by the gross spread between the price

paid for the shares and the offering price. With this method the proceeds for the issuing firm are guaranteed and examples of contracts are US Firm-Commitment and UK Public Offer. Under an underwritten contract the financial intermediary runs the risk that it has to hold any unsold shares in case the issue is not successful and to reduce this risk, the principal-agent model (Baron, 1982) predicts that the financial intermediary will underprice the issue more than when it was issued under a self-placement contract.

Although underpricing is well documented and tested, only a few papers empirically have studied its relation with the offering method and the aim of this chapter is to investigate what the determinants are for the methods and what the effects are on the level of underpricing. One of the empirically found determinants for the method is the volume of the offering. Because the total cost for an underwritten issue makes up a large portion of the amount raised with the IPO, an underwritten contract seems more suitable for larger volumes. For example, Fleming *et al.* (2021) find that the capital raised by underwritten issues in the Australian capital market in the Interbellum was relatively larger. Goergen *et al.* (2006) find similar results for IPOs in the UK between 1991 and 1995. Larger firms, that usually raise more money, use more often an underwritten contract. Firm characteristics are also found to be determinants for the offering method. Ritter (1984 and 1987) finds that firms characterised by a high degree of ex-ante uncertainty about the value of their shares are more likely to issue under a self-placement contract to avoid severe underpricing which would have been the case if they had used an underwritten contract. The empirically found effect of the offering method on the level of underpricing is not unambiguous. Chambers and Dimson (2009) find that the benefit of having an IPO underwritten was on average 7.4 per cent between 1917 and 1945 in the UK, but Fleming *et al.* (2021) find that there is no statistically significant evidence that underwriting reduces underpricing.

For the study on the determinants for the offering method and its effect on the level of underpricing, 167 stock IPOs that were issued in the Interbellum in the Netherlands are analysed. The IPO-market in the Interbellum in the Netherlands is an interesting setting for such study because of several reasons. Firstly, since the dominant theories on underpricing are based on information asymmetry, it is interesting to test some of these theories in a setting where the level of asymmetry was probably low due to the long-term relationships between firms and banks (Van den Broeke, 1988; Jonker, 1989) and investors and the presumed absence of uninformed

investors.⁵⁴ Secondly, in the Interbellum many firms applied for a listing, using different types of methods (with and without the service of an underwriter) for offering shares to investors at a fixed price. This provides an opportunity to study the determinants for the offering methods and its effect on the level of underpricing. Thirdly, the Amsterdam Stock Exchange was in this era well-organized and one of the leading stock exchanges in the world (De Vries, 1976), large enough to process new entries without causing price shocks (Rydqvist, 1993).

I find that the fraction of the volume of the IPO that was offered to investors prior to the listing largely determines the method. When this volume is small, more firms use a self-placement contract and as this volume increases, more firms tend to use an underwritten contract. This finding is consistent with the common practice at the time that an issuing firm first approached investors that had close ties with the firm and only when the volume of the needed capital exceeded the capacity of this network, called on a financial intermediary (Rennooij, 1951). Although the volume of the IPO is not determinative for the method, it is strongly related with underwriter reputation: reputable underwriters were more engaged in larger volumes. As expected, I find no evidence that in this particular setting the level of underpricing was affected by variables that proxy information asymmetries, although the level of underpricing was still on average six per cent. Also, the offering method did not affect the level of underpricing any more than underwriter reputation or the volume of the offering or of the IPO. The level of underpricing mainly fluctuated with stock market return and volatility, proxies for investors' sentiment, in the year prior to the listing. Finally, I find no evidence that underpricing has predictive power for the timing and volume of a firm's subsequent seasoned offering (SEO).

4.2 Historical context in the Netherlands, 1918-1939

Firms that opened up subscriptions to the public for their equity issue could make use of two methods in the interwar period (Rennooij, 1951). The first is a self-placement method called *Voor Eigen Rekening* (for own risk), in which the issuing firm takes care of the subscriptions and of the placement of the shares. Alternatively, a firm could ask a financial intermediary to take over the issue and to arrange all activities that are needed. This method, known as underwritten or *Consortiaal*, was the most used. Such an issue was often taken over by a syndicate of financial

⁵⁴ The higher the offering price of one share, the more wealth-constrained investors are excluded (Burhop, 2010). As a result, the price of a share is a proxy for the homogeneity of the group of investors. Because the nominal value of one share was NLG 1,000, and a weekly salary of a dock worker in 1930 was NLG 35.42, the group of investors was more homogenous than today and probably consisted only of wealthy and experienced investors. Salary via: CBS <https://www.historisch.cbs.nl/detail.php?id=117382485>

intermediaries, with each member participating for a specified amount (Westerhuis and De Jong, 2015). Both methods are based on a fixed price offering and the allocation of the shares was pro rata (*pondspondsgewijs*) in case of oversubscription. For both methods other banks or commissioners, so-called *Guichets*, could be hired to (also) accept subscriptions and to arrange the allocation of the shares. In practice this was always the case for self-placed issues that applied for a listing on the Amsterdam Stock Exchange.

Normally equity issues contained common stock, but preferred shares were also popular among investors and firms alike in the first quarter of the twentieth century (Westerhuis and De Jong, 2015, page 39). The holders of preferred shares were entitled to a fixed dividend, expressed as a percentage of the nominal value, and had priority in the payment thereof compared to other shareholders. Often this entitlement was also cumulative, i.e., if the annual profits did not allow for the (full) pay-out of the dividend, the unpaid part had to be made up in later years before a pay-out to other shareholders could take place. For this entitlement, holders of preferred shares had to waive the right of control. The advantage for the issuing firm was that preferred shares provided them with permanent capital while retaining full control. However, firms learnt that the right to a fixed dividend, and especially a cumulative right, becomes a burden in times of a recession (Westerhuis and De Jong, 2015, page 74).

At the end of the First World War, in which the Netherlands remained neutral, there was a jubilant mood on the Amsterdam Stock Exchange. Firms were able to raise new capital effortlessly, as investors readily subscribed to equity issues that were eagerly guided by banks (Petram, 2016). As a consequence, the stock exchange in the Dutch capital saw a wave of new listings (De Vries, 1976, page 128). To list its shares, the issuing firm needed the services of a bank, commissioner or trader that was a member of the *Vereeniging voor den Effectenhandel* (De Vries, 1976, page 147). For this an application needed to be filed by this member within 24 hours after a notice was published in a national paper in which investors were invited to subscribe to the offering. In this notice was also stated that a request for a listing will be submitted. Normally only a fraction of the issue was open for subscriptions prior to the listing because shares were almost exclusively offered to investors closely associated with the issuing firm (Renooij, 1951 page 186). Together with the application, the prospectus of the issue, the firm's articles of association, balance sheet, income statement and the latest annual report needed to be handed over. During the time that the application was being processed, the shares could receive a preliminary listing, which would lapse as soon as

the official listing was granted or the application was rejected. With filing the application, the firm committed itself to make the balance sheet, income statement and annual report each year available to shareholders in Amsterdam and to pay-out dividends via the stock exchange.⁵⁵ The volume of the issue needed to be at least 500,000 Guilders nominal and at least ¼ of the placed capital. A price was published after trade in shares had actually taken place and this price was stated as a percentage of the par value of one share. Fractions of the price were expressed in 1/16 per cent.⁵⁶

Although listed firms were obliged to provide yearly financial statements, there were no legal requirements for unlisted limited liability firms to disclose this information to shareholders in the early 1920s. This was because under the Commercial Code of 1838, a limited liability firm was considered to be a (temporary) private agreement for which contract law was applicable (Van der Heijden, 1929). Establishing a limited liability firm only required a registered notarial deed and a *Koninklijke Bewilliging* (Royal approval) on the articles of association. The Code contained some requirements for cash-based accounting, but financial statements were considered to be a private instrument in managing the relation between a firm and its shareholders, not as a representation of true income or true capital from which the real value of shares could be derived (Camfferman, 2012). In 1928 and 1929 the Commercial Code was revised. In the new Code the *Koninklijke Bewilliging* was replaced by a statement of *Geen Bezwaar* (no objection) by the Minister of Justice and all limited liability firms with more than NLG 50,000 bearer shares were obliged to publish annually a balance sheet, income statement and a report. In order to reinforce the significance of the disclosure of financial information, minimum requirements were set. However, these requirements only applied to the asset side of the balance sheet and no requirements were imposed on the income statement and the annual report.⁵⁷ Although the financial statements remained form-free and no valuation principles were prescribed, shareholders were from then on entitled to the profits shown in the financial statements by default (Camfferman, 2012).

Under the Commercial Code of 1838, underwriters were liable in case the financial information in the prospectus proved to be false. The revised Code that came into effect on April 1, 1929, included new provisions on liabilities for the prospectus (Van Lutterveld, 1933). From then on, the parties that invited investors to subscribe to an issue ran the risk of being held liable under both criminal and civil law. Punishable under criminal law were those who have been in

⁵⁵ Reglement voor het opnemen van fondsen in de Prijscourant, August 1, 1909, Published in Van Oss Effectenboek 1921 part I.

⁵⁶ Reglement voor de Notering, November 1, 1921, Published in Van Oss Effectenboek 1921 Deel I.

⁵⁷ Letter from Minister Donner, Ministry of Justice, in 1928 in which he answers questions raised in parliament.

charge with the placement of the shares, and those who have cooperated in this respect, if they knew that the content of the published information was incorrect. The directors and supervisory board of the firm were also liable if they had deliberately disseminated misleading information. The penalty was a maximum of three years in prison. Under civil law any person was liable for damage, who, with the intent to persuade investors to buy shares, published or caused information to be published that is untrue, incomplete or mutilated, so that an incorrect representation had to be created as a result.

Because the Netherlands remained neutral in the First World War, the Dutch industry was still in place at the end of the war. Triggered by a strong growth in international trade, the Dutch economy gained momentum and was, except for a brief period between 1921 and 1923, booming until 1929. Although the momentum in upswing was such that the economy hardly was affected by the decline of the world economy in the early 1920s, this economic downturn had a severe impact on the banking sector. In the Netherlands the banking sector had expanded rapidly between 1890 and 1918 (Jonker, 1996). This expansion was accompanied by an increasing concentration of banks triggered by fierce competition and the banks' desire to grow in combination with an increasing volume needed for long-term capital by the Dutch industry (Westerman, 1920 page 134). A close personal network had developed between firms and banks during the First World War (Van den Broeke, 1988; Jonker, 1989) and to protect their interest banks regularly required the right to provide a member for the Supervisory Board of firms for which they had provided (substantial) loans (Westerhuis and De Jong, 2015). These loans became problematic when the economic tide turned at the end of 1920. Falling exports caused a large and sustained decline in aggregate demand and prices, putting pressure on both the firms and the banking sector they relied on (Colvin *et al.*, 2015). As a consequence, many banks ran into serious problems. One of the first major banks was *Marx & Co.* in 1921. This bank went bankrupt in April 1922.⁵⁸ The *Bank-Associatie* could only survive with the support of a consortium of banks in that same year.⁵⁹ When *Rotterdamsche Bankvereniging*, one of the five largest banks in the Netherlands (De Vries, 1976, page 125), threatened to collapse in 1924, the banking crisis in the Netherlands reached its climax. The bank could only survive with support of *De Nederlandsche Bank* (Mooij and Prast, 2002),

⁵⁸ Inventaris van het archief van de Marx & Co.'s Bank, (1893) 1869 - 1970 (1988), Nationaal Archief, Den Haag, De Nederlandsche Bank NV (DNB), nummer toegang 2.25.77.28.

⁵⁹ Inventaris van het archief van de Bank-Associatie, (1895) 1918 – 1971, Nationaal Archief, Den Haag, De Nederlandsche Bank NV (DNB), nummer toegang 2.25.77.10.

backed by the Dutch government (Van Zanden, 1997). In total 61 banks disappeared between 1922 and 1927, of which 14 through bankruptcy (Mooij and Prast, 2002). As a result of the crisis, banks observed their liquidity closer, making them more reluctant to provide long-term credit (De Vries, 1976, page 125).

The stock market crash of 1929 that started in New York, had major impact on economies worldwide. The Dutch economy went into recession and it took until 1935 before the first signs of recovery became visible. The decline in stock prices on the Amsterdam Stock Exchange lasted until 1933. During the banking crisis in the first half of the 1920s the less healthy banks had disappeared and this may have contributed to the absence of serious financial distress during the recession in the 1930s (Mooij and Prast, 2002). *Nederlandsche Handel-Maatschappij* was the only large bank that had to be reorganized in 1934 after it faced considerable losses in the Dutch East Indies ('t Hart *et al.*, 1997). Due to the discontinuous nature of the issue market in the first half of the twentieth century, there were no specialized investment banks in the Netherlands (Renooij, 1951, page 136). Underwriting banks were all mixed banks. In contrast to the US where the *Glass-Steagall act* came into effect in 1933, the lessons learnt from the stock market crash of 1929 did not lead to similar regulations in the Netherlands. The combination of commercial and investment banking was still allowed.

4.3 Theoretical framework and empirical implications

According to Rennooij (1951), a firm that wanted to raise new capital by issuing shares in the interwar period, preferred the self-placement method by first approaching investors that had close ties with the firm. Only when the volume of the needed capital exceeded the capacity of this network, the firm called on a financial intermediary that had close contact with other investors, either to provide administrative support (*Guichet*) or to take over the issue. The investors in the firm's network were probably well aware of its day-to-day business, management, prospects and risks which enabled them to accurately estimate the market value of the firm's shares. Due to the assumed relatively low level of information asymmetry between the firm and these insiders, the firm presumably did not need to underprice its shares much in order to get a full placement. This maximized the proceeds. When for larger issues the issuing firm hired a financial intermediary for administrative support, the level of information asymmetry theoretically increases, because now also outsiders needed to be persuaded to buy shares. The extent to which the level of underpricing initially needs to increase to entice these outsiders, depends on how established the firm is (Ritter,

1984). The more established the firm is, the less difficult it is for outsiders to value the firm and thus its shares, the lower the underpricing. However, the proceeds relative to the volume continue to decrease with the volume as the level of underpricing needs to increase because more outsiders are needed for a full placement. The ‘*winner’s curse*’ model from Rock (1986) predicts that the degree to which the underpricing of the shares needs to increase with the volume, depends on the degree to which the heterogeneity of the group of investors increases with this volume.

Because of the continuous decline in the relative proceeds as the volume of the offering increases, at some point it is optimal for a firm to contact a financial intermediary to take over the issue. In that case the issuing firm is assured of certain proceeds and since this financial intermediary, due to its certification role as an underwriter, can offer the shares to investors at a higher price (Chemmanur and Fulghieri, 1994), these proceeds, net of underwriter’s costs, are higher. Assuming that an underwriter performs a due-diligence at fixed costs according to a standard that fits with its reputation and that the costs for marketing and allocating the shares increases with the volume, the relative total costs decline with the volume of the offering but fluctuate with underwriter reputation. Because the heterogeneity of the group of investors is expected to increase with the volume of the offering (Rock, 1986), the underwriter also needs to increase the underpricing with this volume in order not to endanger a full placement of the shares. A more reputable underwriter is more effective in reducing the impact of information asymmetry (Chemmanur and Fulghieri, 1994) and because of this, a reputable underwriter can offer the shares at a higher price, thus reduce underpricing.

The empirical implication is that firm characteristics and the volume of the issue determine the offering method: well-established firms and firms that issue small volumes prefer the self-placement method. Because of this selection, the expectation is that the offering method has no significant effect on the level of underpricing. The level of underpricing is expected to be positively related to the volume of the issue and negatively related to underwriter reputation and how well-established the issuing firm is.

4.4 Data and sources

During the interbellum, 294 non-financial firms initially listed in total 320 equity issues on the Amsterdam Stock Exchange (raw data).⁶⁰ However, I will not use all these issues for my study on

⁶⁰ De Jong and Legierse (2021). Some firms issued different types of shares simultaneously at their IPO. Each issue with a type of share is counted separately. For this reason, I will use not the term “IPO” in the remainder of this chapter.

the type of offering method and its consequences for the level of underpricing. Foreign firms mainly applied for a listing in Amsterdam if they were unable to obtain the necessary capital under favorable conditions in their own country and for these firms the only option for a successful issue was to use an underwritten contract (Renooij, 1951 page 206). As a consequence, 31 issues are excluded from the dataset. Exchanges can identify good firms through their application process (Fjesme *et al.*, 2021a) and in order to have a homogenous group of firms, I exclude issues from three firms that received a preliminary listing but for which the official listing was denied.⁶¹ In the beginning of the twentieth century a new form of takeover defence for limited liability firms was introduced in the Netherlands. Its main purpose was to permanently safeguard the Dutch character of a firm. To achieve this, a firm founded a holding company that had *Vereenigd Bezit*, *Gemeenschappelijk Bezit* or *Nationaal Bezit* in its name (Westerhuis and De Jong, 2015). Since I do not consider an initial equity listing of such a holding an IPO in case the firm itself was already listed, I remove 13 issues from my dataset. 44 firms listed their equity issue without offering their shares to investors prior to the listing. These issues received a listing after the publication of a notice and because of the absence of a pre-listing offering price, I exclude 49 issues from the dataset. In addition, I exclude 15 issues because no information could be found in the prospectus of the offering price or its volume.

In the 1920s and 30s it was not unusual that the first day of trading was several days later than the first day of listing. In some cases, it took more than several months or even years before a first price was published. For 199 of the remaining 209 issues a price was published within 2 years and for 197 of these issues, within 1 year. Of course, the observed underpricing could be affected by an overall change in the stock market and to limit this effect, I only select the initial equity listings that had a first price published within 15 calendar days after their listing, regardless if the shares had a preliminary or official listing.

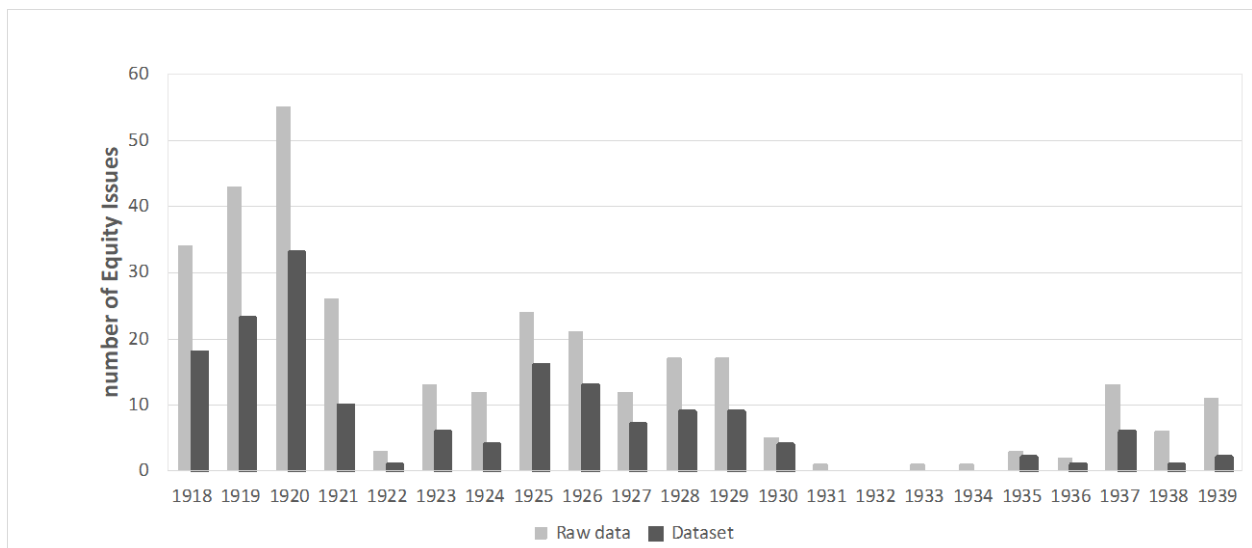
My dataset therefore contains in total 167 issues from 155 different firms. 28 issues were with preferred shares, all of them were cumulative and all of them were offered to investors before 1930. All other issues were with common stock. To determine which method was used to offer the shares to investors, I use the information in the prospectus that was published in *Van Oss Effectenboek*. As Renooij (1951) I consider issues where the prospectus is first signed by the firm

⁶¹ The official listing was denied for Algemeene Motoren Omnibus en Vracht Auto Maatschappij, for Nationaal Sportterrein 't Langeveld and for Oliezaden Import Maatschappij.

a self-placed issue and all other an underwritten contract. In Table 4.12 the characteristics of the issues in my dataset are presented. Robustness checks are executed with the available data to check the effect of the excluded issues that had no price published within 15 calendar days.⁶²

Figure 4.1 presents the time series of the raw data and that of my dataset. It shows that the patterns over time of these time series are similar.⁶³ The concentration and expansion of the banking system that started prior to the First World War was one of the factors triggering the economic boom directly after the war (De Vries, 1976, page 125) and this led to an increasing number of listings.

Figure 4.1: Time series of the number of initial equity issues



This figure shows the number of IPOs of the raw data and of the dataset.

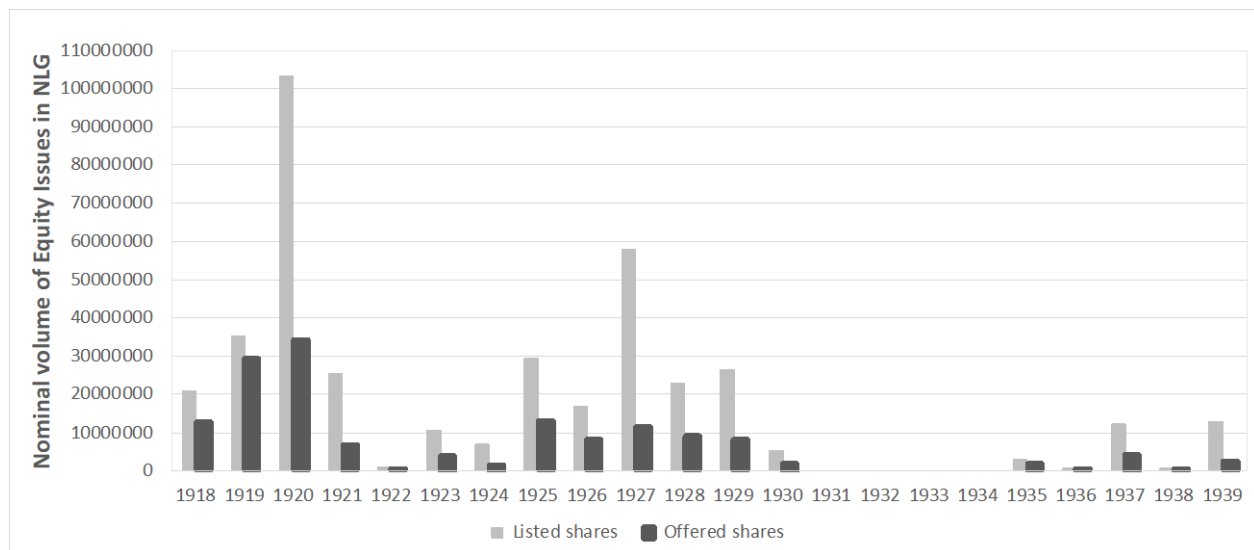
In 1920 the number peaked and that year also marks the end of an era of economic expansion and jubilation on the stock exchange. The low number of issues in the years 1922 and 1923 was probably the result of the banking crisis (Westerhuis and De Jong, 2015). Figure 4.1 reflects also the impact of the stock market crash in 1929 and the subsequent economic recession until 1935.

⁶² Ratio self-placed to underwritten for “all data”: 34/175, within two years: 29/170, within one year: 29/168 and 21/146 for my dataset.

⁶³ The correlation between the time series is 0.98.

On average 38 per cent of the listed shares were offered to investors prior to their listing. Figure 4.2 shows the yearly nominal volumes in NLG of the offered and listed shares. The exceptional large volume of the listed shares in 1920 is caused by two issues: one by *Centrale Suiker Maatschappij* with a volume of NLG 29 million (underwritten by a syndicate led by *De Twentsche Bank*) and one from *Nederlandsche Maatschappij voor Scheepvaart, Handel en Nijverheid* “*Furness-Stokvis*” with a volume of NLG 40 million (underwritten by *Rotterdamsche Bankvereniging*). The exceptional large volume of the listed shares in 1927 is caused by two issues by the same firm: *Margarine Unie*. The total volume of these issues was NLG 51 million and both were underwritten by a syndicate led by *Rotterdamsche Bankvereniging*.⁶⁴

Figure 4.2: Time series of the nominal values of listed and offered shares in NLG



This figure shows the nominal value of the volume offered to investors and the volume of the listing.

A total of 146 issues were underwritten. Often a syndicate was formed, but most of the underwritten issues, 97 in total, had only one underwriter. Syndicates hired a financial intermediary for administrative support six times while single underwriters did this ten times. 21 issues were self-placed for which administrative support was always hired. For these issues the member of the *Vereeniging voor den Effectenhandel* that filed the application for the listing was also one of the

⁶⁴ One issue with a volume of NLG 13 million with preferred shares and one issue with a volume of NLG 38 million with common shares.

financial intermediaries that gave administrative support.⁶⁵ The yearly number of self-placed issues is low over the entire period, without a clear trend.

After the First World War the market for issues (for stocks and bonds) was dominated by the large banks; the smaller banks ranked second and commissioners ranked third (Renooij, 1951, page 201).⁶⁶ This dominance increased even further in the interwar period. The large banks for domestic firms active in the Netherlands and in the Dutch East Indies were *Amsterdamsche Bank*, *Rotterdamsche Bankvereniging*, *De Twentsche Bank*, *Nederlandsche Handel-Maatschappij*, *Incasso-Bank*, *Nederlandsch-Indische Handelsbank* and *Nederlandsch-Indische Escompto Maatschappij* (Renooij, 1951 page 197). I consider these seven banks, based on their market-share (Ritter, 1984), as reputable underwriters. When a prospectus is underwritten by a syndicate, I assume that the first name that signed the prospectus is the lead underwriter. Table 4.1 gives an overview of the different types of methods and the number of issues that were involved. In parentheses is the number of issues for which administrative support was hired.

Table 4.1: Offering methods and number of issues

Method	REPUTATION	SYNDICATE	Preferred Shares	Common Shares	Total Shares
Self-placed	N.A.	N.A.	1 (1)	20 (20)	21 (21)
Underwritten	REPUTABLE	No	12 (1)	41 (3)	53 (4)
		Yes	3 (1)	11 (1)	14 (2)
	NON-REPUTABLE	No	7 (0)	37 (6)	44 (6)
		Yes	5 (1)	30 (3)	35 (4)
Total			28 (4)	139 (33)	167 (37)

SELF-PLACED: the number of issues that was offered to investors prior to the listing by the issuing firm; UNDERWRITTEN: the number of issues where the issuing firm asked a financial intermediary to take over the entire volume of the issue; SYNDICATE: the number of issues that was taken over by a group of underwriters; REPUTATION: the number of issues that was taken over by a reputable financial intermediary. In parentheses is the number of issues for which administrative support by other financial intermediaries was hired.

The overall average age of the firms at the time of the offering is 8.5 years. I calculate the age of a firm by subtracting the date on which the firm was established as a limited liability firm from the

⁶⁵ The application for the listing of *Scheepsexploitiatie Maatschappij "Navis"* in 1919 was filed by *Rotterdamsche Bankvereniging* (source: *Officieele Prijscourant*). Guichet for this IPO was *Nationale Bankvereniging*, a 100% subsidiary bank from *Rotterdamsche Bankvereniging*.

⁶⁶ The average market-share of the large banks, calculated as a percentage of the total amount of stock and bond issues, was 75 per cent in the interwar period.

date that investors needed to subscribe. For two firms the outcome of this calculation is negative and for this reason set to zero.⁶⁷ Underwritten issues are on average from younger firms than issues under a self-placement contract (respectively 8.1 and 11.0 years), while there is no significant difference in the average age of firms of issues that are underwritten by a reputable or non-reputable underwriter.

Table 4.2 gives an overview of the lead underwriters, ranked by the number of their issues and the volume of the shares in NLG that was offered to investors prior to the listing. The self-placed issues are also mentioned in this table. *Rotterdamsche Bankvereeniging* was overall the most dominant lead underwriter, not only in the number of issues but also in volume. It led four syndicates and was the single underwriter for 21 issues. In addition, it was administrative support for four self-placed issues (not tabulated). In the period after it almost went bankrupt in 1924 it underwrote only seven issues and its market share (measured in the volume of the offerings in NLG) decreased from 41 per cent to 16 per cent. The overall market share of the reputable underwriters was 57 per cent and for non-reputable underwriters this was 34 per cent. The average volume offered to investors prior to the listing under a self-placement contract is smaller than under an underwritten contract (respectively NLG 729,098 and NLG 1,097,498). Not surprisingly is that the average volume offered to investors prior to the listing by the seven largest underwriters is almost twice as large as by non-reputable underwriters (respectively NLG 1,500,676 and 755,563).

⁶⁷ The calculated age of *Hollandsche Kunstzijde Industrie* is -150 days and that of *Nederlandsche Bioscoop Trust* -139 days.

Table 4.2: Lead underwriters and their market share

(lead) Underwriter			LISTING							OFFERING			
			Issues			Volume				Volume			
Ranking	Name	Reputation	Issues	market share	market share cumulative	Nominal Value in NLG	market share	market share cumulative	Average Nominal Value in NLG	Value in NLG	market share	market share cumulative	Average Value in NLG
1	Rotterdamse Bankvereniging	reputable	25	15,0%	15,0%	150.605.000	38,0%	38,0%	6.024.200	53.569.000	30,5%	30,5%	2.142.760
2	SELFPLACED		21	12,6%	27,5%	26.342.500	6,7%	44,7%	1.254.405	15.311.063	8,7%	39,2%	729.098
3	Van der Werff & Hulbrecht		13	7,8%	35,3%	13.140.000	3,3%	48,0%	1.010.769	8.439.640	4,8%	44,0%	649.203
4	Nederlandsche Handel-Maatschappij	reputable	11	6,6%	41,9%	30.910.000	7,8%	55,8%	2.810.000	10.569.000	6,0%	50,1%	960.818
5	Amsterdamsche Bank	reputable	9	5,4%	47,3%	17.300.000	4,4%	60,2%	1.922.222	8.536.570	4,9%	54,9%	948.508
6	Arnold Gillissen & Co.		9	5,4%	52,7%	8.000.000	2,0%	62,2%	888.889	5.196.000	3,0%	57,9%	577.333
7	Incasso-Bank	reputable	8	4,8%	57,5%	5.200.000	1,3%	63,5%	650.000	3.267.150	1,9%	59,7%	408.394
8	Marx & Co.'s Bank		7	4,2%	61,7%	7.224.000	1,8%	65,3%	1.032.000	6.975.000	4,0%	63,7%	996.429
9	Mess & Zooren		6	3,6%	65,3%	8.500.000	2,1%	67,5%	1.416.667	7.101.925	4,0%	67,8%	1.183.654
10	Nederlandsch-Indische Handelsbank	reputable	5	3,0%	68,3%	28.018.000	7,1%	74,5%	5.603.600	9.209.560	5,2%	73,0%	1.841.912
11	Nederlandsch-IndischeEscompto Maatschappij	reputable	5	3,0%	71,3%	6.640.000	1,7%	76,2%	1.328.000	6.134.025	3,5%	76,5%	1.226.805
12	Pati jn, Van Notten & Co.		5	3,0%	74,3%	3.490.000	0,9%	77,1%	698.000	2.684.900	1,5%	78,0%	536.980
13	De TwentscheBank	reputable	4	2,4%	76,6%	31.900.000	8,1%	85,1%	7.975.000	9.260.000	5,3%	83,3%	2.315.000
14	Gleichmann & Van Heemstra		3	1,8%	78,4%	1.612.000	0,4%	85,6%	537.333	724.500	0,4%	83,7%	241.500
15	Heldring & Pierson		2	1,2%	79,6%	3.075.500	0,8%	86,3%	1.537.750	3.159.375	1,8%	85,5%	1.579.688
16	Gehr. Lopes Suasso		2	1,2%	80,8%	10.500.000	2,7%	89,0%	5.250.000	2.750.000	1,6%	87,1%	1.375.000
17	Van Vloten en de Gijsselaar		2	1,2%	82,0%	3.050.000	0,8%	89,8%	1.525.000	2.700.000	1,5%	88,6%	1.350.000
19	Theodoor Gillissen		2	1,2%	83,2%	2.000.000	0,5%	90,3%	1.000.000	1.468.750	0,8%	89,5%	734.375
20	Vermeer & Co.		2	1,2%	84,4%	1.900.000	0,5%	90,7%	950.000	1.407.500	0,8%	90,3%	703.750
18	Wurfbain & Zoon		2	1,2%	85,6%	1.500.000	0,4%	91,1%	750.000	1.300.000	0,7%	91,0%	650.000
21	Bank-Associatie		2	1,2%	86,8%	1.560.000	0,4%	91,5%	780.000	812.500	0,5%	91,5%	406.250
22	Bon & Fritz		2	1,2%	88,0%	4.500.000	1,1%	92,6%	2.250.000	773.500	0,4%	91,9%	386.750
24	F. Th. Everard		1	0,6%	88,6%	2.137.000	0,5%	93,2%	2.137.000	2.243.850	1,3%	93,2%	2.243.850
23	Jonas & Kruseman		1	0,6%	89,2%	3.000.000	0,8%	93,9%	3.000.000	2.200.000	1,3%	94,4%	2.200.000
25	Hope & Co.		1	0,6%	89,8%	10.000.000	2,5%	96,5%	10.000.000	1.575.000	0,9%	95,3%	1.575.000
26	Lippmann, Rosenthal & Co.		1	0,6%	90,4%	1.250.000	0,3%	96,8%	1.250.000	1.250.000	0,7%	96,1%	1.250.000
27	Jan Kalf & Co.		1	0,6%	91,0%	1.600.000	0,4%	97,2%	1.600.000	920.000	0,5%	96,6%	920.000
33	Fa. Glerum & Co.		1	0,6%	91,6%	1.500.000	0,4%	97,6%	1.500.000	712.500	0,4%	97,0%	712.500
29	Hultzer & Van Willigen		1	0,6%	92,2%	800.000	0,2%	97,8%	800.000	672.000	0,4%	97,4%	672.000
36	Labouche & Co.		1	0,6%	92,8%	1.000.000	0,3%	98,0%	1.000.000	670.000	0,4%	97,7%	670.000
28	Oppenheim & Van Till		1	0,6%	93,4%	1.100.000	0,3%	98,3%	1.100.000	640.000	0,4%	98,1%	640.000
34	Jacques Krijn & Zoon		1	0,6%	94,0%	600.000	0,2%	98,4%	600.000	560.000	0,3%	98,4%	560.000
31	Bank- en Handelsvereniging v/h A.J. Fortuin Hzn.		1	0,6%	94,6%	600.000	0,2%	98,6%	600.000	440.000	0,3%	98,7%	440.000
30	D.W. Brand		1	0,6%	95,2%	700.000	0,2%	98,8%	700.000	400.000	0,2%	98,9%	400.000
32	Willeumier, Van Tijen & Van Laer		1	0,6%	95,8%	500.000	0,1%	98,9%	500.000	400.000	0,2%	99,1%	400.000
35	Pierson & Co.		1	0,6%	96,4%	1.140.000	0,3%	99,2%	1.140.000	330.000	0,2%	99,3%	330.000
38	Stoop & zoon		1	0,6%	97,0%	500.000	0,1%	99,3%	500.000	275.000	0,2%	99,5%	275.000
37	Effectenkantoor Bouvy & Co.		1	0,6%	97,6%	500.000	0,1%	99,4%	500.000	250.000	0,1%	99,6%	250.000
39	H.H. Westendorp & Co.		1	0,6%	98,2%	600.000	0,2%	99,6%	600.000	200.000	0,1%	99,7%	200.000
40	Gouverne & Co.		1	0,6%	98,8%	600.000	0,2%	99,7%	600.000	165.000	0,1%	99,8%	165.000
41	Schoonman & Van Dorp		1	0,6%	99,4%	500.000	0,1%	99,9%	500.000	157.500	0,1%	99,9%	157.500
42	F. Van Lamschot's Bank		1	0,6%	100,0%	500.000	0,1%	100,0%	500.000	135.000	0,1%	100,0%	135.000
Total			167	100,0%		396.094.000	100,0%		2.371.820	175.545.808	100,0%		1.051.173

Overview of (lead) underwriters and their market share. SELFPLACED: the number of issues that was offered to investors prior to the listing by the issuing firm; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed.

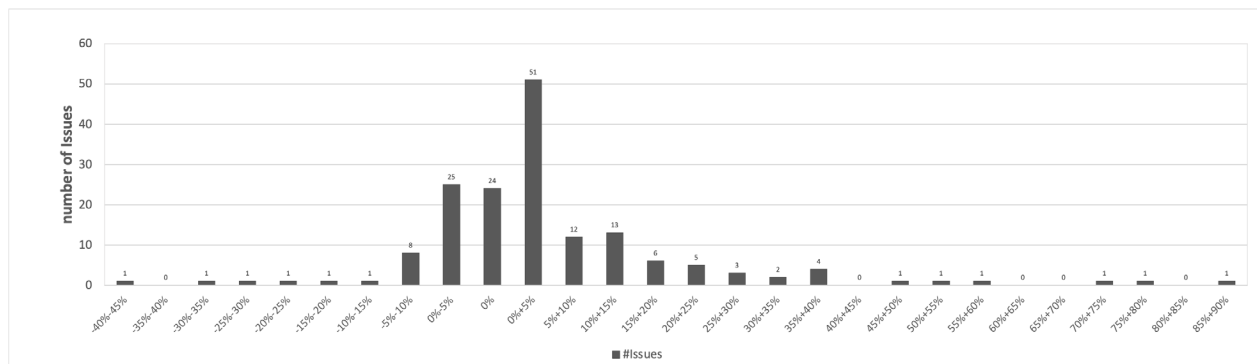
4.5 Underpricing

I calculate the level of underpricing of an issue as a percentage of the offering price as follows:

$$\text{Underpricing} = (P_1 - P_0) / P_0$$

P_0 is the price of one share, mentioned in the prospectus, as it was offered to investors prior to the listing and P_1 is the price of the same share when listed as published in the *Officieele Prijscourant* at the end of the first trading day. The average time between the first day of trading and the date of subscription is 53 days (85 days for self-placed and 48 days for underwritten offerings). The average equally weighted level of underpricing of the issues in my dataset is 7.4 per cent. However, this level is affected by a *small stock effect*. When the underpricing is calculated as the percentage of the *money left on the table* at the subscription, the average level is 9.8 per cent. There are two issues with an underpricing of more than 100 per cent, both with common stock and issued under a self-placement contract.⁶⁸ In the remainder of this chapter these two outliers are excluded. Without these outliers the average level of underpricing is 6.0 per cent, 7.1 per cent for common stock and 0.9 per cent for preferred shares. Figure 4.3 presents the distribution of the underpricing of the issues, rounded per 5 per cent. This distribution is slightly skewed towards positive first day returns, which is an indication for some systematic underpricing.

Figure 4.3: Distribution of issues per level of underpricing rounded per 5 per cent



This figure shows the distribution of the issues per level of underpricing

⁶⁸ Nederlandsche Ford Automobielfabriek (offering: NLG 1 million, underpricing 149 per cent) in May 1929 and Hollandsche Constructiewerkplaatsen (offering: NLG 156,250, underpricing: 102 per cent) in June 1939. An IPO of a similar European subsidiary by Ford Motor Company on the London Stock Exchange in December 1928 recorded an underpricing of 87 per cent (Chambers and Dimson, 2009).

The average level of underpricing of underwritten issues is 6.3 per cent. For issues with a self-placement contract this 3.5 per cent. The average level of underpricing of issues that are underwritten by a reputable underwriter is 7.8 per cent, by a non-reputable underwriter this is 5.1 per cent. Table 4.3 gives an overview of the level of underpricing per sub group.

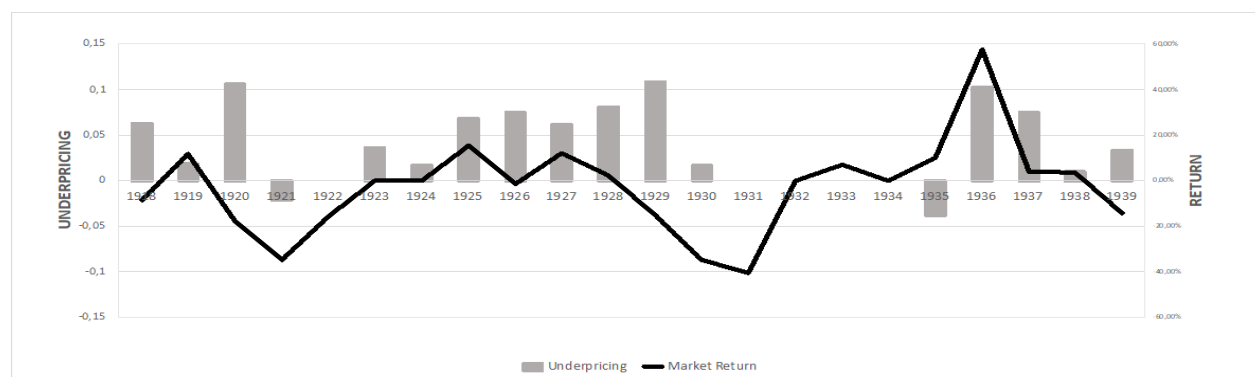
Table 4.3: Descriptive statistics level of underpricing

	SELF-PLACED		UNDERWRITTEN				Total	
	#Issues	Underpricing	#Issues	Underpricing	#Issues	Underpricing	#Issues	Underpricing
Preferred	1	1.0%	15	-0.5%	12	2.7%	28	0.9%
Common	18	3.6%	52	10.2%	67	5.5%	137	7.1%
Total	19	3.5%	67	7.8%	79	5.1%	165	6.0%

Overview of the level of underpricing per type of share for issues under a self-placement contract and that are underwritten by a reputable or non-reputable underwriter.

Figure 4.4 presents the average level of underpricing per year. The average level in 1922 is exactly zero and since there are no issues in my dataset for the years 1931, 1932, 1933 and 1934, no bars are visible. Remarkably, the issues in 1921 and 1935 were overpriced. Ljungqvist (1997) documents that underpricing is significantly related to how well the market performed during the year prior to the subscription date. In years with favorable market conditions more *money is left on the table*. For this reason, Figure 4.4 also shows the stock market return at year end (*RETURN*). The relation between the level of underpricing and (past) stock market return is examined in more detail in the remainder of this chapter.

Figure 4.4: Time series of level of underpricing and market return



This figure shows the yearly level of underpricing and of market return.

4.6 *Determinants of the offering method and underpricing*

4.6.1 **Determinants of the offering method**

For all self-placed issues in my dataset administrative support was hired. This may imply that the volumes of these offerings exceeded the capacity of the issuing firms' network but stayed below the point where it is optimal to use an underwritten contract. It may also imply that the level of information asymmetry between *insiders* and *outsiders* is relatively small. Using firm characteristics as proxies for the level of information asymmetry between issuing firm and investors receives broad empirical support (Lowry *et al.*, 2017). According to Ritter (1984), the more *established* the firm is, the less difficult it is for an investor to value the firm and thus its shares. Like Ritter I define two proxies to capture how *established* a firm is: *AGE* and *SIZE*. The older the firm, the more information it has produced over the years which can be studied by investors. Since some firms were established earlier than the date of their incorporation, the variable *AGE* does not fully capture their track record. I therefore introduce the dummy variable *CONVERSION* which has the value 1 if a firm already existed before it was incorporated and 0 otherwise. My expectation is that the probability of a self-placed issue is positively related to the variables *AGE*, *SIZE* and *CONVERSION*. The available information to accurately value the shares of a firm may also depend on its industry. Specifically, for domestic investors who planned to invest in a domestic firm that is active in the Dutch East Indies it was difficult to assess the quality and prospects of this firm. This was difficult even for banks.⁶⁹ Typically, these firms were riskier because they were mainly active in agriculture (known for its regular crop failures) or in the capital-intensive oil and mining industry (Renooij, 1951 page 48). It therefore seems reasonable to assume that firms active in the Dutch East Indies less likely used self-placement. However, according to Renooij (1951), firms that cannot find an underwriter because of the excessively high risk associated with the issue, have no other option than to use self-placement. To capture any effect of a firm's industry, I introduce the dummy variables *INDIES* for firms active in the Dutch East Indies, *AGRI* for firms active in agriculture, *MANUFACT* for firms active in manufacturing and *SERVICES* for firms active in the industry commercial services, without any specific expectations about their relation with the offering method. To check if the offering method is related to characteristics of

⁶⁹ As an example: Nederlandsch-Indische Handelsbank reports in 1919 that they received the information mentioned in the prospectus from the firm Maatschappij tot voortzetting Der Zaken van Deutekom & Waal, active in Bandoeng, via telegraph and state that they cannot guarantee that this information is correct.

the offering, I add its volume (*OFFERING*) and type of shares (*PREF*) as variables to the regression. It is my expectation that the volumes of self-placed issues are smaller than underwritten issues and therefore I expect a negative relation between the probability of a self-placed issue and the volume of the offering. In a robustness check I replace the volume of the offering by that of the entire issue (*LISTING*). Lungqvist (1997) finds that the level of underpricing is positively related to past stock market return. Stock market return together with its volatility, as a proxy for investors' uncertainty, are proxies for the overall investors' sentiment (Choe *et al.*, 1993; Pástor and Veronesi, 2005). It is my expectation that more firms opt for a self-placed issue in periods with optimistic investors, i.e., in periods with positive stock market return (*RETURN*) and low volatility (*VOLATILITY*). For both variables a lag of one year is used. The dummy variable *REGULATION* is added to capture any effect of the institutional changes in the era after 1927. Please note that the variable *AGRI* is left out in the remaining part of this chapter because of multicollinearity with the variable *INDIES*. In Table 4.12 the characteristics of the data are presented and Table 4.13 shows the sources of the variables.

Table 4.4 presents the results of a bi-variate comparison of the characteristics of the firms and the issues per offering method. The results show that firms that use the self-placement method are on average smaller and the volume of their offering and listing are also smaller. However, these differences are not significant. A robustness check with all the 209 issues for which a price was published within 2 years gives the same results (see appendix, Table 4.14).

Table 4.4: Bi-variate comparisons of firm and issue characteristics per type of offering method

Variable	(1) SELFPLACED	(2) UNDERWRITTEN	(1) vs (2)
AGE	10.85 (10.05)	8.11 (12.06)	-2.74 (0.344)
CONVERSION	0.26 (0.45)	0.41 (0.49)	0.15 (0.217)
SIZE	3,029,263 (6,606,206)	6,803,151 (17,349,915)	3,773,888 (0.350)
INDIES	0.37 (0.50)	0.32 (0.47)	-0.05 (0.687)
MANUFACT	0.47 (0.51)	0.47 (0.50)	-0.01 (0.948)
SERVICES	0.26 (0.45)	0.29 (0.46)	0.03 (0.779)
OFFERING	744,990 (1,481,842)	1,097,498 (1,595,990)	352,508 (0.363)
LISTING	1,097,158 (1,092,484)	2,532,545 (5,536,678)	1,435,387 (0.263)
PREF	0.05 (0.23)	0.18 (0.39)	0.13 (0.150)

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed and PREF represents the number of issues with preferred shares. Columns (1) and (2) present the average and standard deviation in parentheses. The column (1) vs (2) compared SELFPLACED issues with all UNDERWRITTEN issues and presents the difference in averages and a p-value of a t-test of differences. Significance levels are denoted with *** for 1%, ** for 5% and * for 10% for equal variances assumed. Number of observations: 165 issues.

To examine which variables determine the choice of a self-placed issue, I use a binary logistic regression. The results are presented in Table 4.5. Please note that for the variables *SIZE* and *OFFERING* the natural log values are used in this regression. Contrary to my expectations, none of the variables is significant, other than the natural log of the volume of the offering and the constant. The smaller this volume is the more likely it is that the self-placement method is used. Changes in the institutional setting after 1927 had no effect on the offering method. A robustness check using the natural log of the volume of the listing (*LISTING*) instead of that of the offering (see Table 4.5 column 4), shows that the volume of the listing has no significant effect on the offering method. These results are robust as presented in the robustness checks in the appendix, Table 4.15 with all the 209 issues for which a price was published within 2 years. However,

contrary to my expectation, the robustness checks also shows that more issues are underwritten in the year following a year with positive stock market return.

Table 4.5: Binary Logistic regression for self-placed issues

Variable	(1)	(2)	(3)	(4)
AGE	0.004 (0.840)	0.003 (0.884)	0.012 (0.603)	0.011 (0.628)
CONVERSION	-0.731 (0.230)	-0.590 (0.352)	-0.561 (0.389)	-0.567 (0.380)
SIZE	-0.742** (0.021)	-0.272 (0.497)	-0.128 (0.748)	-0.342 (0.539)
INDIES	0.256 (0.746)	0.154 (0.850)	0.035 (0.967)	0.227 (0.779)
MANUFACT	0.702 (0.457)	0.628 (0.516)	0.618 (0.527)	0.797 (0.405)
SERVICES	0.305 (0.725)	0.304 (0.734)	0.348 (0.704)	0.363 (0.680)
OFFERING		-0.741* (0.081)	-0.835* (0.055)	
PREF		-1.100 (0.332)	-1.210 (0.291)	-1.089 (0.353)
RETURN			-1.159 (0.631)	-1.348 (0.567)
VOLATILITY			-31.810 (0.229)	-26.496 (0.308)
REGULATION			0.244 (0.719)	0.343 (0.597)
LISTING				-0.450 (0.539)
CONSTANT	8.427* (0.069)	11.445** (0.028)	10.970** (0.035)	9.118 (0.131)
OBSERVATIONS	165	165	165	165
Cox & Snell R-SQ	0.053	0.074	0.091	0.072

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. P>|t| values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 165 issues.

4.6.2 Underwriter reputation

Theoretically it is optimal for a firm with a certain level of information asymmetry with potential investors, to invite an underwriter to take over the issue when the volume of its issue exceeds a certain value. More reputable underwriters are more effective in reducing the impact of information asymmetry and since the proceeds of an issue, net of underwriter fees, increase with underwriter reputation (Chemmanur and Fulghieri, 1994), firms prefer to use the services of the most reputable underwriter. Firms with a high level of information asymmetry benefit most from using a reputable underwriter. The empirical implication is that underwriter's reputation is negatively related to the variables *AGE*, *SIZE* and *CONVERSION*. However, underwriters are involved in many issues over time and based on their track record they develop a reputation with which they earn a return. According to Beatty and Ritter (1986) this reputation is damaged every time underwriters inaccurately price an issue. As a consequence, reputable underwriters engage in underwriting contracts with less risky firms (Chemmanur and Fulghieri, 1994). There is some empirical support for this. Tiniç (1988) finds evidence that prestigious investment bankers avoid underwriting highly speculative small listings where conducting their customarily careful due-diligence investigations is either too difficult or too expensive. Ritter (1984) states that "*Major bracket underwriters generally refuse to underwrite small offerings from start-up firms, possibly for reputation reasons.*" The empirical implication is that the volume of offerings of issues (*OFFERING*) is positively related to the underwriter's reputation and that reputable underwriters are less likely to underwrite an issue of a start-up firm (*START-UP*). To mitigate the risk that not all shares are placed, an underwriter can make use of administrative support (*ADMIN*) or form a syndicate (*SYNDICATE*) with other underwriters. Since reputable underwriters are larger and have a larger network of investors, the expectation is that these underwriters are less likely to use administrative support or form a syndicate.

Table 4.6 presents the results of a bi-variate comparison of firm and issue characteristics per underwriter reputation. The differences in size of the firms and average values of the volume of the offering and of the listing are significant. Issues that are underwritten by reputable underwriters are on average larger and from larger firms. These results are robust as presented in the robustness check in the appendix, Table 4.16, with all the 175 underwritten issues for which a price was published within two years.

I investigate the determinants that an issue is underwritten by a reputable underwriter by conducting a binary logistic regression. Next to the variables described above I also add the earlier described variables for the firm's industry, investors' sentiment and institutional changes. The results are presented in Table 4.7 and show that reputable underwriters engage more in issues from large firms but that the size of the offering and the type of shares are not significant.

Table 4.6: Bi-variate comparisons of firm and issue characteristics per underwriter reputation

Variable	(1) REPUTABLE	(2) NON- REPUTABLE	(1) vs (2)
AGE	8.12 (12.36)	8.10 (11.88)	-0.02 (0.993)
CONVERSION	0.43 (0.50)	0.39 (0.49)	-0.04 (0.624)
SIZE	11,273,806 (24,632,958)	3,011,582 (3,798,394)	-8,262,224*** (0.004)
INDIES	0.25 (0.44)	0.38 (0.49)	0.13 (0.106)
MANUFACT	0.52 (0.50)	0.42 (0.50)	-0.11 (0.209)
SERVICES	0.39 (0.49)	0.22 (0.41)	-0.173** (0.022)
OFFERING	1,500,676 (2,186,832)	755,563 (656,203)	-745,114*** (0.005)
LISTING	4,038,403 (7,767,715)	1,255,424 (1,527,092)	-2,782,979*** (0.002)
PREF	0.22 (0.42)	0.15 (0.36)	-0.07 (0.267)
START-UP	0.21 (0.41)	0.24 (0.43)	0.03 (0.652)

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed; PREF represents the number of issues with preferred shares and START-UP represents the number of non-converted firms younger than 1 year at the date of subscription. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Columns (1) and (2) present the average and standard deviation in parentheses. The column (1) vs (2) compared UNDERWRITTEN issues by reputable and non-reputable underwriters and presents the difference in averages and a p-value of a t-test of differences. Significance levels are denoted with *** for 1%, ** for 5% and * for 10% for equal variances assumed. Number of observations: 146 issues.

Table 4.7 also shows that reputable underwriters are less likely to form a syndicate that will be led by them. The result of a robustness check in which the volume of the listing (*LISTING*) is used instead of the volume of the offering (see Table 4.7 column 4), shows that firm size is no longer significant. Instead, the volume of the listing is now positively significant related to underwriter reputation. Please note that underwriters took over the volume of the entire listing. The higher the volume of the listing the riskier the issue is for the underwriter. It is therefore not surprisingly that non-reputable underwriters, who are in general smaller, avoid large listings. These results are robust as presented in the robustness check in the appendix, Table 4.17, with all the 175 underwritten issues for which a price was published within two years.

Table 4.7: Binary Logistic regression of issues underwritten by a reputable underwriter

Variable	(1)	(2)	(3)	(4)
AGE	-0.003 (0.875)	0.007 (0.754)	-0.010 (0.719)	-0.009 (0.735)
CONVERSION	-0.638 (0.191)	-0.463 (0.396)	-0.296 (0.612)	-0.150 (0.794)
SIZE	0.820*** (0.000)	0.723** (0.017)	0.603** (0.049)	0.106 (0.815)
INDIES	1.005 (0.121)	0.371 (0.579)	0.473 (0.502)	0.477 (0.503)
MANUFACT	2.267*** (0.005)	2.378*** (0.004)	2.229*** (0.008)	2.123** (0.012)
SERVICES	2.600*** (0.001)	2.649*** (0.001)	2.392*** (0.003)	2.406*** (0.003)
START-UP	-0.995 (0.142)	-0.882 (0.243)	-0.814 (0.307)	-0.792 (0.320)
OFFERING		0.414 (0.275)	0.572 (0.152)	
PREF		-0.423 (0.468)	-0.230 (0.704)	0.224 (0.735)
ADMIN		-0.767 (0.242)	-0.690 (0.323)	-0.934 (0.200)
SYNDICATE		-1.931*** (0.000)	-2.092*** (0.000)	-2.108*** (0.000)
RETURN			-0.244 (0.886)	0.315 (0.853)
VOLATILITY			25.004* (0.074)	18.888 (0.163)
REGULATION			0.532 (0.405)	0.633 (0.323)
LISTING				1.180** (0.045)
CONSTANT	-14.023*** (0.000)	-17.365*** (0.000)	-18.038*** (0.0000)	-19.601*** (0.000)
OBSERVATIONS	146	146	146	146
Cox & Snell R-SQ	0.225	0.318	0.348	0.359

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; START-UP represents the number of non-converted firms younger than 1 year at the date of subscription; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; ADMIN represents the number of issues for which administrative support was hired; SYNDICATE represents the number of issues that was taken over by a group of underwriters; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. P>|t| values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 146.

4.6.3 What are the determinants of underpricing?

To check if the level of underpricing depends on the offering method, I conduct an ordinary least square regression for all issues. The results presented in Table 4.8 show that the level of underpricing is not significantly related to the method. Next to the age of the firm, the level of underpricing is significantly related to past stock market conditions and the type of share. A robustness check in which the volume of the offering is replaced by the volume of the listing, confirms these results (see Table 4,8 column 4). However, the type of share is not significant anymore. These results are robust as presented in the robustness check in the appendix, Table 4.18, with all the 195 issues for which a price was published within one year, but without the two outliers. Stock market return remains significantly related to the level of underpricing for all issues for which a price was published within 2 years (see appendix, Table 4.18 column 5 and 6).

Table 4.8: OLS-regression determinants of underpricing

Variable	(1)	(2)	(3)	(4)
AGE	0.002*	0.002	0.002**	0.002**
	(0.076)	(0.106)	(0.043)	(0.045)
CONVERSION	0.035	0.051	0.049	0.055*
	(0.228)	(0.101)	(0.118)	(0.080)
SIZE	0.013	0.002	0.006	-0.015
	(0.305)	(0.924)	(0.743)	(0.559)
INDIES	-0.007	-0.004	-0.004	-0.006
	(0.862)	(0.914)	(0.930)	(0.890)
MANUFACT	-0.051	-0.033	-0.030	-0.038
	(0.302)	(0.508)	(0.539)	(0.436)
SERVICES	-0.041	-0.034	-0.028	-0.032
	(0.380)	(0.466)	(0.542)	(0.485)
SELFPLACED		-0.021	-0.026	-0.029
		(0.613)	(0.537)	(0.474)
OFFERING		0.024	0.018	
		(0.261)	(0.394)	
PREF		-0.079**	-0.073*	-0.053
		(0.046)	(0.068)	(0.219)
RETURN			0.208**	0.225**
			(0.033)	(0.021)
VOLATILITY			-1.405*	-1.568**
			(0.076)	(0.044)
REGULATION			-0.006	-0.003
			(0.869)	(0.928)
LISTING				0.044
				(0.149)
CONSTANT	-0.121	-0.281	-0.262	-0.316
	(0.520)	(0.185)	(0.213)	(0.134)
OBSERVATIONS	165	165	165	165
R-SQ	0.030	0.069	0.104	0.112

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; SELFPLACED represents the number of issues that was offered to investors prior to the listing by the issuing firm; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 165 issues.

Table 4.9: OLS-regression determinants of underpricing for underwritten issues

Variable	(1)	(2)	(3)	(4)
AGE	0.002 (0.135)	0.001 (0.233)	0.002* (0.064)	0.002* (0.074)
CONVERSION	0.031 (0.324)	0.050 (0.137)	0.050 (0.133)	0.053 (0.111)
SIZE	0.015 (0.253)	0.005 (0.804)	0.012 (0.569)	-0.013 (0.645)
INDIES	0.003 (0.950)	-0.002 (0.960)	-0.005 (0.905)	-0.005 (0.911)
MANUFACT	-0.057 (0.227)	-0.054 (0.324)	-0.062 (0.252)	-0.064 (0.228)
SERVICES	-0.038 (0.450)	-0.051 (0.339)	-0.054 (0.300)	-0.055 (0.287)
OFFERING		0.017 (0.464)	0.007 (0.765)	
PREF		-0.077* (0.062)	-0.067 (0.106)	-0.047 (0.290)
REPUTATION		0.034 (0.281)	0.046 (0.146)	0.043 (0.176)
RETURN			0.263** (0.012)	0.277*** (0.008)
VOLATILITY			-1.873** (0.030)	-1.936** (0.021)
REGULATION			-0.003 (0.944)	-0.001 (0.979)
LISTING				0.038 (0.241)
CONSTANT	-0.156 (0.445)	-0.239 (0.317)	-0.188 (0.425)	-0.264 (0.251)
OBSERVATIONS	146	146	146	146
R-SQ	0.031	0.071	0.125	0.134

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; REPUTATION represents the number of issues that was taken over by a reputable financial intermediary; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 146 issues.

To check whether the level of underpricing is negatively related to the reputation of the underwriter, I conduct an ordinary least square regression for underwritten issues.⁷⁰ The results are presented in Table 4.9 and show that the level of underpricing for underwritten issues increases significantly with the age of the firm⁷¹ but that the size of the offering, underwriter reputation and the type of share are not determinative for the level of underpricing. The level of underpricing for underwritten issues mainly seems to depend on the stock market conditions in the year prior to the listing. In years in which the stock market return increases and when the uncertainty under investors decreases (thus in times when investors are optimistic) the level of underpricing increases significantly. These results are confirmed in the robustness check in the appendix, Table 4.19.

4.6.4 Is underpricing a predictor for a Seasoned Offering?

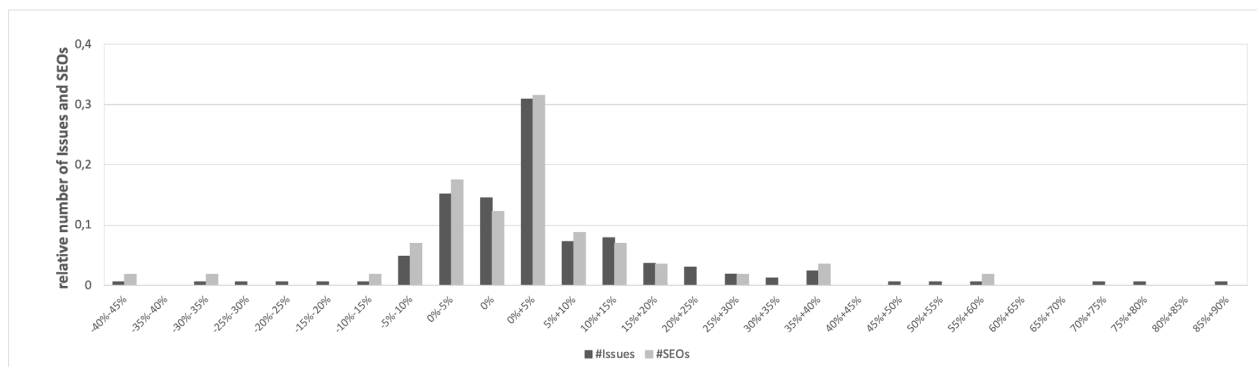
The assumption in the aforementioned theories is that a certain level of underpricing is required for issues where *outsiders* are needed because these investors cannot distinguish which issues are from good firms and which are *lemons* (Rock, 1986). According to Allen and Faulhaber (1989), a firm can also use underpricing of its relatively small issue as a credible signal of its profitable prospects and compensate the *money left on the table* with a higher offering price and a larger volume of its subsequent seasoned offering (SEO). This hypothesis is best described by Ibbotson (1975) that underpricing could be explained “*if new issues leave a good taste in investors’ mouths so that future underwritings from the same issuer could be sold at attractive prices*”. To prevent that a bad firm copies this strategy, the level of underpricing needs to be so high that only a good firm is able to recoup the losses. Allen and Faulhaber (1989) argue that the discounted benefits from the higher offering price of the shares at the first SEO, decrease the longer the time period is between the IPO and the SEO. As Burhop (2010) I therefore only take first SEOs into account if they were issued within 5 years after the date of subscription for the IPO. One should note that when a firm learns that it has inadvertently underpriced its IPO, this firm could also decide to issue a larger SEO at a higher offering price in order to make use of this window of opportunity. This *market-feedback* hypothesis (Spiess and Pettway, 1997) gives a different explanation for the same observed underpricing as the *signaling* hypothesis.

⁷⁰ The number of observations for issues with a self-placement contract is too small for this analysis.

⁷¹ This is an unexpected result for which further investigations are needed.

In the period from 1918 up and until 1944 in total 55 IPOs were followed by a subsequent offering that received a listing. 48 of these issues were underwritten and for 42 of these issues the financial intermediary that applied for the listing of the SEO was also (one of) the underwriter(s) of the IPO. Only six times a different bank was involved.⁷² Figure 4.5 presents the relative number of SEOs (as a percentage of all SEOs) per level of underpricing of their corresponding IPO and the relative number of IPOs per level of underpricing. The relative number of SEOs and IPOs are distributed in the same way (correlation is 0.99). This indicates that the level of underpricing has no predictive power for the probability of a SEO.

Figure 4.5: Distribution relative number of IPOs and SEOs per level of underpricing of the IPO



This figure shows the distribution of the relative numbers of IPOs and SEOs per level of underpricing of the IPO

Table 4.10 shows the result of a bi-variate comparison of the variables for issues that were followed by a subsequent offer and for issues that were not. Only for the variables *MANUFACT* and *PREF* the differences are significant.

⁷² A least in one occasion the underwriter of the issue no longer existed because it had gone bankrupt during the banking crisis.

Table 4.10: Bi-variate comparisons of firm and issue characteristics for seasoned offerings

Variable	(1) Seasoned offering	(2) No seasoned offering	(1) vs (2)
AGE	8.04 (13.05)	8.62 (11.25)	0.58 (0.768)
CONVERSION	0.38 (0.49)	0.40 (0.49)	0.02 (0.823)
SIZE	7,586,727 (18,179,770)	5,759,509 (15,651,947)	-1,827,218 (0.504)
INDIES	0.35 (0.48)	0.32 (0.47)	-0.03 (0.727)
MANUFACT	0.58 (0.50)	0.41 (0.49)	-0.17** (0.036)
SERVICES	0.22 (0.42)	0.33 (0.47)	0.11 (0.148)
OFFERING	1,042,045 (1,667,107)	1,064,337 (1,546,998)	22,292 (0.932)
LISTING	2,352,836 (5,352,270)	2,374,468 (5,205,964)	21,631 (0.980)
PREF	0.25 (0.44)	0.13 (0.34)	-0.13** (0.040)

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed and PREF represents the number of issues with preferred shares. Columns (1) and (2) present the average and standard deviation in parentheses. The column (1) vs (2) compared issues with a seasoned offering with issues that did not issue a seasoned offering and presents the difference in averages and a p-value of a t-test of differences. Significance levels are denoted with *** for 1%, ** for 5% and * for 10% for equal variances assumed.

To investigate the determinants of an SEO I conduct a binary logistic regression. For this I use variables that characterize the firm, its industry, main location of activities and its initial issue. Table 4.11 presents the outcome and confirms the previous finding that the level of underpricing of the initial issue has no significant predictive power for the probability of a SEO. Table 4.11 shows that a SEO was mainly issued by (large) firms active in the industry manufacturing and in the Dutch East Indies.

Table 4.11: Binary Logistic regression of determinants of issuing a SEO

Variable	(1)	(2)	(3)	(4)
AGE	-0.005 (0.751)	0.000 (0.980)	0.006 (0.688)	0.008 (0.608)
CONVERSION	-0.279 (0.468)	-0.436 (0.321)	-0.528 (0.242)	-0.677 (0.138)
SIZE	0.118 (0.458)	0.327 (0.190)	0.353 (0.158)	0.654* (0.073)
INDIES	1.009* (0.064)	1.017* (0.067)	0.953* (0.087)	1.008* (0.069)
MANUFACT	1.574** (0.018)	1.400** (0.040)	1.485** (0.030)	1.663** (0.016)
SERVICES	0.591 (0.339)	0.501 (0.429)	0.617 (0.336)	0.692 (0.283)
OFFERING		-0.399 (0.166)	-0.401 (0.169)	
PREF		0.786 (0.130)	0.699 (0.185)	0.429 (0.442)
UNDERPRICING		-1.604 (0.225)	-1.601 (0.225)	-1.520 (0.248)
SELFPLACED			0.188 (0.728)	-0.263 (0.623)
REGULATION			-0.671 (0.194)	-0.705 (0.173)
LISTING				-0.754* (0.084)
CONSTANT	-3.566 (0.144)	-1.277 (0.650)	-1.585 (0.584)	-0.882 (0.770)
OBSERVATIONS	165	165	165	165
Cox & Snell R-SQ	0.055	0.098	0.108	0.114

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; UNDERPRICING is the return of the issues at the end of the first trading day relative to the price for the investors prior to the listing; SELFPLACED represents the number of issues that was offered to investors prior to the listing by the issuing firm; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the nominal volume of the issue in NLG that was listed. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%.

Of the 55 IPOs that were followed by a subsequent offering, 19 came from firms active in the Dutch East Indies, 27 from firms active in the Netherlands in the industry manufacturing and nine in commercial services. 50 of the SEOs were issued in the period 1918-1929. The growth in the Dutch economy in this period was nothing short of spectacular and much of this growth was due

to a strong growth in international trade. This led to a very rapid expansion in industrial exports (Van Zanden, 1997). The increasing role of the Dutch East Indies in the Dutch and global economy that started in the late 19th century (Sluyterman, 2003) continued after the First World War as Europe craved coffee, tea, rubber and oil (Van Zanden, 1997). Because significant investments were needed for the mechanization of the Dutch industry (Van Zanden, 1997) and in the Dutch East Indies, it seems plausible that SEOs mainly were issued by firms active in these areas to fund these investments.

4.7 Conclusions

In this chapter I investigate the determinants for the method for offering shares to investors prior to the listing of IPOs in the Interbellum in the Netherlands and the effect of the method on the level of underpricing. Normally only a fraction of the volume of the issue was offered to investors prior to the listing. In a setting defined by long-term relationships between issuing firms, financial intermediaries and investors, I find that the volume of this fraction largely determines the method, not the volume of the issue itself. When the volume offered to investors is small, more firms use self-placement with the help of a financial intermediary and as this volume increases, more firms tend to use underwriting. This is consistent with the common practice at that time that shares were first offered to a group of investors already closely associated with the firm and that support from a financial intermediary was needed to apply for a listing on the Amsterdam Stock Exchange. This finding is also consistent with Renooij (1951) who states that Dutch firms opted for a self-placed offer in the Interwar period if the risk of an issue failure was considered small, so that this did not outweigh the costs associated with underwriting. The smaller the volume, the smaller this risk is and the relatively higher the costs are for underwriting.

Although the volume of the issue is not determinative for the method, it is strongly related to the underwriter. Reputable underwriters, who were generally larger than non-reputable underwriters, took over larger volumes and participated less in syndicates. This finding could be the result of the long-term relationships between firms and banks: larger banks are associated more with larger firms that generally issue larger volumes.

I find no evidence that in this particular setting the level of underpricing was affected by variables that proxy information asymmetries. Also, the offering method did not affect the level of underpricing any more than firm characteristics, underwriter reputation or the volume of the offering or the issue. The systematic but relatively low level of underpricing mainly fluctuated with

the sentiment on the stock market in the year prior to the listing. The more optimistic investors were, the higher the level of underpricing.

The finding in this study, that even in a setting with low levels of information asymmetry systematic underpricing can occur, in this case due to favorable stock market conditions, is important for future research on this topic. This finding could imply that the offering prices of the studied IPOs were consistent with their economic values and that the overvaluation was only temporarily, attributed to a speculative appetite of investors who could not get allocations of oversubscribed issues. The findings are in line with the assumption that the level of information asymmetry in the Interbellum was low. However, this raises a new question: when the implications of the 'winner's curse' model are rejected, why did firms choose to make use of the services of an underwriter at all? For this, further research is needed.

Table 4.12: Statistics of the data, Panel A

Statistic	AGE	CONVERSION	SIZE	START-UP	INDIES	AGRI	MANUFACT	SERVICES	OFFERING	LISTING	PREF
Average	8.5	0.4	6,325,246	0.2	0.3	0.2	0.5	0.3	1,051,173	2,371,820	0.2
St. Deviation	11.9	0.5	16,411,286	0.4	0.5	0.4	0.5	0.5	1,574,965	5,213,223	0.4
Minimum	0.0	0	500,000	0	0	0	0	0	46,988	496,500	0
5th perc.	0.0	0	500,00	0	0	0	0	0	157,500	500,000	0
25th perc.	0.2	0	1,000,000	0	0	0	0	0	340,500	600,000	0
Median	3.5	0	2,000,000	0	0	0	0	0	600,000	1,000,000	0
75th perc.	12.7	1	5,000,000	0	1	0	1	1	1,007,500	1,600,000	0
95th perc.	28.4	1	25,000,000	1	1	1	1	1	3,088,000	9,400,000	1
Maximum	66.1	1	125,000,000	1	1	1	1	1	12,000,000	40,000,000	1
Total		65		35	54	40	78	49	175,545,808	396,094,000	28

AGE the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; START-UP represents the number of non-converted firms younger than 1 year at the date of subscription; INDIES represents the number of firms mainly active in the Dutch East Indies; AGRI represents the number of firms mainly active in the industry agriculture; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed; PREF represents the number of issues with preferred shares.

Table 4.12: Statistics of the data, Panel B

Statistic	SELFPLACED	UNDERWRITTEN	ADMIN	SYNDICATE	REPUTATION	UNDERPRICING	RETURN	VOLATILITY
Average	0.1	0.9	0.2	0.3	0.4	0.074	0.040	0.017
St. Deviation	0.3	0.3	0.4	0.5	0.5	0.212	0.147	0.021
Minimum	0	0	0	0	0	-0.419	-0.347	0.002
5th perc.	0	0	0	0	0	-0.080	-0.175	0.005
25th perc.	0	1	0	0	0	0.000	-0.086	0.008
Median	0	1	0	0	0	0.011	0.037	0.012
75th perc.	0	1	0	1	1	0.091	0.117	0.016
95th perc.	1	1	1	1	1	0.400	0.154	0.092
Maximum	1	1	1	1	1	1.490	0.576	0.096
Total	21	146	37	49	67			

SELFPLACED represents the number of issues that was offered to investors prior to the listing by the issuing firm; UNDERWRITTEN represents the number of issues where the issuing firm asked a financial intermediary to take over the entire volume of the issue; ADMIN represents the number of issues for which administrative support was hired; SYNDICATE represents the number of issues that was taken over by a group of underwriters; REPUTATION represents the number of issues that was taken over by a reputable financial intermediary; UNDERPRICING is the return of the issues at the end of the first trading day relative to the price for the investors prior to the listing; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of a year; VOLATILITY is the variance in annual returns over three years on the Amsterdam Stock Exchange.

Table 4.13: Variables and sources

Variable	Abbreviation	Source
When a firm or underwriter made use of a financial intermediary for administrative support for the issue this variable has the value 1 and 0 in other cases.	ADMIN	Prospectus of the issue as published in Van Oss Effectenboek
The number of years since the firm was incorporated at the date investors could subscribe to the offering.	AGE	Van Oss Effectenboek
Domestic non-financial firms with their main activity in the industry agriculture.	AGRI	Van Oss Effectenboek
When the firm already existed before the date of incorporation this variable has the value 1 and 0 in other cases.	CONVERSION	Van Oss Effectenboek
Domestic non-financial firms with their main activity in the Dutch East Indies.	INDIES	Van Oss Effectenboek
The natural log of the nominal volume of the issue in NLG that is listed.	LISTING	Officiele Prijscourant
Domestic non-financial firms with their main activity in the industry manufacturing.	MANUFACT	Van Oss Effectenboek
The natural log of the volume of the issue in NLG that was offered to investors prior to the listing.	OFFERING	Prospectus of the issue as published in Van Oss Effectenboek
When the issue consisted of preferred shares this variable has the value 1 and 0 when the issue consisted of common stock.	PREF	Prospectus of the issue as published in Van Oss Effectenboek
This variable has the value 0 for the years before 1928 and 1 in 1928 and subsequent years.	REGULATION	N.A.
When the underwriter is reputable this variable has the value 1 and 0 in other cases.	REPUTATION	Renooij (1951)
Annual return of the Amsterdam stock index per ultimo of the year prior to the listing.	RETURN	Calculated with the stock market index in “111 Jaar Statistiek in Tijdreeksen” (CBS, 2010)
Type of contract where the issuing firm offers their shares themselves to investors.	SELF-PLACED	Prospectus of the issue as published in Van Oss Effectenboek
Domestic non-financial firms with their main activity in the industry commercial services.	SERVICES	Van Oss Effectenboek
The natural log of the nominal value of the authorized shares of a firm.	SIZE	Van Oss Effectenboek
This variable has the value 1 when a non-converted firm was younger than 1 year at the date that investors could subscribe to the offering.	START-UP	Van Oss Effectenboek
A group of underwriters that takes over the issue, with each member participating for a specified volume.	SYNDICATE	Prospectus of the issue as published in Van Oss Effectenboek
Type of contract where the issuing firm asks a financial intermediary to take over the issue.	UNDERWRITTEN	Prospectus of the issue as published in Van Oss Effectenboek
Three-year volatility of annual returns of the Amsterdam stock index in the year prior to the listing. Volatility is calculated as the variance in the yearly stock market return over the past 3 years prior to the listing.	VOLATILITY	Calculated with the stock market index in “111 Jaar Statistiek in Tijdreeksen” (CBS, 2010)

This table presents variables, abbreviations and sources.

Appendix: Additional results of robustness checks

Table 4.14: Bi-variate comparison of firm and issue characteristics per type of contract

Variable	(1) SELFPLACED	(2) UNDERWRITTEN	(1) vs (2)
AGE	8.72 (9.06)	7.86 (11.59)	-0.86 (0.681)
CONVERSION	0.38 (0.49)	0.42 (0.49)	0.04 (0.663)
SIZE	3,142,676 (5,286,354)	6,254,342 (16,083,944)	3,111,666 (0.266)
INDIES	0.24 (0.43)	0.30 (0.46)	0.07 (0.430)
MANUFACT	0.44 (0.50)	0.50 (0.50)	0.06 (0.552)
SERVICES	0.38 (0.49)	0.27 (0.45)	-0.11 (0.207)
OFFERING	679,001 (1,153,099)	1,045,739 (1,513,798)	366,738 (0.182)
LISTING	1,535,485 (1,776,624)	2,390,671 (5,178,788)	855186 (0.343)
PREF	0.06 (0.24)	0.17 (0.373)	0.11 (0.110)

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed and PREF represents the number of issues with preferred shares. Columns (1) and (2) present the average and standard deviation in parentheses. The column (1) vs (2) compared SELFPLACED issues with all UNDERWRITTEN issues and presents the difference in averages and a p-value of a t-test of differences. Significance levels are denoted with *** for 1%, ** for 5% and * for 10% for equal variances assumed. Number of observations: 209 issues (all data).

Table 4.15: Binary Logistic regression for a self-placement contract

Variable	(1)	(2)	(3)	(4)
AGE	-0.002 (0.893)	-0.001 (0.960)	0.003 (0.870)	-0.003 (0.865)
CONVERSION	-0.325 (0.447)	-0.106 (0.815)	-0.141 (0.767)	-0.177 (0.701)
SIZE	-0.436** (0.043)	0.172 (0.536)	0.181 (0.519)	-0.436 (0.333)
INDIES	-0.538 (0.409)	-0.577 (0.397)	-0.702 (0.319)	-0.569 (0.394)
MANUFACT	-0.017 (0.983)	-0.127 (0.874)	-0.155 (0.851)	0.033 (0.967)
SERVICES	0.491 (0.495)	0.527 (0.482)	0.475 (0.534)	0.500 (0.494)
OFFERING		-0.960*** (0.004)	-0.972*** (0.004)	
PREF		-1.194 (0.140)	-1.301 (0.111)	-1.046 (0.216)
RETURN			-2.876* (0.071)	-2.915* (0.055)
VOLATILITY			-5.892 (0.649)	-0.445 (0.972)
REGULATION			0.126 (0.827)	0.186 (0.734)
LISTING				0.065 (0.898)
CONSTANT	4.857 (0.127)	8.669** (0.019)	8.869** (0.018)	3.999 (0.256)
OBSERVATIONS	209	209	209	209
Cox & Snell R-SQ	0.035	0.081	0.099	0.062

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. P>|t| values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 209 issues (all data).

Table 4.16: Bi-variate comparison of firm and issue characteristics per underwriter reputation

Variable	(1) REPUTABLE	(2) NON- REPUTABLE	(1) vs (2)
AGE	8.25 (12.08)	7.53 (11.22)	-0.72 (0.683)
CONVERSION	0.43 (0.50)	0.42 (0.50)	-0.00 (0.958)
SIZE	10,460,564 (22,846,009)	2,712,263 (3,531,132)	-7,748,299*** (0.001)
INDIES	0.24 (0.43)	0.36 (0.48)	0.12* (0.085)
MANUFACT	0.55 (0.50)	0.45 (0.50)	-0.10 (0.202)
SERVICES	0.38 (0.49)	0.19 (0.39)	-0.19*** (0.006)
OFFERING	1,443,140 (2,075,755)	711,086 (610,811)	-732,054*** (0.001)
LISTING	3,845,488 (7,263,839)	1,165,563 (1,408,350)	-2,679,924*** (0.001)
PREF	0.20 (0.40)	0.14 (0.35)	-0.06 (0.266)
START-UP	0.21 (0.41)	0.24 (0.43)	0.03 (0.644)

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the volume of the issue in NLG offered to investors prior to the listing; LISTING is the nominal volume of the issue in NLG that was listed; PREF represents the number of issues with preferred shares and START-UP represents the number of non-converted firms younger than 1 year at the date of subscription. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Columns (1) and (2) present the average and standard deviation in parentheses. The column (1) vs (2) compared UNDERWRITTEN issues by reputable and non-reputable underwriters and presents the difference in averages and a p-value of a t-test of differences. Significance levels are denoted with *** for 1%, ** for 5% and * for 10% for equal variances assumed. Number of observations: 175 underwritten issues (all data).

Table 4.17: Binary Logistic regression of issues underwritten by a reputable underwriter

Variable	(1)	(2)	(3)	(4)
AGE	0.000 (0.984)	0.014 (0.514)	0.006 (0.828)	0.004 (0.888)
CONVERSION	-0.766* (0.094)	-0.436 (0.405)	-0.246 (0.660)	-0.113 (0.840)
SIZE	0.896*** (0.000)	0.832*** (0.004)	0.736** (0.012)	0.084 (0.852)
INDIES	1.113* (0.081)	0.351 (0.601)	0.408 (0.557)	0.391 (0.580)
MANUFACT	2.562*** (0.001)	2.628*** (0.001)	2.510*** (0.002)	2.453*** (0.004)
SERVICES	2.894*** (0.000)	3.004*** (0.000)	2.785*** (0.000)	2.774*** (0.000)
START-UP	-1.056* (0.099)	-0.706 (0.328)	-0.533 (0.478)	-0.626 (0.416)
OFFERING		0.374 (0.299)	0.490 (0.187)	
PREF		-0.453 (0.420)	-0.282 (0.625)	0.227 (0.720)
ADMIN		-1.242** (0.045)	-1.252* (0.051)	-1.423** (0.035)
SYNDICATE		-2.249*** (0.000)	-2.422*** (0.000)	-2.521*** (0.000)
RETURN			-0.005 (0.998)	0.573 (0.726)
VOLATILITY			21.317 (0.116)	16.140 (0.227)
REGULATION			0.579 (0.355)	0.659 (0.299)
LISTING				1.369** (0.022)
CONSTANT	-15.321*** (0.000)	-18.585*** (0.000)	-19.090*** (0.000)	-22.042*** (0.000)
OBSERVATIONS	175	175	175	175
Cox & Snell R-SQ	0.253	0.365	0.385	0.401

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; START-UP represents the number of non-converted firms younger than 1 year at the date of subscription; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; ADMIN represents the number of issues for which administrative support was hired; SYNDICATE represents the number of issues that was taken over by a group of underwriters; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. P>|t| values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 175 underwritten issues (all data).

Table 4.18: OLS-regression determinants of underpricing for all types of contracts

Variable	(1)	(2)	(3)	(4)	(5)	(6)
AGE	0.003*	0.002*	0.003**	0.003*	0.002	0.002
	(0.053)	(0.061)	(0.048)	(0.053)	(0.223)	(0.240)
CONVERSION	-0.001	0.006	0.016	0.016	0.006	0.009
	(0.965)	(0.862)	(0.625)	(0.630)	(0.887)	(0.819)
SIZE	0.004	0.004	0.011	-0.003	0.003	-0.033
	(0.754)	(0.827)	(0.593)	(0.906)	(0.910)	(0.340)
INDIES	0.006	0.006	0.012	0.012	-0.003	-0.004
	(0.887)	(0.896)	(0.788)	(0.785)	(0.950)	(0.943)
MANUFACT	-0.026	-0.022	-0.022	-0.021	-0.017	-0.020
	(0.629)	(0.684)	(0.687)	(0.700)	(0.794)	(0.761)
SERVICES	-0.018	-0.011	-0.011	-0.011	-0.001	-0.003
	(0.730)	(0.830)	(0.836)	(0.828)	(0.990)	(0.962)
SELFPLACED		-0.063	-0.055	-0.054	0.035	0.032
		(0.133)	(0.180)	(0.188)	(0.470)	(0.506)
OFFERING		0.000	-0.007		0.004	
		(0.994)	(0.772)		(0.903)	
PREF		-0.039	-0.029	-0.020	-0.018	0.010
		(0.365)	(0.500)	(0.668)	(0.734)	(0.860)
RETURN			0.222**	0.224**	0.198	0.212*
			(0.032)	(0.031)	(0.111)	(0.087)
VOLATILITY			-1.899**	-1.878**	-1.262	-1.343
			(0.029)	(0.029)	(0.207)	(0.173)
REGULATION			0.056	0.057	0.119**	0.122**
			(0.182)	(0.174)	(0.018)	(0.015)
LISTING				0.013		0.050
				(0.697)		(0.214)
CONSTANT			-0.026	-0.091	-0.064	-0.184
			(0.911)	(0.690)	(0.819)	(0.497)
OBSERVATIONS	195	195	195	195	199	199
R-SQ	0.025	0.040	0.089	0.090	0.080	0.088

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; SELFPLACED represents the number of issues that was offered to investors prior to the listing by the issuing firm; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. $P > |t|$ values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 195 issues (price within one year, without the two outliers). In column 5 and 6 the number of observations is 199 issues (price within two years and outliers included).

Table 4.19: OLS-regression determinants of underpricing for underwritten issues

Variable	(1)	(2)	(3)	(4)
AGE	0.002*	0.002	0.003**	0.003*
	(0.090)	(0.136)	(0.043)	(0.058)
CONVERSION	0.004	0.018	0.029	0.025
	(0.914)	(0.621)	(0.423)	(0.475)
SIZE	0.010	0.010	0.021	-0.011
	(0.496)	(0.665)	(0.349)	(0.740)
INDIES	0.012	0.004	0.016	0.017
	(0.798)	(0.938)	(0.735)	(0.719)
MANUFACT	-0.041	-0.060	-0.063	-0.054
	(0.477)	(0.323)	(0.284)	(0.350)
SERVICES	-0.016	-0.040	-0.040	-0.039
	(0.768)	(0.490)	(0.477)	(0.490)
OFFERING		-0.007	-0.023	
		(0.793)	(0.384)	
PREF		-0.046	-0.025	-0.010
		(0.305)	(0.581)	(0.840)
REPUTATION		0.050	0.056	0.054
		(0.149)	(0.104)	(0.117)
RETURN			0.282**	0.283**
			(0.013)	(0.013)
VOLATILITY			-2.747***	-2.599***
			(0.004)	(0.006)
REGULATION			0.075	0.072
			(0.110)	(0.123)
LISTING				0.023
				(0.536)
CONSTANT	-0.102	-0.005	0.047	-0.121
	(0.646)	(0.986)	(0.857)	(0.630)
OBSERVATIONS	168	168	168	168
R-SQ	0.028	0.048	0.124	0.122

AGE is the age in years of an incorporated firm at the date of subscription; CONVERSION represents the number of firms that already existed before incorporation; SIZE is the natural log of the nominal volume of the authorized shares in NLG; INDIES represents the number of firms mainly active in the Dutch East Indies; MANUFACT represents the number of firms mainly active in the industry manufacturing; SERVICES represents the number of firms mainly active in the industry commercial services; OFFERING is the natural log of the volume of the issue in NLG offered to investors prior to the listing; PREF represents the number of issues with preferred shares; REPUTATION represents the number of issues that was taken over by a reputable financial intermediary; RETURN is the annual return of the Amsterdam Stock Exchange per ultimo of the year prior to the listing; VOLATILITY is the variance in annual returns on the Amsterdam Stock Exchange in the year prior to the listing; REGULATION is a dummy variable for institutional changes after 1927; LISTING is the natural log of the nominal volume of the issue in NLG that was listed. P>|t| values in parentheses and significance levels are denoted with *** for 1%, ** for 5% and * for 10%. Number of observations: 168 underwritten issues with a price within one year.

5 Summary and concluding comments

This thesis contains three studies on initial public offerings (IPOs) in the Netherlands (stocks) and Belgium (stocks and bonds). The study in chapter 2 on 1,263 Dutch stock IPOs between 1876 and 2015 shows that the yearly number of IPOs fluctuates with the business cycle and that IPOs are timed to coincide with periods in which investors are optimistic and that periods with uncertain investors are avoided. The IPOs cluster in eight hot markets and with a time series regression model 50 per cent of the fluctuations and five of the hot markets can be explained. An in-depth historical analysis, supported by views of contemporaries in the financial press, shows that the essential drivers for the three unexplained hot markets are industry-specific. The firms that went public at the end of the nineteenth century and in the 1950s had specific high capital needs which were unrelated to the overall economy while firms that went public in the mid-1980s used a window of opportunity in which investors were particularly optimistic about their industry in combination with lower entry requirements for a listing.

The study in chapter 3 of the fluctuations in the number of 922 stock IPOs in Belgium between 1839 and 1935 can be seen as a follow-up on the study for the Netherlands. In general, the results of the regressions of both studies are similar: the number of IPOs fluctuates significantly with the growth of the economy, so that it can be assumed that firms use the proceeds of the issue to finance investments, and IPOs are timed by the issuing firm to coincide with favorable market conditions to maximize the proceeds of the issue. The study on the fluctuations of stock IPOs in Belgium adds two important aspects compared to the study for the Netherlands: 1) the possible interaction between stock and bond IPOs and 2) the influence of regulatory changes on the number of IPOs. The study on 387 bond IPOs shows that the number also fluctuates significantly with the economy and that these IPOs are also timed to maximize the proceeds. An important finding in this study, however, is that these effects are strongest for both types of issues after the introduction of major regulatory changes in 1873, which integrated the BSE more into the Belgian economy. Another finding is that there is no significant interaction between the two types of issues. A bond IPO does not complement or substitute a stock IPO and vice versa. Stock and bond IPOs are two independent financing instruments whose number fluctuates with the growth of the economy but with their own timing variables.

The study in chapter 4 analyzes the determinants of the offering method for stock IPOs and investigates whether the chosen method affects the level of underpricing. A large number of papers

have been written on underpricing, but only a few papers empirically studied its dependence on the method. The most used explanation for underpricing is that underpricing is the result of information asymmetries between the issuing firm, the financial intermediary and investors. Because an underwriter can help reducing the adverse impact of the asymmetries between the issuing firm and potential investors, the underpricing of underwritten IPOs is expected to be lower than it would have been if the issuing firm had used a non-underwritten method. As a result, firms whose proceeds of the IPO are most affected by underpricing, prefer the services of an underwriter. However, underwriting is costly and therefore less suitable for small offerings. The empirical implication is that firms that offer small volumes and firms with low levels of information asymmetries, prefer the use of a non-underwritten offering. The period 1918 - 1939 was tumultuous for the Amsterdam Stock Exchange. Many firms listed their shares, using different kinds of offering methods and investor sentiment changed from bullish in the 1920s to bearish after 1929. It was also a period with presumably low levels of information asymmetries due to the close and personal relationship between the executives of firms and banks and investors. It is therefore of interest to investigate whether contemporary theories can explain the choice of the offering method and its effect on the level of underpricing in this era. The study shows that the volume of the fraction that is offered to investors prior to the listing largely determines the offering method. When this volume increases, more firms tend to use an underwritten contract. It also shows that the offering method is not a determinant of the level of underpricing, just like the variables that proxy information asymmetries are not.

The three studies show that historical events, such as IPO waves, offering method and underpricing, can only be partly explained with modern theories. One of the reasons for this is that these theories are based on certain stable institutional settings that may differ from the setting in which the studied event occurred. Without taking these differences into account, it is also difficult to draw valid conclusions when comparing results from studies across time periods or countries, such that the conclusions teach lessons that are relevant for today or the future.

The three studies also have several limitations, which call for further research. Firstly, using only regressions to determine the drivers of the number of IPOs has its limitations because it is assumed in these regressions that the independent variables influence all IPOs to the same extent. That this is not the case becomes clear in the first study. We therefore use an in-depth historical

analysis, in addition to the OLS-regressions. The strengths and weaknesses of both methods make them complementary and we hope that both methods are used more often in future research. Second, based on a large set of exogenous variables, it is found that the number of stock and bond IPOs were not interrelated in Belgium in the period 1839-1935. However, how firms chose between a stock and bond IPO is complex and a more complete study on this topic should also take endogenous variables into account. Third, in the third study underpricing is defined as the difference between the price for which the shares were offered to investors prior to the listing and the price of the shares at the end of the first day of trading. From a firm's perspective this is correct under a self-placed offer. However, the amount of money left on the table for a firm under an underwritten offer, may be substantially higher when underpricing is based on the price for which the financial intermediary has taken over the issue. We call on further research into underpricing to also study the archives of the consortia.

6 References

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7 Nederlandse samenvatting

Na een sterke stijging in de tweede helft van de 19e eeuw bereikte het aantal bedrijven dat hun aandelen noteerde aan de Amsterdamse beurs een recordhoogte in het begin van de jaren dertig van de twintigste eeuw. Ondanks een opleving van tijd tot tijd, is dit aantal sindsdien gedaald. De instroom van nieuwe bedrijven is blijkbaar onvoldoende om de uitstroom als gevolg van overnames, faillissementen, fusies en privatiseringen te compenseren. Daarentegen is de Nederlandse economie sinds 1930 met meer dan een factor 100 gegroeid (bron: CBS)⁷³ en is het aantal binnenlandse bedrijven met een factor 10 toegenomen tot in totaal 1,9 miljoen (bron: Rijksverzekeringsbank en CBS).⁷⁴ Een daling van het aantal genoteerde bedrijven wordt ook waargenomen in andere landen, zoals in België (Van Nieuwerburgh *et al.*, 2006) en in de VS en het VK (Stulz, 2019)⁷⁵, waardoor de daling in Nederland niet zomaar toegeschreven kan worden aan een eventuele veranderende rol van de Amsterdamse aandelenbeurs in internationale kapitaalmarkten.

Een beursnotering kan worden verkregen door middel van een Initial Public Offering (IPO) en de overgang van een private naar een publieke onderneming wordt gezien als een keerpunt in de levenscyclus van elk bedrijf (Lowrey *et al.*, 2017). Met een notering krijgt de onderneming toegang tot een nieuwe financieringsbron, maar moet voorafgaand een toelatingsproces doorlopen (Fjesme *et al.*, 2021a) en gedurende zijn verdere publieke leven omgaan met de regelgeving van de beurs. Zodra het besluit is genomen om een beursnotering aan te vragen, moet het management van een onderneming over veel aspecten beslissen. Zo moet worden bepaald hoeveel aandelen er worden uitgegeven en voor welke prijs, wanneer de aanvraag zal worden ingediend en welke methode zal worden gebruikt om de aandelen bij beleggers aan te bieden voorafgaand aan de notering.

Veel aspecten die te maken hebben met de overgang van een private naar een publieke onderneming zijn eerder onderzocht, maar voornamelijk voor de VS en in recente periodes. Zo documenteren papers de kenmerken van de ondernemingen die een beursnotering verkrijgen (bijvoorbeeld Chemmanur en Fulghieri, 1999), hun motieven voor het aanvragen van een notering

⁷³ Niet gecorrigeerd voor inflatie. BBP van 1930 komt uit Tweehonderd jaar statistiek in tijdreeksen 1800-1999 (CBS, 2001), hoofdstuk 9. CBS heeft het bestand met de data ter beschikking gesteld. BBP van 2020 komt van Statline via CBS <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/84087NED/table?ts=1638105608604>

⁷⁴ In 1930 waren 183.389 bedrijven geregistreerd bij de Rijksverzekeringsbank. Het aantal bedrijven in 2020 komt van Statline, 4e kwartaal 2020 via CBS <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/81589NED/table?ts=1637864097826>

⁷⁵ Terwijl Van Nieuwerburgh *et al.* de periode 1830 – 2000 bestudeert, bestrijkt de data in Stulz (2019) de periode 1975 - 2018.

(bijvoorbeeld Pagano *et al.*, 1998), de fluctuaties in de tijd van het volume van de IPO's (bijvoorbeeld Lowry, 2003) en de timing van het indienen van de aanvraag (bijvoorbeeld Baker en Wurgler, 2002). In deze dissertatie worden de genoemde aspecten onderzocht, maar op een andere manier waarbij gebruik wordt gemaakt van historische data voor Nederland en België.

Een hardnekkig fenomeen met betrekking tot de prijsstelling van IPO's is dat de koers van het aandeel aan het einde van de eerste handelsdag gemiddeld substantieel hoger is dan de prijs waarvoor het aandeel eerder bij beleggers is aangeboden. Door dit fenomeen, dat bekend staat als *underpricing*, laten ondernemingen 'geld op tafel liggen' omdat de markt blijkbaar de waarde van het aandeel hoger inschat. Volgens diverse modellen (bijvoorbeeld Rock, 1986) worden aandelen bewust voor een prijs onder de marktwaarde aangeboden bij beleggers, maar waarom ondernemingen dit doen is een van de grootste puzzels rond beursintroductions (Lowry *et al.*, 2017). Een mogelijke verklaring is dat *underpricing* afhankelijk is van de methode die gebruikt wordt bij het aanbieden van de aandelen voorafgaand aan de notering (bijvoorbeeld Baron, 1982) en in dit proefschrift wordt onderzocht of dit het geval is bij Nederlandse beursintroductions.

In hoofdstuk 2 worden de kenmerken van de ondernemingen, hun motieven voor het aanvragen van een beursnotering en de timing van hun aanvraag, met name de clustering van aanvragen in zogenaamde hot IPO-markten, geanalyseerd voor Nederlandse niet-financiële ondernemingen die een notering verkregen aan de Amsterdamse beurs tussen 1876 en 2015. Dit hoofdstuk is in 2021 gepubliceerd in *European Review of Economic History* onder de titel "What causes hot markets for equity IPOs? An analysis of initial public offerings in the Netherlands, 1876 – 2015". In hoofdstuk 3 worden de motieven voor en de timing van een aanvraag nader onderzocht. In dit hoofdstuk gaat het vooral om de vraag of een aandelen-IPO complementair is met die van een obligatie, of dat deze twee financieringsinstrumenten substituten zijn. Tevens wordt onderzocht of de motieven en timing van deze IPO's worden beïnvloed door wijzigingen in de regelgeving voor de beurs. Voor het beantwoorden van deze vragen zijn de beursintroductions van aandelen en obligaties bestudeerd die zijn uitgegeven door niet-financiële binnenlandse bedrijven in België tussen 1839 en 1935, een periode waarin de regulering van de beurs drastisch wijzigde. In hoofdstuk 4 worden de determinanten van de keuze voor de methode voor het aanbieden van aandelen voorafgaand aan de notering onderzocht en wat het effect is van deze keuze op het niveau van *underpricing*. Hiertoe worden de IPOs onderzocht van Nederlandse niet-financiële

ondernemingen die in het interbellum een notering verkregen. In het resterende deel van deze inleiding worden de analyses van deze aspecten en hun belangrijkste resultaten nader beschreven.

7.1 Wat leidt tot ‘hot’ IPO-markten voor aandelen?

Een levendige markt voor publieke aandelen kan economische groei faciliteren en stimuleren (Van Nieuwerburgh *et al.*, 2006) en om publieke markten te laten groeien binnen het financiële systeem van een land, zijn nieuwe noteringen essentieel. Het is daarom belangrijk om te begrijpen welke ondernemingen een beursnotering aanvragen, wat hun motieven hiervoor zijn en wat de oorzaak is voor het clusteren van beursintroducties in de tijd in zogenaamde hot markets. Deze aspecten worden onderzocht in hoofdstuk 2 met gegevens van 1.263 beursintroducties van Nederlandse niet-financiële bedrijven die tussen 1876 en 2015 een notering verkregen.

Het is algemeen bekend dat het aantal beursintroducties van aandelen in de tijd fluctueert en dat perioden kunnen worden gekarakteriseerd als zogenaamde hot en cold markets met respectievelijk veel en weinig beursintroducties (bijvoorbeeld Ibbotson en Jaffe, 1975). In de literatuur over economische geschiedenis zijn de fluctuaties en hot markets doorgaans over een korte periode bestudeerd en hebben deze periodes vaak specifieke kenmerken (bijvoorbeeld Burhop *et al.*, 2011). Hot IPO-markets zijn ook bestudeerd in de financiële literatuur, maar voornamelijk over relatief korte en recente perioden voor de Amerikaanse markt (bijvoorbeeld Ritter en Welch, 2002). Sommige onderzoekers beweren dat ondernemingen de opbrengsten van hun IPO gebruiken om investeringsmogelijkheden te financieren en omdat deze mogelijkheden variëren met de conjunctuur, fluctueert het aantal IPO's in de tijd (zie Choe *et al.*, 1993; Lowry, 2003; Pástor en Veronesi, 2005). Andere theoretische oorzaken voor de fluctuatie in het aantal IPO's zijn in de tijd variërende marktomstandigheden. De onzekerheid van beleggers over de waarde van een IPO leidt tot hogere selectiekosten die de opbrengst negatief beïnvloeden en omdat deze onzekerheid in de tijd varieert, fluctueert het aantal beursintroducties mee. Als gevolg hiervan worden IPO-golven voorafgegaan door hoge markttrendementen (zie Pástor en Veronesi, 2005; Banerjee *et al.*, 2013) en worden perioden met negatieve marktomstandigheden vermeden (Choe *et al.*, 1993; Pástor en Veronesi, 2005; Banerjee *et al.*, 2013). De derde theoretische oorzaak voor het fluctueren is timing. Volgens deze theorie timen bedrijven hun aandelenuitgifte zodat deze samenvalt met gunstige marktomstandigheden. Deze theorie koppelt de clustering in de tijd

bijvoorbeeld aan een tijdelijke overwaardering die wordt weerspiegeld in de beursindex (zie Lucas en McDonald, 1990; Lerner, 1994; Pagano *et al.*, 1998; Banerjee *et al.*, 2013).

In hoofdstuk 2 van deze dissertatie worden de oorzaken van de fluctuatie in IPO's van aandelen en hun clustering in hot markets onderzocht. Anders dan in de bestaande financiële literatuur en de literatuur over economische geschiedenis, gebruiken we voor ons onderzoek twee complementaire methoden. We gebruiken eerst een econometrisch model, gebaseerd op Ordinary Least Squares-regressies, om te bepalen of de bovengenoemde theoretische oorzaken de fluctuatie in het aantal Nederlandse IPO's en hun clustering in hot markets kunnen verklaren. In een tweede stap gebruiken we een diepgaande historische analyse om de oorzaken te achterhalen van de hot markets die ons model niet verklaart. Op basis van het econometrische model vinden we aanwijzingen dat economische groei een sterke aanjager is voor het aantal IPO's, een indicatie dat het financieren van investeringsmogelijkheden een motief is. We vinden geen significant verband met de rente, een eerste indicatie dat beursintroductions van aandelen niet gerelateerd zijn aan die van obligaties. Deze relatie wordt verder onderzocht in hoofdstuk 3. Daarnaast vinden we dat het aantal IPO's over de gehele periode sterk positief gerelateerd is aan het beursrendement in het jaar voorafgaand aan de notering, een indicatie dat IPO's getimed zijn om samen te vallen met perioden met enthousiaste beleggers, en negatief gerelateerd is aan de volatiliteit van dit rendement, een indicatie dat perioden met grote onzekerheid bij beleggers worden vermeden. We vinden geen bewijs voor de bewering dat IPO's worden getimed op basis van een tijdelijke overwaardering, maar wel aanwijzingen dat de rol van de Amsterdamse beurs op de nationale kapitaalmarkt het aantal IPO's beïnvloedt.

Het econometrische model verklaart ongeveer 50 procent van de fluctuatie in het aantal IPO's en vijf van de acht waargenomen hot IPO-markets. Met behulp van gedetailleerde contextuele beschrijvingen die ondersteund worden door uitspraken van tijdgenoten in de financiële pers, stellen we vast dat de essentiële aanjagers van de drie onverklaarde hot markets sectorspecifiek zijn. De bedrijven die in deze markten naar de beurs gingen, hadden ofwel een hoge kapitaalbehoefte die geen verband hield met de algemene economie, of maakten gebruik van een gelegenheid waarin investeerders bijzonder optimistisch waren over hun sector in combinatie met minder strenge toelatingseisen tot de beurs.

7.2 Een notering aanvragen

Het onderzoek in hoofdstuk 3 van deze dissertatie is een uitbreiding van het onderzoek van hoofdstuk 2. In dit hoofdstuk zijn we vooral geïnteresseerd in de vraag of IPO's van aandelen gerelateerd zijn aan die van obligaties en of de motieven en timing van de aanvraag voor een notering voor beide type IPO's worden beïnvloed door wijzigingen in de regelgeving. Net zoals voor IPO's van aandelen is het bekend dat het aantal IPO's van obligaties ook fluctueert in de tijd (bijvoorbeeld Becker en Ivashina, 2014). De literatuur over deze fluctuaties is echter niet zo uitgebreid als die van beursintroducties van aandelen. Hale en Santos (2008) vinden dat bedrijven hun beursintroducties van obligaties timen om periodes met een economische recessie te vermijden en dat buiten deze periodes geen timing plaatsvindt. Becker en Ivashina (2014) vinden dat monetair beleid en veranderingen in het aanbod van bankkredieten ook relevant zijn omdat bankleningen een alternatief zijn voor obligatie-emissies en Pour (2017) vindt effecten van informatieasymmetrie op de timing van IPO's van obligaties.

IPO's van aandelen en obligaties kunnen elkaars substituten of aanvullingen zijn en hoe een onderneming kiest tussen het uitgeven van aandelen en het verhogen van schuld wordt fel bediscussieerd. De trade-off-theorie voorspelt dat bedrijven de voorkeur geven aan het verhogen van schuld door middel van het uitgeven van een obligatie, zolang het belastingvoordeel van schulden opweegt tegen de kosten van financiële problemen. De alternatieve pecking-order theorie voorspelt dat het verhogen van schuld de voorkeur heeft vanwege de hogere opbrengst als gevolg van een informatiepremie die beleggers eisen bij een aandelenemissie (Myers, 1984). Baker en Wurgler (2002) vinden dat bedrijven hun beursintroductie zo timen dat deze samenvalt met gunstige marktomstandigheden en omdat deze marktomstandigheden voor aandelen en obligaties niet synchroon veranderen, verschillen de voorkeuren voor een aandelen- en obligatie-uitgifte in de loop van de tijd. Glushkov *et al.* (2018) vinden dat ondernemingen eerder via een obligatie dan met een aandelenemissie naar de beurs gaan als ze activa hebben die beter geschikt zijn voor financiële analyse en wanneer ze worden ondersteund door durfkapitaal- of een private equity-onderneming.

We zijn bekend met twee papers die het effect van wijzigingen in de regelgeving hebben onderzocht op fluctuaties in het aantal beursintroducties van aandelen. Gao *et al.* (2013) vinden dat de afname van het aantal beursintroducties met aandelen in de VS tussen 2001 en 2012 niet wordt verklaard door strengere regelgeving, zoals de Sarbanes-Oxley Act van 2002. Ook vinden ze dat

een vermindering van de regeldruk voor kleine ondernemingen niet leidt tot een toename van het aantal beursintroductions door deze ondernemingen. Cattaneo *et al.* (2015) bestuderen alle 879 Italiaanse IPO's vanaf de éénwording van Italië in 1861 tot 2011 en hun belangrijkste bevinding is dat versoepeling van de regelgeving het aantal IPO's niet verhoogt. Er is ons geen recent paper bekend dat het effect van wijzigingen in de regelgeving op fluctuaties in het aantal beursintroductions van obligaties heeft onderzocht.

Voor ons onderzoek hanteren we een historische benadering en koppelen IPO's van aandelen en die van obligaties, twee financieringsinstrumenten die in de bestaande literatuur meestal afzonderlijk worden behandeld. De data is afkomstig van IPO's die in België werden uitgegeven tussen 1839 en 1935, een periode die de mogelijkheid biedt om de effecten te bestuderen van een abrupte en drastische versoepeling van beursregelgeving die plaatsvond in 1873. In deze periode was België een van de meest geïndustrialiseerde landen ter wereld (gemeten naar industriële productie per hoofd van de bevolking) en was de Brusselse beurs een van 's werelds meest toonaangevende beurzen (Buelens, 2001). Het was ook een periode met een slechte bescherming van beleggers, geen fiscale voordelen en een periode waarin significante veranderingen in de algemene monetaire situatie plaatsvonden. Voor onze analyse construeren we een dataset van 922 beursintroductions van aandelen en 387 obligaties die zijn uitgegeven door 943 binnenlandse niet-financiële bedrijven met hun belangrijkste activiteiten in België. We beginnen met een analyse van het aantal IPO's van aandelen en obligaties afzonderlijk. Hiervoor gebruiken we regressiemodellen met economische, timing- en institutionele verklarende variabelen, voor de volledige periode en voor twee deelperiodes 1839-1872 en 1873-1935. Hiermee kunnen we de effecten onderzoeken van de wijzigingen die werden geïntroduceerd in 1873. Deze modellen zijn vergelijkbaar met de modellen die in hoofdstuk 2 worden gebruikt. Vervolgens testen we met een 3SLS-model (Zellner en Theil, 1962) de interactie tussen beursintroductions van aandelen en obligaties, om vast te stellen of ze substituten, complementen of niet-gerelateerd zijn.

Onze belangrijkste bevindingen zijn dat in een goed ontwikkelde effectenmarkt beursintroductions van aandelen en obligaties getimed worden om te profiteren van gunstige marktomstandigheden en dat het aantal IPO's fluctueert met de economie. We stellen ook vast dat bedrijven er de voorkeur aan geven eerst aandelen uit te geven, vooral in expansieve fasen van de conjunctuurcyclus. We vinden geen bewijs dat beursintroductions van aandelen en obligaties substituten of aanvullingen zijn, maar we vinden wel ondersteuning voor de bevindingen van Gao

et al. (2013) en Cattaneo *et al.* (2015) dat versoepeling van de regelgeving niet meteen leidt tot een toename van het aantal beursintroducties. Het is echter waarschijnlijk dat de drastische en abrupte versoepeling van de beursregelgeving die in 1873 plaatsvond, een economische ontwikkeling teweeg heeft gebracht in België die leidde tot een bloeiende IPO-markt in de volgende decennia.

7.3 Determinanten van de aanbiedingsmethode en het effect ervan op underpricing

Het al dan niet gebruikmaken van de diensten van een underwriter bij het aanbieden van aandelen bij beleggers voorafgaand aan een beursintroductie heeft de laatste tijd de aandacht van de financiële media getrokken met de direct listings van unicorns zoals Spotify en eerder met de Dutch Auction voor de beursgang van Google.⁷⁶ Het debat in de financiële literatuur over de voordelen voor ondernemingen om van de diensten van een underwriter gebruik te maken, in plaats van een uitgifte voor eigen risico, is geworteld in studies over underpricing van de jaren tachtig (bijvoorbeeld Beatty en Ritter, 1986). De aanname in deze studies is dat private informatie van de verschillende partijen die betrokken zijn bij de aandelenmarkt de belangrijkste oorzaak is van underpricing. Eén van de fundamentele modellen die underpricing probeert te verklaren is, volgens Lowry *et al.* (2017), het ‘winner’s curse’-model van Rock (1986). Dit model richt zich op informatieasymmetrie tussen de onderneming en beleggers en koppelt underpricing aan de onzekerheid bij beleggers over de marktwaarde van de aandelen en aan de homogeniteit van de groep beleggers. Omdat een underwriter kan optreden als een informatieproducent, waardoor de nadelige gevolgen van deze asymmetrie worden verminderd, is de underpricing van IPO’s waarbij gebruik wordt gemaakt van underwriters lager dan het geval zou zijn geweest bij een uitgifte voor eigen risico (Chemmanur en Fulghieri, 1994). Het gebruikmaken van de diensten van een underwriter is echter duur (Goergen *et al.*, 2006) en omdat underwriters hun waardevolle reputatie willen beschermen en deze reputatie wordt geschaad bij elke IPO die ze onjuist prijzen (Beatty en Ritter, 1986), worden risicovolle ondernemingen gemeden door gerenommeerde underwriters.

In het interbellum was het in Nederland niet ongebruikelijk dat ondernemingen naar de beurs gingen zonder gebruik te maken van de diensten van een underwriter. Ook direct listings kwamen regelmatig voor. Volgens Renooij (1951) hing de keuze om al dan niet gebruik te maken

⁷⁶ Bijvoorbeeld “Spotify goes for gutsy direct listing on stock exchange – here are the winners and losers”, THE CONVERSATION, Academic rigour, journalistic flair, April 4, 2018, via <https://theconversation.com/spotify-goes-for-gutsy-direct-listing-on-stock-exchange-here-are-the-winners-and-losers-94209>

van de diensten van een underwriter af van het risico dat aan de IPO verbonden was. Een onderneming koos ervoor om geen gebruik te maken van de diensten van een underwriter als het risico van het mislukken van de uitgifte door de onderneming kon worden gedragen of wanneer de onderneming geen underwriter kon vinden vanwege een te hoog risico op mislukken. Dit is interessant omdat deze criteria vrijwel identiek zijn aan hedendaagse criteria (zie Chemmanur en Fulghieri, 1994), terwijl het niveau van informatieasymmetrie in het Interbellum waarschijnlijk laag was vanwege langdurige relaties tussen bedrijven en banken (Van den Broeke, 1988; Jonker, 1989) en investeerders, en de veronderstelde afwezigheid van slecht geïnformeerde beleggers. Dit roept de vraag op hoe goed hedendaagse theorieën de methode voor het aanbieden van aandelen bij beleggers voorafgaand aan de beursintroductie in het Interbellum kunnen verklaren en wat het effect van deze keuze is op underpricing. Om deze vragen te beantwoorden, worden in hoofdstuk 4 van deze dissertatie 167 beursintroducties bestudeerd die in de periode 1918-1939 in Nederland zijn uitgegeven door niet-financiële binnenlandse bedrijven.

De resultaten van het onderzoek laten zien dat de fractie van het volume van de IPO die voorafgaand aan de notering aan beleggers werd aangeboden, de belangrijkste bepalende factor is voor het al dan niet gebruikmaken van de diensten van een underwriter. Hoe kleiner dit volume is, hoe meer bedrijven kiezen voor een uitgifte voor eigen risico. Dit resultaat heeft twee implicaties. Ten eerste lijkt het dat ondernemingen bij het bepalen van de aanbiedingsmethode rekening houden met het risico van het mislukken van de aandelenuitgifte. Bij kleinere uitgiftes kan dit risico gemakkelijker door de onderneming zelf worden gedragen. Ten tweede lijkt het dat de kosten die gepaard gaan met het gebruikmaken van de diensten van een underwriter ook relevant zijn. Omdat deze kosten een groot deel uitmaken van de opbrengst (Goergen *et al.*, 2006), lijkt het gebruikmaken van een underwriter minder geschikt voor kleinere volumes.

De resultaten van het onderzoek laten ook zien dat het niveau van underpricing relatief laag was, gemiddeld zes procent, en dat het niveau voor de individuele IPO's niet gerelateerd is aan kenmerken van de onderneming, de gehanteerde methode, de reputatie van de underwriter en de fractie van het volume dat werd aangeboden bij beleggers of het volume van de IPO. De underpricing fluctueerde voornamelijk met het beursrendement en de volatiliteit hierin in het jaar voorafgaand aan de notering. Dit impliceert dat informatieasymmetrie op de aandelenmarkt niet bepalend was voor het niveau van underpricing. Mogelijk waren de prijzen waarvoor de aandelen

werden aangeboden in overeenstemming met hun economische waarden en was een eventuele overwaardering slechts tijdelijk als gevolg van overenthousiaste beleggers.

7.4 *Verantwoording*

Hoofdstuk 2 is gebaseerd op gezamenlijk werk met Abe de Jong. Met dank aan Carsten Burhop, David Chambers, Ton de Graaf, Marc Deloof, Joost Jonker, Christopher Meissner (de redacteur van *European Review of Economic History*), twee anonieme recensenten, Peter Roosenboom en deelnemers aan de jaarlijkse conferentie van de *Economic History Society Annual* (Universiteit van York) en de Eurhistock-conferentie (Universiteit Antwerpen) voor hun commentaren en discussies. Hoofdstuk 3 is gebaseerd op een gezamenlijk werk met Marc Deloof en Abe de Jong. We danken Peter Roosenboom en Gertjan Verdickt voor nuttige opmerkingen en Frans Buelens voor zijn opmerkingen over de institutionele setting van België en voor het verstrekken van de gegevens. Hoofdstuk 4 is volledig van mijn hand. Ik dank Abe de Jong en Peter Roosenboom voor hun commentaar en feedback.



8 Biography

Wilco Legierse was born in Dirksland, the Netherlands, on June 8, 1964. He is married to Annelies and they live in Zoetermeer, the Netherlands. He earned his bachelor's degree in electrical engineering in 1987 and in 2010 he finished his master's degree in Business Administration at the Erasmus University in Rotterdam. The subject of his master thesis is the fluctuation in the number of Dutch stock IPOs between 1876 and 2010. Wilco entered the PhD-program at the Rotterdam School of Management as an external PhD-candidate under the supervision of Prof. Abe de Jong and Prof. Peter Roosenboom in 2015 along his full-time position as Senior Project Manager for Rail Solutions and Services at Siemens Mobility. His academic work is presented at the annual conference of the Economic History Society at the University of York in April 2013 and at the Eurhistock Conference at the University of Antwerp in May 2013. Wilco's research areas of interest are corporate finance and business history. The article version of Chapter 2 "What causes hot markets for equity IPOs? An analysis of initial public offerings in the Netherlands, 1876 – 2015" is based on his master thesis and is published in *European Review of Economic History* in 2021.

9 Portfolio

Completed PhD courses (with ERIM)

Economic Foundations of Research in Management

Philosophy of Science for Research in Management

Methodology for Research in Management

Publishing about Research in Management

Scientific Integrity

Publications

De Jong, A., Legierse, W.E.J., 2021, “What Causes Hot Markets for Equity IPOs? An Analysis of Initial Public Offerings in the Netherlands, 1876-2015”, *European Review of Economic History*, May 2021.

The ERIM PhD Series

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The number of firms that list their shares on the Amsterdam stock exchange reached a record high in the early 1930s and has since fallen. The influx of new listings through Initial Public Offerings (IPOs) is insufficient to compensate for delistings due to takeovers, bankruptcies, mergers and privatizations. Such a decline is also observed in other countries, so that the trend in the Netherlands cannot simply be attributed to a changing role of its stock exchange in the international capital markets. In order to understand the decline in the number of listings, Wilco Legierse investigates in this dissertation which factors determine the influx of newcomers on the basis of Dutch and Belgian historical data. In addition, he investigates the causes of a persistent phenomenon with respect to the pricing of stock IPOs, so-called underpricing.

Wilco's dissertation demonstrates that a firm's capital need, the role of the Amsterdam stock exchange in the Dutch capital market and investors' sentiment were strong drivers for hot IPO-markets between 1876 and 2015 in the Netherlands. An analysis with Belgian data shows that stock IPOs between 1839 and 1935 were neither complementary nor substitute to bond IPOs and that an abrupt drastic relaxation of stock market regulations in 1873 did not immediately increase the number of both types of IPOs. With regard to pricing, Wilco provides evidence that Dutch stock IPOs were on average underpriced in the interwar period and that the level of underpricing fluctuated with the sentiment on the Amsterdam stock exchange, independent of the offering method.

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